The City of Vallejo and
Vallejo Sanitation and Flood Control District

Fairfield-Suisun Urban Runoff Management Program

Clean Watersheds for a Clean Bay (CW4CB)
Task 5 Individual Retrofit Pilot Project Report

Broadway and Redwood Project
Solano County, Vallejo, California

November 2016
1. **Project Description**

This Pilot Project Report is being submitted by the City of Vallejo, the Vallejo Sanitation and Flood Control District (Vallejo Programs) and the Fairfield-Suisun Urban Runoff Management Program (FSURMP) on behalf of Solano County’s four Phase 1, San Francisco Bay Regional Water Resources Control Board (RWRCB) - Region 2 permittees (Solano Permittees).

This individual pilot project is part of the Clean Watersheds for a Clean Bay (CW4CB) Project funded through a United States Environmental Protection Agency (USEPA) grant which focuses on evaluating pilot stormwater best management practices (BMPs) for the control of polychlorinated biphenyls (PCBs) and mercury in stormwater runoff from urban areas in the San Francisco Bay Area. The CW4CB grant project consists of several tasks. This report describes CW4CB Task 5 documenting one retrofit pilot project located in Solano County. This pilot project is being implemented to evaluate their effectiveness to remove PCBs and other pollutants of concern (POCs) from stormwater runoff.

The selected project location was based on Old Industrial land uses and elevated levels of PCBs and mercury in sediments, previously collected from roadways and storm drains. In addition, the selection of the project location was also derived through work conducted by municipal staff and Geosyntec Consultants (Geosyntec). Geosyntec and municipal staff conducted reviews of current and historical property conditions through field reconnaissance and Google Earth on properties thought to be potential PCB source areas.

Due to the significant historical Old Industrial land use area located in the City of Vallejo,\(^1\) as compared to a smaller area of Old Industrial land use in the cities of Fairfield and Suisun City, it was decided that the CW4CB Task 5 retrofit pilot projects for Solano County would best be located in the City of Vallejo. In exchange, the cities of Fairfield and Suisun City committed to implementing dry weather stormwater diversion to the sanitary sewer for Solano Permittees as required under the Municipal Regional Stormwater NPDES Permit (MRP, Order R2-2009-0074).

Sam Kumar with the City of Vallejo, Doug Scott with Vallejo Flood and Sanitation District (VSFCD), and Kevin Cullen with the Fairfield-Suisun Sewer District, are the municipal leads for this project.

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1. Due in part to support the activities of the former Mare Island Naval Shipyard, which began operations in 1854 and was closed in 1996.
1.1 **Project Location**

The City of Vallejo Broadway and Redwood Streets Project (Project) is located east of Broadway Street between Redwood Street and Valle Vista Avenue in downtown Vallejo (see Figures 1 and 2 below and attached Figure 4). The Project is a retrofitted vegetated swale in the area between Broadway Street and the Union Pacific Railroad tracks. The land is owned by Union Pacific Railroad; however, VSFCD has an easement on the property that allowed for the construction of this Project within the easement.

The Project design was provided by WRECO and constructed by Team Ghilotti Construction. Sam Kumar with the City of Vallejo was the primary lead for the design and installation of this Project.

![Figure 1 – Solano County CW4CB Task 5 Project Locations in Vallejo, CA](image)
1.2 Treatment Control Measure

The treatment control measure is a vegetated swale between the railroad tracks and Broadway Street (see Figure 3 below). The width of the swale is 5 feet wide at the top cross-section and 1 foot wide at the bottom cross-section. The swale remains within the VSFCD easement. The length of the swale is 113 feet with eight - 1 foot wide by 3.25 inch high sidewalk underpasses (curb cuts) to divert roadway runoff into the swale. The upper 18 inches of the swale was amended with biofiltration media to support infiltration. The bottom of the swale and side slopes were planted with native bioswale sod (i.e., biofiltration sod, delta native heartland sod, and native preservation mix) for treatment and aesthetic purposes (see Appendix C, Sheets L1, C1, C2 and LS-1 of the attached construction drawings for details).

The catchment area of 3 acres includes (1) a portion of Broadway (between Redwood and Valle Vista) that drains to the east (from the crown in the road) and (2) an area between the railroad tracks and Broadway (see Figure 2). The portion draining from Broadway is completely impervious, whereas the area draining between the tracks and Broadway is mostly pervious. The land use can be characterized as transportation. The site is within a 3 kilometer halo of high PCB concentration.
Figure 2 – Pre-Construction - View Looking South on Broadway at Project Location
Figure 3 – Post-Construction - View Looking South on Broadway at Project Location
2. **Construction Process**

Initially, it was thought that the railroad track line along Broadway and Redwood was owned by the City of Vallejo and had been abandoned and consequently there would be no permits required for encroachment into the rail line area.

After the contract with Team Ghilotti was signed and approved, Team Ghilotti mobilized to the railroad site first, with the intention of a single mobilization and the convenient benefit of having two projects in the same city less than 2 miles apart. Team Ghilotti’s plan was to install the swale just before the winter rains, alleviating a necessary requirement to irrigate for plant establishment for the first six months after installation. It was then discovered, by a construction inspector for the City of Vallejo, that this railroad line was actually owned by UPRR and was allegedly still active. Team Ghilotti was then told to demobilize from this portion of the Project until permits were received from the UPRR.

Team Ghilotti was under contract to construct both projects in Vallejo, the Broadway and Redwood vegetated swale and the PG&E Substation Precast Stormfilter. However, because the Stormfilter had not yet been fabricated, Team Ghilotti was at a standstill and had reasonable claims for delay.

The City of Vallejo immediately preceded with its efforts to obtain permits from UPRR. It was soon discovered that the process for obtaining permits from UPRR was not an easy or quick procedure. Initially, the City was told the process could take anywhere between 6 and 9 months. The process wound up taking 18 months with much coercing and posturing by City staff.

To further complicate things, during the permitting process, it was discovered that UPRR was not the operator of the railroad line and that the railroad line was actually owned by UPRR but managed and operated by MGR Track Maintenance. The result of having a separate owner and operator was two permits for both Team Ghilotti and the City of Vallejo, for a total of four permits. Two insurance indemnities were also required by both applicants, the City of Vallejo and Team Ghilotti. Chronologically, the permits had to be received from the owner first (UPRR) and then the operator.

Construction of the vegetated swale was also delayed because of problems obtaining encroachment permits from UPRR. Further delays were incurred due to the negotiations of the of the final contract change orders. The delays resulted in an increase in contract costs for a construction cost of $90,040.

One of the requirements included in the encroachment permit from UPRR included the evaluation of subsurface soil borings to assist in the design of trench shoring. The trench plates which were used were set at a depth of less than 5 feet, resulting in very little net benefit from the soil borings and the engineering design of the trench plates.

Additionally, City of Vallejo and Team Ghilotti employees were required to receive training and certification to work within the railroad easement. Specially trained flagmen and UPRR
representatives were paid and required to be on-site throughout construction. During the time of construction, not a single train passed through the work zone.

Once construction started, there were no problems or surprises. Plans and specifications by WRECO were excellent and resulted in no changes or problems during construction (see Appendix A). All utilities were properly identified. Once Team Ghilotti broke ground, construction took four weeks. As a result of the delays, irrigation of planted vegetation was provided by Team Ghilotti for three months until winter rains arrived.

3. **Cost Summary**

Project costs are summarized in Table 1 below and in Appendix B.

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**Notes:**
* Assumes original bid percentage of cost between the two Vallejo projects equals the final cost percentages between the two projects.

4. **Monitoring Data**

A detailed monitoring plan for each CW4CB Task 5 retrofit pilot projects was developed by Brian Currier of the Cal State University Sacramento Office of Water Programs and Geosyntec Consultants, with guidance and review from the CW4CB Project Management Team (PMT) and Technical Advisory Committee (TAC) (BASMAA, 2013a, b). All monitoring was conducted in accordance with the methods and procedures set forth in the CW4CB Quality Assurance Project Plan (QAPP) and the CW4CB Task 5 Sampling and Analysis Plans (SAPs) (BASMAA 2012, 2013c). Water quality and flow monitoring reports and laboratory quality assurance (QA) summary reports prepared by the CW4CB monitoring contractor are available as appendices to the CW4CB Final Project Report (BASMAA, in preparation).

CW4CB Task 5 water quality and flow monitoring was not conducted at the Vallejo Broadway and Redwood Project. Due to the presence of multiple inflow points to the swale, the Project design team determined that water quality and traditional flow monitoring would provide inconclusive information and that better information could be obtained through visual observations (AMS, 2016). Visual observations only were conducted during the 2015-2016 wet season. Four events were monitored and observations are summarized below.
• **Event 1** – The Event 1 during-storm observation took place on January 17, 2016. Observations indicated that curb cuts were conveying flow to the swale and no bypass was occurring. Trash was blocking the swale outlet and no outlet discharge was observed. The post-storm observation was conducted on January 18, 2016. There was no evidence of erosion or scour.

• **Event 2** – The Event 2 during-storm observation took place on January 21, 2016. Runoff was entering the swale from the railroad ballast, however rainfall was insufficient to cause flow to the curb cuts. There was standing water upstream of the swale. Trash was observed in the swale and the outlet, although flow was still able to discharge. The post-storm observation was conducted later the same day. Standing water was noted in the swale upstream of the outlet and trash was clogging the outlet grate. Erosion was observed in the swale within 5 feet of the outlet.

• **Event 3** – The Event 3 post-storm observation took place on March 8, 2016. No during-storm observation was conducted. Flow was observed coming into the swale curb cuts from the upstream curb and gutter and some trash was observed in the outlet. Grasses planted in the swale had reached about two feet in height and no erosion was observed.

• **Event 4** – The Event 4 during-storm observation took place on March 10, 2016. No post-storm observation was conducted. Runoff was entering the swale as lateral sheet flow from the road via the curb cuts. No bypass of curb cuts was observed. Trash was observed in the swale and was impacting flow, but not to the degree that it was preventing inflow or outflow.

Precipitation, water depth, width, and velocity measurements within the swale that were collected for each of the four events are summarized in Table 2.

**Table 2. Visual Flow Monitoring Observations at Vallejo Swale**

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<th>Inspection Type</th>
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**Notes:**
1. Precipitation records obtained from WeatherUnderground Station KCAAMERI4.
2. No Pre-Storm inspection conducted for Event 3.
3. No Post-Storm inspection conducted for Event 4.
4. Estimated using a floating object (e.g., an orange peel) and a stopwatch.

Source: AMS, 2016
5. **Conclusions**

Construction of the vegetated swale at Broadway and Redwood was delayed because of problems obtaining encroachment permits UPRR and MGR Track Maintenance. The permits were finally issued after 1.5 years of effort by both the City and the contractor. In hindsight, the City would choose another location that would have not required permits from the railroad company. The overly bureaucratic requirements of the railroad company resulted in a significant cost and time to the Project without much real benefit. Additionally, a design with multiple curb cut inlets made it challenging to monitor performance quantitatively.

The design by WRECO was excellent and the work by Team Ghilotti was very good. The relationship between the contractor and the City could be seen as strained during the change order negotiation process. This is a normal level of tension which occurs between an owner and contractor during delay periods.

Due to delays in construction, the swale was only monitored for flow in WY2016; no water quality data was collected. Although the swale appears to have been designed to effectively capture stormwater from the drainage area, no conclusions can be drawn at this time regarding the effectiveness of the BMP at reducing POCs in stormwater. Future monitoring efforts may provide additional information about the effectiveness of this BMP.
6. References


City of Vallejo, 2013. Urban Runoff Treatment Retrofit Project (PW9814) (BASMAA), Table 1 – Proposed Final Estimate, Prepared by the Department of Public Works – Engineering Division. 14 November.


FIGURES
APPENDIX A:
Broadway and Redwood Project – Conceptual Stormwater Treatment Design Memo
Memorandum

Date: March 20, 2012
To: Sam Kumar – City of Vallejo
    Kevin Cullen – Fairfield-Suisun Sewer District
    Lance Barnett – Vallejo Sanitation & Flood Control District
CC: Geoff Brosseau – Bay Area Stormwater Management Agencies Association
From: Claire Coughlan and Analette Ochoa – WRECO
Project: PG&E Substation Project and Broadway and Redwood Project
Subject: Conceptual Stormwater Treatment Design

Introduction

The PG&E Substation Project and the Broadway and Redwood Project in the City of Vallejo have been selected by the Bay Area Stormwater Management Agencies Association to be included in the Clean Watersheds for a Clean Bay (CW4CB) Implementation Plan. The objective of the CW4CB Implementation Plan is to select and implement representative urban stormwater treatment retrofit projects that can be used to evaluate potential polychlorinated biphenyls (PCBs) load reductions in urban stormwater runoff to the Bay. The purpose of this memorandum is to present a conceptual design for the treatment Best Management Practices (BMPs) at the PG&E Substation Project site and at the Broadway and Redwood Project site. The PG&E Substation site is located at 500 Sutter Street in the City of Vallejo (see Figure 1). The Broadway and Redwood site is located adjacent to the railroad tracks along the east side of Broadway Street, extending from Redwood Street towards Valle Vista Avenue in the City of Vallejo (see Figure 2).

Figure 1. PG&E Substation Project Location
Existing Site Conditions

PG&E Substation Project

The PG&E substation is located on the corner of Sutter Street and Pennsylvania Avenue (see Photo 1). The substation is bounded by an alley named Ford Al to the north, a truck container lot to the east, Pennsylvania Avenue to the south, and Sutter Street to the west. Sutter Street is a crowned, two-lane road that runs north-south with a sidewalk on both sides. Approximately 12 ft of dense vegetation separates the PG&E substation and the Sutter Street sidewalk. The substation groundcover is predominantly compact gravel.

Utilities in the Project vicinity were identified by Luk and Associates on March 15, 2012. A gas line runs parallel to Sutter Street between the roadway centerline and the edge of pavement, approximately 3.5 ft from the northbound sidewalk. The size and depth of the gas line is currently unknown, and will be reported once available.
Photo 1. PG&E Substation Site, looking north up Sutter Street

Broadway and Redwood Project

The Broadway and Redwood Project site is bounded by Redwood Street to the north, Southern Pacific Railroad to the east, and Broadway Street to the west. Broadway Street is a crowned, four-lane road that runs north-south with a sidewalk along both sides. The sidewalk along the northbound lanes has an inconsistent curb height and slumps into the ditch adjacent to the railroad tracks in some locations (see Photo 2). The ditch lining is composed of native material and railroad ballast.

Gas and electrical utilities were identified in the Project vicinity by Luk and Associates on March 15, 2012. A gas line runs under the sidewalk parallel to the northbound lanes of Broadway Street, approximately 20 inches east of the curb. There are three electrical pull boxes along the Broadway northbound sidewalk. An electrical line runs under the sidewalk in the immediate vicinity of these pull boxes and veers under the roadway between pull boxes. The size and depth of these utilities are currently unknown, and will be reported once available.
Photo 2. Broadway Street, looking south

Existing Drainage  
PG&E Substation Project

The drainage pattern and watershed for the site were estimated based on field observations and existing as-built information. Figure 3 shows the general flow pattern and watershed for the site.
The PG&E substation drains into two drainage inlets along Sutter Street; the inlets are labeled as Inlet #1 and Inlet #2 in Figure 3 and Photo 4. Within the substation property, a concrete berm surrounds the substation structure and directs stormwater runoff from the structure area into a concrete lined ditch at the southwest corner of the property (see Photo 3). The ditch connects to a 15” culvert that flows directly into drainage inlet #1 on the northeast corner of Sutter Street and Pennsylvania Street. Stormwater runoff from the rest of the substation property sheet flows via driveway towards Sutter Street and into drainage inlet #2 adjacent to the substation driveway. A curb along the northern and eastern edges of the substation lot prevents substation runoff from draining towards Ford Al alley. The two drainage inlets connect to a 36” culvert that flows south under Sutter Street. Information on the existing drainage systems was provided by the Vallejo Sanitation and Flood Control District; a map of the existing drainage systems along Sutter Street is included in Appendix A.
Broadway and Redwood Project

The existing ditch along the northbound lanes of Broadway Street currently drains runoff from the railroad right-of-way and sheetflow from Valle Vista Avenue; Figure 4 shows the existing drainage pattern and watershed for the site.
Stormwater runoff from Valle Vista Avenue flows west along the curb and outfalls into the ditch adjacent to Broadway Street. Runoff from the railroad area south of Valle Vista Avenue drains north into an 18” culvert crossing Valle Vista and outfalls into the ditch adjacent Broadway Street. The ditch adjacent to Broadway Street flows north and outfalls into a drainage inlet on the southeast corner of the Broadway and Redwood Street intersection. This drainage inlet connects to a 39” culvert flowing west under Redwood Street. A curb and sidewalk runs along the northbound lanes of Broadway Street in the Project vicinity, and prevents the ditch from receiving any runoff from the roadway (see Photo 5). Stormwater runoff from the northbound lanes of Broadway Street collects along the curb and drains into an inlet on the southeast corner of the Broadway and Redwood Street intersection. Information on the existing drainage systems was provided by the Vallejo Sanitation
and Flood Control District; a map of the existing drainage system at the intersection of Redwood and Broadway is included in Appendix A.

Photo 5. Existing Curb and Sidewalk along Broadway Street, looking north

**Soil Characteristics**

WRECO used the Natural Resources Conservation Service (NRCS) Web Soil Survey (WSS) to determine the Hydrologic Soil Group (HSG) rating at each site. The PG&E site is classified as “made land” by the NRCS WSS, and a HSG is not available. Per the NRCS WSS, the Broadway and Redwood Project site is underlain by Clear Lake clay, and is HSG group D. Soils rated HSG D are characterized as having a very slow infiltration rate when thoroughly wet. The soil NRCS WSS soil data for the two project sites is included in the attachments for reference.

The PG&E site and the Broadway and Redwood site have been identified as locations with high PCB concentrations. The soil at these sites may be considered hazardous, and may warrant special handling. A detailed geotechnical exploration is underway; additional subsurface information will be provided in subsequent submittals.
Groundwater Depth

Given the close proximity of both sites to the San Francisco Bay, relatively shallow groundwater depths are anticipated. Per the NRC WSS, the groundwater table at the PG&E Substation site is more than 6.5 ft below ground surface. The groundwater table at the Broadway and Redwood site is between 3.3 and 5 ft deep, per the NRCS WSS.

Design Concepts

The goal of the project would be to maximize stormwater treatment at the two project sites. WRECO developed the conceptual design for the PG&E substation site with input from the City of Vallejo. The preliminary concept for the Broadway and Redwood site was developed by Geosyntec Consultants.

PG&E Substation Project

A new drainage inlet would be installed adjacent to the substation driveway to collect sheetflow from the PG&E substation site. The proposed improvements and treated watershed are shown in Figure 5. The treated watershed was estimated to be approximately 0.13 acres.
Figure 5. PG&E Proposed Improvements
The proposed drainage inlet would be a Contech Catchbasin Stormfilter. Contech Stormfilters provide stormwater treatment through a replaceable media filter cartridge. The cartridge media filter is available with a variety of media, including PhosphoSorb, Perlite, Zeolite, CFS Leaf Media, Granular Activated Carbon (GAC), and a Zeolite, Perlite, GAC (ZPG) blend. Stormwater flows into the drainage inlet influent chamber and then into a second chamber with the media filter cartridge. The medium filter cartridge traps pollutants but allows water to flow through the media filter and into the effluent chamber.

Preliminary surveys show a gas line very close to the proposed inlet location. The curb inlet configuration is proposed to avoid utility conflicts. The site watershed would be approximately 0.15 acres. Based on the watershed size, a single cartridge catchbasin would be sufficient to provide treatment for the site. An 18” culvert would connect the StormFilter to the existing inlet along the northbound lanes of Sutter Street. A preliminary detail of a single cartridge concrete Catchbasin Stormfilter is shown in Figure 6, the water flow pattern is highlighted with blue arrows. The detail below is a standard detail provided by Contech, and is not configured to fit the PG&E site. The inlet side opening and outlet culvert will be reconfigured to fit the site conditions; site specific details will be provided as the design progresses.

![Figure 6. Single-Cartridge Catchbasin StormFilter](https://wreco.com)
Water quality sampling should be completed during storm events to determine the efficiency of the StormFilter at removing PCBs. The StormFilters are configured so that the influent and effluent chambers are adjacent to allow high flows to bypass the media filter cartridge. This configuration is also convenient for sampling. The grate/hatch covering the influent and effluent chambers can be lifted to sample stormwater from each chamber. It may be difficult to sample the influent flow during small, short storm events. To address this concern, a collector pan may be placed under the inlet side opening to capture and retain flow for sampling. A side view of a typical Catchbasin StormFilter and the collector pan location are shown in Figure 7.

![Collector Pan](image)

**Figure 7. Catchbasin Stormfilter Sampling Locations**

The Contech Catchbasin StormFilter would require maintenance and cartridge replacement every other year. Biannual StormFilters maintenance typically includes the removal of the existing cartridge, removal of accumulated sediment, a rinse of the whole unit, and installation of the new cartridge. Maintenance is typically completed by a local contractor and costs about $500 per maintenance event.

During a site visit on March 17, 2012, WRECO observed stormwater runoff ponding at the PG&E substation driveway, as shown in Photo 6. A six inch grated line drain is proposed along the curb from approximately five feet north of the driveway to the Catchbasin Stormfilter to prevent ponding and maximize treatment.
Broadway and Redwood Project

A portion of the existing ditch along Broadway Street would be revised to a biofiltration swale to collect sheetflow and concentrated flow from the Broadway and Redwood Project site. The proposed improvements and treated watershed are shown in Figure 8 and Figure 10, respectively. The typical cross section of the proposed biofiltration swale is shown in Figure 9.
Figure 8. Broadway and Redwood Site Improvements

Reconstructed Sidewalk with openings

Biofiltration Swale

Water Quality Sampling Pad

Figure 9. Biofiltration Swale Typical Cross Section

Biofiltration Treatment Swale

Sidewalk
The biofiltration swale would be designed according to the Fairfield-Suisun Urban Runoff Management Program. The swale would be 100 feet long with a top width of five feet and a bottom width of one foot. The dimensions of the swale would be confirmed once survey information becomes available. The swale would be between the Southern Pacific railroad tracks and the northbound Broadway Street sidewalk. The swale would treat stormwater runoff from the sidewalk and the northbound lanes of Broadway Street and runoff from Valle Vista Avenue between Broadway Street and North Cam Alto. The Broadway Street sidewalk would be replaced along the entire length of the swale. Intermittent cuts would be placed along the new sidewalk to allow stormwater runoff from the roadway to enter the biofiltration swale. The size and location of these cuts would be determined as the design progresses.

The upper 18 inches of the biofiltration swale would be amended with biofiltration top soil to promote infiltration. The swale bottom and side slopes would be planted with native bioswale sod and hydoseed for treatment and aesthetic purposes. Native bioswale sod is available in several
varieties, including biofiltration sod, delta native heartland sod, and native preservation mix. The plants would require irrigation during the six to eight week plant establishment period; the landscape architect sub consultant, PGAdesign, recommends that the contractor irrigate the plants during the plant establishment period by water truck.

Water quality sampling should be completed during storm events to determine the efficiency of the biofiltration swale at removing PCBs. A depressed concrete pad would be placed immediately upstream and downstream of the swale for sampling. Additional details on the depressed concrete pad would be provided as the design progresses.

The Broadway and Redwood Project would require traffic control during construction, including a lane closure along Broadway Street and a sidewalk detour. WRECO will coordinate with the City of Vallejo to determine an appropriate lane closure and detour schedule. Due to the close proximity of the biofiltration swale to the railroad tracks, the Project construction may also impact the railroad schedule. WRECO will coordinate with the City of Vallejo to determine a construction schedule to minimize impacts to the railroad operation.

**Cost Estimate**

WRECO developed a preliminary cost estimate for the proposed improvements for each project site. The preliminary costs were based on preliminary research and current construction costs in the San Francisco Bay Area. The PG&E Substation Project site was estimated to cost approximately $25,000. The Broadway and Redwood Project site was estimated to cost $52,000. A detailed cost estimate for each site is included in Appendix B.

**References**


Appendix A – Existing Drainage
PG&E Substation Project Site

Source: Vallejo Sanitation and Flood Control District
Broadway and Redwood Project Site

Source: Vallejo Sanitation and Flood Control District
Appendix B – Preliminary Cost Estimates
## PG&E Substation
### 500 Sutter Street, Vallejo

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**SUBTOTAL**  
$23,300

**5% CONTINGENCY**  
$1,165

**TOTAL**  
$24,465

**Notes:**  
- Estimate is preliminary based on information available. Costs to be updated once more detailed surveys are available.
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<th>Item Description</th>
<th>Unit of Measure</th>
<th>Total Estimated Quantity</th>
<th>Unit Price</th>
<th>Item Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mobilization</td>
<td>LS</td>
<td>1</td>
<td>$5,000.00</td>
<td>$5,000</td>
</tr>
<tr>
<td>2</td>
<td>Traffic Control</td>
<td>LS</td>
<td>1</td>
<td>$8,000.00</td>
<td>$8,000</td>
</tr>
<tr>
<td>3</td>
<td>Temporary Construction Site BMPs</td>
<td>LS</td>
<td>1</td>
<td>$5,000.00</td>
<td>$5,000</td>
</tr>
<tr>
<td>4</td>
<td>Utility Relocation</td>
<td>LS</td>
<td>1</td>
<td>$8,000.00</td>
<td>$8,000</td>
</tr>
<tr>
<td>5</td>
<td>Remove Asphalt Concrete</td>
<td>SQ YD</td>
<td>40</td>
<td>$5.00</td>
<td>$200</td>
</tr>
<tr>
<td>6</td>
<td>Asphalt Concrete</td>
<td>TON</td>
<td>22</td>
<td>$150.00</td>
<td>$3,260</td>
</tr>
<tr>
<td>7</td>
<td>Place Asphalt Concrete</td>
<td>SQ YD</td>
<td>80</td>
<td>$20.00</td>
<td>$1,600</td>
</tr>
<tr>
<td>8</td>
<td>Clearing and Grubbing</td>
<td>LS</td>
<td>1</td>
<td>$2,000.00</td>
<td>$2,000</td>
</tr>
<tr>
<td>9</td>
<td>Roadway excavation type CAL HAZ</td>
<td>CY</td>
<td>46</td>
<td>$150.00</td>
<td>$6,940</td>
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<tr>
<td>10</td>
<td>Biofiltration Top Soil</td>
<td>CY</td>
<td>39</td>
<td>$100.00</td>
<td>$3,890</td>
</tr>
<tr>
<td>11</td>
<td>Native Bioswale Sod</td>
<td>SF</td>
<td>70</td>
<td>$2.00</td>
<td>$140</td>
</tr>
<tr>
<td>12</td>
<td>Hydroseed</td>
<td>SF</td>
<td>70</td>
<td>$1.00</td>
<td>$70</td>
</tr>
<tr>
<td>13</td>
<td>Plant Establishment</td>
<td>LS</td>
<td>1</td>
<td>$5,000.00</td>
<td>$5,000</td>
</tr>
<tr>
<td>14</td>
<td>Concrete (Miscellaneous Construction)</td>
<td>CY</td>
<td>0.3</td>
<td>$475.00</td>
<td>$160</td>
</tr>
<tr>
<td>15</td>
<td>Miscellaneous Iron and Steel</td>
<td>LB</td>
<td>20</td>
<td>$2.50</td>
<td>$50</td>
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**SUBTOTAL**  $49,400

<table>
<thead>
<tr>
<th></th>
<th><strong>5% CONTINGENCY</strong></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>$51,870</strong></td>
</tr>
</tbody>
</table>

Notes:
- Estimate is preliminary based on information available. Costs to be updated once more detailed surveys are available.
- Estimated costs for Utility Relocation are preliminary, coordination to determine costs is on-going.
APPENDIX B:
Broadway and Redwood Project –
Construction Costs
# TABLE 1 - PROPOSED FINAL ESTIMATE

<table>
<thead>
<tr>
<th>CCD NO.</th>
<th>ITEM NO.</th>
<th>DESCRIPTION</th>
<th>UNITS</th>
<th>QTY.</th>
<th>UNIT PRICE</th>
<th>EXTENSION QTY.</th>
<th>EXTENSION</th>
<th>% COMPLETE</th>
</tr>
</thead>
</table>
| 1       | 1        | Mobilization | LS    | 1    | $3,500.00  | 1.00 | $3,500.00 | 100.00%
| 2       | 1        | Traffic Control | LS    | 1    | $7,500.00  | 1.00 | $7,500.00 | 100.00%
| 3       | 1        | SWPPP        | LS    | 1    | $6,500.00  | 1.00 | $6,500.00 | 100.00%
| 4       | 2        | Remove Asphalt Concrete | SF | 670 | $4.00  | 670.00 | $2,680.00 | 100.00%
| 5       | 7        | Remove Concrete | CY | 7    | $175.00  | 7.00 | $1,225.00 | 100.00%
| 6       | 1        | Clearing Grubbing | LS | 1    | $1,250.00  | 1.00 | $1,250.00 | 100.00%
| 7       | 1        | Adjust Utility Box to Grade | EA | 1    | $500.00  | 1.00 | $500.00 | 100.00%
| 8       | 50       | ditch Excavation | SF | 50  | $55.00  | 50.00 | $2,750.00 | 100.00%
| 9       | 0.30     | Streambed Cobble | CY | 0.30 | $4,000.00  | 0.30 | $1,200.00 | 100.00%
| 10      | 11       | Asphalt Concrete | TON | 11  | $125.00  | 11.00  | $1,375.00 | 100.00%
| 11      | 37       | Place Asphalt Concrete | SY | 37  | $62.00  | 33.44 | $2,073.28 | 90.38%
| 12      | 10       | Class 2 Aggregate Base | CY | 10 | $72.00  | 10.00 | $720.00 | 100.00%
| 13      | 40       | 3.25”x12” Galvanized Metal Duct | LF | 40 | $50.00  | 40.00 | $2,000.00 | 100.00%
| 14      | 5        | 12” Reinforced Concrete Pipe | LF | 5 | $250.00  | 4.00 | $1,000.00 | 80.00%
| 15      | 2        | 4” PVC Pipe | LF | 2 | $85.00  | 2.00 | $170.00 | 100.00%
| 16      | 1       | VISFCD Type C Field Inlet | EA | 1 | $2,750.00  | 1.00 | $2,750.00 | 100.00%
| 17      | 42       | Trench Drain (NDI Dura Slope Trench Drain System) | LF | 42 | $100.00  | 40.00 | $4,000.00 | 95.24%
| 18      | 1       | Precast StormFilter (Contech Linear-2 Precast Stormfilter) | EA | 1 | $24,000.00  | 1.00 | $24,000.00 | 100.00%
| 19      | 35       | Imported Biofiltration Soil | CY | 35 | $100.00  | 35.00 | $3,500.00 | 100.00%
| 20      | 620      | Soil | CY | 620 | $3.00  | 620.00 | $1,860.00 | 100.00%
| 21      | 0.40     | Mulch | CY | 0.40 | $250.00  | 0.40 | $100.00 | 100.00%
| 22      | 10       | Plants | EA | 10 | $50.00  | 10.00 | $500.00 | 100.00%
| 23      | 1        | Plants Establishment | LS | 1 | $6,000.00  | 6,000.00 | - | 0.00%
| 24      | 23       | Concrete (Misc Const.) | CY | 23 | $435.00  | 20.00 | $8,700.00 | 87%
| 25      | 6        | Rapid Strength Concrete | CY | 6 | $1,625.00  | 6.00 | $9,750.00 | 100.00%

**TOTAL:**

- CCD #1 - Additional work due to Railroad shoring requirements for ballast: $64,747.25
- CCD #2 - Contractor’s insurance fee for Union Pacific permit: $4,600.00
- CCD #3 - Additional permit from railroad operators: $9,775.00
- CCD #4 - Railroad operators inspection fee: $690.00
- Delay claim due to conflict of utilities in the field: $4,238.00
- Deduction/credit for rapid strength concrete: $(1,146.68)

**PROPOSAL FINAL CONTRACT AMOUNT:**

- **Final Quantity Complete:**
  - Total: $203,817.57
  - Complete: $195,738.10

**CONTRACT CHANGE ORDERS**

- Total: $106,238.57

**PROPOSAL FINAL CONTRACT AMOUNT:**

- $203,817.57
- $195,738.10
## APPROVED CONTRACT CHANGE ORDERS

<table>
<thead>
<tr>
<th>C.C.O. No.</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Unit Cost</th>
<th>Scheduled Value</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Additional amount required for PG&amp;E substation location work due to separating the work from the entire project work.</td>
<td>LS</td>
<td>1.00</td>
<td>64,747.25</td>
<td>64,747.25</td>
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<tr>
<td>1</td>
<td>Additional work assigned due to railroad permit requirement for shoring along the railroad for ballast.</td>
<td>LS</td>
<td>1.00</td>
<td>23,335.00</td>
<td>23,335.00</td>
</tr>
<tr>
<td>2</td>
<td>Contractor's insurance fee for Union Pacific railroad permit</td>
<td>LS</td>
<td>1.00</td>
<td>4,600.00</td>
<td>4,600.00</td>
</tr>
<tr>
<td>3</td>
<td>Additional amount required to obtain Railroad permit from the railroad operators to work in railroad ROW.</td>
<td>LS</td>
<td>1.00</td>
<td>9,775.00</td>
<td>9,775.00</td>
</tr>
<tr>
<td>4</td>
<td>Additional amount required for Railroad operators to inspect ROW during construction and prior to construction.</td>
<td>LS</td>
<td>1.00</td>
<td>690.00</td>
<td>690.00</td>
</tr>
<tr>
<td>5</td>
<td>Delay claim due to conflict of utilities in the field to change the work direction and delay caused.</td>
<td>LS</td>
<td>1.00</td>
<td>4,238.00</td>
<td>4,238.00</td>
</tr>
<tr>
<td>6</td>
<td>Deduction/credit for rapid strength concrete</td>
<td>LS</td>
<td>1.00</td>
<td>(1,146.68)</td>
<td>(1,146.68)</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total: 106,238.57
APPENDIX C:
Broadway and Redwood Project – As-Builts
GENERAL NOTES

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CITY OF VALLEJO STANDARDS SPECIFICATIONS AND STANDARD DRAWINGS.

2. HORIZONTAL LAYOUTS OR CODE REQUIREMENTS SHOWN ON THE DRAWINGS APPEARING AS APPROPRIATE ACTUAL CONSTRUCTION CONDITIONS AND DETAILSH MAY DIFFER FROM THOSE SHOWN ON THE DRAWINGS. REFER TO THE SPECIFICATIONS FOR EXACT FAUCETS." OF CONSTRUCTION.

3. IT IS CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE CITY OF VALLEJO OF ANY CHANGES OR ADDITIONS TO THE ORIGINAL PLANS AND SPECIFICATIONS.

4. THE CONTRACTOR SHALL NOTIFY THE CITY OF VALLEJO OF ANY CHANGES OR ADDITIONS TO THE ORIGINAL PLANS AND SPECIFICATIONS.

5. LOCATIONS OF EXISTING BUILDINGS AND UTILITIES OR OTHER FACILITIES SHOWN HEREIN ARE APPROXIMATE.

6. EXISTING SURVEY MARKS AND UTENSILS THAT ARE DAMAGED OR INCOMPLETE WILL NOT BE REPAIRED OR REINSTALLED.

7. CONTRACTOR SHALL NOTIFY THE CITY OF VALLEJO OF ANY CHANGES OR ADDITIONS TO THE ORIGINAL PLANS AND SPECIFICATIONS.

8. ALL MATERIALS AND WORKSHIPS SHALL BE IN CONFORMANCE WITH THE STANDARD PLANS SPECIFICATIONS AND REQUIREMENTS SET FORTH IN THE CITY OF VALLEJO'S ENGINEERING STANDARDS.

9. CONTRACTOR RESPONSIBLE FOR VERIFYING ALL EXISTING UTILITIES.

10. ALL EXISTING UTILITIES AND TWO WAY TRAFFIC SHALL BE MAINTAINED IN OPERATION AT ALL TIMES, UNLESS DIRECTLY ORDERED BY THE ENGINEER.

11. TRAFFIC CONTROL DURING CONSTRUCTION SHALL BE THE CONTRACTOR'S RESPONSIBILITY. TRAFFIC CONTROL MUST BE IN ACCORDANCE WITH THE CITY OF VALLEJO STANDARDS SPECIFICATIONS AND STANDARD DRAWINGS.

12. CONSTRUCTION AREA TRAFFIC CONTROL DEVICES, TRAFFIC CONTROL PLANS, AND TRAFFIC CONTROL DEVICES SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), 2009 EDITION.

13. CONTRACTOR SHALL COMPLY WITH THE FOLLOWING TRAFFIC CONTROL PLAN:

14. CONTRACTOR SHALL PROVIDE ACCESSIBLE TO ALL PUBLIC AND PRIVATE PROPERTY ACCESS TO THE TRAFFIC CONTROL PLAN:

15. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING/REPLACING DAMAGED CURBS, SECTIONS FROM CONSTRUCTION ACTIVITIES.

16. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING/REPLACING DAMAGED CURBS, SECTIONS FROM CONSTRUCTION ACTIVITIES.

17. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING/REPLACING DAMAGED CURBS, SECTIONS FROM CONSTRUCTION ACTIVITIES.

18. WITHIN THE EXCEPTS OF AS BUILT OR CONSTRUCTED INSTALLATION, CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL AND DISPOSAL OF (DISCONNECTED) SECTIONS OR MATERIALS AND RESTORATION OF SUBGRADE AND ROADWAY TO PROPER MECHANICS AND CONSTRUCTION AS DIRECTED BY THE ENGINEER.

19. UNPAVED AREAS ADJOINING CURB AND SIDEWALKS AFFECTED BY THE WORK SHALL BE GRADED, GRADED AND SMOOTHED AND CLEARED OF ALL TRASH AND CONSTRUCTION MATERIALS.

20. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING EXISTING UTILITIES, TRAFFIC CONTROL DEVICES, TRAFFIC CONTROL PLANS, AND TRAFFIC CONTROL DEVICES SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), 2009 EDITION.

21. CONTRACTOR RESPONSIBLE FOR VERIFYING ALL EXISTING UTILITIES.

22. THE CONTRACTOR SHALL HOLD HARMLESS, INDEMNIFY, AND DEFEND THE CITY AND ITS OFFICERS, EMPLOYEES, AND AGENTS FROM AND AGAINST ALL LOSSES, CLAIMS, DEMANDS, PAYMENTS, SUITS, ACTIONS, AND OTHER CAUSE OF ACTION OR ANY DAMAGE TO PERSONS OR PROPERTY CAUSED BY THE ACTIONS OR CARELESSNESS OF THE CONTRACTOR, ITS AGENTS OR EMPLOYEES, IN THE PERFORMANCE OF THE WORK.

BASIS OF BEARING

THE BEARINGS SHOWN ARE BASED ON THE CALIFORNIA COORDINATE SYSTEM (CCS 83), ZONE II.

BENCHMARK

SHEETS OF G-1 GENERAL NOTES, LEGEND AND ABBREVIATIONS
NOTES:
1. TRENCH DRAIN CHANNELS TO BE INSTALLED WITH SLANT GRADE. GRADE TO BE PROTECTED FROM CONCRETE POUR CONSIDERATION WITH SLOPE. TRENCH DRAIN SYSTEM CONSISTS OF NEUTRAL SECTIONS AND PRE-SLOPED SECTIONS WITH 0.75 BUILT IN SLOPE. SEE PROFILE VIEW FOR DETAILS.
2. SET TRENCH DRAIN IN CHANNEL SURROUNDED BY 6" OF RAPID STRENGTH CONCRETE WITH A MINIMUM OF 3,500 PSI, AND ALLOW FULL LOAD TRAFFIC UNTIL CONCRETE HAS COMPLETELY HARDENED.
3. ADJUST 2" WIDE GUTTER WITHIN TRENCH DRAIN AREA.
4. CONCRETE FOR CURB AND GUTTER SHALL BE RAPID STRENGTH CONCRETE.

NOS DURA SLOPE TRENCH DRAIN SYSTEM, OR ENGINEER APPROVED EQUAL

SUTTER STREET
PLAN

TRENCH DRAIN WITH NEUTRAL SECTIONS
20'-0"

TRENCH DRAIN WITH PRE-SLOPED SECTIONS
20'-0"

SECTION A-A
NPS

SECTION B-B
NPS

SECTION C-C
NPS

TRENCH DRAIN (NOS DURA SLOPE TRENCH DRAIN SYSTEM)
### PLANT LIST

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>COMMON NAME</th>
<th>DESCRIPTION</th>
<th>SIZE</th>
<th>TOLERANCE</th>
<th>COLOR</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS-1</td>
<td>Baccharis pilularis 'Pozo Surf'</td>
<td>Conifer</td>
<td>6&quot;</td>
<td>8-10</td>
<td>NA</td>
<td>SOD as available from Delta Bluegrass Company, <a href="http://www.deltabluegrass.com">www.deltabluegrass.com</a>, commercial name: Textured Sod, or equivalent.</td>
</tr>
<tr>
<td>LS-1</td>
<td>Plectranthus subsessilis 'Brixton'</td>
<td>Grasses</td>
<td>4&quot;</td>
<td>3-6</td>
<td>NA</td>
<td>SOD as available from Delta Bluegrass Company, <a href="http://www.deltabluegrass.com">www.deltabluegrass.com</a>, commercial name: Textured Sod, or equivalent.</td>
</tr>
<tr>
<td>LS-1</td>
<td>California Fescue</td>
<td>Perennials</td>
<td>4&quot;</td>
<td>3-6</td>
<td>NA</td>
<td>SOD as available from Delta Bluegrass Company, <a href="http://www.deltabluegrass.com">www.deltabluegrass.com</a>, commercial name: Textured Sod, or equivalent.</td>
</tr>
</tbody>
</table>

#### NOTES:

1. **1. Lay sod continuous the planter strip.**
3. **3. Sidewalk opening, typ.**
4. **4. Field inlet**
5. **5. Edge of 3' square cutout in sod for shrub plantings, 4 inch opening with 3" layer of mulch.**

---

**BROADWAY**

**1. BIOFILTRATION SWALE PLANTING (TYP)**

---

**PLANTED AREAS:**

- Landscaping nursery or other, 3'-6' height x 3' spread.