Summary of As-Built Conditions
for the
Strawberry Creek Confluence Ecological Stabilization Project
(2015)

Prepared for the University of California at Berkeley

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I. Project Overview and Summary of As-Built Conditions

A. Regulatory Background

On August 1, 2014, the San Francisco Regional Water Quality Control Board issued the Water Quality Certification for the University of California Berkeley Haas School of Business Expansion Project for Site No.: 02-01-C1181 (bkw). As part of the conditions outlined in the permit, the Strawberry Creek Confluence Ecological Stabilization Project (the Project) was used as partial mitigation for impacts to waters of the State as a result of construction activities to expand the UC Berkeley Haas School of Business. This report is a summary of as-built conditions for the Project as required in the permit conditions.

B. Project Location

The Strawberry Creek Confluence Ecological Stabilization Project is located in the Stawberry Creek watershed on the west side of the campus of the University of California, Berkeley (**Figure 1**). The project site extends from the confluence of the north and south forks of Strawberry Creek to 80 feet up the north fork of Strawberry Creek (**Figure 2**). The drainage area upstream of the confluence encompasses approximately 1,147 acres (1.8 square miles).

C. Project Background and Purpose

The Project is a student-initiated creek restoration effort to improve habitat for native fish and other aquatic species, provide bio-engineered grade control structures, and reduce bank erosion by laying back banks to a stable slope and planting native vegetation. This project introduces pool and riffle habitat with refuge areas for fish species, re-connects disconnected fish habitat by removing an impassible check dam, and mitigates erosion of the stream banks. Long-term conservation goals include the protection and enhancement of habitat for native riparian species on the creek, including three fish species (Sacramento sucker, Three-spined stickleback, and California roach minnow).

The purpose of this project is to enhance the beneficial use of water as stated in Section 2.1.19 (Warm Freshwater Habitat) of the Water Board's Basin Plan: "Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates."

The project site is located in an area that included one failed check dam (CD1) at Station 0+65 and another failing check dam (CD2) at Station 1+00 **(Figure 3).** CD1 was a decades-old check dam constructed on the north fork of Strawberry Creek located immediately upstream of the confluence of the north and south forks. The failure of this check dam in 2002 caused the main concrete body of the dam to orient stream-wise in the center of the channel (**Photos 1** & **2** of

Attachment A). Additionally, remnants of CD1 deflected flow into the right bank at the confluence, causing a near vertical 6-foot scarp (**Photo 3** of **Attachment A**). The failure of CD1 caused the channel bed to incise upstream, undermining CD2 which was located 35 feet upstream of CD1. CD2 was at risk of failure due to undercutting of the support structure on the right bank (left side of **Photo 4** of **Attachment A**) and water piping through the dam.

D. As-Built Summary

The Project removed the remnants of CD1 and the failing check dam CD2, and installed three bio-engineered grade control structures: two step-pool structures and one log drop structure. The step pools were constructed of ungrouted rock and are flexible to adjust to modest changes in channel conditions. The structures and laying back of adjacent banks impacted a total of 80 linear feet of channel bed and approximately 1,600 square feet of channel and bank area. The bio-engineered grade control structures consist of a crest, a cascading drop, and a pool feature which transitions into the channel design grade. The step-pool structures are about 15 feet long, measured along the channel. The crests (measured at the low flow channel) range from 5-8 feet wide. The crests were keyed 4-5 feet into the adjacent channel banks to capture and direct flows to the channel as well as to provide protection against flanking in larger storm events. Each rock structure has a drop of 1.5-2.0 feet and the log drop structure has a drop of 1.0 feet. In addition to the installation of the bio-engineered grade control structures, steep adjacent banks were laid back to a stable slope and planted with native vegetation.

There were four grade control structures in the vicinity of the work area prior to construction:

1. Station 0+48 (approx) – just downstream of confluence, this grade control is near at grade with no signs of deterioration.
2. Station 0+65 (approx) – failed grade control structure (referenced as CD1) just upstream of confluence - REMOVED
3. Station 1+00 (approx) – failing grade control structure (referenced as CD2) - REMOVED
4. Station 1+40 (approx) – existing grade control with no signs of deterioration.

Three new bio-engineered grade control structures were installed:

- Station 0+80 – Crest of Rock Step Pool 1
- Station 0+96 – Crest of Rock Step Pool 2
- Station 1+16 – Crest of Log Weir

Revegetation of the laid-back banks consisted of native plants, including the following: Western Sword Fern, California Rose, Douglas Iris, Alum Root, Common Rush, Western Wild Ginger,

California Honeysuckle, Black Twinberry, Wild Strawberry, Torrent Sedge, White Alder, Red Willow and Big Leaf Maple.

E. Timeline

Construction of the project commenced on October 6, 2014. Heavy equipment work in the channel ended on October 16, 2014. Revegetation, irrigation, final grading and most of the site demobilization ended by November 9, 2014. Large tree logs that were utilized for project construction were removed from the site on December 10, 2011. Minor adjustments were made to the project area following the December 11, 2014 storm event. The project was deemed complete on December 15, 2014.

F. Monitoring plan

The project monitoring period commenced December 15, 2015, the date of project completion. Monitoring will be conducted by UC Berkeley staff according to the methods and monitoring schedule outlined in the Strawberry Creek Ecological Stabilization Project Mitigation Monitoring Plan (MMP, **Attachment B**), with some alterations as required by the permit's certification conditions (pages 13-20 of **Attachment C**). Annual monitoring data will be gathered during the late spring or early summer of each monitoring year, and results will be analyzed to determine performance and success criteria as stipulated in the MMP and the permit. Annual monitoring reports will be submitted to the Regional Water Quality Control Board by December 31 of each monitoring year.

II. Methods

This Summary of As-Built Conditions report provides a description of the biological and structural conditions of the project site immediately following installation relative to the original design documents submitted to the regulatory permitting agencies. Since the construction documents did not deviate significantly from the permitted 60% design, the construction design documents are used as the basis of comparison (**Attachment D).** The intent of the Summary of As-Built Conditions is to document significant deviation from the permitted design.

A. Qualitative assessment of creek channel stability

On January 27, 2015, creek channel stability was visually assessed from station 0+30 to the outlet of the West Circle culvert at station 2+35 using elements of the rapid assessment technique as described in the US Department of Transportation (DOT) *Assessing Stream Channel Stability at Bridges in Physiographic Regions (*2006). Descriptions of each of these parameters along with their rating system are included in **Attachment E**. Not all parameters were relevant to this project assessment. The following list summarizes the parameters that were assessed:

- Entrenchment/channel confinement
- Bed material
- Bank soil texture and coherence
- Average bank slope
- Vegetative or engineered bank protection
- Bank cutting
- Mass wasting or bank failure

All parameters that were included in the assessment were equally weighted and averaged to determine channel stability ratings. This assessment as altered is not the DOT's specific methodology and only represents a baseline characterization by which future studies can occur.

The creek was assessed in the following sections to reflect different characteristics of the project site and its potential impact on surrounding areas:

Table 1: Sections of Creek Assessment

Stations	Description
0+30 to 0+48	Pool below original grade control structure (GCS) at confluence
0+48 to 0+65	Original GCS to the installed project sill
0+65 to 0+96	Installed project sill to step pool 2 crest by buckeye
0+96 to 1+16	Step pool 2 crest by buckeye to log weir crest
1+16 to 1+40	Log weir crest to original GCS immediately upstream (US) of project site
1+40 to 1+85	Original GCS at US edge of project site to downstream edge of culvert pool
1+85 to 2+35	Pool at the outlet of the West Circle culvert

In addition, the three installed bio-engineered structures at stations 0+80, 0+95 and 0+115 and the existing grade control structures at stations 0+48 and 1+40 were visually assessed to determine stability.

B. Post-construction survey of channel features

The project site was surveyed on January 23, 2015 using a Topcon AT-F6 auto level, surveying rod and measuring tape. The data from the baseline survey of existing conditions in 2013 that served to inform the design documents was gathered using a Total Station. Due to the difference in the equipment used, elevations were not exactly correlated. The check dam at Station 1+40 remained untouched during the project construction, therefore elevations at this cross-section were used as a reference to determine actual differences between the design and as-built conditions, versus differences due to equipment variance. It was found that the average elevation difference at the Station 1+40 check dam between the Total Station and the auto level was 1.72 feet. For this as-built report, elevations from the 2015 topographic survey were adjusted to the 2013 reference elevations by subtracting 1.72 feet from all new elevation data (**Chart 1**).

Cross sections of the new and existing grade control crests, pools, thalweg and banks were surveyed on no more than 15 foot increments between stations 0+60 and 1+40. The survey points were used to develop the as-built plan view site map (**Figure 4**). The as-built maps were compared with the original design documents (**Figure 5).**

C. Vegetation Survey

Installed plants were mapped by visual inspection on January 29, 2015 (**Figure 6**). Only the right bank was mapped at this time, given the permit conditions as outlined on page 12 (**Attachment C**), which states that the left bank will not need to be monitored due to the presence of Eucalyptus trees. Installed plants were inventoried on both banks of the creek and are presented in **Table 3** in the Results section.

D. Photo documentation

Nine photo-documentation points were established at the site prior to construction (**Figure 7**). Pre-construction photos were taken prior to construction activities on October 3, 2014 (except for one photo - PP8 – that was taken March 31, 2013 and accurately represents pre-project conditions). Post-construction photos were taken on December 16, 2014 just after the project was deemed complete (**Attachment F**).

III. Results and Discussion

A. Qualitative assessment of creek channel stability

The creek channel was assessed for stability from Station 0+30 to Station 2+35. Field data is included in **Attachment G**. **Table 2** summarizes the results from this qualitative rapid creek stability assessment.

Table 2: Creek Channel Stability Rapid Assessment Ratings

(Ratings: 1-3=excellent; 4-6=good; 7-9=fair; 10-12=poor)

Stations	Description	Average Rating
0+30 to 0+48	Pool below original grade control structure (GCS) at confluence	6.8
0+48 to 0+65	Between original GCS and installed project sill	5.3
0+65 to 0+96	Between installed project sill to step pool crest by buckeye	5.8
0+96 to 1+16	Step pool crest by buckeye to log weir crest	5.6
1+16 to 1+40	Log weir crest to original GCS at upstream (US) edge of project site	7.7
1+40 to 1+85	Original GCS at US edge of project site to downstream (DS) edge of culvert pool	5.1
1+85 to 2+35	Pool at the outlet of the West Circle culvert	9.0

The project site is bounded by Stations 0+60 (sill) and Station 1+16 (log weir crest). Within the project site the average rating is 5.7, which is in "good" condition according to the rating system. This aligns with the project's purpose to increase channel stability at a site that was previously very unstable and the site of erosion and bank failure. It is expected that this overall rating will improve as vegetation starts to fill in the banks.

The best channel stability rating (5.1) is the stretch from the original grade control structure upstream of the project site area to the downstream edge of the culvert pool (Stations 1+40 to 1+85). This reach of the creek is the most connected with the grade of the surrounding terrain and is host to a number plant species that are mixed native and non-native, which help to stabilize banks.

The worst-scored area is the pool at the outlet of the West Circle culvert (Stations 1+85 to 2+35 at 9.0), which is scored in "fair" condition. Although the pool itself seems stable and is a potentially good habitat for a range of riparian species, the banks on either side are not stable. On the right bank, an old retaining wall might be the source of some of the concrete rubble found in the downstream sections of the creek. On the left bank, overland flow from major storm events is

starting to scour around infrastructure of the pool inlet area. The University is currently looking at options to restore this area using bioengineering techniques.

In addition to the rapid assessment ranking of creek channel stability, each of the grade control structures and its surrounding area was visually assessed for stability. **Table 3** shows the results from this assessment as well as recommended actions. Any actions taken will be documented in future annual reports.

Table 3: Grade Control Structure (GCS) Inspection

Station #	Description	Assessment	Recommended Action
0+48	Original GCS at downstream edge of project site	Stable	NA
0+80	Step Pool 1 crest	Stable	NA
0+95	Step Pool 2 crest	Stable – small hole on left bank due to displacement of small boulder, however larger boulders remain stable. Piping – possible piping of water through creek substrate during dry periods leading to subsurface water flow.	The contractor is aware of the possible piping issue and if it presents a problem during dry summer months they will return to fix it.
1+15	Log weir crest	Stable	NA
1+25	Downstream of specimen boulder on right bank	Right bank erosion on downstream edge of specimen boulder due to constriction of channel pathway.	Move boulder further into right bank to open up channel.
1+40	Original GCS at upstream edge of project site	Stable – some additional scour under tree roots on downstream left bank is evident. This provides valuable habitat for fish.	Relocating boulder at Station 1+20 will probably prevent further scour at this location.

B. Post-construction survey of channel features

Elevations

As-built elevations reflect close adherence to the design elevations of the creek channel thalweg. Comparisons of the channel thalweg between design and as built conditions are shown in **Chart 2.** The greatest variance in elevations occurs at the sill - the as-built elevation is one foot higher than the design elevation. Inspection of the site indicates this elevation increase may be due to deposits of cobbles and sediment that were most likely transported during the major storm event on December 11, 2014. In addition, the pools formed below the two rock step structures are about half a foot shallower and about 2.5 feet farther downstream from the crest than the design. This represents the flexible nature of the rock step pools as they adjust to storm events. The small pool just downstream of the original check dam at Station 1+40 is an extra data point that was not taken during the baseline 2013 survey, and therefore cannot be accurately compared with the pre-project conditions. It was included in the graph for purposes of future study of this area.

Plan View

A plan view of the as-built site conditions is presented in **Figure 4**. Comparisons with the design plan (**Figure 5**) show close adherence to the orientation and station locations of the grade control structures.

Bank Slopes

Bank slopes were analyzed within the project site. Generally, bank slopes of no less than 2:1 (horizontal to vertical) are preferred for establishing stable earthen banks. Most of the project as constructed meets this requirement. However there are some areas that are over-steepened (see **Attachment H**). The area encompassing the two rock step pools (Stations 0+91, 0+80 and 0+75) have slopes approaching 1:1 near and in the water. In all three cases, the contractor was unwilling to excessively disturb tree roots in this area. Instead, the contractor lined the banks of both pools with boulders and planted the area immediately upslope in order to stabilize the banks.

C. Vegetation Survey

The plants on the right bank are mapped in **Figure 6**. The following table lists the species and numbers of plants on the right and left banks.

Table 3: Plant List

Common Plant Name	Latin name	Right Bank #s	Left Bank #s	Total Planted	Design #s
Alum Root	*Heuchera maximus*	10	7	17	20 [a]
Big Leaf Maple	*Acer macrophylum*	1	2	3	0 [b]
Black Twinberry	*Lonicera involucrata*	2	7	9	10
California Honeysuckle	*Lonicera hispidula*	9	10	19	20
California Rose	*Rosa californica*	8	7	15	15
Common Rush	*Juncus effusus*	13	24	37	50 [c]
Douglas Iris	*Iris douglasiana*	29	8	37	40
Red Willow	*Salix laevigata*	21	4	25	20 [d]
Torrent Sedge	*Carex nudata*	0	1	1	20 [e]
Western Sword Fern	*Polystichum munitum*	26	11	37	40 [f]
Western Wild Ginger	*Asarum caudatum*	22	7	29	30
White Alder	*Alnus rhombifolia*	3	1	4	8 [b]
Wild Strawberry	*Fragaria californica*	9	16	25	40 [c]

a) The contractor planted *Heuchera maxima* instead of *Heuchera micrantha* as called for in the design plans. The University decided to allow this drought-tolerant native California Alum Root to remain planted even though it is not locally native, rather than waste resources by removing it and replanting.

b) Three (3) Big Leaf Maples were planted in place of four (4) White Alders due to the University's decision that big leaf maples will provide longer term benefits for creek habitat.

c) Common Rushes and Wild Strawberries were present at rates significantly lower than the design plantings (37 vs. 50, and 25 vs. 40 respectively). Most likely this is due to the large storm event of December 11, 2014, in which plants close to the water's edge were swept away.

d) The contractor planted more Red Willow stakes than were requested, probably expecting a high fatality rate. Many of the willow stakes are sprouting strong and may need to be removed to other locations in the future so that they don't overwhelm the project site.

e) Twenty Torrent Sedges were planted and only one has survived. This may be due to defective stock or site conditions that are not conducive to sedges. Because of the high density of plants in the project area, the University did not ask the contractor to replace all of the sedges. Instead, Torrent Sedges will be reintroduced if riparian zone replacement plantings are needed in the future.

f) The design called for Maidenhair Ferns, which generally prefer moist, shaded locations. The University decided to replace this element of the design with the more drought-tolerant Western Sword Fern.

D. Photo documentation

Photo-documentation points (PP) were established at the site prior to construction (**Figure 7**). Pre-construction photos were taken prior to construction activities and post-construction photos were taken just after the channel work, irrigation and planting were completed (**Attachment F**).

IV. Conclusion

A. Adherence to Design

The project as it was built aligns closely with the design plans, with some modifications. The most significant deviances from the design include the following:

- Bank slopes from Station 0+75 to 0+91 are steeper than the recommended 2:1 (horizontal to vertical) slope for earthen banks. The contractor decided to protect tree roots and instead created a steeper slope armored with boulders and stabilized with plants.

- Some planting modifications were made at the University's request in order to provide more drought-tolerant plants (Western Sword Fern in place of Maidenhair Fern) and longer-lived trees (Big Leaf Maple in place of some White Alders).

- The contractor mistakenly planted a non-local variety of Alum Root, *Heuchera maxima* instead of *Heuchera micrantha*. In order to reduce waste, the University decided that this California native, drought-tolerant plant was an acceptable planting even though it is not locally native.

B. Channel Conditions

The channel stability rapid assessment rated the project site in "good" condition. It is expected that this overall rating will improve as vegetation starts to fill in the banks.

Inspection of the grade control structures reveal a couple of items to monitor and/or alter:

- Station 0+95 – Step Pool 2 Crest: Possible piping of water through creek substrate may lead to subsurface water flow during dry periods.
  - Recommendation: if this problem persists during the summer dry season, call the contractor to implement a solution.

- Station 1+25 – Erosion on the right bank just downstream of the specimen boulder is most likely due to scour from constriction of the channel pathway.
  - Recommendation: move the boulder further into the right bank, thereby opening up the channel. Armor right bank with smaller boulders just downstream of specimen boulder and plant with riparian vegetation in order to protect against further erosion.

C. Summary

Overall, the Project is a successful example of an ecologically engineered grade control solution to failing creek infrastructure. A large storm moved through the area on December 11, 2014 and all elements held up well with some minor adjustments. The two rock step pools are already home to California roach minnows and a variety of native plants on the creek banks are becoming established. This site will likely become an ecological oasis for creek life and hopefully will lead to similar projects along the north and south forks of Strawberry Creek.

Figures

Figure 1: Vicinity Map

Figure 2: Site Map

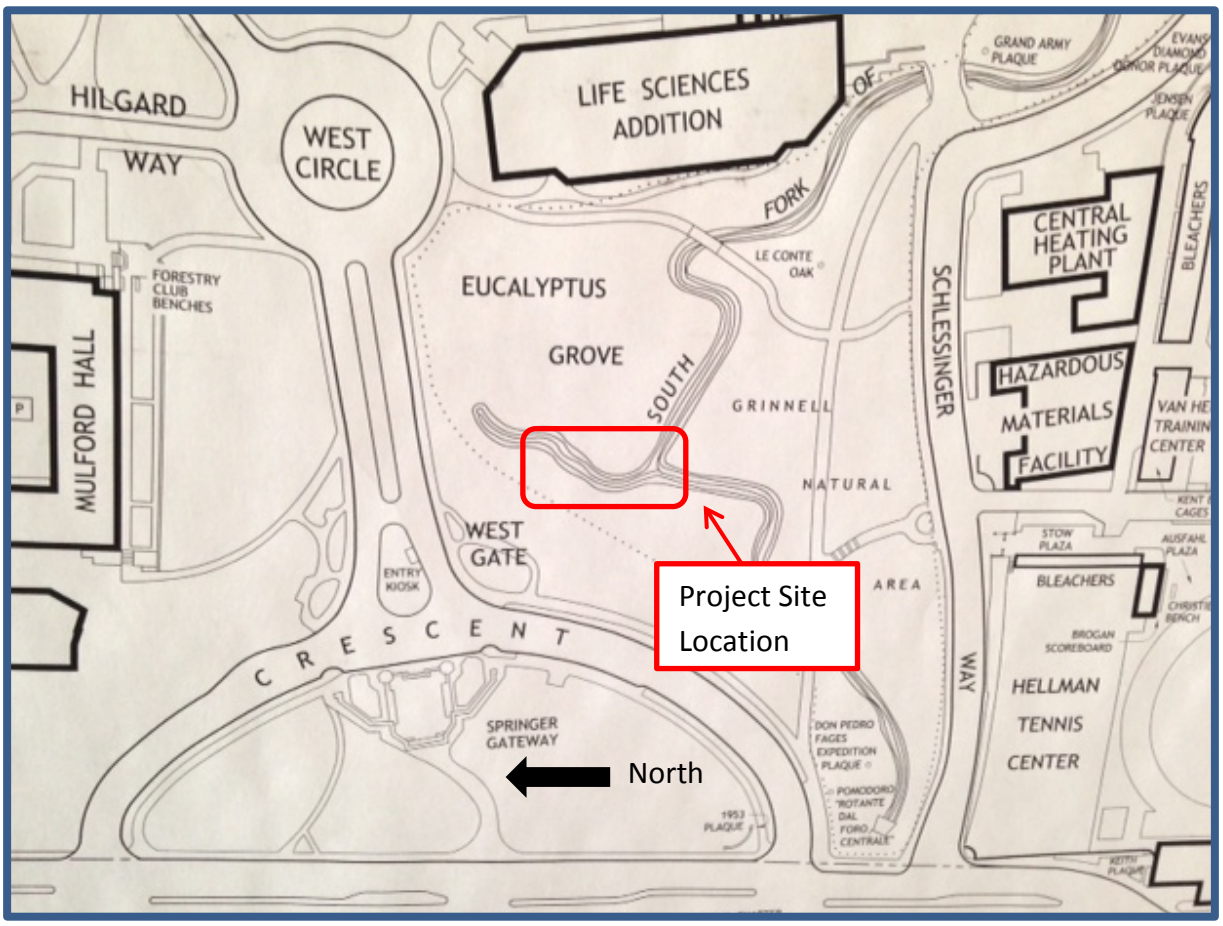


Figure 3: Existing Conditions Site Map

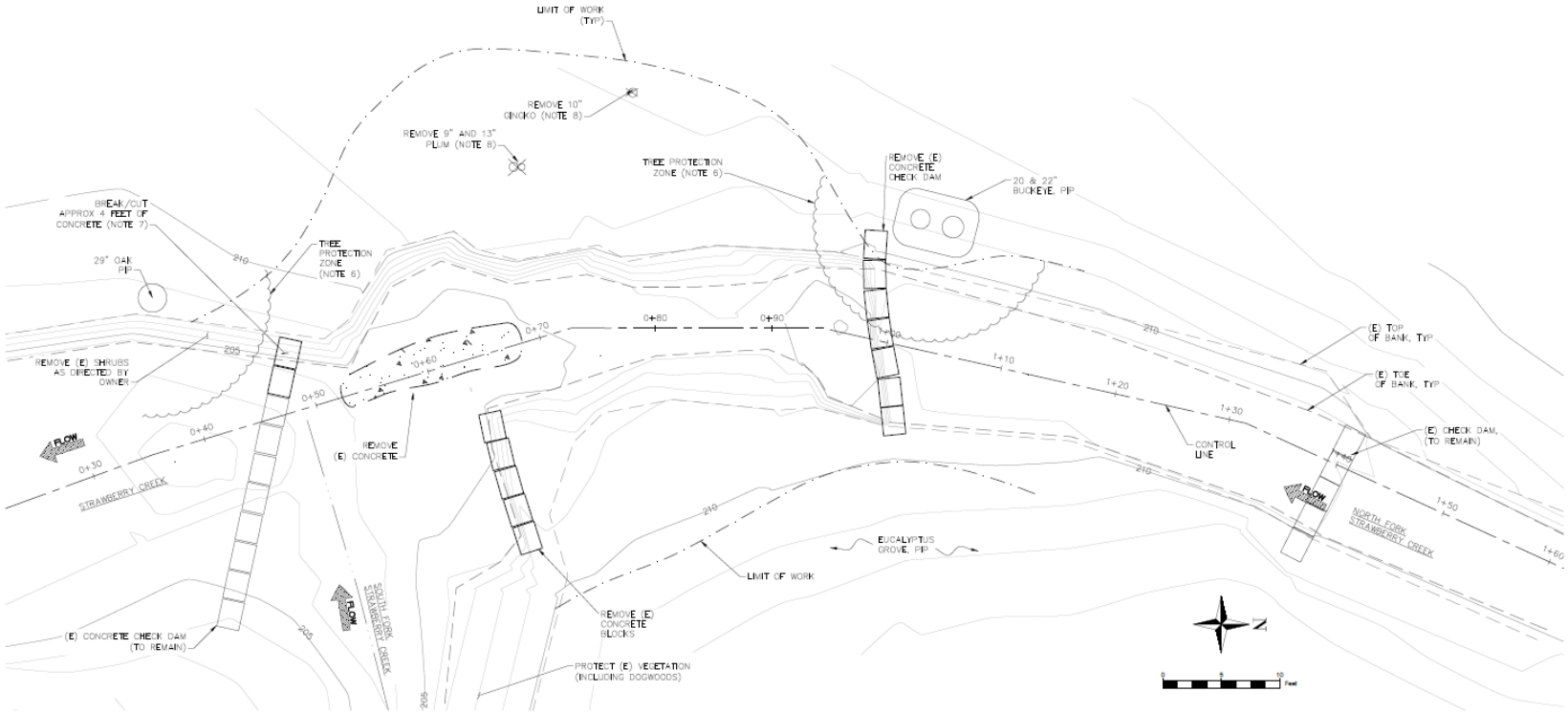


Figure 4: As-Built Site Map

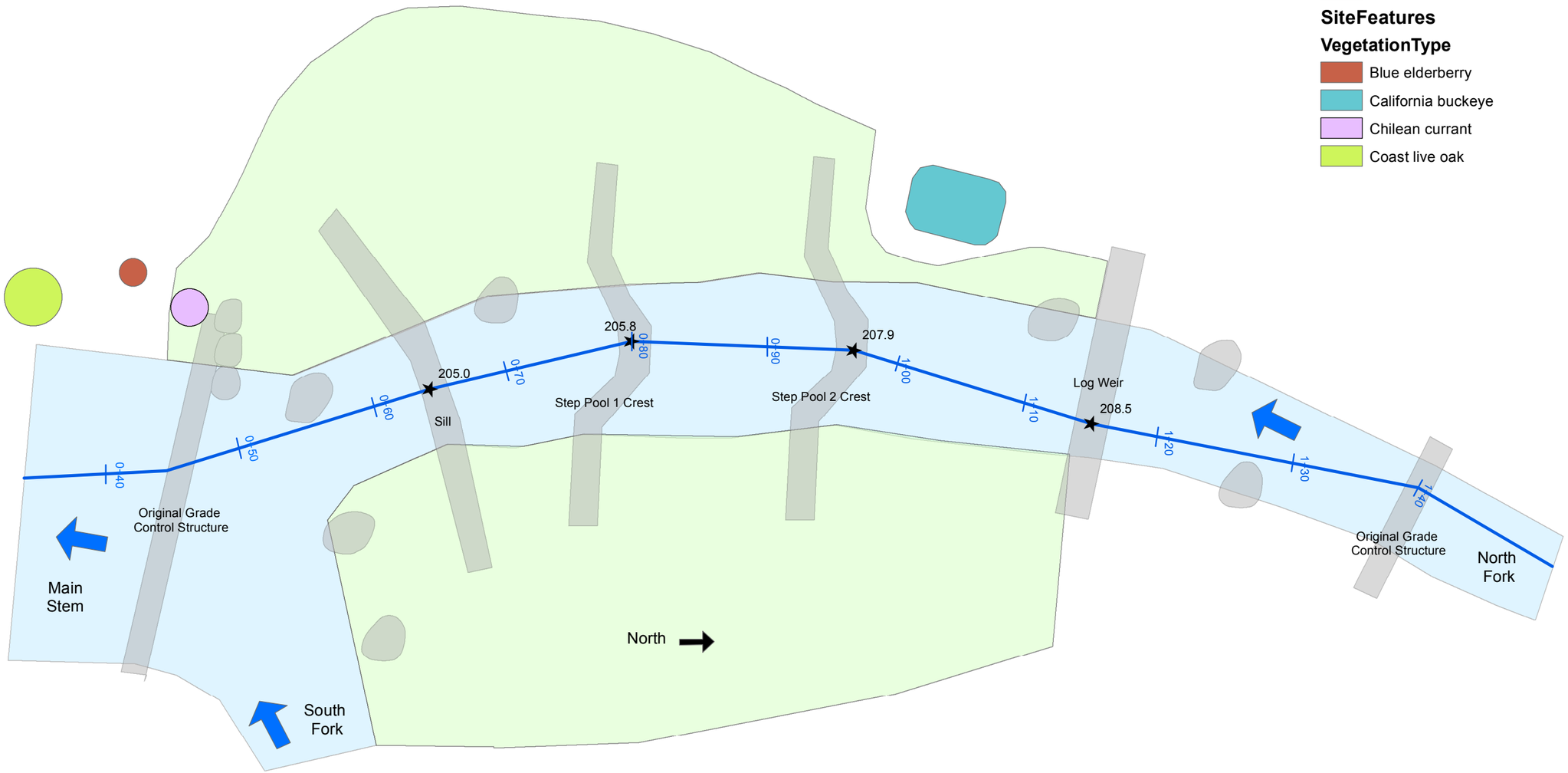


Figure 5: As-Built vs. Design Site Map

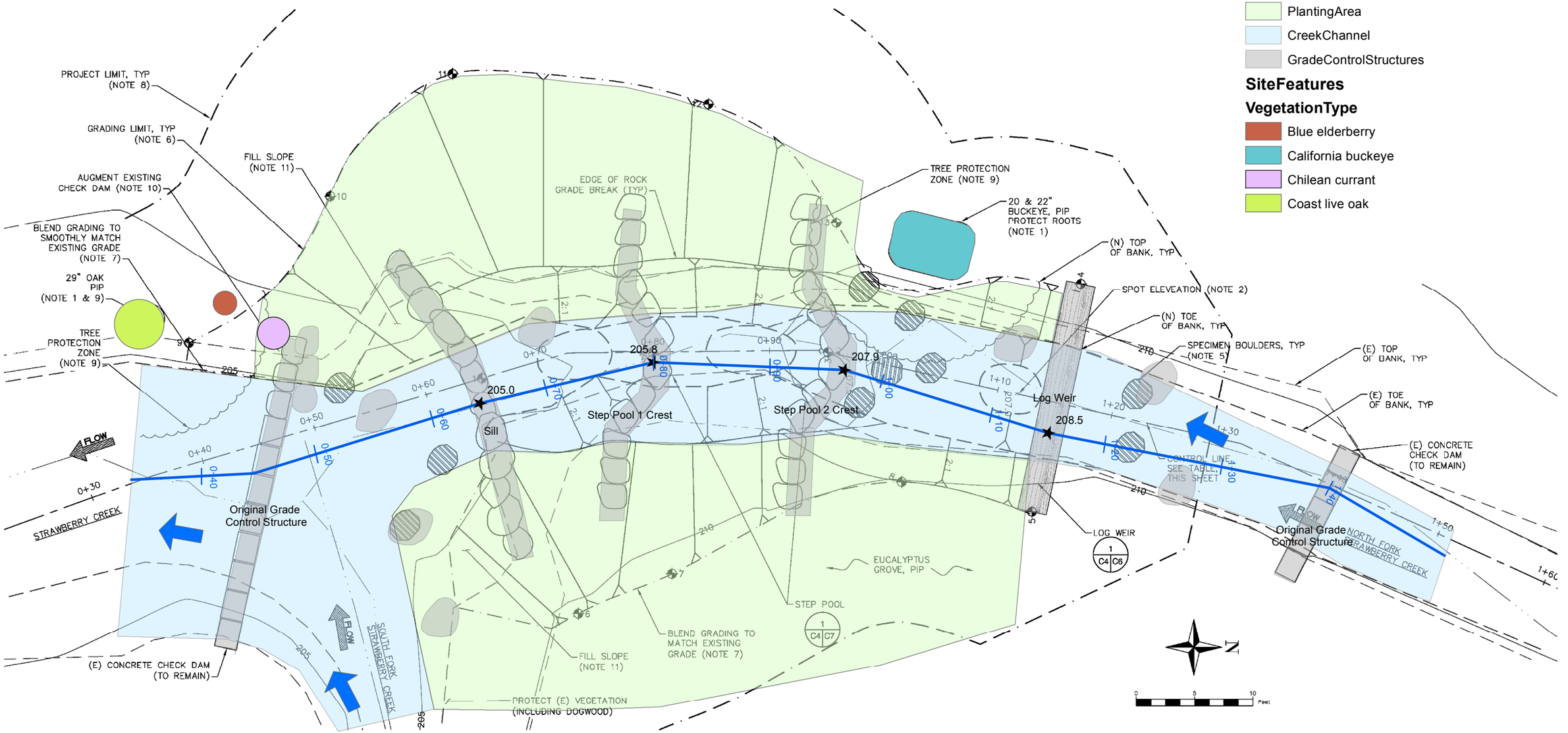
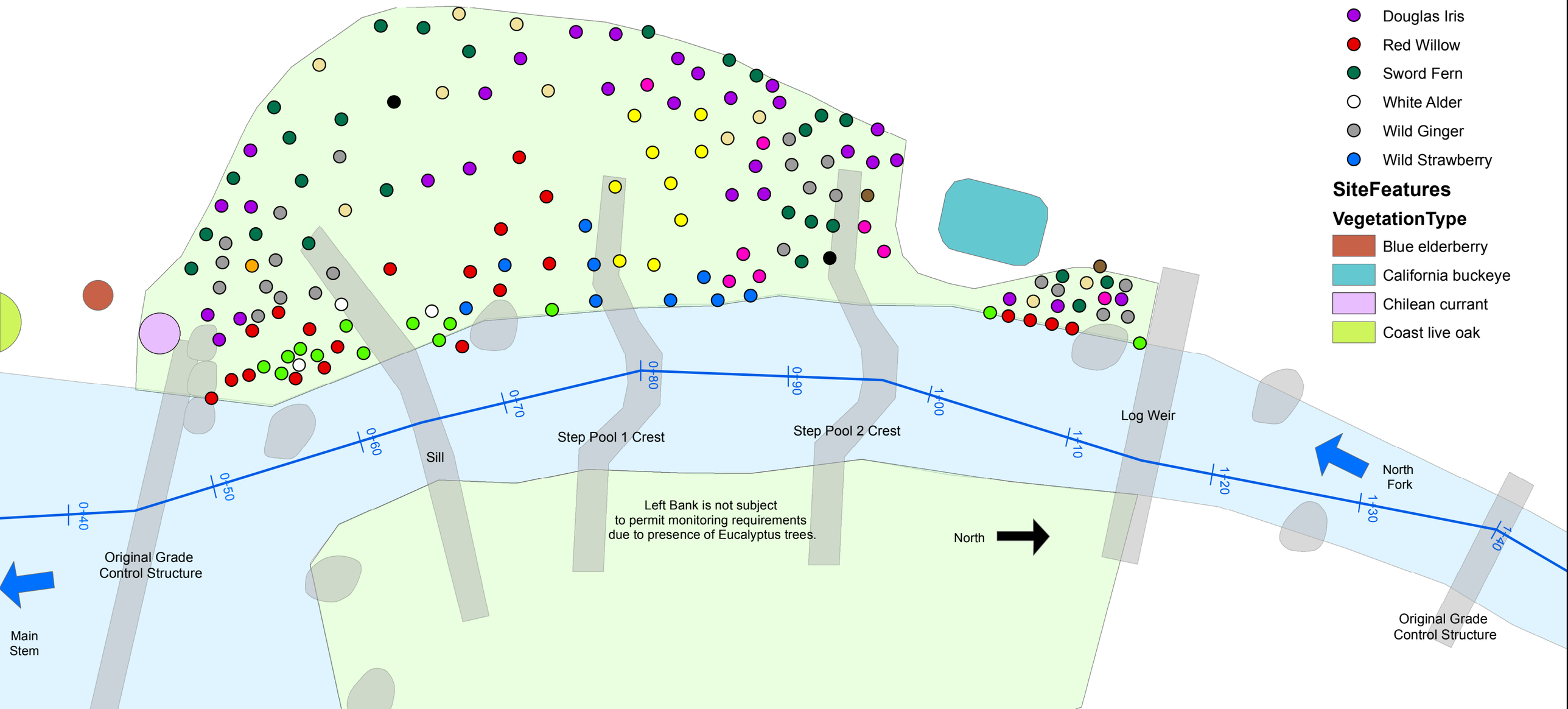


Figure 6: VegetationMap



Legend

Plants

PlantName

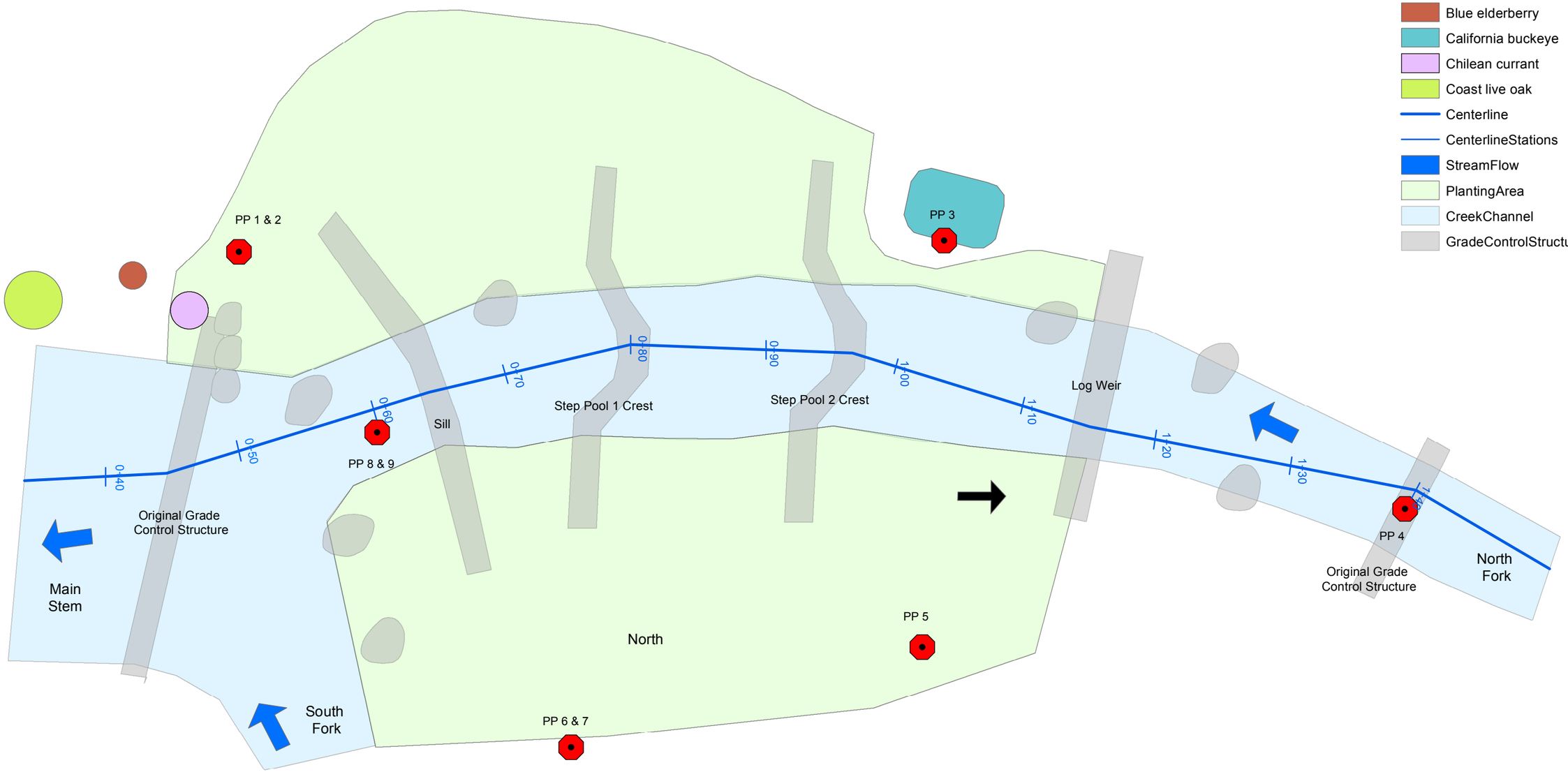
- Alum Root
- Bay Tree
- Big Leaf Maple
- Black Twinberry
- California Honeysuckle
- California Rose
- Common Rush
- Douglas Iris
- Red Willow
- Sword Fern
- White Alder
- Wild Ginger
- Wild Strawberry

SiteFeatures

VegetationType

- Blue elderberry
- California buckeye
- Chilean currant
- Coast live oak

Figure 7: Photo-Point (PP) Locations



Legend

- Photo Points

SiteFeatures

VegetationType

- Blue elderberry
- California buckeye
- Chilean currant
- Coast live oak
- Centerline
- CenterlineStations
- StreamFlow
- PlantingArea
- CreekChannel
- GradeControlStructures

Charts

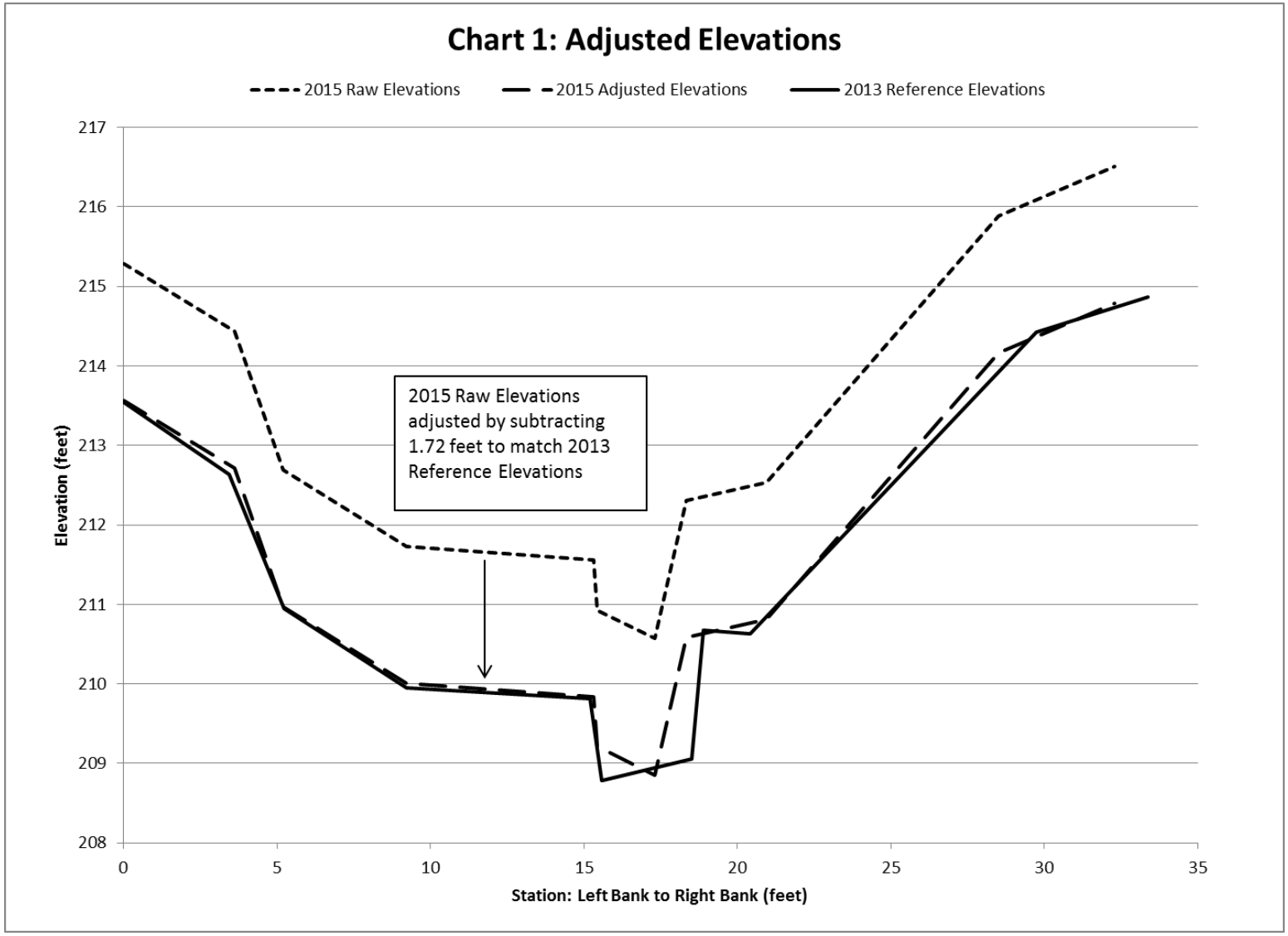


Chart 1: Adjusted Elevations
2015 Raw Elevations
2015 Adjusted Elevations
2013 Reference Elevations
2015 Raw Elevations adjusted by subtracting 1.72 feet to match 2013 Reference Elevations
Elevation (feet)
217
216
215
214
213
212
211
210
209
208
0
5
10
15
20
25
30
35
Station: Left Bank to Right Bank (feet)

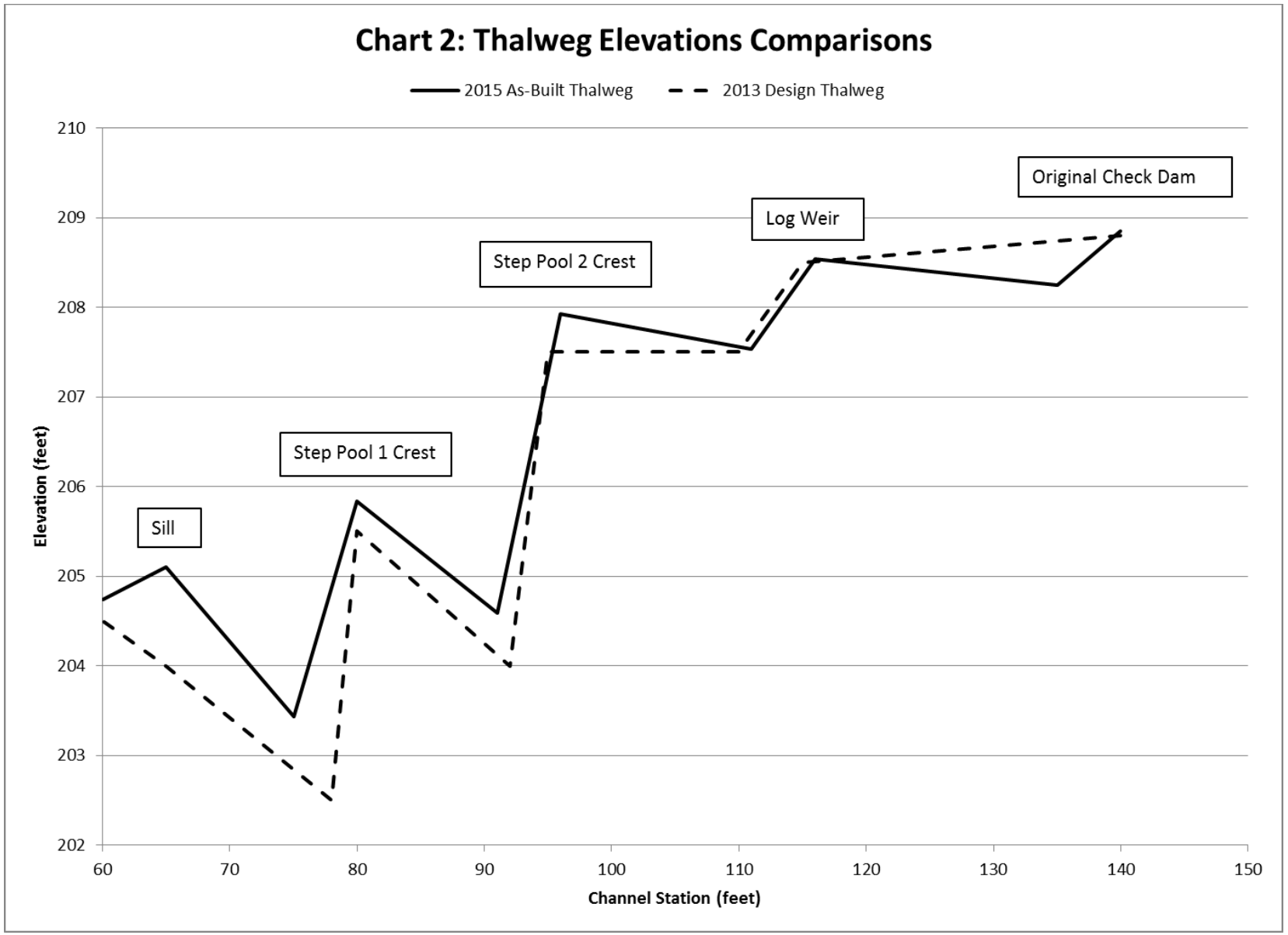


Chart 2: Thalweg Elevations Comparisons
2015 As-Built Thalweg
2013 Design Thalweg
Elevation (feet)
210
209
208
207
206
205
204
203
202
60
70
80
90
100
110
120
130
140
150
Channel Station (feet)
Original Check Dam
Log Weir
Step Pool 2 Crest
Step Pool 1 Crest
Sill

Attachment A:

Pre-Project Site Conditions

Photo 1: Failed check dam 1 (CD1) looking from the confluence upstream to the North Fork.

Photo 2: Failed check dam 1 (CD1) looking downstream to the confluence (South Fork comes in from the left side of the picture).

Photo 3: Right bank at the confluence continues to be eroded, leading to a 6-foot scarp.

Photo 4: Check dam 2 (CD2) is about 35 feet upstream of CD1 on the North Fork. Notice instability on the right bank (left side of picture).

Attachment B:

Mitigation Monitoring Plan

Strawberry Creek Ecological Stabilization Project Mitigation Monitoring Plan

July 30, 2014

Introduction

This Mitigation Monitoring Plan (MMP) describes monitoring actions proposed as a part of the Strawberry Creek Ecological Stabilization Project (Stabilization Project). At the request of the Regional Water Quality Control Board (RWQCB), implementation of the Stabilization Project – a project originally proposed by UC Berkeley as a voluntary restoration and enhancement project with independent utility - will serve to partially offset unavoidable impacts to waters of the State that will result from implementation of the UC Berkeley Haas School of Business Expansion Project (Haas project; Site No. 02-01-C1181 [bkw]).

The activities prescribed in this MMP are not required under the U.S. Army Corps of Engineers Section 404 Clean Water Act Permit issued for the Haas project (USACE File #2014-00051S) or under the California Department of Fish and Game Code [Section 1602(a)(4)(D); CDFW Notification No. 1600-2014-0103-R3).

Strawberry Creek Ecological Stabilization Project – Project Description

Details of the Stabilization Project are included in 401 Water Quality Certification application materials sent to the RWQCB in 2013. In summary, The Stabilization Project is a student-initiated creek restoration effort to improve habitat for native fish and other aquatic species, re-construct in-stream grade control structures, and reduce bank erosion by grading banks to a stable slope and planting native vegetation. The purpose of the Stabilization Project is to enhance the beneficial use of water as stated in Section 2.1.19 (Warm Freshwater Habitat) of the Water Board's Basin Plan: "Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates."

The Stabilization Project site is on the North Fork of Strawberry Creek, beginning at the confluence with the South Fork and extending 80 feet upstream. One failed check dam (CD1) is located at the confluence itself (approximately Station 0+50) and another failing check dam (CD2) is located at Station 1+00. The Stabilization Project location and detailed plans are shown on the attached design drawings (60% complete).

The Stabilization Project proposes to remove the remnants of CD1 and the failing check dam CD2, and install three bio-engineered grade control structures. These consist of two step-pool structures and one log drop structure. The step pools will be constructed of ungrouted rock and will be flexible to adjust to modest changes in channel conditions. The installation of the three bio-engineered structures and the laying back of adjacent banks will impact a total of 80 linear feet of channel bed and approximately 1600 square feet (0.04 acre) of channel and bank area. The bio-engineered grade control structures consist of a crest, a cascading drop, and a pool feature which transitions into the channel design grade. The typical step-pool structure is 15 feet long, measured along the channel. The crests (measured at the low flow

channel) will range from 5-8 feet wide. The crest is keyed 4-5 feet into the adjacent channel banks to capture and direct flows to the channel as well as to provide protection against flanking in larger storm events. The rock structure has an elevation drop of 1.5 feet. Additionally, one (1) log grade control structure will be constructed at Station 1+15. One or two channel-spanning logs (20 ft length), depending on diameter available, will be keyed into the banks a minimum of 2 ft. The total change in grade across the structure is 1.0 feet. There is a rock-armored pool (0.5 ft deep) immediately downstream of the log to dissipate energy. Laying back the banks and revegetation elements will integrate the step-pools with the channel banks. In addition to the installation of the bio-engineered grade control structures, oversteepend adjacent banks will be laid back to a stable slope and planted with native vegetation. Details and dimensions of the grade control structures, laid back banks, and planted vegetation are provided in the attached documents.

Implementation will entail removing the two failing concrete check dams (CD1 and CD2), excavating and removing material to achieve subgrade channel conditions and stable bank slopes, and placing ungrouted rock and logs to achieve design elevations for the three bio-engineered grade control structures. It is anticipated that 60 tons of concrete and 130 cubic yards of sediment will be removed from the channel to achieve subgrade channel conditions and stable slopes on the banks. Following minor over-excavation and laying back of channel slopes to accomplish a stable channel structure, approximately 120 tons of ungrouted rock (ranging from cobbles to 1-ton boulders) will be placed in the channel to create the three grade control structures and associated step pools, which will replace the two failing check dams that currently impede flows. Taking into account the placement of rock and logs (fill) associated with the grade control structures, the project will still result in a net removal of material from the channel bed and banks.

Revegetation of the banks will consist of native plants (plugs and containers) that are typically found in forested coastal watersheds. Plug plantings will occur in random naturalistic clusters with an average plant spacing of 18" on center. Container plantings will be grouped in clusters of 2-6 plants to create a naturualistic mosaic of woody patches and open areas. A preliminary list of plantings is included in **Table 1**, the As-Built Report will include plant list and density actually implemented.

Table 1: Proposed Revegetation Species

Common Name	Scientific Name	Container Size	Spacing OC(ft)
Maidenhair fern	*Adiantum jordanii*	Gallon	2
Western Wild Ginger	*Asarum caudatum*	Gallon	4
Torrent Sedge	*Carex nudata*	Plug	5
Alum Root	*Heuchera micrantha*	Gallon	2
Douglas Iris	*Iris douglasiana*	Gallon	4
Common Rush	*Juncus effusus*	Super Stubby (L6)	3
California Honeysuckle	*Lonicera hispidula*	Gallon	8
Black Twinberry	*Lonicera involucrata*	Tree pot 4	15
Wild Strawberry	*Fragaria californica*	Gallon	1
Western Swordfern	*Polystichum munitum*	5 Gallon	2

California Rose	*Rosa californica*	Tree pot 4	6-8
California Snowberry	*Symphoricarpos albus*	Gallon	5
Big Leaf Maple	*Acer macrophyllum*	Tree pot 4	18

Goals and Success Criteria

The goal of the Stabilization Project is to improve in-stream habitat for native fish and other aquatic species by providing in-stream grade control structures and reducing bank erosion by grading banks to a stable slope and planting native vegetation.

The project site has significant riparian canopy on the channel's right bank (looking downstream), and an established Blue Gum Eucalyptus grove on the left bank. The shady nature of the site and the allelopathic effects of the Eucalyptus (there is currently no understory in the Eucalyptus grove) are expected to be challenges to the survivorship of plantings. Plantings will occur on the channel left bank (under the Eucalyptus), however survivorship and cover will not be criteria for project success due to the existing Eucalyptus.

The following outlines the success criteria by which the Stabilization Project may be evaluated:

- No excessive channel destabilization, erosion, or scour within, or downstream, of the Stabilization Project site;
- Native cover on the channel right bank (looking downstream), including installed native species and recruited native species, should achieve a cover of at least 50 percent by end of the 10-year monitoring period, and;
- No greater than 10 percent cover of invasive species[1] during each monitoring year.

The success criteria will provide a basis for determining the need for possible remedial (corrective) actions. Given the potential vagaries of weather patterns and other environmental conditions beyond the control of the project, failure to attain one or more of the success criteria will not necessarily imply that the mitigation has failed. Rather, the entire set of monitoring results will provide a basis for discussion with regulatory agencies as to whether remedial actions are warranted. Despite failure to attain one or more specific success criteria, monitoring results may suggest that the mitigated areas are developing properly, overall performance goals are being met, and that no remedial intervention would be warranted. Most importantly the success criteria are intended to be used and interpreted based on professional judgment of the monitoring biologists as well as regulatory agency staff.

[1] Invasive species include those listed as “high” or “moderate” on the California Invasive Plant Council’s California Invasive Plant Inventory Database

Monitoring Methods

As-Built Report

A post-restoration baseline monitoring (As-Built) report will be prepared and submitted to the RWQCB 60-days from the completion of the Stabilization Project activities. The report will include existing conditions, any changes in restoration design made during implementation, and documentation of any areas where restoration was not completed (including provision of the reasons the area was not restored, if applicable). This report will set the baseline for future monitoring and will include the following:

- A post-restoration baseline (As-Built) map. The map will include areas that have been restored and location of plants as well as final locations and specifications of the bio-engineered structures.
- A record of general observations regarding newly-installed plant health and vigor.
- Designation of permanent photo-monitoring points (a minimum of 4) to allow future comparison and assessment (see Photo–documentation Section below) of site conditions; photo-monitoring point locations will be marked on the baseline map.

Annual Monitoring

Monitoring will be conducted at the Stabilization Project site for a period of 10 years, to document post-construction stability of the bio-engineered structures and success of the native riparian plantings, as further detailed below. Monitoring will be conducted in Years 1 through 5, 7, 9, and 10. Monitoring will be conducted during the late spring or summer when all plants will be fully leafed-out, actively growing, and easily identifiable.

Channel Stability

The stabilization site shall be visually assessed each monitoring year to determine the integrity of the rock step pools and log drop structure. Evidence of destabilization, erosion, or scour within, or downstream of, the stabilization site shall be qualitatively described in annual monitoring reports submitted to the RWQCB.

Vegetation Assessment

Riparian plantings shall also be visually assessed each monitoring year to determine the plantings general health and vigor. Evidence of stress from inadequate water, disease, wildlife browsing, invasive species cover, or other factors shall be qualitatively described in annual monitoring reports submitted to the RWQCB.

Percent Cover of Vegetation

The percent cover of native vegetation (including installed native species and recruited native species) and the percent cover of invasive species within the revegetation planting area shall be visually estimated. Invasive species include those listed as “high” or “moderate” on the California Invasive Plant Council’s California Invasive Plant Inventory Database.

Plant Survival

Survival of installed shrubs and trees will be documented annually, and assessed as a percentage of the total shrubs and trees installed in the restoration area.

Shrubs and trees that were installed, and their volunteers, will be counted toward the survival criterion of 70 percent.

Photo-documentation

Permanent photo-monitoring points (minimum of 4) shall be established throughout the stabilization project site at the time of the Stabilization Project implementation. Photos shall be taken at these points just prior to project implementation, immediately following project implementation, and during annual monitoring to document changes in channel stability and vegetation cover over time. Photos from each monitoring event can be qualitatively compared with the baseline conditions and previous years.

Reporting

Annual monitoring reports shall be submitted to the RWQCB by December 31 of each monitoring year. Annual reports will include, at the minimum, the following information:

- Summary description of the monitoring methods, including data collection and analysis;
- An overview of the restoration effort, including a general discussion of site conditions, changes in site conditions since the previous report, and quantitative and qualitative comparisons of vegetation and channel stability between previous monitoring years;
- Analysis of success in relation to performance standards;
- Color photographs of the revegetation areas taken from the photo-monitoring point locations, and;
- A discussion of any corrective actions needed or undertaken (including weed control, replanting, or erosion control measures).

Contingency Measures

In the event the restored areas do not meet success criteria as outlined in this document, contingency measures may need to be implemented to maintain regulatory compliance. Contingency measures may include on-site remediation of restored areas and/or providing additional restoration as mitigation, as directed by the regulatory agencies.

On-site remediation may occur if anticipated plant survival and other success criteria were not met during any point in the monitoring period, as described in this document.

Remedial actions can also include reseeding or replanting of restored habitats or removal of invasive species if it is determined that the vegetation component does not meet and is unlikely to meet the vegetation objectives described in the regulatory permits and environmental documents prepared for the project.

Remedial actions may also include re-design or re-implementation of the step-pool or log drop structures.

Responsible Parties

Mitigation success and/or contingency remediation activities in the restored areas are the responsibility of UC Berkeley.

Agency Confirmation

UC Berkeley will be considered released from any further responsibilities for mitigation upon confirmation of mitigation adequacy in writing from the RWQCB. The applicant will be released from further obligation provided that the conditions of the project site meet or exceed the agreed-upon success criteria and that all required annual reports have been submitted and accepted by the agencies.

If the performance criteria are not fully met by the year 10 (i.e., some component of the restoration project is unsuccessful), negotiation with the RWQCB will be initiated to determine the need for further monitoring or compensation.

Attachment C:

Water Quality Certification for the University of California Berkeley Haas School of Business Expansion Project for Site No.: 02-01-C1181 (bkw)

August 1, 2014
Site No.: 02-01-C1181 (bkw)
ACOE File No. 2014-00051S
CIWQS Place ID No. 804886
CIWQS Reg. Meas. ID No. 395449

Sent via electronic mail: No hard copy to follow
University Of California Berkeley
Environment, Health & Safety, and Emergency Management
317 University Hall #1150
Berkeley, CA 94720

Attn.: Mark Freiberg (freiberg@berkeley.edu)

SUBJECT: Water Quality Certification for the University of California Berkeley Haas School Of Business Expansion Project in the City of Berkeley, Alameda County

Dear Mr. Freiberg:

San Francisco Bay Regional Water Quality Control Board (Water Board) staff has reviewed materials submitted by Environmental Science Associates (the Applicant's authorized agent) on behalf of the University of California Berkeley (UC Berkeley; the Applicant) for the University of California Berkeley Haas School of Business Expansion Project on the UC Berekley Campus, in the City of Berkeley in Alameda County (Project). The Project was authorized by the U.S. Army Corps of Engineers (ACOE) pursuant to Clean Water Act (CWA) Section 404 Nationwide Permit Number (NWP) No.12 (*Utility Line Activities*) on April 21, 2014. You have applied to the Water Board for CWA Section 401 water quality certification (Certification) verifying that the Project will not violate State water quality standards.

Project Description: The following Project description is derived from the application materials received by the Water Board on March 24, 2014, revised application materials received on June 13, 2014, and a May 7, 2014, meeting at the Water Board office. The Project purpose is to provide the Haas School of Business with expanded space necessary for its teaching and research functions. The Project includes moving Girton Hall from its current location to a new site in the Botanical Garden in Strawberry Canyon, relocating various utilities within the Project site, and constructing the North Addition to the existing Haas School complex on the current Girton Hall site. The Haas North Addition will provide a new, six-story, 73,185 gross square feet building to address the School's most critical space needs.

The Project is located in the City of Berkeley, Alameda County, on the UC Berkeley campus. The Project site is on the eastern edge of the Central Campus Park. The wedge-shaped site is bounded on the east side by Gayley Road/Piedmont Avenue, on the north by South Drive, on the west by College Way, and on the south by the existing buildings of the Haas School of Business

complex (See Figure 1 in Attachment A to this Certification). Figure 2 in Attachment A to this Certification shows the approximate boundary of the Strawberry Creek watershed and the approximate boundary of the Project site's watershed. The Project site consists of four features: Girton Hall, a 1911 wooden assembly hall constructed for the use of women students and converted into a campus childcare facility in 1970; the existing Haas School of Business; a mixed grove of coast live oak (*Quercus agrifolia*) and coast redwood (*Sequoia sempervirens*) trees; and a fenced, outdoor play yard associated with the child care center.

The south fork of Strawberry Creek originates in the Berkeley Hills east of the UC Berkeley campus and is a natural channel until it reaches an earthen detention basin located just west of the Lower Fire Trail access. An earthen dam within the detention basin controls flow and directs it into the Big Inch and Little Inch bypass culverts by means of a 48-inch by 42-inch hydraulically-operated slide gate. The bypass culverts were originally installed more than 50 years ago, to address flooding concerns. The Big Inch and Little Inch culverts pass under the Strawberry Canyon Recreation Area, California Memorial Stadium, Maxwell Family Field, Gayley Road, Girton Hall, and South Drive before the south fork of Strawberry Creek daylights outside of the Project site, just north of the Women's Faculty Club on the UC Berkeley Campus.

The Big Inch (Strawberry Creek culvert by-pass) and Little Inch (Strawberry Creek culvert) culverts, run east to west under the Project site. The Big Inch culvert, which is located north of the existing Haas Building complex and north of the existing Girton Hall, and the Little Inch culvert, which is located north of the existing Haas Building complex and south of the existing Girton Hall, tie into Strawberry Creek as part of the campus storm drain system (See Figure 3 in Attachment A to this Certification). The Big Inch culvert conveys upper watershed flows, and the Little Inch culvert drains the sub-watershed west of the Campus Fire Trail system entrance below the Botanical Garden. Big Inch is a 72-inch box culvert that is located approximately 7 feet below the existing ground surface, and Little Inch is a 42-inch box culvert that ranges between about 14 and 22 feet below ground surface across the site.

To construct the Haas North Addition, portions of the Big Inch and Little Inch culverts must be re-routed, because the existing culverts are located within the footprint of the lower portion of the new building (see Sheets C1.10 and C1.12 in Attachment A to this Certification). Geotechnical investigations and engineering studies indicated that seismic safety and the long term structural integrity of the building required the alignment of the existing culverts to be relocated outside the footprint and foundation of the new structure

Relocation of the Big Inch and Little Inch culverts will require excavation, temporary structural shoring, culvert construction, and back-fill. Standard excavation and construction equipment will be used for the Project. Re-routing of portions of the Big Inch and Little Inch culverts will include the creation of a new culvert alignment adjacent to each location, constructed "in the dry" and the installation of two by-pass structures (junction boxes; one upstream and one downstream) along each existing culvert, to re-route flows through the newly constructed alignments. After concrete in the new culverts has cured, water will be directed through the new culvert alignments and will no longer flow through the by-passed sections of culvert (see Sheet C7.3 in Attachment A to this Certification). The re-route will be implemented as follows:

1. Crews will walk up Little Inch and Big Inch culverts from a downstream entry point and bring sand bags up the culverts on dollies;

2. A sand bag dam will be built on the upstream end of each junction box and 8-inch diameter flexible pipe will be installed;
3. The downstream sand bag dam will be built at each junction box and the 8-inch diameter flexible pipe will be connect to this downstream dam;
4. The culverts will be broken into from above, at the junction boxes, and any debris/concrete between the two dams will be removed by buckets and a hoist from above;
5. Following water re-route into the new culverts, the old by-passed section of the Big Inch culvert will be almost entirely removed. Portions of the old by-passed culverts that directly conflict with the new building footprint will be removed, while portions that remain below the new building will be filled with slurry.

On the Big Inch culvert, two 270-square-foot by-pass structures will be installed, roughly below the eastern and western edges of the proposed Haas North Addition. A new segment of the Big Inch culvert will be installed in an arced alignment around the new Haas North Addition footprint, and will connect both the upstream and downstream by-pass structures, forming the new alignment (see Figure 4 and Sheet C13.4 in Attachment A to this Certification). The new, 92-linear foot arced culvert segment, which will be a 6-foot by 6-foot box culvert, will replace an approximately 66-linear foot segment of the existing Big Inch culvert.

For the Little Inch culvert, one 53-square-foot by-pass structure will be installed roughly below the western edge of the existing Haas building (on the downstream end), and one 108-square-foot by-pass structure will be installed roughly below the eastern edge of the proposed Haas North Addition (on the upstream end). The new Little Inch culvert segment will be installed in an alignment around the new building footprint and will connect to both the upstream and downstream by-pass structures (see Figure 4 and Sheet C7.2 in Attachment A to this Certification). The new, 166-linear foot re-routed culvert segment, which will be a 42-inch diameter reinforced concrete pipe (RCP), will replace an approximately 158-linear foot segment of the existing Little Inch culvert.

Impacts: Realignment of portions of the Big Inch and Little Inch culverts will impact about 1,350 square feet (0.03 acre) of waters of the State, extending along 300 linear feet of channel. Following Project completion, the re-routed segments will connect to the existing upstream and downstream reaches of the Big Inch and Little Inch culverts, and culvert capacities will not be affected. A geomorphic assessment, discussed below, concluded that the Project will not contribute to downstream channel destabilization in Strawberry Creek.

The beneficial uses of water bodies in the San Francisco Bay Area have been designated by the Water Board in the *Water Quality Control Plan for the San Francisco Bay Region* (Basin Plan). The beneficial uses provide the basis for determining appropriate water quality objectives that are needed to maintain the beneficial uses of these water bodies. The beneficial uses of Strawberry Creek are: warm freshwater habitat, wildlife habitat, water contact recreation, and noncontact water recreation. Potential impacts to beneficial uses are as follows:

- ***Warm Freshwater Habitat.*** Big Inch and Little Inch culverts within the Project site are fully lined underground concrete culverts that do not contain vegetation, and do not provide habitat for warm freshwater species. If these culverts were daylighted, they could provide habitat.

- ***Wildlife Habitat.*** Big Inch and Little Inch culverts within the project boundary do not currently contain wildlife habitat.
- ***Water Contact Recreation and Noncontact Water Recreation.*** The culverts within the project boundary are underground and inaccessible to the public, and therefore do not provide water contact recreation opportunities or noncontact water recreation opportunities in their current conditions. Strawberry Creek downstream of the project site provides aesthetic value to those walking within the UC Berkeley campus.

A total of 560 linear feet, corresponding to 0.059 acre, of waters of the State occur within the Big Inch and Little Inch culverts within the Project site. Big Inch culvert is 246 feet long (0.034 acre) and Little Inch Culvert is 314 linear feet long (0.025 acre). Table 1 summarizes waters of the State with the Project site. Figure 3 in Attachment A to this Certification shows the waters of the State at the Project site.

TABLE 1
WATERS OF THE STATE WITHIN THE PROJECT SITE

Feature type	Linear feet	Area (square feet)	Area (acres)
Waters of the U.S./Waters of the State			
Big Inch Culvert	246	1,476	0.034
Little Inch Culvert	314	1,099	0.025
Total	**560**	**2,575**	**0.059**

Project implementation will impact about 1,350 square feet (0.03 acre), extending along 300 linear feet, of waters of the State (See Table 2**)**. Figure 4 in Attachment A to this Certification shows the limits of impacts to waters of the State.

TABLE 2
IMPACTS TO WATERS OF THE STATE IN THE PROJECT SITE

Feature Type	Project Component	Impact	Impact (linear feet)
Waters of the U.S./Waters of the State			
Big Inch	New Haas North Addition	720 sq. ft. (0.02 acre)	120
Little Inch	New Haas North Addition	630 sq. ft. (0.01 acre)	180
Total		**1,350 (0.03 acre)**	**300**

The Project design team reviewed alternatives to the Project, including alternatives that daylighted a portion of Strawberry Creek within one of the two culverts. However, since the existing culverts are located between 15 feet and 26 feet below the surface, daylighting of the culverts would significantly reduce the available area for the Haas North Addition.

The Project design team analyzed an alternative that included daylighting the Little Inch culvert with 1.5:1 bank slopes. The alternative design that UC Berkeley analyzed is shown in the construction drawings in Attachment B to this Certification. *Figure 1: Daylighting Project Alternative* in Attachment B to this Certification shows the daylighting project alternative with the existing Haas Business Building, daylighted channel, utility corridor, 20-foot setback, and remaining developable area. *Figure 2: Existing Utility Lines* in Attachment B to this Certification shows the existing utility lines. Conceptual cross sections at the upstream and downstream end of the potential daylighted section are shown in the Figure entitled *Conceptual cross sections for Little Inch daylighted channel assuming 1.5:1 side slopes and 12 foot setback at top of bank.* As shown in the cross-section figure, with a 1.5:1 slope, the daylighted creek would range from a top of bank width of 50.8 feet at the downstream end to 88 feet at the upstream end. After a 12-foot top of bank setback is added to both sides of the creek to allow a safe distance between the building and creek, the creek width (including setbacks) would range between 74.8 feet and 112 feet wide. The daylighted portion would be about 280 linear feet and would extend from the upstream end at a new culvert under Girton Hall Road to the downstream end at a new culvert under College Avenue (the new culverts would be needed to direct flows away from the existing Haas Business building). Several existing utility lines (Telecom Duct, Sanitary Sewer, Fire Alarm, Fire Service, Gas, and Storm Drainage) that are currently located in the potential daylighted footprint would need to be rerouted into an approximately 30-foot wide utility corridor located between the daylighted culvert and the existing Haas Business School building. With this culvert daylighting scenario, a 4,000-square-foot area would remain at the Project site that could be developed, while the Haas North Addition building requires a developable area of 12,442 square feet in order to meet the Project objectives. Additionally, the re-routing of subsurface utility lines from the daylighted area would add an extra cost of about $15 million to the Project. Therefore, Water Board staff concurs that the current Project is the least environmentally damaging practical alternative for achieving the Project's goals.

The Applicant's agent evaluated the Project's potential impacts on the geomorphic stability of Strawberry Creek in the *Geomorphic Investigation of Little and Big Inch Culvert Modifications and Potential Effects on Strawberry Creek* (Dr. Andrew Collison, Fluvial Team Director, and Carlos Diaz, Hydraulic Engineer, Environmental Science Associates, March 13, 2014). The geomorphic investigation reached the following conclusions:

- Based on modeling of pre- and post-Project velocities in the culverts, the Project is unlikely to change existing geomorphic or sediment management conditions at the inlet of the Big Inch and Little Inch culverts, and the Project is not expected to result in increased sedimentation at the culvert inlets.
- The Project should maintain existing high levels of sediment conveyance within the culverts, because the modeled velocities are significantly higher than 3 three feet per second, which is the minimum velocity allowed by the Alameda County Flood Control District for flow in an enclosed culvert[1].

[1] *Hydrology and Hydraulics Criteria Summary for Western Alameda County* (Alameda County Public Works Agency, Revised August 7, 1989), Section 2.7.

- Based on modeling of pre- and post-Project velocities in the culverts, there will be a 13 percent reduction in velocity at the discharge point of the Little Inch culvert into Strawberry Creek.
- Based on modeling of pre- and post-Project velocities in the culverts, flow velocity will not increase at the point where the Big Inch culvert discharges into Strawberry Creek, and therefore there should be no increase in erosion. At the discharge point from the culverts, Strawberry Creek has a mix of hardened and un-hardened reaches, with extensive grade control structures incorporated into the channel bed.

Mitigation: The Project results in permanent impacts to waters of the State, by eliminating opportunities to restore the culverted segments of Strawberry Creek to viable habitat for the useful lifetime of the new building. The existing segments of the Big Inch and Little Inch culverts located within the project area are fully enclosed in concrete-lined culverts beneath the ground. If these segments were daylighted, they would be able to support warm freshwater habitat, wildlife habitat, non-contact water recreation, and contact water recreation. In addition, the interaction of sunlight with vegetation and fauna in the creek channel would provide enhanced pollutant removal through filtration, enhanced pollutant removal through bio-chemical reactions, and nutrient cycling within the creek channel.

Converting the existing culverts into open channels at the project site in order to enhance beneficial uses is impractical for the Project because of the physical site constraints discussed above. Therefore, the Project is providing mitigation for the deferred opportunity to enhance beneficial uses at the Project site with two creek improvement projects in the Strawberry Creek watershed on the UC Berkeley campus.

- Riparian vegetation enhancement at the Women's Faculty Club reach of Strawberry Creek.
- Strawberry Creek Ecological Stabilization Project in the North Fork of Strawberry Creek

Riparian Vegetation Enhancement at the Women's Faculty Club Reach of Strawberry Creek (Riparian Enhancement Project)

About 30 feet west of the Project's fence line, the Little Inch culvert discharges into a drop pool and flows in a meandering open channel under mature redwood and live oak over-story. See the Figure, *Attachment A: Project Site Map*, in Attachment C to this Certification for a site map of the Riparian Enhancement Project. Over the years, several highly invasive species of non-native vines have dominated the forest floor and creek banks along this section of the Strawberry Creek South Fork. Two of these species, Algerian Ivy (*Helix hedera*) and Small leaf spiderwort (*Tradescantia fluminensis*), can suppress plant and animal biodiversity by virtually blanketing the riparian zone (and in the case of the ivy, climbing up tree trunks to seek sunlight for photosynthesis), retarding germination of native seed stock, competing with remnant native plants for soil moisture and nutrients, and providing a poor basis for the food web that existed prior to the introduction of these vining species.

From 2009 to 2011, student volunteers, working as part of the 27-year old Strawberry Creek Restoration Program and under direction from staff in the UC Berkeley Office of Environment, Health and Safety (EH&S - Environmental Protection Group), removed much of the ivy and spiderwort present in the Riparian Enhancement Project reach and planted several native species in the cleared riparian zone. However, the student volunteers lacked funds to obtain sufficient

numbers of plants to achieve recommended planting densities for an effective restoration of a native plant community food web. See *Attachment B: Propose Restoration Site Photos*, in Attachment C to this Certification for a series of current site photos.

The mitigation project at this reach will consist of removing any remnant or newly sprouted ivy and spiderwort and then extensively planting the creek banks from the wetted edge of the creek to the outer drip line of the riparian tree grove established along this reach of Strawberry Creek. This Riparian Enhancement Project area has a surface area of about 35,000 square feet (0.80 acres), extending along 350 linear feet of creek channel. The native planting palette will include appropriate species for the location and will be planted to a density that will provide optimal habitat and water quality function. Irrigation will be installed to help establish plants during the first 2 to 3 years after planting. Once plants are established, summer irrigation water should not be necessary. The Riparian Enhancement Project should enhance the Beneficial Uses of wildlife habitat and non-contact water recreation at the mitigation project site.

Revegetation of the banks will consist of native plants installed as either plugs or container plants. Plug plantings will occur in random naturalistic clusters with an average plant spacing of 18-inches on center. Container plantings will be grouped in clusters of 2 to 6 plants to create a naturalistic mosaic of woody patches and open areas. Local and seasonal availability of plants will determine the final planting palette. Plantings may include, but are not limited to, the native plants listed in Table 3.

Table 3: Potential Revegetation Species at the Riparian Enhancement Project

Planting Location	Native Plant Species
Wetted bank	sedge, horsetail, rush
Middle bank	western sword fern, wild ginger, Douglas iris, California honeysuckle, black twinberry, thimbleberry, California rose, strawberry, California snowberry
Upper bank	alum root, western redbud, toyon, flowering currant

The following success criteria will be used to evaluate the performance of the Riparian Enhancement Project:

- Native cover at the site (including installed native species and recruited native species) should achieve a cover of at least 50 percent by the end of the initial 5-year monitoring period;
- Shrub and tree plantings shall achieve at least 80 percent survival by the end of the initial 5-year monitoring period, and;
- Invasive plant species[2] shall not make up more than 10 percent cover of the mitigation project area during each monitoring year.

[2] Invasive species include those listed as “high” or “moderate” on the California Invasive Plant Council’s California Invasive Plant Inventory (http://www.cal-ipc.org/paf/).

Annual Monitoring. Monitoring shall be conducted at the Riparian Enhancement Project site for a period of 5 years to document the success of the native riparian plantings. Monitoring shall be conducted in Years 1 through 5, during the late spring or summer when plants will be fully leafed-out, actively growing, and easily identifiable.

Vegetation Assessment. Native plantings shall be visually assessed each monitoring year to determine the plantings general health and vigor. Evidence of stress from inadequate water, disease, wildlife browsing, invasive species cover, or other factors shall be qualitatively described in annual monitoring reports submitted to the Water Board.

Percent Cover of Vegetation. The percent cover of native vegetation (including installed native species and recruited native species) and the percent cover of invasive species within the revegetation planting area shall be visually estimated. Invasive species include those listed as "high" or "moderate" on the California Invasive Plant Council's California Invasive Plant Inventory Database.

Plant Survival. Survival of installed shrubs and trees shall be documented annually, and assessed as a percentage of the total shrubs and trees installed in the restoration area. Shrubs and trees that were installed and volunteers will be counted toward the survival criterion of 80 percent at the end of year 5.

Photo-documentation. 8 photo-documentation points shall be established throughout the restoration site at the time of the South Fork Restoration Project implementation. Photos shall be taken at these points just prior to project implementation, immediately following project implementation, and during annual monitoring to document changes in vegetation cover over time. Photos from each monitoring event can be qualitatively compared with the baseline conditions and previous years.

*Reporting***.** Annual monitoring reports shall be submitted to the Water Board by January 31 following each monitoring year, for a minimum of five years. Annual reports shall include, at a minimum, the following information:

- A summary description of the monitoring methods, including data collection and analysis;
- An overview of the restoration effort, including a general discussion of site conditions, changes in site conditions since the previous report, and quantitative and qualitative comparisons of vegetation between monitoring years;
- An analysis of success in relation to performance standards;
- Color photographs of the revegetation areas taken from the photo-documentation points, and;
- A discussion of any corrective actions needed or undertaken (including weed control, replanting, or erosion control measures).

Strawberry Creek Ecological Stabilization Project in the North Fork of Strawberry Creek (North Fork Mitigation Project).

The Strawberry Creek Ecological Stabilization Project (North Fork Mitigation Project) is a student-initiated creek restoration effort to improve habitat for native fish and other aquatic

species by replacing concrete grade control structures with bio-engineered grade control structures and reducing bank erosion by laying back banks to stable slopes and planting the banks with native vegetation. The Project site is located in the Stawberry Creek watershed on the west side of the University of California, Berkeley campus (Latitude 37.871500; Longitude -122.26454) (See Sheet C.1 in Attachment D to this Certification). The drainage area upstream of the Project site encompasses approximately 1,147 acres (1.8 square miles).

The North Fork Mitigation Project will use bio-engineered grade control structures to introduce pool and riffle habitat for fish species into the creek channel, re-connect disconnected fish habitat by removing an impassible check dam, and reduce the amount of erosion along the stream banks. Implementation of the North Fork Mitigation Project is part of a long-term conservation goal to protect and enhance habitat for native riparian species, including three native fish species, the Sacramento sucker, the three-spined stickleback, and the California roach minnow. Implementation of the mitigation project will enhance the beneficial use of Warm Freshwater Habitat that is designated for Strawberry Creek in the Basin Plan.

The North Fork Mitigation Project site extends from the confluence of the North and South Forks of Strawberry Creek to 80 feet up the North Fork of Strawberry Creek. At the upstream end of the mitigation reach, flow enters the open channel via a 3.5-foot diameter culvert (Station 2+25). There are four grade control structures in vicinity of the work area (See Sheet C3 in Attachment D to this Certification):

1. Station 0+45. Just downstream of the confluence, an existing grade control is almost flush with the channel thalweg, with no signs of deterioration.

2. Station 0+65 A failed grade control structure (referenced as CD1), located just upstream of the confluence, with associated concrete debris in the creek.

3. Station 1+00. A failing grade control structure (referenced as CD2).

4. Station 1+45 An existing grade control structure with no signs of deterioration is located at this station.

CD1 is a decades-old check dam constructed on the north fork of Strawberry Creek, located immediately upstream of the confluence of the north and south forks. The failure of this check dam in 2002 caused the main concrete body of the dam to orient stream-wise in the center of the channel (See Photos 1 and 2 in Attachment D to this Certification). Additionally, remnants of CD1 deflect flow into the right bank at the confluence, causing the creation of a near vertical 6-foot tall scarp (See Photo 3 in Attachment D to this Certification). The failure of CD1 has caused the channel bed to incise upstream, undermining CD2 which is located 35 feet upstream of CD1 (See Photo 4 in Attachment D to this Certification). CD2 is at risk of failure due to undercutting of the support structure on the right bank (left side of Photo 4) and due to water piping through the dam.

The North Fork Mitigation Project will remove the remnants of CD1 and the failing check dam CD2. The failed check dams will be replaced with three bio-engineered grade control structures, two step-pool structures and one log drop structure. The step pools will be constructed of ungrouted rock and will be flexible to adjust to modest changes in channel conditions. Installing the bioengineered grade control structures and laying back over-steepened creek banks will

impact a total of 80 linear feet of channel bed and about 1600 square feet (0.037 acre) of channel and bank area.

The bio-engineered step-pool structures will consist of a crest, a cascading drop, and a pool feature that transitions into the channel design grade. Each step-pool structure will extend about 15 feet along the channel thallweg. The crests (measured at the low flow channel) will range from 5 to 8 feet wide, and will be keyed 4 to 5 feet into the adjacent channel banks to provide protection against flanking in larger storm events. Each rock structure will have a drop of about 1.5 feet (See Sheets C3, C4, and C5 in Attachment D to this Certification). A log grade control structure will be constructed at Station 1+15. A channel-spanning log, about 20 feet long, will be keyed into each bank a minimum of 2 feet. The total change in grade across the structure will be 1.0 foot. A 0.5-foot deep, rock-armored pool will be constructed immediately downstream of the log to dissipate energy.

Construction will include removing two concrete check dams (CD1 and CD2), excavating and removing material to achieve subgrade channel conditions and stable bank slopes, and placing rock fill and logs to achieve design elevations for the three bio-engineered grade control structures. 60 tons of concrete will be removed from the channel and 140 tons of sediment will be removed to achieve subgrade channel conditions and establish stable slopes for the creek banks. Following minor over-excavation and laying back of channel slopes to create a stable channel structure, about 120 tons of rock, ranging from cobbles to 1-ton boulders, will be placed in the channel to create the three bioengineered grade control structures. The mitigation project will still result in a net removal of material form the channel bed and banks (See Table 4).

Table 4. North Fork Mitigation Project, Fill and Removal Quantities			
Location on Stabilization Reach	**Activitiy**	**Fill and Excavation**	**Impact Area**
Station 0+65 to Station 1+00.	Remove failed check dam CD1 and failing check dam CD2.	Remove 30 CY concrete (60 tons).	30 LF 900 SF (0.02 acres)
Station 0+65 to Station 1+15.	Remove material to achieve subgrade channel conditions and stable bank slopes.	Remove 130 CY of channel and bank material (140 tons)	60 LF 1000 square feet (0.023 acres)
Station 0+65 to Station 0+95.	Construct two rock step pools.	Place 80 CY rock ranging from cobbles to 1-ton boulders (120 tons).	30 LF 500 square feet (0.011 acres)
Station 1+15.	Construct one log weir.	2 Logs spanning channel width and anchored into banks. 4.5 CY (2 tons)	15 LF 75 square feet (0.0017 acres)
Net Fill		Remove 75.5 CY (78 tons)	

CY = cubic yards; LF = linear feet

In addition to the installation of the bio-engineered grade control structures, steep adjacent creek banks will be laid back to a stable slope and planted with native vegetation. The creek banks will be revegetated with of native plants as plugs and container plants. Plug plantings will occur in random naturalistic clusters, with an average plant spacing of 18 inches on center. Container plantings will be grouped in clusters of 2 to 6 plants o create a naturualistic mosaic of woody patches and open areas. (See Sheet C6 in Attachment D to this Certification). A preliminary list of plantings is included in Table 5, the As-Built Report will include plant list and density actually implemented.

Table 5: Proposed Revegetation Species for the North Fork Mitigation Project

Common Name	Scientific Name	Container Size	Spacing OC(ft)
Maidenhair fern	*Adiantum jordanii*	Gallon	2
Western Wild Ginger	*Asarum caudatum*	Gallon	4
Torrent Sedge	*Carex nudata*	Plug	5
Alum Root	*Heuchera micrantha*	Gallon	2
Douglas Iris	*Iris douglasiana*	Gallon	4
Common Rush	*Juncus effusus*	Super Stubby (L6)	3
California Honeysuckle	*Lonicera hispidula*	Gallon	8
Black Twinberry	*Lonicera involucrata*	Tree pot 4	15
Wild Strawberry	*Fragaria californica*	Gallon	1
Western Swordfern	*Polystichum munitum*	5 Gallon	2
California Rose	*Rosa californica*	Tree pot 4	6-8
California Snowberry	*Symphoricarpos albus*	Gallon	5
Big Leaf Maple	*Acer macrophyllum*	Tree pot 4	18

OC = on center; ft = foot

Work in the channel will be conducted during the late summer dry season (September to October). It is anticipated that the mitigation project will be completed within three weeks. Prior to construction, fish (Sacramento Sucker, California Roach Minnow, Three Spined Stickleback) will be relocated downstream of the project site, after their spawning cycle is finished in early July. Flow in the creek will be diverted around the mitigation project reach with a coffer dam and a submersible pump. Details of the proposed dewatering plan are provided in the Figure, *Water Control System Suggested Layout Plan*, in Attachment D to this Certification.

The North Fork Mitigation Project site has significant riparian canopy on the channel's right bank, and an established Blue Gum Eucalyptus grove on the left bank. The shady nature of the site and the allelopathic effects of the Eucalyptus are expected to be challenges to the survivorship of plantings. Plantings will occur on the channel left bank (under the Eucalyptus) and on the right bank, however survivorship and cover will not be used to assess mitigation project success on the left bank, because of the influence of the existing Eucalyptus on vegetation. The following success criteria shall be used to evaluate the performance of the North Fork Mitigation Project:

- The Project reach (Station 0+45 to Station 1+45) will not show evidence of excessive channel destabilization, erosion, scour within the channel, bank undercutting, bank slumping, or rilling on the banks, and the grade control structures at Station 0+45 and Station 1+45 should remain at grade in the channel bed;
- Cover by native plant species on the channel right bank, including installed native species and recruited native species, should achieve be least 50 percent by the end of the initial 10-year monitoring period, and;

- Invasive plant species[3] shall not make up more than 10 percent cover of the mitigation project area during each monitoring year.

Annual Monitoring. Monitoring shall be conducted at the North Fork Mitigation Project site for a period of 10 years, to document post-construction stability of the bio-engineered structures and the success of the native riparian plantings. Monitoring shall be conducted in Years 1 through 5, 7, 9, and 10. Monitoring shall be conducted during the late spring or summer when plants will be fully leafed-out, actively growing, and easily identifiable.

Channel Stability. The mitigation site shall be visually assessed each monitoring year to determine the integrity of the rock step pools and log drop structure. Evidence of destabilization, erosion, or scour within, or downstream of, the stabilization site shall be qualitatively described in annual monitoring reports submitted to the Water Board.

Vegetation Assessment. Riparian plantings shall be visually assessed each monitoring year to determine the general health and vigor of the plantings. Evidence of stress from inadequate water, disease, wildlife browsing, invasive species cover, or other factors shall be qualitatively described in annual monitoring reports submitted to the Water Board.

Percent Cover of Vegetation. The percent cover of native vegetation (including installed native species and recruited native species) and the percent cover of invasive species within the revegetation planting area shall be visually estimated. Invasive species include those listed as "high" or "moderate" on the California Invasive Plant Council's California Invasive Plant Inventory Database.

Plant Survival. Survival of installed shrubs and trees shall be documented annually, and assessed as a percentage of the total shrubs and trees installed in the restoration area. Shrubs and trees that were installed and volunteers will be counted toward the survival criterion of 70 percent at the end of year five.

Photo-documentation. Six permanent photo-documentation points shall be established throughout the stabilization mitigation site prior to implementing the mitigation project. Photos shall be taken at these points just prior to project implementation, immediately following project implementation, and during annual monitoring to document changes in channel stability and vegetation cover over time. Photos from each monitoring event can be qualitatively compared with the baseline conditions and previous years.

*Reporting***.** Annual monitoring reports shall be submitted to the Water Board by January 31 following each monitoring year. Annual reports will include, at a minimum, the following information:

- A summary description of the monitoring methods, including data collection and analysis;
- An overview of the restoration effort, including a general discussion of site conditions, changes in site conditions since the previous report, and quantitative and qualitative comparisons of vegetation and channel stability between previous monitoring years;

[3] Invasive species include those listed as "high" or "moderate" on the California Invasive Plant Council's California Invasive Plant Inventory (http://www.cal-ipc.org/paf/).

- An analysis of success in relation to performance standards;
- Color photographs of the revegetation areas taken from the photo-documentation points, and;
- A discussion of any corrective actions needed or undertaken (including weed control, replanting, or erosion control measures).

Minimization Measures. To minimize potential impacts to waters of the State downstream of the Project site, the Applicant has developed the *East Campus Utility Improvements, University of California, Storm Water Pollution Prevention Plan* (SWPPP) (Ranger Pipelines, 2013). Since the Project will disturb less than one acre of soil, a Notice of Intent was not filed with the Water Board. However, the SWPPP was prepared, by a Qualified SWPPP Developer, consistent with the Water Board's General Construction Permit SWPPP requirements. The SWPPP identifies potential sources of pollution and describes best management practices (BMPs) the discharger is using to protect stormwater runoff and the placement of those BMPs. BMPs are measures that are undertaken to control degradation of surface water by preventing soil erosion or the discharge of pollutants from the construction area.

EcoAtlas: The Water Board tracks routine riparian repair and creek maintenance projects in an effort to detect potential systemic instabilities and document project performance in the creeks of the Bay Area. As such, the Applicant is required to submit a Riparian Repair and Maintenance (short) Form for the North Fork Mitigation Project, describing project size, type, and performance measures. An electronic copy of the short form and instructions can be downloaded at: http://www.waterboards.ca.gov/sanfranciscobay/certs.shtml.

Project information will be made available at the web link: http://ecoatlas.org.

CEQA: Components of the Project that impact waters of the State were reviewed in conformance with the requirements of the California Environmental Quality Act (CEQA) in the context of two projects at the UC Berkeley Campus; the East Campus Utility Improvement Project and the UC Berkeley Long Range Development Plan.

The University determined in August 2013 that the East Campus Utility Improvement Project (Utility Project) qualified for a CEQA class 2 categorical exemption because the Utility Project will result in new structures located on the same site as the structures replaced and will have the same purpose and capacity as the structures replaced (14 CCR § 15302). Class 2 exemptions are specifically allowed for "replacement or reconstruction of existing utility systems and/or facilities involving negligible or no expansion of capacity" (14 CCR § 15302(c)). The Utility Project consists of the replacement or reconstruction of existing utility systems. In addition, none of the exceptions to the categorical exemptions applies (i.e., the project location is not in a particularly sensitive environment; there is no significant individual or cumulative CEQA effect of the project; there will be no damage to scenic highways or historical resources; and the project is not located on a hazardous waste site (14 CCR § 15300.2)). As part of the Utility Project, the University planned to move one portion of the Little Inch Culvert, described in the categorical exemption documentation as the "storm sewer culvert." Within this categorical exemption determination, the University highlighted potentially applicable mitigation measures from the campus's Long Range Development Plan, including a measure that requires the University to coordinate with the US Army Corps of Engineers and the Water Board for any modifications to

Strawberry Creek. UC Berkeley recorded a Notice of Exemption for the Utility Project on August 1, 2013.

Around the same time as the Utility Project's CEQA review, the University prepared Addendum No. 10 to the UC Berkeley Long Range Development Plan EIR for construction of the Haas North Addition Project and the movement of Girton Hall (State Clearinghouse No. 2003082131). This addendum referenced the CEQA review for the Utility Project, including consideration of the Little Inch Culvert realignment. In finalizing the building's design after CEQA review, the University discovered that the Big Inch Culvert also requires realignment. While this does represent a change in the details of the project, it does not necessitate any additional CEQA review. Additional review is required only where: a new significant adverse impact (from the CEQA perspective) might occur; a substantial increase in the severity of a previously identified significant impact might take place; or the project proponent declines to adopt mitigation measures that would substantially reduce a significant effect of the project (14 CCR § 15162(a)). The realignment of Big Inch Culvert will not contribute to other previously identified significant impacts under CEQA, because the new culvert alignment will retain baseline conditions, and CEQA measures impacts from baseline conditions. UC Berkeley filed a Notice of Determination for Addendum No. 10 with the State Clearinghouse on September 16, 2013.

Certification: I hereby issue an order certifying that any discharge from the referenced Project will comply with the applicable provisions of Sections 301 (Effluent Limitations), 302 (Water Quality Related Effluent Limitations), 303 (Water Quality Standards and Implementation Plans), 306 (National Standards of Performance), and 307 (Toxic and Pretreatment Effluent Standards) of the Clean Water Act, and with other applicable requirements of State law. This discharge is also regulated under State Water Resources Control Board Order No. 2003- 0017-DWQ, "General Waste Discharge Requirements for Dredge and Fill Discharges That Have Received State Water Quality Certification", which require compliance with all conditions of this Water Quality Certification. The following conditions are associated with this certification:

1. No debris, rubbish, creosote-treated wood, 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 Strawberry Creek. Any of these materials placed within or where they may enter Strawberry Creek by the Applicant or any party working under contract, or with the permission of the Applicant shall be removed immediately. 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 Strawberry Creek. During construction, the contractor shall not dump any litter or construction debris within the riparian/stream zone. All such debris and waste shall be picked up daily and properly disposed of at an appropriate site;
2. The Applicant shall adhere to the conditions imposed by Nationwide Permit No. 12 issued to the Applicant by the ACOE (File No 2014-00051S);
3. The Project shall be constructed in conformance with the revised Project description in the supplemental application materials received by the Water Board on June 13, 2014, and with the design sheets in Attachments A, C, and D to this Certification. In water work must be performed in conformance with Sheets C1.10, C1.12, C.7.2, C7.3, and

C13.4 in Attachment A to this Certification and the design sheets in Attachment D to this Certification;

4. Within 30 days of the first Project-related disturbance of waters of the State, the Applicant shall provide the Executive Officer of the Water Board with written notification that the Project has disturbed waters of the State;

5. Within 30 days of completing construction of any component of the Project that impacts waters of the State (e.g., completion of the new alignments of the Big Inch and Little Inch culverts), the Applicant shall provide the Executive Officer of the Water Board with written notification that construction of the Project component is complete;

6. No fueling, cleaning, or maintenance of vehicles or equipment shall take place within any areas where an accidental discharge to Strawberry Creek may occur;

7. Where areas of bare soil are exposed during the rainy season, silt control measures shall be used where silt and/or earthen fill threaten to enter waters of the State. Silt control structures shall be maintained for effectiveness within 2 business days before and after a rain event and shall be repaired or replaced as needed. Buildup of soil behind silt fences shall be removed and any breaches or undermined areas repaired immediately;

8. Prior to the start of the rainy season, and no later than 24 hours prior to a likely rain event, the Applicant shall ensure that disturbed areas that drain to waters of the State are protected with correctly installed erosion control measures (e.g., jute, straw, coconut fiber erosion control fabric, coir logs, etc.). The likely rain event is defined as any weather pattern that is forecast to have a 50 percent or greater probability of producing precipitation in the Project area. The Applicant shall obtain a printed copy of precipitation forecast information from the National Weather Service Forecast Office (e.g., by entering the zip code of the Project's location at http://www.srh.noaa.gov/forecast);

9. All work performed within Strawberry Creek shall be completed in a manner that minimizes impacts to beneficial uses and habitat; measures shall be employed to minimize disturbances along Strawberry Creek that will adversely impact the water quality of waters of the State. Disturbance or removal of vegetation shall not exceed the minimum necessary to complete Project implementation;

10. Prior to the start of Project construction, the Applicant shall provide a final dewatering plan for the Big Inch and Little Inch culverts, including the area to be dewatered, timing of dewatering, and method of dewatering to be implemented, to the Executive Officer of the Water Board for review and approval. All temporary dewatering methods shall be designed to have the minimum necessary impacts to waters of the State to isolate the immediate work area. All dewatering methods shall be installed such that natural flow is maintained upstream and downstream of the project area. Any temporary dams or diversions shall be installed such that the diversion does not cause sedimentation, siltation, or erosion upstream or downstream of the project area. All dewatering methods shall be removed immediately upon completion of Project activities;

11. Following curing of the concrete in the new culverts and the by-pass structures, water will be directed through the new culvert alignments (see Sheet C7.3 in Attachment A to

this Certification). Concrete will be considered cured when water poured over the surface of the concrete has a pH of less than 8.5;

12. At the Strawberry Creek Ecological Stabilization Project (North Fork Mitigation Project), flow in the creek shall be diverted around the mitigation project reach with a coffer dam and a submersible pump, prior to implementing the North Fork Mitigation Project. A *Draft Dewatering Plan for the Strawberry Creek Confluence Ecological Stabilization Project* (Environmental Science Associates, May 16, 2014) has been prepared for the North Fork Mitigation Project, and is illustrated in the Figure, *Water Control System Suggested Layout Plan*, in Attachment D to this Certification. No more than 30 days prior to dewatering the North Fork Mitigation Project reach of Strawberry Creek, the Applicant shall submit a final Dewatering Plan to the Water Board's Executive Officer for review and approval. The North Fork Mitigation Project reach shall not be dewatered until the Water Board's Executive Officer has approved the final Dewatering Plan. The Dewatering Plan shall include procedures for removing fish from the mitigation project reach prior to dewatering (e.g., the use of block nets to isolate the mitigation project reach). If pumps are to be used in dewatering the reach, they shall be provided with intake screens that are selected and installed in accordance with the National Marine Fisheries Service (NMFS) Fish Screening Criteria for Anadromous Salmonids (http://swr.nmfs.noaa.gov/hcd/fishscrn.pdf) and the Addendum for Juvenile Fish Screen Criteria for Pump Intakes (http://swr.nmfs.noaa.gov/hcd/pumpcrit.pdf);

13. The Strawberry Creek Women's Faculty Club Reach Riparian Enhancement Project (Riparian Enhancement Project) shall be implemented in the same year as the relocation of the Big Inch and Little Inch culverts. Implementation shall include the removal of invasive plants and replanting the riparian area with native riparian vegetation, as described in the body of this Certification and in Attachment C to this Certification. Any changes to the plans for the Riparian Enhancement Project in the body of this Certification and in Attachment C to this Certification must be submitted to the Water Board's Executive Officer for review and approval before they are implemented;

14. The North Fork Mitigation Project shall be implemented in the same year as the relocation of the Big Inch and Little Inch culverts. The North Fork Mitigation Project shall be implemented in conformance with the description in the body of this Certification and the plan sheets in Attachment D to this Certification. Implementation shall include the removal of failed and failing grade control structures, the construction of three bio-engineered grade control structures, laying back creek banks to stable slopes, and revegetation of the affected creek banks. Any changes to the plans for the North Fork Mitigation Project in the body of this Certification and in Attachment D to this Certification must be submitted to the Water Board's Executive Officer for review and approval before they are implemented;

15. The Applicant shall implement all mitigation measures presented in the *Strawberry Creek South Fork Restoration Project – Women's Faculty Club Reach Mitigation Monitoring Plan* (ESA, July 31, 2014) (South Fork MMP). Any changes to this MMP, including changes to the success criteria or timelines, must be submitted to the Water Board's Executive Officer for review and approval before it is implemented;

16. The Applicant shall implement all mitigation measures presented in the *Strawberry Creek Ecological Stabilization Project Mitigation Monitoring Plan* (ESA, July 31, 2014) (North Fork MMP). Any changes to the North Fork MMP, including changes to the success criteria or timelines, must be submitted to the Water Board's Executive Officer for review and approval before it is implemented;

17. The Applicant shall be responsible for funding and implementing all components of the South Fork MMP, including contracting directly for services necessary for site preparation, revegetation, monitoring, adaptive management, and contingency measures;

18. The Applicant shall be responsible for funding and implementing all components of the North Fork MMP, including contracting directly for services necessary for earthwork, site preparation, revegetation, monitoring, adaptive management, and contingency measures;

19. Plants installed at the Riparian Enhancement Project and the North Fork Mitigation Site shall be native riparian species that currently exist onsite or within the Strawberry Creek watershed, and shall be documented in the as-built reports for each mitigation project (See Conditions 22 and 23). Plant material shall be obtained from a native plant nursery, with emphasis on collection or propagation from local plant sources, or be grown by the Applicant from propagules collected from the Strawberry Creek watershed. A qualified restoration biologist or professional horticulturalist shall oversee the collecting and planting;

20. The Applicant shall establish a minimum of 8 photo-documentation points throughout the 350 LF length of the Riparian Enhancement Project. The photo-documentation sites shall be selected to document pre- and post-enhancement conditions of riparian habitat. The Applicant shall prepare a site map(s) with the photo-documentation points clearly marked. Prior to implementing the Project, the Applicant shall photographically document the condition of the riparian enhancement site. Following implementation of the Project, the Applicant shall photographically document the immediate post-construction condition of the riparian enhancement site and submit a report within 60 days from the completion of project construction to the Water Board including the pre-construction photographs, the post-construction photographs, and the map with the locations of the photo-documentation points;

21. The Applicant shall establish a minimum of 6 photo-documentation points throughout the 80 LF length of the North Fork Mitigation Project. The photo-documentation sites shall be selected to document pre- and post-stabilization conditions of riparian habitat, and to facilitate tracking the stability of the bio-engineered grade stabilization measures and the stability of the creek banks. The Applicant shall prepare a site map(s) with the photo-documentation points clearly marked. Prior to implementing the Project, the Applicant shall photographically document the condition of the riparian stabilization site. Following implementation of the North Fork Mitigation Project, the Applicant shall photographically document the immediate post-construction condition of the riparian stabilization site and submit a report within 60 days from the completion of project construction to the Water Board including the pre-construction photographs, the post-

construction photographs, and the map with the locations of the photo-documentation points;

22. Within 60 days of completing invasive plant removal and planting of riparian plants at the Riparian Enhancement Project site, the Applicant shall submit an as-built report and plan(s) to the water board. In addition to the information required in Condition 20, the as-built plan will show the actual planting that was implemented, with locations and numbers of each plant species;

23. Within 60 days of completing construction and mitigation planting activities at the North Fork Mitigation Project, the Applicant shall submit as-built plans(s) to the Water Board. In addition to the information required in Condition 21, the as-built plan shall compare the project plans with the actual locations and configurations of the bio-engineered grade control structures and laid back bank areas. As-built plans shall also include a qualitative assessment of creek channel stability between the grade control structure at Station 0+45 and the culvert at the upstream end of the North Fork Mitigation Project reach survey of the creek. The report shall provide revised Project plans, showing the actual planting that was implemented, with locations and numbers of each plant species;

24. Plantings at the Riparian Enhancement Project mitigation site shall be monitored for a minimum period of five years, until the success criteria in the South Fork MMP and the body of this Certification are achieved. Percent survival must be evaluated individually for each planted species. If these success criteria are not achieved, dead plants must be replaced in kind, unless the Applicant demonstrates that the site is not conducive to survival of a plant species, in which case alternate native riparian plant species may be used, with the concurrence of the Executive Officer of the Water Board. Replacement plantings must be made within one year of survival rates failing to meet the specified success criteria. Replacement plants shall be monitored for five years from the date of replanting. Replacement plants are subject to the same performance criteria as the initial plantings No more than 10 percent of the vegetation cover in the mitigation project area shall consist of species designated in Cal-IPC's California Invasive Plant Inventory Database as high or moderate during the initial 5 years of monitoring. If the presence of invasive species exceeds this threshold, the Applicant is responsible for conducting appropriate control activities;

25. Plantings at the North Fork Mitigation Project shall be monitored for a minimum period of five years, until the success criteria in the North Fork MMP and the body of this Certification are achieved. Percent survival must be evaluated individually for each planted species. If these success criteria are not achieved, dead plants must be replaced in kind, unless the Applicant demonstrates that the site is not conducive to survival of a plant species, in which case alternate native riparian plant species may be used, with the concurrence of the Executive Officer of the Water Board. Replacement plantings must be made within one year of survival rates failing to meet the specified success criteria. Replacement plants shall be monitored for five years from the date of replanting. Replacement plants are subject to the same performance criteria as the initial plantings. No more than 10 percent of the vegetation cover in the mitigation project area shall consist of species designated in Cal-IPC's California Invasive Plant Inventory Database as high or moderate during the initial 5 years of monitoring. If the presence of invasive

species exceeds this threshold, the Applicant is responsible for conducting appropriate control activities;

26. The Applicant shall water riparian plantings at both mitigation sites for a minimum of 3 years. The Applicant shall continue to water all plantings during all projected dry water years (defined as 75 percent of average annual rainfall) that occur during the first 10 years after construction. Any replacement plants (see previous Condition) shall be watered for a minimum of 3 years;

27. Annual reports for the Riparian Enhancement Project shall be submitted to the Water Board by January 31 following each year of the initial five year monitoring period, summarizing each year's monitoring results, including the need for any remedial actions (e.g., re-planting or invasive pant removal), and including all information specified in the South Fork MMP and the body of this Certification. The annual reports shall compare data to previous years and detail progress towards meeting success criteria. At the end of year 5, a comprehensive final report shall be prepared that includes summaries of the monitoring data, representative photos, and maps. Annual reports and the comprehensive final report shall include photographs from the photo-documentation points specified in Condition 20. The final report shall document if the site meets the success criteria in the South Fork MMP and the body of this Certification. If the criteria are not met, the report shall identify measures to be undertaken, including extension of the monitoring period until the criteria are met. Success of the mitigation program shall be determined by Water Board staff;

28. Annual reports for the North Fork Mitigation Project shall be submitted to the Water Board by January 31 following each year of the first five years of the initial ten year monitoring period, and in years seven, nine, and ten, summarizing each year's monitoring results, including the need for any remedial actions (e.g., re-planting or bank stabilization), and including all information specified in the North Fork MMP and the body of this Certification. If vegetation performance standards, including invasive species control, have been attained at the end of year 5, the remaining monitoring reports may only cover the geomorphic stability of the North Fork Mitigation Project. The annual reports shall compare data to previous years and describe progress towards meeting final success criteria. At the end of year 10, a comprehensive final report shall be prepared that includes summaries of the monitoring data, representative photos, and maps. Annual reports and the comprehensive final report shall include photographs from the photo-documentation points specified in Condition 21. The final report shall document if the site meets the final performance criteria in the North Fork MMP and the body of this Certification. If the criteria are not met, the report shall identify remedial measures to be undertaken, including extension of the monitoring period until the criteria are met. Success of the mitigation program shall be determined by Water Board staff;

29. Annual reports for the North Fork Mitigation Project shall include an evaluation of channel geomorphology and fish passage. The evaluation shall include an assessment of the stability of the channel banks, an assessment of any scour, rilling, or slumping visible on the creek banks, an assessment of the channel thalweg for any signs of head cuts or nick points, an assessment of any accumulation of sediment in the Project reach, an assessment of the stability of the three bio-engineered grade control structures, an

assessment of the stability of the grade control structure at Station 0+45, and an assessment of the stability of the grade control structure at Station 1+45. If the project reach is not geomorphically stable at the end of year 10, the Applicant shall work with the Water Board to prepare an analysis of the cause of the instability. If deemed necessary by the Water Board, remedial actions shall be implemented by the Applicant, which may include additional monitoring and maintenance;

30. The Applicant is required to use the Riparian Repair and Maintenance (short) Form to provide Project information for the North Fork Mitigation Project site within 14 days from the date of this certification. An electronic copy of the short form and instructions can be downloaded at: http://www.waterboards.ca.gov/sanfranciscobay/certs.shtml. The completed short form and map showing the project boundaries shall be submitted electronically to habitatdata@waterboards.ca.gov or shall be submitted as a hard copy to both: 1) the Water Board (see the address on the letterhead), to the attention of EcoAtlas; and 2) the San Francisco Estuary Institute, 4911 Central Avenue, Richmond, CA 94804, to the attention of EcoAtlas]
31. In accordance with CWC §13260, the Discharger shall file with the Board a report of any material change or proposed change in the ownership, character, location, or quantity of this waste discharge. Any proposed material change in operation shall be reported to the Executive Officer at least 30 days in advance of the proposed implementation of any change. This shall include, but not be limited to, all significant new soil disturbances, all proposed expansions of development, or any change in drainage characteristics at the Project site. For the purpose of this Order, this includes any proposed change in the boundaries of the area of wetland/waters of the State to be filled;
32. This certification action is subject to modification or revocation upon administrative or judicial review, including review and amendment pursuant to Section 13330 of the California Water Code (CWC) and Section 3867 of Title 23 of the California Code of Regulations (23 CCR);
33. This certification action does not apply to any discharge from any activity involving a hydroelectric facility requiring a Federal Energy Regulatory Commission (FERC) license or an amendment to a FERC license, unless the pertinent certification application was filed pursuant to California Code of Regulations (CCR) Title 23, Subsection 3855(b) and that application specifically identified that a FERC license or amendment to a FERC license for a hydroelectric facility was being sought; and
34. Certification is conditioned upon full payment of the required fee as set forth in 23 CCR Section 3833. Water Board staff received payment in full of $1,097.00 on March 24, 2014.

This certification applies to the Project as proposed in the application materials. Please be advised that failure to implement the Project as proposed is a violation of this water quality certification. Violation of water quality certification is a violation of State law and is subject to administrative civil liability pursuant to CWC Section 13350. Failure to meet any condition of a certification may subject you to civil liability imposed by the Water Board to a maximum of $5000 per day of violation or $10 for each gallon of waste discharged in violation of the certification. Any request for a report made as a condition to this action is a formal request

pursuant to CWC Section 13267 (e.g. Conditions 4, 5, 10, 12, 20, 21, 22, 23, 27, 28, 29, 30, and 31), and failure or refusal to provide, or falsification of such requested report is subject to civil liability as described in CWC Section 13268.

Should new information come to our attention that indicates a water quality problem with this Project, the Water Board may issue Waste Discharge Requirements pursuant to 23 CCR Section 3857. If you have any questions, please contact Brian Wines of my staff at (510) 622-5680, or by email at Brian.Wines@waterboards.ca.gov.

Sincerely,

Bruce Wolfe
Executive Officer

Attachments:

A. Project Location Maps and Design Sheets
B. Daylighting Alternative Figures
C. Location Map and Photographs of the Riparian Enhancement Project Mitigation
D. Design Sheets and Photographs of the North Fork Mitigation Project

Cc: State Board, 401 Certifications, Bill Orme, Stateboard401@waterboards.ca.gov
U.S. EPA Region 9, Jason Brush, R9-WTR8-Mailbox@epa.gov
USACE, SF Regulatory Branch, Holly Costa, holly.n.costa@usace.army.mil
CDFW, Marcia Grefsrud, marcia.grefsrud@wildlife.ca.gov
UC Berkeley, Greg Haet: gjhaet@berkeley.edu
UC Berkeley, Tom Leffler: tleffler@berkeley.edu
ESA Inc., Michelle Giolli, mgiolli@esassoc.com

Attachment D:

Construction Design Documents

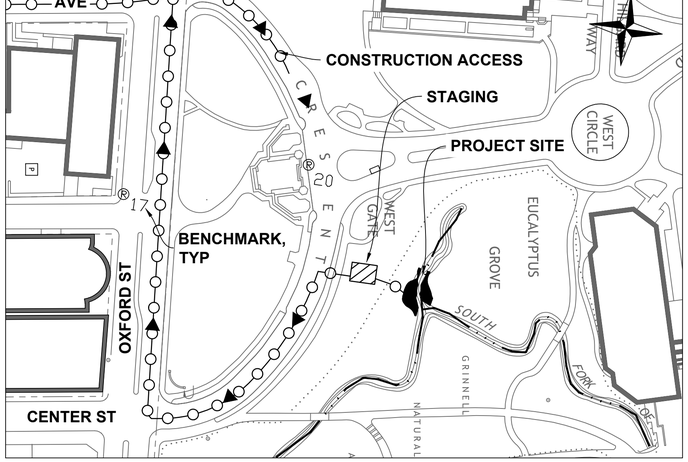
STRAWBERRY CREEK CONFLUENCE STABILIZATION PROJECT

UNIVERSITY OF CALIFORNIA, BERKELEY

BERKELEY, CALIFORNIA

BID SET

VICINITY MAP
NOT TO SCALE



LOCATION MAP
SCALE: 1" = 120'

SHEET INDEX

SURVEY CONTROL

BM 17	E: 6051915.390	N: 2144615.340	Z: 205.960	BRASS CAP
BM 20	E: 6052199.350	N: 2144702.160	Z: 224.370	BRASS CAP

DEFINITIONS

OWNER: UC BERKELEY CAPITAL PROJECTS
RICHARD LARSON
510-643-5434

RESTORATION ENGINEER: ESA PWA
SCOTT STOLLER, P.E.
415-896-5900

PREPARED BY:
ESA PWA
550 Kearny Street, Suite 900
San Francisco, CA 94108
415.262.2300 phone
415.262.2303 fax
www.esapwa-ltd.com

SHEET TITLE: TITLE SHEET

PROJECT: STRAWBERRY CREEK CONFLUENCE STABILIZATION
Proj No. 17146A

PREPARED FOR:
UNIVERSITY OF CALIFORNIA
ENVIRONMENTAL HEALTH AND SAFETY
Berkeley Campus
Berkeley, California

REGISTERED PROFESSIONAL ENGINEER
SCOTT L. STOLLER
C71728
CIVIL
STATE OF CALIFORNIA
09-12-15

APPROVED	
DESIGNED	ESA PWA
DRAWN	J. UY
INCHARGE	S.STOLLER C71728
SCALE	AS NOTED
DATE	08/26/2014
SHEET	C1

1 OF 9

GENERAL NOTES

GENERAL

1. THE PLANS AND SPECIFICATIONS DESCRIBED HEREIN RELATE TO CHANNEL AND BANK STABILIZATION AND REVEGETATION ELEMENTS.
2. CONTRACTOR AGREES TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR THE JOB SITE DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD THE OWNER AND ITS REPRESENTATIVES HARMLESS FROM ANY AND ALL LIABILITY, REAL AND/OR ALLEGED, IN CONJUNCTION WITH THE PERFORMANCE OF THIS PROJECT.
3. A SET OF SIGNED WORKING DRAWINGS WILL BE KEPT ON THE JOB SITE AT ALL TIMES ON WHICH ALL CHANGES OR VARIATIONS IN THE WORK, INCLUDING ALL EXISTING UTILITIES, ARE TO BE RECORDED AND/OR CORRECTED DAILY AND SUBMITTED TO THE OWNER'S REPRESENTATIVE WHEN THE WORK TO BE DONE IS COMPLETED. A COMPLETE SET OF ENVIRONMENTAL PERMITS SHALL BE KEPT ON SITE AT ALL TIMES.
4. CONTRACTOR SHALL CONTACT THE OWNER TO ARRANGE A PRE-CONSTRUCTION CONFERENCE FOR THE PURPOSE OF REVIEWING JOB REQUIREMENTS AND PROCEDURES.
5. ALL MATERIAL SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR UNLESS OTHERWISE NOTED. ALL MATERIALS DEMOLISHED OR REMOVED SHALL BECOME THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE RECYCLED/ DISPOSED OF IN ACCORDANCE WITH ALL APPLICABLE LAWS. CONTRACTOR IS REQUIRED TO OBTAIN EXPRESS WRITTEN APPROVAL FOR THE REMOVAL OF ALL MATERIALS FROM THE SITE. THE OWNER MAY BE ABLE TO FURNISH A LOG FOR USE IN THE LOG WEIR. THE CONTRACTOR SHALL DOCUMENT THE AMOUNT AND PERCENTAGE OF REMOVED MATERIALS THAT ARE TAKEN TO A RECYCLING FACILITY OR TO A LANDFILL AND SHALL PROVIDE THIS INFORMATION TO THE OWNER UPON COMPLETION OF THE PROJECT.
6. ALL WORKMANSHIP AND MATERIALS FOR ON-SITE IMPROVEMENTS SHALL CONFORM TO THE LATEST EDITION OF THE STATE OF CALIFORNIA STANDARD SPECIFICATIONS AND STANDARD PLANS. THE ON-SITE IMPROVEMENTS SHALL BE INSPECTED BY THE OWNER'S INSPECTORS.
7. CONTRACTOR SHALL NOTIFY THE OWNER AT LEAST 72 HOURS PRIOR TO COMMENCEMENT OF ANY PART OF WORK.
8. CONTRACTOR SHALL PROVIDE AND MAINTAIN SUFFICIENT TEMPORARY BARRICADES TO PROVIDE FOR THE SAFETY OF THE STAFF AND GENERAL PUBLIC TO THE SATISFACTION OF THE OWNER.

SUBMITTALS

9. THE TECHNICAL AND PERFORMANCE SPECIFICATIONS CONTAIN A COMPREHENSIVE LIST OF CONTRACTOR SUBMITTALS. KEY SUBMITTALS ARE LISTED BELOW.
10. SCHEDULE OF VALUES: UPON CONTRACT AWARD, CONTRACTOR SHALL FURNISH A SCHEDULE OF VALUES TO THE OWNER PRIOR TO MOBILIZATION.
11. TRAFFIC CONTROL PLAN: SHALL BE SUBMITTED AT LEAST FOURTEEN (14) CALENDAR DAYS PRIOR TO INTERRUPTIONS IN TRAFFIC FLOW. SEE ITEM 35 BELOW.
12. OPERATIONS PLAN: CONTRACTOR SHALL SUBMIT AN OPERATIONS PLAN 7 DAYS PRIOR TO MOBILIZING ON THE SITE. OPERATIONS PLAN SHALL CONTAIN PROPOSED ACCESS ROUTES TO THE SITE/WITHIN SITE, FENCE LOCATIONS, EQUIPMENT STORAGE, REFUELING, AND STAGING AREA, AND EQUIPMENT LIST AND DESCRIPTION.
15. MATERIALS: CONTRACTOR SHALL FURNISH A MATERIALS LIST AND SOURCE, COMPLETE WITH CERTIFICATION THAT EACH ITEM MEETS THE PERFORMANCE SPECIFICATIONS.
16. DEWATERING PLAN: A FINAL DEWATERING PLAN HAS BEEN SUBMITTED TO THE RWQCB FOR APPROVAL. CONTRACTOR SHALL REVIEW THIS PLAN AND SUBMIT ANY PLANNED CHANGES IN WRITING AT LEAST 7 DAYS PRIOR TO DEWATERING ACTIVITIES. THE PROJECT PERMITS WILL REQUIRE THAT ALL WORK BE COMPLETED WITHIN THE STREAM CHANNEL BY OCTOBER 31ST. IN THE EVENT OF A PREDICTED STORM THAT MAY OVERWHELM THE BYPASS SYSTEM, THE CONTRACTOR SHALL BE AVAILABLE TO SHUT DOWN OPERATIONS AND REMOVE THE UPPER IMPOUNDMENT(S) OR A PORTION OF THE DAM(S) TO ACCOMMODATE FLOWS.
17. STORMWATER AND SEDIMENT CONTROL PLAN: CONTRACTOR SHALL SUBMIT FOR OWNER APPROVAL A PLAN DESCRIBING MEASURES CONTRACTOR IS IMPLEMENTING DURING CONSTRUCTION TO PREVENT THE TRACKING OF SOIL OFF SITE OR MIGRATING INTO WATERWAYS, WHICH MAY INCLUDE BUT IS NOT LIMITED TO SILT FENCES, CHECK DAMS, WATTLES, ETC. THE PLAN MUST BE APPROVED BY OWNER PRIOR TO EARTHWORK.
18. IRRIGATION PLAN: CONTRACTOR SHALL SUBMIT AN IRRIGATION PLAN THAT SATISFIES THE CONDITIONS OUTLINED IN THE PERFORMANCE SPECIFICATION. IT MUST BE APPROVED BY THE OWNER PRIOR TO PLANT INSTALLATION.

PROTECTION OF EXISTING CONDITIONS

19. CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ANY AND ALL DAMAGES TO EXISTING VEGETATION, STRUCTURES AND UTILITIES DURING CONSTRUCTION. NO TREE LARGER THAN 6" DBH SHALL BE REMOVED UNLESS NOTED ON PLANS.
20. STAGING AREA AND ACCESS ROUTES: GRASSED AREAS USED FOR ACCESS AND STAGING SHALL BE PROTECTED WITH PLYWOOD OR OTHER MATERIAL APPROVED BY OWNER. ALL DAMAGED OR BROKEN ELEMENTS (E.G., PAVEMENT, DRAINS, HEADERS, ETC.) SHALL BE REPAIRED OR REPLACED, ALL LANDSCAPE ELEMENTS (E.G., IRRIGATION, LAWN, GRADING, WOOD CHIPS, ETC.) RESTORED AND ALL FOREIGN MATTER (E.G., SIGNS, CONTAMINATED SOIL, FENCING, GRAVEL, DEBRIS, ETC.) SHALL BE REMOVED.
21. PRIOR TO CONSTRUCTION, THE LIMITS OF WORK FOR CONSTRUCTION, ACCESS, AND STAGING WILL BE CLEARLY DELINEATED IN THE FIELD WITH TEMPORARY CONSTRUCTION FENCING, FLAGGING OR STAKES TO ENSURE THAT ALL PROJECT ACTIVITIES ARE RESTRICTED TO AUTHORIZED WORK AREAS. THE FLAGGED/FENCED AREAS WILL BE DESIGNATED AS "NO CONSTRUCTION" ZONES AND PROTECTED FROM DIRECT OR INDIRECT IMPACTS.
22. PRIOR TO COMMENCING WORK, THE CONTRACTOR SHALL REVIEW ALL TREE AND OTHER PROTECTION FENCING WITH THE OWNER'S REPRESENTATIVE, AND FIELD ADJUST THE LIMITS AS DIRECTED. STAGING AND ACCESS ROUTE TO BE APPROVED BY OWNER. NO VEHICLE SHALL BE PARKED UNDER THE TREES' DRIPLINE.

UTILITIES

23. CONTRACTOR SHALL NOTIFY ALL PUBLIC OR PRIVATE UTILITY COMPANIES 48 HOURS PRIOR TO COMMENCEMENT OF WORK ADJACENT TO EXISTING UTILITY LINES.
24. CONTRACTOR SHALL NOTIFY UNDERGROUND SERVICE ALERT (USA) AT 1-800-227-2600 PRIOR TO START OF ANY CONSTRUCTION.
25. LOCATIONS OF UTILITIES AND FACILITIES SHOWN ARE APPROXIMATE AND FOR GENERAL INFORMATION ONLY. CONTRACTOR SHALL POTHOLE ALL EXISTING UTILITIES AS NEEDED FOR VERIFICATION.
26. CONTRACTOR SHALL FIELD LOCATE ALL EXISTING UTILITIES AND PROTECT THROUGHOUT CONSTRUCTION.

ENVIRONMENTAL PROTECTION

27. CONTRACTOR SHALL CONDUCT ALL GRADING OPERATIONS IN SUCH MANNER AS TO PRECLUDE WIND BLOWN DIRT AND DUST AND RELATED DAMAGE TO PROPERTY AND PATRONS. CONFIRM PREFERRED DUST CONTROL METHOD WITH THE OWNER OR REPRESENTATIVE PRIOR TO INITIATING DUST CONTROL MEASURES. SUFFICIENT WATERING TO CONTROL DUST IS REQUIRED AT ALL TIMES. CONTRACTOR SHALL ASSUME LIABILITY FOR CLAIMS RELATED TO WIND BLOWN MATERIAL. IF THE DUST CONTROL IS INADEQUATE AS DETERMINED BY THE OWNER THE CONSTRUCTION WORK SHALL BE TERMINATED UNTIL CORRECTIVE MEASURES ARE TAKEN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PREVENTING ANY POTABLE WATER ENTERING THE CREEK FROM THE PROJECT AREA OR AS PART OF THE PROJECT ACTIVITIES.
28. CONTRACTOR SHALL ANTICIPATE DIVERTING CREEK BASEFLOW DURING WORK. A FINAL DEWATERING PLAN HAS BEEN SUBMITTED TO THE RWQCB. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FOLLOW THIS PLAN AND TO ALERT THE OWNER'S REPRESENTATIVE IF A DEVIATION FROM THIS PLAN IS ANTICIPATED.
29. CONTRACTOR SHALL PROVIDE TO THE OWNER ANY CHANGES PROPOSED FOR THE PROJECT'S EROSION CONTROL PLAN AND SHALL PROVIDE A SCHEDULE FOR IMPLEMENTATION OF CONTROL MEASURES. CONTRACTOR SHALL MEET WITH THE OWNER PRIOR TO OCTOBER 1 TO REVIEW STATUS OF PROJECT'S EROSION CONTROL AND WATER POLLUTION MEASURES.
30. AN NOI FOR A SWPPP IS NOT REQUIRED FOR THIS PROJECT. CONTRACTOR SHALL SUBMIT A STORMWATER AND SEDIMENT CONTROL PLAN AND FOLLOW THE EROSION CONTROL PLAN ON SHEET C8.
31. THE CONTRACTOR SHALL IMPLEMENT AND UTILIZE BEST MANAGEMENT PRACTICES TO PREVENT EROSION, SEDIMENT AND HAZMAT RUNOFF FROM THE CONSTRUCTION SITE.
32. THE OWNER HAS OBTAINED PERMITS FROM RESOURCE AGENCIES FOR THIS PROJECT. COMPLY WITH ALL PERMIT REQUIREMENTS FOR PROTECTION OF WATER QUALITY, WILDLIFE AND VEGETATION. CONTRACTOR SHALL KEEP A COPY OF PERMITS ON SITE AND FOLLOW THEIR PROVISIONS.

CULTURAL RESOURCES

33. THE CONTRACTOR SHALL NOTIFY THE OWNER IMMEDIATELY IF CULTURAL RESOURCES ARE ENCOUNTERED DURING EXCAVATION FOR ANY PHASE OF THE PROJECT, AND THAT PORTION OF WORK SHALL BE HALTED UNTIL A CULTURAL RESOURCE CONSULTANT HAS EVALUATED THE SITUATION.

TRAFFIC CONTROL

34. ALL TRAFFIC CONTROL REQUIRED FOR CONSTRUCTION ACTIVITIES SHALL CONFORM TO THE REQUIREMENTS OF THE LATEST EDITION OF THE CALTRANS TRAFFIC MANUAL.
35. FOR ALL LANE CLOSURES, DETOURS, OR INTERRUPTION TO TRAFFIC FLOWS ON ROADS OR PATHS A TRAFFIC CONTROL PLAN SHALL BE SUBMITTED TO THE OWNER FOR REVIEW AND APPROVAL AT LEAST FOURTEEN (14) CALENDAR DAYS BEFORE THE SCHEDULED INTERRUPTION. THE PLAN SHALL DESCRIBE THE NATURE, DURATION AND DETOURS PROPOSED.

TOPOGRAPHIC DATA AND MAPPING

36. THE TOPOGRAPHY SHOWN IS BASED ON GROUND BASED SURVEY PERFORMED BY ESA (2013).
37. THE EXISTING GRADE REFLECTS SITE CONDITIONS AT THE TIME OF THE SURVEYS. CONTRACTOR SHALL VERIFY GRADES PRIOR TO COMMENCING WORK AND SHALL REPORT ANY DISCREPANCY BETWEEN DESIGN DRAWINGS AND FIELD CONDITIONS IMMEDIATELY TO THE OWNER'S REPRESENTATIVE. THE CONTRACTOR SHALL NOT COMMENCE WITH GRADING UNTIL THE DISCREPANCY IS RESOLVED.
38. HORIZONTAL CONTROL IS CALIFORNIA STATE PLANE ZONE III (NAD83) IN US FT. VERTICAL CONTROL IS NAVD88.
39. CONTRACTOR SHALL VERIFY LOCATIONS, LEVELS, DISTANCES, AND FEATURES THAT MAY AFFECT THE WORK. SHOULD EXISTING CONDITIONS DIFFER FROM THOSE SHOWN OR INDICATED, OR IF IT APPEARS THAT THESE PLANS, STANDARD SPECIFICATIONS, AND SPECIAL PROVISIONS DO NOT ADEQUATELY DETAIL THE WORK TO BE DONE, CONTRACTOR SHALL NOTIFY THE OWNER AND RESTORATION ENGINEER PRIOR TO CONTINUING WITH ANY RELATED WORK. NO ALLOWANCE WILL BE MADE ON HIS/HER BEHALF FOR ANY EXTRA EXPENSE RESULTING FROM FAILURE OR NEGLECT IN DETERMINING THE CONDITIONS UNDER WHICH WORK IS TO BE PERFORMED. NOTED DIMENSION SHALL TAKE PRECEDENCE OVER SCALE.

EARTHWORK

40. RESTORE ALL DISTURBED AREAS BY APPLYING EROSION CONTROL MEASURES PER THE DRAWINGS AND SPECS. RESTORE ALL ACCESS ROUTES TO ORIGINAL GRADES AND CONDITION.

LEGEND

- EXISTING GRADE (PROFILE & SECTION)
- DESIGN GRADE
- PROJECT LIMITS
- GRADING LIMITS
- (E) CHANNEL ALIGNMENT
- (N) FLOWLINE
- CONSTRUCTION ACCESS
- EXISTING WATERLINE
- 4 EXISTING CONTOUR LINE, GROUND BASED SURVEY
- NATIVE BANK MATERIAL
- OVER EXCAVATE AND RECOMPACT (SECTION)
- BEDDING
- ENGINEERED STREAMBED MATERIAL (ESM)
- STAGING
- FLOW — FLOW DIRECTION
- × 9.36 SPOT ELEVATION
- ⊛17 BENCHMARK
- HORIZONTAL CURVE CONTROL POINT
- CONTROL POINT
- POC POINT OF CONNECTION
- ROCK (SIZE PER PLAN)

SHEET NUMBER FROM WHICH SECTION OR DETAIL WAS SPECIFIED — 1 / 2 3 — INDICATES SECTION OR DETAIL NUMBER; SHEET NUMBER ON WHICH SECTION OR DETAIL APPEARS

ABBREVIATIONS

APPROX	APPROXIMATE
℄	CENTERLINE
DBH	DIAMETER AT BREAST HEIGHT
DEMO	DEMOLISH
DIA	DIAMETER
DG	DESIGN GRADE
DS	DOWNSTREAM
ECF	EROSION CONTROL FABRIC
ELEV	ELEVATION
(E)	EXISTING
EG	EXISTING GRADE
ESA	ENVIRONMENTAL SCIENCE ASSOCIATES
FG	FINISHED GRADE
FL	FLOW LINE
FT	FOOT, FEET
GB	GRADE BREAK
IN	INCH
MAX	MAXIMUM
MIN	MINIMUM
(N)	NEW
NIC	NOT IN CONTRACT
NOI	NOTICE OF INTENT
NTS	NOT TO SCALE
OC	ON CENTER
PIP	PROTECT IN PLACE
POC	POINT OF CONNECTION
QTY	QUANTITY
RC	RELATIVE COMPACTION
RWQCB	REGIONAL WATER QUALITY CONTROL BOARD
SPECS	SPECIFICATIONS
STA	STATION
3:1	SLOPE, HORIZONTAL: VERTICAL
TBD	TO BE DETERMINED
TYP	TYPICAL
US	UPSTREAM
VAR	VARIES
VIF	VERIFY IN FIELD

PREPARED BY:
ESA PWA
550 Kearny Street, Suite 900
San Francisco, CA 94108
415.262.2300 phone
415.262.2303 fax
www.pwa-ltd.com

SHEET TITLE: SYMBOLS, ABBREVIATIONS, & GENERAL NOTES

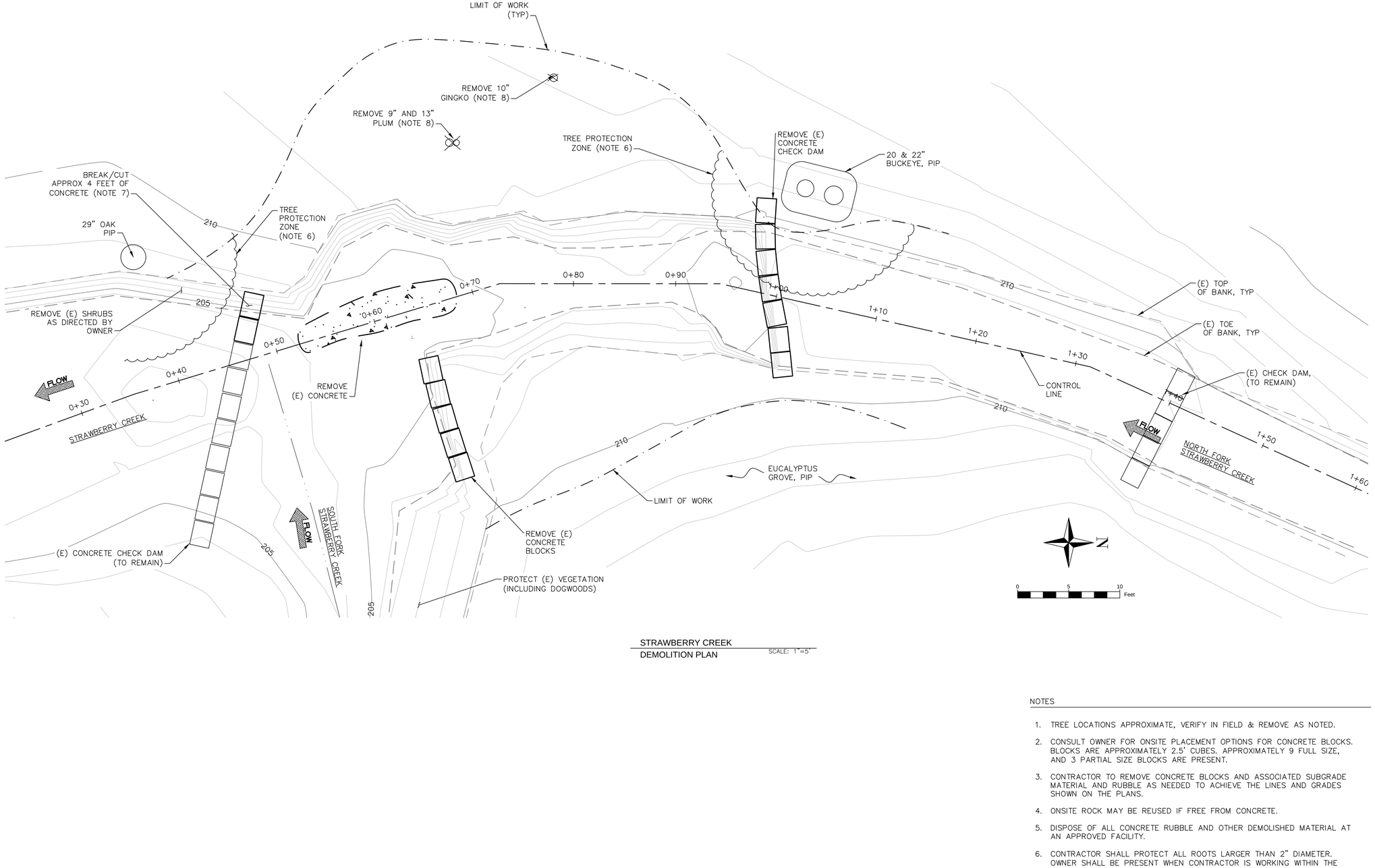
PROJECT: STRAWBERRY CREEK CONFLUENCE STABILIZATION
Proj No. 17146A

PREPARED FOR:
UNIVERSITY OF CALIFORNIA
ENVIRONMENTAL HEALTH AND SAFETY
Berkeley Campus
Berkeley, California

REGISTERED PROFESSIONAL ENGINEER
SCOTT L. STOLLER
C71728
CIVIL
STATE OF CALIFORNIA
EXP. 12-31-15

APPROVED	
DESIGNED	ESA PWA
DRAWN	B.TANAKA
INCHARGE	S.STOLLER C71728
SCALE	AS NOTED
DATE	08/26/2014
SHEET	C2

2 OF 9



STRAWBERRY CREEK
DEMOLITION PLAN
SCALE: 1"=5'

NOTES

1. TREE LOCATIONS APPROXIMATE, VERIFY IN FIELD & REMOVE AS NOTED.
2. CONSULT OWNER FOR ONSITE PLACEMENT OPTIONS FOR CONCRETE BLOCKS. BLOCKS ARE APPROXIMATELY 2.5' CUBES. APPROXIMATELY 9 FULL SIZE, AND 3 PARTIAL SIZE BLOCKS ARE PRESENT.
3. CONTRACTOR TO REMOVE CONCRETE BLOCKS AND ASSOCIATED SUBGRADE MATERIAL AND RUBBLE AS NEEDED TO ACHIEVE THE LINES AND GRADES SHOWN ON THE PLANS.
4. ONSITE ROCK MAY BE REUSED IF FREE FROM CONCRETE.
5. DISPOSE OF ALL CONCRETE RUBBLE AND OTHER DEMOLISHED MATERIAL AT AN APPROVED FACILITY.
6. CONTRACTOR SHALL PROTECT ALL ROOTS LARGER THAN 2" DIAMETER. OWNER SHALL BE PRESENT WHEN CONTRACTOR IS WORKING WITHIN THE TREE PROTECTION ZONE, DEFINED AS 10 FEET FROM THE TRUNK OF THE 29" OAK AND DOUBLE BUCKEYE IDENTIFIED ON THE PLANS. CONTRACTOR SHALL PROVIDE 48 HOURS NOTICE TO OWNER FOR ANY WORK WITHIN THE TREE PROTECTION ZONE
7. CONTRACTOR SHALL BREAK/CUT WESTERN-MOST 4-FEET OF CHECK DAM FLUSH WITH ADJACENT FLAT PORTION OF THE CHECK DAM. PLACE 1-TON BOULDERS AT CHECK DAM ELEVATION, KEYED INTO BANK SUCH THAT IT IS COVERED BY 2 FEET OF SOIL. SEE SHEET C4.
8. REMOVE CROWN OF ALL DEMOLISHED TREES TO 2 FEET BELOW FINISHED GRADE.

VERIFY SCALE
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

PREPARED BY:
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San Francisco, CA 94108
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SHEET TITLE
EXISTING CONDITIONS & DEMOLITION PLAN

PROJECT
STRAWBERRY CREEK
CONFLUENCE STABILIZATION
Proj No. 17146A

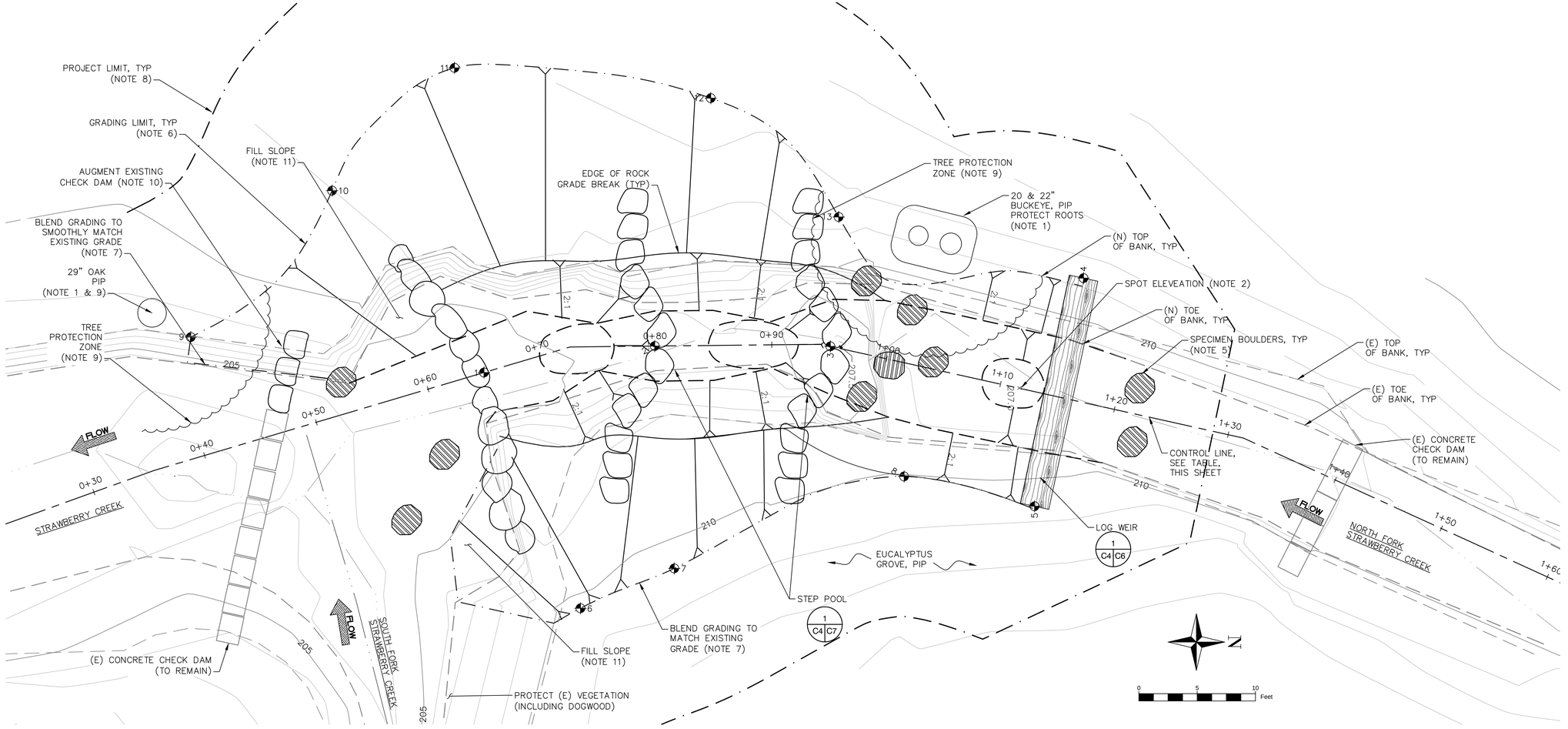
PREPARED FOR:
UNIVERSITY OF CALIFORNIA
ENVIRONMENTAL HEALTH AND SAFETY
Berkeley, California
Berkeley Campus

REGISTERED PROFESSIONAL ENGINEER
SCOTT L. STOLLER
C71728
CIVIL
STATE OF CALIFORNIA
DATE 12-31-15

APPROVED	
DESIGNED	ESA PWA
DRAWN	J. UY
INCHARGE	S.STOLLER C71728
SCALE	AS NOTED
DATE	08/26/2014
SHEET	C3

3 OF 9

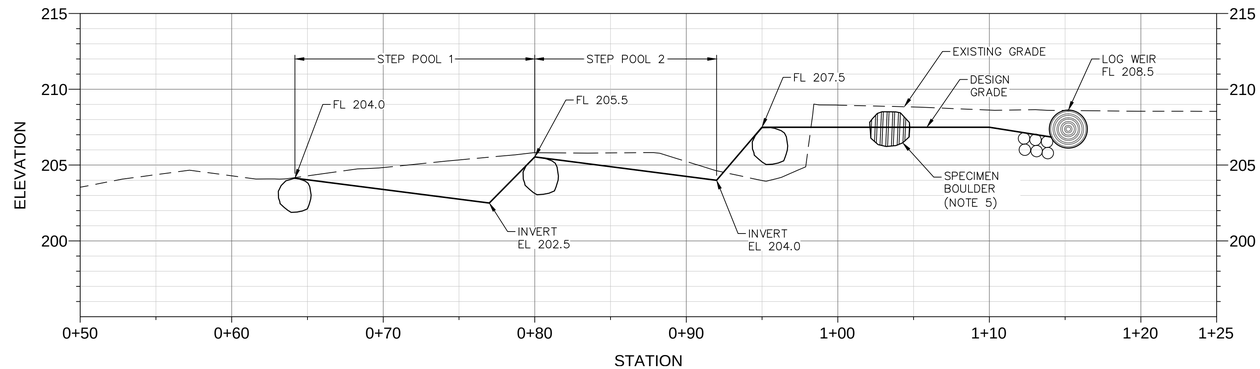
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT



STRAWBERRY CREEK
PLAN
SCALE: 1"=5'

CONTROL POINT TABLE				
CP	EASTING	NORTHING	ELEV	DESCRIPTION
1	6052398.68	2144513.98	204.0	STEP POOL 1 SILL
2	6052396.41	2144528.62	205.5	STEP POOL 1 CREST
3	6052396.44	2144543.69	207.5	STEP POOL 2 CREST
4	6052390.59	2144565.40	208.5	LOG WEIR (WEST END)
5	6052410.15	2144561.20	208.5	LOG WEIR (EAST END)
6	6052418.89	2144522.26	-	GRADING LIMIT
7	6052415.47	2144530.30	-	GRADING LIMIT
8	6052407.59	2144550.02	-	GRADING LIMIT
9	6052395.65	2144488.82	-	GRADING LIMIT
10	6052383.09	2144500.95	-	GRADING LIMIT
11	6052372.57	2144511.45	-	GRADING LIMIT
12	6052375.16	2144533.43	-	GRADING LIMIT
13	6052385.35	2144544.40	-	GRADING LIMIT

CONTROL LINE TABLE		
STA	EASTING	NORTHING
0+00	6052419.11	2144452.30
0+35.5	6052407.08	2144485.68
0+72.2	6052396.49	2144521.36
0+94.2	6052396.26	2144542.89
1+31.3	6052404.30	2144579.12
1+50	6052412.05	2144596.09



STRAWBERRY CREEK
PROFILE
SCALE: 1"=5'

NOTES

1. TREE LOCATIONS APPROXIMATE, VERIFY IN FIELD & PROTECT IN PLACE. WHERE NOTED, CONSULT CAMPUS ARBORIST FOR METHODS OF ROOT PROTECTION & TRIMMING. AT MINIMUM, CLEANLY CUT ALL ROOTS IN EXCAVATION ZONE. PROTECT ALL TREE ROOTS 2" DIAMETER & GREATER.
2. SPOT ELEVATIONS INDICATE DESIGN GRADE.
3. ALL GRADING SHALL HAVE SLOPES NO STEEPER THAN 2:1 (H:V).
4. CONTOURS SHOWN ARE EXISTING GROUND.
5. SPECIMEN BOULDERS ARE ½ TO 1–TON ROCK. PLACE LONG AXIS ON CHANNEL BED, ALIGNED WITH THE DIRECTION OF FLOW. EMBED MIN ½ DIAMETER INTO CHANNEL BED. SPECIMEN BOULDERS WILL BE FIELD–LOCATED BY RESTORATION ENGINEER.
6. GRADING LIMITS TO BE VERIFIED BY RESTORATION ENGINEER PRIOR TO GRADING. CONTRACTOR SHALL STAKE CONTROL POINTS & PROVIDE MINIMUM THREE WORKING DAYS NOTICE.
7. ALL GRADING TRANSITIONS SHALL BE SMOOTH AND GRADUAL. CONFORM TO EXISTING GRADE WITH NON–PRISMATICT TRANSITION.
8. PROJECT LIMIT IS A 12 FOOT OFFSET FROM THE GRADING LIMITS.
9. OWNER SHALL BE PRESENT WHEN CONTRACTOR IS WORKING WITHIN TREE PROTECTION ZONE, DEFINED AS 10 FT FROM THE TRUNK OF THE 29–INCH OAK AND THE DOUBLE BUCKEYE IDENTIFIED ON THE PLANS. CONTRACTOR SHALL PROVIDE 48 HOURS NOTICE TO OWNER FOR ANY WORK WITHIN TREE PROTECTION ZONE.
10. PLACE 1–TON ROCKS AS NEEDED TO KEY (E) CHECK DAM INTO NEWLY GRADED BANK SUCH THAT THERE IS 2 FEET OF COVER OVER TERMINAL ROCK. ROCKS SHALL BE PLACED AT THE SAME ELEVATION AS THE (E) CHECK DAM.
11. IN AREAS WHERE FILL IS BEING PLACED, INCLUDING BACKFILL OF OVEREXCAVATED AREAS OR FILLING VOIDS FROM CONCRETE BLOCKS, MATERIAL IS TO BE PLACED IN LIFTS NOT GREATER THAN 8 INCHES AND COMPACTED. ALLUVIAL FILL IN CHANNEL TO BE COMPACTED TO 90% RC. FILL ON BANKS TO BE 88% EXCEPT IN AREAS OF PLANTING UPPER ONE (1) FOOT SHALL BE COMPACTED TO 85% R.C.

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SHEET TITLE
PLAN & PROFILE

PROJECT
STRAWBERRY CREEK
CONFLUENCE STABILIZATION
Proj No. 17146A

PREPARED FOR:
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ENVIRONMENTAL HEALTH AND SAFETY
Berkeley, California
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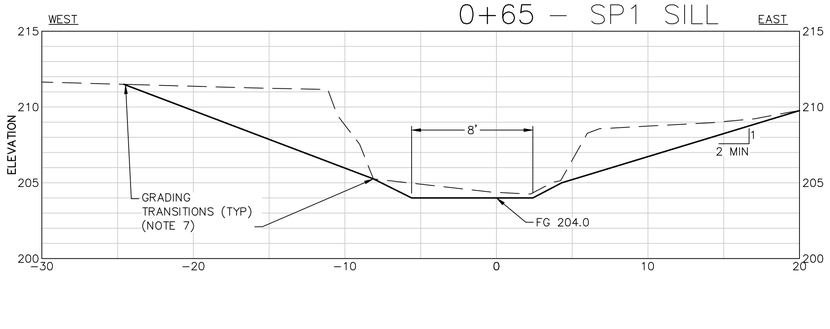

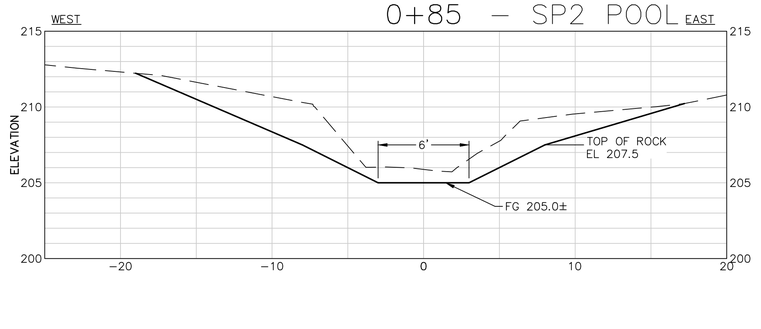

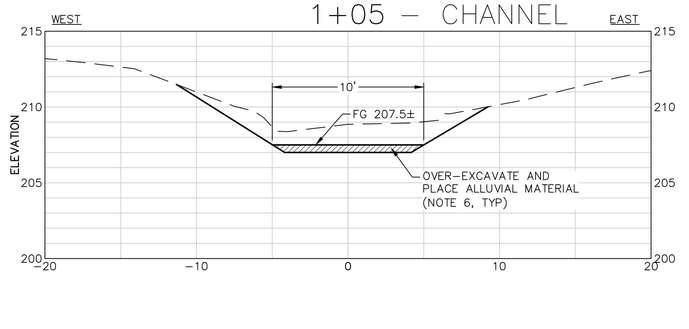

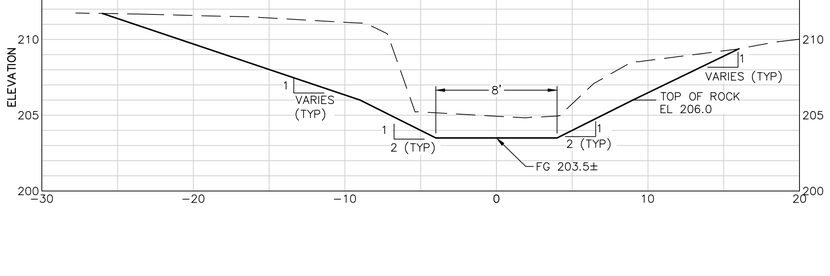

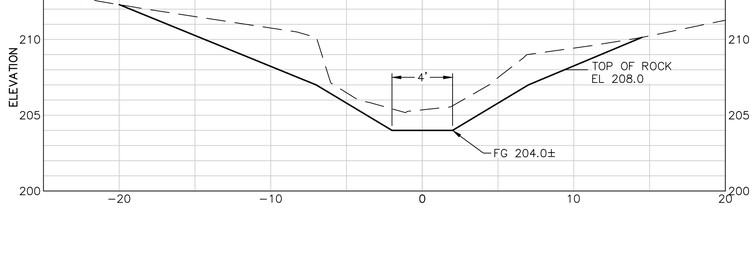

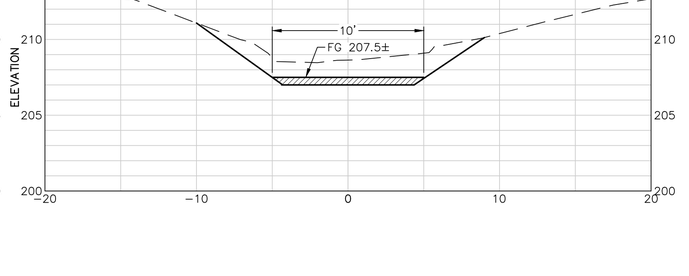

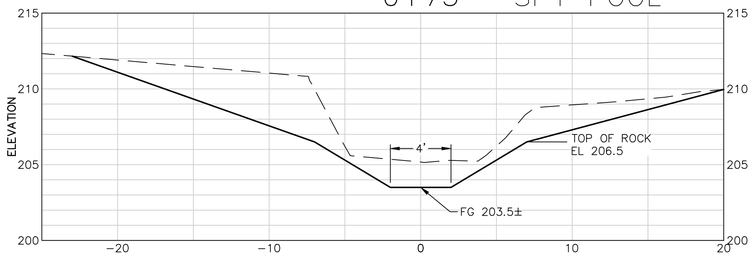

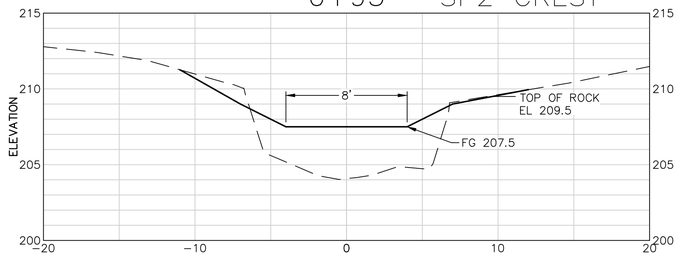

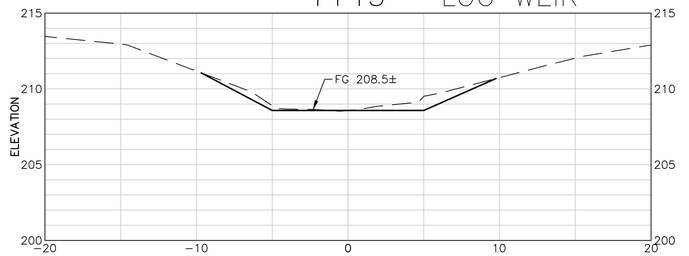

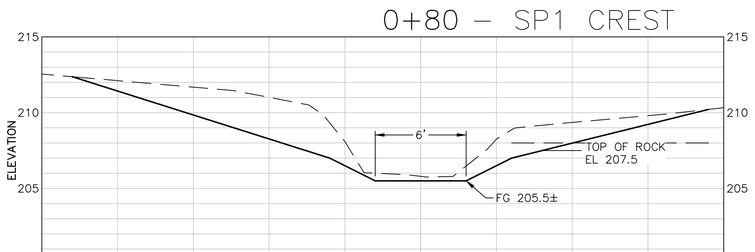

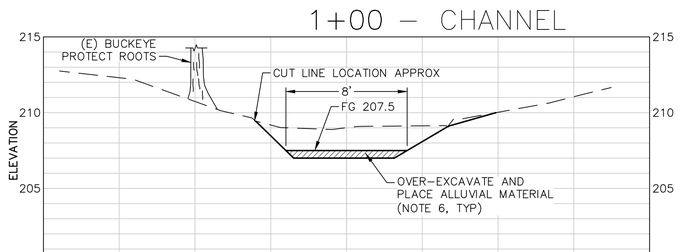

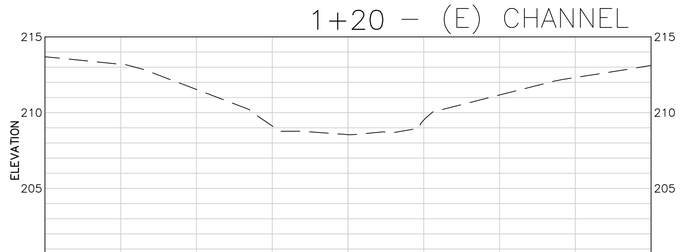

GRADING SECTIONS

SCALE: 1"=5'

NOTES

1. ALL CROSS SECTIONS ARE SHOWN LOOKING UPSTREAM.
2. STATIONS ARE MEASURED ALONG CONTROL LINE, SEE SHEET C4.
3. STEP POOL 1 (SP1) EXTENDS FROM STA 0+65 TO 0+80.
4. STEP POOL 2 (SP2) EXTENDS FROM STA 0+80 TO 0+95.
5. LOG WEIR LOCATED AT STA 1+15.
6. BETWEEN STA 0+95 AND 1+10 OVEREXCAVATE CHANNEL BOTTOM BY 0.5 FEET AND REPLACE WITH NATIVE ALLUVIAL MATERIAL AS IDENTIFIED BY RESTORATION ENGINEER.
7. ALL GRADING TRANSITIONS SHALL BE SMOOTH AND GRADUAL. CONFORM TO EXISTING GRADE WITH NON–PRISMATIC TRANSITION.
8. PLACE THREE (3) INCHES OF TOP SOIL ATOP A SCARIFIED SURFACE TO ACHIEVE FINISHED GRADE ON ALL GRADED SLOPES WHERE PLANTING WILL OCCUR. TOP SOIL SHALL BE TRACK WALKED PERPENDICULAR TO THE SLOPE FOR COMPACTION PRIOR TO PLACEMENT OF EROSION CONTROL FABRIC AND REVEGETATION.

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SHEET TITLE
GRADING SECTIONS

PROJECT
STRAWBERRY CREEK
CONFLUENCE STABILIZATION
Proj No. 17146A

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INCHARGE	S.STOLLER C71728
SCALE	AS NOTED
DATE	08/26/2014
SHEET	C5

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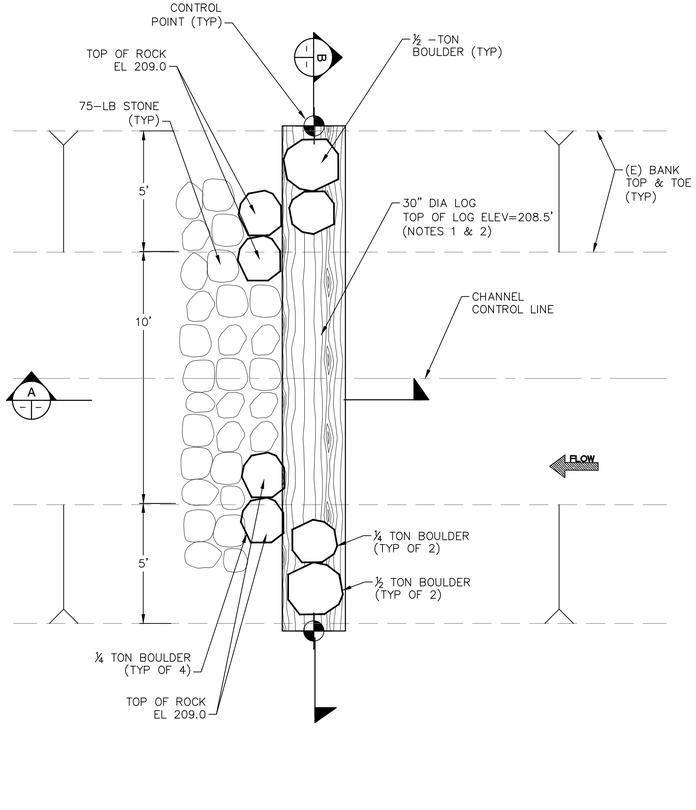
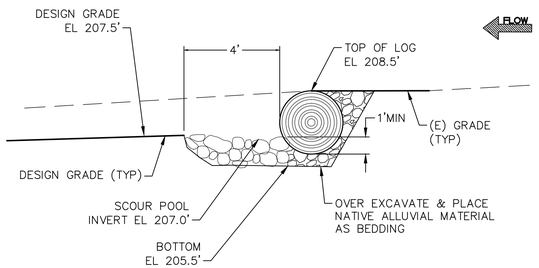


SHEET NOTES

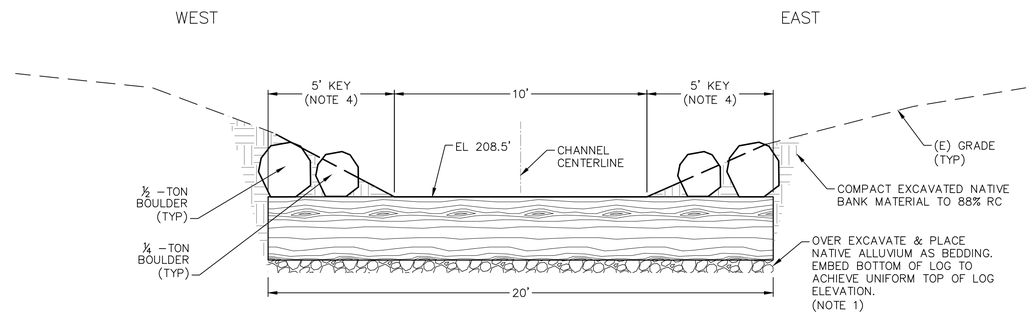
1. TOP OF LOG SHALL BE APPROXIMATELY LEVEL. ADJUST SUBGRADE ELEVATION TO ACCOUNT FOR TAPERING OR OTHER IRREGULARITIES IN SURFACE. IF LOG IS NOT SUFFICIENTLY LEVEL, CONTRACTOR SHALL CUT A FLAT CHANNEL-SPANNING WEIR AT OWNER'S DISCRETION.
2. LOG THICKNESS (DIAMETER) SHALL BE MINIMUM 30 INCHES. IF 30-INCH LOG IS NOT AVAILABLE, TWO (2) SMALLER LOGS MAY BE USED TO ACHIEVE SAME FUNCTION. CONSULT OWNER PRIOR TO PROCUREMENT AND PLACEMENT.
3. LOG SHALL BE STRIPPED/DE-BARKED PRIOR TO INSTALLATION.
4. LOG SHALL BE KEYED INTO BANK 5FT MINIMUM ON EITHER SIDE OF CHANNEL. CONTRACTOR SHALL CONSULT OWNER IF UNABLE TO PROCURE 20-FT LONG LOG FOR ALTERNATE KEY-IN METHODS.

0 1.5 3 6
SCALE (FEET)

1 / C4 C6 — LOG WEIR PLAN — SCALE: 1" = 3'



A / - - — LOG WEIR PROFILE — SCALE: 1" = 3'



B / - - — LOG WEIR SECTION — SCALE: 1" = 3'

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SHEET TITLE
DETAILS
LOG WEIR

PROJECT
STRAWBERRY CREEK
CONFLUENCE STABILIZATION
Proj No. 17146A

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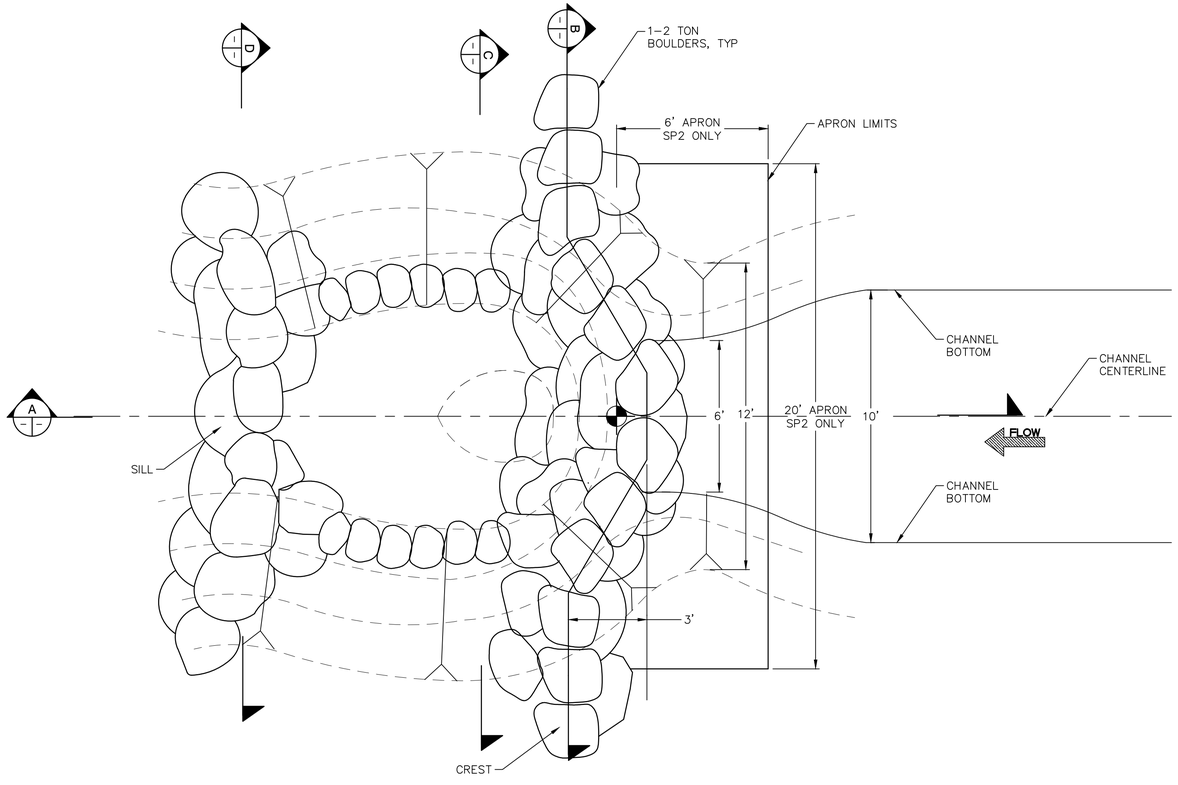
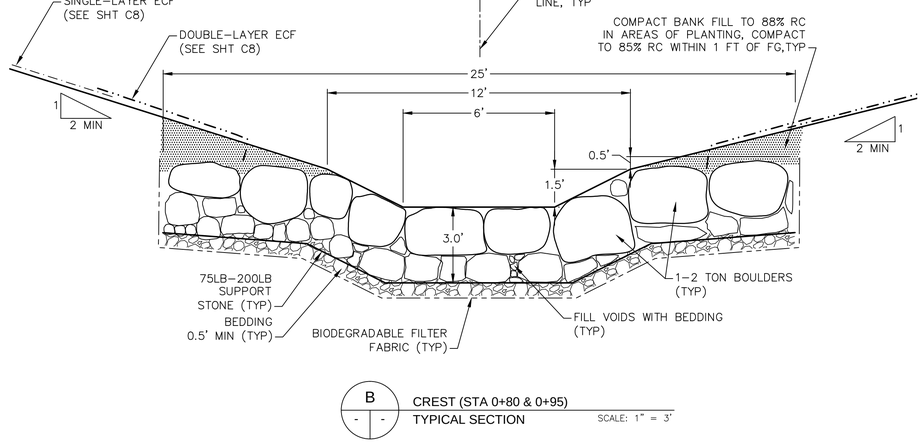
DATE	08/26/2014
SHEET	C6

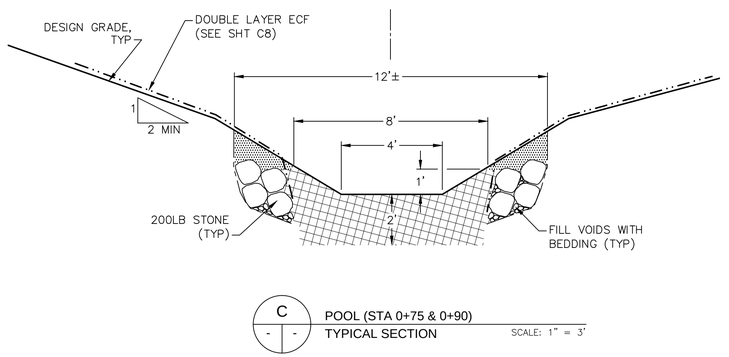
6 OF 9



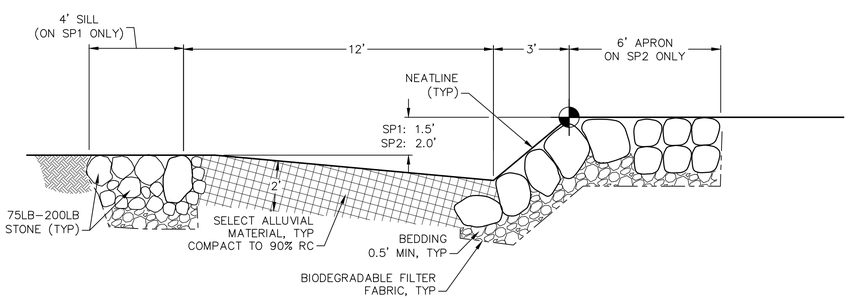
1 / C4 | C7 — STEP POOL PLAN — SCALE: 1" = 3'



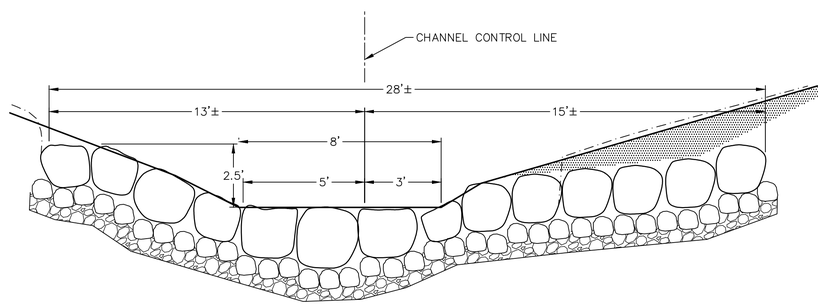
B — CREST (STA 0+80 & 0+95) TYPICAL SECTION — SCALE: 1" = 3'



C — POOL (STA 0+75 & 0+90) TYPICAL SECTION — SCALE: 1" = 3'



A — STEP POOL PROFILE THROUGH CENTERLINE — SCALE: 1" = 3'



D — SILL (STA 0+65) TYPICAL SECTION — SCALE: 1" = 3'

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SHEET TITLE: STEP POOL DETAILS

PROJECT: STRAWBERRY CREEK CONFLUENCE STABILIZATION
Proj No. 17146A

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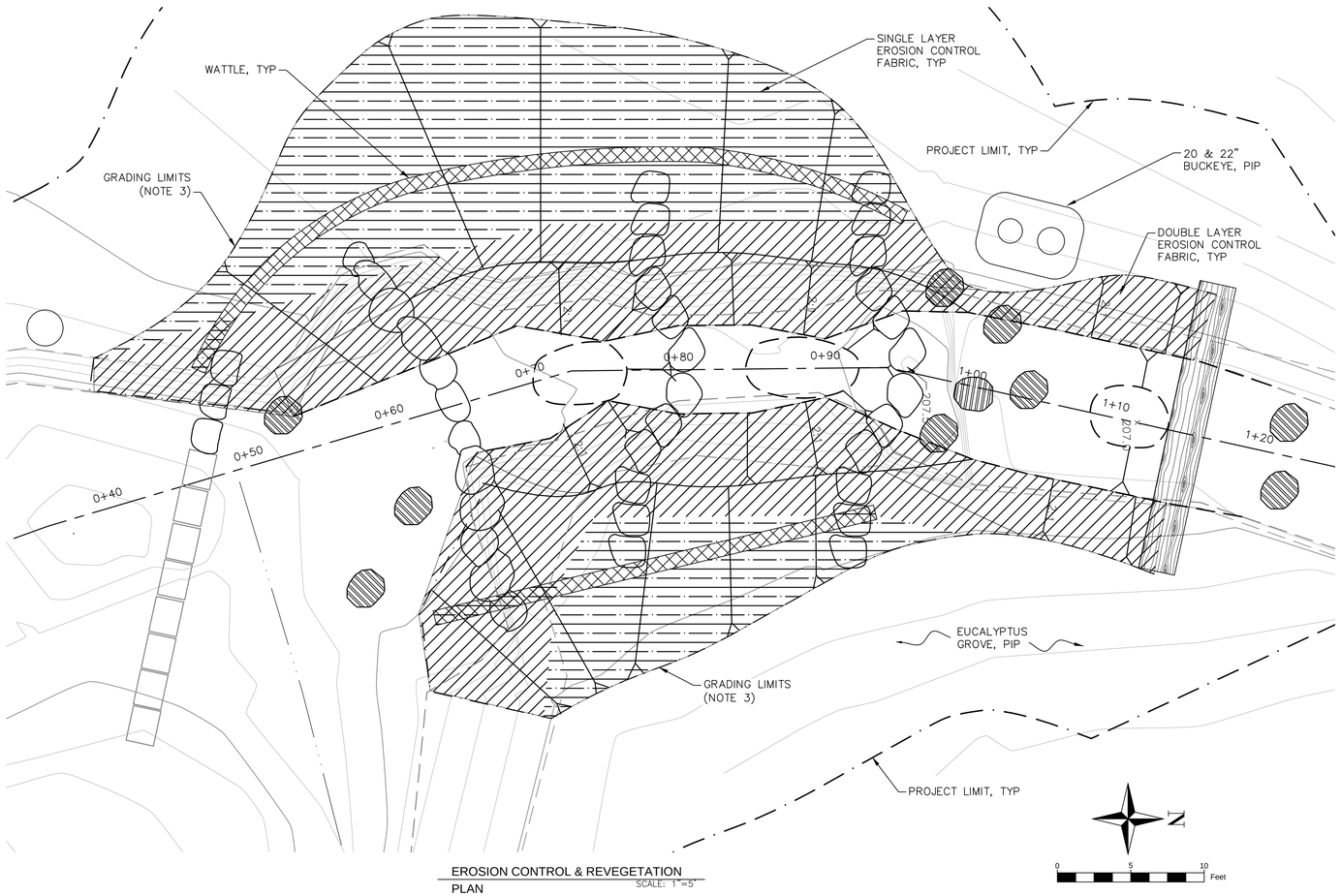
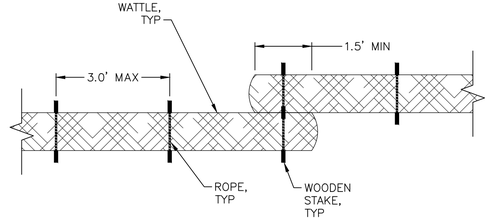
DATE	08/26/2014
SHEET	C7

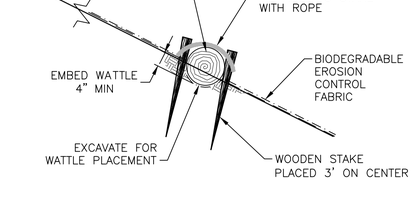
7 OF 9



EROSION CONTROL & REVEGETATION PLAN
SCALE: 1"=5'



WATTLE
TYPICAL PLAN
SCALE: 1"=2'



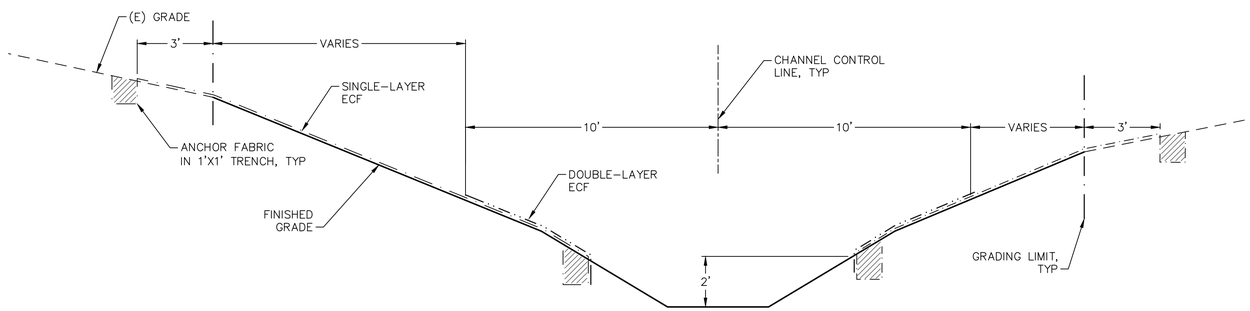
WATTLE
TYPICAL SECTION
SCALE: 1"=2'

LEGEND

- SINGLE LAYER EROSION CONTROL FABRIC (NOTE 1 & 2)
- DOUBLE LAYER EROSION CONTROL FABRIC
- WATTLE

NOTES

1. BEGIN DOUBLE-LAYER ECF TWO (2) FEET ABOVE CHANNEL INVERT AND EXTEND TO 10 FT FROM CHANNEL CONTROL LINE. FROM STA 0+55 TO 0+75 ON EAST SIDE PLACE DOUBLE-LAYER ECF PER PLAN (EXTENDS BEYOND 10 FT DISTANCE).
2. USE SINGLE-LAYER ECF ON ALL DISTURBED SOIL MORE THAN 10 FT FROM CHANNEL CONTROL LINE.
3. EXTEND EROSION CONTROL FABRIC 3 FT BEYOND GRADING LIMITS.
4. 9" COIR WATTLE TO BE INSTALLED MID-SLOPE ON GRADED BANKS. CONTRACTOR TO STAKE ALIGNMENT OF WATTLES; ALLOW 48 HOURS FOR OWNER TO REVIEW AND REVISE OR ACCEPT.



EROSION CONTROL FABRIC LAYOUT (NOTES 1, 2, & 3)
TYPICAL SECTION
SCALE: 1"=3'

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SHEET TITLE
EROSION CONTROL PLAN

PROJECT
STRAWBERRY CREEK
CONFLUENCE STABILIZATION
Proj No. 17146A

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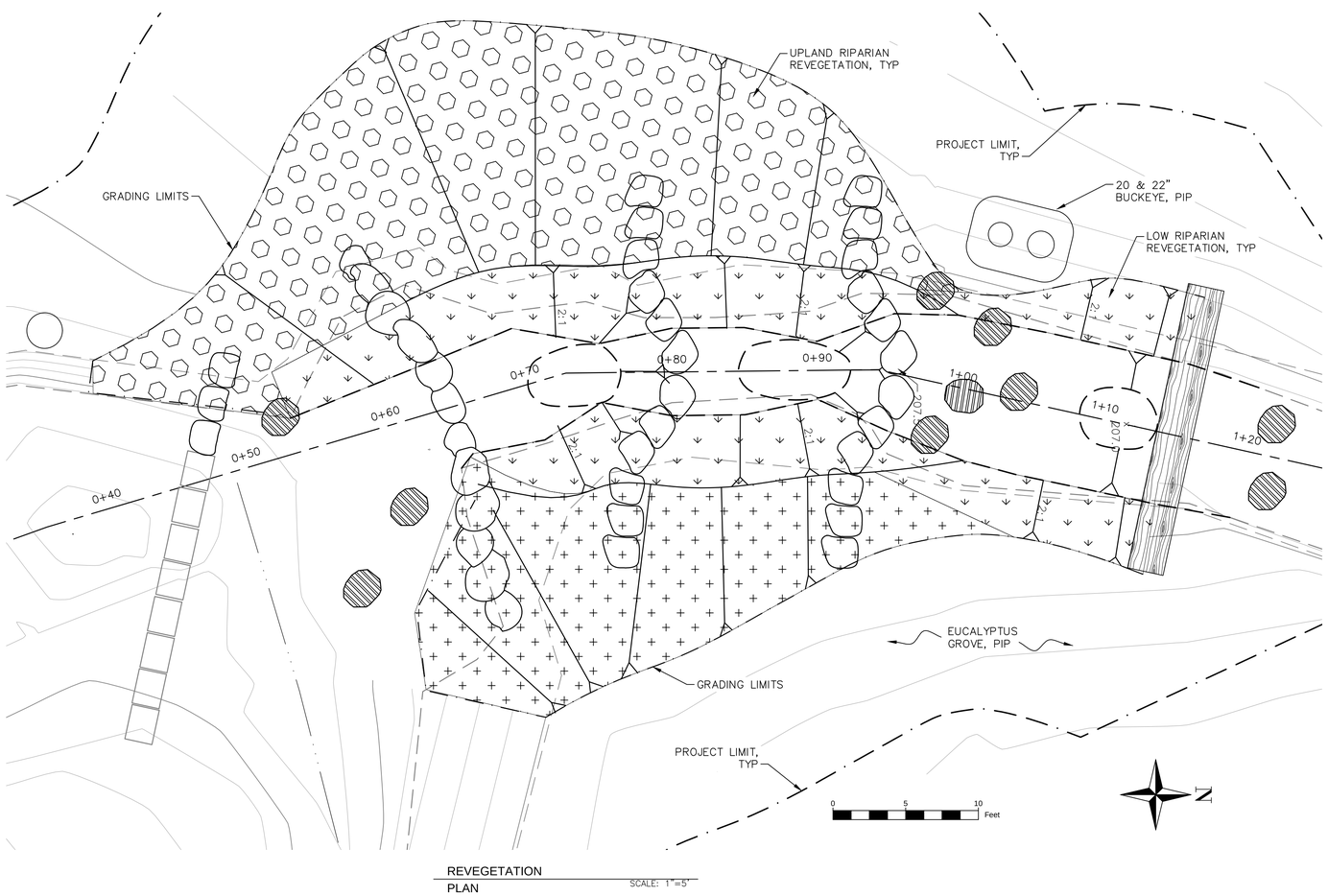
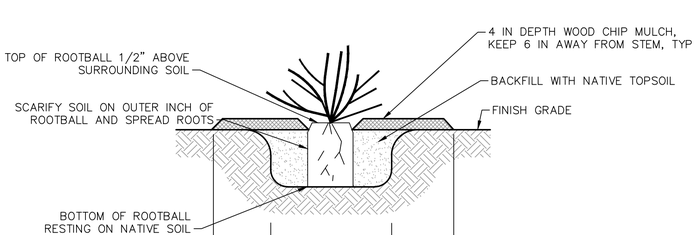
8 OF 9



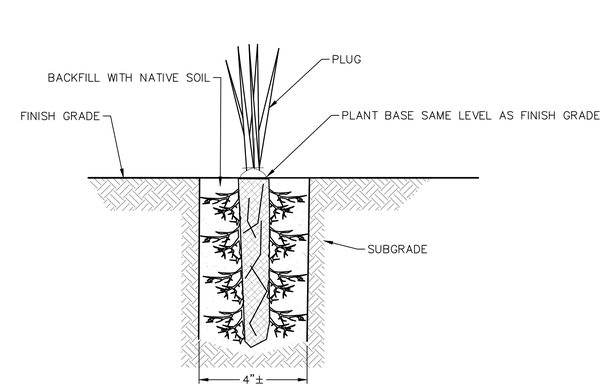
REVEGETATION PLAN

SCALE: 1"=5'



1 CONTAINER PLANTING - TYPICAL

NOT TO SCALE



2 PLUG PLANTING - TYPICAL

NOT TO SCALE

LEGEND

- UPLAND RIPARIAN REVEGETATION
- LOW RIPARIAN REVEGETATION
- AREA OF NO REVEGETATION (EXCEPT AS DIRECTED BY OWNER)

NOTES

1. FERTILIZE EACH PLANT WITH 20–10–5 AGRIFORM TABLET OR APPROVED EQUAL.
2. PLUG PLANTINGS TO OCCUR IN TRIANGULAR PATTERN (18" ON CENTER), AND CLUSTERED IN AN IRREGULAR, NATURALISTIC PATTERN.
3. CONTAINER PLANTINGS TO BE GROUPED IN CLUSTERS OF 2–6 PLANTS TO CREATE A NATURALISTIC MOSAIC OF WOODY PATCHES AND OPEN AREA.
4. CONTRACTOR TO SUBMIT IRRIGATION PLAN TO OWNER FOR APPROVAL. SEE PERFORMANCE SPECIFICATION.

REVEGETATION PLANT MATERIALS

	Common Name	Scientific Name	Container Size	Spacing OC (ft)	Qty
LOW RIPARIAN ZONE					
PERENNIALS					
	Maidenhair fern	*Adiantum jordanii*	Gallon	2	20
	Common Rush	*Juncus effusus*	Super Stubby (L6)	1.5	50
	Torrent Sedge	*Carex nudata*	Plug	5	20
TREES					
	Red Willow	*Salix laevigata*	Pole	2	20
	White Alder	*Alnus rhombifolia*	5 Gallon	10	8
UPLAND RIPARIAN ZONE					
PERENNIALS					
	Maidenhair fern	*Adiantum jordanii*	Gallon	2	20
	Western Wild Ginger	*Asarum caudatum*	Gallon	4	30
	Alum Root	*Heuchera micrantha*	Gallon	2	20
	Douglas Iris	*Iris douglasiana*	Gallon	4	40
	California Honeysuckle	*Lonicera hispidula*	Gallon	8	20
	Black Twinberry	*Lonicera involucrata*	Tree pot 4	15	10
	Wild Strawberry	*Fragaria californica*	Gallon	1	40
SHRUBS					
	California Rose	*Rosa californica*	Tree pot 4	6-8	15

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SHEET TITLE
REVEGETATION PLAN

PROJECT
STRAWBERRY CREEK
CONFLUENCE STABILIZATION
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DATE	08/26/2014
SHEET	C9

9 OF 9

Attachment E:

Rapid Channel Assessment Descriptions

[from pages 65- 68 of the US Department of Transportation,

*Assessing Stream Channel Stability at Bridges in Physiographic Regions (*2006)]

Table 8. Stability indicators, descriptions, and ratings.*

Stability Indicator	Ratings			
	Excellent (1–3)	**Good (4–6)**	**Fair (7–9)**	**Poor (10–12)**
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream
3. Channel pattern	Straight to meandering with low radius of curvature; primarily suspended load	Meandering, moderate radius of curvature; mix of suspended and bed loads; well-maintained engineered channel	Meandering with some braiding; tortuous meandering; primarily bed load; poorly maintained engineered channel	Braided; primarily bed load; engineered channel that is not maintained
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ratio small; deeply confined; no active flood plain; levees are high and along the channel edge

*Range of values in ratings columns provide possible rating values for each factor
H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Table 8. Stability indicators, descriptions, and ratings, continued.

Stability Indicator	Ratings			
	Excellent (1–3)	**Good (4–6)**	**Fair (7–9)**	**Poor (10–12)**
5. Bed material Fs = approximate portion of sand in the bed	Assorted sizes tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20%	Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50%	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70%	Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70%
6. Bar development	For S < 0.02 and w/y > 12, bars are mature, narrow relative to stream width at low flow, well vegetated, and composed of coarse gravel to cobbles. For S > 0.02 and w/y < 12, no bars are evident	For S < 0.02 and w/y > 12, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For S > 0.02 and w/y < 12, no bars are evident	For S < 0.02 and w/y > 12, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for S > 0.02 and w/y < 12	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for S < 0.02 and w/y > 12
7. Obstructions, including bedrock outcrops, armor layer, LWD jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen
8. Bank soil texture and coherence	Clay and silty clay; cohesive material	Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials	Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures	Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers or lenses that include noncohesive sands and gravels

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Table 8. Stability indicators, descriptions, and ratings, continued.

Stability Indicator	Ratings			
	Excellent (1–3)	**Good (4–6)**	**Fair (7–9)**	**Poor (10–12)**
9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over (60°) in clays common on one or both banks
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70–90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the blank. Woody vegetation oriented 80–90° from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50–70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70–80° from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70° from horizontal with extensive root exposure. No lining or armoring of banks
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Table 8. Stability indicators, descriptions, and ratings, continued.

Stability Indicator	Ratings			
	Excellent (1–3)	**Good (4–6)**	**Fair (7–9)**	**Poor (10–12)**
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping, is considerable. Channel width is highly irregular, and banks are scalloped
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20–35 m; bridge is aligned with flow	10–20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Attachment F:

Pre- and Post-Project Photo Documentation

Pre-construction photos are pictured at the top of each page and were taken on October 3, 2014 [with the exception of one photo (PP8) that was taken on March 31, 2013].

Post-construction photos are pictured at the bottom of each page and were taken December 16, 2014.

Locations of photo-points (PP) are displayed in **Figure 7**.

PP1

PP2

PP3

PP4

PP5

PP6

PP7

PP8

PP9

Attachment G:

Channel Assessment Field Data

Section # 0+30 to 0+48	**Excellent**	**Good**	**Fair**	**Poor**	**Rating**	**Avg LB vs RB**	**Section Avg**	**Comments**
Pool below original GCS at confluence	**(1-3)**	**(4-6)**	**(7-9)**	**(10-12)**				
Entrenchment/confinement			9		9	9		deeply entrenched
Bed material			7		7	7		New deposits of rubble and cobbles evident
Bank soil texture and coherence			8		8	8		Heavy clay
Vegetated/Engineered bank protection	2				2	2		Dogwood on left bank, overhang vegetation on right bank
Average bank slope - Left bank	3				3			
Average bank slope - Right bank				12	12	7.5		
Bank cutting - Left bank	3				3			
Bank cutting - Right bank				12	12	7.5		
Mass wasting or bank failure - Left bank	3				3			
Mass wasting or bank failure - Right bank				10	10	6.5	6.8	
Section # 0+48 to 0+65	**Excellent**	**Good**	**Fair**	**Poor**	**Rating**	**Avg LB vs RB**	**Section Avg**	**Comments**
Between original GCS and installed project sill	**(1-3)**	**(4-6)**	**(7-9)**	**(10-12)**				
Entrenchment/confinement			7		7	7		entrenched with some room for floodplain
Bed material		6			6	6		
Bank soil texture and coherence		4			4	4		Heavy clay
Vegetated/Engineered bank protection				10	10	10		small plants
Average bank slope - Left bank		4			4			
Average bank slope - Right bank		4			4	4		
Bank cutting - Left bank	3				3			
Bank cutting - Right bank	3				3	3		
Mass wasting or bank failure - Left bank	3				3			
Mass wasting or bank failure - Right bank	3				3	3	5.3	
Section # 0+65 to 0+96	**Excellent**	**Good**	**Fair**	**Poor**	**Rating**	**Avg LB vs RB**	**Section Avg**	**Comments**
Between installed project sill to step pool crest by buckeye	**(1-3)**	**(4-6)**	**(7-9)**	**(10-12)**				
Entrenchment/confinement				11	11	11		deeply entrenched
Bed material	3				3	3		New material
Bank soil texture and coherence		4			4	4		Heavy clay
Vegetated/Engineered bank protection				10	10	10		Plants are still small
Average bank slope - Left bank		4			4			
Average bank slope - Right bank			9		9	6.5		
Bank cutting - Left bank	3				3			
Bank cutting - Right bank	3				3	3		
Mass wasting or bank failure - Left bank	3				3			
Mass wasting or bank failure - Right bank	3				3	3	5.8	

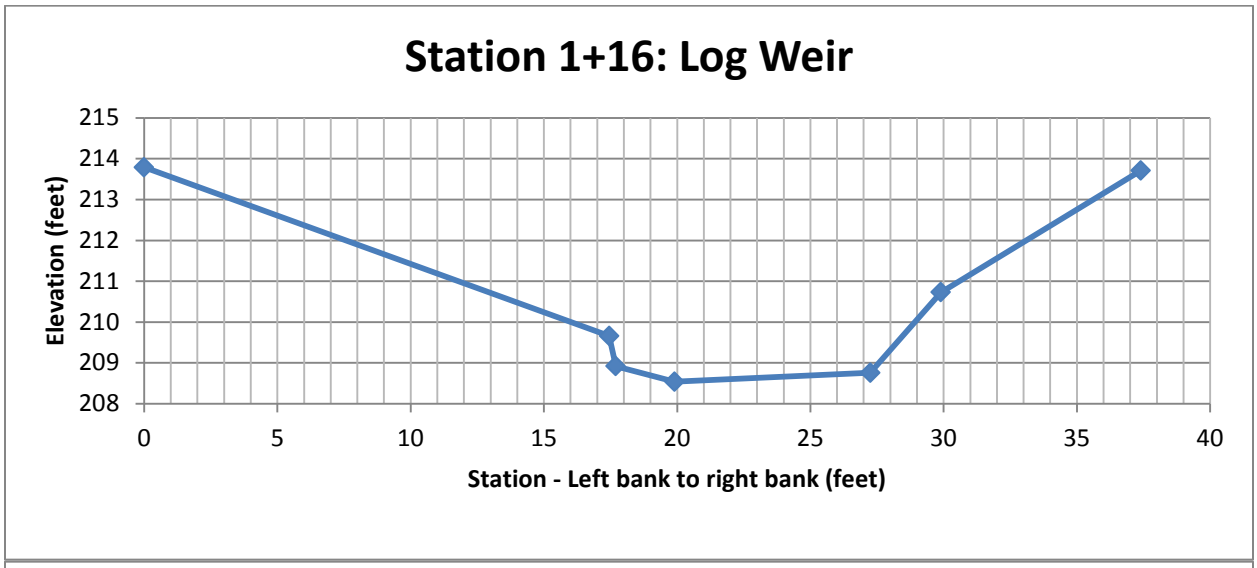
Section # 0+96 to 1+16	**Excellent**	**Good**	**Fair**	**Poor**	**Rating**	**Avg LB vs RB**	**Section Avg**	**Comments**
Step pool crest by buckeye to log weir crest	**(1-3)**	**(4-6)**	**(7-9)**	**(10-12)**				
Entrenchment/confinement			9		9	9		entrenched
Bed material			7		7	7		
Bank soil texture and coherence		4			4	4		Heavy clay
Vegetated/Engineered bank protection			8		8	8		Mostly bare but with mature buckeye tree
Average bank slope - Left bank		4			4			
Average bank slope - Right bank			7		7	5.5		
Bank cutting - Left bank	3				3			
Bank cutting - Right bank	3				3	3		
Mass wasting or bank failure - Left bank	3				3			
Mass wasting or bank failure - Right bank	3				3	3	5.6	
Section # 1+16 to 1+40	**Excellent**	**Good**	**Fair**	**Poor**	**Rating**	**Avg LB vs RB**	**Section Avg**	**Comments**
Log weir crest to original GCS at upstream (US) edge of project site	**(1-3)**	**(4-6)**	**(7-9)**	**(10-12)**				
Entrenchment/confinement				10	10	10		narrowed channel due to tree roots and steep RB
Bed material			9		9	9		Lots of rubble, remains of old engineered channels
Bank soil texture and coherence		4			4	4		Heavy clay
Vegetated/Engineered bank protection					9	9		
Average bank slope - Left bank			7		7			
Average bank slope - Right bank			7		7	7		
Bank cutting - Left bank			8		8			
Bank cutting - Right bank			8		8	8		
Mass wasting or bank failure - Left bank			7		7			
Mass wasting or bank failure - Right bank			7		7	7	7.7	Erosion occuring around rock, exposing some irrigation line
Section # 1+40 to 1+85	**Excellent**	**Good**	**Fair**	**Poor**	**Rating**	**Avg LB vs RB**	**Section Avg**	**Comments**
Original GCS at US edge of project site to downstream (DS) edge of culvert pool	**(1-3)**	**(4-6)**	**(7-9)**	**(10-12)**				
Entrenchment/confinement			7		7	7		channel close to grade
Bed material		5			5	5		
Bank soil texture and coherence		4			4	4		Heavy clay
Vegetated/Engineered bank protection			9		9	9		
Average bank slope - Left bank	3				3			
Average bank slope - Right bank		6			6	4.5		
Bank cutting - Left bank	3				3			
Bank cutting - Right bank	3				3	3		
Mass wasting or bank failure - Left bank	3				3			
Mass wasting or bank failure - Right bank	3				3	3	5.1	

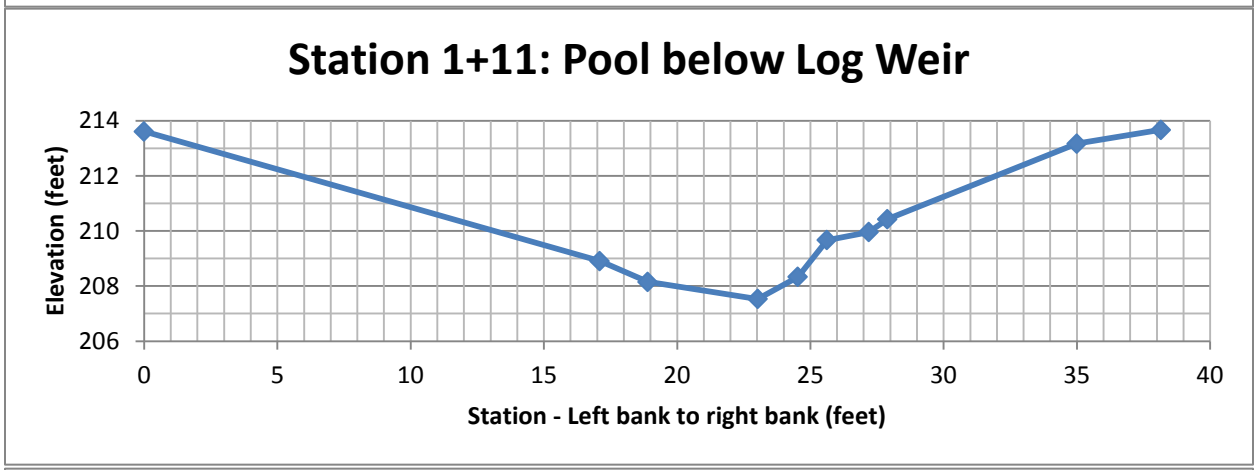
Section # 1+85 to 2+35	**Excellent**	**Good**	**Fair**	**Poor**	**Rating**	**Avg LB vs RB**	**Section Avg**	**Comments**
Pool at the outlet of the West Circle culvert	**(1-3)**	**(4-6)**	**(7-9)**	**(10-12)**				
Entrenchment/confinement				10	10	10		deeply entrenched
Bed material			7		7	7		
Bank soil texture and coherence			7		7	7		Right bank is an old concrete wall, left bank is heavy clay
Vegetated/Engineered bank protection				10	10	10		
Average bank slope - Left bank			8		8			
Average bank slope - Right bank				12	12	10		Vertical wall
Bank cutting - Left bank				11	11			scour under roots - good habitat
Bank cutting - Right bank				11	11	11		scour behind wall
Mass wasting or bank failure - Left bank			8		8			overland flow causing some scour
Mass wasting or bank failure - Right bank			8		8	8	9.0	old wall might be source of downstream rubble

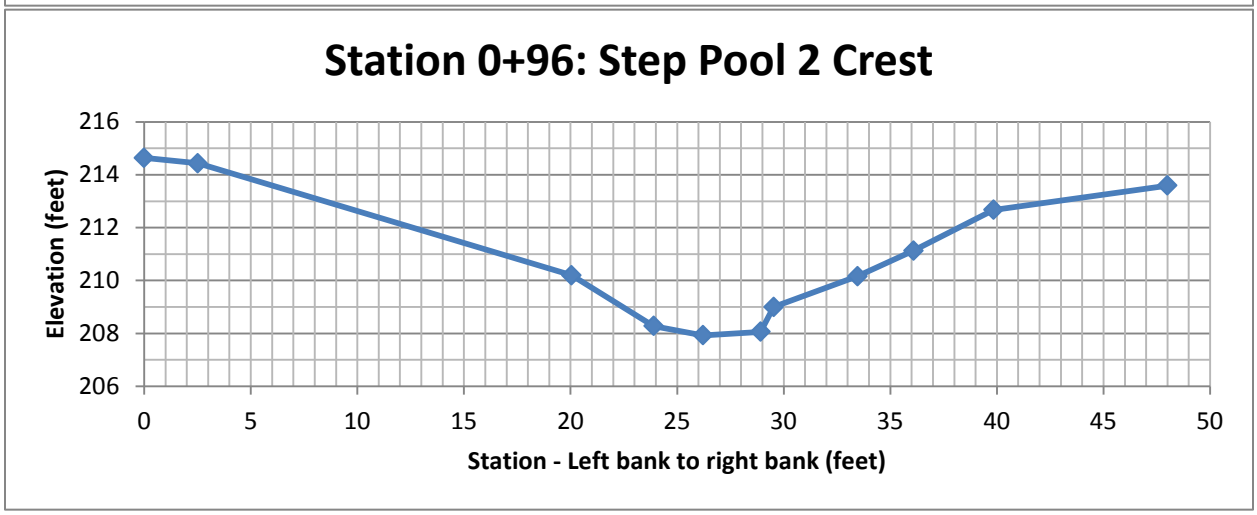
Attachment H:

Bank Slopes

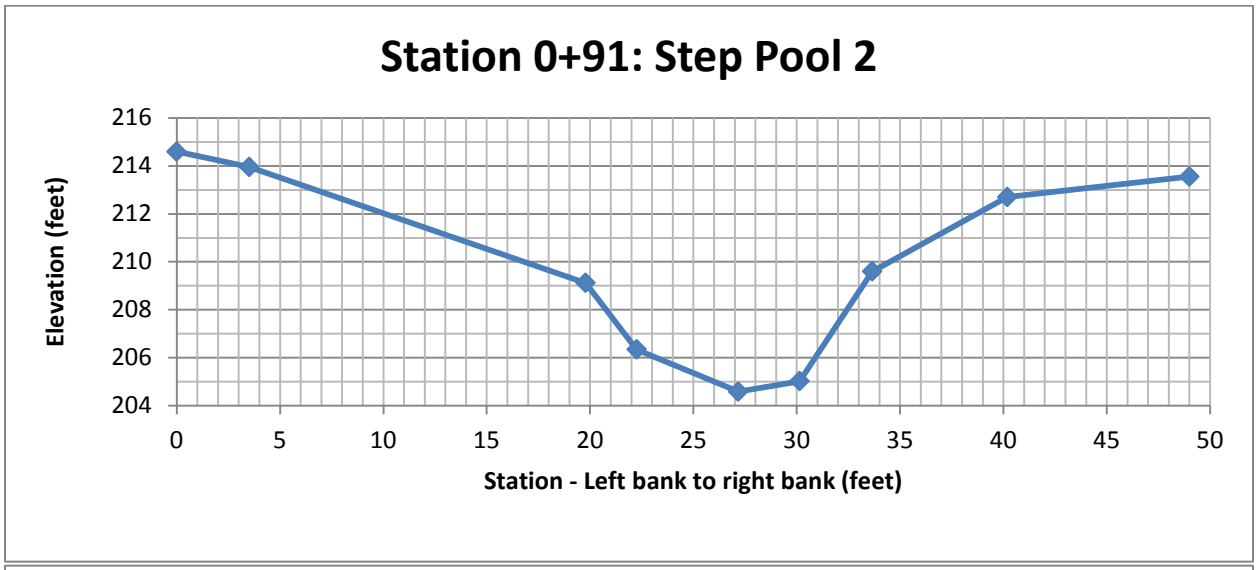
Attachment H: Bank Slopes

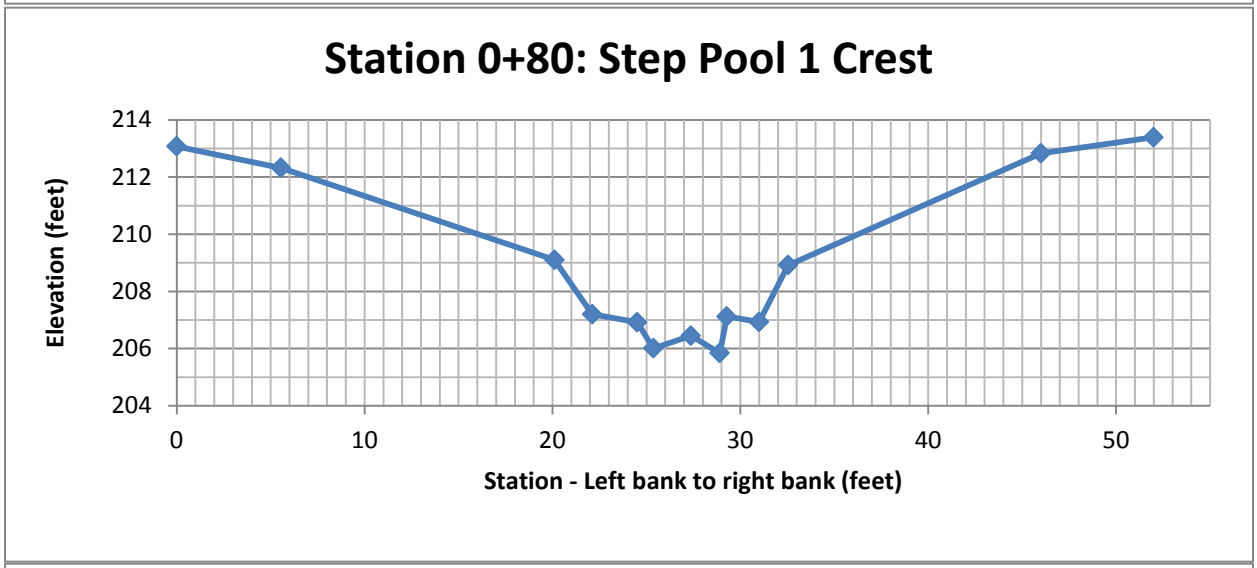


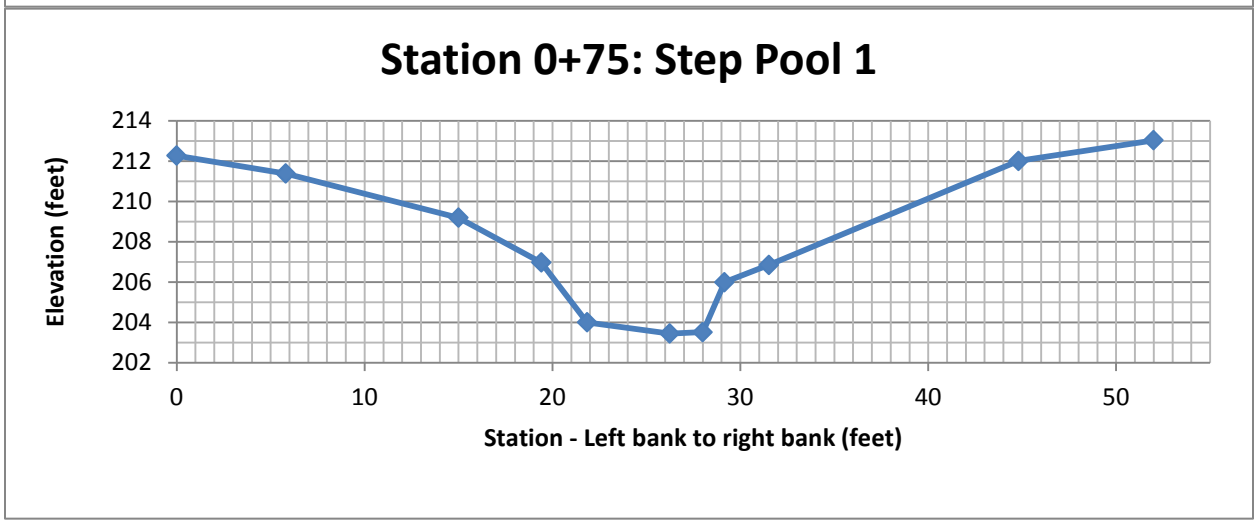




Attachment H: Bank Slopes







Attachment H: Bank Slopes