Napa County Flood Control and
Water Conservation District

Annual Report for 2012
Stream Maintenance Projects

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Stream Maintenance Program
2012 Projects

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Section 1
Stream and Watershed Maintenance Summary

The 2012 Stream Maintenance season, included nine vegetation maintenance, nine downed tree management, two sediment removal, one barrier removal and five riparian planting projects. The one bank stabilization project on the Yountville Collector which appeared in the 2012 notification was not completed during the 2012-2013 maintenance season. The tables below summarize the project locations, maintenance activities implemented, and quantity of material removed from each site in cubic yards. Maps delineating project locations are provided in Appendix A.

1A. Vegetation Management

During the 2012 Stream Maintenance season, vegetation maintenance included selective trimming, thinning, and removal of instream vegetation that is causing flow blockages or significantly increasing hydraulic roughness and thereby reducing channel conveyance capacity. In most channels, meeting these goals requires balancing flood protection needs with habitat protection or enhancement. Vegetation management is focused on high priority sites and only occurred in a portion of the identified reach, not over the entire reach length. Vegetation maintenance activities were implemented according to the principles and procedures outlined in the Stream Maintenance Manual (SMM) (*Chapter 4 Vegetation Maintenance*), as well as the associated terms outlined in the Napa County Flood Control and Water Conservation District's (District) Stream Maintenance Program (SMP) permits.

Table 1-1: 2012 Vegetation Maintenance Activities

Creek	Location	Latitude/ Longitude	Vegetation Maintenance Activities				
			Willow Pruning yrds²	*Cattail Management Linear ft.*	*Invasive Removal yrds²*	*Arundo/ Invasive Spraying*	*Blackberry Removal yrds²*
Engineered Flood Control Channel							
Beard Ditch	Finnell Rd.	122°21'23.265"W 38°24'20.364"N		**75**			
Villagio Channel	Washington St.	122°21'30.505"W 38°23'53.71"N		**25**			
Salvador Collector	Trower Ave.	122°21'46.446"W 38°24'19.348"N		**250**			
Salvador Reach 1	Byway E.	122°19'10.226"W 38°20'1.562"N	**16**		**16**		**30**
Salvador Reach 2	Jefferson St.	122°18'15.62"W 38°19'56.634"N	**20**		**10**		**20**
Modified Channels							
Hopper Creek	Washington St.	122°21'48.353"W 38°24'18.077"N	**2**		**8**		

Creek	Location	Latitude/ Longitude	Vegetation Maintenance Activities				
			Willow Pruning yrds²	*Cattail Management Linear ft.*	*Invasive Removal yrds²*	*Arundo/ Invasive Spraying*	*Blackberry Removal yrds²*
Tulocay Creek	Shurtleff Ave.	122°16'0.532"W 38°17'20.784"N	**10**				
Natural Channels							
Napa River	Oakville Cross Rd.	122°22'44.665"W 38°26'46.24"N				**X**	
Dry Creek	Hwy 29	122°20'14.701"W 38°21'56.233"N	**10**		**3**		

1B. Downed Tree Management

The District considers downed trees (and their woody debris) a highly valuable ecological resource to stream channels. Large trees varying in length from 20-170 ft. tall and 2-5 ft. 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. The District manages downed trees and woody debris for flood control and habitat benefits in accordance with the procedures outlined in the SMM (*Chapter 5 Downed Tree Management*).

Table 1-2: Downed Tree Management & LWD Recruitment

Creek/Reach	*Project Site*	*Tributary To*	*Linear FT*	*Area Disturbed Sq. Ft./ Acreage*	*Downed Tree Removal*	*LWD Recruitment*	*Latitude/ Longitude*
Engineered Flood Control Channel							
Salvador Creek Reach 2	Garfield Ln.	Napa River	20	100ft²/.002	Remove	NA	122°17'54.964"W 38°19'50.9"N
Modified Channel							
Milliken Creek	Kaanapali Rd.	Napa River	40	200ft²/.004	NA	Re-Orient	122°15'49.635"W 38°20'45.358"N
Natural Channel							
Upper Browns Valley	Broadmoor Dr.	Napa Creek	30	250ft²/.006	NA	Re-Orient/ Modify	122°20'43.001"W 38°18'31.125"N
Lower Browns Valley	Chase Ln.	Napa Creek	40	400ft²/.009	NA	Re-Orient	122°19'33.674"W 38°18'13.674"N
Napa Creek	California Blvd.	Napa River	20	100ft²/.002	NA	Re-Orient/ Modify	122°16'1.095"W 38°19'29.862"N
Napa River	Spring Street	Napa River	20	100ft²/.002	NA	Modify	122°34'56.708"W 38°34'46.948"N
Winter Notification-Flood Debris and Downed Tree Issues Arising From Winter Storms							
Dry Creek	Vineyard Ln.	Napa River	20	100ft²/.002	NA	Modify	122°19'17.772"W 38°22'58.771"N
Napa River	Berry Street	Napa River	20	100ft²/.002	NA	Remove	122°34'56.708"W 38°34'46.948"N
Taplin Creek	Taplin Rd.	Napa River	10	50ft²/.001	NA	Modify	122°25'54.399"W 38°30'2.345"N

1C. Bank Stabilization

The District implemented preventative measures to reduce streambank erosion, which included planting of riparian vegetation along exposed streambanks and the removal of non-native invasive species. During the District's annual stream survey, bank erosion issues and locations were identified and mapped. Repair and stabilization activities are initiated to improve weak, unstable, or failing streambanks. The District intended to implemented one biotechnical bank stabilization project on the Yountville Collector, however, the project was not completed during the 2012 maintenance season. The District's approach to streambank stabilization is outlined in the SMM (*Chapter 6 Erosion Protection and Bank Stabilization*).

Table 1-3: Bank Stabilization

Creek	*Project Location*	*Tributary To*	*Reach*	*Area Disturbed (Acreage)*	*Height*	*Linear Feet*	*Latitude/ Longitude*	*Status*
Engineered Flood Control Channel								
Yountville Collector	Solano Ave. at Hoffman Ln.	Hopper Creek	North Yountville Collector	.004	12 ft	25 ft.	122°20'43.943" W 38°22'43.878"N	Not Completed

1D. Sediment Removal

Accumulated sediment can reduce a channel's capacity to safely convey stream flow and can create erosive stream flows in flood control channels. To alleviate potential flood risks and improve geomorphic processes the District removed accumulated sediment from two engineered flood control channels. Sediment was removed from four locations on Salvador Creek and at one location on the Yountville Collector. The District's approach to sediment removal is outlined in the SMM (*Chapter 7 Sediment and Debris Removal Activities*), as well as the associated terms outlined in the District's Stream Maintenance Program permits. Post project details appear in Appendix B.

Table 1-4: Sediment Removal Project Sites

Creek	*Project Location*	*Tributary To*	*Reach*	*Linear Ft.*	*Total Cubic Yards*	*Latitude/Longitude*
Engineered Flood Control Channel						
Salvador Creek	Downstream of Jefferson St.	Napa River	1 & 2	440	430	122°18'28.587" W 38°19'59.43"N
Yountville Collector	Solano Ave.	Hopper Creek	NA	25	40	122°20'42.047" W 38°22'39.571"N

1E. Riparian Planting & Tree Removal/Mitigation Requirements

The District is making a concentrated effort to enhance canopy cover while creating a diverse and complex riparian ecosystem. The District takes every opportunity to plant native plants and implement erosion control BMP's in an effort to stabilize slops and improve habitat. Per mitigation

agreements negotiated with the California Department of Fish and Game for routine maintenance activities, native trees between 3 and 6 inches dbh removed will 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 will be replaced in kind with native trees at a 6:1 ratio to mitigate for net loss of canopy cover. Non-native trees greater than 3 inches in diameter, which provide canopy cover, shall be replaced at a 1:1 ratio. The District planting and monitoring tables appear in Section 4 Riparian Habitat Enhancement.

Table 1-5: Tree Mitigation Requirements

Scientific Name	Common Name	Size	Quantity Removed	Mitigation Ratio	Mitigation Plantings
Salvador Creek Sediment Removal Project					
Salix laevigata	Red willow	8”	1	6:1	6 willow sprigs
Salix laevigata	Red willow	6”	1	6:1	6 willow sprigs
Populus fremontii	Fremont Poplar	6”	1	6:1	6 white alders
Dry Creek (mitigation planting occurred on Yountville collector)					
Salix laevigata	Red willow	8”	1	6:1	6 willow sprigs
Total Mitigation Planting Required All mitigation plantings were installed along Salvador Creek and are displayed in Section 3B					24

Table 1-6: Riparian Planting Project Sites

Creek	***Project Site***	**Invasive Removed**	**Natives Planted**	***Latitude/Longitude***
Milliken Creek	Kannapali	Blackberry	2012	122°15'49.635"W 38°20'45.358"N
Napa River	Foothill	Arundo Removed in 2011	2012	122°34'13.08"W 38°34'25.525"N
Dry Creek	Darms Ln.	Arundo Removed in 2011	2012	122°20'27.081"W 38°21'50.141"N
Salvador Creek	Trower Ave.	Blackberry	2012	122°18'28.587"W 38°19'59.43"N
Yountville Collector	Hoffman Ln.	Blackberry	2012	122°20'43.943"W 38°22'43.878"N

1F. Barrier and Debris Removal

The District routinely monitors streams throughout the Napa River watershed and responds to citizen’s request to assess and manage debris and instream barriers. The District collaborates with other agencies and private property owners to ensure that hydraulic conditions and channel conveyance capacity are sufficient to minimize potential flooding, erosion of stream banks and to enhance instream habitat.

Table 1-7: 2012 Barrier Removal Projects

Creek	*Project Site*	*Tributary To*	*Debris Type*	*Latitude/Longitude*
Modified and Natural Channels				
Murphy Creek	1003 Palomino Way	Napa River	Concrete Weir	122°13'32.509"W 38°17'42.048"N

Section 2

Implementation of Impact Avoidance, Minimization and Best Management Practices

The following section describes the Districts Best Management Practices (BMP's) implemented to avoid and minimize potential impacts to resources and summarizes the results of pre-construction surveys for wildlife and special-status species (nesting birds, fish, amphibians, mammals, invertebrates, and plants). The District sees stream maintenance as an integrated stream management approach that involves protecting and enhancing existing instream resources and implements the appropriate measures as described in Chapter 3.3 (Impact Avoidance and minimization) of the Stream Maintenance Manual (SMM) to minimize potential impacts.

2A. Wildlife and Special-Status Species Surveys

As part of the District pre-project planning efforts, an investigation of known occurrences of special-status species within each proposed project reach is conducted using the following resources; USFWS list of federally listed and proposed endangered and threatened species for three USGS quadrangles (Cuttings Wharf, Yountville, and Napa) overlapping the program area (USFWS 2012), a California Natural Diversity Database (CNDDB) search for Napa County (CDFG 2010), and through referencing the California Native Plant Society's (CNPS) Electronic Inventory of Rare and Endangered Vascular Plants of California database. Reconnaissance level surveys are also conducted during the project planning phase and prior to the onset of work. In areas where special-status species potentially could occur or where suitable habitat is identified, a qualified biologist will flag areas to be avoided by maintenance crews to minimize potential impacts to habitat and wildlife.

Nesting Bird Surveys

During the nesting bird season (February 15-August 15) nesting bird surveys are conducted prior to the onset of stream maintenance activities. These surveys are conducted in advance of vegetation management, access road mowing, sediment removal and bank repair projects. The District standard protocol is to minimize the amount of work performed during the nesting bird season, to flag nests prior to maintenance and avoid maintenance in and around flagged areas. Surveys were conducted prior to any ground disturbing or vegetation related activities and BMP's including BIO-1 (Minimize impacts to Nesting Birds via site Assessments and Avoidance Measures) were implemented. The observations made during the Districts Nesting Bird Surveys are described in

Table 2-1 below. Table 2-1 is limited to nest identified during surveys and does not include the complete list of birds observed at a particular site during the pre-project nesting bird survey.

Reptiles

Pacific pond turtles (*Actinemys marmorata*) could potentially occur in the vast majority of SMP reaches. Pacific pond turtles were observed in an off channel pond along Salvador Creek Reach 2 and outside of a project site on the Napa River in Calistoga. Prior to the onset of any work within a reach that has been identified as a site where western pond turtles potentially could occur, a qualified biologist conducted pre-maintenance surveys for turtles and work within areas where turtles were identified was avoided. Surveys were conducted prior to any ground disturbing or vegetation related activities and BMP's including BIO-5 (Protection of Special-Status Amphibians and Reptile species) described in Table 2-3 and in Chapter 3 of the SMM were implemented to avoid and minimize potential impacts to turtles and suitable habitats. The Districts wildlife and special-status species observations are displayed in Table 2-2.

Mammals

The District conducts reconnaissance level surveys prior to any maintenance to minimize and avoid disturbance to areas that could potentially be habitat for mammals. A qualified biologist conducts a habitat assessment for mammals including bats (*Antrozous pallidus, Lasiurus blossevillii, Eumops perotis californicus*) and Dusky-Footed Woodrat (*Neotoma suscipes*) during the pre-project planning phase and prior to the onset of work. If habitat features are found they are flagged and avoided to minimize potential disturbance. The appropriate BMP including BIO-6 (Protection of Bat Colonies) and BIO-7 Protection of (Dusky-Footed Woodrats) as described in Table 2-3 and in Chapter 3 of the SMM. The Districts wildlife and special-status species observations are displayed in Table 2-2.

Amphibians

Reconnaissance level surveys were conducted for all ground disturbing activities within areas considered potential habitat for California red-legged frog (*Rana draytoni*), foothill yellow legged frog (*Rana boylii*), and western spadefoot (*Scaphiopus hammondii*). Surveys were conducted during the project planning phase and prior to the onset of SMP work. For vegetation management activities occurring in areas were the above species have been identified as potentially occurring, a qualified biologist conducted a reconnaissance level survey of aquatic habitats and identified potential foraging or breeding areas. Prior to the onset of work these areas were flagged and avoided. Surveys were conducted prior to any ground disturbing or vegetation related activities and BMP's including BIO-5 (Protection of Special-Status Amphibians and Reptile species) described in Table 2-3 and in Chapter 3 of the SMM were implemented to avoid and minimize potential impacts. The Districts wildlife and special-status species observations are displayed in Table 2-2.

Invertebrates

In stream reaches where California fresh water shrimp have been identified and potentially could occur, reconnaissance level surveys were conducted. If fresh water shrimp habitat is identified within a project reaches then the area is flagged and avoided by maintenance crews. For vegetation management activities within areas which may potentially provide suitable habitat, maintenance crews avoided disturbing riparian and aquatic vegetation, exposed roots, overhanging woody debris, or overhanging vegetation that may be providing suitable habitat. Surveys were conducted

prior to any ground disturbing or vegetation related activities and BMP's including BIO-2 (Avoid and Minimize Impacts to Special-Status Invertebrate Species) described in Table 2-3 and in Chapter 3 of the SMM were implemented to avoid and minimize potential impacts. The Districts wildlife and special-status species observations are displayed in Table 2-2.

Fish

The Napa River, its estuaries, and its tributaries provide habitat for a wide variety of fresh water, marine, and anadromous fish species. All fish communities in the Napa River watershed include both native and non-native (introduced) fish species. Reconnaissance level surveys were conducted for all ground disturbing activities within areas considered potential habitat for species listed in Table 2-1 of the SMM. The majority of the SMP projects occur when water levels are low and most work occurs outside of the wetted channel. If ground disturbing activities occur within the wetted channel the appropriate BMP's including GEN-14 (Dewatering Measures) and GEN-15 (Relocation of Aquatic Species for Dewatering) as described in Table 2-3 and in Chapter 3 of the SMM were implemented. The Districts wildlife and special-status species observations are displayed in Table 2-2

2B. Results of Wildlife & Special-Status Species Survey

Table 2-1: Bird Nest Data

Creek/Reach	Date	Common Name	Habitat	Location	Nest #	# Eggs	Notes
Salvador 1	7/17/12	Unidentified	Mixed Riparian Scrub	Canopy	1		Abandoned
Salvador 2	7/20/12	Red-Winged Blackbird	Cattails	In Channel	1		Area Avoided
Salvador 3	7/21/12	Brewers Blackbird	Riparian Woodland	Canopy	1		Area Avoided
Tulocay 1	7/16/12	Swallow	Box Culvert	Under Bridge	Many		Area Avoided
Salvador Collector	7/14/12	Mixed Blackbird Flock	Cattails	In Channel	2		Area Avoided
Salvador Collector	7/14/12	Starling	Box Culverts	Under Bridge	Many		Area Avoided

Table 2-2: Wildlife Surveys Results

Creek/Reach	Date	Observed Species	Observed Habitat	BMP Notes
Salvador Reach 2	7/26/12	Pacific Pond Turtle	Off channel pond	Downstream and outside of Project Area, Flagged & Avoided
		Beaver	Identified one abandoned and one active den along downstream bank	Downstream of project Area, Flagged and Avoided
		Bullfrog	In channel	NA
		Spine Stickleback	In Channel	Avoided Area
		California roach	In Channel	Avoided Area
Murphy Creek	9/11/12	Steelhead	Downstream pool	Outside of project area
		Prickly Sculpin	Downstream pool	Outside of project area
		Pacific Tree Frog	Adjacent to stream channel	Outside of project area
Napa River	10/12/12	Pacific pond Turtle	In Channel	Avoided Area
South Yountville Collector	9/26/12	Pacific Gopher Snake	In tall grass along upper bank zone	Relocated outside of project area
Beard Ditch	8/30/12	Gartner Snake	In tall grass along upper bank	Relocated outside of project area

Best Management Practices

As part of standard operation procedures, the District implements impact avoidance and minimization measures these practices are applied based on activity and stream type. 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 stream maintenance program and are implemented to ensure that maintenance activities protect and enhance existing habitat and also protect maintenance workers and the community from equipment hazards.

Table 2-3: Best Management Practices (BMPs) by Activity

BMP	Name	Sediment Removal	Bank Stabilization	Debris Removal	Vegetation Management Activities						
					Willow Removal	Blackberry Removal	Cattail Removal	Tree Pruning and Exotics Removal	Downed Tree Management	Mowing	Nursery Stock Tree Planting
General Impact Avoidance and Minimization											
GEN-1	Work Window	X	X	X	X	X	X	X	X	X	
GEN-2	Minimize the Area of Disturbance	X	X	X	X	X	X	X	X	X	X
GEN-3	Erosion and Sediment Control Measures	X	X	X	X	X	X	X	X	X	X
GEN-4	Dust Management Controls	X	X		X	X	X	X	X	X	X
GEN-5	Staging and Stockpiling of Materials	X	X		X	X	X	X	X	X	X
GEN-6	Stream Access	X	X	X	X	X	X	X	X	X	X
GEN-7	In-Channel Minor Sediment Removal	X									
GEN-8	On-Site Hazardous Materials Management	X	X	X	X	X		X		X	
GEN-9	Existing Hazardous Materials	X	X	X							
GEN-10	Spill Prevention and Response	X	X	X	X	X	X	X	X	X	
GEN-11	Fire Prevention	X	X	X	X	X	X	X	X	X	
GEN-12	Vehicle and Equipment Maintenance	X	X	X	X	X	X	X	X	X	X
GEN-13	Vehicle and Equipment Fueling	X	X	X	X	X	X	X	X	X	X
GEN-14	Dewatering Measures	X	X	X							

BMP	Name	Sediment Removal	Bank Stabilization	Debris Removal	Vegetation Management Activities						
					Willow Removal	Blackberry Removal	Cattail Removal	Tree Pruning and Exotics Removal	Downed Tree Management	Mowing	Nursery Stock Tree Planting
GEN-15	Relocation of Aquatic Species	X	X	X							
GEN-16	Pump/Generator Operations and Maintenance	X	X	X							
Public Safety											
GEN-17	Planning for Pedestrians, Traffic Flow, and Safety Measures	X	X	X						X	
GEN-18	Public Safety Measures	X	X	X	X	X	X	X	X	X	X
GEN-19	Minimize Noise Disturbances to Residential Areas	X	X	X	X	X	X	X	X	X	X
GEN-20	Work Site Housekeeping	X	X	X	X	X	X	X	X	X	X
Vegetation Management BMPs **Tree Pruning**											
VEG-1	Routine Pruning Measures				X	X	X	X	X	X	X
Non-Native and Invasive Plant Removal											
VEG-2	Minimize Local Erosion from In-channel Vegetation Removal				X	X	X	X	X	X	X
VEG-3	Arundo and Tamarisk Removal							X			
Herbicide Application											
VEG-4	Standard Herbicide Use Requirements				X	X		X			
Site Restoration											
RESTOR-1	Restore Channel Features	X	X								
RESTOR-2	Seeding	X	X	X		X		X			X
RESTOR-3	Planting Material	X	X	X		X		X			X
RESTOR-4	Bank Protection Plantings	X	X					X			X
RESTOR-5	Site Maintenance	X	X	X		X		X			X
Biological Resource BMPs											
BIO-1	Minimize Impacts to Nesting Birds Via Site Assessments and Avoidance Measures	X	X	X	X	X	X	X	X	X	X

BMP	Name	Sediment Removal	Bank Stabilization	Debris Removal	Vegetation Management Activities						
					Willow Removal	Blackberry Removal	Cattail Removal	Tree Pruning and Exotics Removal	Downed Tree Management	Mowing	Nursery Stock Tree Planting
BIO-2	Avoid/Minimize Impacts to Special-Status Invertebrate Species	X	X	X	X	X	X	X	X	X	X
BIO-3	Protection of Sensitive Fauna Species From Herbicide Use	X	X	X	X	X	X	X	X	X	X
BIO-4	Avoid/Minimize Impacts to Special-Status Plant Species and Sensitive Natural Vegetation Communities	X	X	X	X	X	X	X	X	X	X
BIO-5	Protection of Special-Status Amphibian and Reptile Species	X	X	X	X	X	X	X	X	X	X
BIO-6	Protection of Bat Colonies	X	X	X	X	X	X	X	X	X	X
BIO-7	Protection of Dusky-Footed Woodrats	X	X	X	X	X	X	X	X	X	X
Cultural Resource BMPs											
CUL-1	Review Cultural Sensitivity Maps	X	X	X							
CUL-2	Field Inventory for High or Moderately Sensitive Areas	X	X	X							
CUL-3	Construction Monitoring for Highly Sensitive Cultural Areas	X	X	X							
CUL-4	Review of Projects with Native Soil	X	X	X							
CUL-5	Pre-Maintenance Educational Training	X	X	X							
CUL-6	Discovery of Cultural Remains or Historic or Paleontological Artifacts	X	X	X							

Section 3
Project Documentation

The following section provides brief project descriptions and before and after photo documentation of the 2012 maintenance projects.

3A. Vegetation Maintenance

The purpose of vegetation management is to develop a mature and complex riparian canopy and corridors that offer substantial shading of the creek, habitat, and water quality improvements while minimizing invasive species, understory maintenance requirements, and ensuring adequate flood conveyance.

Salvador Creek Reach 1

Photo 3-1: Before Salvador Outfall Reach 1 looking downstream from top of bank at willow trees.

Photo 3-2: After Salvador Outfall Reach 1 looking downstream from instream after willow pruning .

Salvador Creek Reach 2

Photo 3-3: Before looking upstream at a multi-stem red willow that is causing debris blockage.

Photo 3-4: After willow pruning looking upstream at a channel from Garfield Ln. Bridge.

Villagio Channel

Photo 3-6: Before looking at cattails constricting flow into culvert under Washington St.

Photo 3-7: After looking upstream of Washington Street at cut cattails.

Beard Ditch

Photo 3-8: Before looking upstream at cattails constricting flow of culvert at Finnell Rd.

Photo 3-9: After looking downstream of Finnell Rd. at cut cattails.

Tullocay Creek at Soscol Ave.

Photo 3-10: After looking downstream from Soscol Ave. at cut cattails.

Salvador Collector

Photo 3-11: After looking downstream from Salvador Ave. at cut cattails.

Napa River at Yountmill Rd.

Photo 3-12: Before looking upstream at large Arundo patch on the Napa River at Yountmill Rd.

Photo 3-13: After looking at area where Arundo patch was removed, re-growth was treated with an aquatically approved herbicide.

3B. Downed Tree Management

The District identifies downed trees during stream surveys that can be modified or repositioned to enhance channel complexity. The objective of LWD recruitment is to enhance instream ecological conditions, improve instream physical process and minimize flow obstructions and debris jams. The District tags LWD structure, take GPS coordinates for mapping purposes and monitors how the structure respond to winter flows. This approach allows the District to conduct ongoing monitoring of large wood debris to assess potential flood risks while enhancing instream habitat for aquatic species.

Browns Valley Creek

Photo 3-14: Before looking downstream at downed tree crossing creek and constricting flow.

Photo 3-15: After looking downstream at modified downed tree during winter flows.

Napa River Calistoga

Photo 3-16: Napa River in Calistoga looking downstream at downed tree crossing creek and constricting flow.

Photo 3-17: After downed tree was modified and left along bank.

Napa Creek

Photo 3-18: Before looking downstream at downed tree and debris jam.

Photo 3-19: After looking at modified downed tree during high flows.

Napa Creek

Photo 3-20: Before looking upstream at downed tree.

Photo 3-21: After looking at modified downed tree during high flows.

Milliken Creek Downed Tree Management and Riparian Planting

During the Districts annual stream survey the District identified an exposed streambank that could benefit from a riparian planting project. The District worked with the property owner to relocate a downed tree that fell along the top of the bank during winter storms to facilitate a riparian planting project and to improve instream habitat. The tree was positioned along the toe of the bank and keyed in with a big leaf maple (*Acer macrophyllum*) along the top of bank to create a natural terrace that will protect the bank and allow for native plants to be installed and to establish.

Photo 3-22: Before looking upstream at exposed streambank and degrading sandbags.

Photo 3-23: After looking downstream at re-oriented downed tree, erosion control, and riparian plantings.

3 C. Flood Debris & Downed Tree Management

The District monitors streams during winter storms and responds to private property owners concerns about flood related issues. On occasion, there are flood related debris and downed tree issues that require immediate maintenance. In these cases the District collaborates with stakeholders to implemented projects in accordance with regulatory permits to restore the channels conveyance capacity. The District also attempt to turn flood related issues into restoration opportunities that will enhance the ecology of the stream.

Dry Creek

Photo 3-24: Dry Creek looking upstream at emergency flooding issues caused by a downed tree and debris jam.

Photo 3-25: After looking downstream at modified downed tree and riparian planting.

Napa River Calistoga

Photo 3-26: Before looking upstream at downed alder tree and large snag.

Photo 3-26: After looking upstream at river during high flows on 2-22-12.

Taplin Creek

Photo 3-28: Before looking downstream at large rootwad constricting the channel.

Photo 3-29: After looking upstream at modified rootwad.

3D. Sediment Removal

Salvador Creek Sediment Removal Project Description

The District completed a sediment removal project on Salvador Creek, which encompassed the removal of sediment from four locations. The Project is summarized below in **Table 3-1** including project length, cubic yards removed, and affected area below the OHWM. The material was hauled to an upland disposal site nearby and reused as upland fill. The actual work completed matched the project description and estimates that appeared in the 2012 Notification. A biologist was onsite monitoring the work and conducted reconnaissance level surveys prior to the onset of work. The appropriate BMP's outlined in the SMM were implemented including but not limited to GEN-2 (Minimize the Area of Disturbance), GEN-3 (Erosion and Sediment Control Measures), and GEN-7 (In-Channel Minor Sediment Removal). Post project cross sections and photos of the site during high flows appear in Appendix B.

Photo 3-31: Before looking upstream at Jefferson St. at sediment wedge.

Photo 3-32: After looking upstream at Jefferson St. bridge.

Photo 3-33: Looking downstream from Trower Ave. bridge at the sediment wedge blocking the box culvert at site 2.

Photo 3-34: After looking downstream from Trower Ave. bridge at completed project and LWD.

Photo 3-35: Before looking upstream at footbridge #2 in Vintage High School Campus.

Photo 3-36: After looking upstream at footbridge #2 in Vintage High School Campus.

Photo 3-37: Before looking downstream at footbridge #3 in Vintage High School Campus.

Photo 3-38: After looking downstream at footbridge #3 in Vintage High School Campus. Notice that the Red willow in the center of the channel in Photos 3-37which was relocated to the toe of the stream bank.

Table 3-1: Project Summary

Maintenance Site	Length (LF)	Affected Area Below OHWM (sq ft)	Average Width of Sediment Deposit (ft)	Depth of Sediment Removed (ft)	Amount of Sediment Removed (cu yds)
Site 1: Jefferson to Trower	118	1,534	13	2	113
Site 2: Downstream Trower (Concrete Box Culvert)	136	1,496	11	2	111
Site 3: Footbridge 2 (Concrete Bank)	69	1,035	15	2	76
Site 4: Footbridge 3 (Concrete Bank)	117	1,755	15	2	130
Totals	440	5,820	-	-	430

Salvador Creek Mitigation Planting

Salvador Creek Downstream of Jefferson Street				1st Year Monitoring		2nd Year Monitoring		3rd-5th Year Monitoring		Total Replacement Plantings
Scientific Name	Common Name	Quantity	Size	Survival	Change	Survival	Change	Survival	Change	
Alnus rhombifolia	Alder	6	1 gallon							
Salix lasiolepis	Willow	30	Sprigs							
Quercus lobata	Valley Oak	10	D pots							
Sambucus mexicana	Elderberry	4	1 gallon							
Calycanthus occidentalis	Spice Bush	3	1 gallon							
Symphoricarpos albus	Snowberry	40	1 gallon							
Baccharis pilularis	Coyote bush	10	1 gallon							
Rosa Californica	California rose	30	1 gallon							
Carex barbarae	Santa Barbara sedge	60	Plants/ plugs							
Juncus spp.	Rush	20	Plants/ plugs							
Note: The tree mitigation requirements for the 2012 maintenance year as presented in Table 1-5 are noted in red.										

Salvador Creek

Photo 3-39: Looking downstream at CCC's installing native plants.

Photo 3-40: Looking downstream at CCC's installing native plants.

South Yountville Collector Sediment Removal Project Description

The South Yountville Collector (SYC) is a trapezoidal engineered channel that collects runoff from natural drainages and vineyards to the west. Two and a half feet of sediment had accumulated at the outfall of a small bridge crossing Solano Avenue and was reducing the capacity of the channel. Sediment was removed from a 25 ft section directly downstream from the bridge. Approximately 40 cubic yards of sediment was removed from the channel. The banks of the channel are constructed with concrete sacks. This is completely dry during summer months so there is no need to de-water or isolate the stream. The District anticipates implementing a large sediment removal project in 2013 through this reach.

South Yountville Collector Mitigation Plantings

Yountville Collector 2012 Plantings				1st Year Monitoring		2nd Year Monitoring		3rd -5th Year Monitoring		Total Replacement Plantings
Scientific Name	Common Name	Quantity	Size	Survival	Change	Survival	Change	Survival	Change	
Salix lasiolepis	Willow	20	Sprigs							
Symphoricarpos albus	Snowberry	10	1 gallon							
Baccharis pilularis	Coyote bush	20	1 gallon							
Rosa Californica	California rose	10	1 gallon							
Carex barbarae	Santa Barbara sedge	20	Plants/ plugs							
Juncus	Rush	10	Plants/ plugs							

Yountville Collector

Photo 3-41: Before looking upstream at sediment accumulation at Solano Ave. crossing outfall.

Photo 3-42: After looking upstream at Solano Ave. crossing outfall after first rains.

Section 4
Riparian Habitat Enhancement & Offsite Mitigation

The following section describes the strategy and locations of the District's Habitat Enhancement projects for the 2012 maintenance season. The District sees stream maintenance as an integrated stream management approach that involves protecting and enhancing existing instream resources while providing for necessary flood conveyance.

4A. Habitat Enhancement Project Description

The District's primary habitat enhancement goals are to protect and enhance instream physical processes, water quality conditions, riparian vegetation, and instream habitat. The District's approach includes a combination of nursery stock planting, understory planting along the bank and channel edge, native seed dispersal and the installation of cottonwoods, red willow cuttings at the toe-of-bank. The riparian planting program together with the invasive removal program provides program mitigation and benefits by developing a more dynamic and complex native riparian canopy and understory along SMP channels and throughout the watershed.

The District planted trees, shrubs and instream species at all sediment removal and invasive removal project sites. The District targets invasive species removal during the implementation of all SMP activities. Upon successful invasive species eradication at a site the District makes a concentrated effort to introduce native plants and propagules that will be strong competitors for less desirable species, such as cattail species, Himalayan blackberry, and ivy, which result in unfavorable ecological and flood management conditions.

The objective of the riparian planting program is to establish vegetation that mimics natural plant communities found in the program area under similar environmental conditions. The District's planting palate is displayed in chapter 9 of the SMM which includes a list of trees, shrubs and instream species which are commonly used in District restoration projects. As the restoration plantings mature, they provide shade to the active channel, provide foraging and nesting habitat for many small mammals and birds, forage for aquatic species and moderate water temperatures. Through the development of a mature and complex riparian corridor the District hopes to shade out invasive species and reduce the abundance of cattails which trap sediment and in turn increase the need for sediment removal projects.

4B. Invasive Removal and Riparian Planting Projects

The subsequent table presents project geographic information and locations for each of the 2012 planting project sites. These planting projects are associated with invasive species removal projects and provide program mitigation for temporal impacts associated with SMP activities. Tree mitigation requirements are presented in Table 1-5 and mitigation plantings for the 2012 maintenance season occurred at Salvador Creek and are displayed in Section 3B.

Table 4-1: Riparian Planting Project Sites

Creek	*Project Site*	Invasive Removed	Linear Ft	*Latitude/Longitude*
Milliken Creek	Kannapali	Blackberry	150	122°15'49.635"W 38°20'45.358"N
Napa River	Foothill Blvd.	Arundo Removed in 2010-2011	75	122°34'13.08"W 38°34'25.525"N
Dry Creek	Darms Ln.	Arundo Removed in 2010-2011	50	122°20'27.081"W 38°21'50.141"N

Riparian Planting 5 Year Monitoring Tables

Milliken Creek 279 Kannapalli Rd.		Plants Installed 2012		1st Year Monitoring		2nd Year Monitoring		3rd-5thYear Monitoring		Total Replacement Plantings
Scientific Name	Common Name	Quantity	Size	Survival	Change	Survival	Change	Survival	Change	
Alnus rhombifolia	White alder	2	1 gallon							
Calycanthus occidentalis	Spice Bush	10	1 gallon							
Symphoricarpos albus	Snowberry	5	1 gallon							
Carex barbaea	Santa Barbara sedge	10	1 gallon							

Milliken Creek 259 Kannapalli Rd.		Plants Installed 2012		1st Year Monitoring		2nd Year Monitoring		3rd-5thYear Monitoring		Total Replacement Plantings
Scientific Name	Common Name	Quantity	Size	Survival	Change	Survival	Change	Survival	Change	
Alnus rhombifolia	White alder	2	1 gallon							
Symphoricarpos albus	Snowberry	10	1 gallon							
Rosa californica	California Wild Rose	10	1 gallon							
Carex barbaea	Santa Barbara sedge	10	1 gallon							

Napa River, 200 Foothill Rd, Calistoga
40x40 Patch of Arundo Removed & Natives Planted

				1st Year Monitoring		2nd Year Monitoring		3rd -5th Year Monitoring		Total Replacement Plantings
Scientific Name	Common Name	Quantity 2012	Size	Survival	Change	Survival	Change	Survival	Change	
Salix lasiolepis	Willow	20	Sprigs							
Quercus kellogii	Black oak	2	15 gallon							
Quercus lobata	Valley oak	2	15 gallon							
Symphoricarpos albus	Snowberry	2	1 gallon							
Rosa Californica	California rose	2	1 gallon							
Cornus sericea	Creek dogwood	2	1 gallon							
Carex barbarae	Santa Barbara sedge	4	Plants/ plugs							

Dry Creek 1043 Darms Lane
25x60 Arundo Patch removed & Natives Planted

				1st Year Monitoring		2nd Year Monitoring		3rd -5th Year Monitoring		Total Replacement Plantings
Scientific Name	Common Name	Quantity 2012	Size	Survival	Change	Survival	Change	Survival	Change	
Salix lasiolepis	Willow	20	Sprigs							
Quercus lobata	Valley Oak	4	D pots							
Symphoricarpos albus	Snowberry	5	1 gallon							
Rosa Californica	California rose	5	1 gallon							
Cornus sericea	Creek dogwood	2	1 gallon							
Carex barbarae	Santa Barbara sedge	10	Plants/ plugs							

Dry Creek

Photo 4-1: After native plants installed.

Napa River Calistoga

Photo 4-2: After native plants installed.

4C. Debris & Barrier Removal

The District routinely monitors its flood control channels 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. As a creek and watershed steward, the District assists private property owners and other local partners (including other agencies) in assessing existing instream obstructions and abandoned structures for possible removal. When feasible, the District will assist local watershed stakeholders through removing such obstructions and abandoned facilities. The District responds to debris removal requests, conducts annual stream surveys to identify project sites and implements projects according to the guidelines outlined in the SMM (*Chapter 7 Sediment and Debris Removal Activities).*

Murphy Creek Project Description

Two (2) weirs were identified as barriers to fish passage in September 2007 as part of a Murphy Creek stream inventory conducted by Napa County RCD. They were categorized as "red" in the DFG Green-Gray-Red system because they are expected to be severe (possibly complete) barriers to both adult and juvenile steelhead. The downstream weir is 1.0 ft tall and 0.7 ft. thick. The upper weir, located 12.3 ft. upstream, is 2.2 ft. tall and 0.7 ft thick.

Photos 4-3: Before looking upstream at weirs.

Photo 4-4: After looking downstream at project.

4D. Off-Site Mitigation

The District is committed to making a concerted effort to reduce streambank erosion and enhance riparian corridors throughout Napa County. Potential permanent or temporary impacts associated with the District's stream maintenance activities will be mitigated off-site by restoring or enhancing habitat and stabilizing eroded areas within the same watershed. Riparian and stream bank enhancement measures include extensive planting of riparian vegetation along exposed streambanks, removing non-native invasive species and supporting biotechnical bank stabilization projects. In an effort to reduce streambank erosion the District offers a Stream Bank Stabilization Cost-Share Program to assist private property owners with streambank stabilization. Watershed-based mitigation provides restorative and mitigating watershed solutions by partnering with private property owners to address erosion throughout the watershed which will help reduce the need for stream maintenance activities in the lower watershed.

The District identifies streambank erosion issues during annual stream surveys and response to citizen request for streambank stabilization assistance. The District offers a cost-share program that covers 75% of the total cost up to $30,000 for biotechnical streambank stabilization projects. The property owner is required to obtain the necessary permits, hire the engineer to design the project and contractors to construct the project. The District provides technical guidance upfront and ongoing monitoring support to ensure that native riparian plantings are being maintained and that the bank stabilization project is functioning appropriately. Additionally, the District works with private property owners to implement small-scale native riparian planting projects to stabilize vulnerable streambanks.

Off-Site Mitigation projects completed for the 2012 project season were at the following locations:

- Milliken Creek
- Browns Valley Creek

The subsequent table presents project geographic information and locations for each of the 2012 Steam Bank Stabilization Cost-Share Program project sites.

Table 4-2: Stream Bank Stabilization Cost-Share Program Projects

Creek	***Project Site***	***Tributary To***	***Biotechnical Bank Stabilization***	***Project Length***	***Latitude/Longitude***
Milliken Creek	1166 Monticello Rd	Napa River	Willow Wall/Riparian Plantings	45 feet	122°16'19.886"W 38°19'58.766"N
Browns Valley Creek	Browns Valley Rd.	Napa River	Willow Wall/Riparian Planting	50 feet	122°15'49.635"W 38°20'45.358"N

Bank Stabilization Cost-Share Monitoring Program

The following tables are used to track native riparian plantings associated with the Bank Stabilization Cost-Share Program. The District will work with property owners to track riparian plantings for three years and update monitoring tables annually in the annual report. The purpose is to make sure that riparian plantings are being properly maintained and ensure that the Bank Stabilization Cost-Share Program is successful.

Milliken Creek 1166 Monticello Rd

				1st Year Monitoring		2nd Year Monitoring		3rd Year Monitoring		Total Replacement Plantings
Scientific Name	Common Name	Quan tity	Size	Survival	Change	Survival	Change	Survival	Change	
Calycanthus occidentalis	Spice Bush	4	1 gallon							
Symphoricarpos albus	Snowberry	3	1 gallon							
Daucus carota	Queen anne's lace	1	1 gallon							
Monarda didyma	Bee balm	2	1 gallon							
Scrophularia californica	Bee Plant	2	1 gallon							
Carex barbarae	Santa Barbara sedge	32	Plants/ plugs							
Juncus Balticus	Baltic rush	32	Plants/ plugs							
Leymus triticoides	Creeping wildrye	150	Plants/ plugs							

Browns Valley Creek
An assortment of native grasses were also planted

				1st Year Monitoring		2nd Year Monitoring		3rd Year Monitoring		Total Replacement Plantings
Scientific Name	Common Name	Quan tity	Size	Survival	Change	Survival	Change	Survival	Change	
Calycanthus occidentalis	Spice Bush	4	1 gallon							
Symphoricarpos albus	Snowberry	5	1 gallon							
Sambucus spp.	Elderberry	7	1 gallon							
Roas californica	Wild rose	5	1 gallon							
Baccharis pilularis	Coyote bush	7	1 gallon							
Lonicera involucrata	Twinberry honeysuckle	7	1 gallon							
Rhamnus californica	Coffeeberry	5	1 gallon							

Browns Valley Creek

Photo 4-5: Before looking upstream at failed concrete block wall.

Photo 4-6: After looking downstream completed willow wall revetment and native plantings.

Milliken Creek

Photos 4-7: Before looking upstream at failed bank covered in ivy.

Photo 4-8: After looking down at willow wall revetment.

Section 5
Program Overview & Recommendations

This section provides an overview of the Districts SMP and provides recommendations based on lessons learned from the projects implemented during the 2012 maintenance season.

5A. Maintenance Program

The Districts developed a new Stream Maintenance Manual (SMM) in December of 2011, and renewed/expanded its permit coverage in 2012. The expanded coverage allowed the District to implement a broader set of activities including sediment removal and biotechnical bank stabilization. The 2012 maintenance season, marks the first year of operation under this new program.

Overall, the maintenance season was very successful. The District followed the operational procedures outlined in the SMM which outlines an integrated approach to stream maintenance that balances flood conveyance with habitat enhancement. On each of this year's maintenance projects the appropriate BMP's were implemented, wildlife surveys were conducted, and new techniques as described in the SMM were integrated into the Districts operational procedures to minimize potential impacts to sensitive resources.

5B. Maintenance Activities

During the Districts annual stream surveys staff have observed a rapid expansion of *Acacia spp.* trees on Salvador Creek and an abundance of Himalayan blackberry and English ivy in flood control channels. The District is purposing to focus invasive species management heavily on these three species over the coming years. Additionally, the District will continue to concentrate vegetation management efforts on the removal of Arundo from the Napa River Watershed. Due to these efforts the District has an ongoing need for native plant materials, so we are working with the California Conservation Corps (CCC) to revamp a native plant nursery at their Napa facility. During the 2012 season, the District utilized the CCC's to salvage Santa Barbara sedge (*Carex barbara)* and Snow Berry (*Symphoricarpos albus*) from the Rutherford Restoration Reach which was utilized on the Salvador Creek and Milliken Creek projects. The District will continue to seek out native plant salvaging

opportunities and utilize the CCC's and their facility in the future to propagate native species.

A major focus of the SMP is on the preservation of Large Woody Debris. However, there are many uncertainties associated with the preservation of LWD, so the District has actively been mapping and monitoring how LWD structures are responding to seasonal high flows. It is becoming evident that some LWD structures will require ongoing maintenance. The District also recognizes that there will be an ongoing need to notify resource agencies about flood debris and downed tree issues as they arise during winter storms.

The expansion of the Districts permit coverage allowed for two sediment removal projects to be implemented in 2012. These projects were implemented to restore the hydrological capacity of the channel and enhance instream physical processes. At each project site the District looked for opportunities to minimize impacts or enhance habitat. On the Salvador Creek project an 8 in dbh red willow was excavated and relocated from the middle of the channel to the toe of the bank (see photo 3-38). Also a large cottonwood, which had been severely damaged by beavers, was cut down and anchored at the toe of the stream and four stumps were left in the channel to enhance instream complexity. The District is noticing that sediment deposition is reducing the hydrological capacity of some flood control channels and will need to be a focus of maintenance in coming years. The District is anticipating a sediment removal project along the South Yountville Collector during the 2013 SMP season.

5C. Monitoring

The District has developed a GIS database to track SMP projects and is currently mapping annual maintenance activities. Over the coming maintenance season, the District will be working with a consultant to refine the GIS system to streamline data collection. The Districts mapping efforts will assist with long-term project monitoring and documentation. The District data collection efforts will help to identify maintenance trends, depositional reaches, reoccurring bank failures and support long-term project success. The District is also using the I-Tree modeling software to develop an inventory of all trees planted along flood control easements. This database allows the District to quantify the ecosystem services associated with riparian trees, evaluate population diversity, size distribution, location in channels, and canopy cover.

Over the winter, the District will work on documenting high flow events and begin developing a plan for evaluating maintenance triggers. The District anticipates evaluating flow data from channels including stage, velocity, and eventually developing stage/discharge relationships where possible. This monitoring effort will be an ongoing endeavor and may require multiple maintenance seasons to complete. The objective will be to develop a mechanism/methodology for evaluating maintenance triggers in flood control channels.

Appendix A

Figure 1-1
Napa County Stream Maintenance Program Area and Maintenance Reaches

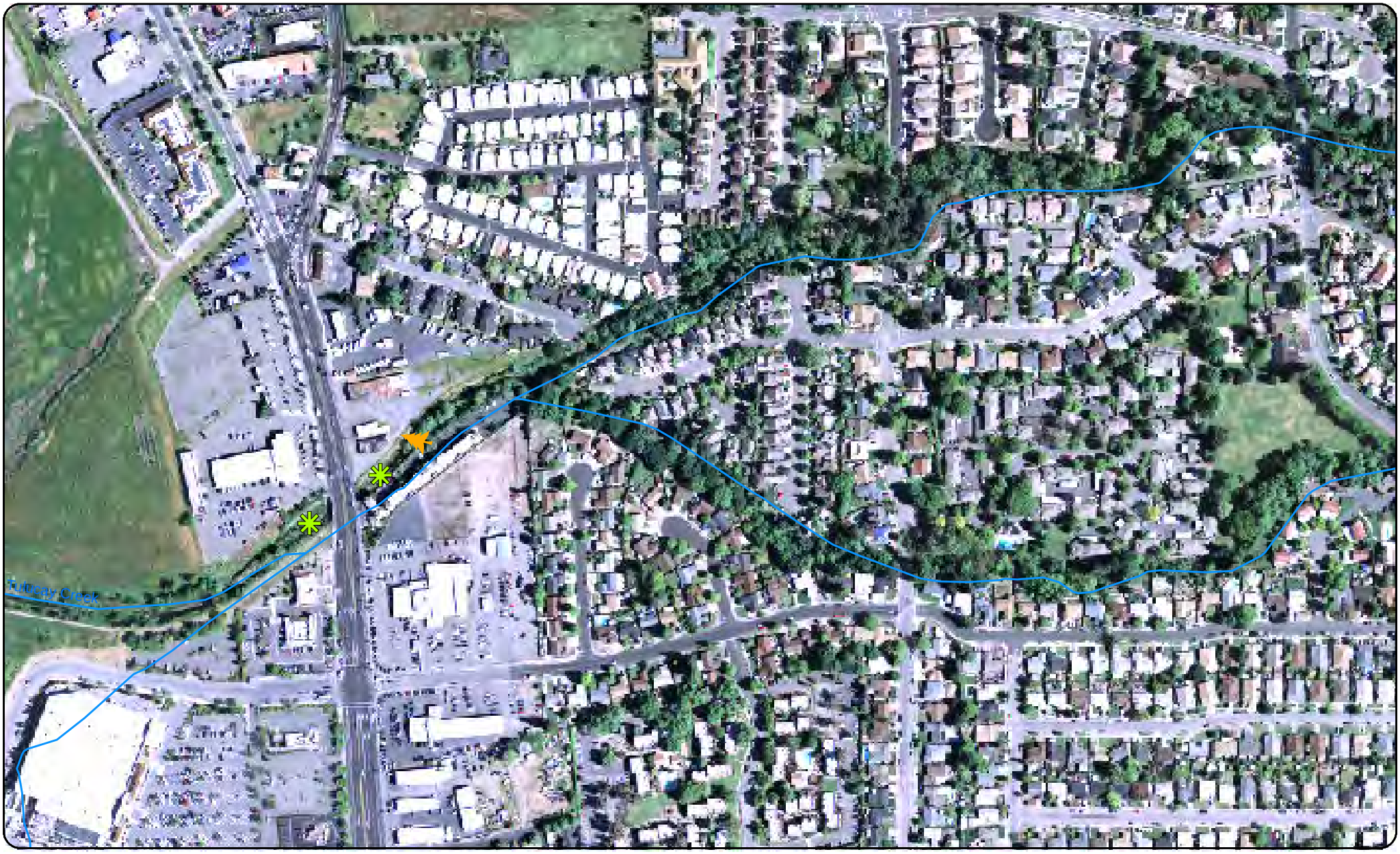
Watershed & Stream Maintenance Program 2012
Salvador Creek Reach 1 & Salvador Collector

0 0.05 0.1 0.2 Miles

N W E S

Stream Maintenance Projects

- Streams
- Downed_Tree
- Veg_Management
- Sediment_Removal
- Herbicide_Application2012
- Arundo_Biomass



Watershed & Stream Maintenance Program 2012
Tulocay & Camille Creek

0 0.05 0.1 0.2 Miles

N W E S

Stream Maintenance Projects

- Streams
- Downed_Tree
- Veg_Management
- Sediment_Removal
- Herbicide_Application2012
- Arundo_Biomass

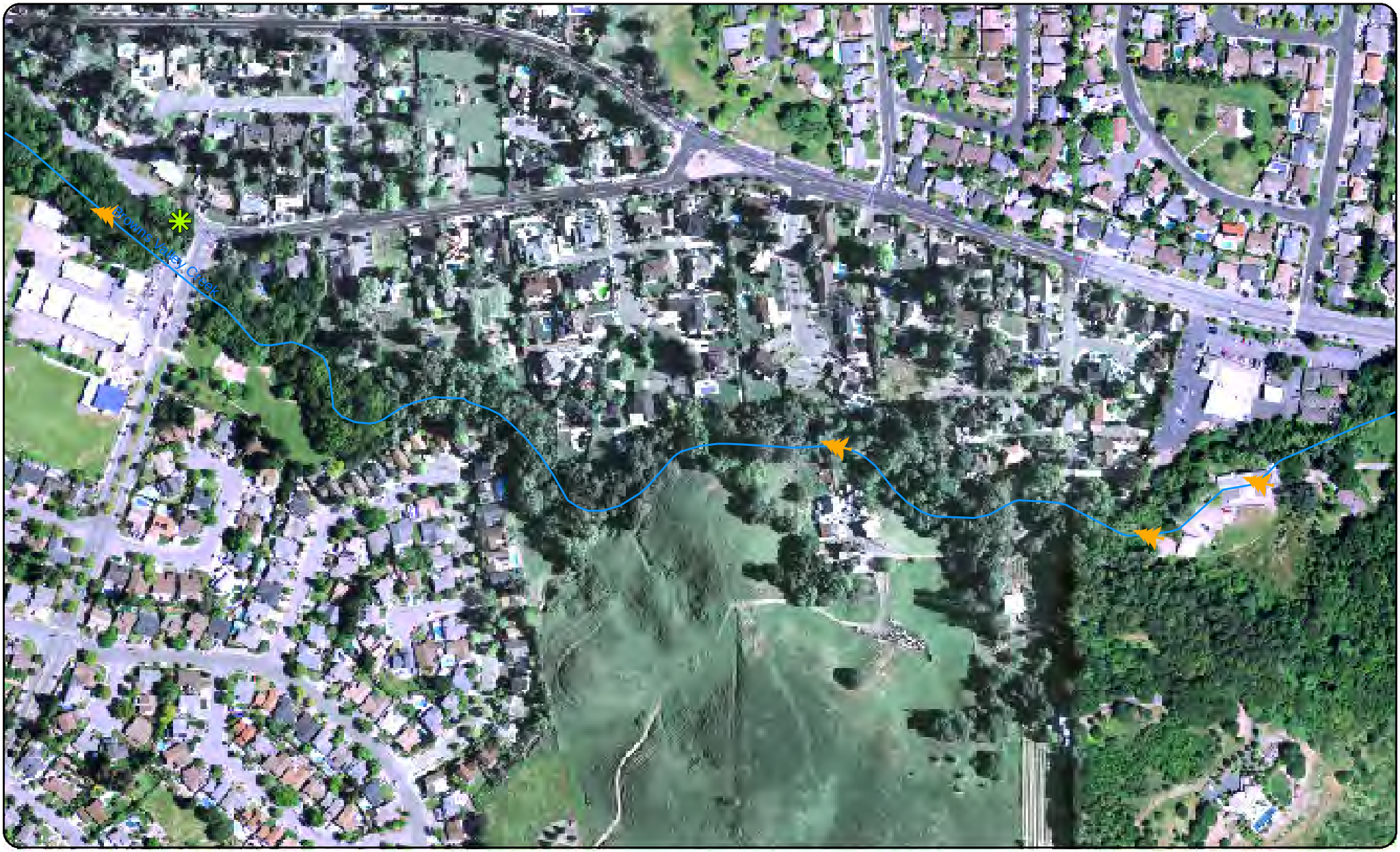
Watershed & Stream Maintenance Program 2012
Salvador Creek Reach 2

0 0.05 0.1 0.2 Miles

N W E S

Stream Maintenance Projects

- Streams
- Sediment_Removal
- Downed_Tree
- Herbicide_Application2012
- Veg_Management
- Arundo_Biomass



Watershed & Stream Maintenance Program 2012
Browns Valley Creek

0 0.05 0.1 0.2 Miles

N W E S

Stream Maintenance Projects

- Streams
- Downed_Tree
- Veg_Management
- Sediment_Removal
- Herbicide_Application2012
- Arundo_Biomass

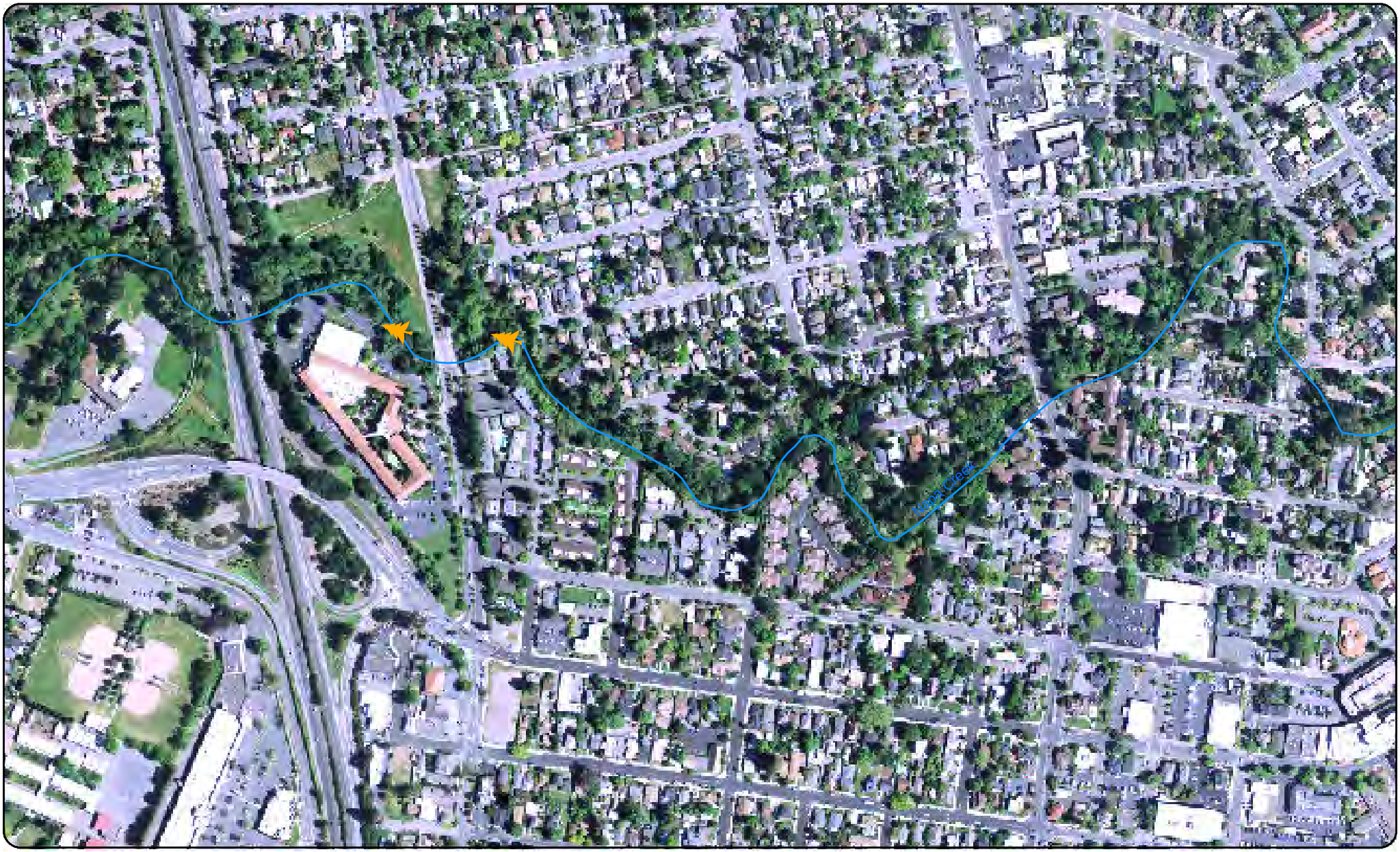
Watershed & Stream Maintenance Program 2012
Milliken Creek

0 0.1 0.2 0.4 Miles

N W E S

Stream Maintenance Projects

- Streams
- Downed_Tree
- Veg_Management
- Sediment_Removal
- Herbicide_Application2012
- Arundo_Biomass



Watershed & Stream Maintenance Program 2012
Napa Creek

0 0.05 0.1 0.2 Miles

N
W E
S

Stream Maintenance Projects

- Streams
- Downed_Tree
- Veg_Management
- Sediment_Removal
- Herbicide_Application2012
- Arundo_Biomass

Watershed & Stream Maintenance Program 2012
Dry Creek

0 0.0475 0.095 0.19 Miles

N
W E
S

Stream Maintenance Projects

- Streams
- Downed_Tree
- Veg_Management
- Sediment_Removal
- Herbicide_Application2012
- Arundo_Biomass

Watershed & Stream Maintenance Program 2012
Villagio Channel

0 0.0125 0.025 0.05 Miles

N W E S

Stream Maintenance Projects

- Streams
- Downed_Tree
- Veg_Management
- Sediment_Removal
- Herbicide_Application2012
- Arundo_Biomass

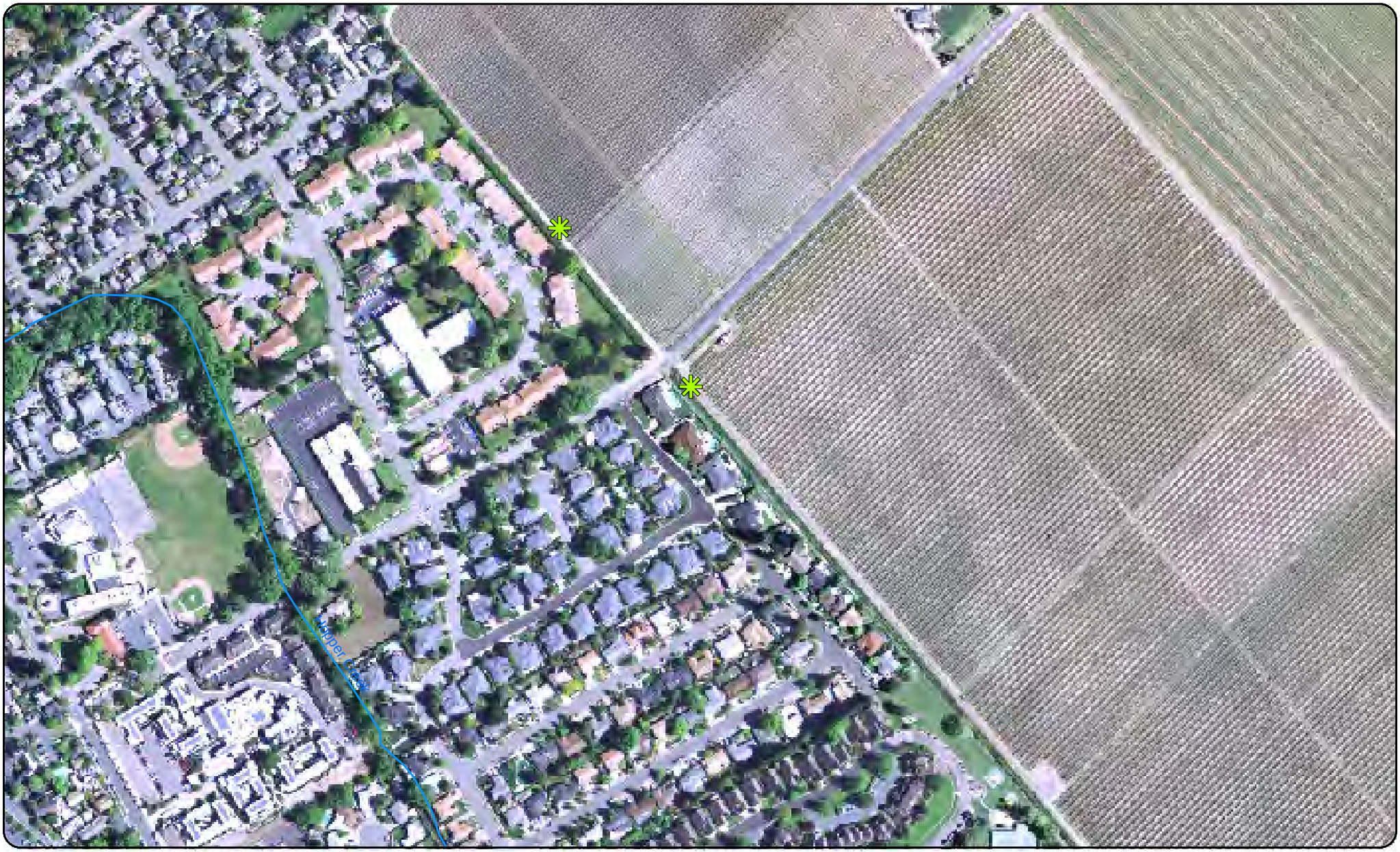
Watershed & Stream Maintenance Program 2012
Napa River Arundo Removal

0 0.175 0.35 0.7 Miles

N W E S

Stream Maintenance Projects

- Streams
- Downed_Tree
- Veg_Management
- Sediment_Removal
- Herbicide_Application2012
- Arundo_Biomass



Watershed & Stream Maintenance Program 2012
Beard Ditch

0 0.05 0.1 0.2 Miles

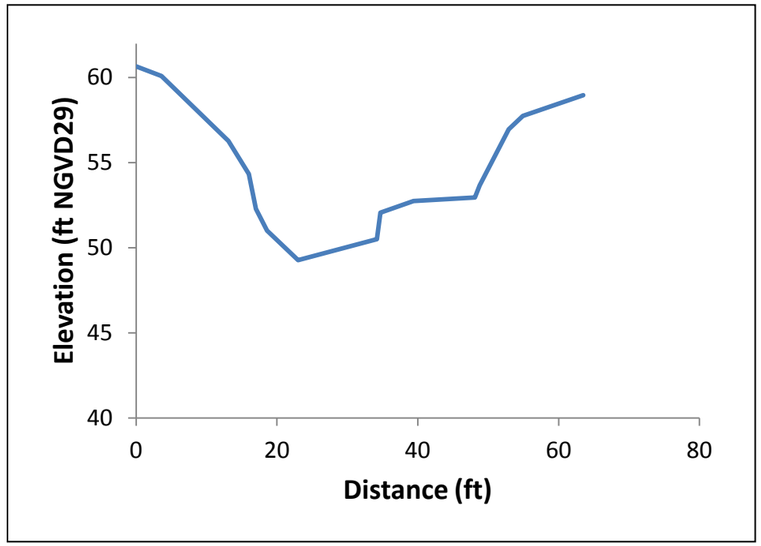
N W E S

Stream Maintenance Projects

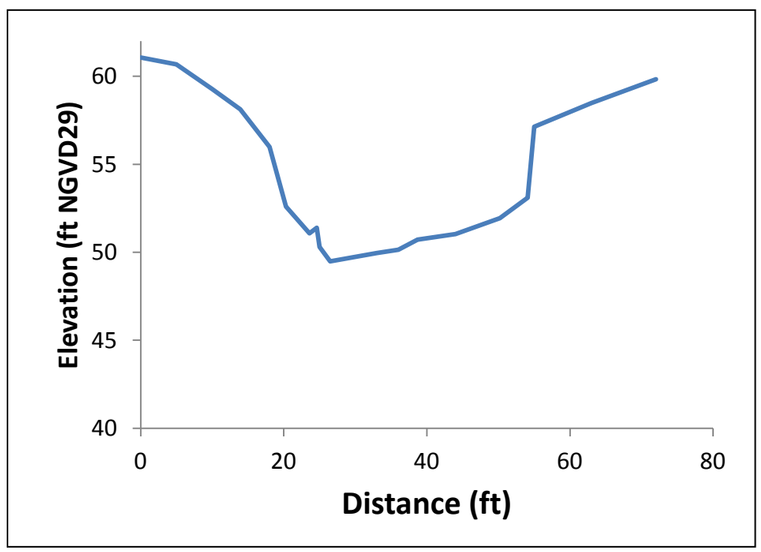
- Streams
- Downed_Tree
- Veg_Management
- Sediment_Removal
- Herbicide_Application2012
- Arundo_Biomass

Appendix B

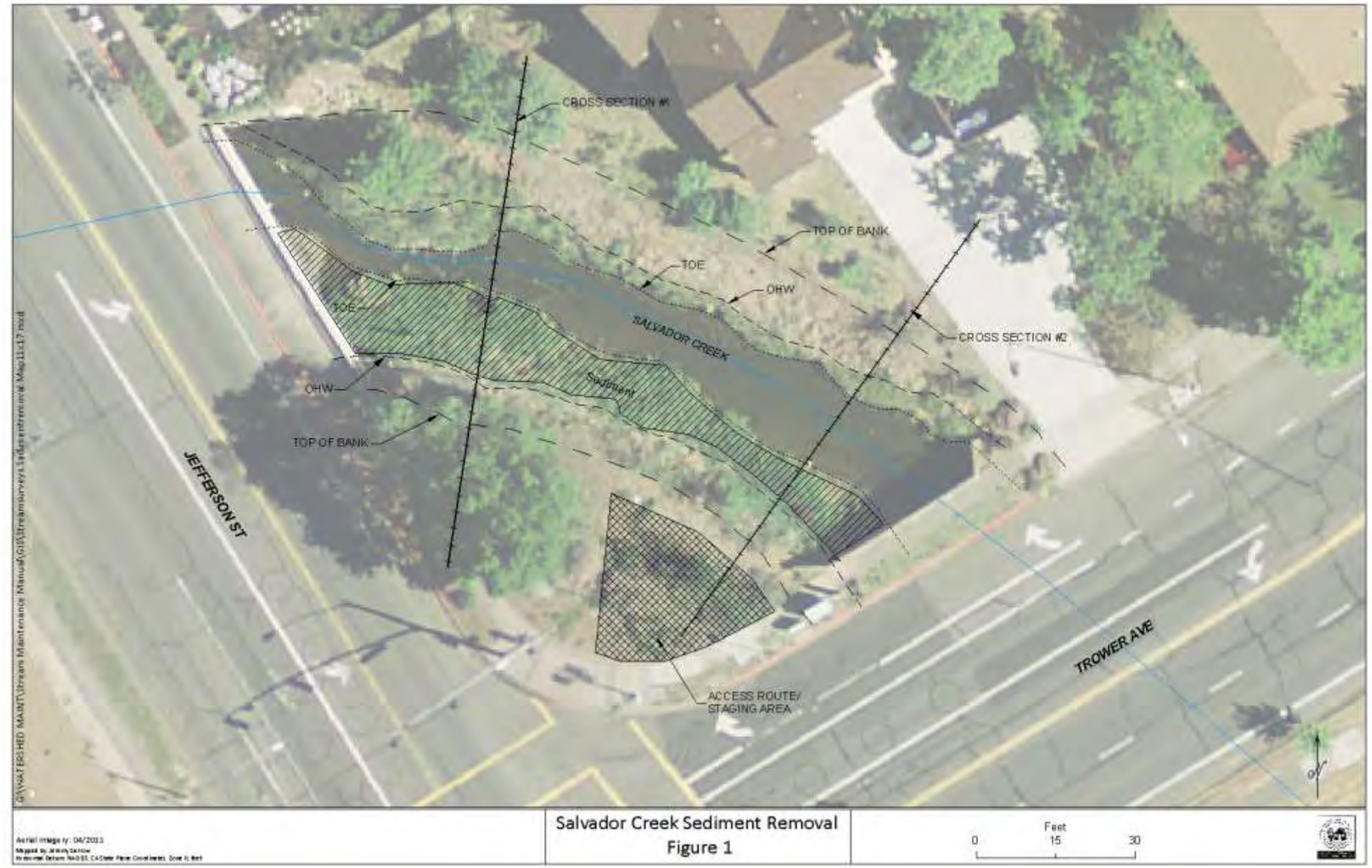
Salvador Creek Sediment Removal Plan



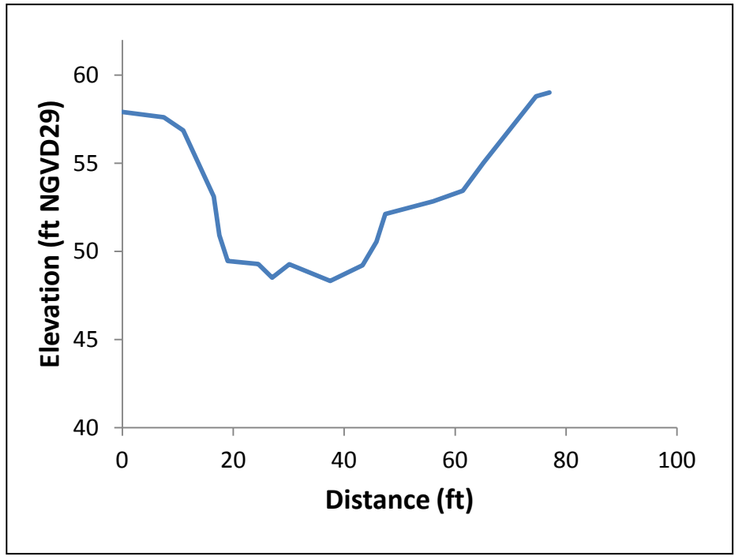
Cross Section #1Before-42 Feet Downstream of Jefferson Ave.



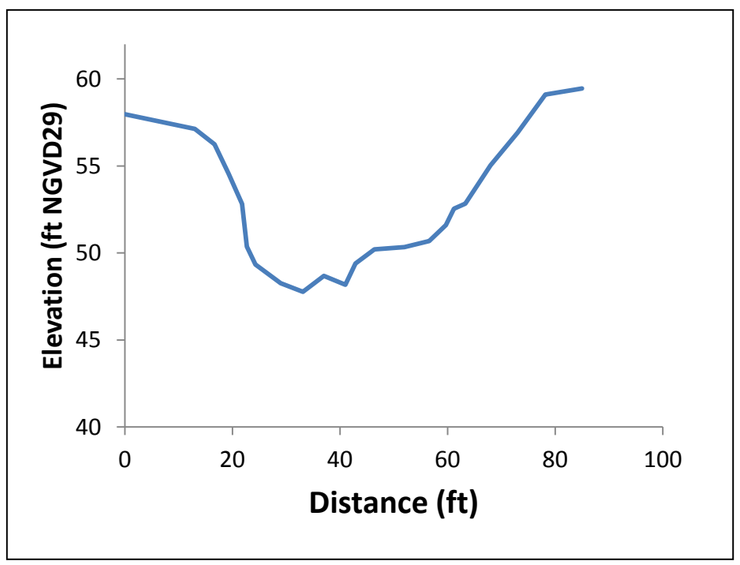
Cross Section After-47 feet downstream of Jefferson Ave.



Salvador Creek Downstream of Jefferson Avenue					
Excavation					
Project Activity Description	Length (Linear FT.)	Average Width of Sediment (Linear FT.)	Effected Area Below Ordinary High Water (Square FT.)	Depth of Sediment (FT)	Cubic Yards (To Remove)
Accumulated Sediment Removal Using Excavator in Isolated Channel	118	13	1,534	2	113

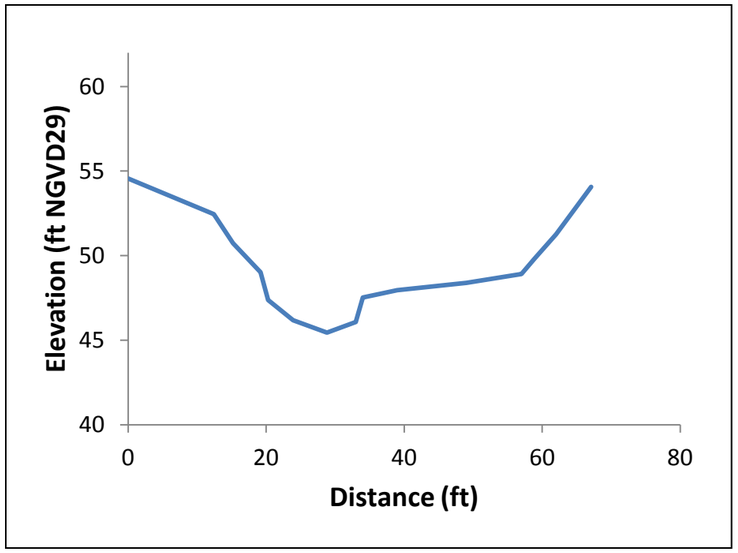


Cross Section #4 Before- 47 Feet Downstream of Trower Avenue Culvert

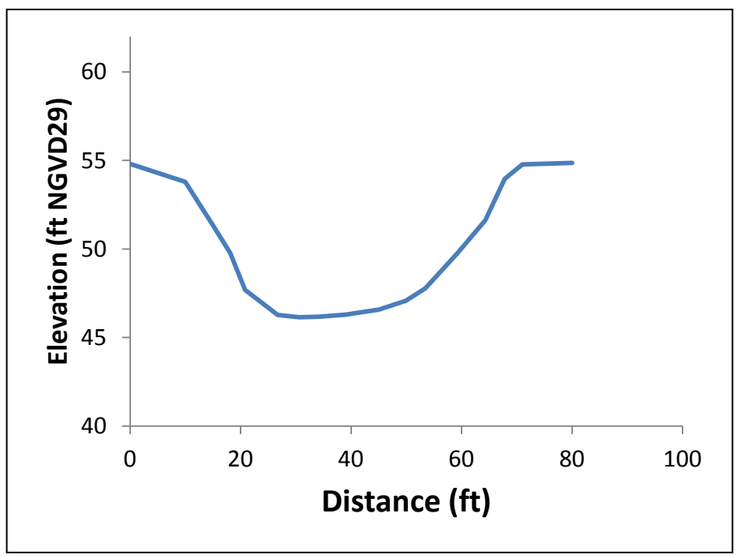


Cross Section After-59 Feet Downstream of Trower Avenue Culvert

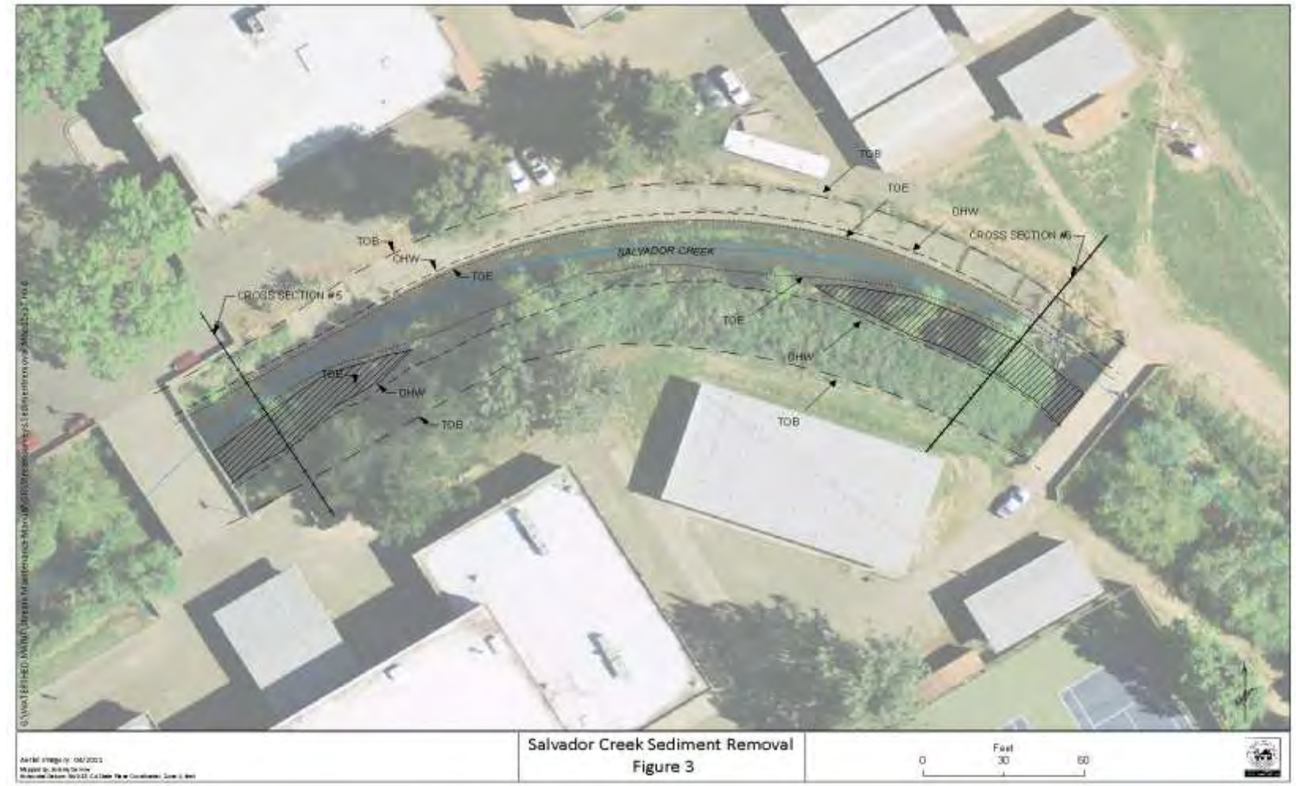
Salvador Creek Through Trower Avenue Box Culvert & Downstream					
Excavation					
Project Activity Description	Length (Linear FT.)	Average Width of Sediment (Linear FT.)	Effected Area Below Ordinary High Water (Square FT.)	Depth of Sediment (FT)	Cubic Yards (To Remove)
Accumulated Sediment Removal Using Excavator in Isolated Channel	136	11	1,496	2	111



Cross Section #5 Before-32 Feet Downstream of Foot Bridge #2

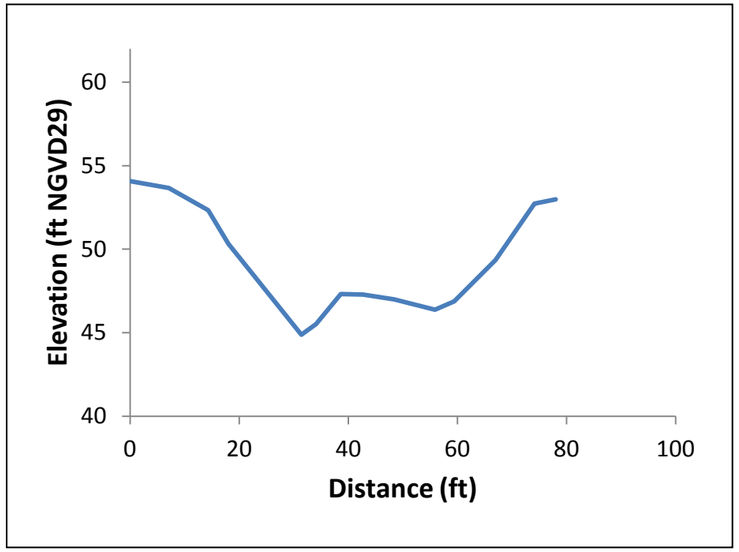


Cross Section After-38 Feet Downstream of Foot Bridge #2

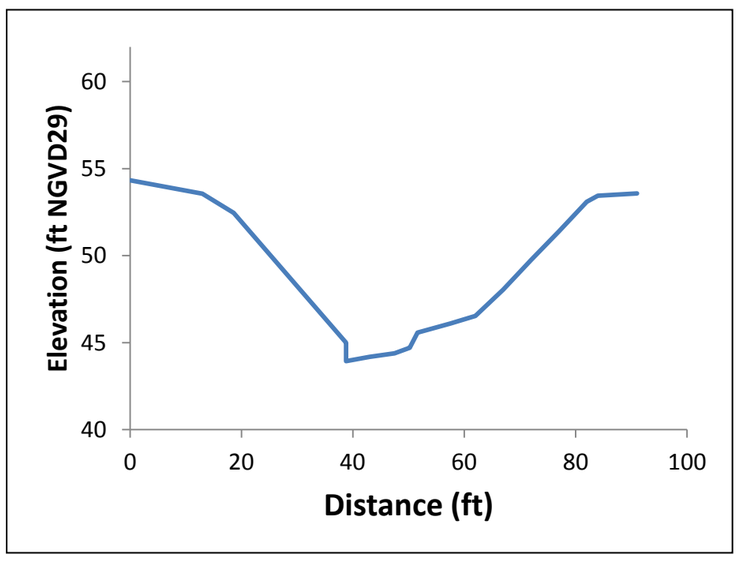


Salvador Creek Downstream of Foot Bridge #2					
Excavation					
Project Activity Description	Length (Linear FT.)	Average Width of Sediment (Linear FT.)	Effected Area Below Ordinary High Water (Square FT.)	Depth of Sediment (FT)	Cubic Yards (To Remove)
Accumulated Sediment Removal Using Excavator in Isolated Channel	69	15	1,035	2	76

Salvador Creek Upstream of Foot Bridge #3					
Excavation					
Project Activity Description	Length (Linear FT.)	Average Width of Sediment (Linear FT.)	Effected Area Below Ordinary High Water (Square FT.)	Depth of Sediment (FT)	Cubic Yards (To Remove)
Accumulated Sediment Removal Using Excavator in Isolated Channel	117	15	1,755	2	130



Cross Section #6-24.5 Feet Upstream of Foot Bridge #3



Cross Section After-55 Feet Upstream of Foot Bridge #3

Project Site 1-Looking upstream at Jefferson during winter flow.

Project Site 3-Looking upstream at footbridge #2 during winter flow.

Project Site 2-Looking downstream from Trower Ave. during winter flow.

Project Site 4-Looking downstream at footbridge #3during winter flow.