

## **2008/2009 Annual Monitoring Report**

Arroyo De La Laguna  
Alameda County, California

### **Project Identification**

U.S. Army Corps of Engineers File Number: 30262S  
California Department of Fish and Game Notification Number: 0600-2006-0272-3  
Regional Water Quality Control Board Site No.: 02-01-C0903

### **Summary**

The Arroyo de la Laguna Streambank Project has been monitored for three years since completion in November 2006. The site is geomorphically stable, the features are structurally sound and performing as expected, and vegetation is becoming established. 80-95% ground cover has been established in seeded areas (except when covered by alluvial sediment buildup) and survival rates for planted woody species other than willows is 100%. Survival of the willow stakes installed during construction dropped below 80%, however the survival of additional willows planted in 2007 is very good and volunteer willows can be found throughout the site. Additional replanting of willows is planned for the winter of 2009/2010.

### **Project Description**

The project site is approximately a 1000 foot reach of the Arroyo de la Laguna just north of the Hetch Hetchy Aqueduct. The watershed is approximately 405 square miles and includes the communities of Dublin, Pleasanton, Sunol and Livermore. As indicated by the name, the reach is incised with approximately 30 foot high, near vertical banks. The reach has two sharp bends in an "S" curve.

The overall project goals included:

- Protecting the streambank;
- Stabilizing the streamcourse;
- Reducing erosion; and
- Improving wildlife habitat.

The project was designed to encourage the natural creation of vegetated terraces along the toe of the banks to provide stability for moderate storm events. Further bed movement will be allowed for and the project is not expected to prevent erosion during very large storm events. The project should aid in the formation of edge habitat and eventually create shade that will reduce thermal loading to the stream water.

This demonstration project provides an opportunity to evaluate several cost-effective biotechnical practices for stream bank restoration and habitat enhancement in an urban/rural setting. The bank protection techniques utilized

on this site fall under the NRCS practice Streambank Protection (580) and include:

- Channel Modifications including:
  - Moving thalweg of channel away from banks,
  - Creation of terraces, and
  - Bank shaping and planting
- Vegetated Spur
- Eucalyptus Pin Dikes
- Christmas Tree Revetment
- Rock Barbs with Rootwads
- Critical Area Planting
- Control of Overland Flow and Gully Erosion on Banks

Figure 2 shows the overall project plan and the location of streambank protection practices not including vegetative practices. Figure 3 shows the As-Built Vegetation Plan.

### **Purpose**

This annual Monitoring Report has been compiled for documentation and for submittal to permitting agencies. As required by permitting agencies, this report includes the following:

- Map of photo monitoring sites (Figure 1)
- Photos from photo monitoring sites (Appendix A)
- Comparison of data to previous years (see Monitoring Results)
- Evaluation of geomorphic stability of the Creek channel
- Assessment of progress towards meeting final re-vegetation success criteria in the Monitoring Plan and long-term planting plan.

### **Monitoring Methods**

Alameda County Conservation Partnership staff performed photo-monitoring prior to construction (August 24, 2006), upon completion of construction (December 7 & 8, 2006), at the end of the 2007 rainy season (May 22, 2007) and at the end of the summer (October 1, 2007). In 2008, photo-monitoring was performed at the end of the summer (August 1, 2008), capturing both the effects of winter flows and the dry summer. In 2009, photo-monitoring was performed April 6, 2009. During these monitoring visits, the staff utilized seven permanent photo-monitoring points.

The largest flow event of the period was a peak flow of 2,400 cubic feet per second (cfs) on March 3, 2009 which did not trigger an additional monitoring event (was less than the 2-year event or an estimated flow of 3,000 cfs). The site

was visited periodically during the year (June 27, 2008, January 9, 2009, and March 27, 2009).

All physical features including vegetative features were physically assessed and compared to the “As Built” condition. These inspections document the integrity of the structures, health of the vegetative plantings and effectiveness of the practice based on its intended purpose. Additional photographs were taken to document changes to individual features as necessary. The results of the inspections are summarized below.

## **Monitoring Results**

### Photo Monitoring

Figure 1 shows a map of the permanent photo points and directions. The photographs from this monitoring period are included in Appendix A. Each photo is labeled with location point or feature name, purpose of photo, and date. Pre-Project photographs from the photo points are also included for comparison.

### Structural Features

For the most part, the structural features (not including vegetative plantings) were stable, had no issues with seating or scour, and require no maintenance. The following exceptions were noted during this monitoring period:

- The vegetative barb (a temporary practice) successfully performed its intended purpose. It is no longer part of the active channel and is half covered with sediment. Willows that were part of the barb have taken root and are now growing (see photo).
- Pipe Outfall near Rock Barb 6 – erosion below pipe unseated some of the rocks in the rock barb in 2007. The situation has improved over previous years as vegetation establishes and stabilizes the erosion (see photo). Rock barb will still function as designed.
- Sediment deposition around some of the rock barbs has isolated some of the rootwads from the stream during low flows (see photo). Otherwise the sediment deposition is desirable and aquatic plants have already established along the toe of the terraces to provide cover, food and other habitat functions.

### Vegetation

The “As Built” Vegetation Map (Figure 3) shows the vegetation plantings as of June 2007 including type, number and locations. In addition, over 100 willow stakes were installed in November 2007 to further enhance the site and replace

stakes lost during the year. These stakes were installed in Zone 1, mostly along the Rock Barbs and the channel edge.

The terraces (Planting Zone 1) are within the alluvial zone of the creek and have varying rates of vegetative cover and diversity depending on the season and depth of recent sediment deposition. Terraces and other areas seeded for erosion control had 80-95% cover during the monitoring event (although natives are being out-competed by annual grasses) and the areas near the stream channel were heavily vegetated. A variety of native (mugwort, rushes, sedges, juncus, coyote brush, willow, boxelder and cottonwood seedlings, grasses and forbs) and non-native (cocklebur, sweet clover, annual grasses, stinkwort, hemlock, and thistle) vegetation is present. An inventory of plant species identified at the site in April 2009 is included in Appendix B. The terraces adjacent to the stream channel are dominated by: cattails, rushes, sedges, cocklebur and sweet clover. Willow stake survival in Zone 1 is over 80%. The new willow stakes installed in November 2007 replaced any willows lost since construction in this zone and natural willows have begun establishing on the terraces closer to the stream (see photo).

In Planting Zone 2, California buckeyes achieved 100% survival (18 trees). Coast live oak and buckeye seedlings have begun to grow on the banks, especially where sloughing or grading during the project has decreased the slope. Willow stakes in Zone 2 and along the toe of the banks have not survived well in most of the project (less than 20%) as many were installed too high on the terraces to survive the drought years. New willow stakes are planned in conjunction with an irrigation system in order to establish willows in Zone 2, especially along the toe of the banks.

### Geomorphic Stability

Overall the stream channel through the reach of the project appeared geomorphically stable during the monitoring period. According to USGS Stream Gauge data collected near the project site, the peak flow during this monitoring period was 2,400 cfs, from a storm on March 3, 2009. The channel forming, bankfull flow is estimated to be 3,000 cfs and the 25-year design flow is estimated to be 13,000 cfs.

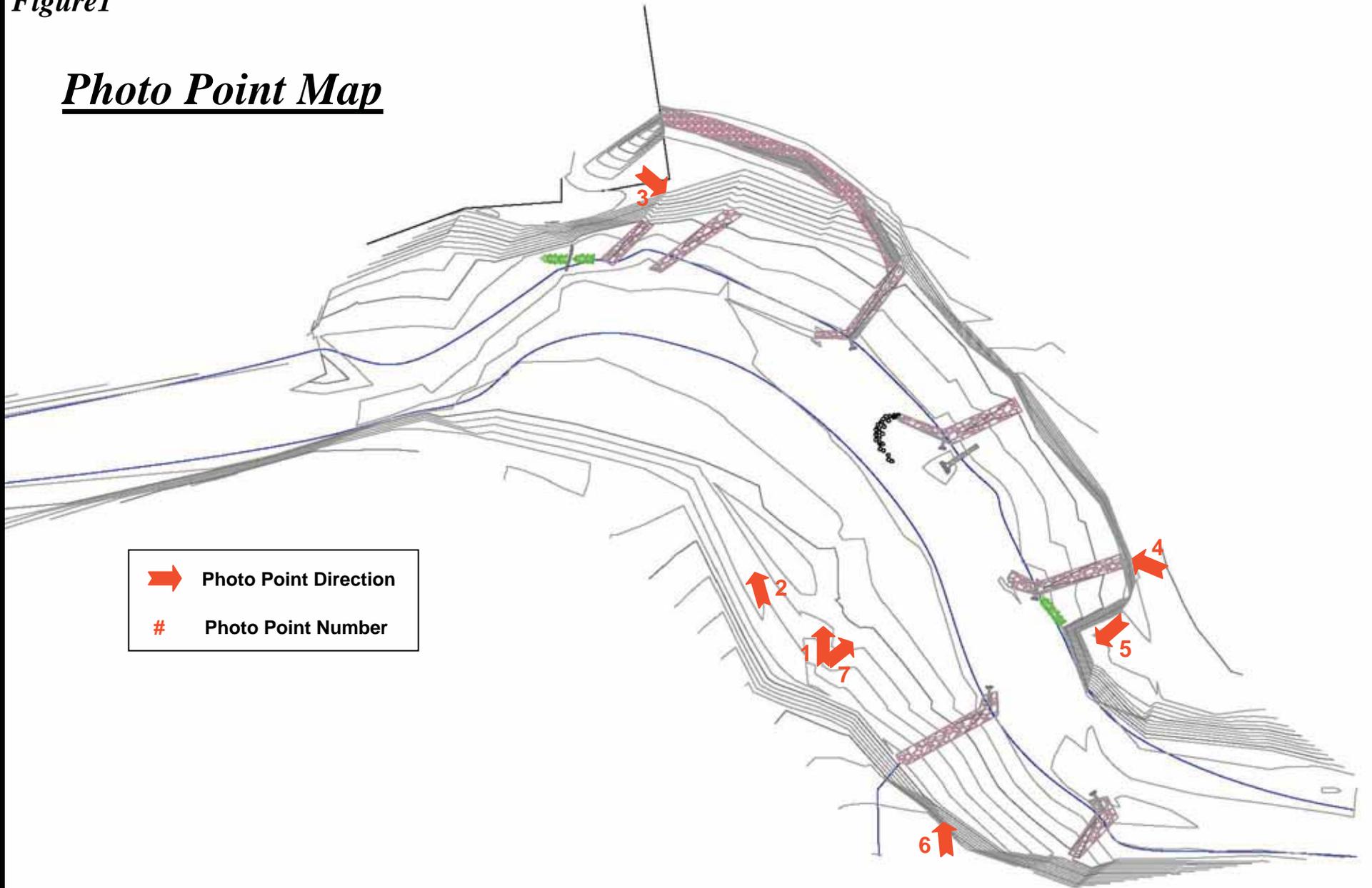
No headcuts or nick points are visible in the channel reach. No evidence of significant incision or aggradation of the channel bed was seen. Some erosion of the terrace toe occurred between Rock Barb 2 and Rock Barb 3 in 2006/2007, but the erosion has not impacted the bank and there has been some recent deposition along the toe of the terrace where the scalloping had occurred. Sediment build up is evident on the constructed terraces between rock barbs (this is desirable for the project) and on the inside stream curves.

Bank erosion did not occur during this monitoring period as there were no significant flow events. Vegetation has established on the soil sloughed during the 2007/2008 (see Photo Monitoring Point 7 photo). No additional trees from the top of bank have been lost since construction.

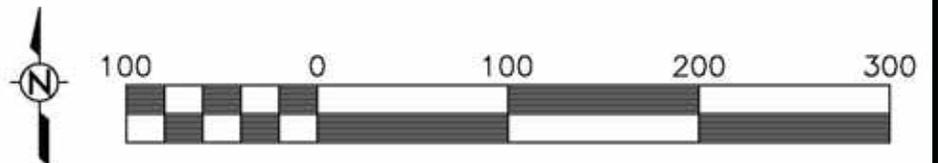
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Figure 1

Photo Point Map



- ➔ Photo Point Direction
- # Photo Point Number



Scale 1" = 100'

Figure 2

# Overall Project Plan Map

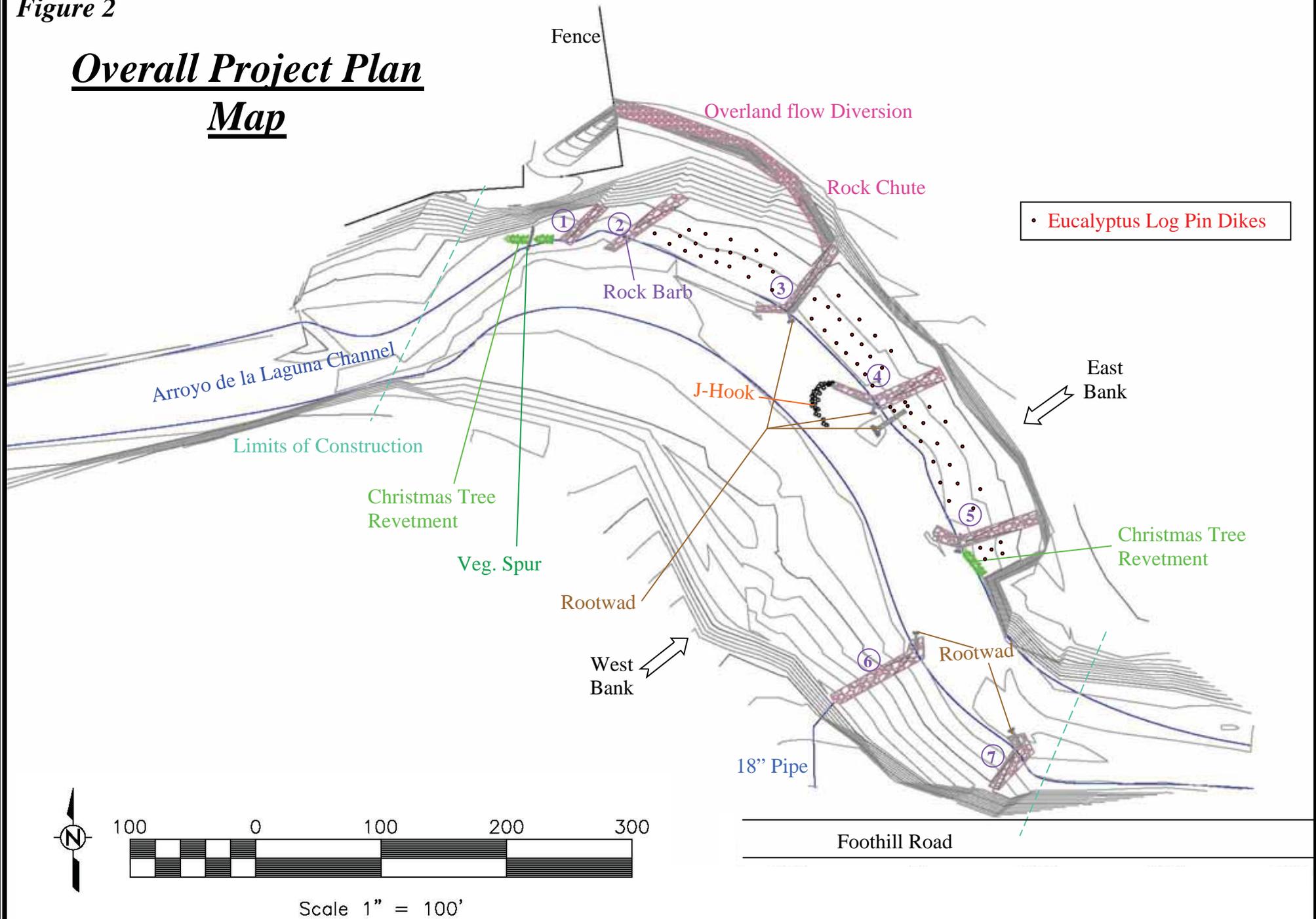
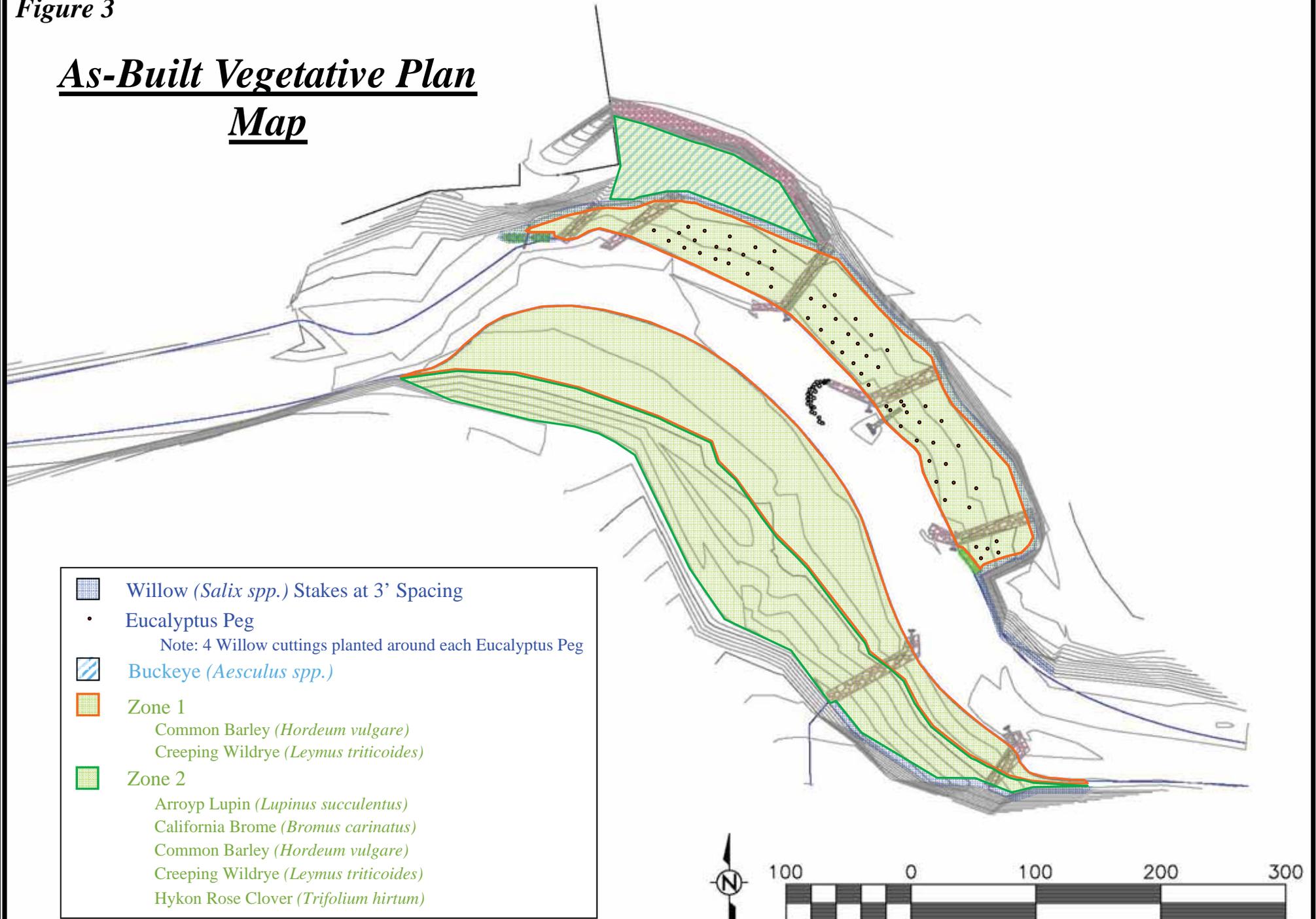


Figure 3

# As-Built Vegetative Plan Map



# **APPENDIX A PHOTOGRAPHS**

BEFORE CONSTRUCTION PHOTOGRAPHS: PHOTO-MONITORING POINTS

2008/2009 PHOTOGRAPHS: PHOTO-MONITORING POINTS

2008/2009 PHOTOGRAPHS: FEATURES AND VEGETATION



**August 2006 Photo Monitoring Point 1**



**April 2009 Photo Monitoring Point 1**



**August 2006 Photo Monitoring Point 2**



**April 2009 Photo Monitoring Point 2**



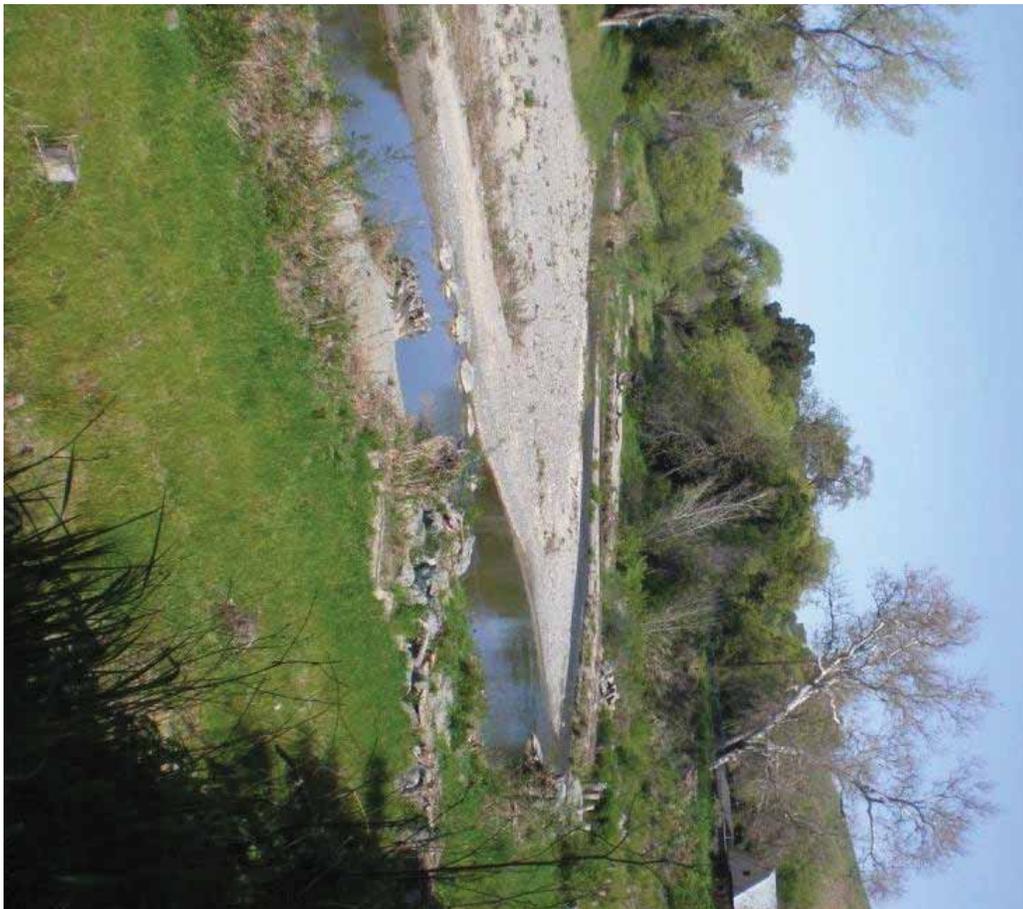
**August 2006 Photo Monitoring Point 3**



**April 2009 Photo Monitoring Point 3**



August 2006 Photo Monitoring Point 4



April 2009 Photo Monitoring Point 4



**August 2006 Photo Monitoring Point 5**



**April 2009 Photo Monitoring Point 5**



**August 2006 Photo Monitoring Point 6**



**April 2009 Photo Monitoring Point 6**



**August 2006 Photo Monitoring Point 7**



**April 2009 Photo Monitoring Point 7**



**April 2009 – Willow growth, sediment deposition and vegetation establishment at vegetative barb**



**March 2009 – Erosion and vegetation establishment at pipe outfall, Rock Barb 6**



April 2009 – Aquatic vegetation and Rootwads at Rock Barbs 6 (stranded by deposition) and 7 (not stranded)



January 2009 – Willow Growth Near Rock Barb 1

**APPENDIX B  
PLANT SPECIES INVENTORY**

Plant Species Inventory at Arroyo de la Laguna

April 6, 2009

Scientific Name	Common Name	Native/ Introduced	b/ veg spur & Barb#1	b/ Barb#1 & Barb#2	b/ Barb#2 & Barb#3	b/ Barb#3 & Barb#4	b/ Barb#4 & Barb#5	b/ Barb#5 & end
<i>Acer negundo</i>	boxelder	N				X		
<i>Aesculus californica</i>	California buckeye	N			X		X	
<i>Agrostis sp.?</i>		I?	X	X		X	X	
<i>Anagalis arvensis</i>	scarlet pimpernel	I						X
<i>Artemisia douglasiana</i>	mugwort	N	X	X	X	X	X	X
<i>Baccharis pilularis</i>	coyote brush	N	X	X		X	X	X
<i>Baccharis salicifolia</i>	mule fat	N	X					
<i>Bromus carinatus</i>	California brome	N		X	X			
<i>Bromus diandrus</i>	ripgut brome	I	X	X	X	X	X	X
<i>Bromus hordeaceus</i>	soft chess	I			X	X		
<i>Cardamine oligosperma?</i>	bitter-cress?	N					X	X
<i>Carduus pycnocephalus</i>	Italian thistle	I		X	X	X	X	X
<i>Claytonia perfoliata</i>	miner's lettuce	N					X	X
<i>Conium maculatum</i>	poison hemlock	I		X	X	X	X	X
<i>Cyperus eragrostis</i>	tall flatsedge; nutsedge	N	X	X		X	X	X
<i>Dittrichia graveolens</i>	stinkweed	I			X		X	
<i>Elymus glaucus</i>	blue wildrye	N	X	X	X	X	X	
<i>Epilobium sp. (probably E. brachycarpum)</i>	fireweed	N					X	X
<i>Euthamia occidentalis</i>	Western goldenrod	N	X	X	X		X	X
<i>Foeniculum vulgare</i>	fennel	I			X			X
<i>Galium sp.</i>	bedstraw	N						X
<i>Geranium dissectum</i>	cutleaf geranium	I			X		X	
<i>Gnaphalium luteo-album</i>	cudweed	I			X	X		X
<i>Hirschfeldia incana or Brassica nigra</i>	shortpod mustard	I			X	X	X	
<i>Hordeum murinum</i>	farmer's foxtail	I		X	X	X	X	
<i>Hordeum vulgare</i>	common barley	I		X				
<i>Juncus xiphioides</i>	iris-leaved rush	N					X	
<i>Kickxia sp.</i>	flullin	I					X	
<i>Lepidium latifolium</i>	perennial pepperweed	I	X	X		X	X	
<i>Leymus triticoides</i>	creeping wildrye	N		X	X	X	X	X
<i>Lolium multiflorum</i>	Italian ryegrass	I	X		X	X	X	X

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<i>Lotus corniculatus</i>	birdfoot trefoil	I	X		X	X	X	X
<i>Ludwigia sp.</i>	water primrose	N		X				
<i>Lupinus succulentus</i>	arroyo lupine	N		X	X	X	X	
<i>Malva sp.</i>	cheeseweed	I			X		X	
<i>Medicago polymorpha</i>	bur clover	I			X	X	X	
<i>Melilotus alba</i>	white sweetclover	I		X	X	X	X	X
<i>Nicotiana glauca</i>	tree tobacco	I		X			X	
<i>Phalaris aquatica</i>	harding grass	I	X	X		X		
<i>Picris echioides</i>	bristly ox-tongue	I		X	X	X	X	X
<i>Piptatherum miliaceum</i>	smilgrass	I	X		X	X	X	X
<i>Plantago major</i>	common plantain	I	X		X	X	X	X
<i>Polygonum sp.</i>	water smart weed	N				X		
<i>Populus fremontii</i>	Fremont cottonwood	N	X			X	X	X
<i>Quercus agrifolia</i>	coast live oak	N					X	
<i>Raphanus sativa</i>	wild radish	I	X		X	X	X	X
<i>Rumex crispus?</i>	curly dock	I	X				X	
<i>Rumex sp. (probably Rumex conglomeratus)</i>		I				X		
<i>Salix lasiolepis</i>	arroyo willow	N	X					X
<i>Salix sp.</i>	willow	N	X	X		X	X	
<i>Sambucus mexicana</i>	blue elderberry	N						X
<i>Scripus acutus</i>	hardstem bulrush	N	X	X		X	X	X
<i>Scrophularia californica</i>	bee-plant	N						X
<i>Senecio vulgaris</i>	common groundsel	I				X	X	X
<i>Silybum marianum</i>	milk thistle	I					X	
<i>Solanum sp.</i>	nightshade	I					X	
<i>Solanum umbelliferum</i>	blue witch	N					X	
<i>Sonchus sp.</i>	sowthistle	I		X	X			
<i>Syphoricarpus sp. (probably S. albus)</i>	snowberry	N						X
<i>Trifolium hirtum</i>	rose clover	I		X	X			
<i>Typha sp.</i>	cattail	N	X	X	X		X	X
<i>Urtica dioica</i>	stinging nettle	N			X			

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<i>Veronica sp. (probably Veronica anagallis-aquatica)</i>	water speedwell	N			x		x	
<i>Vicia sativa</i>	common vetch	I		x	x	x	x	
<i>Xanthium spinosum or Xanthium strumarium</i>	cocklebur	N	x			x	x	x
<i>Scripus sp. Or Carex sp.?</i>	unknown sedge			x				x
<i>Brassica sp.?</i>	unknown mustard	I						x