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DOCKET	
09-AFC-4	
DATE	MAR 09 2010
RECD.	MAR 09 2010

March 9, 2010

Mr. Joseph Douglas
Project Manager
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

Subject: Oakley Generating Station Project (09-AFC-4)
Response to CEC Staff Data Requests # 44–67

Dear Mr. Douglas:

Attached are 13 hard copies and one electronic copy on CD-ROM of the Contra Costa Generating Station LLC's response to California Energy Commission Staff Data Requests #44-67, dated February 17, 2010. Please note that, due to the large size of the following three documents (more than 800 pages total for the three documents), the documents have been included on the CD-ROM and are not included in the hard copies filed with the Commission (although hard copies of these three documents are available upon request):

- East County Industrial Recycled Water Facilities Plan – Final. October 2009 (Attachment DR47-1)
- Waste Discharge Requirements for the Ironhouse Sanitary District Wastewater Treatment Plant Contra Costa County. April 2008 (Attachment DR55-1)
- Draft Construction Drainage, Erosion, and Sediment Control/Stormwater Pollution Prevention Plan. March 2010 (Attachment DR62-1)

If you have any questions, please contact me at (916) 286-0278.

Sincerely,
CH2M HILL

Douglas M. Davy, Ph.D.
AFC Project Manager

Attachment
cc: POS List
Project File

APPLICATION FOR CERTIFICATION

Response to Data Requests 1–43

Oakley Generating Station

09-AFC-4

February 2010

Submitted by

RADBACK ENERGY

Submitted to

California Energy Commission

With Technical Assistance by

CH2MHILL

IS012010223151SAC

Supplemental Filing

Response to CEC Staff Data Requests 44 through 67

In support of the

Application for Certification

for

Oakley Generating Station Project

Oakley, California

(09-AFC-04)

Submitted to the:

California Energy Commission

Submitted by:

RADBACK ENERGY

With Technical Assistance by:

CH2MHILL

Sacramento, California

March 2010

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DR47-1 ECIRWPF Report (electronic submittal)
DR52-1 ISD's June 2007 Report of Waste Discharge
DR55-1 ISD's Waste Discharge Requirements (electronic submittal)
DR62-1 Construction Drainage, Erosion, and Sediment Control/Stormwater Pollution Prevention Plan (electronic submittal)

Introduction

Attached are Contra Costa Generating Station, LLC's (CCGS's) responses to California Energy Commission (CEC) Staff data requests numbers 44 through 67 for the Oakley Generating Station (OGS) project (09-AFC-04). The CEC Staff served the data requests on February 17, 2010, as part of the discovery process for the OGS project.

The responses are grouped by individual discipline or topic area. Within each discipline area, the responses are presented in the same order as CEC Staff presented them and are keyed to the Data Request numbers (44 through 67). New or revised graphics or tables are numbered in reference to the Data Request number. For example, the first table used in response to Data Request 45 would be numbered Table DR45-1. The first figure used in response to Data Request 48 would be Figure DR48-1, and so on.

Additional tables, figures, or documents submitted in response to a data request (supporting data, stand-alone documents such as plans, folding graphics, etc.) are found at the end of a discipline-specific section and are not sequentially page-numbered consistently with the remainder of the document, though they may have their own internal page numbering system.

Cultural Resources (44–46)

Ground Disturbance Depth

44. *Please provide a table similar to Table 5.11-2 and revise the project description to reflect the locations and the anticipated maximum depth for all physical ground disturbances, such as grading, trenching, and excavations, associated with this project. Please be specific as to the anticipated depth of ground disturbances on the project site itself (facility per AFC, Vol. 1, Figure 2.1-1), the lay down areas, and along the transmission line.*

Response: The anticipated maximum depths for physical ground disturbances associated with the construction of the OGS are shown in Table DR44-1.

TABLE DR44-1
Depth of Ground Disturbance

Feature*	Ground Disturbance Depth
Project Site	Ground disturbances could generally be as much as 12 feet deep at any location on the site except for the following: • Areas occupied by pile-supported foundations, which could be disturbed to depths of as much as 50 feet (includes the steam turbine/generator, combustion turbines/generators, heat recovery steam generators, generator step-up transformers, air-cooled condenser, steam turbine exhaust duct, and utility/pipe racks) • 15 feet, maximum, at the oil/water separator, combustion turbine drains tanks, air-cooled condenser duct drain pit, and wastewater lift station • Areas occupied by the mature eucalyptus trees which will generally remain undisturbed, except where trees are removed for the access road to the area east of the air-cooled condenser
Project Laydown Area	No disturbance in paved areas, 7 feet maximum disturbance for other areas
Stockpile Areas	1 foot, maximum
Transmission Corridor, tower replacement	30-foot disturbance at each tower location (which will use drilled pier foundations), no ground disturbance at other areas within the corridor
Transmission Laydown Area	1 foot, maximum

* See AFC Figures 1.1-2 and 2.1-1 for feature locations.

S-334821 Report

45. *Please provide a complete copy of the S-334821 report, including all appendices.*

Response: The complete copy of the S-334821 report has been submitted to the CEC under separate cover under a request for confidentiality.

Oakley DuPont Plant

46. *Please provide a reasoned and supported argument as to whether the Oakley DuPont plant is a district potentially eligible for the CRHR. The argument should develop an appropriate historical context, determine which of the buildings and structures associated with the plant may be potential contributors or non-contributors, and delimit what the boundary of the potential district would be.*

Response: Attachment DR46-1 is a historical resources evaluation of the DuPont Antioch Works.

ATTACHMENT DR46-1

Historical Resources Evaluation: DuPont Antioch Works

Historical Resource Evaluation: DuPont Antioch Works

PREPARED FOR: Greg Lamberg, Radback Energy

PREPARED BY: Jessica Feldman, CH2M HILL

DATE: March 9, 2010

This historical resource evaluation of the DuPont Oakley manufacturing plant (aka DuPont Antioch Works) was prepared in response to California Energy Commission (CEC) Staff Data Request #46 as part of the power plant site certification proceeding before the California Energy Commission (CEC) for Contra Costa Generating Station, LLC's (CCGS's) Oakley Generating Station (OGS) project (CEC Docket #09-AFC-04), which is located in the City of Oakley, Contra Costa County, California. CEC Staff's data request asks for a historical resources evaluation of the DuPont Oakley plant, given its proximity to the OGS. The OGS is located within the boundaries of property owned by the DuPont Corporation on land that adjacent to, but not part of the manufacturing facility. The data request is as follows:

46. *Please provide a reasoned and supported argument as to whether the Oakley DuPont plant is a district potentially eligible for the CRHR. The argument should develop an appropriate historical context, determine which of the buildings and structures associated with the plant may be potential contributors or non-contributors, and delimit what the boundary of the potential district would be.*

The following is the data request response:

Historical Context

The DuPont Company purchased 552 acres of land in unincorporated eastern Contra Costa County in 1955 to construct a Freon manufacturing plant. The plant site was located east of Antioch on Bridgehead Road, with access to the Atchison, Topeka, and Santa Fe (ATSF) railroad located a few parcels to south of the property. Bridgehead Road was a primary north-south road, providing access to the Antioch Bridge, which crosses the San Joaquin River north of the plant. Bridgehead Road is also part of State Route 160, which connects Antioch with Sacramento. This location gave the company access to both rail and road transportation options. Although the plant was close to the river, DuPont does not appear to have used the river for transportation of goods.

The DuPont Antioch Works began operation in 1956, producing not only Freon, but also tetraethyl lead (TEL). The former was used as a refrigerant and the later was an additive to gasoline to reduce "knocking." Freon, the name trademarked by DuPont, is actually several different chlorofluorocarbons (CFCs), containing carbon and fluorine, with additives such as hydrogen, bromine and chlorine. (Britannica Online Encyclopedia, accessed March 4, 2010). This product was created in the late 1920s as a substitute refrigerant to ammonia, sulfur

dioxide and methyl chloride then being used. CFCs were believed to be non-toxic, unlike methyl chlorine, as well as non-flammable and non-corrosive. In addition to refrigeration equipment, Freon was used in home air conditioning units, automobiles and aerosol cans. CFCs were found to be one cause of ozone-depletion and, as a result, most have been banned in the United States since the 1990s. The banning of Freon as a refrigerant, of course, removed the market for this product and led to the shutdown and dismantling of DuPont's Freon manufacturing works at Oakley.

TEL, also referred to as leaded gasoline, was first produced in 1927. Studies continuing through the 1970s showed that the levels of lead in the gasoline posed significant threats to the public health. The amount of lead in gasoline has been, by law, decreasing since 1975. This led to the shutdown and eventual dismantling of DuPont's TEL manufacturing works in Oakley.

A 1958 aerial photograph (see Image 1 below) shows that the plant consisted of more than 20 buildings and a number of holding tanks, including the administrative building, gate house, water storage tank and associated fire pump house, and the purchased power station. On the northeast of the property were two holding basins. The internal road system and railroad spur were already in place. It is not known if the roads had street lighting; there was no sign of these during the 2009 survey. It is also not known if the streets were named from the onset of manufacturing, but street signs were still in existence during the 2009 survey.

IMAGE 1
1958 aerial photograph of the DuPont Antioch Works. The administration building is the "E" shape at lower left.

In 1963, the company built facilities at this location to produce titanium oxide (TiO_2), a white pigment used in a variety of products, such as paint and toothpaste. Based on examination of the 1965 aerial and 1980s/1990s site map, it appears that buildings associated with the production of the pigment were built on eastern/southern end of the property. Most of the existing buildings at this location were replaced or expanded. Two retention ponds were constructed north of the pigment production-related buildings around this time. It does not appear that any significant building periods occurred after 1963 at the plant.

In 1978, the California Department of Transportation removed the 1926 Antioch Bridge over the San Joaquin River. The original 1926 bridge was a two lane lift span and was unable to hand the increasing river traffic. It was also damaged by several serious collisions. The construction of the new bridge coincided with upgrades and alterations to State Route 160. State Route 160 was moved off of Bridgehead Road and shifted to an elevated roadway a few yards to the west. The on/off ramps to State Route 160 are located at Main Street/ E. 18th Street, one-half mile south/southwest of the main entrance to the plant.

IMAGE 2
DuPont Antioch Works, circa 1980, view east (Source: DuPont Corporation)

At its peak era of production in the 1980s, the DuPont Antioch Works employed 600 people from the nearby communities of Oakley and Brentwood and the City of Antioch. The TEL plant shut down in 1981 and the Freon plant was shut down in 1997. In 1998, the TiO_2 facility shut down and the company demolished or removed all remaining buildings and manufacturing equipment, except for the gate house, administration building, fire pump house and water storage tank, the RCRA building, purchased power substation, the Freon

warehouse and a few small buildings near the former site of the container storage and loading building. Not all of these buildings and/or structures are still in use.

Since 1998, the City of Oakley and the DuPont Company have been working to prepare the site for redevelopment, including preservation of wetlands and reuse. Some parcels have already been designated, reducing the original boundary of the factory site. Because of the toxic materials manufactured and stored on the property, three plumes of groundwater contamination were identified and clean-up was initiated. Additionally, soil contamination is known to exist at the former factory site, so remediation is being prepared and/or commencing.

IMAGE 3
View northwest, 2009, across the former manufacturing area

According to B.C. Deaver, DuPont's Oakley Site Manager, the DuPont Oakley plant was the only DuPont plant in California and one of three nationwide producing Freon (personal communication, March 1, 2010). The DuPont Company website shows that their Louisville plant manufactured Freon beginning in 1955, along with neoprene. In the 1980s, the Louisville plant stopped producing Freon-22. Freon-22 is also known as chlorodifluoromethane. The Louisville plant still produces neoprene, and switched to production of non-CFC substitutes. (DuPont Company website, accessed March 4, 2010).

Another DuPont plant is in Corpus Christi, Texas, and opened in 1974 and manufactured CFC products. This plant is still operating and currently produces alternative CFC products, and other items. (DuPont Company website, accessed March 4, 2010). There is also a DuPont plant in Deepwater Point, New Jersey. This plant produced TEL until the mid-1990s.

Evaluation of Historical Resources

For a property to qualify to the California Register of Historical Resources, the historic context must be identified, a period of significance established and a discussion of the integrity of the property prepared. This is a former chemical manufacturing site, which operated from 1956 until 1998. The primary building periods were 1955-1956 and 1963. No significant changes to the factory occurred after that time, as evidenced from the aerial photographs and site map and personal correspondence with a former employee of DuPont. Since the plant closed, more than 30 buildings and/or structures have been removed and/or demolished. Only 12 buildings and/or structures remain, of which only five date to 1955-1956. Please see Figure 1 (1958 Aerial), Figure 2 (1965 aerial) and Figure 3 (2009) aerial.

1. Admin Building (appears on 1958 aerial)
2. Gate House (may appear on 1958 aerial)
3. Purchased Power Substation (appears on 1958 aerial)
4. Water Storage Tank (appears on 1958 aerial)
5. Fire Pump House (appears on 1958 aerial)
6. Flammable Drum Storage (does not appear in 1958 or 1965 aerial, appears in 1984 aerial)
7. Security, Personnel Orientation, Emergency Response/Terp (does not appear in 1971 aerial, appears in 1984 aerial)
8. Freon Warehouse (does not appear in 1971 aerial, appears in 1984 aerial)
9. DAP Warehouse (does not appear in 1984 aerial;
10. Unidentified building #1, possible warehouse building (does not appear in 1971 aerial, appears in 1984 aerial, possibly on northeast side of Container Warehouse)
11. Unidentified building #2, possible truck loading dock (may appear for first time in 1984 aerial, unclear);
12. RCRA Building (appears in first in 1965 aerial).

At this time, there is no information available from DuPont sources, which discusses the reason for the location of this factory at this site, nor any information about the size, type and/or style and number of buildings which the DuPont Company deemed necessary for the operation of its factory. The DuPont Antioch Works was not the only factory owned by the DuPont Company producing these materials, but it was the only one on the west coast and the only one in California. The plant distributed these products nationally; they were not shipped internationally. This was confirmed by Bob Deaver during personal conversations in April 2009 and March 2010.

National Register Bulletin 15, "How to Apply the National Register Criteria for Evaluation," provides guidance for the evaluation of historic properties, such as potential historic districts. The definition of a historic district, according to the National Register of Historic Places (NRHP) is:

> A district possesses a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development.
>
> A district derives its importance from being a unified entity, even though it is often composed of a wide variety of resources. The identification of a district results from the interrelationship of its resources, which can convey a visual sense of the overall historic environment or be an arrangement of historically or functionally related properties.
>
> A district must be significant, as well as being an identifiable entity. It must be important for historical, architectural, archaeological, engineering, or cultural values. Therefore, districts that are significant will usually meet the last portion of Criterion C plus Criterion A, Criterion B, other portions of Criterion C, or Criterion D.

Questions:

1. *Can the boundaries of a potential historic district be clearly defined? The boundaries must be based upon a shared relationship among the properties constituting the district.* Visually, the current boundaries of the former DuPont Antioch Works can be seen from aerial images. The original acreage was 552 acres. If it was added to between 1955 and 1998 is unknown. The railroad forms the southern boundary, and Bridgehead Road constitutes the western boundary. These two boundaries are easily identified from the ground. At the eastern edge is a gate and a row of high bushes that marks the eastern boundary of the neighboring vineyard. There is no clear northern boundary.

2. *Have the boundaries changed?* The boundaries for this property are shown on Figure 3. The property is being reduced through redevelopment, reuse, sale and wetland preservation. The boundaries of the property have changed on the north and the east, but remain essentially the same on the south and west.

3. *What is the period of significance?* DuPont purchased the property in 1955 and the plant opened in 1956. In 1963, a third operation was added to the factory within the existing acerage. The TEL facilities stopped producing in 1981, followed by the Freon plant in 1997 and then the TiO_2 plant in 1998. The peak period of employment for the plant has been cited as the 1980s. The period of significance would encompass 1955 to 1981, the peak years of construction and production for the former DuPont Antioch Works.

4. *Does the property have integrity? Can it convey those properties for which it may be considered significant for Criterion 1, 2 or 3?* This property retains integrity of location and some integrity of setting. The abutting parcels are still commercial and agricultural in nature, but the reclamation of some land for wetlands, and the construction of the elevated and banked State Route 160 immediately to the west have altered the setting. Furthermore, roughly three-fourths of the buildings and/or structures that occupied the factory site from the 1960s until the late 1990s have been removed. This has significantly altered the

setting. In addition to the setting, the former DuPont Antioch Works property does not retain integrity of design, materials, workmanship, feeling, and association.

A property must retain those physical features which enable it to convey its historic identity. For a manufacturing site, those features would include buildings dedicated to manufacturing of materials. In addition, holding basins, tanks for water and fuel, power stations, and cooling towers would also be considered part of a working factory site. The internal movement of goods and people on a road network would also be considered a contributing element.

Three-fourths of those buildings and/or structures at the former DuPont Antioch Works are gone, although many footprints and foundations can still be seen in aerials. These remnants are much more difficult to see from the ground. Buildings associated with shipping goods and materials to and from the site, which would be another important feature of a factory, are also gone, although the railroad spurs are still in situ. Due to this, the former DuPont Factory Works does not retain integrity from its period of significance and is not able to convey its historic significance. It lacks a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development.

IMAGE 4
View northeast at B Avenue and Fifth Street. April 2009. Before the buildings were removed, the view would have included the Control Lab, the Pigments Storage building, drum storage, and probably the Pigments Warehouse.

Application of Criteria (California Register of Historical Resources)

Under Criterion 1, is this property associated with events that have made a significant contribution to the broad patterns of local or regional history or the cultural heritage of California or the United States?

While the former DuPont Antioch Works was the only manufacturing plant for Freon owned and operated by the DuPont Company in California, there is not enough historical information to clearly show that this its construction and operation constitute an event which made a significant contribution to the broad patterns of local or regional history. According to the DuPont Company site, the Louisville plant also produced Freon; it was not determined how many buildings involved in the production of Freon at that plant are still intact and if they are being reused.

It can be argued that this plant was important to the local and/or regional economy for providing more than 600 jobs locally, but it lacks the integrity to convey the historical importance of this plant in the development of the nearby community or any significant contribution to local or regional history. It was never specifically associated with either the City of Antioch or the Town of Oakley, despite the name of the plant. Therefore, it is not eligible as a historic district for the California Register of Historical Resources (CRHR) under Criterion 1.

Under Criterion 2, is this property associated with the lives of person important to local, California, or national history?

At this time, there are no known persons important to local, California, or national history specifically associated with the former DuPont Antioch Works; therefore, it is not eligible as a historic district for the CRHR under Criterion 2.

Under Criterion 3, does this property embody the distinctive characteristics of a type, period, region or method of construction or does it represent the work of a master or posses high artistic value?

Between 1955 and 1981, the former DuPont Antioch Works site contained roughly forty buildings and/or structures, most built between 1955 and 1963. These included tank farms, holding basins, warehouses, office buildings, a substation, a gate house, labs and shops associated with the production of Freon, TEL and $T10_2$. There were also railroad tracks, loading docks roads, and parking lots. Only a few buildings and/or structures remain. The site has lost integrity of design, setting, materials, workmanship, feeling and association. With only one-fourth of the buildings and/or structures still on site, the site cannot convey the distinctive characteristics of a manufacturing site, or more specifically, a former Freon, TEL and TiO_2 manufacturing site. There is nothing left on site that identifies this as a former DuPont Company plant. Those building which would have best conveyed the type and the use of the site are gone.

Besides the administration building and gate house, none display the distinctive characteristics of a type, period, region or method of construction. The administration building, along with the gate house both display elements of the International style, but are not distinctive examples of the style. The remaining buildings exemplify common styles of industrial buildings, such as the RCRA and fire pump house buildings and the water storage tank. Therefore, the former DuPont Antioch Works does not appear to be eligible as a historic district under Criterion 3.

References Cited

Britannica Online Encyclopedia:
http://www.britannica.com/EBchecked/topic/219567/Freon, accessed March 4, 2010.

California Department of Environmental Protection, Department of Toxic Substances Control. 2002. "E.I. DuPont de Nemours and Company, Inc. 6000 Bridgehead Road, Oakley 94561, Fact Sheet." October.

DuPont, Corpus Christi: http://www2.dupont.com/Heritage/en_US/related_topics/corpus_christi.html, accessed March 4, 2010.

DuPont, Louisville: (http://www2.dupont.com/Heritage/en_US/related_topics/louisville.html

MedicalNet: "Tetraethyl Lead, http://www.medterms.com/script/main/art.asp?articlekey=40211&page=2, accessed March 4, 2010.

Deaver, Bob / DuPont's Oakley Site Manager. 2010. Personal communication with Jessica Feldman/CH2M HILL. April 2009 and March 2010.

This map was compiled from various scale source data and maps and is intended for use as only an approximate representation of actual locations.

Aerial data source: http://services.arcgisonline.com/v92, USA Prime Imagery, Copyright:© 2009 i-cubed.

N

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Feet

FIGURE 1
EXISTING BUILDINGS 1958
CONTRA COSTA GENERATING STATION
OAKLEY, CALIFORNIA

CH2MHILL

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This map was compiled from various scale source data and maps and is intended for use as only an approximate representation of actual locations.

Aerial data source: http://services.arcgisonline.com/v92, USA Prime Imagery, Copyright:© 2009 i-cubed.

N

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Feet

FIGURE 2
EXISTING BUILDINGS 1965
CONTRA COSTA GENERATING STATION
OAKLEY, CALIFORNIA

CH2MHILL

\\ZION\SACGIS\PROJ\RADBACKENERGY\399328\MAPFILES\HISTORICAL_PHOTOBKGRND_BLDGS.MXD MCLAY1 3/9/2010

This map was compiled from various scale source data and maps and is intended for use as only an approximate representation of actual locations.

Aerial data source: http://services.arcgisonline.com/v92, USA Prime Imagery, Copyright:© 2009 i-cubed.

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Feet

FIGURE 3
EXISTING BUILDINGS 2009
CONTRA COSTA GENERATING STATION
OAKLEY, CALIFORNIA

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Soil and Water (47–67)

Recycled Water

47 a. Please describe the OGS's commitment to use recycled water when it becomes available.

Response: CCGS's commitment to the use of recycled water is stated in Section 2.1.8.3 of the AFC. Specifically, the OGS will include a water treatment building sized to accommodate the potential future installation of a microfiltration system to provide additional treatment, if required, of the raw water supply upstream of the reverse osmosis (RO) system. Given that Ironhouse Sanitary District (ISD) will be utilizing a membrane bioreactor (MBR) to produce recycled water, it is unlikely that additional filtration will be required at the OGS for recycled water serving uses other than feedwater to the RO system. Depending on the quality of the recycled water and the requirements of the RO system, it may be more appropriate to use ultrafiltration instead of microfiltration. The decision regarding the appropriate technology for pre-treatment of the RO feedwater would best be made after analyzing the actual recycled water quality and performing pilot testing.

At the time CCGS filed the AFC, ISD was participating in the East County Industrial Recycled Water Facilities Plan (ECIRWFP) along with several other wastewater agencies, water purveyors, and cities in the area including Delta Diablo Sanitation District (DDSD), Central Contra Costa Sanitary District, Contra Costa Water District, the City of Pittsburg, and the City of Antioch, in addition to several corporations (including Pacific Gas and Electric Company and Mirant) representing potential industrial recycled water customers. ISD has indicated to CCGS that one of the alternatives the ECIRWPF considered was a recycled water pipeline from ISD's new wastewater treatment plant to the Antioch power plant site on Wilbur Avenue. This plan included a high-TDS wastewater (i.e., blowdown) pipeline running from the Antioch power plant site to DDSD's wastewater treatment plant located in Pittsburg. Given ISD's discharge limitations pertaining to salinity, the CCGS's commitment to use recycled water is contingent on having an acceptable discharge solution for the wastewater. The blowdown pipeline considered in the ECIRWFP appears to provide such a solution.

The final version of the ECIRWFP was published in October 2009, (included as Attachment DR47-1). Section 5.1.1 of the final report indicates that the alternative described above was the recommended alternative for the "Antioch Project."

b. Please specify the industrial process and miscellaneous uses (e.g., landscape irrigation) planned for recycled water.

Response: As depicted in AFC Figures 2.1-6A and 2.1-6B, the project will be designed to accommodate recycled water for the following purposes:

- Makeup to the RO system, which is followed by offsite regenerated mixed bed demineralizers to produce demineralized water for makeup to the heat recovery steam generators (HRSGs) and for combustion turbine wash water

- Landscape irrigation
- Plant washdown/service water (i.e., hose bibs)
- Makeup to the combustion turbine inlet air evaporative coolers
- Makeup to the closed-loop cooling system evaporative fluid cooler

Recycled Water Agreements

48. *Please identify what agreements or contracts will be needed to provide the recycled water supply to the project from Ironhorse Sanitary District and the project.*

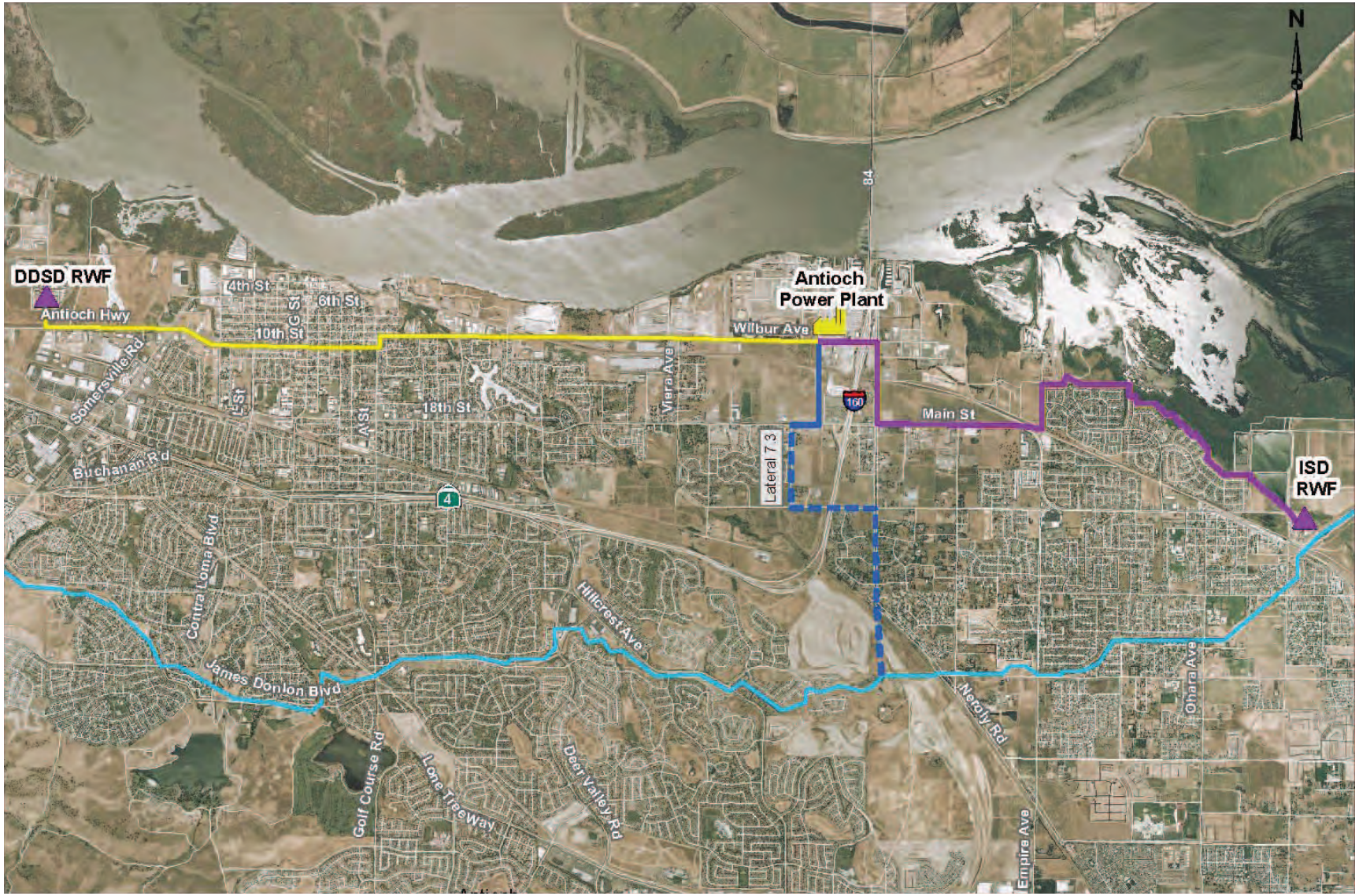
Response: Typically, a recycled water supply agreement would be needed. This agreement would cover such things as rates and charges for the supply of recycled water, obligations of the recycled water user (e.g., compliance with rules and regulations pertaining to recycled water use, site-specific permit requirements, and reporting requirements) and the recycled water provider's access for onsite inspections to monitor compliance.

Recycled Water Conveyance

49. *Please identify the distance between the Ironhorse Sanitary District's proposed new wastewater treatment plant and OGS site; and describe how recycled water would be transported to OGS. Please discuss details of the installation of a recycled water supply pipeline including when the line will be installed, pipe size, route, installation methods, and specific best management practices (BMPs) to be used to stabilize the disturbed soil and limit impacts to soil and water.*

Response: Figure DR49-1 is based on Figure 5-1 from the final ECIRWFP and identifies a potential route for a recycled water pipeline from ISD's wastewater treatment plant to Wilbur Avenue. The route runs along Bridgehead Road between Main Street and Wilbur Avenue and passes by the proposed OGS site. The distance between the IDS wastewater treatment plant and the OGS site is approximately 3.6 miles. The ECIRWFP proposes a 14-inch-diameter PVC pipeline and a 150-hp pump station located at the ISD wastewater treatment plant to deliver 3.5 mgd of recycled water to Wilbur Avenue industrial uses. CCGS understands that if recycled water were to be transported from ISD's wastewater treatment plant to the OGS, it would likely be via a pipeline such as that proposed in the ECIRWFP. The majority of the pipeline would be installed in open trenches using conventional cut-and-cover construction techniques, similar to those indicated for the OGS natural gas pipeline in AFC Section 4.1. The route identified in the ECIRWFP includes at least one railroad crossing, which would likely require jack and bore or horizontal directional drilling. BMPs to be used to stabilize the disturbed soil and limit impacts to soil and water are described in the Drainage Erosion and Sediment Control Plan (see the response to Data Request #62). For example, standard erosion and sediment control BMPs include the following:

- EC-1 Scheduling
- EC-2 Preservation of Existing Vegetation
- EC-4 Hydroseeding
- EC-7 Geotextiles and Mats
- EC-15 Soil Preparation/Roughening



1 inch equals 0.8 miles

0 0.375 0.75 1.5

Miles

Existing Facilities

- Recycled Water Facility
- Contra Costa Canal
- Raw Water Lateral

Potential Facilities

- Power Plant Site
- Recycled Water Pipe
- Blowdown Pipe
- Raw Water Pipe

Source: RMC Water and Environment

FIGURE DR49-1
ECIRWFP-PROPOSED RECYCLED WATER PIPELINE ROUTES

OAKLEY GENERATING STATION RESPONSE TO DATA REQUESTS

OAKLEY, CALIFORNIA

CH2MHILL

IS012010223151SAC Figure_DR49-1.ai 03.05.2010 tdaus

- EC-16 Non-vegetative Stabilization
- SE-1 Silt Fence
- SE-2 Sediment Basin
- SE 3 Sediment Trap
- SE-5 Fiber Rolls
- SE-6 Gravel Bag Berm
- SE-7 Street Sweeping and Vacuuming
- SE-8 Sandbag Barrier
- SE-9 Straw Bale Barrier
- WE-1 Wind Erosion Control

ISD Construction Timeline

50. *Please discuss the timeline for Ironhorse Sanitary District to complete construction of the proposed new wastewater treatment plant and the availability of recycled water for use by the OGS. Please compare this timeline to the timeline for construction and operation of OGS.*

Response: ISD expects to complete construction of the wastewater treatment plant expansion in October 2011, which is well in advance of the OGS commercial operation date of fourth quarter 2013 (AFC Section 2.2.1.1). ISD is not able to predict when recycled water might be available at the OGS, as they currently have no plans for the construction of the recycled water distribution pipeline identified in the ECIRWFP. The pipeline identified in the ECIRWFP was proposed to provide a significant quantity of recycled water to industrial uses along the Wilbur Avenue industrial corridor. According to ISD, these demands either are not materializing or are proposed to be supplied from other sources.

Water Agreements Schedule

51. *Please discuss the status and schedule for completing any agreements or contracts needed for Ironhorse Sanitary District to construct the tertiary treatment upgrade and conveyance to serve the project.*

Response: ISD's tertiary treatment upgrade is currently under construction; therefore, CCGS assumes that ISD has already completed any agreements or contracts necessary for such construction to commence. Since ISD currently has no plans for the construction of the recycled water conveyance system that would potentially serve the OGS, no schedule has been established for completing any agreements or contracts needed for such construction.

ISD Treatment Plant Capacity, Treatment, Quantity

52. *Please discuss whether the capacity of the Ironhorse Sanitary District's proposed new wastewater treatment plant will be adequate to meet all of the water supply needs of the OGS.*

Response: AFC Table 2.1-1 indicates that the OGS's maximum water demand would be 369 gpm using Diablo Water District potable water. If recycled water were to be used, it is projected that the peak demand would increase by about 11 percent to 409 gpm. On a 24-hour basis, this would result in a peak daily demand of about 0.59 mgd, which represents about 22 percent of ISD's current average dry weather flow of 2.64 mgd (see page 3 of ISD's Waste Discharge Requirements, provided separately due to its size as Attachment DR55-1) or 13.5 percent of ISD's Phase 1 wastewater treatment plant (WWTP) capacity of 4.3 mgd

and 6.7 percent of ISD's build-out flow of 8.6 mgd. Also, ISD will maintain approximately 80 million gallons of onsite storage for its fully treated water.

a. *Please provide a detailed description of the additional treatment measures that will be implemented when OGS converts to the use recycled water, and an estimate of the quality of the water produced for use in the power plant.*

Response: The additional treatment measures that would likely be required if the OGS were to convert to recycled water would consist of an additional filtration step upstream to the RO system to reduce the potential for fouling of the RO membranes. As described in the response to Data Request #47a, either microfiltration or ultrafiltration would be considered. Depending upon the quality of the recycled water, additional filtration for the non-RO feedwater uses (e.g., service water, irrigation, combustion turbine inlet air evaporative cooler makeup, and the closed-loop cooling system evaporative fluid cooler makeup) might or might not be needed if the project were to convert to recycled water use.

Since ISD's new wastewater treatment plant is not yet operational, no actual recycled water quality data exists. In ISD's June 2007 Report of Waste Discharge, ISD estimated the quality of the future recycled water using available influent data and known, or best professional judgment analysis of, constituent removal performance from existing treatment plants having similar design characteristics. Attachment DR52-1 is an excerpt from the Report of Waste Discharge describing the projected recycled water quality.

b. *Given the projected efficiency of the additional treatment measures, please provide an estimate of the amount of recycled water required to produce the raw water makeup required by OGS.*

Response: As indicated in the response to Data Request #52, if recycled water were to be used, the OGS peak demand would likely increase by about 11 percent. This increase conservatively assumes that the entire recycled water flow passes through an additional filtration step and that backwash flow is 10 percent of the influent flow. Thus, the peak recycled water demand would be approximately 409 gpm, the average recycled water demand would be approximately 105 gpm, and the average annual recycled water use would be approximately 247 acre-feet.

Wastewater Discharge Quantity and Quality

53. *Please provide the anticipated quantity and quality of wastewater discharge following conversion to a tertiary treated recycled water supply.*

Response: Using recycled water, the peak discharge rate would be approximately 200 gpm, the average discharge rate would be approximately 78 gpm, and the average annual discharge would be approximately 51 million gallons. Because the actual quality of the recycled water supply is unknown at this time, it is difficult to predict how the future recycled water supply will impact the quality of the wastewater discharge from the OGS. Table DR53-1 shows the projected wastewater quality based on the limited data presented in ISD's projected recycled water quality (see Attachment DR52-1).

TABLE DR53-1
Projected Wastewater Quality If Using Recycled Water

Constituent	Units	Projected Recycled Water Supply	Projected OGS Wastewater Peak July	Projected OGS Wastewater Average Ambient
Chloride	mg/L	160	368	218
EC	µmhos/cm	1,197	2,755	1,630
Iron, total	µg/L	137	315	187
Manganese, total	µg/L	52	120	71
TDS	mg/L	603	1,388	821
Aluminum	µg/L	146	339	199
Copper	µg/L	2.1	4.8	2.9
Lead	µg/L	0.86	2.0	1.2
Mercury, total	µg/L	0.005	0.012	.007
Zinc	µg/L	28	64	38

Sewerline Capacity

54. *Please discuss whether the existing sewer line has adequate capacity to convey wastewater discharge peak flows during operation with process water supplied by potable water from the Diablo Water District or recycled water from the Ironhorse Sanitary District.*

Response: ISD recently advised the CCGS that the OGS may not connect to the existing sewer facilities in Bridgehead Road as these facilities are inadequate to serve anticipated flows from the OGS. ISD has suggested that the project install a separate 0.5-mile force main interconnecting to an existing 18-inch gravity sewer in Main Street, approximately 600 feet east of the intersection of Bridgehead Road and Main Street. ISD is presently evaluating the impact of OGS's discharge on the capacity of their sewer system. Once ISD has completed this evaluation, the Applicant will advise the CEC of the results. If it is necessary to construct this 0.5-mile-long pipeline segment, CCGS will conduct all appropriate environmental impact and permitting analyses and provide the results of these analyses to the CEC.

ISD Waste Discharge Requirements

55. *Please provide a copy of the Ironhorse Sanitary District's Waste Discharge Requirements (WDRs).*

Response: ISD's Waste Discharge Requirements provided are included as Attachment DR55-1 (this attachment is provided electronically due to its size).

a. *Please discuss whether Ironhorse Sanitary District anticipates that their WDRs will change with the construction of the new treatment plant, and if so, how.*

Response: ISD does not anticipate that their WDRs would change with the construction of the new treatment plant, as the existing WDRs contemplate the construction of the new wastewater treatment plant.

b. *Please provide a comparison of OGS's process wastewater quality (assuming potable water supply and recycled water supply) and the Ironhorse Sanitary District's WDRs.*

Response: ISD's effluent limitation and discharge specifications are included in pages 10 through 13 of the Waste Discharge Requirements (see Attachment DR55-1). Table DR55-1 shows the effluent limitations that are applicable to the constituents listed for the projected OGS wastewater quality shown above in Table DR53-1.

TABLE DR55-1
Projected Wastewater Quality If Using Recycled Water

Constituent	Units	Effluent Limitations			Projected OGS Wastewater Peak July	Projected OGS Wastewater Average Ambient
		Average Monthly	Maximum Daily	Annual Average		
Chloride	mg/L				368	218
EC	µmhos/cm	See page 12 of the Waste Discharge Requirements			2,755	1,630
Iron, total	µg/L				315	187
Manganese, total	µg/L			50	120	71
TDS	mg/L				1,388	821
Aluminum	µg/L	71	143		339	199
Copper	µg/L	8.5	17		4.8	2.9
Lead	µg/L	3.4	6.9		2.0	1.2
Mercury, total	µg/L				0.012	.007
Zinc	µg/L				64	38

c. *Please discuss Ironhorse Sanitary District's schedule for obtaining the necessary permits for treatment and delivery of a tertiary treated recycled water supply.*

Response: ISD has obtained all necessary permits for construction of the new recycled water treatment facilities. This facility is currently under construction and will become operational in October 2011.

Regarding delivery of treated recycled water to the OGS, ISD included in its Draft Supplemental EIR for the WWTP expansion, an environmental review of a conveyance alignment that starts at the treatment plant and heads west to Wilbur Avenue, passing the OGS site. ISD has not obtained funding or permits for construction of the delivery pipeline.

Soil/Construction Water Use Data Request

56. *Please provide an estimate of annual water supply needs for construction. Please estimate the annual volume of water required for dust suppression and other construction needs.*

Response: Water will be required primarily for dust suppression (10 to 12 hours/day) during construction. Construction will use approximately 100,000 gallons per day (150 gpm average and approximately 400 gpm maximum, for 1 hour) for dust control and soil compaction. The average water use for construction would be approximately 31.3 million gallons per year.

Erosion Control Methods

57. *Please describe the measures that will be taken to limit wind erosion when dust suppression using sprayed water is not in progress (i.e., nights and weekends)*

Response: Black and Veatch, who served as PG&E's engineer/construction manager for the nearby Gateway project, indicated that additional measures were not needed for dust suppression during nights and weekends. With similar soils and wind conditions at the OGS site, it is doubtful that additional measures would be required at the OGS site either. However, if dust control were to become a problem on nights and weekends, one or more of the following measures would be implemented:

- Cover soil stockpiles with plastic tarps (BMP SS-7)
- Provide additional gravel or aggregate base surfacing or "after hours" watering to areas that are frequently disturbed (BMP WE-1)
- Apply soil stabilizer/dust control agents to areas that will be infrequently disturbed (BMP SS-5)
- Hydro-seed or apply mulch to areas that will be subject to limited or no future disturbance (BMP SS-4)

Bioswale Sizing Calculations

58. a *Please provide updated sizing calculations for the proposed bioswales that demonstrate that the swales are wide enough to convey the water quality flowrate at a depth of less than 4 inches.*

Response: The project is required to comply with the California Regional Water Quality Board's C.3 requirements. To ensure compliance with this requirement, the project's stormwater management plan was designed in compliance with Contra Costa Clean Water Program (CCCWP) Stormwater C.3 Guidebook, 4th edition. This guidebook does not contain a requirement to "convey the water quality flow rate at a depth of less than 4 inches."

b. *Please demonstrate that the swales can convey a 10-year peak flow rate with at least 6 inches of freeboard.*

Response: Per Appendix C, page C-6 and C-7 of the CCCWP Stormwater C.3 Guidebook, the C.3 design process does not use a specific storm for design. The OGS stormwater management plan used the Integrated Management Practices (IMP) method, which is based

on a continuous simulation model using hourly rainfall data over 30 or more years. The bioswale design, as shown on drawings 163994-SS-3001 and 163994-SS-3050 included in AFC Appendix 5.15A, has a 6-inch minimum freeboard based on the IMP design method.

Mitigation Wetland Outlets

59. a. *Please provide details (size, elevation, etc) of the primary and emergency outlets of the mitigation wetland at the northwest corner of the project site.*

Response: The mitigation wetland area presently has no outlets. There is an existing culvert that runs between the wetlands area and a concrete stormwater sump that is located north of the wetlands. DuPont advises that the culvert is actually a potential inlet to the wetlands area as it served as an emergency overflow for the stormwater sump. The concrete stormwater sump receives stormwater that drains from the DuPont parking lot, located north of the sump. Previously, sump pumps discharged the stormwater from this sump into the DuPont stormwater system, which ultimately discharged to the river. DuPont has indicated that the stormwater pumps have not been operated in over 5 years. Currently, the parking lot is used sparingly and stormwater is allowed to puddle in the southern portion of the parking lot until it percolates or evaporates. CCGS intends to plug the culvert to eliminate the possibility of future discharges of untreated stormwater into the wetlands area through this line. The existing topography is such that if the wetlands area were ever to be completely flooded, the discharge would flow over the existing road that runs along the north edge of the mitigation easement. The topographical survey indicates that the low point of this road is approximately elevation 11.7 feet.

b. *Please describe the receiving water that accepts discharge from the mitigation wetland.*

Response: As there are no outlets from the wetlands area, there is no receiving water that receives the discharge.

HEC-HMS Modeling

60. a. *Please provide updated HEC-HMS modeling for the OGS site under the proposed development conditions reflecting the proposed increase in impervious area. The modeling should reflect changes in runoff volumes for the project site (including the mitigation wetland) for the 10-year and 100-year 24-hour events.*

Response: The post-development stormwater management facilities were designed using the C.3 design process with IMPs. Per page C-5 of the CCCWP Stormwater C.3 Guidebook: "The sizing factors were calculated to ensure runoff discharged from the IMP does not exceed the pre-project peaks and durations of runoff from the area tributary to the IMP." The summary on page 3 of calculation 52.5406.1003 "Stormwater Analysis for Wetland," contained in AFC Appendix 5.15A, states that since the wetland is adequate for 100-year runoff in the pre-development condition and the post-development runoff is equal to the pre-development runoff, the wetland is adequate for post-development runoff.

b. *Please identify typical water levels in the mitigation wetland during summer, winter, and storm periods. Modeling for extreme events should reflect the anticipated starting water levels encountered during storm periods.*

Response: Typical water levels during summer and winter months are at their current level shown on the drawing, which is approximately elevation 4.6 feet. The modeling was based on an assumed water level of 5.0 feet, which allows for some residual water from a previous storm.

Stormwater Control Plan

61. *Please submit a Stormwater Control Plan consistent with the requirements of Contra Costa County C3 Guidebook.*

Response: The stormwater control plan is consistent with the Contra Costa County C.3 Guidebook as noted above and as demonstrated by documents included in AFC Appendix 5.15A.

Drainage Erosion and Sediment Control Plan

62. *Please provide a draft Drainage Erosion and Sediment Control Plan (DESCP), containing elements A through I below, which outlines site management activities and erosion/sediment control BMPs to be implemented during site mobilization, excavation/demolition, construction, and post-construction activities. The level of detail in the draft DESCP should be commensurate with the current level of planning for site grading and drainage. Please provide all conceptual erosion control information for those phases of construction and post-construction that have been developed or provide a statement when such information will be available. The DESCP may be combined with the Stormwater Pollution Prevention Plan (SWPPP) required by the Regional Water Quality Control Board to limit the need for the project to develop separate stormwater management plans.*

    a. ***Vicinity Map*** *– A map(s) at a minimum scale 1"=100' shall be provided indicating the location of all project elements (construction site, laydown area, pipelines, etc.), with depictions of all significant geographic features including swales, storm drains, and sensitive areas.*

    b. ***Site Delineation*** *– All areas subject to soil disturbance for the OGS (project site, laydown area, all linear facilities, landscaping areas, and any other project elements) shall be delineated showing boundary lines of all construction/demolition areas and the location of all existing and proposed structures, pipelines, roads, and drainage facilities.*

    c. ***Watercourses and Critical Areas*** *– The DESCP shall show the location of all nearby watercourses including swales, storm drains, and drainage ditches; the proximity of those features to the OGS construction, laydown, and landscape areas; and all transmission and pipeline construction corridors.*

    d. ***Drainage Map*** *– The DESCP shall provide a topographic site map(s) at a minimum scale 1"=100' showing all existing, interim and proposed drainage systems and drainage area boundaries. On the map, spot elevations are required where relatively flat conditions exist. The spot elevations and contours shall be extended off-site for a minimum distance of 100 feet in flat terrain.*

    e. ***Narrative of Project Site Drainage*** *– The DESCP shall include a narrative of the drainage measures to be taken to protect the site and downstream facilities. The narrative should include the summary pages from the hydraulic analysis prepared by a professional engineer/erosion control specialist. The narrative shall state the watershed size(s) in acres*

that was used in the calculation of drainage measures. The hydraulic analysis should be used to support the selection of BMPs and structural controls to divert off-site and on-site drainage around or through the OGS construction and laydown areas.

f. ***Clearing and Grading Plans*** *– The DESCP shall provide a delineation of all areas to be cleared of vegetation and areas to be preserved. The plan shall provide elevations, slopes, locations, and extent of all proposed grading as shown by contours, cross sections or other means. The locations of any disposal areas, fills, or other special features will also be shown. Illustrate existing and proposed topography by tying in proposed contours with existing topography.*

g. ***Clearing and Grading Narrative*** *– The DESCP shall include a table with the quantities of material excavated or filled for the site and all project elements of the OGS project (project site, lay down area, transmission corridors, and pipeline corridors) whether such excavations or fill are temporary or permanent, and the amount of such material to be imported or exported.*

h. ***Best Management Practices Plan*** *– The DESCP shall identify on the topographic site map(s) the location of the site-specific BMPs to be employed during each phase of construction (initial grading/demolition, project element excavation and construction, and final grading/stabilization). BMPs shall include measures designed to prevent wind and water erosion.*

i. ***Best Management Practices Narrative*** *– The DESCP shall show the location (as identified in H above), timing, and maintenance schedule of all erosion and sediment control BMPs to be used prior to initial grading, during all project element (site, pipelines, etc.) excavations and construction, final grading/stabilization, and postconstruction. Separate BMP implementation schedules shall be provided for each project element for each phase of construction. The maintenance schedule should include post-construction maintenance of structural control BMPs or a statement provided when such information will be available.*

Response: A draft Drainage Erosion Sediment Control Plan/Storm Water Pollution Prevention Plan (DESCP/SWPPP) has been prepared incorporating items a through i listed above. The DESCP/SWPPP has also been prepared to comply with the California General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, the State Water Resources Control Board (SWRCB) Order No. 2009-0009-DWQ, and the DESCP/SWPPP Construction General Permit requirements which take effect July 2010. A copy of the draft DESCPP/SWPPP is included as Attachment DR62-1 (this attachment is provided electronically due to its size).

Stormwater Monitoring Program

63. *Please describe the stormwater quality monitoring program for compliance with the proposed SWPPP (location, frequency and parameters). In addition, please identify procedures to be followed in the event that stormwater discharged to the mitigation wetland exceeds allowable discharge limits.*

Response: Appendix N of the DESCP/SWPPP contains the site-specific Construction Site Monitoring Plan (CSMP) for the OGS Site (See Attachment DR62-1). Included in the CSMP is a map showing the sampling/observation locations, frequency of monitoring, and the parameters and protocol a field monitor must follow for sampling events. Because the OGS

site is a Risk Level 1 site, sampling for non-visible pollutants will be necessary. The monitoring and site-specific information for the OGS Site is presented in Section 7 of the DESCP/SWPPP, also titled Construction Site Monitoring Plan.

The technical memorandum titled Contra Costa Generating Station Stormwater Management Design, Wetland E, dated August 7, 2009, describes the permanent bioswale system design in conjunction with the function of Wetland E. Ongoing discussions with the California Department of Fish and Game regarding specific procedures to be followed in the event that stormwater discharged into Wetland E (mitigation wetland) exceeds current allowable discharge limits are currently taking place, and a final plan is forthcoming. Until a specific protocol is agreed upon by all parties, the following protocol will be used in the event of a non-allowable discharge.

In the event of a non-allowable discharge, the site operators will notify CDFG within 24 hours of the discharge. Simultaneously, depending on the constituent or constituents that are above the allowable threshold, the source of those constituents will be traced back to their source on the project site if possible. It is assumed the likely cause of a non-allowable discharge would be an upstream treatment bioswale failure and/or from the source of the constituent itself. Once the source is known, corrective actions will be taken either at the source of the constituent of concern or through maintenance of the bioswale system. If it is possible to curtail and/or stop the flow of discharge into the wetland easement area without the threat of an overflow offsite, stormwater discharge will be blocked from entering the wetland by controlling the flow out of drop structures DS-1 and DS-5 and/or the perforated underdrain, which is located under the northern bioswale, until the problem is remediated. In the event of a large rain event where runoff cannot be contained within the existing system, temporary portable tanks could be brought to the site to contain stormwater. Sampling and analysis will continue to occur until water quality has been restored.

Stormwater Testing Schedule

64. *Please indicate the stormwater testing schedule, to provide assurance that stormwater from process and non-process areas will be separated, and that oil/water separator performance is maintained.*

Response: Runoff at the OGS site currently drains to the mitigation wetlands on the northwestern corner of the project site. Post-development drainage at the site will be designed to maintain the natural drainage pattern and continue to discharge to the wetland. Bioswales will be constructed within the plant site to collect and infiltrate stormwater. The wetland is capable of receiving runoff from the project site for a 100-year, 24-hour storm event without overflowing to adjacent properties (Black & Veatch, 2009). Runoff from the power block area will be routed through an oil/water separator before being discharged to the sanitary sewer system and will not be discharged onsite. Quarterly testing schedules will ensure that stormwater from process and non-process areas will be separated, and that oil/water separator performance is maintained. In the event that excessive storm events occur and/or the facility is operating at a maximum level and/or or if sampling shows evidence of powerblock runoff in the bioswale system, rigorous testing will occur until water quality has been restored.

Seasonal Groundwater Levels

65. Please provide the seasonal high and low groundwater levels at the project site.

Response: The project site is located in Oakley, California, approximately 0.63 mile to the south of the San Joaquin River. A shallow groundwater table is present at the site at approximately 11 feet below ground surface elevation at finished design grade (Black & Veatch, 2009). The Phase I Environmental Site Assessment (ESA) reported a water table level between approximately 5 and 15 feet below ground surface (Tetra Tech, 2009). These values represent the approximate late spring and late summer or fall groundwater levels, respectively. Seasonal variations are due to the site's proximity to the river, with highest groundwater levels occurring at the end of spring when the spring runoff contributes to high river flows, which results in increased groundwater basin recharge through infiltration from the river. The lowest groundwater levels are expected to occur at the end of the dry season when river flows are low. Deeper aquifers are also present at the site (up to 120 feet), but generally they are not affected as much by seasonal variations in water table elevations.

Groundwater Wells

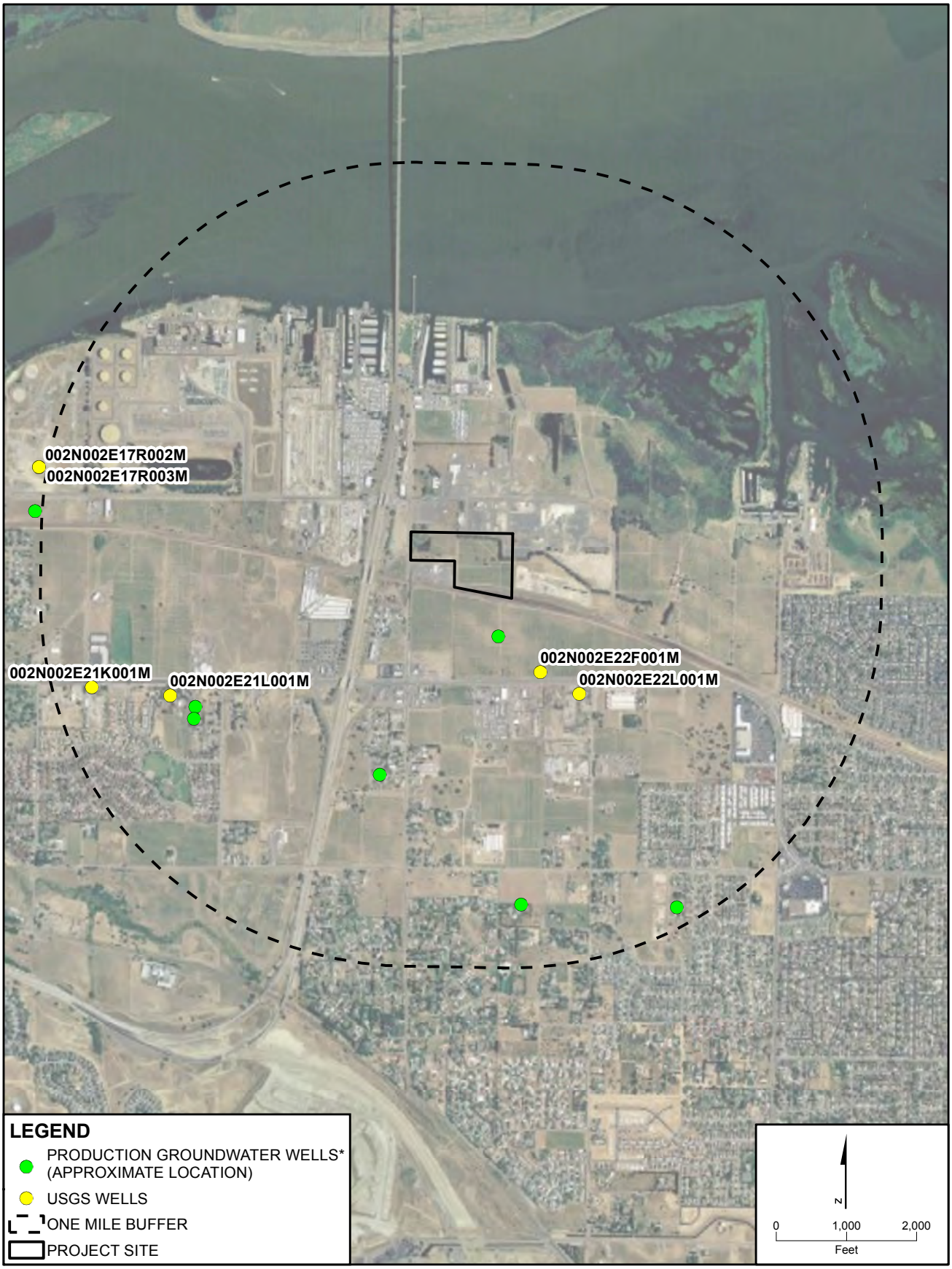
66. a. Please identify all groundwater wells (monitoring and production) within 1 mile of the project site.

Response: No groundwater wells were identified on the project site during the site reconnaissance performed by Tetra Tech as part of the ESA (Tetra Tech, 2009). However, there are six groundwater monitoring wells within one mile of the project site (USGS, 2009; Figure DR66-1). These wells are maintained by USGS, but 1982 was the last year for which data were available (USGS, 2009). Table DR66-1 provides basic well information and the time period for data recorded. As shown in Table DR66-1, the average groundwater level for each of the six monitoring wells varies between 24 and 36 feet below ground surface.

TABLE DR66-1
USGS Groundwater Wells Located Within 1 Mile of the Project Site

USGS Well ID	Latitude	Longitude	Land surface elevation (feet above sea level)	Well Depth (feet below land surface)	Average Water level (feet below land surface)	Water level measurement date range
002N002E17R002M	38°00'48"	121°46'09"	30	67	26.4	7/1972 to 9/1982
002N002E17R003M	38°00'48"	121°46'09"	30	102	24.1	4/1978 to 9/1982
002N002E22F001M	38°00'20"	121°44'39"	27	66	14.4	1/1973 to 9/1982
002N002E22L001M	38°00'17"	121°44'32"	32	63	23.4	6/1962 to 9/1982
002N002E21L001M	38°00'16"	121°45'45"	50	140	36.4	1/1962 to 1/1980
002N002E21K001M	38°00'17"	121°45'59"	44	120	N/A	N/A

Source: USGS, 2009



* - Includes domestic and agricultural wells

SOURCE: Contra Costa Environmental Health Division, 2010.
USGS, 2009.

This map was compiled from various scale source data and maps and is intended for use as only an approximate representation of actual locations.

FIGURE DR66-1
GROUNDWATER WELLS LOCATED WITHIN 1 MILE OF THE PROJECT SITE
CONTRA COSTA GENERATION STATION
OAKLEY, CALIFORNIA

CH2MHILL

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In addition to the USGS wells, seven active production wells (including domestic and agricultural use) were identified within one mile of the project site by the Contra Costa Environmental Health Division (Morris, 2010; Figure DR66-1). Table DR66-2 provides a summary of production wells within one mile of the project site.

TABLE DR66-2
Production Groundwater Wells Located Within 1 Mile of Project Site

Assessor's Parcel Number	Address
037-040-015	Bridgehead Rd, Oakley
051-230-006	3200-3210 Barton Lane, Antioch
041-100-007	4900 Beldin Lane, Oakley
051-220-045	5234 Elm Lane, Oakley
041-090-037	4790 Knarlwood Rd, Oakley
051-230-008	3201 Stroer Lane, Antioch
051-032-009	2600 Wilbur Ave, Antioch

Source: Morris, 2010

References

Black & Veatch. 2009. Contra Costa Generating Station, Oakley, California. Preliminary Geotechnical Report. June.

Morris, Barbara / Senior Clerk, Contra Costa Environmental Health Division. 2010. Personal communication with Lisa Porta/CH2M HILL. January.

Tetra Tech, Inc. 2009. Phase I Environmental Site Assessment Contra Costa Generating Station Site Oakley, California. August.

U.S. Geological Survey (USGS). 2009. National Water Information System. Date accessed: January 7th, 2010. Website accessible at: http://wdr.water.usgs.gov/nwisgmap/.

b. *If possible, please provide pumping rates for production wells in the vicinity of the project site.*

Response: As discussed in the response to Data Request #66a, the approximate locations of the seven production wells in the vicinity of the project site were provided by the Contra Costa County Environmental Health Division (CCCEHD). However, the CCCEHD does not release well construction and well pumping records to a person other than the well owner or a person entitled by the owner to review the records. Therefore, no pumping rates for production wells can be provided.

Wetland Contaminants

67. *Please discuss what, if any, contaminants may be transported to the wetland and what the potential is for groundwater contamination.*

Response: The wetland (Wetland "E" on the project site) occupies an approximate area of 0.62 acre in the northwestern corner of the project site (see Figure DR67-1). The wetland was

built as a mitigation wetland to collect stormwater runoff from surrounding areas. The shallow portion of the wetland lies at 5 feet above mean sea level, which is lower than the seasonal water table (see response to Data Request #65), and thus the wetland is seasonally in contact with shallow groundwater at the site. Pathways of potential contaminants to the wetland are: (a) transportation via surface runoff from stormwater and (b) discharge from groundwater when the water table rises, especially in the spring. In the case of (a) above, the potential contaminants could travel from surface runoff to the wetland and subsequently be discharged into the groundwater when the groundwater table decreases and water from the wetland moves downward into the subsurface.

Identification of potential contaminants at the site and within the 1 mile buffer zone (see Figure DR67-1) is done through an analysis of past and present land uses. Land use types determine the type of substances that might have been released to the environment and local hydrological features determine the potential threat for wetland and groundwater contamination.

The project site is part of the former Oakley DuPont chemical plant property, which was in operation between 1956 and 1999. While in operation, the chemical plant's production areas, located north and northeast of the project site (see Figure DR67-1), released various chemicals and hazardous materials into the environment, which affected the quality of soil and groundwater (Tetra Tech, 2009). According to the Phase 1 Environmental Site Assessment (ESA):

> Chemicals identified in soil and/or groundwater include arsenic, tetrachloroethylene ("PCE"), TPH-gasoline, TPH-diesel, TPH-motor oil, 1,1,1-tetrachloroethylene, 1,1-dichloroethane, tetraethyl lead, carbon tetrachloride, vanadium, trichloroethylene ("TCE"), 1,1-dichloroethylene, vinyl chloride, lead, freon, and various hydrocarbon solvents.

Because of the presence of these chemicals, remediation and groundwater monitoring are currently in progress at the former production sites, under RCRA (Resource Conservation Recovery Act). The California Department of Toxic Substances Control has determined that residual chemicals on the former DuPont property do not threaten the soil and groundwater quality at the project site. In addition, the western area of the former DuPont property, which encompasses the project site, has been released for unrestricted land use since 2006.

The portion of the former DuPont property located directly south of the project site (refer to Figure DR67-1), was never used for any chemical production activities. Historical aerial photographs show that this site was used for agricultural land use (mostly wine grapes) before, and while the chemical plant was in production (CH2M HILL, 2009). The project site itself has also been used for grapevine production in the past (Tetra Tech, 2009). Agricultural production on these sites has released various herbicides on the soil, with the potential for infiltration into groundwater. Based on various monitoring activities at the site, residual chemicals from herbicides are not considered a threat to the environment (Tetra Tech, 2009).

Current land uses within the 1-mile buffer zone include agricultural (at the project site as well as to the south and east of the site), industrial (directly surrounding the project site), residential (at the far south), and interspersed open space and commercial land use. A utility parcel is also located to the northwest of the project site on the other side of State Route 160.

A map of land use types and distribution in the vicinity of the project site is given in AFC Figure 5.6-1.

From this map it can be seen that no active industrial sites exist currently in the vicinity of the project site. There is a limited potential for agricultural herbicides and pesticides to be carried to the wetland by surface runoff during storms, as well as leaching of these chemicals into groundwater. There are no data to support any existing effects to water quality from pesticides; further study would be needed to assess these potential impacts.

This wetland will be protected during construction and operation of the proposed project through implementation of erosion and sediment control best management practices (BMPs) (AFC Section 5.11, Soils). The BMPs will decrease the potential for contaminants to reach the wetland and infiltrate into the subsurface under the wetland area. Thus, the construction of the OGS will not alter affect the wetland or groundwater.

References

CH2M HILL, Inc. 2009. Contra Costa Generating Station Stormwater Management Design, Wetland E. August.

Tetra Tech, Inc. 2009. Phase I Environmental Site Assessment Contra Costa Generating Station Site Oakley, California. August.

* - Includes domestic and agricultural wells

SOURCE: Contra Costa Environmental Health Division, 2010.
USGS, 2009.

This map was compiled from various scale source data and maps and is intended for use as only an approximate representation of actual locations.

FIGURE 67-1
HISTORIC LAND USE AT AND SURROUNDING THE PROJECT SITE
CONTRA COSTA GENERATION STATION
OAKLEY, CALIFORNIA

CH2MHILL

SAC\\ZION\SACGIS\PROJ\RADBACKENERGY\385962\MAPFILES\FIG1_GROUNDWATER_WELLS_WITHIN_1_MILE_PROJECT_SITE.MXD MHASKELL 2/4/2010 10:05:06
IS012010223151SAC Figure_67-1.ai 02.26.2010 tdaus

ATTACHMENT DR47-1

ECIRWPF Report

Delta Diablo Sanitation District

Central Contra Costa Sanitary District
Protecting Public Health and the Environment

CITY OF PITTSBURG

CONTRA COSTA WATER DISTRICT

IRONHOUSE SANITARY DISTRICT

CITY OF ANTIOCH CALIFORNIA

MIRANT

PG&E

East County Industrial Recycled Water Facilities Plan

Final

Prepared by:

RMC Water and Environment

October 2009

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List of Abbreviations

ADPM	average day of the peak month
ADWF	average dry weather flow
af	acre feet
afy	acre feet per year
Calpine	Calpine Corporation
Canal	Contra Costa Canal
CCCCDB	Contra Costa County Community Development Board
CCCPWD	Contra Costa County Public Works Department
CCCSD	Central Contra Costa Sanitary District
CCWD	Contra Costa Water District
CDPH	California Department of Public Health
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CPUC	California Public Utilities Commission
CVP	Central Valley Project
DDSD	Delta Diablo Sanitation District
DEC	Delta Energy Center
Delta	Sacramento-San Joaquin River Delta
DI	ductile iron
DMMs	demand management measures
East County	East Contra Costa County
ECCID	East Contra Costa Irrigation District
EIR	Environmental Impact Report
GSWC	Golden State Water Company
gpcd	gallons per capita per day
gpm	gallons per minute
GWF	GWF Power Systems
hp	horsepower
HPCA	East Contra Costa County Habitat Conservation Plan Association
ISD	Ironhouse Sanitary District
kWh/af	kilowatt-hours per acre-foot
LF	linear feet
LMEC	Los Medanos Energy Center
M&I	municipal and industrial
Mirant	Mirant Corporation
MG	million gallons
mgd	million gallons per day
MG/L	milligrams per liter
MND	Mitigated Negative Declaration

NPDES	National Pollutant Discharge Elimination System
PG&E	Pacific Gas and Electric Company
Plan	Recycled Water Facilities Plan
ppm	parts per million
RFO	Request for Offers
RWF	Recycled Water Facility
SWRCB	California State Water Resources Control Board
TDS	total dissolved solids
UV	ultraviolet
UWMP	Urban Water Management Plan
WWTP	Water Pollution Control Facility
WWTP	Wastewater Treatment Plant

Common Recycled Water Terms

Primary Treatment	The mechanical process to remove suspended and settleable solids and organic matter from wastewater.
Raw Water	Surface water or groundwater that has not been treated in any way.
Recycled Water	Municipal wastewater that has gone through various treatment processes to meet specific water quality criteria with the intent of being used in a beneficial manner (such as irrigation or industrial cooling process).
Secondary Treatment	The biological and chemical processes to remove biodegradable organic matter (in solution or suspension) and suspended solids. Usually the process follows primary treatment by sedimentation.
Tertiary Treatment	Removal of residual suspended solids (after secondary treatment), usually by granular medium filtration, surface filtration, or membranes. Disinfection is also typically a part of tertiary treatment.
Title 22 Regulation	The State of California regulations for how treated and recycled water is used and discharged is listed in Title 22 of the California Administrative Code. The statewide Water Recycling Criteria are developed by the Department of Health Services and enforced by the nine State Regional Water Quality Control Boards.
Wastewater	Water discharged untreated from homes, business, cities, industry, and agriculture.
Water Reclamation	Treatment or processing of wastewater to make it reusable with definable treatment reliability and water quality criteria.
Water Recycling	The use of wastewater that is captured and redirected back into the same water use scheme such as in industry. However, the term water recycling is often used synonymously with water reclamation.
Water Reuse	The use of treated wastewater for a beneficial use, such as agricultural irrigation and industrial cooling.

Chapter 1 Introduction

Several wastewater agencies, water purveyors, cities, and corporations in east Contra Costa County (East County) are currently pursuing a mutually beneficial project aimed at evaluating the feasibility of implementing regional industrial recycled water projects in the Pittsburg/Antioch industrial corridor. The project partners that participated in this effort include:

- **Delta Diablo Sanitation District (DDSD):** DDSD provides wastewater collection and treatment services for 184,000 customers within Antioch, Pittsburg and unincorporated community of Bay Point (Bay Point). Through agreements with the Contra Costa Water District (CCWD) and the cities of Antioch and Pittsburg, DDSD also has recycled water purveyorship rights within the DDSD service area.
- **Central Contra Costa Sanitary District (CCCSD):** CCCSD provides wastewater collection and treatment services for approximately 465,000 residents in the central Contra Costa County area. CCCSD is also the producer and purveyor of 200 million gallons (MG) per year of recycled water through an agreement with the local potable water purveyor, CCWD.
- **Ironhouse Sanitary District (ISD):** ISD provides wastewater collection, treatment, storage and disposal to more than 30,000 people residing in the communities of Oakley and Bethel Island and portions of unincorporated Contra Costa County.
- **Contra Costa Water District (CCWD):** CCWD serves a population of approximately 550,000 people in north, central and east Contra Costa County. CCWD is a wholesale and retail water purveyor for the recycled water service area and provides treated potable water to a large area (Treated Water Service Area) in central Contra Costa County, including Concord and portions of Walnut Creek and Pleasant Hill. CCWD draws the majority of its water from the San Joaquin River (Rock Slough, Old River, and, occasionally, Mallard Slough), which is within the Sacramento-San Joaquin Delta (Delta), under a contract with the federal Central Valley Project (CVP).
- **City of Antioch (Antioch):** Antioch provides water distribution and wastewater collection services for over 100,000 residents. Antioch treats and distributes Delta water supplies purchased from CCWD and supplements its water supplies with San Joaquin River water rights. Antioch also maintains a wastewater collection system that connects to the DDSD wastewater collection system and Wastewater Treatment Plant (WWTP).
- **City of Pittsburg (Pittsburg):** Pittsburg provides water treatment and distribution and wastewater collection services for approximately 57,000 residents. Pittsburg treats and distributes Delta water supplies purchased from CCWD. In addition, Pittsburg maintains a wastewater collection system that connects to the DDSD wastewater collection system and WWTP.
- **Mirant Corporation (Mirant):** Mirant operates 13 generating plants that produce approximately 10,300 megawatts (MW) of electricity for wholesale and large retail customers in the metropolitan areas of San Francisco, Washington, D.C., Boston, and New York City. Approximately half of the plants are base-load units and the other half are peaking units. In East County, Mirant currently operates Pittsburg and Contra Costa Power Plants, which were acquired from PG&E in 1999.
- **Pacific Gas and Electric Company (PG&E):** PG&E, which is based in San Francisco, is one of the largest combination natural gas and electric utilities in the United States. The company provides natural gas and electrical service to approximately 15 million residents of northern and central California.

This Recycled Water Facilities Plan (Plan) documents the results from this study which included:

- Characterization of the project setting;
- Assessment of the industrial recycled water market in the Pittsburg/Antioch industrial corridor, which lies within the DDSD service area;
- Development and evaluation of recycled water project alternatives;
- Recommended Facilities Plan;
- Documentation of recycled water market assurances; and
- Preparation of a construction financing plan and implementation plan for the preferred project.

1.1 Background

East County is a rapidly growing and diverse region located on the southwestern shore of the Delta. Although it is a relatively isolated region with a distinct set of water management challenges, activities in East County have ramifications for the entire California water supply. With the exception of limited groundwater supplies, the large majority of water supply for the region derives from the Delta and lands that drain to the Delta.

This Plan focuses on the Pittsburg/Antioch area of East County, coinciding with the area's existing recycled water purveyor, DDSD. In 2001, DDSD completed construction of a 12.8 million gallons per day (mgd) Recycled Water Facility (RWF) and has been providing approximately 7 mgd of recycled water supply on average to two Calpine Corporation (Calpine) power plants and some parks with Pittsburg ever since.

In 2004, DDSD received a recycled water planning grant from the State Water Resources Control Board (SWRCB) to evaluate the feasibility of expanding recycled water use within its service area, which includes Antioch, Pittsburg and unincorporated community of Bay Point. A Recycled Water Facilities Plan for the Pittsburg/Bay Point area was completed in 2005 and a Recycled Water Facilities Plan for Antioch was completed in 2007. Although potential industrial reuse demands were identified in both of these recycled water facilities plans, the primary focus of each was development of irrigation reuse projects. Both plans specifically stated that additional evaluation would be needed to develop any industrial reuse projects, and that additional recycled water supply sources may be required to serve the potential industrial demands.

Recent developments have prompted the need for further evaluation of industrial reuse opportunities within the DDSD service area. Since completion of the previous recycled water facilities plans, Mirant and PG&E have expressed interest in constructing new power plants within the DDSD service area, near existing industries within Pittsburg and Antioch1. The viability of these and other new industrial projects within the DDSD service area may be contingent upon securing a reliable water supply. Power plants currently have a range of cooling technologies available to them, from dry cooling with air-cooled condensers to wet cooling with cooling towers. The cooling method selected is determined by the power generator; recently, PG&E elected to implement dry cooling at its Gateway Power Generation Facility in Antioch because it minimized the need to rely upon outside agencies and facilities to provide supporting infrastructure. Dry cooling systems are available at higher costs so the owners of new industrial facilities

[1] Mirant's existing power plants in Pittsburg and Antioch use once-through cooling technology, which requires substantial water supplies (over 100 mgd) that vastly exceed potential recycled water supplies. The two plants are currently operated intermittently to meet peak demands, so even if there were sufficient new water supplies to meet the demand, the cost effectiveness of constructing a new water supply system would be significantly reduced because the facilities with a large capacity would require and use a limited volume of water for a very limited time during the year. Therefore, given the current cooling technology, the existing Mirant plants were not considered feasible recycled water customers at this time. However, if and when this cooling technology is changed in the future, opportunities for recycled water and surface water will need to be reevaluated.

will ultimately select the appropriate technology for their operations based on many factors, including the availability and cost of water supplies. The existing DDSD recycled water supplies are limited; however, there are additional recycled water supplies available from adjacent wastewater utilities and untreated (raw) surface water supplies from CCWD.

The purpose of this Plan is to evaluate the feasibility of constructing regional industrial reuse projects to serve new industrial demands within the DDSD service area and compare with surface water alternatives. Development of this Plan is desirable for a variety of reasons:

- Several regional partners, including CCWD, Pittsburg, Antioch, ISD and CCCSD have expressed a willingness to evaluate water supplies for potential new industries in the study area;
- Major industrial users (e.g. Mirant and PG&E) have expressed interest in citing a facility in the area and using recycled water;
- Using recycled water to serve industrial demands would conserve the use of water supplies from the Delta;
- A regional industrial reuse project would make use of a valuable resource that would provide other benefits when discharged to the Delta; and
- Expanded use of recycled water is consistent with the DDSD mission statement to be environmental stewards.

Given these reasons, DDSD has formed a partnership with the aforementioned wastewater agencies, water agencies, municipalities and industry partners to explore the use of additional recycled water to meet industrial needs and assess the full potential of the industrial recycled water market within the DDSD service area.

1.2 Report Organization

This Plan consists of five sections and is organized as follows:

Section 1 – Introduction (this section)

Section 2 – Project Setting: This section characterizes the study area, including climate, hydrologic features, land use, water supply and use, wastewater treatment and disposal, and existing recycled water use.

Section 3 – Recycled Water Market Assessment: This section identifies potential industrial users of recycled water within the study area, providing information on both the quantity and quality of recycled water supplies needed.

Section 4 – Recycled Water Alternatives: This section discusses the methodology for developing and evaluating various industrial recycled water project alternatives. It defines the design assumptions and provides a detailed description of each project alternative, including a "No Project Alternative."

Section 5 – Recommended Alternative & Facilities Plan: This section describes the preferred project, including the operational strategy, cost, implementation plan and financing plan.

Chapter 2 Project Setting

This section provides a characterization of the study area, including information on climate, population, land use, water supply and use, wastewater treatment and disposal and existing recycled water use. The study area is defined as the DDSD service area, which includes Antioch, Pittsburg and the unincorporated community of Bay Point as well as conveyance facilities that would be necessary for delivery of recycled water from adjacent wastewater districts: Central San to the west and ISD to the east (see **Figure 2-1**).

2.1 Study Area Characteristics

The following provides general characteristics of the study area:

Location: The study area is located in eastern Contra Costa County at the confluence of the San Joaquin and Sacramento Rivers, approximately 40 miles northeast of San Francisco. It is bordered by the Concord Naval Weapons Station to the west, the Sacramento River and Suisun Bay/Delta to the north, the foothills of the Mt. Diablo range to the south, and the cities of Oakley and Brentwood to the east.

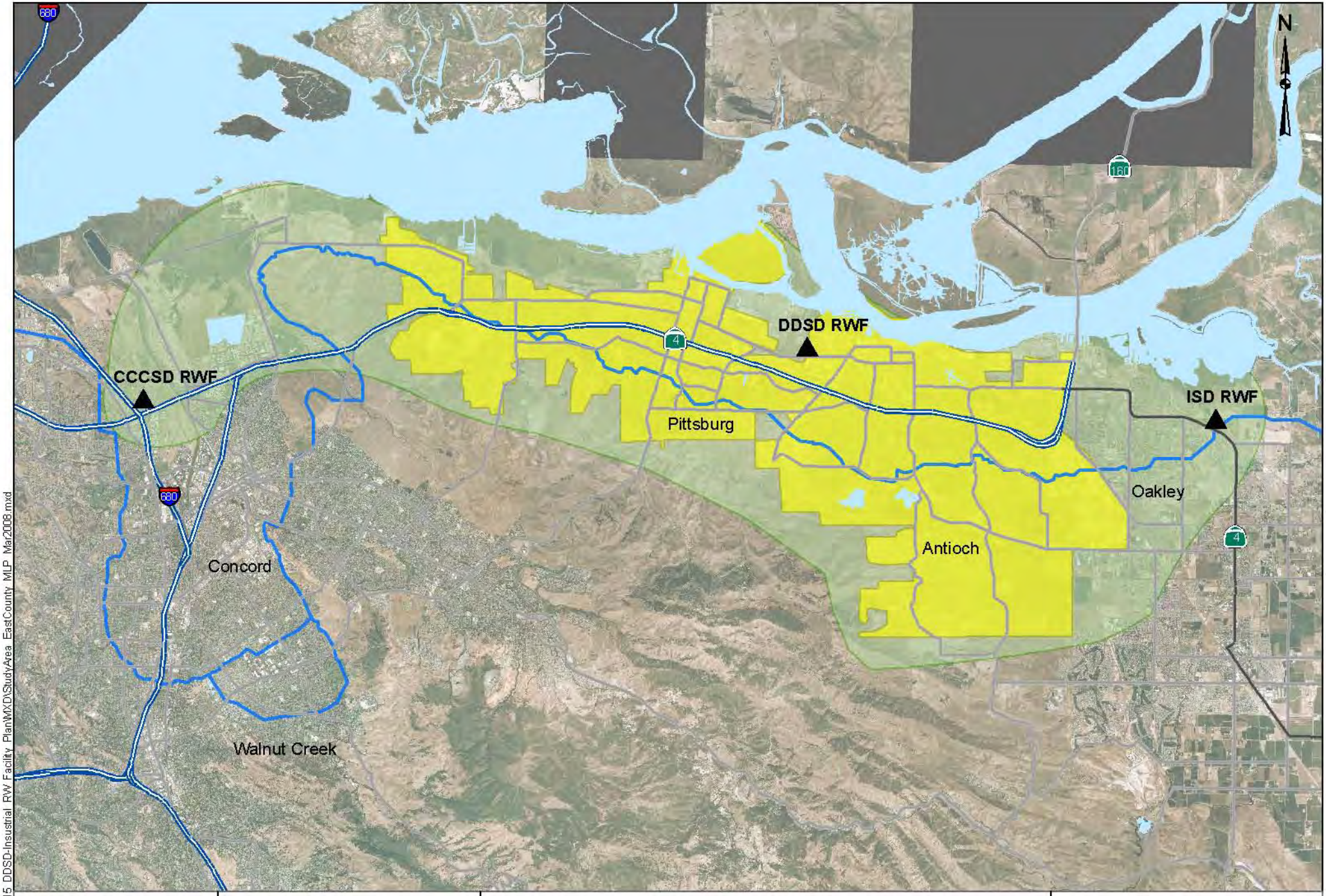
Climate: The climate of the study area is characterized by hot, dry summers and cool, wet winters. Most of the precipitation occurs from November to March with little to no precipitation occurring during the summer months from June to September.

Soils and Topography: The topography of the study area slopes upward in a southwesterly direction from an approximate elevation of 5 feet above sea level along the San Joaquin River to an approximate elevation of 1,500 feet in the Mt. Diablo foothills (CCCCDB and CCCPWD, 2003). The low-lying areas along the San Joaquin River are underlain mostly by clay loam soils. The southeastern portion of Antioch is underlain with mostly clay soil, as well as some alkali clays and loams. The higher elevation areas in the southwestern portion of Antioch are underlain by Altamont-Fontana Complex soils (HPCA, 2005).

The coastal areas are underlain by Bay Mud which consists of unconsolidated silt and clay with abundant organic material, peat, sand and gravel lenses. Further inland is underlain by alluvial deposits of sand, silt and clay. The hills generally consist of tilted marine sedimentary and volcanic rocks (Carollo, 2000).

Hydrologic Features: The study area spans a number of hydrological boundaries. Bay Point and a portion of Pittsburg lie in the Willow watershed, which consists of mostly intermittent streams all draining from the Mt. Diablo foothills into Suisun Bay (CCCCDB and CCCPWD, 2003). Most of Pittsburg and a small portion of western Antioch, including the DDSD treatment facility, fall within the 11,300-acre Kirker Creek Watershed. Kirker Creek flows from the Mt. Diablo foothills into the New York Slough. Most of the Antioch area falls within the watersheds of East and West Antioch Creeks. Other watersheds that contain portions of Antioch include the Lower Marsh Creek watershed in the south, and the small Delta drainage known as the Oakley Sub-basin along the San Joaquin River in the northeast (CCCCDB and CCCPWD, 2003). The CCCSD treatment facility falls into a watershed named Grayson and Murderer's Creek watershed, while the ISD treatment facility falls into the East County Delta drainages.

The study area overlies two groundwater basins. Bay Point and Pittsburg overlie the Pittsburg Plain Groundwater Basin, while Antioch lies on the western limit of the Tracy sub-basin of the San Joaquin Valley Groundwater Basin. Hydrographs created from California Department of Water Resources well data indicate that groundwater levels for the both basins have remained fairly stable over the period of record with the exception of season variation due to recharge and pumping for the Tracy sub-basin and the recent 1976-1977 and 1987-1992 drought periods for the Pittsburg Plain Groundwater Basin (DWR, 2003).



RMC Water and Environment

1 inch equals 2.3 miles

0 1 2 4

Miles

DDSD ServiceArea

Industrial Reuse Study Area

Wastewater Treatment Plant

Contra Costa Canal

Figure 2-1

East County - Study Area

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Sources:

2.2 Land Use Trends and Population Projections

This section presents land use information and population projections.

2.2.1 Land Use Trends

The existing land use within the study area is summarized in **Table 2-1** and shown in **Figure 2-2**. As indicated in the table, industrial uses comprise 2% of the land use in Antioch and 19% of the land use in Pittsburg / Bay Point.

Table 2-1: Existing Land Use in Study Area

Land Use Type	Antioch[1]		Pittsburg / Bay Point[2]		Study Area Total	
	Total Acres	Percent of Total	Total Acres	Percent of Total	Total Acres	Percent of Total
Residential	3,871	23%	2,704	33%	6,575	26%
Commercial	456	3%	423	5%	879	4%
Industrial	400	2%	1,515	19%	1,915	8%
Agricultural	928	6%	--	--	928	4%
Vacant	6,383	38%	--	--	6,383	26%
Other Open Space	4,759	28%	--	--	4,759	19%
Public/Quasi Public	--	--	461	6%	461	2%
Parks/Open Space	--	--	2,665	33%	2,665	11%
Utility/ROW	--	--	354	4%	354	1%
Total	**16,797**	**100%**	**8,122**	**100%**	**24,919**	**100%**

-- Not reported

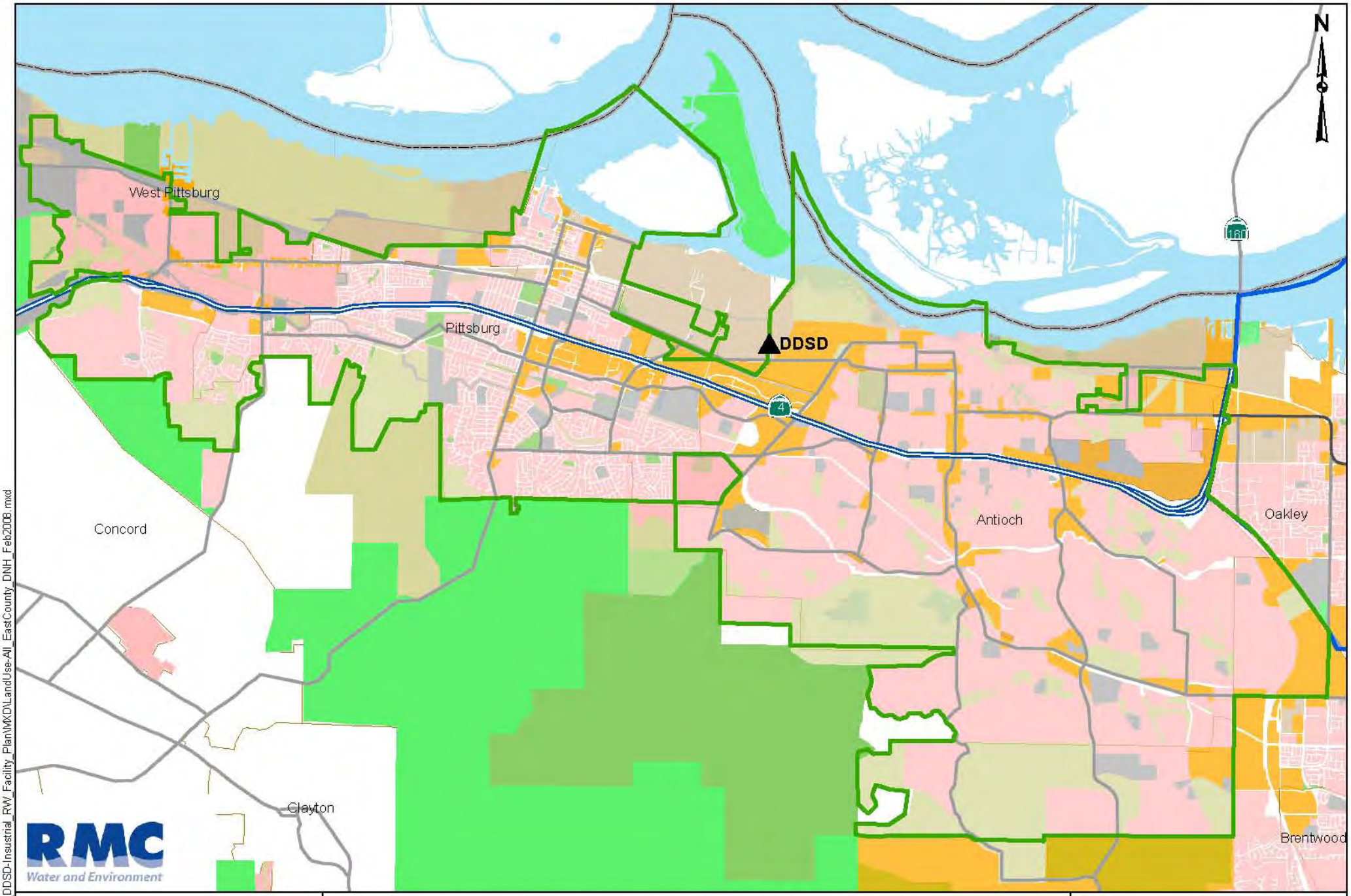
Notes:

1. Source: Antioch and Mundie Associates, 2003
2. Source: Pittsburg, 2001

Antioch

Despite substantial development in the past, Antioch has a great deal of land available for future development. Approximately 38% of the land within Antioch is vacant. Additional land (6%) is in agricultural use and may be available for future development, depending upon its land use designation. Overall, open space uses, including agricultural, open water, recreational lands, and vacant lands account for approximately half of the land within Antioch. Within the developed portion of the city, single-family residential uses cover the largest area (23%) (Antioch and Mundie Associates, 2003).

Current industrial land use in the Antioch area is concentrated in the northern portion of the city to the west and east of Rivertown. The Antioch General Plan calls for future large-scale industrial uses to be concentrated along the waterfront east of Rodgers Point and within areas designated for industrial use along existing rail lines (Antioch and Mundie Associates, 2003).



1 inch equals 1.34 miles

0 0.4 0.8 1.6 2.4 Miles

Wastewater TP
ISD Service Area
DDSD Service Area
County Boundary
City
Water Body
Agriculture
Commercial
Parks and Recreation
Open Space
Public/Semi-Public
Industrial
Residential

Figure 2-2
Existing Land Use

C:\RMCLA-GIS\0013-015_DDSD-Insustrial_RW_Facility_Plan\MXD\LandUse-All_EastCounty_DNH_Feb2008.mxd

Sources:

Pittsburg / Bay Point

The land use pattern within Pittsburg/Bay Point can be traced to Pittsburg's heritage as Contra Costa County's industrial center. Both the historic downtown and adjacent industrial waterfront evolved along the shores of the Sacramento River, which was a shipping route for goods. As the city grew southward, residential subdivisions became dominant, and regional streets and highways such as State Route 4 became major transportation routes (Pittsburg, 2001). Residential use represents approximately 33% of total land use in the Pittsburg/Bay Point area. Open space accounts for another 33% of land use. In Pittsburg, there are many industries related to steel, petroleum and chemical production. Industrial use makes up about 19% of total use (Pittsburg, 2001).

Today, the waterfront is host to major manufacturing operations such as USS-POSCO, Dow Chemical, Mirant's Pittsburg power plant, Calpine's Delta Energy Center (DEC), and Calpine's Los Medanos Energy Center (LMEC). All industrial uses are located north of State Route 4, primarily within the Northeast River and Loveridge subareas, with the exception of the Southern Energy power plant (formerly owned by PG&E) west of Downtown. A smaller pocket of industrial uses is located along the BNSF and Southern Pacific railroad tracks in the West Central subarea. Future industrial uses that are anticipated are: manufacturing, wholesale, warehousing and distribution, commercial and business services, research and development, and storage uses are permitted, in addition to agricultural, food and drug, and industrial processing.

2.2.2 Population Projections

The study area contains significant potential for future growth in terms of population. **Table 2-2** provides a summary of population projections for the study area based on each jurisdiction's Urban Water Management Plans (UWMP). As shown in this table, the population for the study area is expected to increase 34% from 2005 to 2030, with Pittsburg experiencing the most rapid growth.

Table 2-2: Population Projections in Study Area

	2005	2010	2015	2020	2025	2030	% Increase
Antioch[1]	101,049	102,900	109,350	115,800	118,800	121,800	21%
Pittsburg[2]	62,605	67,800	73,800	80,700	87,800	95,500	53%
Bay Point[3]	23,923	25,142	28,087	30,069	31,502	33,184	39%
Total	**187,577**	**195,842**	**211,237**	**226,569**	**238,102**	**250,484**	**34%**

Notes:

1. Source: Brown & Caldwell, 2005. Population projection for 2030 was estimated based on projecting the growth rate from 2020 to 2025.
2. Source: Pittsburg, 2005.
3. Source: CH2MHill, 2005.

2.3 Water Supply and Use

This section describes the various water supplies used within the study area (except for recycled water, which is discussed in Section 3.3), the major water facilities, current rates, and water use trends.

2.3.1 Water Supply Characteristics and Facilities

There are a variety of water agencies that supply water in the study area.

- Contra Costa Water District
- City of Antioch
- City of Pittsburg
- Community of Bay Point

Contra Costa Water District

CCWD is a retail and wholesale water provider for portions of north, central, and east Contra Costa County. CCWD operates and maintains a complex system of water transmission, treatment, and storage facilities to supply both treated and untreated (raw) water to its customers. Raw water customers include: Antioch, Golden State Water Company (GSWC) (which serves Bay Point), Diablo Water District, Pittsburg, and several large industrial, landscape irrigation, and agricultural customers. Treated water customers include: Clayton, Clyde, Concord, Pacheco, Port Costa, and portions of Martinez, Pleasant Hill, and Walnut Creek. In addition, CCWD treats and delivers water to the City of Brentwood, GSWC (Bay Point) and Antioch.

Water Supply Sources

CCWD draws its water from the Delta under a contract with the United States Bureau of Reclamation (USBR) for water from the CVP and transports the water to its service area via the Contra Costa Canal (Canal). CCWD Delta intakes include Old River (at State Route 4) intake and Rock Slough diversions at Canal Pumping Plant No. 1. The CCWD long-term CVP contract with USBR, which was renewed in 2005, provides a maximum supply of 195,000 afy to CCWD.

Other CCWD sources include supplies from East Contra Costa Irrigation District (ECCID), Mallard Slough, and a minor amount of local well water. CCWD has an agreement with ECCID to purchase surplus irrigation water to be used for municipal and industrial (M&I) purposes in the ECCID service area. The agreement allows CCWD to purchase up to 8,200 afy for service in the overlap area with ECCID, and an option for up to 4,000 afy of groundwater (by exchanges) if the CVP is in a shortage situation. This exchange water can be used anywhere within the CCWD service area. CCWD also has additional water rights at Mallard Slough for a maximum diversion of Delta water of up to 26,700 afy. CCWD groundwater wells are immediately adjacent to Mallard reservoir. The wells have limited use (less than 1,000 afy) as an alternative short-term supply.

The CCWD CVP water source is affected by regulatory conditions in the Delta and drought. Based on the 2001 *Draft M&I Water Shortage Policy* (USBR), CCWD CVP reliability ranges from 65 percent to 100 percent of the supply allocation in critical or multiple dry years. The *Draft M&I Water Shortage Policy* assumes that M&I allocations will not be reduced below 75 percent until agricultural allocations fall below 25 percent of the contract amount. The CCWD situation is unique within the CVP so it is not subject to the same supply limitations as other CVP contractors.

Under multiple year drought conditions or critical years, the *Draft M&I Water Storage Policy* indicates that USBR will deliver CVP water to municipal and industrial customers at levels that are not less than a public health and safety water supply level, which CCWD has determined to be 65 percent.

The industries served by CCWD are a significant source of jobs and revenue for Contra Costa County and the State of California. Driven by the incentives to reduce costs and the risks of production losses, many industries have aggressively pursued water conservation practices for twenty years. As a result, significant water conservation has been achieved and further water reduction may be more difficult and much more expensive. Thus, CCWD does not anticipate reducing deliveries to industry below 95 percent during critical or multiple dry years.

Water System Facilities

Major facilities for the CCWD raw water system include the Contra Costa Canal (and associated pumping and storage facilities) and the Los Vaqueros Project:

> **Contra Costa Canal:** The Canal is the oldest unit of the CVP. It was originally constructed to serve agricultural needs and now comprises the backbone of the CCWD untreated water conveyance system. The Canal conveys water from the Delta to the CCWD treatment facilities and untreated water customers. Water is supplied to the Canal from Old River (via the Los

Vaqueros Project pipelines), Mallard Slough, and Rock Slough. Spanning 48 miles in total length, the Canal starts at Rock Slough in East County, passes through several communities including the cities of Oakley, Antioch, Pittsburg, and Bay Point, and ends at the terminal reservoir in Martinez (Martinez Reservoir).

Pump Stations: The Canal system includes a series of four pump stations (Pumping Plants One through Four) that lift the water from Rock Slough to a height of 126 feet above sea level, after which water flows via gravity to the terminal reservoir in Martinez. In addition to these pump stations, CCWD operates the Mallard Slough Pump Station. This facility, which was rehabbed in 2001 as part of the Seismic Reliability Improvement Project, provides water for fire suppression and serves as a back-up water supply facility in the event of catastrophic failure of the Canal.

Reservoirs: Four reservoirs (Contra Loma Reservoir, Martinez Reservoir, Mallard Reservoir, and Los Vaqueros Reservoir) provide approximately 110,000 af of storage capacity for untreated water supplies. The Contra Loma Reservoir is used to provide emergency storage, to regulate flows in the Canal, to meet peak flows, and to provide back-up supplies during periods of Canal maintenance. The Martinez Reservoir and the Mallard Reservoir serve as terminal storage for flow regulation and emergency use. The Los Vaqueros Reservoir provides emergency storage and high quality water for blending.

Los Vaqueros Project: The Los Vaqueros Reservoir Project, completed in 1998, includes a 100,000 AF reservoir, intake and pump station at Old River, and transmission facilities. Water diverted from Old River can be stored in the Los Vaqueros Reservoir or conveyed by pipeline to the Canal system. The Los Vaqueros Reservoir provides water quality benefits to CCWD because it provides the ability to store high quality water from Old River to use for blending during dry periods when salinity at the CCWD Delta intakes tends to increase. This ensures delivery of high-quality water to CCWD customers year-round.

Major facilities for the CCWD treated water system include the Bollman WTP and Randall-Bold WTP (and associated distribution facilities) and the Multi-Purpose Pipeline:

Water Treatment Plants: CCWD operates two water treatment facilities. The 75 mgd Bollman WTP serves CCWD treated water customers in Central Contra Costa County. The 40 mgd Randall-Bold Water Treatment Plant currently provides treated water to Diablo Water District and the cities of Brentwood and Antioch. An additional 12 mgd water treatment facility was constructed at the Randall-Bold site. This facility is operated in partnership with Brentwood to serve demands within the city.

It should be noted that several of CCWD untreated water customers, including Antioch, Martinez, Brentwood, and Pittsburg, also operate their own water treatment facilities. Facilities operated by Antioch and Pittsburg are discussed later in this section. These facilities treat water from the Canal prior to distribution to their respective communities.

Distribution Facilities: CCWD treated water distribution facilities include more than 800 miles of pipeline, 30 pump stations, and 40 active storage reservoirs. The total treated water storage capacity is approximately 70 MG.

Multi-Purpose Pipeline: The 21-mile Multi-Purpose Pipeline (MPP) was constructed in 2003 to increase CCWD water system capacity and to improve system reliability. The MPP delivers treated water via 42-inch steel pipe from the Randall-Bold WTP to customers in Central Contra Costa County, allowing greater capacity in the Canal for use by wholesale municipal and industrial customers.

In addition to the facilities described above, CCWD has embarked on several recent infrastructure improvement projects to improve the quality and reliability of its supplies:

Alternative Intake Project: The Alternative Intake Project is a water quality project that will add a new drinking water intake for CCWD in the central Delta. The alternative intake would enable CCWD to relocate some of its diversions to a Delta location with better source water quality than is currently available at the Old River and Rock Slough intakes. It would allow CCWD to divert higher quality water, but would not increase the amount of water pumped from the Delta (rate or annual quantity). Initial planning work has identified the lower third of Victoria Canal as the most feasible location for a new intake. The project would include construction of a fish screen, pumping plant, and associated conveyance facilities from the new intake to the existing CCWD Old River conveyance system, which has a capacity of 162 mgd.

East Bay Municipal Utility District (EBMUD) Intertie: This joint project among CCWD, EBMUD, and the Freeport Regional Water Authority (FRWA) will function as an emergency connection between EBMUD Mokelumne Aqueduct and CCWD Los Vaqueros Pipeline, enabling the agencies to share water resources in the event of an emergency. The project is currently under construction. Its primary use will be to wheel a portion of CCWD CVP supply through the FRWA and EBMUD facilities.

Canal Replacement Project: CCWD is currently in the process of modifying portions of the unlined Canal to improve the quality of source water available to its customers, improve security and public safety, and ensure that CCWD water supply conveyance facilities are compatible with the changing land uses immediately adjacent to the Canal. This multi-phase project involves encasing four miles of unlined Canal.

Water Rates

Raw water supplies from CCWD are currently $0.001537 per gallon ($501/af) and treated water supplies from CCWD are currently $0.003321 per gallon ($1,082/af) (CCWD, 2008).

Antioch

Antioch provides water distribution services for over 100,000 residents and serves about 29,860 connections within the city and some adjacent land in unincorporated areas to the northeast and west.

Water Supply Sources

Antioch receives water supplies from two main sources: 1) CCWD; and 2) San Joaquin River. Antioch's primary source of supply is raw water obtained from CCWD via the Canal. Unless constrained by conditions in the Delta, the supplies purchased from CCWD will meet projected water needs through the year 2028 (Brown & Caldwell, 2005).

Antioch also has pre-1914 water rights for the San Joaquin River that allow for a 16 mgd diversion. However, actual diversions from the river are limited due to poor water quality conditions in dry years. Antioch therefore relies on CCWD to meet the majority of customer demands. In the last five years, Antioch has pumped an average of 6,438 afy from the river (Brown & Caldwell, 2005). Antioch is currently investigating an alternative San Joaquin River intake location to improve the quality and quantity of extracted water throughout the year.

Water System Facilities

The water system is comprised of the following components (Antioch, 2003; Antioch, 2005):

Water Treatment Plant: Antioch owns and operates a 26 mgd water treatment plant, with available room to expand the plant to a 56 mgd capacity. The plant can receive water pumped directly from the Canal or from the municipal reservoir.

Municipal Reservoir: The 735 af (240 MG) municipal reservoir provides supply reliability and volume for equalization storage for water pumped from the Canal and San Joaquin River.

Distribution System: Antioch's distribution system consists of four primary pressure zones. The system includes transmission and distribution lines ranging in size from 4 to 30 inches in diameter.

Other Storage Reservoirs: Antioch currently has 12 storage reservoirs within the distribution system with a combined capacity of 22 MG. Proposed expansion of the storage reservoir system will increase the available storage to 25.7 MG by 2028.

Water Rates

The water rates for Antioch are divided into four zones and currently range from $1.73/ccf to $2.07/ccf ($754/af to $902/af) (Darone/Antioch, 2008).

Pittsburg

Pittsburg provides water treatment and distribution services for approximately 57,000 residents.

Water Supplies Sources

The primary source of supply for Pittsburg is raw surface water from CCWD delivered through the Canal. Pittsburg's 2005 UWMP notes that current demands can be met under all supply conditions; however, beginning in 2010, short-term water purchases and/or voluntary short-term conservation may be required in multi-year droughts.

Pittsburg augments the Delta supply with groundwater extracted from two active wells in the central part of the city. Although groundwater can account for up to 15% of Pittsburg's water supply, it is highly seasonal and not available year-round. In addition, more stringent groundwater quality regulations and issues with groundwater overdraft reduce the viability of this source for long-term needs (Carollo, 2000).

Water System Facilities

Pittsburg pumps raw water from the Canal as well as supplemental groundwater from two groundwater wells to its 32 mgd water treatment plant. The primary system storage consists of two reservoirs at the Pittsburg WTP and supplemented by six storage reservoirs through the city for a total storage capacity of 16.9 MG (Pittsburg, 2005).

Water Rates

Pittsburg currently charges its water customers a treated water rate of $1,285/af. The rate charged to the Golf Course is $317.17/af (Pease/Pittsburg, 2008).

Community of Bay Point

Water Supply Sources

An investor-owned water utility, GSWC, is responsible for purchasing, treating and distributing these supplies to Bay Point via the Bay Point System. The primary source of supply for the Bay Point System is both raw and treated water from CCWD. The CCWD supplies are supplemented with groundwater extracted from three wells, which have a capacity of 190 gallons per minute (gpm), in the Pittsburg Plain Groundwater Basin. Annual supplies derived from groundwater are expected to be constant at 230 afy (CH2MHill, 2005).

The Bay Point UWMP (CH2MHill, 2005) notes that current demands can be met under normal year and single-dry year periods; however, short-term water purchases and/or voluntary short-term conservation may be required in multi-year droughts.

Water System Facilities

Raw water supplies from CCWD are treated at the Hill Street WTP, which has a capacity of 4.14 mgd, prior to distribution to the Bay Point System. Treated water supplies from CCWD are received through

the Port Chicago water connection, which has an ultimate capacity of 2.85 mgd. Also, Bay Point has an emergency connection with Pittsburg (CH2MHill, 2005).

Water Rates

GSWC currently charges $3.09/ccf ($1,346/af) for treated water supplies (GSWC, 2007).

2.3.2 Water Use Trends

In the last few decades, water consumption in the study area has steadily increased, with the exceptions of the major droughts of 1976-77 and the early 1990's. Increasing population is the primary factor affecting water demand. Industrial use of water has generally grown steadily in line with population growth. The greatest amount of water use occurs during summer months, corresponding to increased landscape irrigation. Based on their respective 2005 UWMPs, the total demand for the study area is projected to increase by approximately 27% to nearly 50,000 afy by 2030, as shown in **Table 2-3**.

Table 2-3: Water Demand Projections (afy)

	2005	2010	2015	2020	2025	2030	% Increase
Antioch[1]	23,590	22,370	23,770	25,170	25,820	26,490	12%
Pittsburg[2]	12,620	13,670	14,870	16,270	17,700	19,260	53%
Bay Point[3]	2,920	3,080	3,450	3,700	3,910	4,120	41%
Total	**39,130**	**39,120**	**42,090**	**45,140**	**47,430**	**49,870**	**27%**

Notes:
1. Source: Brown & Caldwell, 2005 (Table 3-10).
2. Source: Pittsburg, 2005 (Table 3-2).
3. Source: CH2MHill, 2005 (Table 4-5).

2.3.3 Water Management Strategies

As the primary water supplier for study area, CCWD evaluates water management strategies periodically through updates to its Future Water Supply Study (FWSS). The FWSS evaluates water demand, conservation, and existing and potential sources of supplies including continued use of CVP water, groundwater, recycled water, desalination, and water transfers from other sources in the Sacramento Valley, the Delta, the San Joaquin Valley, and East County (CCWD, 2005).

Furthermore, all water supply entities in this study area are signatories to the California Urban Water Conservation Council Memorandum of Understanding, which outlines potential water conservation demand management measures (DMMs) for implementation. The 14 DMMs were assessed by each water supply entity in their respective 2005 UWMP (CCWD, 2005; Brown & Caldwell, 2005; Pittsburg, 2005; CH2MHill, 2005).

In addition to implementing DMMs as a water conservation strategy, each water supplier in the study area is interested in developing cost effective recycled water supplies to offset use of water supplies for non-potable demands, such as irrigation and industry, thereby improving water supply reliability.

2.4 Wastewater Treatment and Disposal

There are three wastewater agencies that are partners in this Plan:

- Delta Diablo Sanitation District
- Central Contra Costa Sanitary District
- Ironhouse Sanitary District

Although the study area is only comprised of the DDSD service area, each of these agencies could potentially produce recycled water that can be delivered to the study area.

2.4.1 Delta Diablo Sanitation District

DDSD provides wastewater services for Antioch, Pittsburg and Bay Point (see **Figure 2-3**). The total service area covers approximately 25 square miles, with approximately 184,000 residential customers.

Wastewater Facilities

The DDSD Wastewater Treatment Plant (WWTP) is a secondary treatment plant with a rated average dry weather flow (ADWF) capacity of 16.5 mgd. As shown in **Figure 2-4**, the major treatment processes include screening and grit removal, primary clarification, tower trickling filters, aeration, secondary clarification, and disinfection/ dechlorination. Treated and disinfected secondary effluent is discharged to New York Slough in the Delta. A portion of the effluent is diverted to the DDSD RWF prior to chlorination at a varying rate depending on recycled water demands.

Planned collection system improvements include new and extended force mains, new gravity sewers, increased pumping capacity at the pump stations, emergency facilities, and security improvements (HDR, 2004). DDSD is currently implementing replacement and expansion projects at the WWTP to increase the rated average dry weather capacity to 22.6 mgd.

Wastewater Flows

Wastewater flow projections developed in 2004 (HDR) have not been realized so new flow projections were developed for this Plan based on 2007 average dry weather flows (14.0 mgd) and assuming a 2% growth per year. **Table 2-4** presents the ADWF projections for the DDSD WWTP.

Table 2-4: DDSD Average Dry Weather Flow Projections (mgd)

2010	2015	2020	2025	2030
14.9	16.4	18.1	20.0	22.1

Source: DDSD, 2008

2.4.2 Central Contra Costa County Sanitary District

CCCSD provides wastewater services for approximately 450,000 residents and 3,000 businesses in central Contra Costa County. It provides wastewater collection, treatment, and disposal for the cities/towns of Danville, Lafayette, Martinez, Moraga, Orinda, Pleasant Hill, San Ramon, Walnut Creek and several unincorporated areas in the central county area. CCCSD currently provides over 600 afy of recycled water for landscape irrigation and light industrial uses to customers in Pleasant Hill, Concord, and Martinez near the I-680 corridor.

Wastewater Facilities

CCCSD has a collection system that consists of 1,500 miles of pipeline from 6 inches to 102 inches in diameter, and 19 pumping stations. Wastewater undergoes secondary treatment at the CCCSD WWTP in Martinez. The facilities permitted wastewater flow is 53.8 mgd and the design ADWF is 42.2 mgd (SFB RWQCB, 2007). As shown in **Figure 2-5**, the process includes bar screen, pre-aeration, primary sedimentation, secondary aeration, clarification, and ultraviolet (UV) light disinfection.

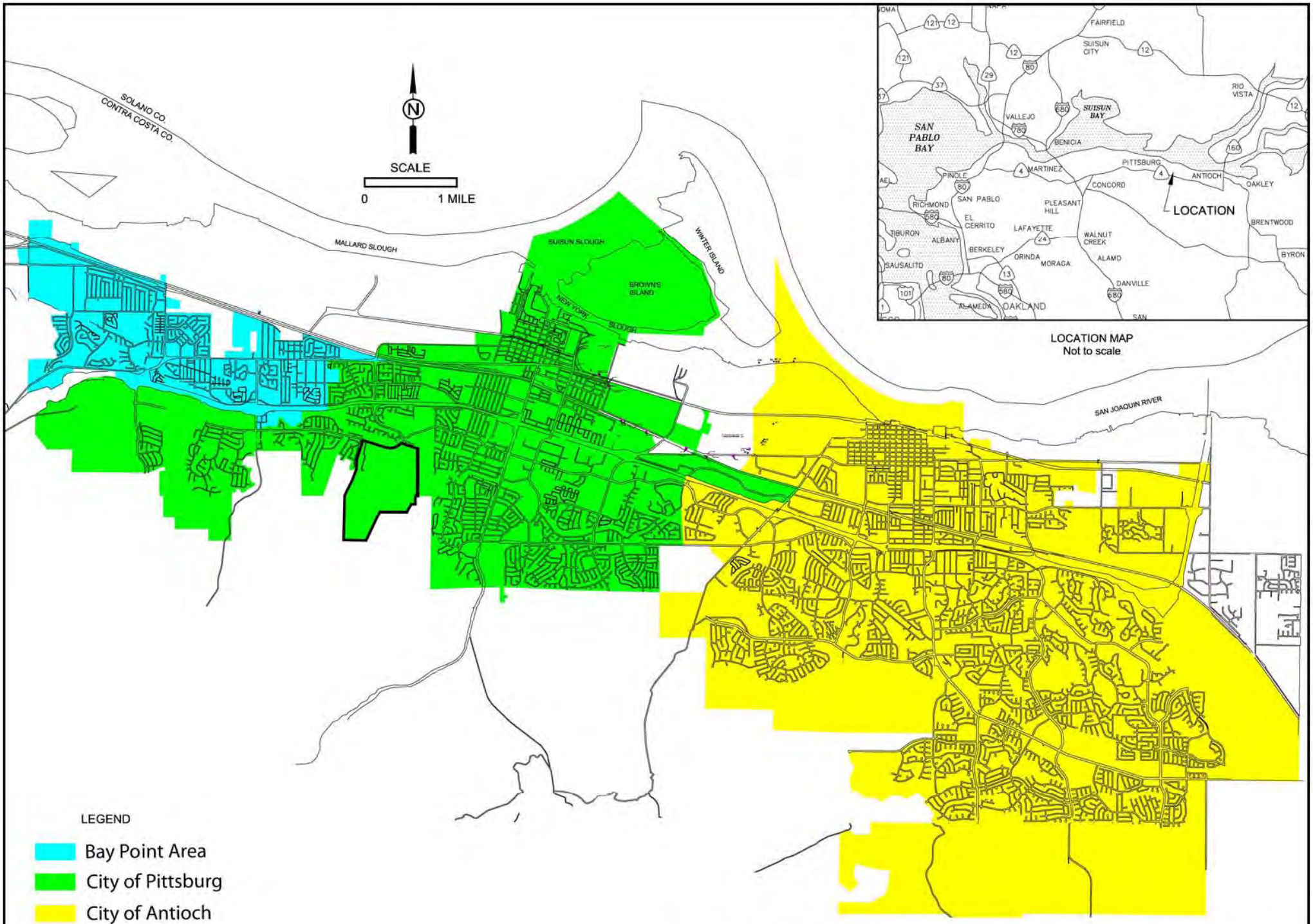


Figure 2-3: Project Location Map & DDSD Service Area

Figure 2-4: Water Pollution Control Facility Schematic

DELTA DIABLO SANITATION DISTRICT

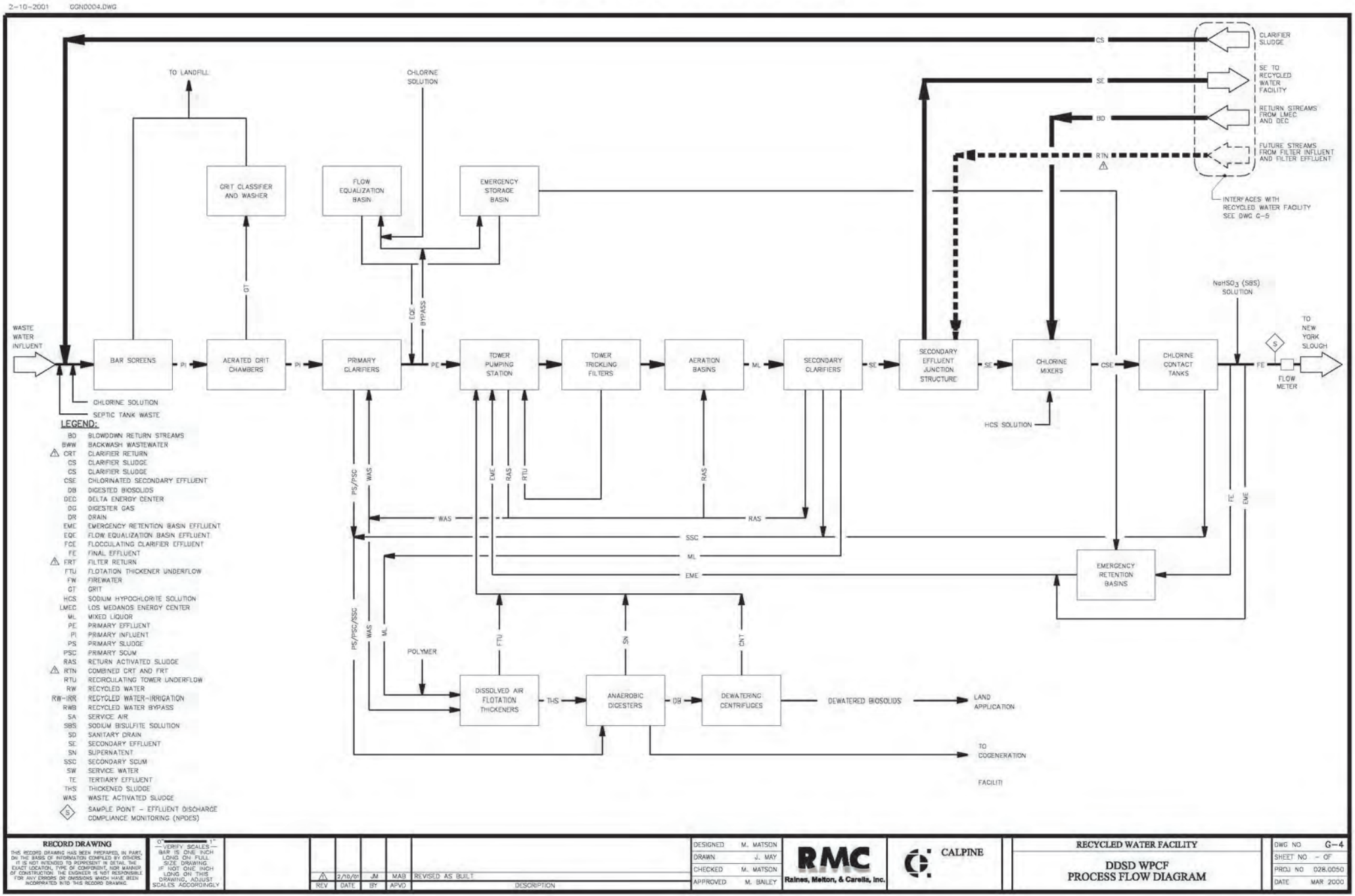
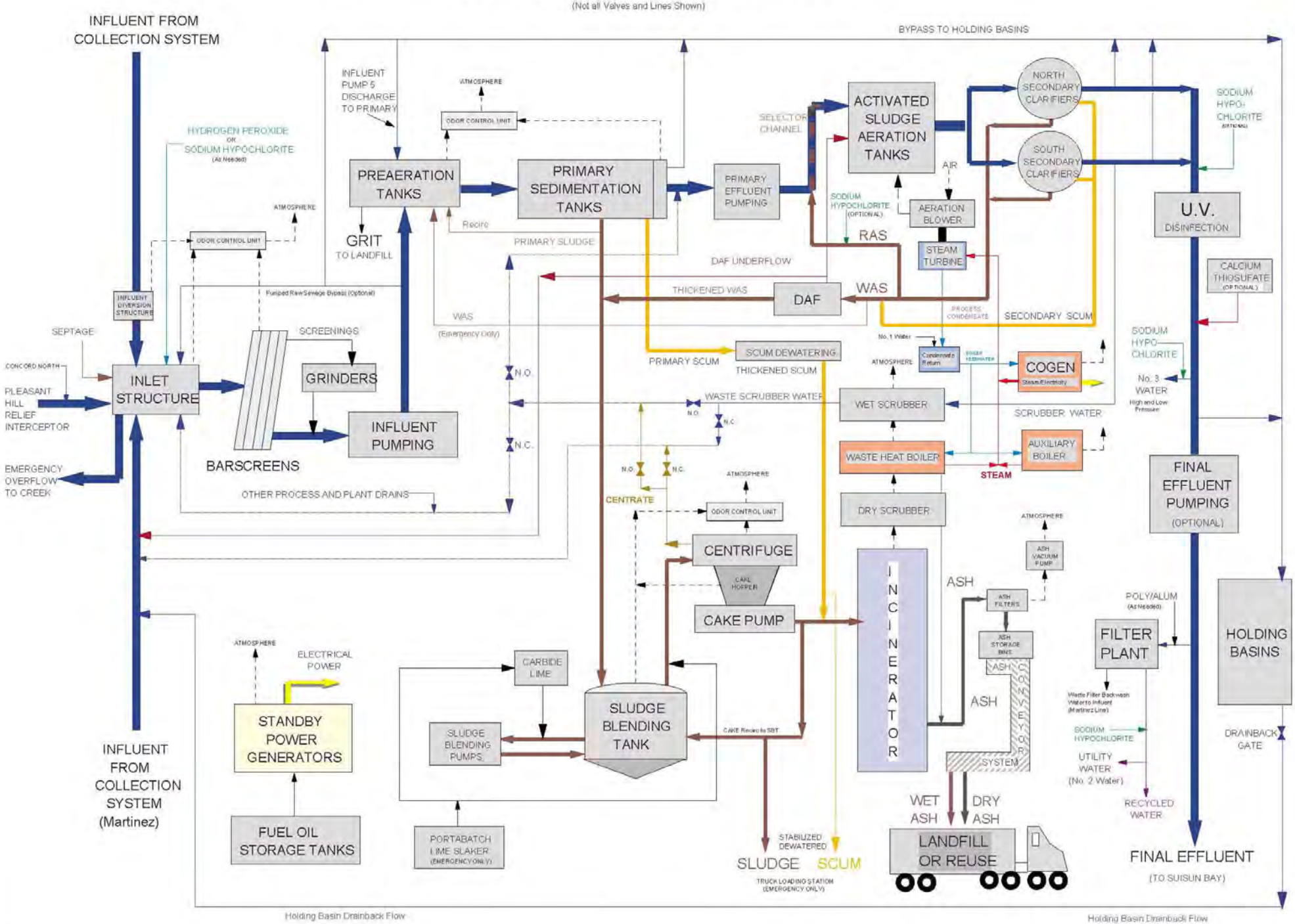


Figure 2-5: Wastewater Treatment Plant and Recycled Water Facility Schematic

CENTRAL CONTRA COSTA SANITARY DISTRICT

(Not all Valves and Lines Shown)



PLANT OPS TRAINING 02-13-03

Wastewater Flows

In 2007, an average of 41.1 mgd of wastewater was treated at the Martinez WWTP. The majority of this flow was discharged into Suisun Bay, while approximately 3 mgd was diverted to the CCCSD WRP for tertiary treatment. The CCCSD service area is near build-out, so only minor increases in wastewater treatment flows are expected, as shown in **Table 2-5**.

Table 2-5: CCCSD Average Dry Weather Flow Projections (mgd)

2005	2010	2015	2020	2025	2030
39.9	41.3	42.7	44.0	45.4	46.8

Source: ESA, 2002; Table 2-1; Average groundwater infiltration projection

2.4.3 Ironhouse Sanitary District

ISD provides collection, treatment and disposal of wastewater for 30,000 residents of the City of Oakley, Bethel Island and, unincorporated areas in East County.

Wastewater Facilities

Currently, the ISD WWTP has a secondary treatment capacity of 2.7 mgd. As shown in **Figure 2-6**, treatment facilities consist of a 9-inch parshall flume, two channel grinders, two 42-inch-diameter screw pumps, and two parallel two-stage aerated ponds with return sludge capability (CV RWQCB, 2008). In this two-stage aerated pond system, the first aerated pond is a completely mixed basin with a 1.7 MG volume and five 20 hp floating aerators. The second pond has a 2.4 MG volume and six 10 hp floating aerators.

Currently, the secondary treated water produced at the ISD WWTP is land disposed via agricultural application on property adjacent to the WWTP and on Jersey Island. The amount of water that was applied in 2003 was 250 MG on the mainland (166 acres) and 514 MG on Jersey Island (425 acres), which is equivalent to an annual average of 2.1 mgd.

ISD is in the process of upgrading and expanding its treatment capacity to 4.3 mgd of tertiary treatment for land disposal and surface water discharge. These facilities are discussed further in Section 2.5.3 and were planned in coordination with the development of a new NPDES permit from the Central Valley Regional Water Quality Control Board (RWQCB). The new NPDES permit was adopted on April 25, 2008.

Wastewater Flows

The 2007 ISD ADWF was 2.64 mgd (CV RWQCB, 2008) and **Table 2-6** presents projected ISD ADWF. The wastewater flow at build-out for the ISD service area was estimated as 8.6 mgd (ISD, 2005).

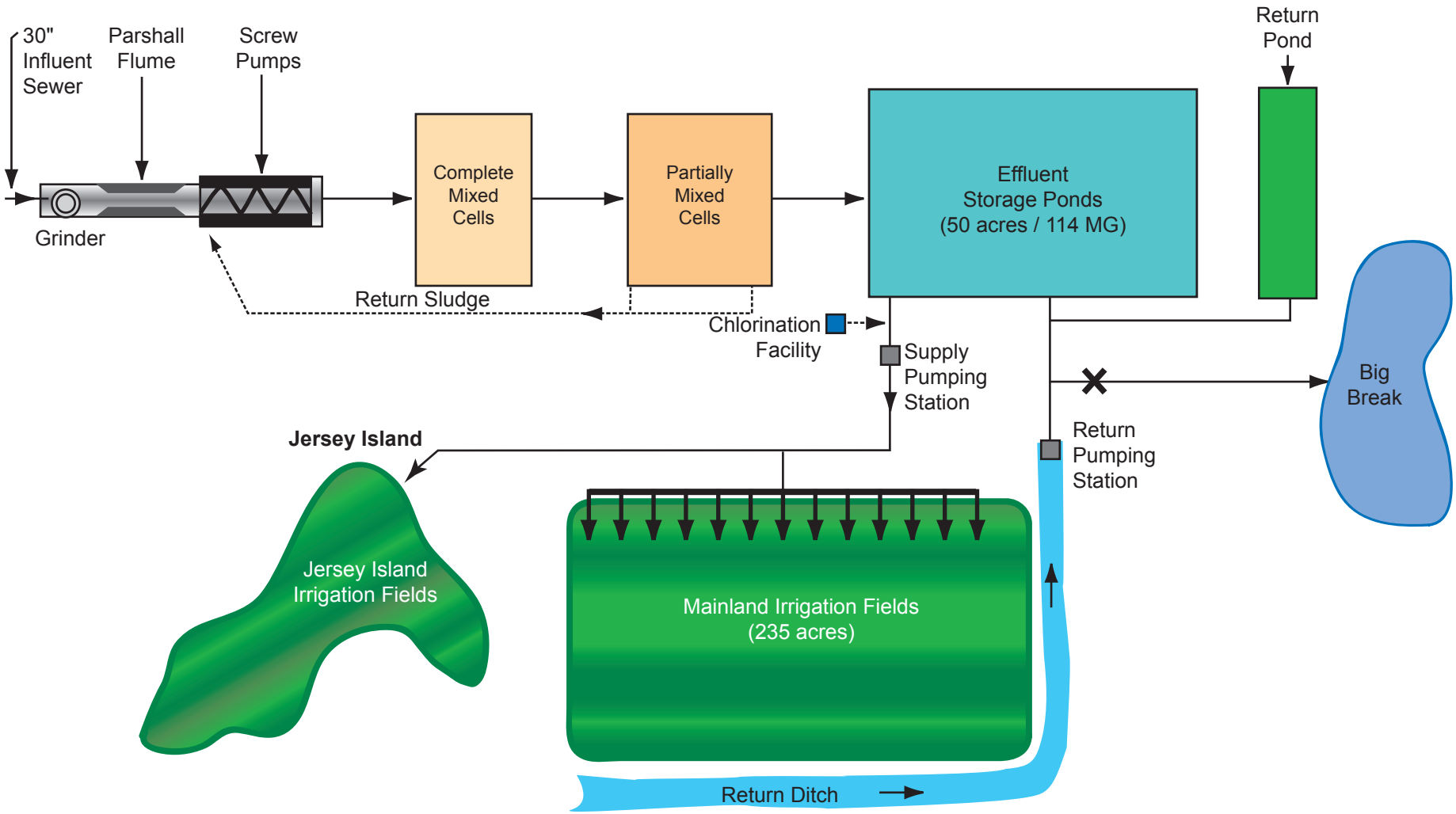
Table 2-6: ISD Average Dry Weather Flow Projections (mgd)

2005	2010	2015	2020	2025	2030
2.4	2.9	3.6	4.2	4.8	5.4

Source: Williams/ISD, 2008; Moderate growth projection (500 dwelling units per year)

Figure 2.6: Wastewater Treatment Plant Flow Schematic

Ironhouse Sanitary District



Source: ISD Wastewater Facilities Plan Update (ISD, 2005)

2.5 Recycled Water

All three wastewater agencies have notable quantities of wastewater supplies that could be treated to tertiary levels for non-potable recycled water use. Currently DDSD and CCCSD produce recycled water from a portion of their wastewater flows and apply the recycled water for non-potable uses. ISD currently applies all of its wastewater for land application but plans to treat all of its flows to tertiary levels by 2010. The following sections describe the existing recycled water facilities, existing and future recycled water uses for each agency.

2.5.1 Delta Diablo Sanitation District

Recycled Water Facilities

The DDSD Recycled Water Facility (RWF) was constructed in 2000 as part of a collaborative effort between DDSD and Calpine Corporation. It is permitted to treat up to 12.8 mgd of secondary effluent from the WWTP. As shown in **Figure 2-7**, secondary effluent is diverted upstream of the WWTP disinfection, and undergoes flocculation, clarification, sedimentation, filtration and disinfection before being distributed to recycled water users (DDSD, 2000). Effluent quality meets or exceeds the California Department of Public Health (CDPH) Title 22 water quality requirements for “unrestricted” use of recycled water.

Existing Recycled Water Use

DDSD currently operates a tertiary treatment facility and associated infrastructure to provide 7,750 afy of industrial supply to DEC/LMEC for cooling tower uses and 70 afy of irrigation supply for landscape irrigation in Pittsburg. The power plants are located in an industrial area along the northern border of Pittsburg. DEC is located immediately adjacent to the RWF, while LMEC receives recycled water via a pipeline extending three miles from the RWF. The two Pittsburg parks being irrigated with recycled water are located along this route. CCWD has an agreement with DEC to provide back-up raw water service to be used exclusively at DEC/LMEC.

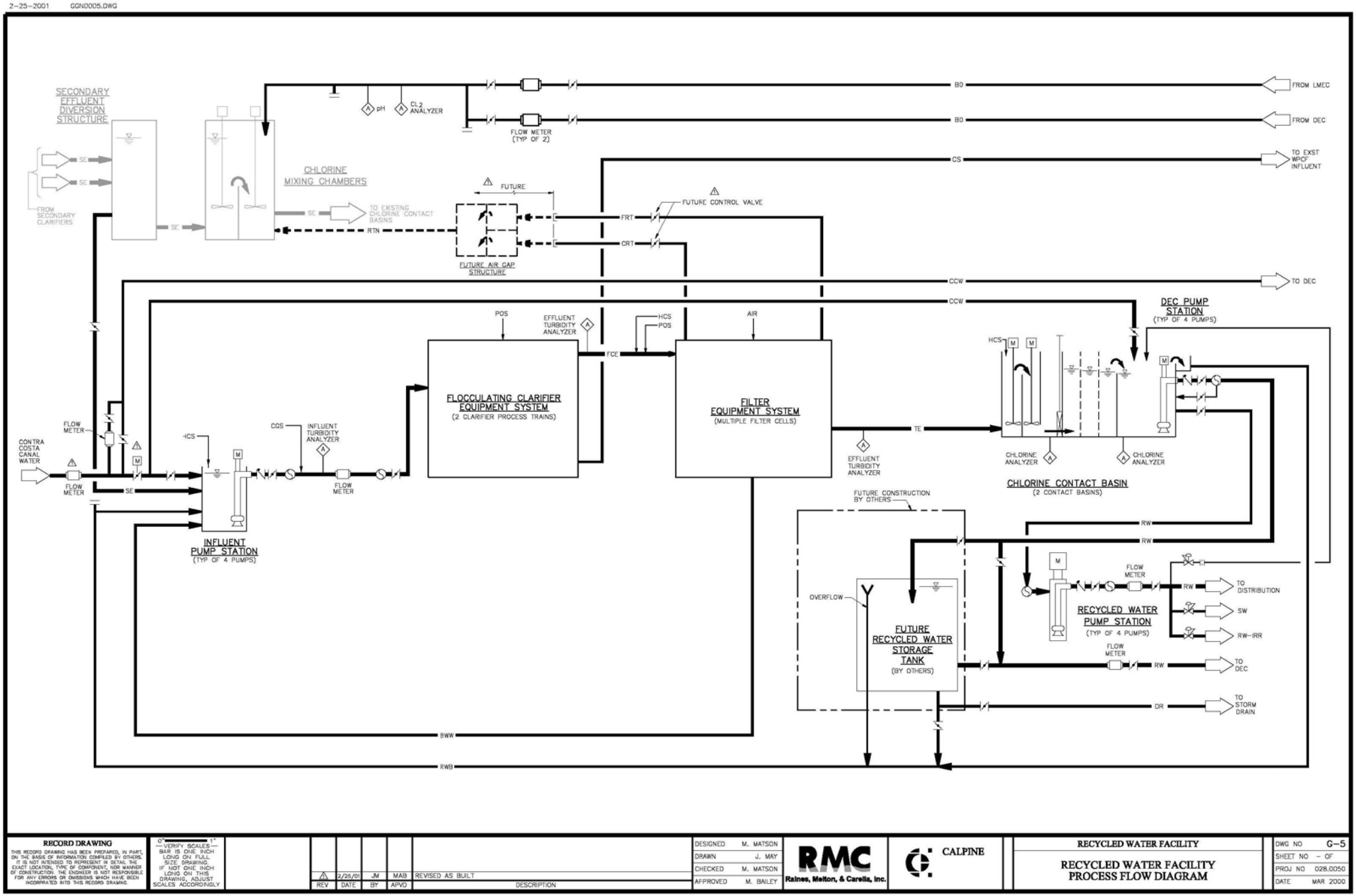
Future Recycled Water Plans

DDSD has a recycled water agreement with CCWD to expand its existing recycled water system to serve an additional 1,654 afy of irrigation demands within Pittsburg and Antioch. The Pittsburg Urban Water Reuse project (the preferred alternatives from the 2005 Pittsburg/DDSD Recycled Water Facilities Plan; RMC, 2005), which will provide 615 afy of additional irrigation supply to serve the Lone Tree Golf course and other municipal parks in Pittsburg, started operations in late 2008.

The facilities planning stage was completed for the Antioch Urban Water Reuse Project (the preferred alternatives from the 2007 Antioch/DDSD Recycled Water Facilities Plan; RMC, 2007), and design of the preferred project began in the Spring 2008. The Antioch Urban Water Reuse Project is expected to deliver 490 afy of irrigation supply to local parks and golf courses. DDSD expects that the Antioch Urban Water Reuse project will be online in 2010. It is anticipated that subsequent expansions of the Pittsburg and Antioch recycled water systems will be completed by 2020. In order to help meet increased recycled water demand, DDSD is currently completing a tertiary filter loading performance study of the RWF to increase the permitted capacity by 50% (to 19.2 mgd).

Figure 2-7: Recycled Water Facility Schematic

DELTA DIABLO SANITATION DISTRICT



Recycled Water Rates

DDSD has established recycled water rate of $307/af for the Pittsburg Urban Water Reuse project through an agreement with the City of Pittsburg. The rate was established by DDSD Ordinance 90 adopted in December 2008 for calendar year 2009 operations. Recycled water rates for the Antioch Urban Water Reuse project have not been established yet (because the project is not planned to start operations until 2010) but the rate will follow the same methodology used to establish Pittsburg project rate.

Financing of the recycled water supply for DEC / LMEC was structured such that the power plant paid for all capital costs when they were incurred and the recycled water rate is only based on the O&M costs for the tertiary treatment, pumping and distribution costs.

2.5.2 Central Contra Costa Sanitary District

CCCSD has delivered recycled water for landscape irrigation and industrial customers since 1995 and the volume used has been steadily increasing since then.

Recycled Water Facilities

As shown in Figure 2-5, the CCCSD RWF provides tertiary treatment with four dual granular media anthracite/sand filters. The facility is permitted for 3.8 mgd (nominally 4 mgd) and is limited by several factors, including restrictions to piping, pumping, valving, and chlorination. The filters were originally designed for a hydraulic loading of about 36 mgd (at about 4 gpm per square foot) assuming low turbidity water. However, the filters receive water directly from the secondary clarifiers without an interim step of sedimentation basins so the system is sensitive to normal turbidity fluctuations characteristic of biological secondary effluent (Berger/CCCSD, 2008). Consequently, a recent filter study (MWH, 2006) rated the filter plant at 4 mgd capacity.

To expand the existing tertiary treatment capacity, CCCSD would need a series of upgrades including the addition of pre-treatment for tertiary filtration preparation and tertiary filter media modifications. Also, CCCSD would likely add an ammonia removal step.

Existing Recycled Water Use

CCCSD has an agreement with CCWD to provide up to 1,600 afy of recycled water to irrigation customers as part of the Zone 1 project, which is located within portions of Pleasant Hill, Concord, and Martinez near the I-680 corridor. Current deliveries consist of up to 2.0 mgd and 600 afy to Zone 1 recycled water customers, including golf courses, schools and parks and light industrial uses. CCCSD has served primarily landscape irrigation needs, however approximately 7% of its recycled water in 2006 was delivered to industrial uses including concrete manufacturing and wood waste recycling, soil compaction and dust control (CCCSD, 2006). Approximately an additional 1,100 afy of recycled water is used on-site at the CCCSD WWTP for process water and landscape irrigation.

Future Recycled Water Plans

It is expected that the existing recycled water use will increase to a peak day demand of 2.8 mgd and an annual average demand of 1,600 afy by 2020 when the Zone 1 project is completed. Once existing use of approximately 1.0 mgd of recycled water on-site at the WWTP is considered, there would be no surplus recycled water available from the existing 3.8 mgd CCCSD RWF.

The CCCSD Recycled Water Master Plan (CCCSD/RMC, 2000) identified recycled water demands of 34 mgd for landscape irrigation and industrial uses. Approximately 20.7 mgd was for industrial users, while the remainder was from landscape irrigation. However, projects to serve these potential customers have not moved forward due to higher costs associated with the urban setting of potential pipeline alignments and additional tertiary treatment facilities. Also, recycled water projects implemented within the CCWD service area may include duplication of service fees to recover costs previously incurred by CCWD for

system improvements needed to serve its customers. Duplication of service fees are addressed on a case-by-case basis. The current fee was recently estimated as $315/af (CCWD, October 2008).

Production of tertiary treated water beyond the existing 3.8 mgd capacity would require additional tertiary treatment facilities and, possibly, pretreatment facilities (CCCSD, 2004). Availability of recycled water from new facilities would be considered on a first-come, first-serve basis (Berger/CCCSD, 2008).

Recycled Water Rates

CCCSD has a two-tiered pricing structure for recycled water customers in the District Code that depends on the customer's alternate or prior water source. Customers that replaced potable water for recycled water currently pay $896/af and customers that replaced raw water from the Contra Costa Canal or groundwater pay $426/af.

These rates were established primarily for our landscape irrigation customers that connect to our existing distribution system as part of our Zone 1 Water Purveyor Agreement with CCWD. The rates for any new industrial customers would be established based on the cost of service and, therefore, would be established on a case-by-case basis as part of a Business Plan that must be prepared for any new projects proposed that involve CCWD customers.

2.5.3 Ironhouse Sanitary District

Recycled Water Facilities

The ISD WWTP will be undergoing an upgrade and expansion to 4.3 mgd of tertiary treatment with the construction of membrane filtration via a membrane bioreactor (MBR) and UV disinfection facilities. The effluent would be nitrified and denitrified. As shown in **Figure 2-8**, these new facilities will be downstream of the existing secondary treatment facilities. ISD plans to begin construction of the first phase (4.3 mgd) facility in May 2009 and is expected to start operations in November 2011.

Future Recycled Water Plans

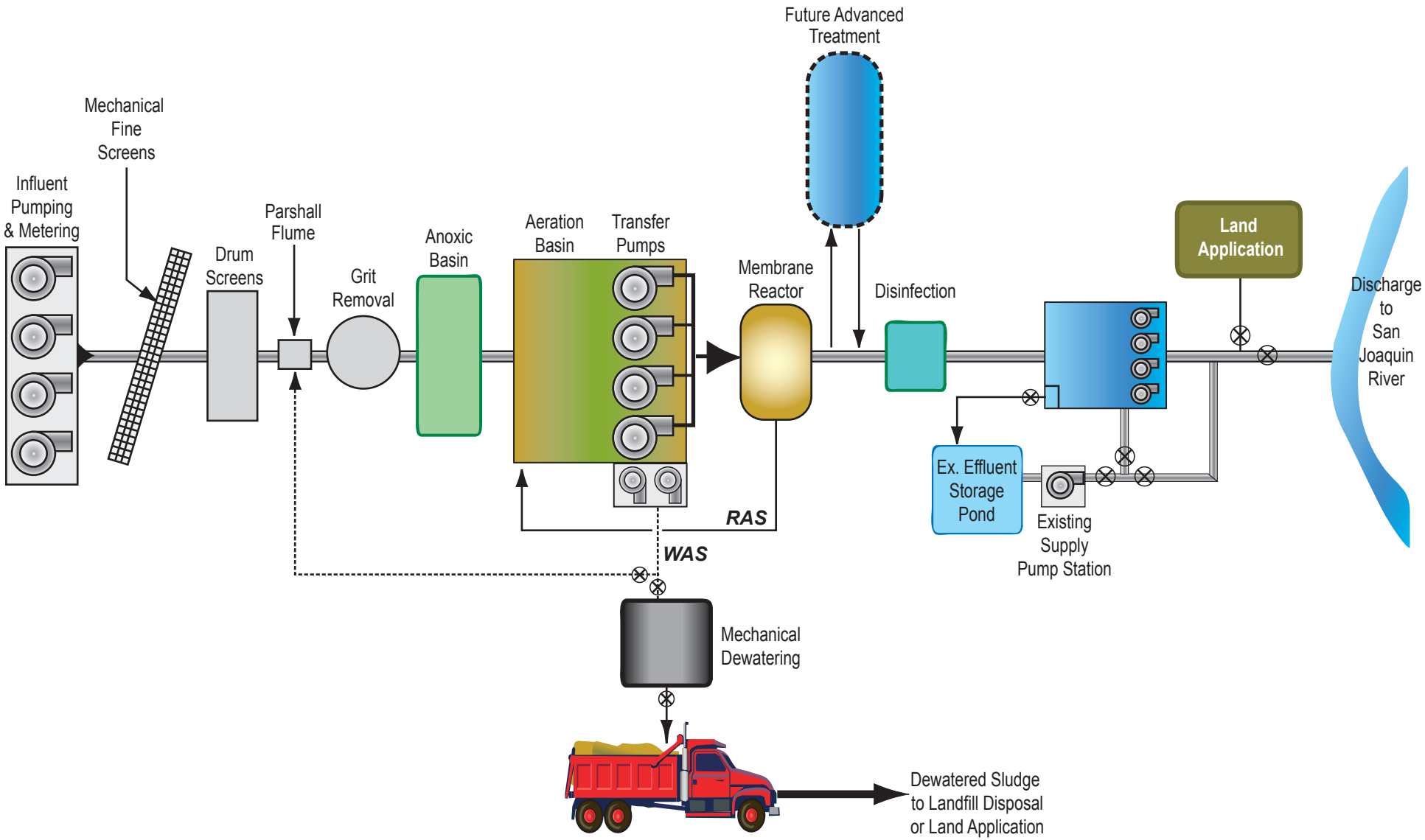
After upgrade to tertiary treatment, ISD plans to maximize land disposal on Jersey Island but cease disposal on the lands adjacent to the WWTP. The Jersey Island land application will be limited to approximately 1.3 mgd of year-round application on 510 net acres available for irrigation (RBI, 2008). The remainder will be discharged into the San Joaquin River at the north end of Jersey Island. ISD received an NPDES permit from the Central Valley RWQCB in April 2008 that outlines this discharge management approach.

At the current time, ISD has no plans to use tertiary treated water for other purposes but has expressed a willingness to apply their tertiary treated flows for industrial reuse. ISD confirmed that there is not any minimum recycled water flows required during peak periods to maintain the planned land disposal operations because they can apply stored recycled water or supplement irrigation with ISD water rights on Jersey Island (Williams/ISD, 2008). It is important to note that whatever recycled water use opportunities are identified and implemented by ISD, ISD will still need to discharge to surface water and to land because recycled water users (landscape, agricultural or industrial) can always elect not to take water at any time.

Wastewater flows are expected to reach the first phase capacity (4.3 mgd) by about 2020 under an assumption of a growth rate of 500 dwelling units per year (ISD, 2005). A second stage of expansion will then provide tertiary treatment capacity of 8.6 mgd.

Figure 2.8: Recycled Water Facility Schematic

Ironhouse Sanitary District



Source: ISD Wastewater Facilities Plan Update (ISD, 2005)

Chapter 3 Recycled Water Market Assessment

This section presents the results from the recycled water market assessment for industrial uses within the study area.

3.1 Methodology

The goal of the recycled water market assessment is to identify both near- and long-term industrial uses of recycled water within the study area. The market assessment included a detailed examination within the study area of potential users and demands, recycled water supply availability, water quality needs, and other implementation issues. The methodology used for the recycled water market assessment for the study area involved the following:

1. **Identify Potential Users:** The first step in the recycled water market assessment was to identify existing and future industrial customers within the DDSD service area that could be served by recycled water. Title 22 guidelines define minimum water quality standards for use of recycled water for: 1) industrial cooling; 2) industrial process water that may come in contact with workers; and 3) industrial process water that will not come in contact with workers.
2. **Determine Potential Recycled Water Demands:** After a list of potential recycled water users within the study area was compiled, the next step was to determine the recycled water demand for each user. Demands for existing industrial users were compiled from water use records and demands for potential new power plants were developed in coordination with the industrial partners (Mirant and PG&E). The recycled water demands for potential users in the study area are presented in Section 3.2.
3. **Confirm Availability of Supplies:** Once the full industrial recycled water market potential for the study area was determined, the next step was to determine if the additional demands could be met with surplus capacity of existing and planned RWFs, surplus wastewater flows, and raw surface water sources. Each potential supply (both recycled water and raw surface water) provided capacity and delivery data for the peak demand period (June to August) to determine the actual surplus capacity available to serve industrial customers (see Section 3.3.1).
4. **Determine Customer Water Quality Need:** In addition to confirming that sufficient recycled water supplies are available to meet customer needs, it is also important to confirm that the quality of recycled water is sufficient for the intended use given that many industrial applications have stricter water quality requirements than can be met by typical recycled water supplies (see Section 3.3.2).
5. **Evaluate Other Implementation Considerations:** A final component of the market assessment is to review other implementation considerations such as customer retrofit needs, public perception, environmental impacts, and other agency coordination issues to determine if implementation of a recycled water project may be problematic or cost-prohibitive (see Section 3.5).

3.2 Industrial Recycled Water Market

The industrial use of recycled water in California has expanded considerably over the last decade, including in the study area by DDSD. Since the start of recycled water production at the DDSD RWF in 2001, DDSD has served recycled water primarily for cooling water supply for two Calpine power plants in Pittsburg:

- Delta Energy Center (DEC): An 840 megawatts (MW) natural gas-fired, combined-cycle power plant located on 20 acres.

- Los Medanos Energy Center (LMEC): A 540 MW natural gas-fired, combined-cycle generating facility located on 12 acres.

As shown in **Figure 3-1,** a variety of other industrial uses exist within the study area.

3.2.1 Existing Industrial Customers

Existing industrial demands in the study area consist of cooling tower and boiler needs for power plants and process water for steel rolling operations. Existing demands and the associated potential recycled water use are summarized in **Table 3-1.**

Table 3-1: Existing Industrial Demands

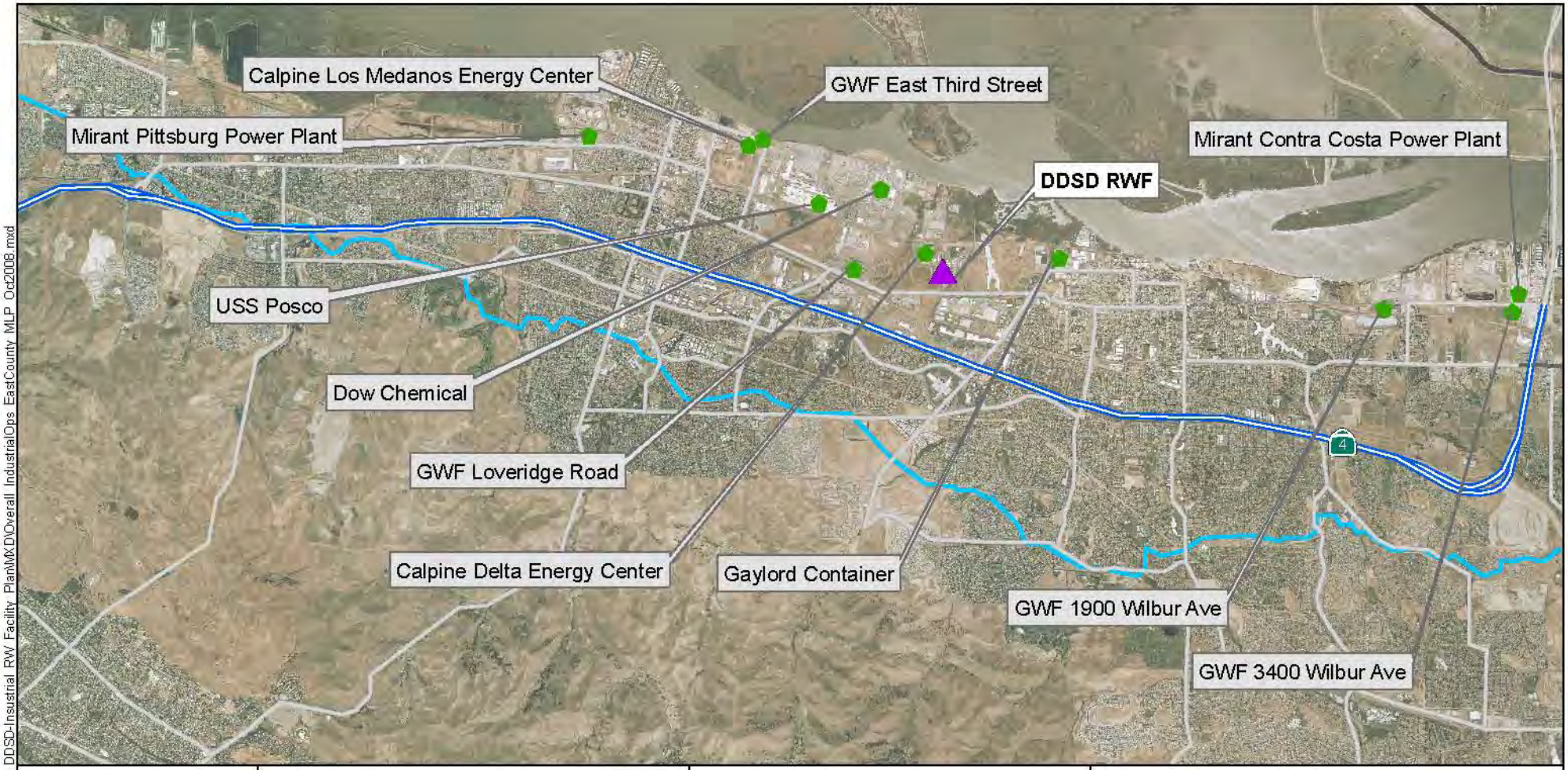
Customers	Existing Water Supply		Average Annual Demand	Notes
	Source	Type		
Calpine DEC/LMEC	DDSD RWF	Recycled Water	7,750 afy	1
USS-POSCO	CCWD Canal	Raw Imported Water	6,690 afy	2, 3
USS-POSCO	San Joaquin River	Raw Surface Water	Not Available	4
Dow Chemical	CCWD Canal	Raw Imported Water	730 afy	2, 3
Minor Industrial	CCWD Canal	Raw Imported Water	3,030 afy	5
Pittsburg Power Plant	Suisun Bay	Raw Surface Water	Up to 1,200,000 afy	6, 7
Contra Costa Power Plant	San Joaquin River	Raw Surface Water	Up to 400,000 afy	6, 7

Notes:

1. Source: DDSD recycled water use records for 2006 and 2007.
2. Source: CCWD water use records for 2005 to 2007.
3. Existing water supplies from CCWD were not considered for conversion to recycled water because existing industrial demands may require retrofits with significant costs to accept water with a different quality than what the site was designed. For this reason, this study is focused on serving recycled water for *new uses,* where the quality and supply considerations can be incorporated into facility design. Also, recycled water projects implemented within the CCWD service area may include duplication of service fees to recover costs previously incurred by CCWD for system improvements needed to serve its customers. Duplication of service fees are addressed on a case-by-case basis. The current fee was recently estimated as $315/af (CCWD, October 2008).
4. The water volume taken from the San Joaquin River could not be provided by the customer for this study.
5. Minor industrial customers include (but not limited to): GWF Power Systems; DEC/LMEC process water.
6. The existing use values are the *maximum permitted intake capacity* for each power plant primarily to supply once-through cooling systems, which use significant volumes of raw surface water for direct cooling purposes and discharge the warmed water directly back to the Delta. *Actual water use* varies based on the length of time each year that the power plants are producing power.
7. Recycled water could not be used for this process because the volume of water required for operations far exceeds the available recycled water available. However, the customers could be replaced with new power plants that apply existing cooling technology, as discussed in Section 3.2.2.

Mirant Power Plants – Pittsburg and Contra Costa

Mirant acquired two power plants from PG&E in 1999: Pittsburg and Contra Costa. The Pittsburg Power Plant is located in Pittsburg and is natural gas-fired with a capacity of 1,311 MW. The Contra Costa Power Plant is located in Antioch and is natural gas-fired with a capacity of 674 MW. The power plants apply “once-through” cooling systems, which use significant volumes of water from the San Joaquin River for direct cooling purposes and discharge the warmed water directly back to the Delta. In comparison, evaporative cooling systems use cooling towers to transfer heat to air for discharge of warm air to the atmosphere.



RMC Water and Environment

1 inch equals 1.25 miles

0 0.5 1 2

Miles

N

Legend

- Industrial Operations
- Recycled Water Facility
- Contra Costa Canal

Figure 3-1
Existing Industrial Operations

Sources: PCC ROWALL GIS FILES

L:\Projects GIS\0013-015 DDSD-Insustrial RW Facility Plan\MXD\Overall IndustrialOps EastCounty MLP Oct2008.mxd

USS-POSCO

USS-POSCO owns and operates a flat rolled steel processing facility that is just over a mile away from the DDSD RWF. San Joaquin River water and Canal water are currently being used for the cooling tower supply and potable supplies are used for other applications. USS-POSCO staff indicated that about 5,300 afy of the process water used at the facility could conceivably be replaced by recycled water if the quality, quantity and pricing were competitive with existing water supplies (Allen/USS-POSCO, 2004). They are currently using river water, Canal water and potable supplies, depending on the type of application.

DOW Chemical

The Dow Chemical Company has a facility located less than a mile northwest of the DDSD RWF. The facility uses Canal water and CCWD records indicate an annual average demand of 730 afy. Of this, approximately 560 afy for its cooling towers could potentially be replaced with recycled water if the quality, quantity and pricing were competitive with existing water supplies (Behmlander/DOW Chemical, 2004).

GWF Power Systems

GWF Power Systems (GWF) is an independent electrical power producer with two plants in Antioch and two plants in Pittsburg. Each facility currently uses approximately 400 afy of cooling water that could potentially be replaced with recycled water. The GWF facilities in Antioch currently use treated potable water from the Antioch's treatment plant and the facilities in Pittsburg use raw water from the Contra Costa Canal for their cooling tower supply.

3.2.2 Potential Future Industrial Customers

Potential future industrial customers in the study area are primarily new power plants with significant water demands for evaporative (wet) cooling towers and, possibly, boilers and auxiliary equipment.

Estimating the size and location of future power plants is a difficult task. Generally, on a two-year interval, the electric utility performs a study that determines its need for new power plants. The study starts with a forecast of the future energy demand of its customers, and then forecasts the resource mix that will meet the demand using a preferred loading order of customer energy efficiency, customer demand response, renewable energy sources, and, if there is any remaining demand, conventional fossil resources. Once the California Public Utilities Commission (CPUC) approves the resource plan, the utility conducts solicitations [Requests for Offers (RFOs)] for these resources. These RFOs may result in a company building a conventional power project in order to sell the output to the utility. Additionally, a company may build a conventional power project in order to sell the facility to the utility to own and operate. The CPUC authorizes the utility to enter into contracts with the successful RFO bidders for either the power output or the power project. A merchant power project developer may forego participation in an RFO and simply build the project in order to sell power into the market or under long term sales agreements outside the RFO process.

The siting of a fossil power project falls under the jurisdiction of the California Energy Commission (CEC) if the project is 50 MW or larger. The approval process is rigorous and approval takes into account a range of considerations. In particular, the CEC is the lead agency under the California Environmental Quality Act (CEQA) and the process is documented in an Application for Certification, which is equivalent to a CEQA Environmental Impact Report (EIR).

The CPUC and CEC processes may run sequentially or in parallel. The CPUC approved PG&E's most recent long term plan in December 2007, which became the basis for an April 2008 RFO where PG&E was seeking to procure 800 to 1,200 MW of new dispatchable, operationally flexible resources with on-line dates no later than May 2015. The results of this RFO are not known at this time. The purpose of this report is not to speculate as to which specific projects may be built, if any. However, a review of the CEC

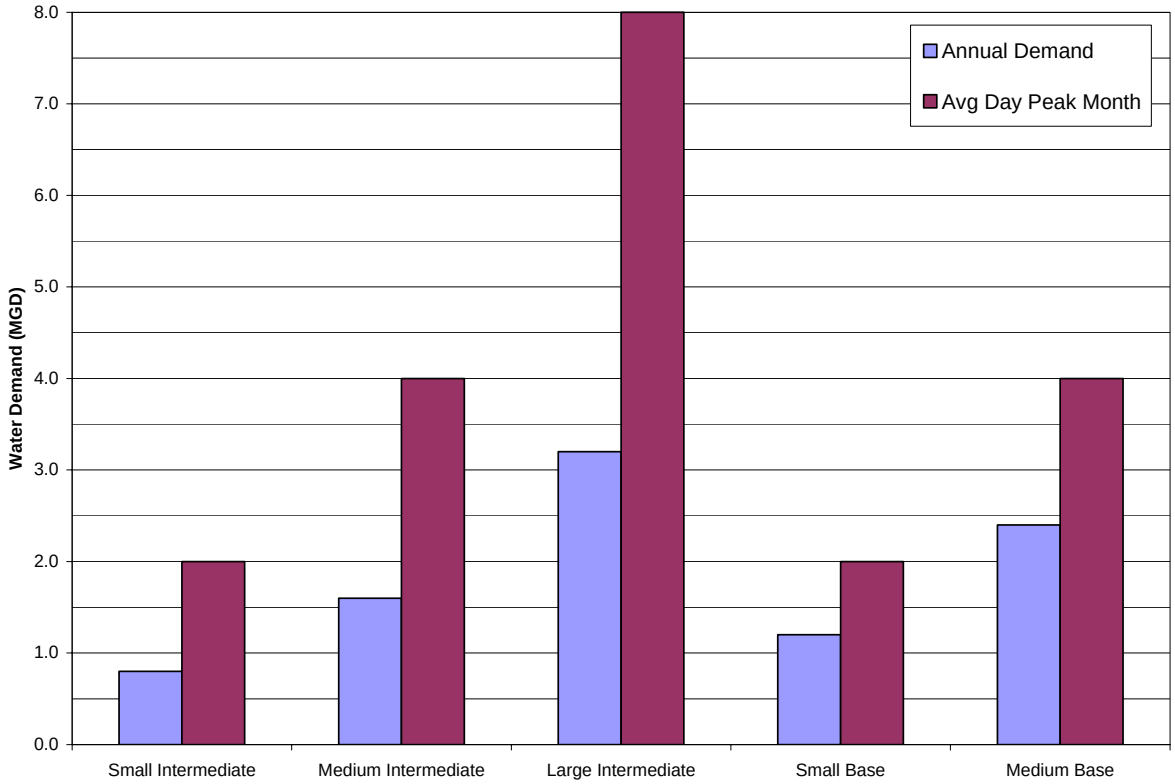
website and the California Independent System Operator website demonstrates there is interest in power project development in the Pittsburg/Antioch corridor. Both Pittsburg and Antioch have potential sites for new power plants. For this study, it was presumed that new generation facilities would likely be sited near existing gas and electric transmission interconnection locations. The general location of an Antioch plant would likely be adjacent to Mirant's existing Contra Costa Power Plant and PG&E's Gateway Generating Station on Wilbur Avenue, just west of the Antioch Bridge. Mirant has submitted an Application for Certification at the CEC to construct the Marsh Landing Generating Station at its Antioch site. Marsh Landing would be a 930 MW facility which would be comprised of two combined cycles and two simple cycle combustion turbines. Contra Costa Generating Station, LLC, has submitted an Application for Certification at the CEC to construct a 624 MW combined cycle power plant at a location near the DuPont facility in Oakley. The general location of a Pittsburg plant would likely be adjacent to Mirant's existing Pittsburg Power Plant on West 10th Street. Mirant has submitted an Application for Certification at the CEC to construct the Willow Pass Generating Station at its Pittsburg site. Willow Pass would be a 550 MW facility comprised of two combined cycles. The site locations are indicated on Figure 3-1.

As energy supply and demand continues to be evaluated, there may be additional RFOs in the upcoming years which could be one source of potential new power plants in the study area.

Due to the preliminary nature of the power companies' plans and the process associated with new power plant siting and approval, potential future power plant demands were developed in general terms for comparison with available supplies. General demands for different size power plants were developed based on input from Mirant and PG&E and demands from other existing power plants. Based on this information, the maximum demand considered by this Plan assumed either a 500 MW base-load plant or combination of smaller intermediate-load plants totaling 1,000 MW at both Pittsburg and Antioch. A base-load plant is considered to operate at greater than 60% of capacity throughout the year and an intermediate-load plant is considered to operate between 15% and 60% of capacity throughout the year. A peaker plant is considered to operate at less than 15% of capacity throughout the year and was not considered in this Plan because, based on input from PG&E and Mirant, a new peaker plant would most likely be air cooled rather than wet cooled due to the higher cost of water service resulting from the need for water supply capacity that is used briefly throughout the year.

Figure 3-2 and **Table 3-2** present the estimated demands associated with each probable power plant type; however, it should be noted that exact demands can vary for wet cooling towers depending on the technology and cycles of concentration applied. The values presented below are only meant to provide an order of magnitude planning estimate. Alternatively, dry cooling methods using air cooled condensers, which have 2% to 20% of the demand for a similar sized wet cooling tower, have been constructed throughout California in recent years to avoid water supply issues. Each power plant developer will make their ultimate decision on power plant size and associated technology based on a combination of factors, including the availability, reliability, quality, and cost of water supply as well as the feasibility and cost of blowdown discharge. As such, a primary objective of this Plan is to identify these factors for consideration by each power plant developer.

Figure 3-2: Potential Future Power Plant Demands



Notes:

1. Average day peak months demands were estimated based on input from Mirant and PG&E and demands from other existing power plants. The actual demand associated with a specific size of power plant will vary based on the type of technology applied and operations throughout the year. The purpose of the values in the figure is to provide an order of magnitude planning estimate.
2. Peaking factors were calculated from 2006 and 2007 DDSD records for DEC / LMEC and applied to average day peak month demands to estimate average annual demand.

Table 3-2: Potential Future Power Plant Demands

Power Plant Size	Power Plant Loading[1]	Approximate Annual Demand [2]
Small (approximately 250 MW)	Intermediate	900 afy
	Base	1,300 afy
Medium (approximately 500 MW)	Intermediate	1,800 afy
	Base	2,700 afy
Large (approximately 1,000 MW)	Intermediate	3,600 afy

Notes:

1. A base-load plant is considered to operate at greater than 60% of capacity throughout the year and an intermediate-load plant is considered to operate between 15% and 60% of capacity throughout the year.
2. The values in the table are only meant to provide an order of magnitude planning estimate.

3.2.3 Industrial Recycled Water Customer Summary

This market assessment reviewed existing and potential future industrial demands in the study area. Of the demands considered, potential new power plants would be ideal recycled water customers due to a variety of reasons. First, existing industrial demands may require significant retrofits to accept water with a different quality than what the site was designed. Also, recycled water projects implemented within the CCWD service area may include duplication of service fees to recover costs previously incurred by CCWD for system improvements needed to serve its customers. Duplication of service fees are addressed on a case-by-case basis. The current fee was recently estimated as $315/af (CCWD, October 2008). However, CCWD may not apply a duplication of service fee to new industrial customers that opt to use recycled water pending project-specific agreements between the

recycled water retailer and CCWD that are developed on a case-by-case basis. DEC / LMEC provide an example of the necessary agreement.

New power plants are excellent recycled water customers since base-load plants have large, year-round demands and recycled water use for new wet cooling towers is strongly preferred by the CEC (as discussed in Section 3.6). Also, water quality is less of an issue because new types of materials can be more accommodating and water quality can be incorporated into plant design. Finally, no retrofits are necessary with new facilities.

3.3 Recycled Water Supplies

3.3.1 Recycled Water Availability

The Pittsburg and Antioch power plant sites are located within the DDSD service area but the magnitude of potential new industrial demands are greater than existing DDSD recycled water surplus supplies so this Plan looked at three different recycled water sources:

- DDSD Recycled Water Supplies
- ISD Recycled Water Supplies
- CCCSD Recycled Water Supplies

DDSD Recycled Water Supplies

The DDSD RWF has a rated capacity of 12.8 mgd.[2] The average annual demand for the power plants and existing irrigation users is approximately 6.9 mgd (7,750 afy) with peak hour flows of up to 12.0 mgd. As discussed in Section 2.5.1, in addition to these existing flows, the Pittsburg Urban Water Reuse project commenced operations in late 2008 and the Antioch Urban Water Reuse Project is expected to begin operations online in 2010. Flows for industrial applications from the DDSD RWF would require additional tertiary treatment capacity via a third tertiary treatment train and/or increased filter loading rates (if approved by CDPH). Limited reserve capacity left over from the existing and planned projects would be available on average days of the peak month but this capacity decreases during peak demand periods associated with extended hot weather when the DEC / LMEC operate at peak production. Both urban reuse projects include storage to address peak day supply shortfalls and backup supplies or operational flexibility for peak hour conditions.[3]

[2] DDSD is currently implementing a secondary clarification improvement project that will modify existing operations and may reduce available equalization storage resulting in less supply available for the RWF. This report does not consider these operational changes.

[3] DDSD has a contractual obligation to fulfill the recycled water demands of DEC / LMEC so any additional users must defer any demands to the two power plants. Existing and planned users in the Pittsburg and Antioch urban water reuse projects will receive priority for recycled water and new users will be supplied on a first-come, first-served basis based on available supply, production and delivery capacity. Despite this obligation and the potential capacity reduction discussed in the previous footnote, there still remains recycled water available for use.

Table 3-3 shows the existing recycled water deliveries and typical surplus supplies available during the peak summer months when industrial users have high demand.

Table 3-3: DDSD Recycled Water Supply Surplus (mgd)

Items	Average Annual	Average Day Peak Month	3-Day Peak [1]	Peak Day [1]	Peak Hour [1]
Tertiary Supply (RWF Capacity)	12.8	12.8	12.8	12.8	12.8
Existing Demand [2]	7.2	8.4	10.0	10.2	12.0
Pittsburg Project Demand [3]	0.6	1.2	1.2 [4]	1.2 [4]	1.6 [4]
Antioch Project Demand [5]	0.4	1.0	1.0 [4]	1.0 [4]	1.2 [4]
Total Demand Subtotal	*8.2*	*10.6*	*12.2*	*12.4*	*14.8*
Tertiary Surplus (Deficit)	**4.6**	**2.2**	**0.6**	**0.4**	**(2.0)**
Potential Tertiary Treatment Expansion (2015 ADWF) [6]	3.3	3.3	3.3	3.3	3.3
Expanded Tertiary Surplus	**7.9**	**5.5**	**3.9**	**3.7**	**1.3**

Note:

1. Peak daily and hourly tertiary supply assumes sufficient daily equalization.
2. Existing demand values are based on 2006 and 2007 DDSD RWF flow records.
3. Source: RMC, 2005
4. Values have been adjusted to reflect the effects of conservative storage assumptions. The values would be higher if planned storage was not considered and would be lower if recycled water operations were optimized.
5. Source: RMC, 2007
6. Projected ADWF flows in 2015 are estimated to be 16.4 mgd. Assuming 2% losses during secondary and tertiary treatment, 16.1 mgd of tertiary treated water would be available for use. This is 3.3 mgd greater than the existing tertiary capacity.

If DDSD adds a third tertiary treatment train to the existing two tertiary treatment trains, the RWF could have an expanded capacity of 19.2 mgd. Alternatively, DDSD is currently requesting approval from the CDPH to increase the permitted loading rate on its continuous backwashing filter units to achieve a 50% production capacity increase (from 12.8 mgd to 19.2 mgd). Since it is contingent upon CDPH approval, potential increases in capacity from the tertiary filter loading performance study were not considered as part of this Plan.

CCCSD Recycled Water Supplies

The CCCSD RWF has the capacity to produce 3.8 mgd of tertiary treated water, which is a small portion of the 39.8 mgd ADWF in 2007. Existing and planned recycled water demands, which were described in Section 0, will use all of the existing tertiary treatment capacity during the peak season; however, approximately 36 mgd of secondary treated flows are available for treatment to tertiary levels.

ISD Recycled Water Supplies

ISD is in the midst of an upgrade to tertiary treatment that will provide 4.3 mgd of tertiary treatment capacity so all of its wastewater will be treated to tertiary levels. There are plans to further expand the tertiary treatment facilities to 8.6 mgd, which represents the maximum wastewater flow at build-out for the ISD service area.

Table 3-4 shows the projected recycled water supplies based on ADWF projections, which would be available during the summer months that correspond with peak industrial water demand. ISD is implementing plans for land disposal and surface water discharge for all of its tertiary water; however, all flows would be available for beneficial reuse. ISD confirmed there are not any minimum recycled water

flows required during peak periods to maintain the planned land disposal operations because they can apply stored recycled water or supplement irrigation with ISD water rights on Jersey Island and its mainland property (Williams/ISD, 2008).

Table 3-4: ISD Average Dry Weather Flow Projections (mgd)

	2010	2015	2020	2025	2030
Wastewater Flow[1]	2.9	3.6	4.2	4.8	5.4
Tertiary Supply[2]	2.8	3.5	4.1	4.7	5.3

Notes:
1. Source: ISD, 2005; Figure 3-2; Moderate growth projection (500 dwelling units per year)
2. Assumes 2% losses during treatment.

Satellite Treatment Supplies

Given the location of the potential new power plants relative to the DDSD RWF, this Plan also evaluated serving these future users from a satellite treatment facility. Aside from cost impacts, the feasibility of using satellite treatment requires consideration of the amount of wastewater flow available for treatment and the impact of reducing wastewater flows to the DDSD RWF.

For the purposes of this Plan, sites were chosen for satellite treatment facilities adjacent to DDSD wastewater pump stations in the vicinity of the Antioch and Pittsburg power plant sites. The Bridgehead Pump Station is approximately 0.4 miles from the Antioch power plant site and the Pittsburg Pump Station is approximately 0.3 miles from the Pittsburg power plant site. (See Section 4.2 for further discussion of the sites).

Hourly flow monitoring data from 2005 through 2007 for June through August were used to develop projected wastewater flows available for satellite treatment in 2015 as well as the estimated recycled water flow available. **Table 3-5** presents this data.

Table 3-5: Satellite Treatment Flow Estimates (mgd)

Pump Station Location	2005-2007 [1]			2015 [2]	
	Wastewater Daily Flow			Wastewater Daily Flow	Recycled Water Effluent [3]
	Min / Max	Average	95th Percentile	95th Percentile	
Bridgehead	1.0 / 2.7	2.3	2.1	2.5	2.4
Pittsburg	2.8 / 4.7	3.9	3.2	3.8	3.7

Notes:
1. Hourly monitoring data for June through August of 2005, 2006, and 2007.
2. Assumes 2% annual growth rate from 2006 to 2015.
3. Assumes 3% flow losses during treatment.

Constructing a satellite treatment plant would reduce flows to the RWF, and therefore could impact the ability of DDSD to deliver sufficient recycled water to existing users. However, the estimated surplus supply in 2015 on a peak day is 3.7 mgd and is 5.5 mgd on the average day of the peak month in 2015 (see Table 3-3). Therefore, diversion of 2.5 mgd for satellite treatment at the Bridgehead Pump Station should not impact recycled water production at the DDSD RWF and diversion of 3.8 mgd for satellite treatment at the Pittsburg Pump Station could have a minor impact on recycled water production at the DDSD RWF on peak demand days.

3.3.2 Recycled Water Quality

This section provides a general summary of water quality issues associated with cooling tower uses at new power plant facilities, discusses the water quality of DDSD, CCCSD and ISD recycled water supply and identifies water quality concerns for cooling towers. The primary water quality considerations are preventing corrosion, scaling, and biological fouling. In particular, corrosion can be controlled with corrosion-resistant material but the material may cost more.

The accumulation of dissolved minerals and organic constituents in cooling towers is controlled by adding makeup water and removing blowdown water. The makeup water in this case would be recycled water. The volume of blowdown is usually determined by the cooling tower's allowable salt concentration. Similarly, the cycles of concentration, which is the ratio of dissolved solids in the cooling tower versus the makeup water, is determined by the makeup (recycled) water quality and cooling tower dissolved concentration limits. Typical cycles of concentration for cooling towers using recycled water are two to five (Asano, et al, 2006).

As noted in **Table 3-6**, there are several constituents of concern for cooling towers because they may cause scaling or fouling. Depending on the constituent, these issues will either need to be addressed at the recycled water facility and/or at the power plant site via additional treatment.

Table 3-6: Constituents of Concern for Cooling Towers

Constituents of Concern	Potential Problems	Control Options	Point of Control
Ammonia	Biological fouling	Nitrification; Stripping	RWF, On-Site
Carbonate, Bicarbonate	Corrosion, scaling	pH control; Use of antiscalants	On-Site
Calcium	Scaling	Nanofiltration; Reverse osmosis; Ion exchange; Electrodialysis reversal	RWF, On-Site
Magnesium	Scaling		RWF, On-Site
Microorganisms	Biological fouling	Disinfection; Shock chlorination; mechanical cleaning	RWF, On-Site
Organic Compounds	Biological fouling	Biological treatment	RWF
Phosphates	Scaling	Lowering pH; Biological nutrient removal; Cold lime treatment	RWF, On-Site
Silica	Scaling	Blowdown	On-Site
Total Dissolved Solids	Corrosion, scaling	Blowdown	On-Site

Source: Adapted from Asano, et al, 2006; Table 19-9

Table 3-7 presents a summary of the typical water quality for each recycled supply source compared with water quality goals for cooling towers from multiple sources. One source (SPX, 2007) provided water quality objectives. Any recycled water supply exceedances of these goals are indicated with bold type. The following table does not include values for microorganisms, organic compounds, and phosphates even though they are listed in the previous table because the water quality references did not include objectives for these types of constituents. Also, data for ammonium, mercury and residual chlorine were identified as constituents of concern but no data was available for inclusion in this Plan.

Table 3-7: Recycled Water Quality Data

Constituent	Units	SPX Water Quality Limits[1]	DDSD [1,2]			CCCSD [1,3]			ISD [1,4]	Satellite[1,5]
			Avg	Max	Min	Avg	Max	Min	Avg	Avg
Total Alkalinity (as $CaCO_3$)	mg/L	< 100 - 500	**232**	**250**	**220**	**219**	**232**	**186**		**298**
Ammonia	mg/L	< 10 - 50 [6]	**25**	**29**	**19**	**21**	**23**	**18**	< 0.5	< 1
Bicarbonate (as $CaCO_3$)	mg/L	< 300	230	240	220	219	232	186		298
Calcium (as $CaCO_3$)	mg/L	< 800	54	59	49	32	34	30		74
Chloride (as Cl^-)	mg/L	< 300 - 450	**305**	**405**	210	121	140	118	160	260
Iron	mg/L	< 3.0	1.1	1.9	0.4	0.04	0.05	0.02	0.14	0.58
Magnesium	mg/L	--[7]	23	25	22	15	16	14		27
Manganese	mg/L	0.1							0.02	
Nitrate (as NO_3)	mg/L	< 300				0.53	0.93	0.21	< 8	< 3
Silica (as SiO_2)	mg/L	< 150	22	23	21	15	17	14		24
Sulfate (as $CaCO_3$)	mg/L	< 800 [8]	245	280	200	125	175	90	71	460
Total Dissolved Solids	mg/L	< 5,000	960	1,000	830	492	526	457	744	962
Total Suspended Solids	mg/L	< 50 – 250 [6]				7	14	3		< 5

Notes:

1. **Bold** value exceeds water quality objective from SPX (2007).
2. Sources: DDSD RWF effluent data was primarily developed from 2007 quarterly samples. Ammonia values were from 14 samples collected between September and December 2007 as part of an ammonia study. Iron values were from 4 samples collected in October 2004.
3. Sources: CCCSD RWF effluent data was primarily developed from weekly grab samples between June and November 2002. TSS and pH values were taken from the CCCSD 2007 NPDES Report.
4. Sources: All the values except for TDS were water quality projections taken from Table 4 of the Antidegradation Analysis for the ISD WWTP (RBI, 2008). TDS value was based on the daily average for January 2008 to through October 2008.
5. Water quality data based on raw wastewater quality data (see Table 3-8) and typical removal rates of an MBR/UV system for ammonia, nitrate, and TSS. Removal rates for remaining constituents could not be estimated without further analysis and/or testing. Inorganic constituents (e.g. iron) would not likely have any significant removal and minerals (measured as $CaCO_3$) may have some removal.
6. Limit from SPX is dependent upon film fill type.
7. Magnesium limit is calculated relative to pH and silica values.
8. Sulfate limit from Marley applicable if calcium is high.

The following sections discuss constituents that had concentrations in recycled water above water quality objectives for cooling tower applications, as defined in Table 3-7. However, elevated concentrations of these constituents does not equate to a fatal flaw in the application of the recycled water source for cooling towers. Rather, the power plants could be designed with consideration of elevated concentrations of these constituents and control options that may increase project costs may need to be considered. Also, the power plants could apply dry cooling technologies to avoid water quality concerns.

DDSD Recycled Water Quality

The following constituents had concentrations in DDSD recycled water above water quality objectives for cooling tower applications: total alkalinity; ammonia; and chloride. Each constituent is discussed briefly:

- **Total Alkalinity (Average = 232 mg/L):** Total alkalinity concentrations exceeded the minimum threshold (100 mg/L) but not the maximum threshold (500 mg/L) of the SPX water quality objective range.
- **Ammonia (25 mg/L):** Ammonia concentrations exceeded the minimum threshold (10 mg/L) but not the maximum threshold (50 mg/L) of the SPX water quality objective. SPX provides a range of water quality limits for ammonia because the objective varies based on cooling tower materials.
- **Chloride (305 mg/L):** Chloride concentrations exceeded the minimum poor quality value (300 mg/L) and were less than the minimum SPX water quality objective (450 mg/L).

In addition, notable constituents for which no data was available include manganese, nitrate and TSS.

DDSD recycled water is currently used in cooling towers at DEC and LMEC, which further supports the notion that elevated concentrations of specific constituents in recycled water does not constitute a fatal flaw in its application for cooling towers. However, DEC and LMEC must actively manage their operations to address potential water quality issues.

CCCSD Recycled Water Quality

The following constituents had concentrations in CCCSD recycled water above water quality objectives for cooling tower applications: total alkalinity and ammonia. Each constituent is discussed briefly:

- **Total Alkalinity (Average = 219 mg/L):** Total alkalinity concentrations exceeded the minimum threshold (100 mg/L) but not the maximum threshold (500 mg/L) of the SPX water quality objective range.
- **Ammonia (21 mg/L):** Ammonia concentrations exceeded the minimum threshold (10 mg/L) but not the maximum threshold (50 mg/L) of the SPX water quality objective. SPX provides a range of water quality limits for ammonia because the objective varies based on cooling tower materials.

In addition, the only notable constituent for which no data was available was manganese. As with recycled water from the DDSD RWF, these elevated concentrations does not constitute a fatal flaw in its application for cooling towers.

ISD Recycled Water Quality

No constituents had concentrations in ISD recycled water above water quality objectives for cooling tower applications. However, notable constituents for which no data was available include: total alkalinity; bicarbonate; calcium; magnesium; nitrate; silica; and TSS. As with recycled water from the DDSD RWF, these elevated concentrations does not constitute a fatal flaw in its application for cooling towers.

Satellite Treatment Water Quality

As shown in **Table 3-8**, raw wastewater samples were collected from the two proposed satellite treatment plant locations: 1) Bridgehead Pump Station; and 2) Pittsburg Pump Station. The raw wastewater quality does not seem abnormal and likely to cause any treatment issues with an MBR/UV system.

Table 3-8: Satellite Treatment Influent Water Quality Comparison

Parameter	Units	Bridgehead Pump Station	Pittsburg Pump Station
Temperature	Degrees C	24.4	25.4
Total Suspended Solids	mg/L	207	145
Biological Oxygen Demand	mg/L	129	163
Chemical Oxygen Demand	mg/L	377	537
Total Kjeldahl Nitrogen	mg/L	49	59
Ammonia (as N)	mg/L	35	44
Total Phosphorus	mg/L	5.0	7.0
pH	S.U.	7.3	7.6
Alkalinity (as $CaCO_3$)	mg/L	280	317

Source: Raw wastewater samples collected by DDSD on July 2, July 3, and July 10, 2008.

Total alkalinity was the only constituents that had estimated effluent concentrations after satellite treatment with an MBR/UV system that was above water quality objectives for cooling tower applications. It is discussed briefly:

- **Total Alkalinity (Average = 298 mg/L):** Estimated total alkalinity concentrations exceeded the minimum threshold (100 mg/L) but not the maximum threshold (500 mg/L) of the SPX water quality objective range. Note that a constituent removal rate could not be assumed for the MBR/UV system without additional analysis and/or testing and total alkalinity may be removed slightly.

In addition, the only notable constituent for which no data was available was manganese. As with recycled water from the DDSD RWF, these elevated concentrations does not constitute a fatal flaw in its application for cooling towers.

3.4 Raw Surface Water Supplies

Most existing industrial demands in the study area are met with raw surface water supplies from the San Joaquin River or via the CCWD Contra Costa Canal so use of these supplies to serve new industrial customers was included in the Plan. Also, the SWRCB Water Recycling Funding Program, which is funding approximately 50% of this Plan, requires the discussion and assessment of other potentially viable new sources of water. The availability and quality of the two raw surface water sources considered as alternatives to recycled water are discussed in the following sections.

3.4.1 Raw Surface Water Availability

CCWD Surface Water

CCWD long-term water supply planning includes an assumption to serve up to 18,200 afy to new industrial demands in its service area. The average daily volume available during peak season (June to August), based on currently planned facilities, is approximately 17 mgd in normal water years and 15 mgd (95%) in dry years (CCWD, 2005).

CCWD Los Vaqueros Reservoir stores higher quality San Joaquin River / Delta water blending with the Delta supply during dry periods when sodium and chloride levels typically increase. Besides improving water quality, the reservoir stores water for emergency supply and operational flexibility. CCWD is also constructing the Alternative Intake Project, which could be completed as early as 2010. The AIP will improve CCWD existing water supply and enable CCWD to relocate some of its water diversions to a Delta location with better source water quality than is currently available at CCWD existing Delta intakes. These projects have helped reduced water quality variability and, as a result, improved water quantity reliability for CCWD.

City of Antioch San Joaquin River

Antioch also has pre-1914 water rights for the San Joaquin River. Based on inquiries to the Water Rights Division of SWRCB, no quantity limitation on the Antioch's appropriation from the San Joaquin River was identified provided that diverted water is used beneficially (Brown & Caldwell, 2005). The existing intake facilities limit the current river diversion to 16 mgd. Additional raw surface water supplies from the San Joaquin River for a new industrial customer would require construction of a new intake and conveyance facilities.

Antioch's use of water from the San Joaquin River has been limited for periods throughout the year because pumping is generally halted if mean chloride concentrations exceed 250 mg/L. In addition, the SWRCB has established water quality standards for the Delta, including maximum chloride concentrations of 250 mg/L at Antioch's San Joaquin River pumping station for a minimum duration depending on net Delta outflow. Concentrations of constituents, such as TDS, can vary widely during the year with concentrations highest in the late summer and fall months and lowest in the winter and early spring (Antioch and Mundie Associates, 2003).

In the future, Antioch's access to water from the river is dependent on similar factors as CCWD Delta intakes (variations in water quality caused by salinity intrusion, Delta hydrodynamics, and discharges into the Delta and its tributary streams from both point and non-point sources (CCWD, 2005).

Note that use of Antioch's water rights from the river for industrial uses limits use of the water to Antioch's sphere of influence so this supply could not be used in Pittsburg.

3.4.2 Raw Surface Water Quality

This section discusses the raw surface water quality from the CCWD Canal and Antioch's San Joaquin River intake. **Table 3-9** presents a summary of the typical water quality for each supply source. The values are compared against water quality goals for cooling towers from multiple sources. One source (SPX, 2007) provided water objectives. Any recycled water supply exceedances of these goals are indicated with bold type.

The following table does not include values for microorganisms, organic compounds, and phosphates even though they are listed in the previous table because the water quality references did not include objectives for these types of constituents. Also, data for ammonium, mercury and residual chlorine were identified as constituents of concern but no data was available for inclusion in this Plan.

As with recycled water, the following sections discuss constituents that had concentrations in raw surface water above water quality objectives for cooling tower applications, as defined in Table 3-9. However, elevated concentrations of these constituents does not equate to a fatal flaw in the application of the water source for cooling towers. Rather, the power plants should be designed with consideration of elevated concentrations of these constituents and control options may need to be considered. Examples of control options, such as cooling tower material selection, are listed in Table 3-6.

Table 3-9: Raw Surface Water Quality Data

Constituent	Units	SPX Water Quality Limits[1]	CCWD Contra Costa Canal [1,2]			San Joaquin River Intake [1,3]		
			Avg	Max	Min	Avg	Max	Min
Total Alkalinity (as $CaCO_3$)	mg/L	< 100 - 500	67	89	39	63	86	45
Ammonia	mg/L	< 10 - 50 [4]	ND	ND	ND			
Bicarbonate (as $CaCO_3$)	mg/L	< 300	70	78	63	63	86	45
Calcium (as $CaCO_3$)	mg/L	< 800	16	21	9	20	41	9
Chloride (as Cl^-)	mg/L	< 300 - 450	49	98	10	254	**1,200**	10
Iron	mg/L	< 3.0	0.45	1.40	0.12	1.13	2.60	0.44
Magnesium	mg/L	--[5]	11	15	8	24	84	4.3
Manganese	mg/L	0.1	0.04	0.07	0.01	0.03	0.06	0.02
Nitrate (as NO_3)	mg/L	< 300	1.4	4.5	0.1	8	50	ND
Silica (as SiO_2)	mg/L	< 150						
Sulfate (as $CaCO_3$)	mg/L	< 800 [6]	25.6	44	12	58	280	11
Total Dissolved Solids	mg/L	< 5,000	230	338	111	1,018	**5,324**	20
Total Suspended Solids	mg/L	< 50 – 250 [4]	5.4	13.0	1.8			

ND Non-detect

Notes:

1. **Bold** value exceeds water quality objective from SPX (2007).
2. Source: Water quality results from 2005 to 2007 from the Contra Costa Canal. TDS values were calculated by applying a 0.65 conversion factor to electrical conductivity (EC) data.
3. Sources: Antioch San Joaquin River water quality data was primarily from intake drinking water quality monitoring reports to CDPH from 1998 through 2007. TDS values were daily EC values between 1997 and 2007 from the California Data Exchange Center San Joaquin River at Antioch station (ANH). TDS values were calculated by applied a 0.65 factor to the EC values.
4. Limit from Marley is dependent upon film fill type.
5. Magnesium limit is calculated relative to pH and silica values.
6. Sulfate limit from Marley applicable if calcium is high.

Contra Costa Canal

No constituents had concentrations in Canal water above water quality objectives for cooling tower applications. In addition, the only notable constituent for which no data was available was silica. CCWD Canal water is currently used for a variety of industrial applications, including cooling towers, which supports the notion that elevated concentrations of specific constituents in the water does not constitute a fatal flaw in its application for cooling towers.

San Joaquin River

The following constituents had concentrations in the San Joaquin River water above water quality objectives for cooling tower applications: chloride; and TDS. Each constituent is discussed briefly:

- **Chloride (254 mg/L):** Average chloride concentrations did not exceed the SPX water quality objective (450 mg/L) but the maximum concentration (1,200 mg/L) did exceed the objective.
- **TDS (1,018 mg/L):** Average TDS concentrations exceeded the maximum good quality value (500 mg/L) but did not exceed the minimum poor quality value (1,500 mg/L); however, the maximum concentration (5,324 mg/L) exceeded the minimum poor quality value and the SPX water quality objective (5,000 mg/L).

In addition, notable constituents for which no data was available include: ammonia; silica; and TSS. The elevated concentrations of TDS could constitute a significant shortcoming for use of San Joaquin River water extracted at Antioch's existing intake facility in its application for cooling towers since maximum values exceed 5,000 mg/L. This may require once-through cooling operations, which could be a fatal flaw. Also, TDS concentrations vary by almost two orders of magnitude, which could cause significant operational issues.

As previously discussed, Antioch is considering an alternative intake project that would add a new intake further upstream on the San Joaquin River. The alternative intake would enable Antioch to relocate some of its diversions to a Delta location with better source water quality than is currently available. Implementation of this project should improve water quality but not necessarily supply reliability concerns as a potential industrial water supply.

3.5 Water Supplies vs. Potential Industrial Demands

Figure 3-3 presents a summary of the recycled water supplies discussed in the previous section and compares them with estimated demands for future potential power plants.

As discussed in Section 3.2, the maximum demand considered by this Plan assumed either a 500 MW base-load plant or combination of smaller intermediate-load plants totaling 1,000 MW at both Pittsburg and Antioch. A base-load plant is considered to operate at greater than 60% of capacity throughout the year and an intermediate-load plant is considered to operate between 15% and 60% of capacity throughout the year. The estimated demands associated with each probable power plant type were presented in Figure 3-2 and are shown in Figure 3-3; however, it should be noted that exact demands can vary for wet cooling towers depending on the technology and cycles of concentration applied.

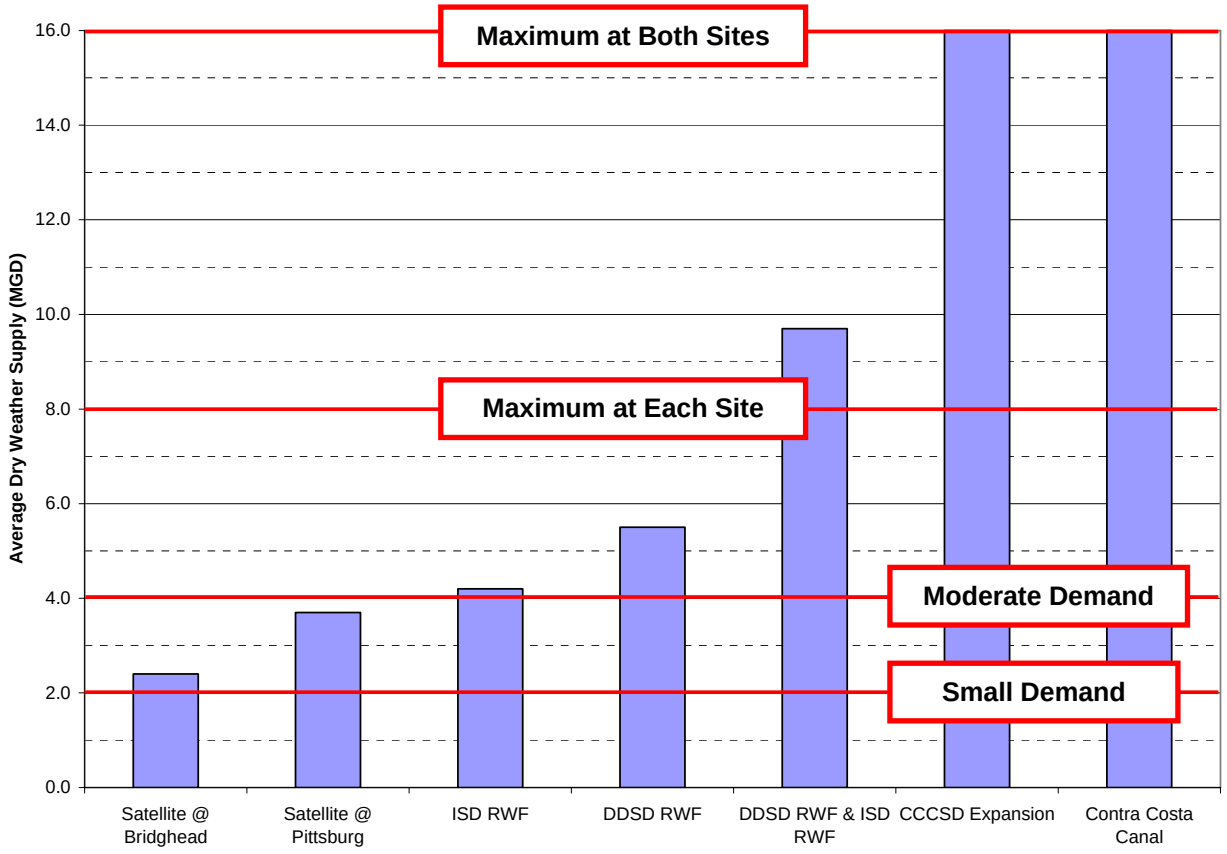
As noted in Figure 3-3, various combinations of recycled water supply sources can be used to meet the projected future industrial demands. These various options, described briefly below, will be discussed further as part of the alternative development in Section 4.1:

- **Satellite @ Bridgehead (2.4 mgd):** Treatment of raw wastewater from the DDSD Bridgehead Pump Station could meet small power plant demands.
- **Satellite @ Pittsburg (3.7 mgd):** Treatment of raw wastewater from the DDSD Pittsburg Pump Station could meet moderate power plant demands.

- **ISD RWF (3.5 mgd):** Tertiary treated supplies from the planned ISD RWF could meet moderate power plant demands.
- **DDSD RWF (5.5 mgd):** Through expansion of the existing DDSD tertiary treatment capacity, it would be able to serve at least moderate power plant demands.
- **ISD & DDSD RWFs (9.0 mgd):** Combining the two supplies would enable maximum power plant demands to be met instead of two separate moderate demands.
- **CCCSD RWF (16.0+ mgd):** Only CCCSD has the recycled water supply to meet maximum power plant demands at two sites.
- **CCWD Contra Costa Canal (16.0+ mgd):** The Canal has enough supply to meet maximum power plant demands at two sites.

The San Joaquin River was not further considered as a raw water supply due to water supply reliability and quality concerns. As previously discussed, Antioch is considering measures to address these issues.

Figure 3-3: Recycled Water Supplies vs. New Power Plant Peak Month Demands



3.6 Implementation Issues

A final component of the market assessment is to review other implementation considerations such as public perception, environmental impacts, and other agency coordination issues to determine the extent to which, implementation of a recycled water project specifically for industrial users, and more specifically for power plant cooling, may be problematic or cost-prohibitive. Potential issues associated with using recycled or raw water for a new power plant are discussed in the following section labeled "California Energy Commission".

3.6.1 California Energy Commission

The California Energy Commission (CEC) is the agency that approves all new power plants proposed in California. The approval process is rigorous and approval takes into account a range of considerations. In particular, the CEC is the lead agency under CEQA and the process is documented in an Application for Certification, which is functionally equivalent to an EIR, under CEQA.

As part of the certification process, the CEC performs a water reliability assessment of proposed water supplies to determine if there are sufficient water supplies from existing resources available to serve the power plant. For the assessment, the CEC considers whether the water use would cause a "substantial, or potentially substantial, adverse change in the quantity or quality of groundwater or surface water" (CEC, 2007).

Two primary policy documents provide the basis for the CEC's analysis of water supplies for new power plants: 1) Section 7.5 of Title 22 of the California Administrative Code [1991 Water Reclamation Act (Kelley)]; and 2) CEC Integrated Energy Policy Report (CEC, 2003). The Water Reclamation Act basically asserts that recycled water should be used in California when its application is made available and can be used in an appropriate manner. The CEC Integrated Energy Policy Report (CEC, 2003) established "two tests" for the use of fresh water (or conversely, for not using recycled water):

> …the [CEC] will approve the use of fresh water for cooling purposes by power plants which it licenses only where alternative water supply sources and alternative cooling technologies are shown to be **"environmentally undesirable"** or **"economically unsound."** … The [CEC] interprets "environmentally undesirable" to mean the same as having a "significant adverse environmental impact" and "economically unsound" to mean the same as "economically or otherwise infeasible."[4]

Implementation of this policy has led to a preference expressed by CEC staff for use of recycled water as the primary water supply for new wet cooling processes, hybrid wet-dry processes, or the application of dry cooling technologies. However, the CEC has recently approved at least three projects that do not use recycled water.[5]

3.6.2 Reduced Delta Discharges

Drainage and wastewater from the study area are discharged or returned to the Delta (San Joaquin River from ISD and DDSD, and Suisun Bay from CCCSD). Consequently, a large fraction of the wastewater discharged from the study area is already put to beneficial use (as an increment of Delta outflow). In other words, if wastewater discharges in the study area are removed due to recycling, additional releases from upstream water storage reservoirs could be required at times to meet Delta needs. As such, recycling wastewater within the study area may not provide a one-to-one statewide benefit in water supply as would

[4] "Feasible" is defined under CEQA as meaning "capable of being accomplished in a successful manner with a reasonable period of time taking into account economic, environmental, legal, social and technological factors. The same definition existing in the CEC's siting regulations. (Source: CEC, 2003)

[5] Three projects approved by the CEC for non-recycled water as recently as 2007 include: 1) El Centro Power Plant (raw water); 2) Blythe (groundwater); and 3) MID Woodland (treated water).

use of recycled water that would otherwise be discharged directly to the ocean or a salt sink. This "discharge as benefit" factor reduces as the discharge moves from a freshwater zone to a brackish zone, to a saline zone (which varies seasonally, with background Delta outflow, and with the location of discharge).

Also a large portion of the water CCWD diverts from the Delta is flow that is surplus to the needs of the Delta and if unused due to recycling would otherwise flow to the ocean and would not be available as a new water supply. While there is not complete agreement among the project participants on the quantification of the water supply benefits of recycling within the study area, CCWD modeling studies show that the water supply benefit is limited to periods when Delta flow is low, and at less than one to one. The greater the salinity of the discharge sink, the greater the water supply benefit.

On the other hand, reducing surface water withdrawals by CCWD from its facilities, and leaving those flows in the River at times can provide additional water flow and fishery benefits by reducing overall pumping in the Delta. Because this Facility Plan is contemplating a project with two potential use locations (Pittsburg and Antioch), and several potential supply sources, information provided on analyses of water supply benefits is provided for general informational purposes in this document, and these analyses would need to be made at a project specific level in order to complete a project impact analysis.

3.6.3 Level of Service Reliability

Existing industrial water supplies have a relatively high level of service since CCWD plans to provide a minimum of 95% of average year deliveries in dry years. Recycled water has the benefit of being relatively drought-resistant since its availability is based on wastewater flows. However, recycled water systems have limited facility duplication such that the operational reliability is less than existing water supplies. This concern is addressed by providing adequate operational storage and provisions for a backup water supply such as raw water from the CCWD Canal.

In providing reliability for the backup, CCWD is required to reserve capacity in its system so that water can be served when needed, which means that the reserved capacity is unavailable for other customers. CCWD charges a backup supply connection fee as compensation for reserving these facilities as the backup supply.

CCWD has entered into general recycled water agreements with DDSD and CCCSD that provide a framework for independent or joint development of recycled water projects within the CCWD service area. Consideration of duplication of service, backup supply requirements, and other issues are addressed on a case-by-case basis according to the terms of the general agreements.

3.6.4 Greenhouse Gas Emissions

The greenhouse gas (GHG) footprint of new projects is an emerging concern in California and is an important criterion for consideration during the environmental assessment of alternatives. The GHG footprint for each alternative in this Plan is directly related to the energy intensity (or energy use for treatment and distribution) of the water supplies expressed as kilowatt-hours per acre-foot (kWh/af).

The energy intensity to produce recycled water is equivalent to the treatment necessary to supply tertiary treated water beyond what is required for discharge by the wastewater agency. ISD has no additional treatment requirements to supply recycled water since tertiary treated water will be produced from the ISD RWF regardless of whether a recycled water project is implemented. On the other hand, DDSD and CCCSD require an additional tertiary treatment step to provide recycled water for beneficial use beyond the current secondary treatment process currently used at their respective facilities. The energy intensity related to the treatment of supply was not available for either RWF but numerous studies have been conducted to derive an estimate of approximately 100 kWh/af for tertiary filtration and an additional 100

kWh/af if a nitrification step is added.[6] As discussed in Section 3.3.1, CCCSD RWF includes nitrification and DDSD RWF does not include nitrification.

The energy intensity associated with water distribution varies according to topography of the distribution system. In general, recycled water tends to have higher distribution energy intensity than other supply systems since the water is supplied from wastewater treatment plants that are typically sited a lower elevations to take advantage of gravity collection. For this Plan, the energy intensity of distributing recycled water supplies from centralized treatment plants to the Antioch and Pittsburg plant sites varied from 180 kWh/af to 250 kWh/af with most of the supplies near 200 kWh/af. The energy intensity of delivering recycled water from satellite treatment plants was approximately 100 kWh/af.

CCWD provided estimates of the energy intensity to supply raw surface water via the Canal of 165 kWh/af for diversion upstream of milepost 7, such as Rock Slough, and 300 to 400 kWh/af downstream of milepost 7. For this Plan, all Canal turnout locations were downstream of milepost 7 so the latter value has been applied. Raw surface water from the Canal can flow by gravity to either of the power plant sites so no additional energy is needed.

As shown in **Table 3-10**, the estimated unit energy intensities of the water supplies considered in this Plan are comparable. However, recycled water may require more cycles of concentration in cooling towers compared with Canal water, which would cause higher recycled water use to achieve the same energy production and result in greater energy use to achieve the same energy production. The potential for higher cycles of concentration is usually driven by TDS and silica concentrations. All the recycled water supplies in this study have higher TDS than Canal water and the recycled water supplies have similar silica concentrations but silica data was not available for Canal water.

Table 3-10: Estimated Energy Intensity of Supplies

	Units	CCCSD RWF	DDSD RWF	ISD RWF	Canal
Treatment	kWh/af	200	100	--	--
Distribution	kWh/af	200	200	200	300 to 400
Total	**kWh/af**	**400**	**300**	**200**	**300 to 400**

3.6.5 Public Concerns

The public perception of recycled water varies but typical concerns focus on safety if there is a potential for direct contact with the public. Its use for an industrial process would likely reduce this concern provided the area is clearly zoned for industrial development. There may, however, be a general public health concern with new industrial development because of other environmental footprint factors, such as air emissions and GHG emissions regardless of water issues.

In addition, aerosols and windblown spray from cooling towers using recycled water have the potential to concern workers and the public due to potential exposure to particulate matter and microorganisms. However, biocides and other chemicals are typically used for cooling tower operational purposes (to prevent growth) and have a secondary effect of eliminating or greatly reducing these elements in the spray (Asano et al, 2006).

[6] Based on: 1) Los Angeles Department of Water and Power tertiary treatment estimate of 100 kWh/af (CSA, 2008); 2) West Basin Municipal Water District tertiary filtration estimate of 205 kWh/af (Wilkinson, et al, 2005), which mostly consists of pumping secondary-treated wastewater from Hyperion WWTP to the West Basin Title 22 facility; 3) 115 kWh/af for "advanced treatment" (tertiary filtration) and additional 115 kWh/af with nitrification (NRDC, 2004).

3.7 Market Assessment Summary

The following summarize key findings from the recycled water market assessment.

- Application of recycled water for cooling towers is a viable use. There is a potential demand of over 6,000 afy from multiple new power plants in the study area.
- Over 10,000 afy of industrial water demand currently exists within the study area. It was determined, however, that new power plants in Pittsburg and Antioch were better customers for recycled water.
- All recycled water sources provide adequate minimum quantity and quality for cooling tower applications.
- CCCSD RWF was the only recycled water supply that could meet the maximum potential demand for a Pittsburg plant and a combination of DDSD RWF and ISD RWF was the only recycled water supply that could meet the maximum potential demand for an Antioch plant.

Chapter 4 Recycled Water Alternatives

This section examines both the recycled and raw water supply system alternatives. For all the recycled water alternatives, there is an assumed back up raw water supply available from the Contra Costa Canal.

4.1 Alternative Development

This section details the development of the water supply alternatives for serving the proposed new power plants in Antioch and Pittsburg beginning with defining components that make up each alternative and then listing the water supplies for each alternative.

4.1.1 Alternative Components

Each alternative will supply up to 8.0 mgd of water to new power plant sites at either Antioch or Pittsburg. As discussed in Section 3.2.2, the demand at each site could be made up of one medium base-load plant or multiple smaller intermediate-load plants. Also, all alternatives assume the power plant provides sufficient operational storage for daily operations. The following alternative components are further discussed in this section:

- Water Supplies
- Alignments / Right-of-Way
- Backup Water Supply
- Blowdown Management

Water Supplies

As discussed in Section 2.5, four recycled water supplies are considered in this Plan. Three of the supplies are from centralized treatment at CCCSD, DDSD, and ISD and the fourth supply is satellite treatment of DDSD raw wastewater flows in the vicinity of the power plant sites. The recycled water supplies can be combined to obtain more supplies with the exception of DDSD satellite treatment and centralized treatment since recycled water produced from these systems come from the same collection system.

The only non-recycled water supply considered for alternatives development is raw surface water from the Contra Costa Canal. Although not a recycled water supply, the raw water supply is essential for comparison to recycled water supply alternatives as well as to provide a back up to those recycled water supplies.

Recycled Water Pipeline Alignments

The study area consists of a range of land use types, owners, and historical industrial use that could lead to difficult right-of-way situations. For example, the area between DDSD and the new power plant sites is generally privately owned by industry or public right-of-way with significant existing underground infrastructure. Idle pipelines also exist from previous industrial activities that could either be used for water conveyance (with appropriate improvements) or removed so that the right-of-way can be used for a new pipeline.

The CCCSD RWF to Pittsburg alignment provided a particularly complex situation because most of the land between the RWF and the plant is part of the Concord Naval Weapons Station. Federal ownership of the site could cause challenging investigation conditions due to the extended approval period for site access and the limited access likely available once it is approved. Also, right-of-way acquisition tends to take longer periods when Federal ownership is involved.

A right-of-way specialist, PPC Land Consultants, was contracted during this Plan to investigate potential recycled water supply alignments to begin to address some of these alignment concerns. Three alignments were investigated:

1. CCCSD to Pittsburg
2. DDSD to Pittsburg
3. DDSD to Antioch

The pipeline alignment from ISD to Antioch was previously investigated for Alternative B the ISD WWTP Expansion EIR. As a result, the alignment recommended for Alternative B in the document (Jones & Stokes, 2006) was applied to this Plan.

The right-of-way investigation considered various alignment options, including existing recycled water facilities, public right-of-way parallel to roads and highways, private industrial property, idle pipelines and railroad right-of-way. The alignments that were evaluated are presented in **Figure 4-1** and the preferred alignments are presented in **Figure 4-2**.

A basic evaluation of those alignments was conducted in keeping with the planning level of this effort but in order to identify the most cost-effective alignment to schedule requirements a more robust analysis will need to be completed. For example, idle pipelines were assumed to require replacement with a new pipeline however some pipelines upon completing a conditions assessment could use a less costly approach of sliplining the existing pipeline to create a new functioning pipeline. Alignments that were parallel to existing railroads and within the railroad right-of-way were assumed to require a steel casing pipe based on BNSF Railway's Utility Accommodation Policy.[7] There remains a possibility that negotiations with the railway could lead to the waiver of this requirement and/or that sliplining an idle pipeline could suffice for the steel casing requirement but further investigation would be required to change the assumption.

Contra Costa Canal Water Pipeline Alignments

The Canal has over 30 existing turnouts between the Rock Slough Intake and Pittsburg. The turnouts serve either the north or south side of the Canal and serve laterals owned and operated by either CCWD or private entities. Of these, CCWD identified 13 active, non-agricultural turnouts that service the north side of the Canal with diameters range in size from 15" to 36". Six of these turnouts include laterals that are owned and operated by CCWD and at least three of these turnouts serve privately-owned laterals.

Selection of the preferred turnout and lateral for initial alternative development was primarily based on proximity of the turnout's lateral to the power plant site. Other criteria were considered and should be further investigated to identify the most cost-effective Canal water conveyance option. Other considerations include the cost of longer pipelines to reach laterals farther from the site, the CCWD Canal connection fee, existing lateral capacity (including current customer commitments) sufficient for peak demands, idle lateral conditions, and the cost of constructing new pipelines from the Canal.

The preferred lateral for the Antioch site is CCWD Lateral 7.3 for flows up to 4.0 mgd and the 30" East Gaylord lateral for flows greater than 4.0 mgd. Both laterals are located within 1 mile of the site. Conveyance of Canal water through gravity from Lateral 7.3 to the Antioch site assumes installation of a new pipeline between 18th St. and Wilbur Ave and would require a railroad crossing.

Conveyance of Canal water through gravity from the East Gaylord lateral to the Antioch site assumes installation of a new pipeline along Wilbur Ave and would not require any major railroad or road crossings. The owner of the East Gaylord lateral was contacted and indicated a willingness to sell the lateral for $5 million.[8] The final sale price would need to be negotiated between the interested parties in the future. Construction of a new lateral or a long-term basis may prove to be more cost effective depending on the results of purchase price negotiations.

[7] www.bnsf.com/tools/fieldengineering/pdf/utilacc.pdf
[8] Based on conversation with Gary Thatcher of Gaylord (Inland) Container in June 2008.

RMC
Water and Environment

1 inch equals 2 miles

0 0.5 1 2 3 4

Miles

Pipelines

- Existing Recycled Water Pipeline
- CCWD Mallard Slough Pipeline
- Mirant Pipeline
- PG&E Richmond-Pittsburg Pipeline
- CCWD Shortcut Pipeline
- Contra Costa Canal
- Recycled Water Facility
- Power Plant Site

Figure 4-1
Right-of-Way
Investigation Alignments

L:\Projects GIS\0013-015 DDSD-Insustrial RW Facility Plan\MXD\Overall ROW Investigation EastCounty MLP Oct2008.mxd

Sources: PCC ROW ALL GIS FILES

RMC
Water and Environment

1 inch equals 2.29 miles

0 0.5 1 2 3 4
Miles

Legend

Recycled Water Facility
Power Plant Site
Contra Costa Canal
Preferred Recycled Water Pipeline Alignment

N

Figure 4-2
Overall Figure

L:\Projects GIS\0013-015 DDSD-Insustrial RW Facility Plan\MXD\P2 CCCSD Pittsburg PipeAlignment EastCounty MLP June2008.mxd

Sources:

The preferred lateral for the Pittsburg site would be the 12" Mirant (formerly PG&E) lateral, which is located adjacent to the site; however, Mirant is unsure of its future availability so the preferred lateral for this Plan is assumed to be a new pipeline from the Canal that roughly parallels the existing Mirant lateral and existing electrical power line corridor. The lateral can take advantage of gravity flow from the Canal. As with the Antioch site, purchase or use of an existing lateral may prove to be more cost effective.

Backup Water Supply

Power plants typically have some kind of backup water supply system in case the primary water supply is unavailable, particularly if unexpectedly. As discussed in Section 3.6, recycled water systems have limited facility duplication which results in an operational reliability less than existing water supplies. Therefore having a backup supply for recycled water is even more important than for other supplies.

Raw surface water from the Contra Costa Canal is the assumed backup supply source for all recycled water alternatives. Associated facilities for delivery of Canal water to the power plant sites were described in the previous section. Three days of backup supply from the Canal has been assumed for this analysis based on the backup supply approach for DEC/LMEC. CCWD must reserve capacity in its system when providing a backup supply so that water can be served when needed so CCWD must be compensated for reserving this capacity through a connection fee. The fee is determined on a case-by-case basis.

Determining the optimal approach for a backup supply must balance the additional cost associated with providing a more reliable back up supply with the consequences to power plant operations and associated monetary losses if the primary supply is interrupted. This evaluation is beyond the scope of this Plan so the backup supply approach applied by DEC/LMEC was assumed.

A more-cost effective option to supply Canal water as a backup supply may be to convey Canal water from a lateral to a recycled water line and use the recycled water line as conveyance. This approach may require the development of additional turnouts and laterals. As an example, ISD is located within 1 mile of the Canal and its recycled water conveyance infrastructure could be used a backup raw water supply conveyance for alternatives that include ISD recycled water but, no active turnout was identified in the vicinity of ISD RWF or conveyance infrastructure. For DDSD recycled water, CCWD Lateral 14.0 is located within 1 mile to the west of DDSD RWF and crosses the proposed DDSD to Pittsburg alignment but limited capacity is available due to existing demands and recent diameter reduction to 15" due to sliplining so use of this lateral may be limited to lower flows.

The use of storage at the RWF, distribution, and/or plant facilities could provide an alternative to using the Canal as a backup supply. The usual limitation to use of storage is the high cost of construction and lack of land availability (and/or cost of land purchase). ISD will utilize an existing 80-MG surface reservoir adjacent to the new RWF as part of the plant upgrade. This could supply up to 10 days of supply to an 8.0 mgd power plant. The only concerns associated with use of the reservoir as the backup supply are the potential for water quality degradation due to open-air exposure and the inability for supply to reach the plant if there is a problem within the recycled water distribution system. In addition, only alternatives that include recycled water from ISD would likely choose to use the ISD storage as a backup supply because connecting to the Canal would likely be less expensive than connecting to the ISD surface reservoir.

As a final option, the power plants could choose to include on-site storage as a backup supply. As previously mentioned, the cost and availability of land could limit the application of on-site storage. Considering this, it would probably be more applicable to power plants with small water demands since storage requirements are less than at larger plants. Also, the backup supply available from on-site storage would likely be less than the assumption for all alternatives in this Plan: three days supply from the Canal.

Blowdown Management

Blowdown water is the water remaining after it is run through cooling tower process and has a higher concentration of dissolved minerals and organic constituents than the makeup water. (Makeup water is the recycled or Canal water). The constituents become more concentrated as the cooling tower water is reused and evaporated until reaching maximum concentration limits. The most recently constructed power plants, DEC and LMEC, included a separate blowdown return line to the DDSD WWTP industrial bypass line.

The majority of existing industrial wastewater discharges bypasses the DDSD WWTP but is discharged to New York Slough along with the DDSD WWTP secondary effluent. The bypass is permitted by the San Francisco Bay RWQCB (NPDES Permit No. CA0038547) based on the different characteristics of industrial wastewater compared with municipal wastewater, such as the lack of organic and nutrient loadings. The effluent is discharged through a deep-water outfall that is approximately 400 feet from shore at a depth of 46 feet below mean sea level (HDR, 2004).

Based on current permit conditions and the approach of DEC and LMEC, each alternative is assumed to have a separate blowdown return system, which includes a pipeline from the power plant site to the DDSD bypass line and a small pump station at the power plant site for pressurized flow.

Alternatively, the blowdown conveyance system could be avoided if the new power plant were to acquire an NPDES permit from the San Francisco Bay RWQCB to discharge directly to the Delta from the power plants, instead of through DDSD discharge at New York Slough. This option would reduce blowdown conveyance system costs, but would add schedule risks such as the chance that a permit would not be granted and the additional time involved if it were approved.

Another option would be for the power plant to discharge blowdown directly to the sanitary sewer system that feeds the DDSD WWTP. This approach would avoid the construction of a blowdown conveyance system but would require the treatment of this water at the DDSD WWTP. This option would also accelerate the timing of the treatment plant expansion and decrease available collection system capacity, due to the increase in total flows. For this reason, DDSD would likely assess a discharge fee to any discharger to the existing sanitary sewer system. Future permit conditions are not known at this time, but there is a possibility that DDSD would not be able to continue to bypass industrial flows directly to discharge. Instead, DDSD could be required to treat all incoming flows to secondary levels so DDSD would likely still assess a fee in this situation.

4.2 Alternatives Definition

This section presents the definition and assessment of each alternative identified for this Plan.

4.2.1 List of Alternatives

Recycled Water Alternatives

The first step in defining alternatives for detailed evaluation was to determine how many alternatives are possible based on available supplies. Approximately 14 recycled water alternatives could be defined based on four recycled water supplies (see Section 3.5) plus three recycled water supply combinations, and two customer sites. Note that the maximum water supply for each alternative is assumed to be 8.0 mgd. This list of possible alternatives was screened down to seven alternatives based on the following criteria:

- Sufficient supply (i.e. DDSD cannot provide 8.0 mgd)
- Proximity to supply (i.e. ISD is too far from Pittsburg to be cost effective)
- Mutually exclusive supplies (DDSD satellite and centralized treatment supplies)

The recycled water alternatives selected for evaluation are listed in **Table 4-1**.

Table 4-1: Recycled Water Alternatives Selected for Evaluation

Alternative ID	Recycled Water Supply	2015 Supply (mgd)	Recycled Water Pipeline(s)
Antioch Alternatives			
A1	DDSD RWF	5.5	DDSD RWF to Antioch site
A2	ISD RWF	3.5	ISD RWF to Antioch site
A3	Combination of DDSD RWF & ISD RWF	8.0	1) DDSD RWF to Antioch site 2) ISD RWF to Antioch site
A4	Satellite @ Bridgehead Pump Station	2.4	Bridgehead PS to Antioch
Pittsburg Alternatives			
P1	DDSD RWF	5.5	DDSD RWF to Pittsburg site
P2	CCCSD RWF	8.0	CCCSD RWF to Pittsburg site
P3	Satellite @ Pittsburg Pump Station	3.7	Pittsburg PS to Pittsburg

Canal Water Alternatives

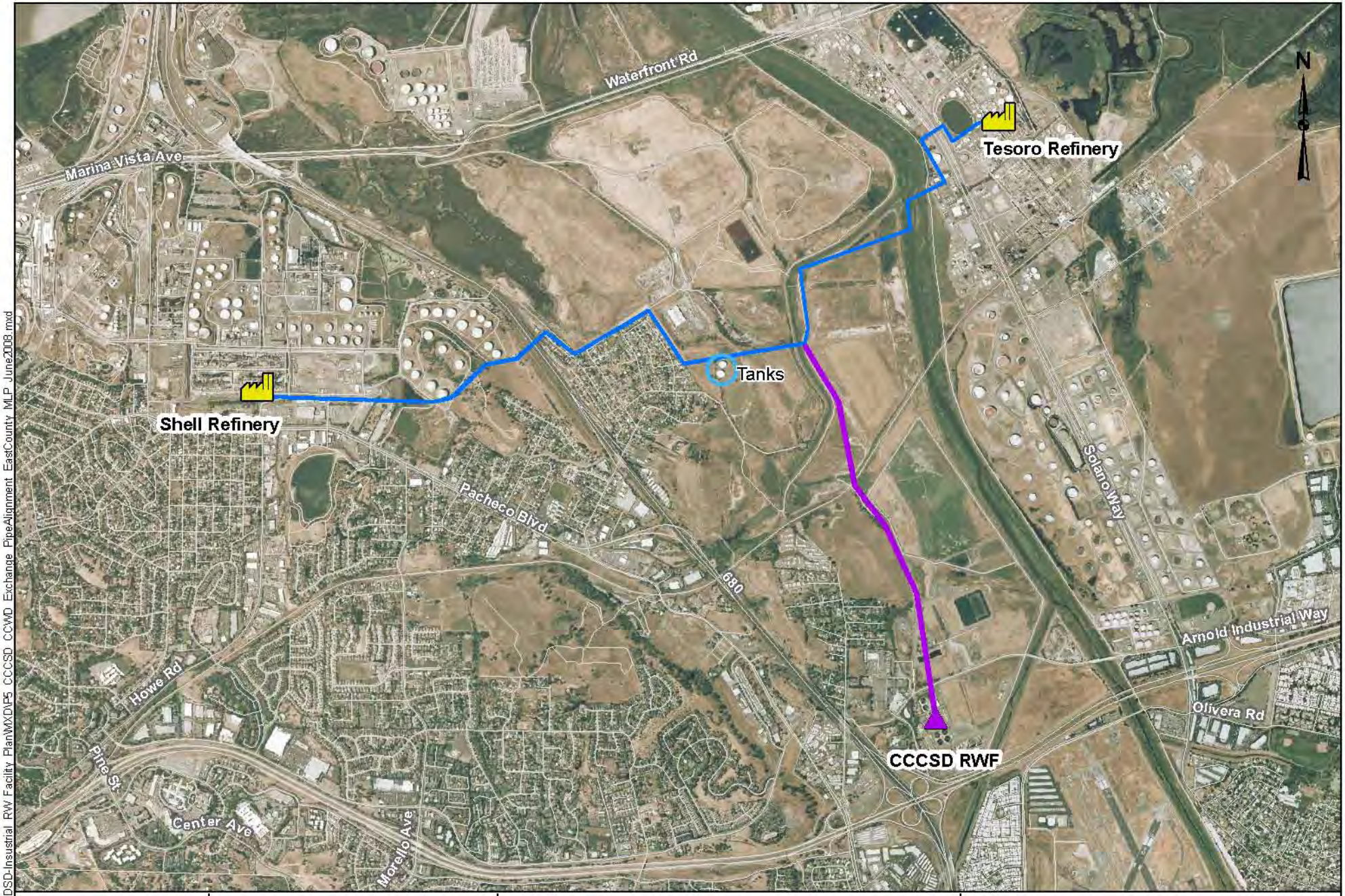
The alternatives developed also include non-recycled water supply as raw surface water from the Canal. The Canal alternatives include a low-end estimate that matches the lowest required recycled water supply flow for that particular power plant site and the estimated maximum demand for each site of 8.0 mgd. The low-end and high-end estimates were chosen so that book-end alternatives could be developed.

Exchange Alternatives

The exchange concept developed from the desire to avoid the distant transport of CCCSD recycled water supplies when sufficient industrial demand was located near the CCCSD RWF where industries had previously used recycled water. The Shell and Tesoro refineries are located approximate 2 miles and l mile from the CCCSD RWF, respectively, and received recycled water from CCCSD on two occasions (in 1988 and 1991) when CCWD Canal water supplies were strained during the 1987 to 1992 California drought.

The existing infrastructure, which is shown in **Figure 4-3**, consists of an 1.2 mile 42” diameter pipeline within CCCSD property boundary, 3.5 miles of 20” to 24” pipe connecting the 42” pipe to the Shell and Tesoro refineries, and two, 3-MG tanks along the pipelines to Shell. CCWD continues to use portions of those pipelines outside of CCCSD property to provide fire suppression to a nearby landfill and CCWD is considering using portions of the pipelines as bypass lines during maintenance service to the CCWD Shortcut Pipeline. Use of the pipe that serves the landfill may require the landfill to convert the fire suppression supply to recycled water and use of the bypass pipe sections would require coordination with CCWD.

The exchange concept is for the new power plants to use the Canal as their primary supply. This new canal supply would be offset by having decreased use of Canal supplies from the Shell or Tesoro refineries, since they would be instead using recycled water supplies from the CCCSD RWF. In this way, the new power plants would not cause an overall increase in the use of Canal water even though that it is their primary water supply. The estimated maximum demand for each site was assumed to be 8.0 mgd.



RMC Water and Environment

1 inch equals 0.44 miles

0 0.2 0.4 0.8

Miles

Existing Facilities

Recycled Water Facility

Refinery Site

CCWD 20" to 24" Pipes

CCCSD 42" Pipe

Figure 4-3
Existing Distribution Infrastructure to Shell and Tesoro Refineries

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Sources:

4.2.2 Alternative Definitions

This section defines each of the alternatives prior to their evaluation in the following section. First, the hydraulic analysis and design criteria are discussed and then each alternative is defined.

As discussed in Section 4.1.1, each alternative assumes the blowdown is returned via a separate conveyance system and that all operational storage is located at the power plant site. Also, recycled water alternatives assumed the backup water supply is Canal water.

Hydraulic Analysis and Design Criteria

A hydraulic analysis using H_2OMap modeling software was applied to each of the conceptual alternatives in order to determine pipeline sizing, storage and pumping requirements. The hydraulic model spreadsheets and basis for sizing facilities for each alternative are included in Appendix A. **Table 4-2** summarizes the design criteria used in the hydraulic model runs.

Table 4-2: Hydraulic Design Criteria for Model Development

System Component	Criteria
Minimum Design Pressure	20 psi (assumes on-site storage)
Maximum Design Pressure	120 psi for PVC pipe, 185 psi for ductile iron (DI) pipe
Pipe Material	Up to 14” diameter: PVC pipe, C900 Class 150 16” to 36” diameter: Ductile Iron pipe, Class 250
Maximum Head Loss	7 feet per 1000 feet of pipe
Allowable Velocity Range	2 to 8 feet per second
Hazen-Williams Coefficient for Head Loss Calculation	135 for PVC pipe 130 for DI pipe

Alternative A1 – DDSD RWF (5.5 MGD)

For this alternative, up to 5.5 mgd of recycled water will be supplied from the DDSD RWF to the Antioch power plant site. Associated facilities are presented in **Figure 4-4** and described below.

- *Recycled Water Treatment*: The alternative includes installation of a third 6.4 mgd tertiary treatment train that would expand the DDSD RWF from a capacity of 12.8 mgd to 19.2 mgd. Recycled water production from the expanded facility will be limited to projected flows (16.4 mgd in 2015) less treatment plant losses (approximately 2%), which leaves 16.1 mgd of recycled water available. Of this, existing and planned demands will require 10.6 mgd, which leaves 5.5 mgd for this alternative.
- *Recycled Water Pipeline*: The alternative would require approximately 27,100 linear feet (LF) of 16” PVC pipeline from the DDSD RWF to the Antioch power plant. The general alignment of the pipe is east along West 10th Street until A Street where the pipeline turns north briefly and then east along Wilbur Ave to the power plant site. The alignment’s major crossing is the Wilbur Ave Bridge / BNSF Railroad.
- *Recycled Water Pump Station*: Recycled water conveyance from the DDSD RWF to the power plant requires a new 310-hp pump station, which is assumed to be located at the RWF.
- *Blowdown System*: The blowdown system consists of 27,100 LF of 12” PVC pipe from the power plant to the DDSD WWTP and aligned parallel to the recycled water pipeline. A new 70-hp booster station is also needed, which is assumed to be located at the power plant site.
- *Backup Water Supply*: The Canal water will be conveyed from the East Gaylord Lateral to the power plant via gravity through a 4,350 LF of 14” PVC pipeline along Wilbur Ave. No pump station is needed and there are no major crossings.

Alternative A2 – ISD RWF (3.5 MGD)

For this alternative, up to 3.5 mgd of recycled water will be supplied from the ISD RWF to the Antioch power plant site. Associated facilities are presented in **Figure 4-5** and described below.

- *Recycled Water Treatment:* The alternative assumes ISD completes installation of their 4.3 mgd tertiary treatment plant as planned in 2010. Recycled water production from the expanded facility will be limited to projected flows (3.6 mgd in 2015) less treatment plant losses (approximately 2%), which leaves 3.5 mgd of recycled water available. All of this supply is available for use at the power plant.
- *Recycled Water Pipeline:* The alternative would require approximately 21,200 LF of 14" PVC pipeline from the ISD RWF to the Antioch power plant. The general alignment of the pipe is northwest from the ISD RWF along Walnut Meadows Dr then west along Hwy 4/Main St and north along Bridgehead Road to Wilbur Ave at the power plant site. Major crossings along this alignment include two railroads (BNSF twice) and one highway (Hwy-4).
- *Recycled Water Pump Station:* Recycled water conveyance from the ISD RWF to the power plant requires a new 150-hp pump station, which is assumed to be located at the RWF. This pump station has the potential to be replaced by the planned effluent distribution pump station but that cannot be assumed at this time based on conversation with ISD (Williams/ISD, 2008).
- *Blowdown System:* The blowdown system consists of 27,100 LF of 12" PVC pipe from the power plant to the DDSD WWTP and aligned parallel to the Alternative A1 recycled water pipeline. A new 40-hp booster station is also needed, which is assumed to be located at the power plant site.
- *Backup Water Supply:* The Canal water will be conveyed from CCWD Lateral 7.3 to the power plant via gravity through 4,000 LF of 12" PVC pipeline along Vineyard Drive. No pump station is needed but one major railroad crossing (BNSF) is necessary.

Alternative A3 – DDSD RWF (4.5 MGD) & ISD RWF (3.5 MGD)

For this alternative, up to 8.0 mgd of recycled water will be supplied from a combination of the DDSD RWF and ISD RWF to the Antioch power plant site. Associated facilities are presented in **Figure 4-6** and described below.

- *Recycled Water Treatment*: The alternative includes installation of a third 6.4 mgd tertiary treatment train at the DDSD RWF (as in Alt A1) and assumes ISD completes installation of their 4.3 mgd tertiary treatment plant as planned in 2010 (as in Alt A2). The maximum combined supply from both sources (9.0 mgd) exceeds the estimated maximum demand (8.0) by 1.0 mgd so the alternative assumes the DDSD contribution is reduced to maximize reuse from ISD in place of disposal and to minimize constraints on serving existing DDSD demands.
- *Recycled Water Pipeline*: The alternative would require approximately 27,100 LF of 16" DI pipeline from the DDSD RWF to the Antioch power plant and approximately 21,200 LF of 14" PVC pipeline from the ISD RWF to the Antioch power plant. The general alignment and major crossings for the DDSD RWF pipeline and the ISD RWF pipeline were described in Alt A1 and Alt A2, respectively.
- *Recycled Water Pump Station*: Recycled water conveyance from the DDSD RWF to the power plant and from ISD RWF to the power plant requires a new 190-hp pump station and a new 150-hp pump station, respectively. Both pump stations are assumed to be located at their respective RWFs.
- *Blowdown System*: The blowdown system consists of 27,100 LF of 12" PVC pipe from the power plant to the DDSD WWTP and is aligned parallel to the recycled water pipeline from the DDSD RWF. A new 90-hp booster station is also needed, which is assumed to be located at the power plant site.

- *Backup Water Supply*: The Canal water will be conveyed from the East Gaylord Lateral to the power plant via gravity through a 4,350 LF of 18" DI pipeline along Wilbur Ave. No pump station is needed and there are no major crossings.

Alternative A4 – Satellite Treatment @ Bridgehead Pump Station (2.4 MGD)

For this alternative, up to 2.4 mgd of recycled water will be supplied from a satellite treatment plant adjacent to Bridgehead Pump Station and conveyed to the Antioch power plant site. Associated facilities are presented in **Figure 4-7** and described below.

- *Recycled Water Treatment*: The alternative includes installation of a satellite treatment system to provide tertiary treatment to raw wastewater at Bridgehead Pump Station. The assumed satellite treatment technology is an MBR with UV disinfection.
- *Recycled Water Pipeline*: The alternative would require approximately 2,130 LF of 10" PVC pipeline from the satellite treatment site to the Antioch power plant. The general alignment of the pipe is north along Bridgehead Rd. to Wilbur Ave and west to the power plant site. There are no major crossings along this alignment.
- *Recycled Water Pump Station*: Recycled water conveyance from the satellite treatment site to the power plant requires a new 40-hp pump station, which is assumed to be located at the satellite treatment plant site.
- *Blowdown System*: The blowdown system consists of 27,100 LF of 8" PVC pipe from the power plant to the DDSD WWTP with the same alignment as the blowdown pipeline for Alt. A1. A new 40-hp booster station is also needed, which is assumed to be located at the power plant site.
- *Backup Water Supply*: The Canal water will be conveyed from CCWD Lateral 7.3 to the power plant via gravity through 4,000 LF of 12" PVC pipeline along Vineyard Drive. No pump station is needed but one major railroad crossing (BNSF) is necessary.

Alternative A5a – Contra Costa Canal (2.4 MGD)

For this alternative, up to 2.4 mgd of raw surface water will be supplied from the Canal to the Antioch power plant site. Associated facilities are presented in **Figure 4-8** and described below.

- *Canal Water Supply*: The Canal water will be conveyed from CCWD Lateral 7.3 to the power plant via gravity through 4,000 LF of 12" PVC pipeline along Vineyard Drive. No pump station is needed but one major railroad crossing (BNSF) is necessary.
- *Blowdown System*: The blowdown system consists of 27,100 LF of 8" PVC pipe from the power plant to the DDSD WWTP with the same alignment as the blowdown pipeline for Alt. A1. A new 40-hp booster station is also needed, which is assumed to be located at the power plant site.

Alternative A5b – Contra Costa Canal (8.0 MGD)

For this alternative, up to 8.0 mgd of raw surface water will be supplied from the Canal to the Antioch power plant site. Associated facilities are presented in **Figure 4-8**, Table 4-3 and described below.

- *Canal Water Supply*: The Canal water will be conveyed from the East Gaylord Lateral to the power plant via gravity through a 4,350 LF of 18" DI pipeline. No pump station is needed.
- *Blowdown System*: The blowdown system consists of 27,100 LF of 12" PVC pipe from the power plant to DDSD WWTP with the same alignment as the blowdown pipeline for Alt. A1. A new 160-hp booster station is also needed, which is assumed to be located at the power plant site.

Alternative P1 – DDSD RWF (5.5 MGD)

For this alternative, up to 5.5 mgd of recycled water will be supplied from the DDSD RWF to the Pittsburg power plant site. Associated facilities are presented in **Figure 4-9** and described below.

- *Recycled Water Treatment*: The alternative includes installation of a third 6.4 mgd tertiary treatment train, as described for Alt. A1.
- *Recycled Water Pipeline*: The alternative would require approximately 19,700 LF of 16" DI pipeline from the DDSD RWF to the Pittsburg power plant. The general alignment of the pipe is west along the Pittsburg-Antioch Hwy then north on Solar Ave and west on 10th St to the power plant site. There are no major crossings along the alignment.
- *Recycled Water Pump Station*: Recycled water conveyance from the DDSD RWF to the power plant requires a new 240-hp pump station, which is assumed to be located at the RWF.
- *Blowdown System*: The blowdown system consists of 19,700 LF of 10" PVC pipe from the power plant to the DDSD WWTP and aligned parallel to the recycled water pipeline. A new 100-hp booster station is also needed, which is assumed to be located at the power plant site.
- *Backup Water Supply*: The Canal water will be conveyed from the Canal to the power plant via gravity through 9,500 LF of 18" DI pipeline. The general alignment is parallel to the existing 12" Canal lateral owned by PG&E, which heads north along the electrical utility corridor that heads directly to the power plant site. The alignment's major crossings include two major roads, Highway 4, and a railroad. No pump station is needed.

Alternative P2 – CCCSD RWF (8.0 MGD)

For this alternative, up to 8.0 mgd of recycled water will be supplied from the CCCSD RWF to the Pittsburg power plant site. Associated facilities are presented in **Figure 4-10** and described below.

- *Recycled Water Treatment*: The alternative includes the upgrades of the existing CCCSD RWF for an additional 8.0 mgd of tertiary treatment capacity. The upgrades include the addition pre-treatment for tertiary filtration preparation, tertiary filter media modifications and the addition of an ammonia removal step.
- *Recycled Water Pipeline*: The alternative would require approximately 67,920 LF of 24" DI pipeline from the CCCSD RWF to the Pittsburg power plant. The general alignment of the pipe is east along Arnold Industrial Way then north along Port Chicago Highway past Mallard Reservoir then east along the right-of-way for the existing Mallard Slough pipeline across Concord Naval Weapons Station, and then along the abandoned railroad right-of-way to the power plant site. The alignment's major crossings include multiple wetlands, two railroads, and the CCWD Mallard Slough pipeline.
- *Recycled Water Pump Station*: Recycled water conveyance from the CCCSD RWF to the power plant requires a new 550-hp pump station, which is assumed to be located at the RWF, and another 400-hp pump station near Waterfront Rd and Main St, which is approximately mid-way between the RWF and the power plant site.
- *Blowdown System*: The blowdown system consists of 19,700 LF of 12" PVC pipe from the power plant to DDSD WWTP. The alignment is the same as for Alt P1 and there are no major crossings. A new 120-hp booster station is also needed, which is assumed to be located at the power plant site.
- *Backup Water Supply*: The Canal water will be conveyed from the Canal to the power plant via gravity through 9,500 LF of 21" DI pipeline. The alignment and crossings are the same as for Alt P1. No pump station is needed.

Alternative P3 – Satellite Treatment @ Pittsburg Pump Station (3.7 MGD)

For this alternative, up to 3.7 mgd of recycled water will be supplied from a satellite treatment plant adjacent to Pittsburg Pump Station and conveyed to the Pittsburg power plant site. Associated facilities are presented in **Figure 4-11** and described below.

- *Recycled Water Treatment*: The alternative includes installation of a satellite treatment system to provide tertiary treatment to raw wastewater at Pittsburg Pump Station. The assumed satellite treatment technology is an MBR with UV disinfection.
- *Recycled Water Pipeline*: The alternative would require approximately 1,400 LF of 12" PVC pipeline from the satellite treatment site to the power plant. The general alignment of the pipe is west along 10th St to the power plant site. There are no major crossings along this alignment.
- *Recycled Water Pump Station*: Recycled water conveyance from the satellite treatment site to the power plant requires a new 60-hp pump station, which is assumed to be located at the satellite treatment plant site.
- *Blowdown System*: The blowdown system consists of 19,700 LF of 10" PVC pipeline from the power plant to DDSD WWTP. The alignment is the same as for Alt P1 and there are no major crossings. A new 40-hp booster station is also needed, which is assumed to be located at the power plant site.
- *Backup Water Supply*: The Canal water will be conveyed from the Canal to the power plant via gravity through 9,500 LF of 14" PVC pipeline. The alignment and crossings are the same as for Alt P1. No pump station is needed.

Alternative P4a – Contra Costa Canal (3.7 MGD)

For this alternative, up to 3.7 mgd of raw surface water will be supplied from the Canal to the Pittsburg power plant site. Associated facilities are presented in **Figure 4-12** and described below.

- *Canal Water Supply*: The Canal water will be conveyed from the Canal to the power plant via gravity through 9,500 LF of 14" PVC pipeline. The alignment and crossings are the same as for Alt P1's backup supply. No pump station is needed.
- *Blowdown System*: The blowdown system consists of 19,700 LF of 10" PVC pipeline from the power plant to DDSD WWTP. The alignment is the same as for Alt P1 and there are no major crossings. A new 100-hp booster station is also needed, which is assumed to be located at the power plant site.

Alternative P4b – Contra Costa Canal (8.0 MGD)

For this alternative, up to 8.0 mgd of raw surface water will be supplied from the Canal to the Pittsburg power plant site. Associated facilities are presented in **Figure 4-12** and described below.

- *Canal Water Supply*: The Canal water will be conveyed from the Canal to the power plant via gravity through 9,500 LF of 21" DI pipeline. The alignment and crossings are the same as for Alt P1's backup supply. No pump station is needed.
- *Blowdown System*: The blowdown system consists of 19,700 LF of 12" PVC pipeline from the power plant to DDSD WWTP. The alignment is the same as for Alt P1 and there are no major crossings. A new 120-hp booster station is also needed, which is assumed to be located at the power plant site.

Alternative AX1 – CCCSD RWF to Shell (8.0 MGD) & Canal to Antioch (8.0 MGD)

For this alternative, up to 8.0 mgd of raw surface water will be supplied from the Canal to the Antioch power plant site and a similar volume of recycled water will be supplied to the Shell Refinery. Associated facilities are presented in **Figure 4-13**. The necessary raw water delivery facilities are the same as Alt A5b and the recycled water facilities are described below.

- *Recycled Water Treatment*: The alternative includes the upgrades of the existing CCCSD RWF for an additional 8.0 mgd of tertiary treatment capacity. The upgrades include the addition pre-

treatment for tertiary filtration preparation, tertiary filter media modifications and the addition of an ammonia removal step.

- *Recycled Water Pipeline*: The alternative would use existing pipelines from the CCCSD RWF to the Shell Refinery. The pipeline owned by CCCSD is 6,500 LF of 42" cement mortar lined and coated cement steel pipe. The pipelines owned by CCWD consist of 5,890 LF of 20" to 21" steel pipe that would need to be purchased from CCWD.
- *Recycled Water Pump Station*: Recycled water conveyance from the CCCSD RWF to the Shell Refinery requires a new 280-hp pump station, which is assumed to be located at the RWF.

Alternative AX2 – CCCSD RWF to Tesoro (8.0 MGD) & Canal to Antioch (8.0 MGD)

For this alternative, up to 8.0 mgd of raw surface water will be supplied from the Canal to the Antioch power plant site and a similar volume of recycled water will be supplied to the Tesoro Refinery. Associated facilities are presented in **Figure 4-14**. The necessary raw water delivery facilities are the same as Alt A5b and the recycled water facilities are described below.

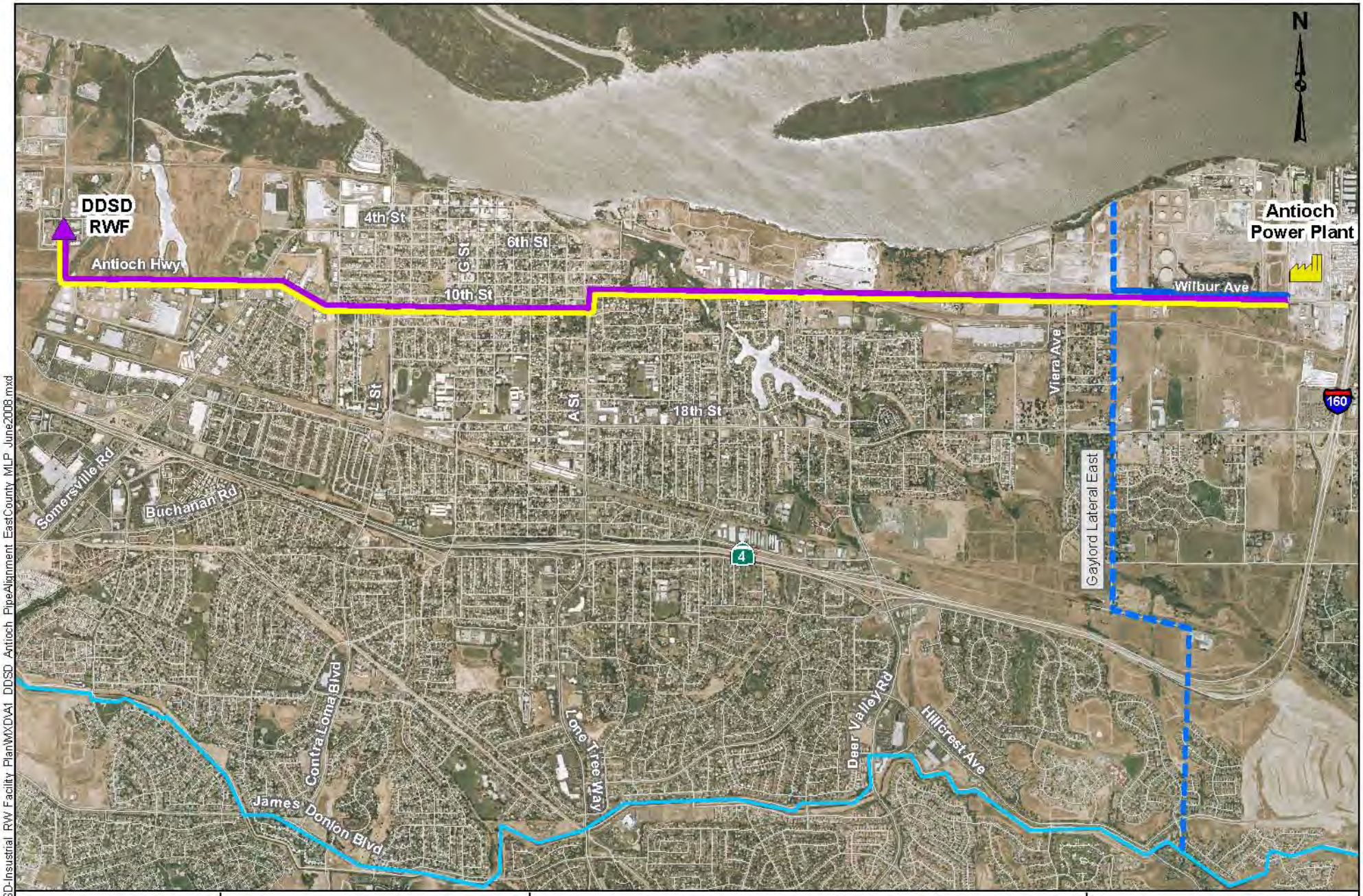
- *Recycled Water Treatment*: The alternative has the same recycled water treatment upgrades as Alt AX1.
- *Recycled Water Pipeline*: The alternative would use existing pipelines from the CCCSD RWF to the Tesoro Refinery. The pipeline owned by CCCSD is 6,500 LF of 42" cement mortar lined and coated cement steel pipe. The pipelines owned by CCWD consist of 12,510 LF of 20" to 24" steel pipe that would need to be purchased from CCWD.
- *Recycled Water Pump Station*: Recycled water conveyance from the CCCSD RWF to the Tesoro Refinery requires a new 130-hp pump station, which is assumed to be located at the RWF.

Alternative PX1 – CCCSD RWF to Shell (8.0 MGD) & Canal to Pittsburg (8.0 MGD)

For this alternative, up to 8.0 mgd of raw surface water will be supplied from the Canal to the Pittsburg power plant site and a similar volume of recycled water will be supplied to the Shell Refinery. Associated facilities are presented in **Figure 4-15**. The necessary raw water delivery facilities are the same as Alt P4b and recycled water facilities are the same as Alt AX1.

Alternative PX2 – CCCSD RWF to Tesoro (8.0 MGD) & Canal to Pittsburg (8.0 MGD)

For this alternative, up to 8.0 mgd of raw surface water will be supplied from the Canal to the Pittsburg power plant site and a similar volume of recycled water will be supplied to the Tesoro Refinery. Associated facilities are presented in **Figure 4-16**. The necessary raw water delivery facilities are the same as Alt P4b and recycled water facilities are the same as Alt AX2.



RMC Water and Environment

1 inch equals 0.5 miles

0 0.25 0.5 1

Miles

Existing Facilities

- Recycled Water Facility
- Contra Costa Canal
- Raw Water Lateral

Potential Facilities

- Power Plant Site
- Recycled Water Pipe
- Blowdown Pipe
- Raw Water Pipe

Figure 4-4
Alternative A1
DDSD RWF (5.5 MGD)

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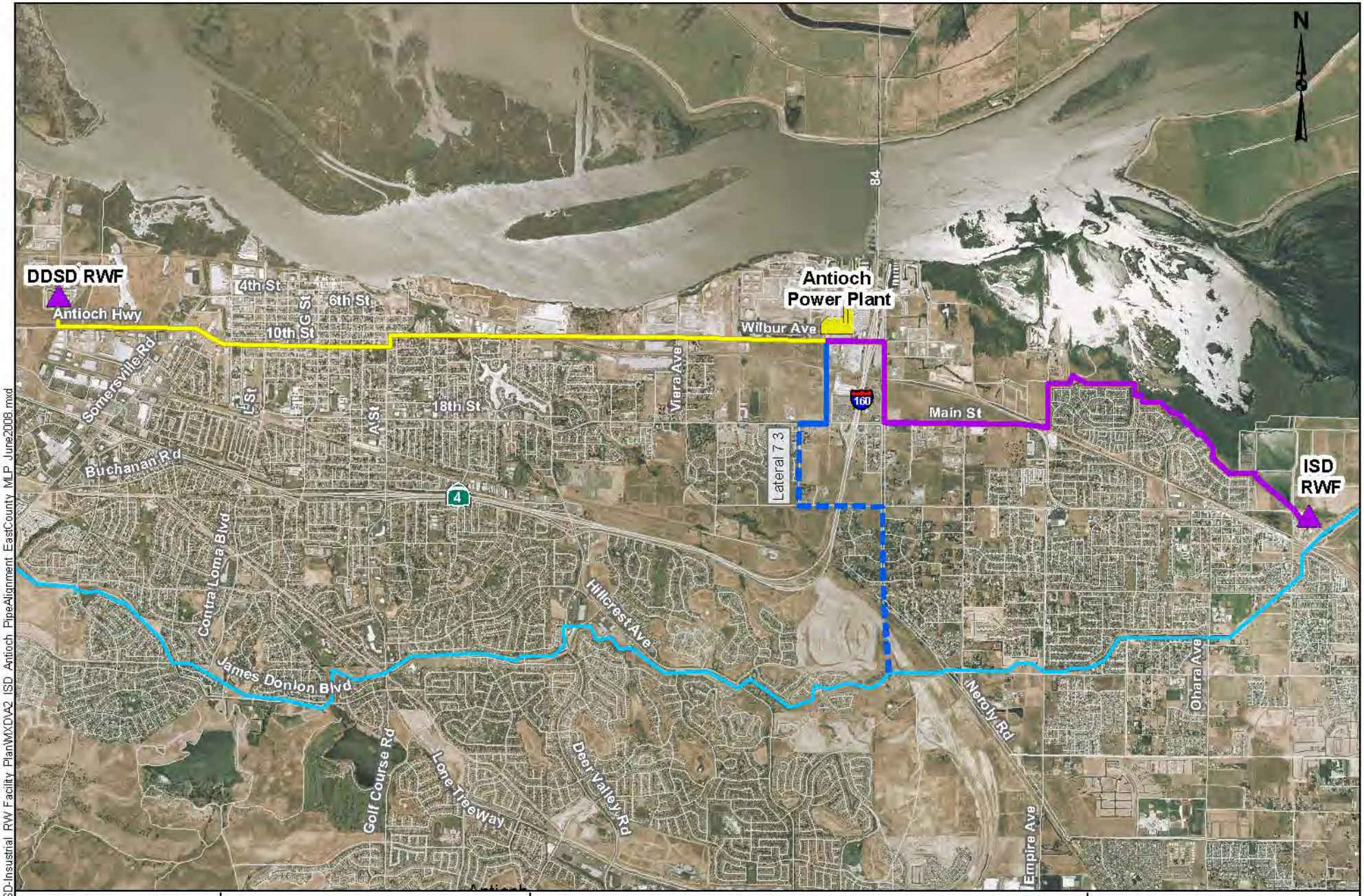
Sources:



RMC
Water and Environment

1 inch equals 0.8 miles

0 0.375 0.75 1.5

Miles

Existing Facilities

- Recycled Water Facility
- Contra Costa Canal
- Raw Water Lateral

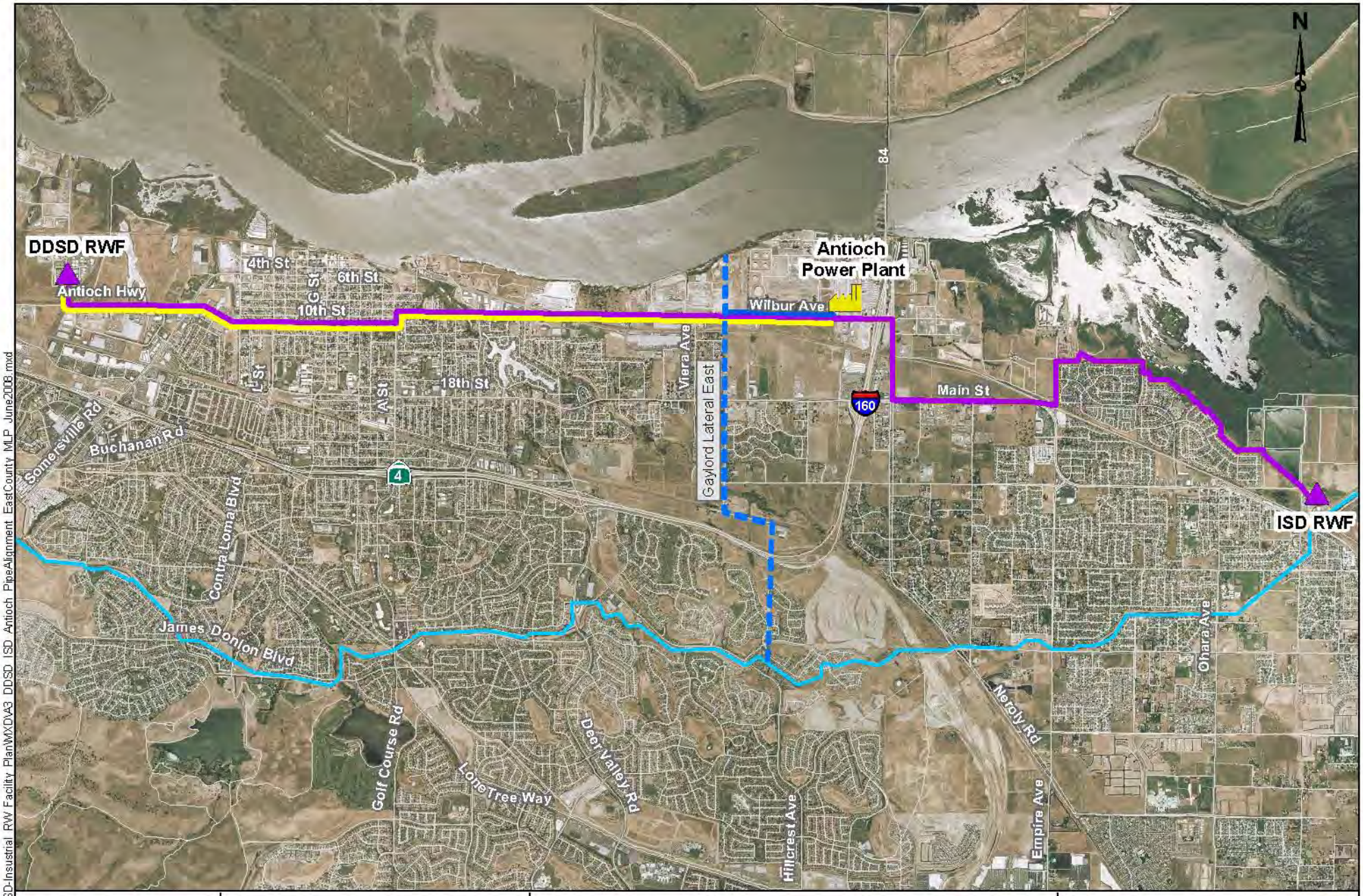
Potential Facilities

- Power Plant Site
- Recycled Water Pipe
- Blowdown Pipe
- Raw Water Pipe

Figure 4-5
Alternative A2
ISD RWF (3.6 MGD)

L:\Projects GIS\0013-015 DDSD-Insustrial RW Facility PlanMXD\A2_ISD_Antioch PipeAlignment EastCounty MLP June2008.mxd

Sources:



L:\Projects GIS\0013-015 DDSD-Insustrial RW Facility Plan\MXD\A3 DDSD ISD Antioch PipeAlignment EastCounty MLP June2008.mxd

RMC Water and Environment

1 inch equals 0.8 miles

0 0.4 0.8 1.6

Miles

Existing Facilities

- Recycled Water Facility
- Contra Costa Canal
- Raw Water Lateral

Potential Facilities

- Power Plant Site
- Recycled Water Pipe
- Blowdown Pipe
- Raw Water Pipe

Figure 4-6
Alternative A3
DDSD and ISD RWF
(8.0 MGD)

Sources:

RMC Water and Environment

1 inch equals 0.6 miles

0 0.25 0.5 1

Miles

Existing Facilities

- Recycled Water Facility
- Contra Costa Canal
- Raw Water Lateral

Potential Facilities

- Power Plant Site
- Satellite Treatment Facility
- Recycled Water Pipe
- Blowdown Pipe
- Raw Water Pipe

Figure 4-7
Alternative A4
Satellite at Bridgehead
(2.4 MGD)

L:\Projects GIS\0013-015 DDSD-Insustrial RW Facility PlanMXD\A4 Satellite Antioch PipeAlignment EastCounty MLP June2008.mxd

Sources:

RMC
Water and Environment

1 inch equals 0.52 miles

0 0.2 0.4 0.8

Miles

Existing Facilities

- Recycled Water Facility
- Contra Costa Canal
- Raw Water Lateral

Potential Facilities

- Power Plant Site
- Blowdown Pipe
- Raw Water Pipe

Figure 4-8
Alternative A5
CCWD Canal (2.4 & 8.0 MGD)

L:\Projects GIS\0013-015 DDSD-Insustrial RW Facility Plan\MXD\A5 CCWD Antioch PipeAlignment EastCounty MLP June2008.mxd

Sources:

RMC
Water and Environment

1 inch equals 0.5 miles

0 0.25 0.5 1

Miles

Existing Facilities

Recycled Water Facility

Contra Costa Canal

Potential Facilities

Power Plant Site

Recycled Water Pipe

Blowdown Pipe

Raw Water Pipe

Figure 4-9
Alternative P1
DDSD RWF (5.5 MGD)

L:\Projects GIS\0013-015 DDSD-Insustrial RW Facility PlanMXD\P1 DDSD Pittsburg PipeAlignment EastCounty MLP June2008.mxd

Sources:

RMC Water and Environment

1 inch equals 1.3 miles

0 0.5 1 2

Miles

Existing Facilities

- Recycled Water Facility
- Contra Costa Canal

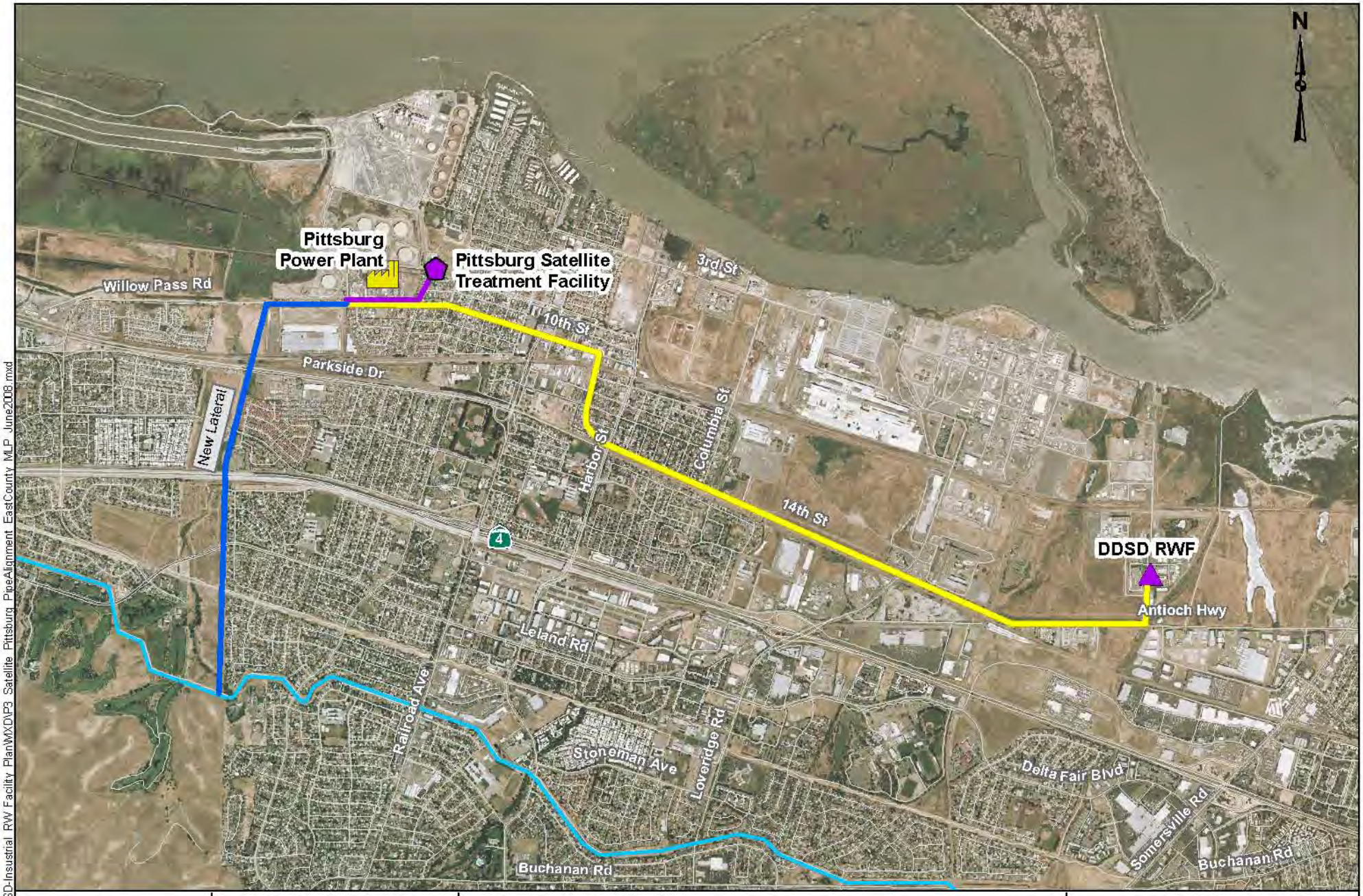
Potential Facilities

- Power Plant Site
- Recycled Water Pipe
- Blowdown Pipe
- Raw Water Pipe

Figure 4-10
Alternative P2
CCCSD RWF (8.0 MGD)

L:\Projects GIS\0013-015 DDSD-Insustrial RW Facility PlanMXD\P2 CCCSD Pittsburg PipeAlignment EastCounty MLP June2008.mxd

Sources:



RMC Water and Environment

1 inch equals 0.5 miles

0 0.2 0.4 0.8

Miles

Existing Facilities

- Recycled Water Facility
- Contra Costa Canal

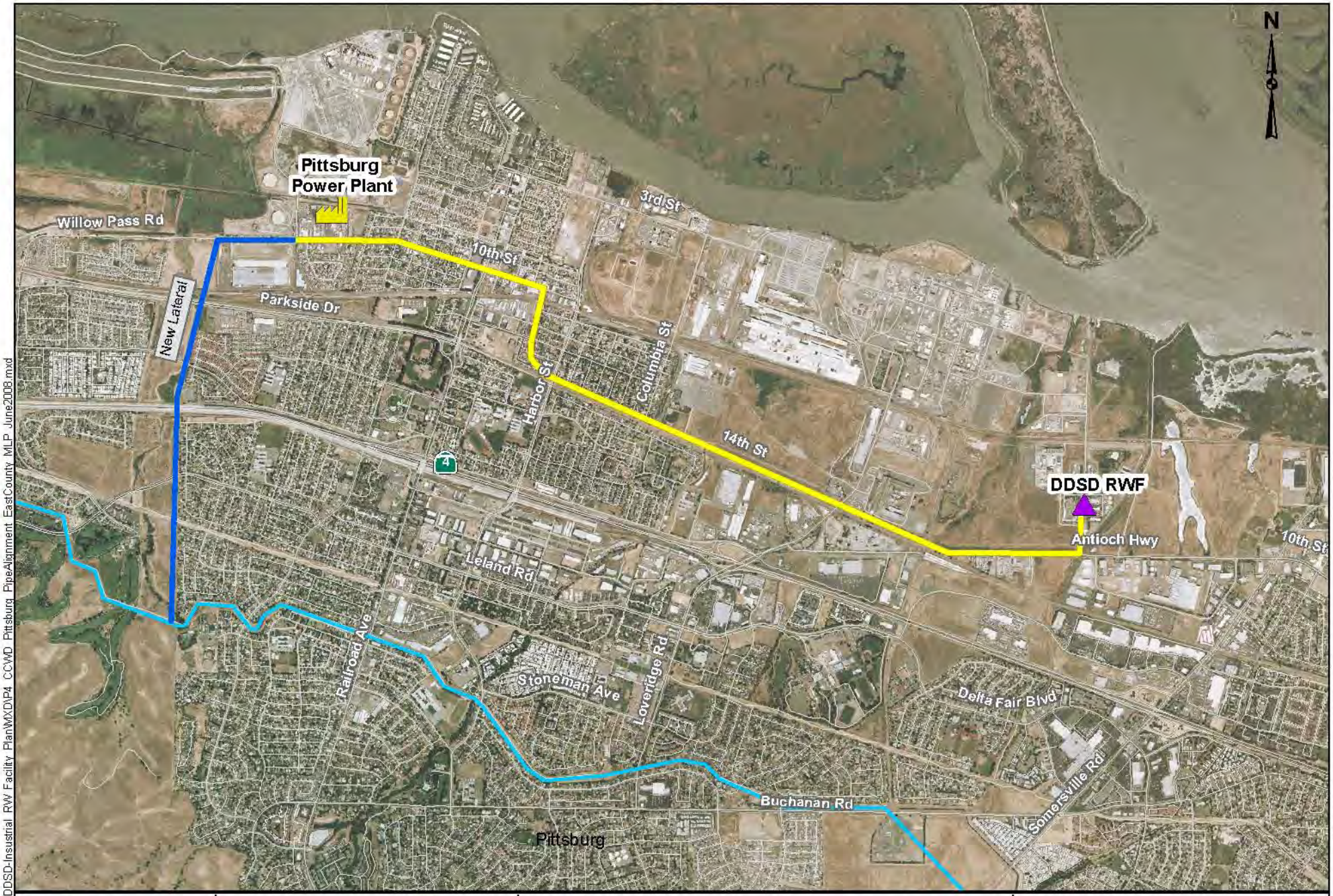
Potential Facilities

- Power Plant Site
- Satellite Treatment Facility
- Recycled Water Pipe
- Blowdown Pipe
- Raw Water Pipe

Figure 4-11
Alternative P3
Satellite at Pittsburg
(3.7 MGD)

L:\Projects GIS\0013-015 DDSD-Insustrial RW Facility PlanMXD\P3 Satellite Pittsburg PipeAlignment EastCounty MLP June2008.mxd

Sources:



RMC Water and Environment

1 inch equals 0.5 miles

0 0.2 0.4 0.8

Miles

Existing Facilities

Recycled Water Facility

Contra Costa Canal

Potential Facilities

Power Plant Site

Blowdown Pipe

Raw Water Pipe

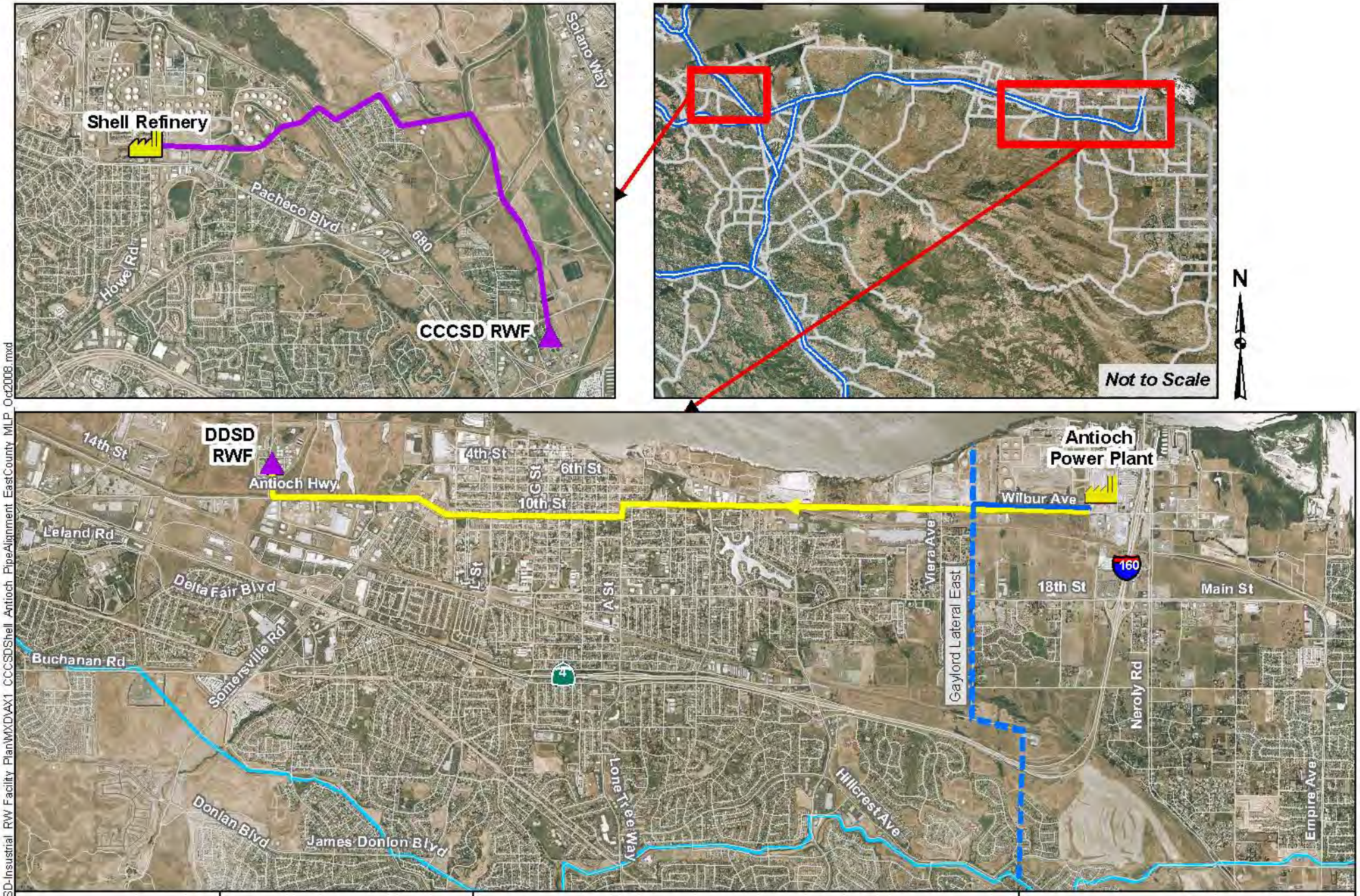
Figure 4-12

Alternative P4

CCWD Canal (3.7 & 8.0 MGD)

L:\Projects GIS\0013-015 DDSD-Insustrial RW Facility PlanMXD\P4 CCWD Pittsburg PipeAlignment EastCounty MLP June2008.mxd

Sources:



L:\Projects GIS\0013-015 DDSD-Insustrial RW Facility PlanMXD\AX1 CCCSDShell Antioch PipeAlignment EastCounty MLP Oct2008.mxd

RMC Water and Environment

1 inch equals 0.75 miles

0 0.25 0.5 1 Miles

Existing Facilities

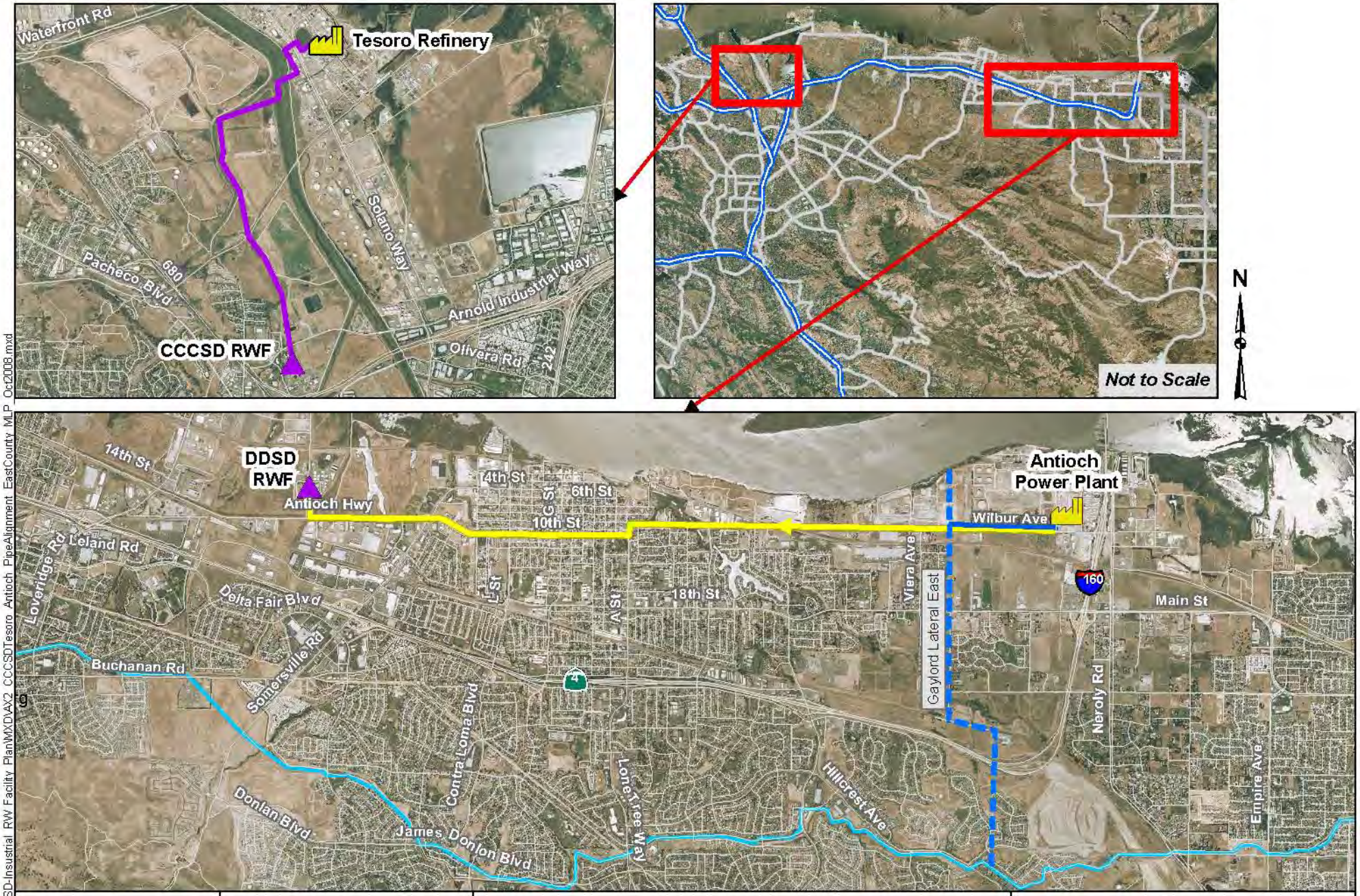
- Recycled Water Facility
- Contra Costa Canal
- Raw Water Lateral

Potential Facilities

- Power Plant Site
- Recycled Water Pipe
- Blowdown Pipe
- Raw Water Pipe

Figure 4-13
Alternative AX1
CCCSD RWF to Shell Refinery
(8.0 MGD)

Sources:



RMC Water and Environment

1 inch equals 0.82 miles

0 0.25 0.5 1 Miles

Existing Facilities

- Recycled Water Facility
- Contra Costa Canal
- Raw Water Lateral

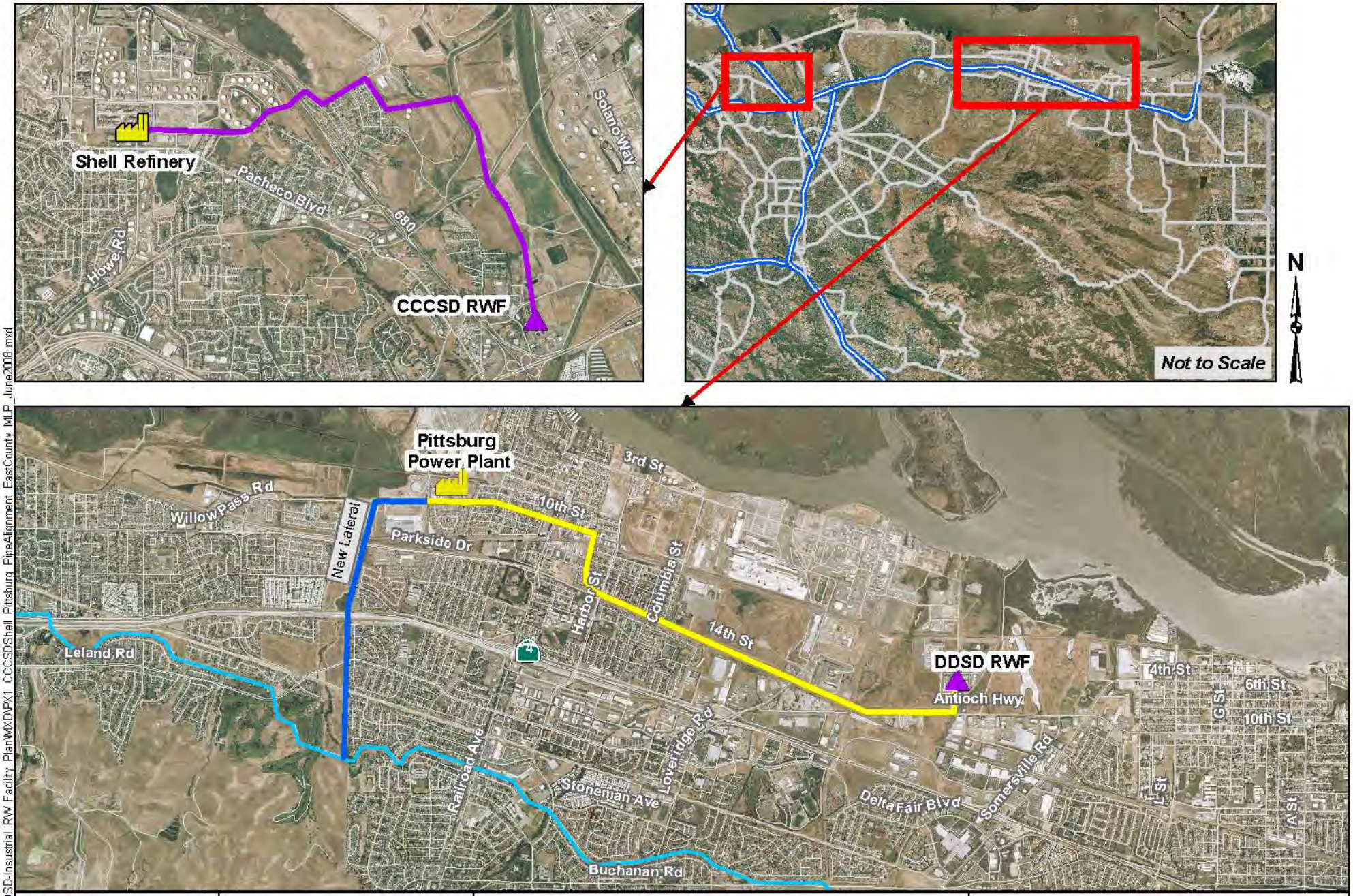
Potential Facilities

- Power Plant Site
- Recycled Water Pipe
- Blowdown Pipe
- Raw Water Pipe

Figure 4-14
Alternative AX2
CCCSD RWF to Tesoro Refinery
(8.0 MGD)

L:\Projects GIS\0013-015 DDSD-Insustrial RW Facility Plan\MXD\AX2_CCCSDTesoro_Antioch_PipeAlignment_EastCountty_MLP_Oct2008.mxd

Sources:



RMC Water and Environment

1 inch equals 0.75 miles

0 0.3 0.6 1.2

Miles

Existing Facilities

- Recycled Water Facility
- Recycled Water Pipe
- Contra Costa Canal

Potential Facilities

- Power Plant Site
- Recycled Water Pipe
- Blowdown Pipe
- Raw Water Pipe

Figure 4-15
Alternative PX1
CCCSD RWF to Shell Refinery
(8.0 MGD)

L:\Projects GIS\0013-015 DDSD-Insustrial RW Facility PlanMXD\PX1 CCCSDShell Pittsburg PipeAlignment EastCounty MLP_June2008.mxd

Sources:

Summary of Alternative Facilities

The water supplies and facilities for each alternative are summarized in **Table 4-3**.

Table 4-3: Summary of Facilities for Each Alternative

Alt	Supply		Recycled Water		Blowdown		Canal
	Source	Volume	Pipe	Pumps	Pipe	Pumps	Pipe
Antioch Recycled Water Alternatives							
A1	DDSD RWF	5.5 mgd	27,100' @ 16"	310 hp	27,100 @ 12"	70 hp	4,350' @ 14"
A2	ISD RWF	3.5 mgd	21,170' @ 14"	150 hp	27,100 @ 10"	50 hp	4,350' @ 12"
A3	DDSD RWF	4.5 mgd	27,100' @ 16"	190 hp	27,100 @ 12"	160 hp	4,350' @ 18"
	ISD RWF	3.5 mgd	21,170' @ 14"	150 hp			
A4	Satellite	2.4 mgd	2,130 @ 10"	40 hp	27,100 @ 8"	40 hp	4,350' @ 10"
Pittsburg Recycled Water Alternatives							
P1	DDSD RWF	5.5 mgd	19,650' @ 16"	250 hp	19,650' @ 10"	100 hp	9,500' @ 18"
P2	CCCSD RWF	8.0 mgd	19,650' @ 18"	550, 400 hp	19,650' @ 12"	120 hp	9,500' @ 21"
P3	Satellite	3.7 mgd	19,650' @ 12"	70 hp	19,650' @ 8"	40 hp	9,500' @ 14"
Canal Alternatives							
A5a	Canal	2.4 mgd	--	--	27,100' @ 8"	40 hp	4,350' @ 10"
A5b	Canal	8.0 mgd	--	--	27,100' @ 12"	160 hp	4,350' @ 18"
P4a	Canal	3.7 mgd	--	--	19,650' @ 10"	40 hp	9,500' @ 14"
P4b	Canal	8.0 mgd	--	--	19,650' @ 12"	120 hp	9,500' @ 21"
Exchange Alternatives							
AX1	Canal/CCCSD	8.0 mgd	--	280 hp	27,100 @ 12"	160 hp	4,350' @ 18"
AX2	Canal/CCCSD	8.0 mgd	--	130 hp	27,100 @ 12"	160 hp	4,350' @ 18"
PX1	Canal/CCCSD	8.0 mgd	--	280 hp	19,650' @ 12"	120 hp	9,500' @ 21"
PX2	Canal/CCCSD	8.0 mgd	--	130 hp	19,650' @ 12"	120 hp	9,500' @ 21"

No Project (No Action) Alternative

In addition to the proposed project alternatives discussed above, a No Project alternative was also considered as part of this Plan. The No Project alternative represents a scenario in which neither recycled water nor raw surface water would be used to meet industrial demands within the study area. Under such a No Project scenario, the following potential construction related impacts would not occur:

- *Air Quality*: Fugitive dust emissions from construction activities.
- *Biological Resources*: Potential impacts to special status and protected wildlife species located within the study area.
- *Cultural Resources*: Potential impacts to archaeological and paleontological resources caused by construction activities.
- *Hazardous Materials*: The potential for uncontrolled release of hazardous materials during the construction phase.
- *Noise:* Potential noise impacts from operation of equipment and vehicles.
- *Traffic:* Potential traffic impacts from construction activities.
- *Water Quality*: Potential water quality degradation and increased runoff of surface water caused by grading of lands.

Although the No Project alternative would avoid these temporary construction impacts, there are several consequences associated with failing to implement any of the alternatives identified as part of this Plan:

- **Wet-Cooled Power Plant Construction:** If the CEC were to not approve a new power plant in Antioch or Pittsburg that uses raw surface water or recycled water as its primary supply, the No Project alternative would result in either no new power plants to meet local, regional or Statewide utility demands or construction of more energy-intensive dry cooled power plants may be considered.
- **Wastewater Discharges:** DDSD, ISD, and/or CCCSD will not be able to redirect some of their treated effluent for beneficial use. Currently, treated wastewater is discharged to the Delta for conveyance into a saline sink (San Francisco Bay).
- **Recycled Water Use:** CCCSD, DDSD, and ISD each have the potential to supply recycled water for beneficial uses in East County as part of an industrial recycling project that serves other users along the alignment. Without this project, such opportunities would be limited.

4.2.3 Preliminary Cost Estimates

Based on the facilities described in the previous section, preliminary cost estimates were developed for each of the alternatives to determine which alternatives were most cost effective. The preliminary cost estimates are provided in Appendix B and summarized in **Table 4-4**. In addition, capital costs and unit costs are compared in **Figure 4-17** through **Figure 4-20**.

Table 4-4: Preliminary Cost Estimates – Annual & Unit Costs

Alternatives		Capital Cost ($ M)[1]	Annual Costs ($ Million)			Annual Yield (afy)[3]	Unit Cost ($/af)	Potential Duplication of Service ($/af)[4,5]	Adjusted Unit Cost ($/af)
ID	Supply (mgd)		Capital[2]	O&M	Total				
A1	5.5	$60.9	$5.3	$0.9	**$6.2**	3,690	**$1,670**	$315	**$1,985**
A2	3.5	$24.7	$2.1	$0.9	**$3.1**	2,350	**$1,320**	$315	**$1,635**
A3	8.0	$74.2	$6.5	$1.6	**$8.0**	5,380	**$1,490**	$315	**$1,805**
A4	2.4	$34.7	$3.0	$0.6	**$3.7**	1,610	**$2,280**	$315	**$2,595**
P1	5.5	$49.0	$4.3	$0.8	**$5.1**	3,690	**$1,390**	$315	**$1,390**
P2	8.0	$69.1	$6.0	$1.5	**$7.5**	5,380	**$1,400**	$315	**$1,400**
P3	3.6	$51.0	$4.4	$1.0	**$5.4**	2,480	**$2,180**	$315	**$2,495**
A5a	8.0	$9.8	$0.8	$0.9	**$1.7**	1,610	**$1,080**	--	**$1,395**
A5b	8.0	$23.4	$2.0	$2.9	**$4.9**	5,380	**$910**	--	**$1,225**
P4a	8.0	$13.5	$1.2	$1.3	**$2.5**	2,480	**$1,020**	--	**$1,335**
P4b	8.0	$17.6	$1.5	$2.9	**$4.4**	5,380	**$820**	--	**$1,135**
AX1	8.0	$43.8	$3.8	$1.6	**$5.4**	5,380	**$880**	$315	**$880**
AX2	8.0	$41.4	$3.6	$1.8	**$5.4**	5,380	**$870**	$315	**$870**
PX1	8.0	$38.0	$3.3	$1.6	**$4.9**	5,380	**$790**	$315	**$1,105**
PX2	8.0	$35.6	$3.1	$1.7	**$4.8**	5,380	**$790**	$315	**$1,105**

Notes:

1. CCWD connection fees have not been included.
2. Annualized over 20 years at 6%.
3. For base-load power plant assuming annual operations at 60% of capacity.
4. Recycled water projects implemented within the CCWD service area may include duplication of service fees to recover costs incurred by CCWD for system improvements needed to serve its customers. The duplication of service issues are addressed on a case-by-case basis.
5. The current fee was recently estimated as $315/af (CCWD, October 2008).

Figure 4-17: Preliminary Cost Estimates – Capital Costs Summary

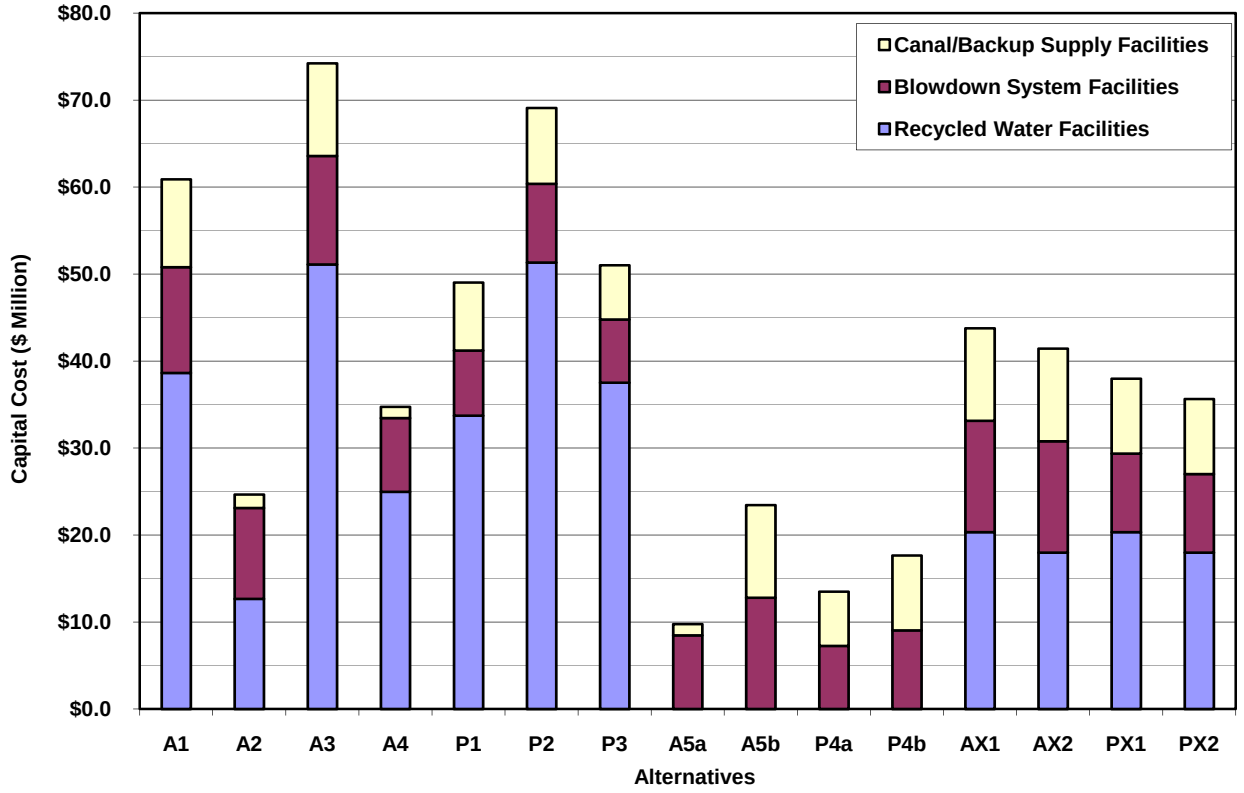


Figure 4-18: Preliminary Cost Estimates – Unit Cost vs. Capital Cost Summary

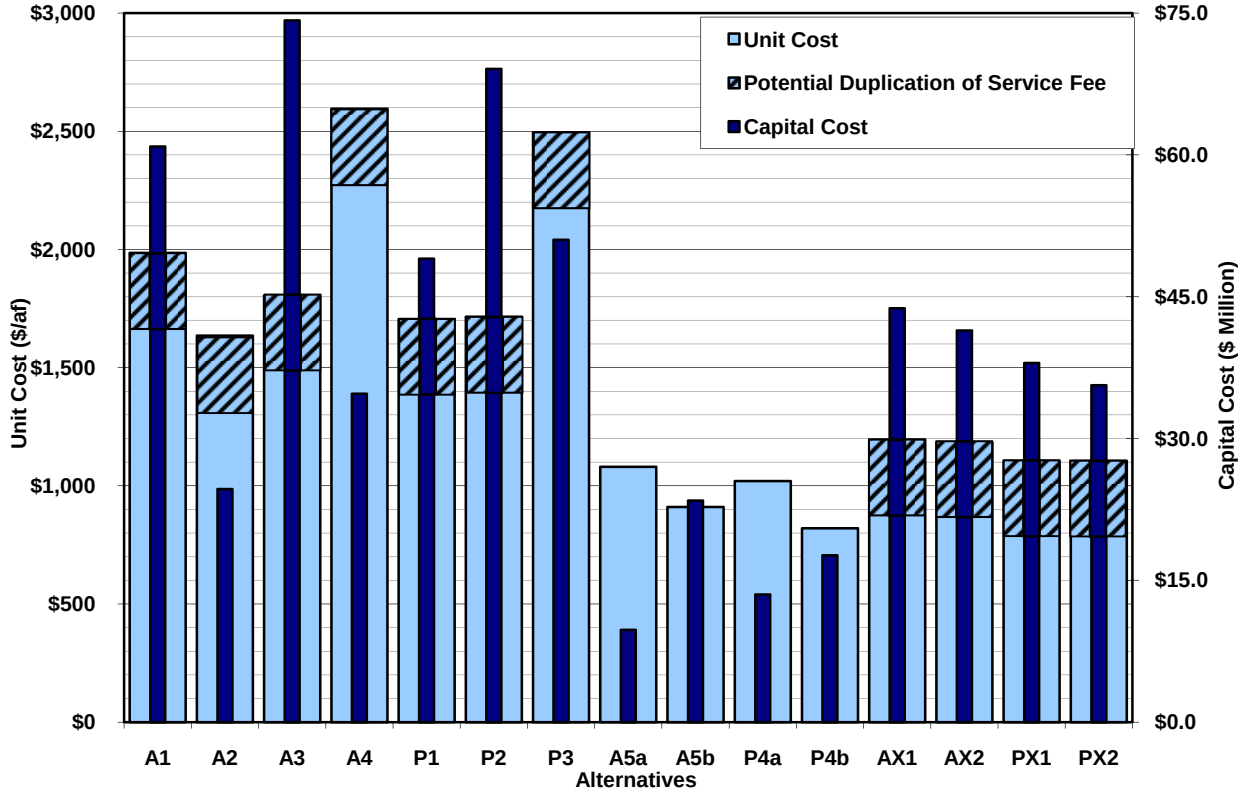


Figure 4-19: Preliminary Cost Estimates – Unit Cost Breakdown by Cost Type

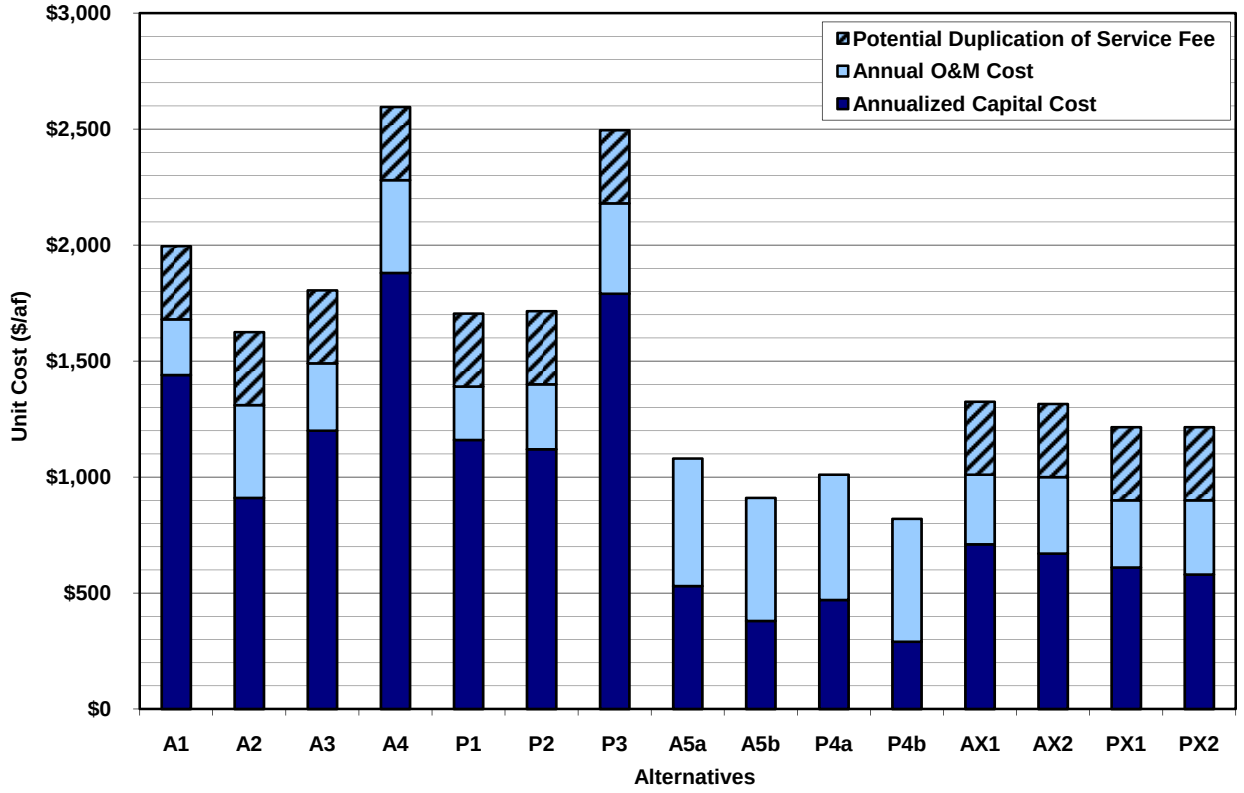
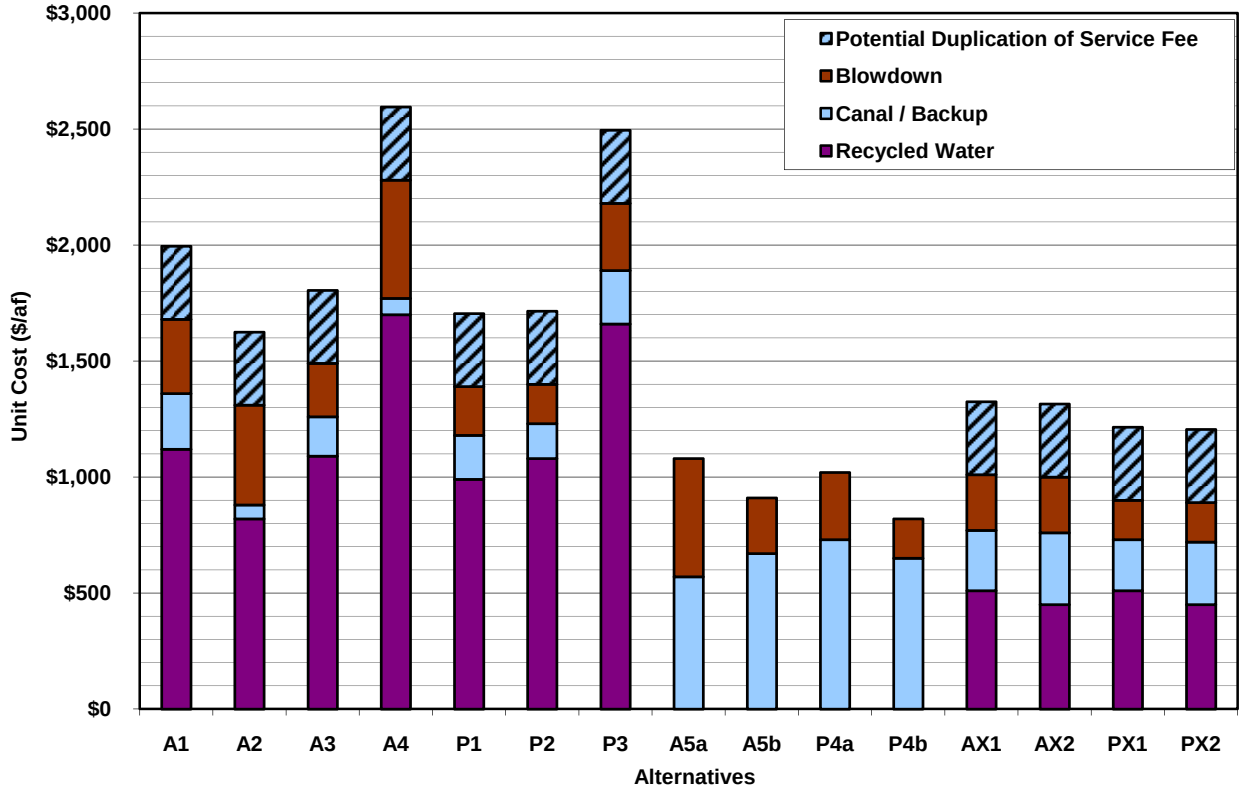


Figure 4-20: Preliminary Cost Estimates – Unit Cost Breakdown by Project Component



Key Cost Estimate Assumptions

These cost estimates were based on the following assumptions:

- Proposed pipe is Class 150, AWWA C900 PVC pipe for pipes up to 14" in diameter and Class 250 DI for pipes greater than 14" in diameter.
- Construction will not take place within a wetlands area.
- Pump station costs include one stand-by pump.
- All reference costs were updated to San Francisco area July 2008 Engineering News Report Construction Cost Index of 9,286.

The following contingencies and allowances were added to the raw construction costs to determine the total project cost:

- Conceptual design level contingency was calculated as 25% of the total raw construction costs
- Pre-construction tasks, such as engineering and environmental documentation, were estimated to be 15% of the sum of the raw construction cost and the planning contingency cost.
- Construction tasks, such as construction management, engineering services during construction, and legal services, were estimated to be 15% of the sum of the raw construction cost and the planning contingency cost.

Total capital costs were annualized assuming financing at 6% over 20 years. Estimated operating and maintenance (O&M) costs were combined with the annualized costs and then divided by the annual recycled water demand to derive a unit cost.[9]

Also, the following components of the detailed cost estimate had a large impact on the applicable alternative:

- Treatment O&M cost for ISD RWF was estimated as $960/MG ($310/af) but this cost will be incurred whether or not recycled water is delivered. Therefore, Alt A2's unit cost could be reduced by up to $310/af.
- New pump stations were assumed for recycled water and blowdown for all of the alternatives. However, each recycled water supplier has existing recycled water pump stations that have the potential to be modified and, as a result, could result in lower capital and unit costs. Evaluation of the opportunity to incorporate these pump stations was beyond the scope of this Plan.
- As discussed in Section 3.3.1, DDSD is currently requesting approval from the CDPH to achieve a 50% production capacity increase (from 12.8 mgd to 19.2 mgd). Since it is contingent upon CDPH approval, the improvements were not considered as part of this Plan but have the potential to eliminate the capital cost for tertiary treatment plant expansion.
- A CCWD duplication of service fee of $315/af may apply to the recycled water and exchange alternatives but was not included because they are addressed on a case-by-case basis. Recycled water projects implemented within the CCWD service area may include duplication of service fees to recover costs incurred by CCWD for system improvements needed to serve its customers. The fee would ultimately be included in the alternative's cost depending upon whether a project-specific agreement is negotiated by CCWD and the project proponent. Currently, none of the alternatives have applicable agreements.

[9] Annual and unit costs were determined assuming that similar flowrates and volumes of recycled water and raw surface water were required to produce certain power production; in fact the higher the salinity for the water source, the higher the required flowrate because the number of cooling tower cycles (which are generally limited by silica concentrations in new power plants/new cooling towers) will be reduced, resulting in correspondingly higher blowdown flowrates. The overall net consumption of water will remain the same irrespective of salinity.

4.3 Alternative Evaluation

This section compares each alternative against a set of evaluation criteria to attempt to determine a recommended alternative. Compared with the screening criteria applied to identify the alternatives that were defined, the evaluation criteria consider the more detailed quantitative information defined in Section 4.2.2 Preliminary recommendations are discussed following the evaluation; however, selecting a single recommended alternative was made difficult by the variable nature of the demands to be served (particularly magnitude of demand and location) as well as remaining unknowns (such as regulatory and institutional approvals) that could change which alternative was ultimately selected for implementation. The implications of these unknown factors are discussed at the conclusion of this section.

4.3.1 Evaluation Criteria

A set of evaluation criteria was selected to provide a comparison of alternatives that was appropriate given the information available at this stage of project development. The criteria include both quantitative and qualitative criteria.

The only quantitative criterion was unit cost, with lower unit cost preferred. Capital cost was considered as a criterion but not included, because the initial higher capital costs associated with implementing the water use facilities were minimal relative to the overall capital costs of constructing the actual power plant. Funding potential was also considered as a criterion but was not included in the evaluation. Instead, a sensitivity analysis of the unit cost evaluation was conducted that included significant unknown costs or subsidies, including funding, to identify if the relative ranking of projects was sensitive to such subsidies. The sensitivity analysis is included in Appendix C.

Five qualitative criteria were used in the evaluation of each alternative. The purpose of the qualitative analysis was to document the primary positive and negative aspects of each alternative and combine these with the quantitative unit costs to provide an appropriate cost vs. non-cost tradeoff between alternatives. The following qualitative criteria were used:

- **Institutional:** This criterion considers how many multi-lateral agreements would be necessary to implement the alternative and likelihood of their successful completion. For example, the exchange alternatives would require higher levels of effort to implement from an institutional perspective without any precedence among the partners and the lead agency loses command of the process. Therefore, the exchange alternatives would receive a lower rating.
- **CEC Approval:** This criterion considers the likelihood of project approval by the CEC. In particular, a low probability of CEC approval of the alternative would substantially downgrade the alternative.
- **Right-of-Way:** This criterion considers the degree of difficulty that the project developer may encounter acquiring a feasible pipeline alignment for a given alternative. In general, alternatives with large lengths of pipe, and pipeline alignments outside the jurisdiction of the project partners, would increase the degree of difficulty. Note that the additional cost of constructing a new pipeline in a dense urban corridor has been accounted for in the cost estimates, so this criterion is only considering the difficulty (and impact on the lead agency) of right-of-way acquisition issues occurring during project implementation.
- **Water Quality - Ammonia:** This criterion considers ammonia concentrations exceeding power plant cooling tower guidelines for biological fouling. Relatively high ammonia concentrations would result in additional costs to the project for supplemental treatment steps or power plant operational modifications and/or limits. The monetary impact of poorer water quality was not defined precisely in the unit costs but rather addressed qualitatively.
- **Operational Reliability:** This criterion considers the day-to-day reliability of the water supply for power plant operations. Recycled water has the potential for interruption on short notice due

to treatment excursions; however, as a point of comparison, this has not occurred at the DDSD RWF since operations started 6 years ago.

- **Drought Reliability:** This criterion considers the annual water supply reliability. Canal water could be impacted by drought; however, CCWD plans to provide a minimum of 95% of the average supply in dry years.

Three qualitative criteria that were initially considered but not ultimately included in the evaluation were public acceptance, permitting, and environmental impact. The public acceptance criterion considers how supportive the public would be of the alternative and the degree of opposition. The alternatives did not appear to have any controversial components and no public input has been sought to-date so any public opposition to the alternative included in this evaluation would be speculative. Similarly, the alternatives did not appear to have potential permitting issues. Therefore, these criteria would not provide any differentiation between alternatives and were therefore not included in the evaluation at this time.

Evaluation of environmental impacts is typically completed during the preparation of an environmental review document that follows CEQA guidance. A CEQA review would be conducted once a preliminary design has started on the final project to be implemented. The review would assess and compare the impact of the multiple alternatives described in this report as they relate to the chosen alternative. Preparation of any CEQA required evaluation and documentation is beyond the scope of this effort but a cursory environmental review based on information currently available was not able to identify any potential significant impacts that would differentiate alternatives. The environmental review is summarized below.

- *Air Quality*: Each alternative would likely produce some level of fugitive dust emissions from construction activities and the alternatives with more facilities would have higher emissions but this was not considered to be a significant difference. The quality of the water used in cooling towers effects the air emissions from the cooling tower and recycled water does have different water quality parameters than Canal water but this was not considered to be a significant difference.
- *Biological Resources*: Each alternative would have potential impacts to special status and protected wildlife species located within the construction area and the alternatives with more facilities in an unpaved setting has a higher potential for impact to biological resources but this was not considered to be a significant difference. In particular, Alt P2 (CCCSD to Pittsburg) has a long pipeline section across Concord Naval Weapons Station but the majority of the alignment is within previously disturbed land.
- *Cultural Resources*: Each alternative would have potential impacts to archaeological and paleontological resources caused by construction activities and the alternatives with more facilities has a higher potential for impact to cultural resources but this was not considered to be a significant difference. In particular, Alt P2 (CCCSD to Pittsburg) has a long pipeline section across Concord Naval Weapons Station but the majority of the alignment is within previously disturbed land.
- *Hazardous Materials*: Each alternative has some potential for uncontrolled release of hazardous materials during the construction phase and the alternatives with more facilities would have a higher probability of uncontrolled releases but this was not considered to be a significant difference.
- *Noise:* Each alternative has potential noise impacts from operation of equipment and vehicles during construction activities and the alternatives with more facilities would have higher noise impacts but this was not considered to be a significant difference.
- *Recreation:* Construction activities for each alternative are not expected cause any recreational impacts.

- *Traffic*: Each alternative would have potential traffic impacts from construction activities and the alternatives with more facilities right-of-way within roadways have a higher potential for traffic impacts but this was not considered to be a significant difference.
- *Water Quality*: Each alternative would reduce discharges to the Delta, which has both potential positive and negative impacts. Reduced discharges of wastewater benefits the Delta's water quality (and overall health) from reduced introduction of mass of constituents that may be of concern, such as ammonia nitrogen. On the other hand, reduced discharges also reduce the volume of water introduced to the Delta which could have a negative impact on water quality from increased salinity since the Delta outflow is reduced, which holds back downstream water with higher salinity.
- *Climate Change*: Greenhouse gas emissions were discussed in Section 3.6 but there was not a significant difference between the water supplies considered for each alternative.

Environmental documentation is recommended as part of the implementation plan in Section 0 and will provide additional information relative to potential environmental impacts of remaining alternatives at that stage of analysis.

4.3.2 Antioch Power Plant Site

This section uses the criteria described previously to evaluate the alternatives that would serve the Antioch power plant site. The unit costs for each alternative are compared in **Figure 4-21**. Alt A5b (Canal supply; 8.0 mgd) has the lowest unit cost followed by the two exchange alternatives (Alt AX1 and AX2). Of the traditional recycled water alternatives (compared in **Figure 4-22**), Alt A2 (ISD; 3.5 mgd) has the lowest unit cost while Alt A4 (Satellite; 2.4 mgd) have the highest unit cost. Alt A3 (ISD & DDSD; 8.0 mgd) has a slightly higher unit cost than Alt A2 and Alt A1 (DDSD; 5.5 mgd) has a slightly unit cost that Alt A3.

Figure 4-21: Antioch Alternatives – Unit Cost Comparison

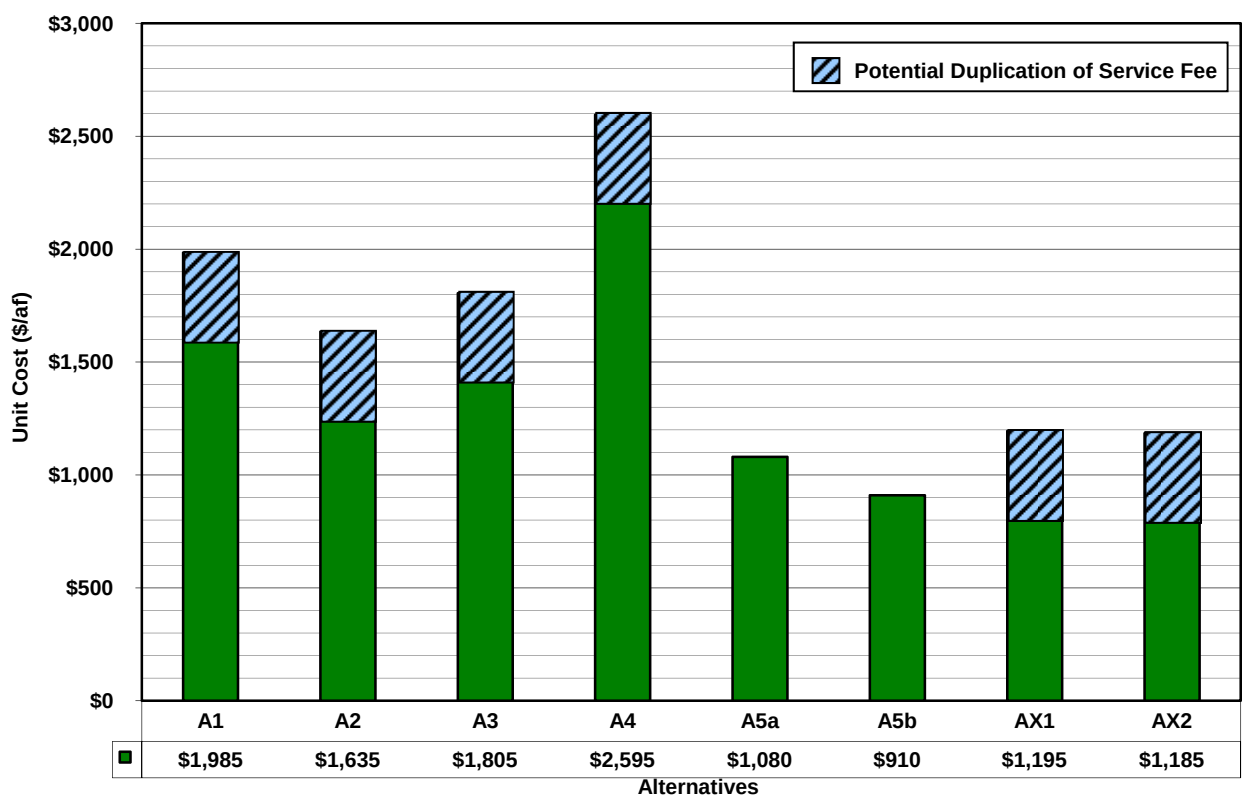


Figure 4-22: Antioch Recycled Water Alternatives – Unit Cost Breakdown

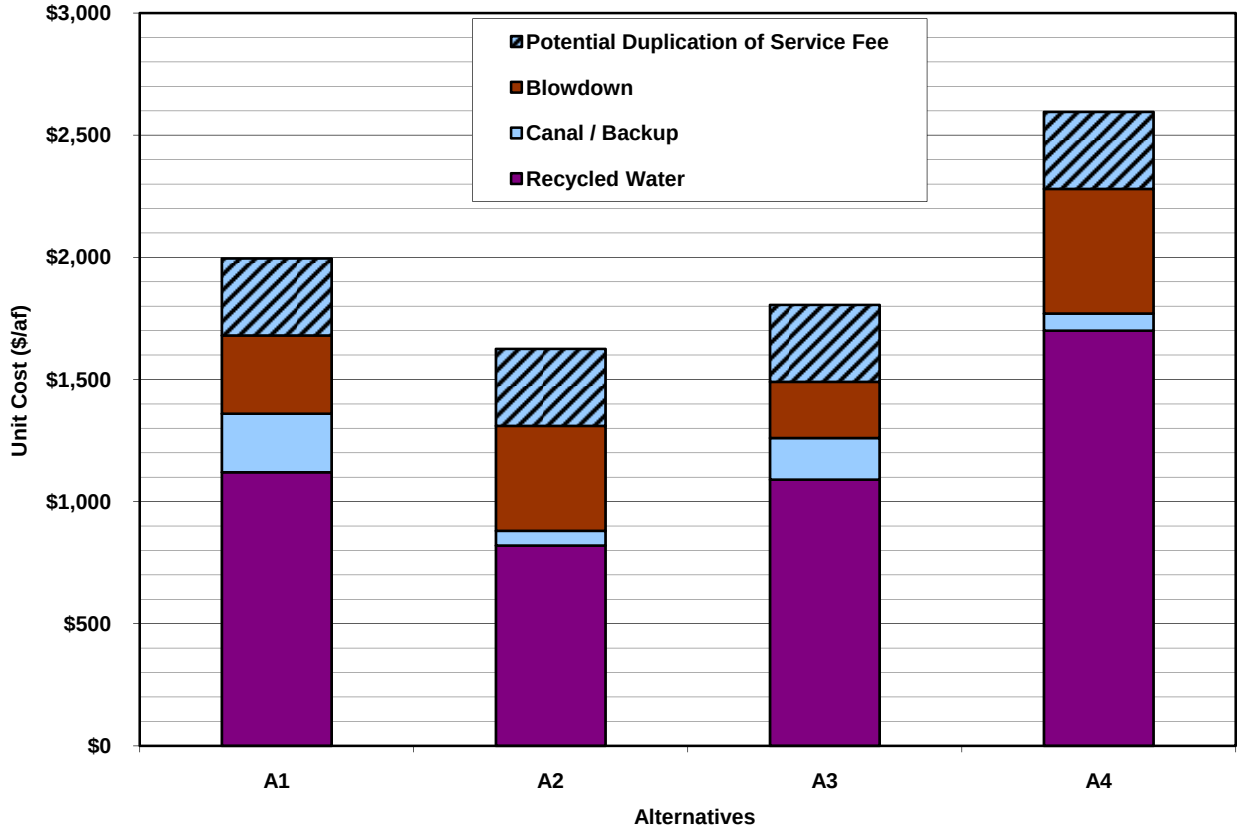


Table 4-5 shows a comparison matrix of each of the alternatives for each qualitative evaluation criteria. Scores are given as "good", "average", or "poor" relative to how attractive the alternative is in each category (represented by ●, ◒, and ○ symbols, respectively). Weighting of each criteria and assignment of numerical ratings was not conducted because this is a qualitative evaluation. Rather, the ratings were summed by level at the bottom of the table.

Table 4-5: Antioch Alternatives Evaluation

Alternative / Supply (mgd)		A1 DDSD (5.5)	A2 ISD (3.5)	A3 DDSD/ISD (8.0)	A4 Satellite (2.4)	A5 Canal (8.0)	AX Exchange (8.0)
Qualitative Criteria							
Institutional		◒	◒	◒	◒	◒	○
CEC Approval		●	●	●	●	○	◒
Right-of-Way		◒	◒	◒	●	●	●
Water Quality - Ammonia		○	●	◒	●	●	●
Operational Reliability		◒	◒	●	◒	●	●
Drought Reliability		●	●	●	●	◒	◒
Rating	**Interpretation**	**Qualitative Criteria Evaluation Summary**					
●	Good	2	3	3	4	3	3
◒	Average	3	3	3	2	2	2
○	Poor	1	--	--	--	1*	1

The following is an explanation of the qualitative evaluation for each alternative:

- **Alt A1 (DDSD; 5.5 mgd):** This alternative could be considered the typical recycled water project due to its basic concept of expanding centralized treatment plant capacity and constructing a pipeline to convey the supply to the customer. Only the water quality criterion was rated poor due to relatively high ammonia concentrations.
- **Alt A2 (ISD; 3.5 mgd):** This alternative is similar to Alt A1 but has higher water quality due to ammonia removal.
- **Alt A3 (DDSD & ISD; 8.0 mgd):** As a combination of alternatives A1 and A2, this alternative was roughly rated between their evaluations. Operational reliability was rated good because two recycled water sources supply the site instead of one for the other recycled water alternatives. Water quality was rated average due to blending of good and poor sources.
- **Alt A4 (Satellite; 2.4 mgd):** This alternative was generally evaluated positively due to satellite treatment resulting in a smaller footprint and good water quality. The other ratings were similar to Alt A1.
- **Alt A5 (Canal; 2.4 & 8.0 mgd):** Similar to Alt A4, this alternative was generally evaluated positively due to its smaller footprint from avoiding construction of a recycled pipeline and good water quality. The primary concern is CEC approval of the project, which is a potential limitation.
- **Alt AX (Exchange; 8.0 mgd):** These alternatives rate similar to Alt A5 since the Canal would be the primary supply for the power plant. In comparison, Alt AX has a higher CEC approval rating than Alt A5 due to a higher likelihood of approval but lower rating than the recycled water alternatives due to a lower likelihood of approval. The alternatives raise institutional issues due to the new and innovative concept of a water exchange plus involvement of the refineries adds an additional party that is vital to successful project implementation.

Based on the economic and qualitative evaluation, preliminary implications for the Antioch alternatives include:

- Alt A5 would be preferred because it has the lowest unit cost except for the potential limitation (CEC approval).
- Next, the exchange alternatives would be preferred because they have the next lowest unit cost except for the institutional and regulatory risk inherent in the exchange concept.
- Of the recycled water alternatives, Alt A2 has the lowest unit cost and favorable qualitative reviews. Alt A3 has a slightly higher unit cost Alt A2 and Alt A2 could be constructed as the first phase of Alt A3, which results in implementation flexibility.
- Of the remaining alternatives, Alt A1 is a reliable alternative with little risk but water quality is a slight drawback. Alt A4 (Satellite; 2.4 mgd) would be a good option based on its favorable qualitative review, but has a relatively high unit cost. The unit cost could be reduced (as with the other alternatives) by choosing less expensive blowdown management and backup supply options but the unit cost associated with recycled water would still be higher.

Recommended Projects

Considering all of this, the recommended alternative for Antioch is Alt A2 to supply up to 3.5 mgd as the first phase of Alt A3 (which could supply 8.0 mgd), pending the resolution of CEC and institutional issues for the exchange alternatives. To address these unknowns, it is recommended that the exchange alternatives should progress in parallel with Alt A2. Note that the Antioch Canal alternatives would be preferred for all other industrial customers except for new power plants.

4.3.3 Pittsburg Power Plant Site

This section uses the criteria described previously to evaluate the alternatives that would serve the Pittsburg power plant site. The unit costs for each alternative are compared in **Figure 4-23**. Alt P4a and P4b (Canal; 3.7 & 8.0 mgd) have the lowest unit cost followed by the two exchange alternatives (Alt PX1 and PX2). Of the traditional recycled water alternatives (compared in **Figure 4-24)**, Alt P1 (DDSD; 5.5 mgd) and Alt P2 (CCCSD; 8.0 mgd) have the lowest unit cost while Alt P3 (Satellite; 3.6 mgd) has the highest unit cost.

Figure 4-23: Pittsburg Alternatives – Unit Cost Comparison

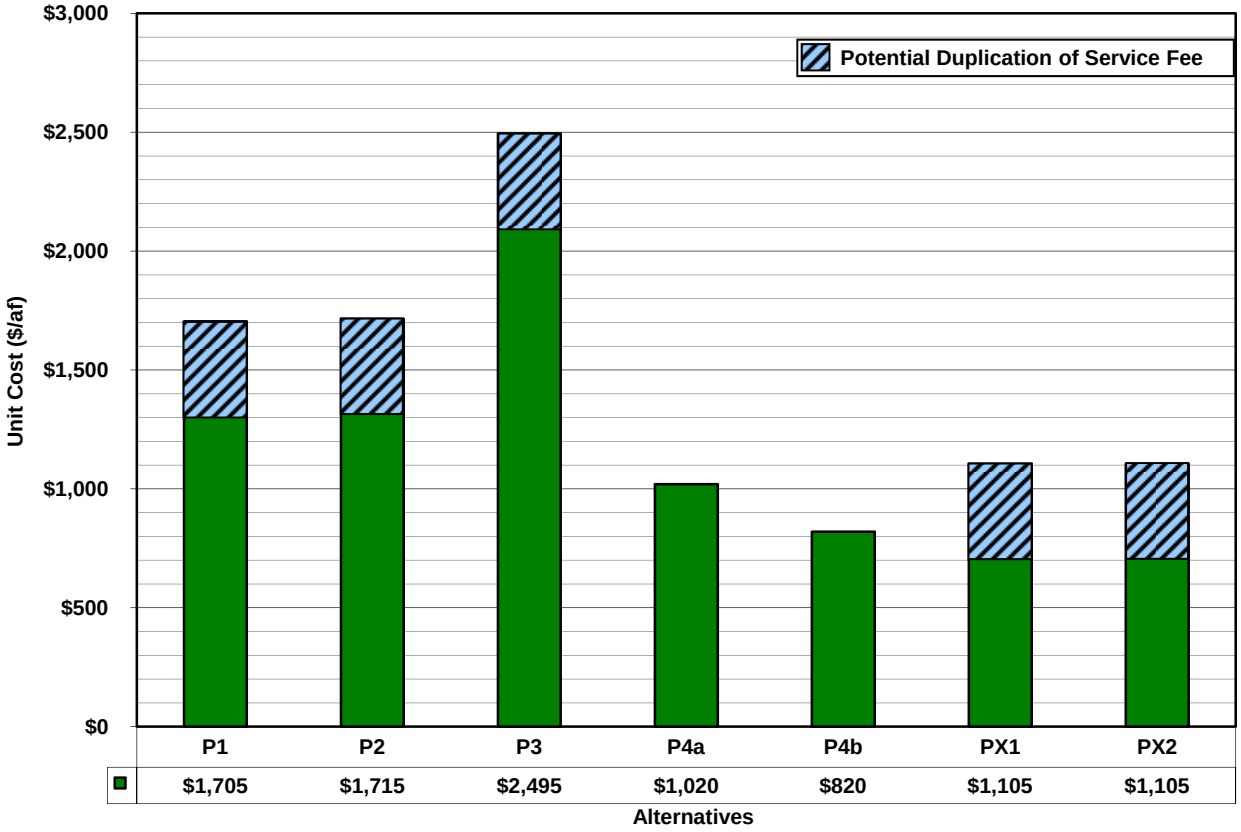


Figure 4-24: Pittsburg Recycled Water Alternatives – Unit Cost Breakdown

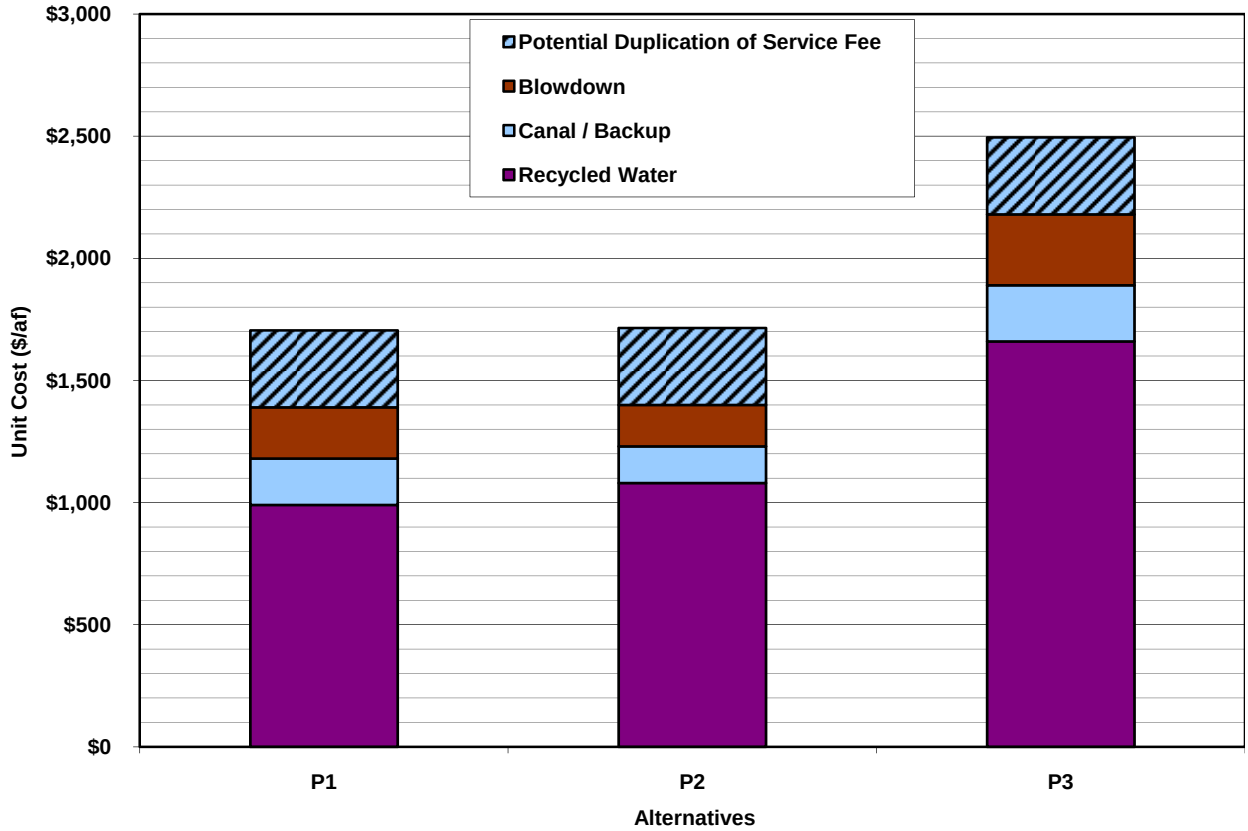


Table 4-6 shows a comparison matrix of each of the alternatives for each qualitative evaluation criteria. Scores are given as "good", "average", or "poor" relative to how attractive the alternative is in each category (represented by ●, ◒, and ○ symbols, respectively). Weighting of each criteria and assignment of numerical ratings was not conducted because this is a qualitative evaluation. Rather, the ratings were summed by level at the bottom of the table.

Table 4-6: Pittsburg Alternative Evaluation

Alternative Supply (mgd)		P1 DDSD (5.5)	P2 CCCSD (8.0)	P3 Satellite (3.6)	P4 Canal (8.0)	PX Exchange (8.0)
Qualitative Criteria						
Institutional		◒	◒	◒	◒	○
CEC Approval		●	●	●	○	◒
Right-of-Way		◒	○	●	●	●
Water Quality - Ammonia		○	●	●	●	●
Operational Reliability		◒	◒	◒	●	●
Drought Reliability		●	●	●	◒	◒
Rating	**Interpretation**	**Qualitative Criteria Evaluation Summary**				
●	Good	2	3	4	3	3
◒	Average	3	2	2	2	2
○	Poor	1	1	--	1*	1

The following is an explanation of the qualitative evaluation for each alternative:

- **Alt P1 (DDSD; 5.5 mgd):** This alternative could be considered the typical recycled water project due to its basic concept of expanding centralized treatment plant capacity and constructing a pipeline to convey the supply to customer. Only the water quality criterion was rated poor due to relatively high ammonia concentrations.
- **Alt P2 (CCCSD; 8.0 mgd):** This alternative is similar to Alt P1 but would have higher water quality due to ammonia removal while raising right-of-way issues caused by implementing 13-mile recycled water pipeline across US Navy property.
- **Alt P3 (Satellite; 3.6 mgd):** This alternative was generally evaluated positively due to satellite treatment resulting in a smaller footprint and good water quality. The other ratings were similar to Alt P1.
- **Alt P4 (Canal; 3.6 & 8.0 mgd):** Similar to Alt P3, this alternative was generally evaluated positively due to its smaller footprint from avoiding construction of a recycled pipeline and good water quality. The primary concern is CEC approval of the project, which is a potential limitation.
- **Alt PX (Exchange, 8.0 mgd):** These alternatives rate similar to Alt P4 since the Canal would be the primary supply for to the power plant. In comparison, Alt PX has an average CEC approval rating than Alt P4 due to a higher likelihood of approval but lower rating than the recycled water alternatives due to a lower likelihood of approval. The alternatives raise institutional issues due to the new and innovative concept of a water exchange plus involvement of the refineries adds an additional party that is vital to successful project implementation.

Based on the economic and qualitative evaluation, preliminary implications for the Pittsburg alternatives include:

- The Canal alternatives would be preferred because they have the lowest unit cost except for the potential limitation (CEC approval).
- Next, the exchange alternatives would be preferred because they have the next lowest unit cost (and potentially the lowest once the CCWD connection fee and recycled water grant funding are included) except for the institutional and regulatory risk inherent in the exchange concept.
- Of the recycled water alternatives, Alt P1 has a slightly lower unit cost than Alt P2 while Alt P2 has a slightly more favorable qualitative review so these alternatives are rated overall similarly.
- Alt P3 would be a good option based on its favorable qualitative review except for the relatively high unit cost. The unit cost could be reduced (as with the other alternatives) by choosing less expensive blowdown management and backup supply options but the unit cost associated with recycled water would still be higher.

Recommended Projects

Considering all of this, the recommended recycled water alternative for Pittsburg is a tossup between Alt P1 and Alt P2, pending the resolution of CEC and institutional issues for the exchange alternatives (PX). To address unknowns associated with the exchange alternatives, it is recommended that these alternatives should progress in parallel with the recommended recycled water alternative. And note that the Pittsburg Canal alternatives (P4a and P4b) would be preferred for all other industrial customers except for new power plants.

Further analysis of distinctions between Alt P1 and Alt P2, revealed the potential to lower construction costs by utilizing nearly 40,000 ft of existing pipeline along the Alt P2 alignment by installing a slipliner within the existing pipeline instead of constructing a new pipeline within this right-of-way. The application of 38,800 ft of a 15” slipliner within the existing 16” Shell pipeline would reduce recycled water pipeline costs by $8.7 million (or nearly two-thirds); however, maximum deliveries would be reduced from 8.0 mgd to 6.0 mgd because the maximum sliplining diameter would be less than the 18”

pipeline necessary to transport 8.0 mgd. Accounting for the reduced supply of 6.0 mgd on all of the Alt P2 facilities (such as 16" recycled water non-slipliner pipelines and avoided major crossings) as well as associated contingencies and planning costs resulted in a capital cost reduction of $27.4 million (or approximately one-third). The resultant unit cost for Alt P2 with a slipliner that limited capacity to 6.0 mgd was $1,240/af, which was slightly lower than Alt P2 without a slipliner (at 8.0 mgd) and similar to Alt P1 (at 5.5 mgd).

Since cost does not distinguish between Alt P1 and Alt P2 with or without a slipliner, Alt P2 with a slipliner is the recommended alternative for Pittsburg based on the following factors:

- Sliplining avoids typical construction impacts for nearly 60% of the pipeline length and, in particular, avoids impacts/constraints from construction adjacent to wetlands for the entire slipliner length
- Larger flows can be met in the future by adding DDSD flow from Alt P1 or upsizing the new pipeline segments of Alt P2 and installing a new, smaller pipe to convey flows greater than 6.0 mgd.
- DDSD has other potential landscape and industrial recycled water customers that could use some (or all) flow from Alt P1 while Central San is not supply constrained

4.3.4 Evaluation Summary

This Plan evaluated eight recycled water alternatives, four raw surface water alternatives and four exchange alternatives. A comparison of alternative supply yields and unit costs are provided in **Figure 4-25** and **Figure 4-26**. In both figures, the recommended recycled water alternatives – Alt A2 (ISD; 3.5 mgd) and Alt P2 with slipliner (CCCSD; 6.0 mgd) – are circled.

Figure 4-25: Cost & Supply Alternative Comparison

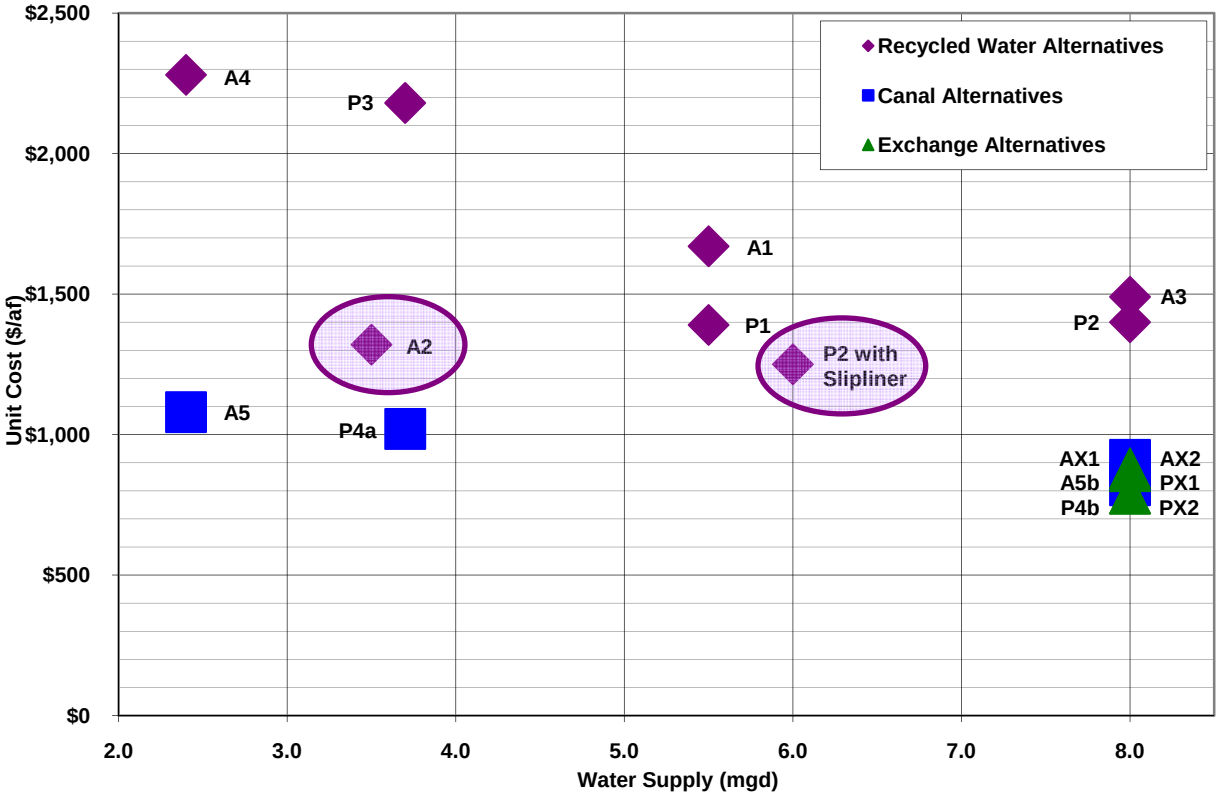
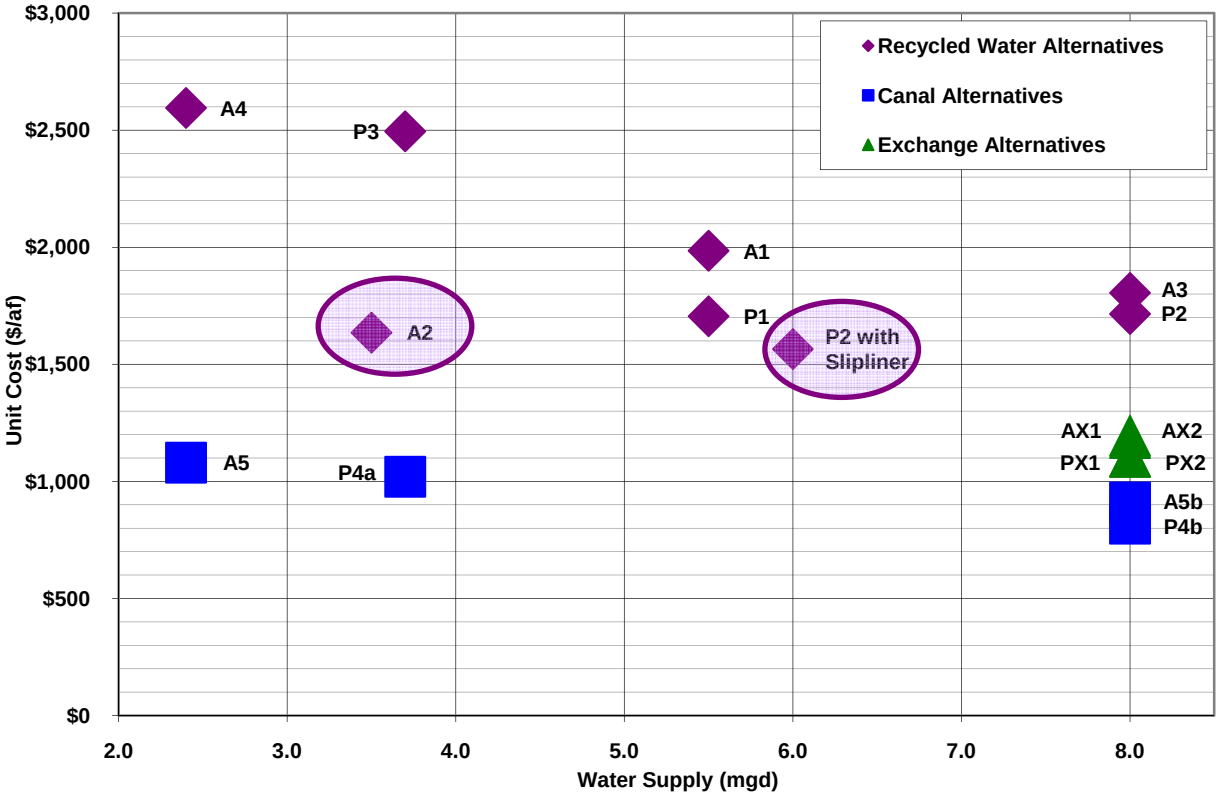


Figure 4-26: Figure 4-25 with Potential Duplication of Service Fee



Chapter 5 Recommended Projects & Facilities Plan

The evaluation identified the Canal (raw surface water) alternatives as the most cost effective but they also have a potential limitation in that the CEC would not likely approve the supply for a new power plant. This limitation was important because the market assessment identified new power plants in the study area as better customers for recycled water than other potential existing and future industrial customers. Therefore, it should be noted that the Canal alternatives would have likely been recommended if new power plants were not the target customer for this Plan.

This Plan evaluated alternatives for both Antioch and Pittsburg sites but did not compare alternatives between the sites and ultimately recommended two recycled projects for implementation whereas typically recycled water facilities plans prepared in coordination with the SWRCB only recommend one project. The primary reason for this, as discussed in the market assessment, is that implementation of a new plant is contingent upon a variety of factors (such as CEC approval, total cost of power plant, and potentially PG&E approval) such that the location of new power plants cannot be predicted between Antioch and Pittsburg. Another unknown is that the initial and long-term demands at each site are subject to change.

Also, the power plant implementation process includes many obstacles, such as CEC approval and cost effectiveness, which could result in power plants proposed with recycled water supplies from the recommended projects and all, one, or none are approved by CEC and get the go-ahead from the developers. Each power plant developer will make their ultimate decision on power plant size and associated technology based on a combination of factors, including the availability, reliability, quality, and cost of water supply. As such, a primary objective of this Plan is to identify these factors for consideration by each power plant developer. The power plant developer will decide early in their planning process what source of water to propose as part of their project to the CEC and the amount of risk that the developers are willing to take in order to receive CEC approval and complete the project on schedule is unknown at this time. Also, as previously discussed, the water supply component of a new power plant is just one component considered during planning and design of the plant. Alternatives for other power plant components, such as cooling technology and materials, are evaluated along with the cost and quality of the water supply to determine the best choices for the new power plant.

The evaluation for Antioch and Pittsburg identified a recommended recycled water alternative for each site and recommended addressing CEC and institutional issues for the exchange alternatives to provide resolution in comparison with the recycled water alternatives (because the exchange alternatives had lower unit costs). And, as discussed in Appendix C, the recycled water alternatives may become cost competitive with the exchange alternatives once CCWD connection fees (which are determined on a case-by-case basis so were estimated for the analysis in Appendix C) and grant funding are included in the cost estimates. Until these issues are resolved the recycled water alternatives are recommended but the exchange alternatives have been defined in the next section for use if the issues are resolved and the exchange alternatives are shown to be feasible and remain cost effective.

5.1 Recommended Project Descriptions & Cost

This section presents the project descriptions and cost estimates for each of the three recommended projects:

1. Alternative A2 was recommended for recycled water service (3.5 mgd from ISD) to Antioch
2. Alternative P2 with sliplining was recommended for recycled water service (6.0 mgd from CCCSD) to Pittsburg
3. The Exchange Alternatives (AX1, AX2, PX1, and PX2) were recommended for further consideration as an alternative to recycled water service to Antioch or Pittsburg

5.1.1 Recommended Antioch Project

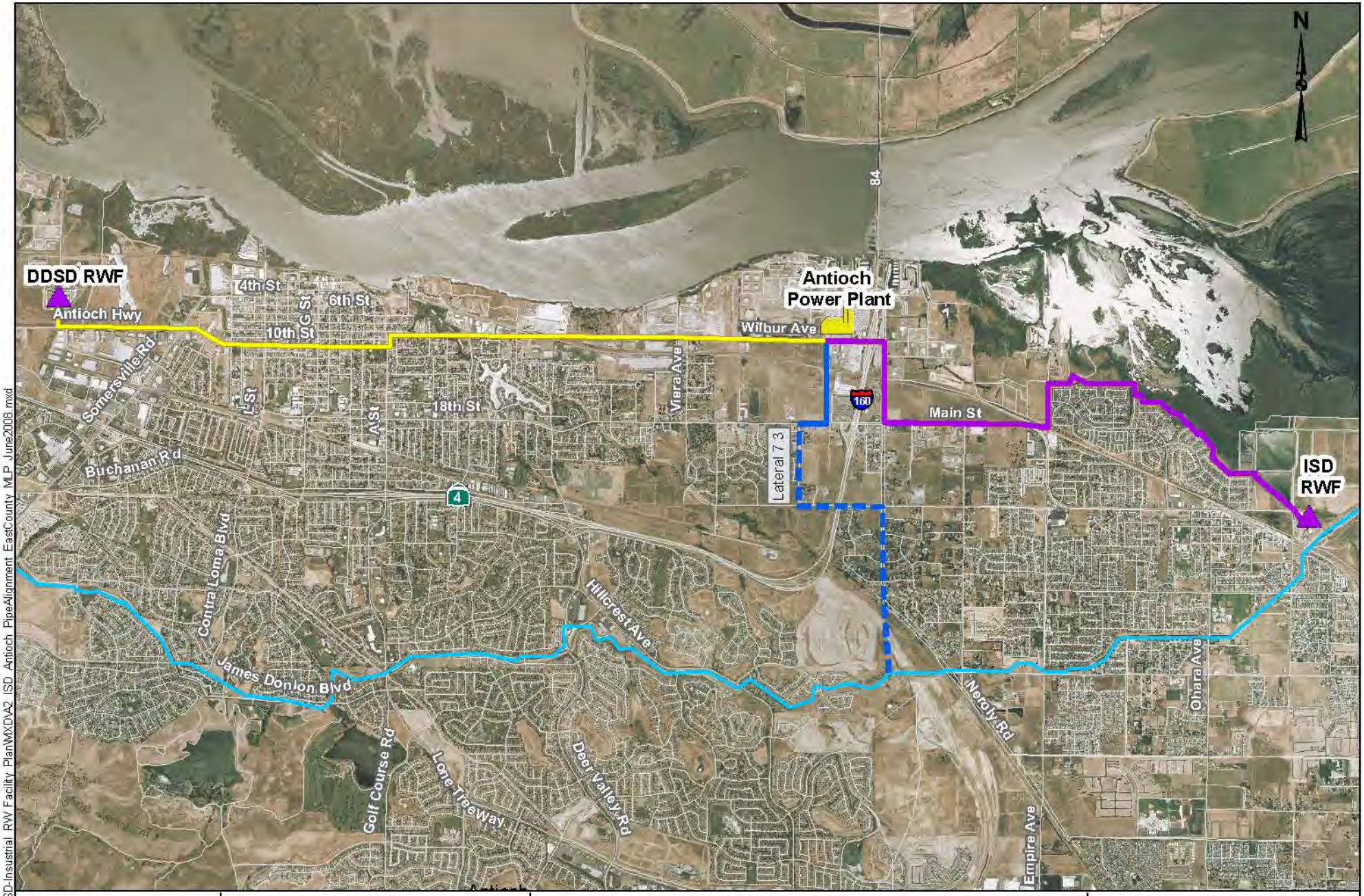
The recommended project for Antioch is Alt A2, which could provide up to 3.5 mgd of recycled water from the ISD RWF to the Antioch power plant site. Associated facilities are presented in **Figure 5-1**. It should be noted that the focus of this facilities plan is on recommending the most cost effective and feasible recycled water project. This recommendation does not necessarily reflect the views of all project participants; in particular, if the power project applicant were successful in convincing the CEC that the exchange alternative or the raw water supply alternative were defensible using CEC criteria (as compared with this recommended recycled water alternative) such an alternative may be recommended and pursued in the future. In addition, power project applicants could opt to use dry cooling which would dramatically reduce the need for recycled water.

The major project components for the Recommended Antioch Project are summarized in **Table 5-1** and detailed below.

Table 5-1: Summary of Major Project Components for Recommended Antioch Project

Project Aspect	Project Component
Recycled Water	Treatment: Use of all tertiary flow (3.5 mgd) from the ISD RWF (under construction) Pipeline: 21,200 LF of 14" PVC; from the ISD RWF to the power plant Pump Station: New 150-hp pump station; assumed to be located at the ISD RWF
Blowdown System	Pipeline: 27,100 LF of 10" PVC; from the power plant to DDSD WWTP Pump Station: New 40-hp booster station; assumed to be located at the power plant
Backup Water Supply	Pipeline: Use of existing CCWD Lateral 7.3 plus 4,000 LF of 12" PVC pipe Pump Station: No pump station is needed

- **Recycled Water Treatment:** The alternative assumes ISD completes installation of their 4.3 mgd tertiary treatment plant as planned in 2011. Recycled water production from the expanded facility will be limited to projected flows (3.6 mgd in 2015) less treatment plant losses (approximately 2%), which leaves 3.5 mgd of recycled water available. All of this supply is available for use at the power plant.
- **Recycled Water Pipeline:** The alternative would require approximately 21,200 LF of 14" PVC pipeline from the ISD RWF to the Antioch power plant. The general alignment of the pipe is from the ISD RWF along Walnut Meadows Dr to Hwy 4/Main St to Bridgehead Road to Wilbur Ave at the power plant site. Major crossings along this alignment include two railroads (BNSF twice) and one highway (Hwy-4).
- **Recycled Water Pump Station:** Recycled water conveyance from the ISD RWF to the power plant requires a new 150-hp pump station, which is assumed to be located at the RWF. This pump station has the potential to be replaced by the planned effluent distribution pump station but that cannot be assumed at this time.
- **Blowdown System:** The blowdown system consists of 27,100 LF of 10" PVC pipe from the power plant to DDSD WWTP. A new 40-hp booster station is also needed, which is assumed to be located at the power plant site.
- **Backup Water Supply:** The Canal water will be conveyed from CCWD Lateral 7.3 to the power plant via gravity through 4,000 LF of 12" PVC pipeline along Vineyard Drive. No pump station is needed but one major railroad crossing (BNSF) is necessary.



RMC Water and Environment

1 inch equals 0.8 miles

0 0.375 0.75 1.5

Miles

Existing Facilities

- Recycled Water Facility
- Contra Costa Canal
- Raw Water Lateral

Potential Facilities

- Power Plant Site
- Recycled Water Pipe
- Blowdown Pipe
- Raw Water Pipe

Figure 5-1
Recommended Antioch Project

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Sources:

As shown in **Table 5-2**, the estimate capital cost for the recommended alternative is $24.7 million and, As shown in **Table 5-3**, the estimated unit cost for a base-load power plant is $1,320/af. The detailed cost estimate is included in Appendix B and, as discussed in the Cost Sensitivity Analysis (Appendix C), these costs do not include CCWD connection fees and duplication of service fees or grant and loan funding opportunities.

Table 5-2: Summary of Capital Costs for Recommended Antioch Project

Item	Cost
Construction Costs	
Raw Construction Costs	
Recycled Water Supply Components	$7.80 M
Blowdown System Components	$6.43 M
Backup Water Supply Components	$0.95 M
Raw Construction Costs Subtotal	*$15.18 M*
Conceptual Design Level Contingency (25%)	$3.79 M
Construction Costs Subtotal	**$18.97 M**
Project Planning Costs	
Pre-Construction (15%)	$2.845 M
During Construction (15%)	$2.845 M
Project Planning Costs Subtotal	**$5.69 M**
Total Capital Cost	**$24.66 M**

Note: Cost basis was ENR CCI, July 2008 for the San Francisco Bay area: 9286.

Table 5-3: Summary of Annual Costs for Recommended Antioch Project

Item	Cost
Annualized Capital Cost	$2.15 M
Annual Operations and Maintenance Cost	$0.94 M
Total Annual Cost	**$3.09 M**
Estimated Annual Project Yield	2,350 afy
Average Annual Unit Cost	**$1,320 / af**

Note: Capital cost was annualized at 6% over 20 years.

Future Phases

The Recommended Antioch Alternative can only provide up to 3.5 mgd of recycled water supply to the Antioch power plant site. If additional recycled water supply is needed for a larger power plant with high water demands, Alt A1 would be recommended since up to 5.5 mgd of recycled water would be available if all or some of the recycled water is not used at the Pittsburg power plant site.

The estimated capital cost for Alt A1 is $60.9 million and the estimated unit cost for a base-load power plant is $1,670/af. The estimated capital cost of both Alt A1 and the Recommended Antioch Alternative that provides up to 8.0 mgd is $74.2 million and the estimate unit cost for a base-load power plant is $1,490/af.

5.1.2 Recommended Pittsburg Project

The recommended project for Pittsburg is Alt P2 with a slipliner, which could provide up to 6.0 mgd of recycled water from the CCCSD RWF to the Pittsburg power plant site. Associated facilities are presented in **Figure 5-2**. It should be noted that the focus of this facilities plan is on recommending the most cost effective and feasible recycled water project. This recommendation does not necessarily reflect the views of all project participants; in particular, if the power project applicant were successful in convincing the CEC that the exchange alternative or the raw water supply alternative were defensible using CEC criteria (as compared with this recommended recycled water alternative) such an alternative may be recommended and pursued in the future. In addition, power project applicants could opt to use dry cooling which would dramatically reduce the need for recycled water. The major project components for the Recommended Antioch Project are and summarized in **Table 5-4** and detailed below.

Table 5-4: Summary of Major Project Components for Recommended Pittsburg Project

Project Aspect	Project Component
Recycled Water	Treatment: Upgrades (pre-treatment and filter media modifications) to existing CCCSD RWF for an additional 6.0 mgd of tertiary treatment Pipeline: 29,200 LF of 16" DI from the CCCSD RWF to the existing 16" Shell line; 38,800 LF of 15" slipliner inside the existing 16" Shell line to the Pittsburg power plant Pump Station: New 410-hp pump station assumed to be located at the ISD RWF; Plus 300-hp booster pump station mid-way between the RWF and the power plant
Blowdown System	Pipeline: 19,700 LF of 10" PVC from the power plant to DDSD WWTP Pump Station: New 90-hp booster station assumed to be located at the power plant
Backup Water Supply	Pipeline: 9,500 LF of 18" DI pipeline from the Canal to the power plant generally along the alignment of the existing 12" line. Pump Station: No pump station is needed

- **Recycled Water Treatment:** The alternative includes the upgrades of the existing CCCSD RWF for an additional 6.0 mgd of tertiary treatment capacity. The upgrades include the addition pre-treatment for tertiary filtration preparation, and tertiary filter media modifications.
- **Recycled Water Pipeline:** The alternative would require approximately 29,200 ft of 16" DI pipeline from CCCSD RWF to the existing 16" Shell pipeline on Concord Naval Weapons Station. Approximately 38,800 LF of 15" slipliner would be installed inside the existing 16" Shell pipeline to the Pittsburg power plant. The general alignment is east along Arnold Industrial Way then north along Port Chicago Highway past Mallard Reservoir then east along the right-of-way for the existing Mallard Slough pipeline across Concord Naval Weapons Station, and then along the abandoned railroad right-of-way to the power plant site. The alignment's major crossings include multiple wetlands, two railroads, and the CCWD Mallard Slough pipeline.
- **Recycled Water Pump Station:** Recycled water conveyance from the CCCSD RWF to the power plant requires a new 410-hp pump station, which is assumed to be located at the RWF, and another 300-hp pump station near Waterfront Rd and Main St, which is approximately mid-way between the RWF and the power plant site.
- **Blowdown System:** The blowdown system consists of 19,700 LF of 10" PVC pipe from the power plant to the DDSD WWTP and aligned parallel to the recycled water pipeline. A new 90-hp booster station is also needed, which is assumed to be located at the power plant site.
- **Backup Water Supply:** The Canal water will be conveyed from the Canal to the power plant via gravity through 9,500 LF of 18" DI pipeline. The general alignment is parallel to the existing 12" Canal lateral owned by PG&E, which heads north along the electrical utility corridor that heads directly to the power plant site. The alignment's major crossings include two major roads, Highway 4, and a railroad. No pump station is needed.

RMC Water and Environment

1 inch equals 1.3 miles

0 0.5 1 2

Miles

Existing Facilities

- Recycled Water Facility
- Contra Costa Canal

Potential Facilities

- Power Plant Site
- Recycled Water Pipe
- Blowdown Pipe
- Raw Water Pipe

Figure 5-2
Recommended Pittsburg Project

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Sources:

As shown in **Table 5-5**, the estimate capital cost for the recommended alternative is $44.7 million and, as shown in **Table 5-6**, the estimated unit cost for a base-load power plant is $1,250/af. The detailed cost estimate is included in Appendix B and, as discussed in the Cost Sensitivity Analysis (Appendix C), these costs do not include CCWD connection fees and duplication of service fees or grant and loan funding opportunities.

Table 5-5: Summary of Capital Costs for Recommended Pittsburg Project

Item	Cost
Construction Costs	
Raw Construction Costs	
Recycled Water Supply Components	$18.04 M
Blowdown System Components	$4.64 M
Backup Water Supply Components	$4.81 M
Raw Construction Costs Subtotal	*$27.49 M*
Conceptual Design Level Contingency (25%)	$6.87 M
Construction Costs Subtotal	**$34.36 M**
Project Planning Costs	
Pre-Construction (15%)	$5.154 M
During Construction (15%)	$5.154 M
Project Planning Costs Subtotal	**$10.31 M**
Total Capital Cost	**$44.67 M**

Note: Cost basis was ENR CCI, July 2008 for the San Francisco Bay area: 9286.

Table 5-6: Summary of Annual Costs for Recommended Pittsburg Project

Item	Cost
Annualized Capital Cost	$3.90 M
Annual Operations and Maintenance Cost	$1.12 M
Total Annual Cost	**$5.02 M**
Estimated Annual Project Yield	4,030 afy
Average Annual Unit Cost	**$1,250 / af**

Note: Capital cost was annualized at 6% over 20 years.

5.1.3 Exchange Projects

The exchange projects could replace the recommended alternatives for both Antioch and Pittsburg if the outstanding issues are resolved with sufficient outcomes, such as CEC approval of the concept and agreements between CCWD and CCCSD as well as with the Shell and/or Tesoro refineries. The exchange projects' facilities were defined in Section 4.2.2 based on an 8.0 mgd capacity but the projects have the potential to be scaled up or down as determined by the demands from new power plant development. The actual facilities to be constructed will depend on whether the Shell or Tesoro refinery is served with recycled water from the CCCSD RWF and whether Antioch or Pittsburg is served from the CCWD Canal. Associated facilities for recycled water service to the Shell Refinery were presented in Figure 4-13 and Figure 4-15 and are described below.

- **Recycled Water Treatment:** The alternative includes the upgrades of the existing CCCSD RWF for an additional 8.0 mgd of tertiary treatment capacity. The upgrades include the addition pre-treatment for tertiary filtration preparation, tertiary filter media modifications and the addition of an ammonia removal step.

- **Recycled Water Pipeline:** The alternative would use existing pipelines from the CCCSD RWF to the Shell Refinery. The pipeline owned by CCCSD is 6,500 LF of 42" cement mortar lined and coated cement steel pipe. The pipelines owned by CCWD consist of 5,890 LF of 20" to 21" steel pipe that would need to be purchased from CCWD.
- **Recycled Water Pump Station:** Recycled water conveyance from the CCCSD RWF to the Shell Refinery requires a new 280-hp pump station, which is assumed to be located at the RWF.

Associated facilities for recycled water service to the Tesoro Refinery were presented in Figure 4-14 and Figure 4-16 and described below.

- **Recycled Water Treatment:** The alternative includes the upgrades of the existing CCCSD RWF for an additional 8.0 mgd of tertiary treatment capacity. The upgrades include the addition pre-treatment for tertiary filtration preparation, tertiary filter media modifications and the addition of an ammonia removal step.
- **Recycled Water Pipeline:** The alternative would use existing pipelines from the CCCSD RWF to the Tesoro Refinery. The pipeline owned by CCCSD is 6,500 LF of 42" cement mortar lined and coated cement steel pipe. The pipelines owned by CCWD consist of 12,510 LF of 20" to 24" steel pipe that would need to be purchased from CCWD.
- **Recycled Water Pump Station:** Recycled water conveyance from the CCCSD RWF to the Tesoro Refinery requires a new 130-hp pump station, which is assumed to be located at the RWF.

Associated facilities for Canal service to Antioch were presented in Figure 4-8 and described below.

- **Canal Water Supply:** The Canal water will be conveyed from the East Gaylord Lateral to the power plant via gravity through a 4,350 LF of 18" DI pipeline. No pump station is needed.
- **Blowdown System:** The blowdown system consists of 27,100 LF of 12" PVC pipe from the power plant to DDSD WWTP with the same alignment as the blowdown pipeline for Alt. A1. A new 160-hp booster station is also needed, which is assumed to be located at the power plant site.

Associated facilities for Canal service to Pittsburg were presented in Figure 4-12 and described below.

- **Canal Water Supply:** The Canal water will be conveyed from the Canal to the power plant via gravity through 9,500 LF of 21" DI pipeline. The alignment and crossings are the same as for Alt P1's backup supply. No pump station is needed.
- **Blowdown System:** The blowdown system consists of 19,700 LF of 12" PVC pipeline from the power plant to DDSD WWTP. The alignment is the same as for Alt P1 and there are no major crossings. A new 120-hp booster station is also needed, which is assumed to be located at the power plant site.

The estimate capital costs for the exchange alternatives range from $35.6 million to $43.8 million and the estimated unit costs for a base-load power plant range from $900/af to $1,010/af. The detailed cost estimate is included in Appendix B and, as discussed in the Cost Sensitivity Analysis (Appendix C), these costs do not include CCWD connection fees and duplication of service fees or grant and loan funding opportunities.

5.2 Implementation Plan

This section includes:

- Financing Plan
- Environmental Documentation
- Interagency Agreements
- User Assurances
- Implementation Schedule

5.2.1 Financing Plan

This section discusses potential funding and revenue sources. It is common practice for power plants to finance at least part of the water infrastructure required to serve the plant since the cost for securing the water infrastructure may be a small percentage of the overall cost of building the plant. Thus, the power plant could reasonably assume part of the cost for construction of the pipeline. This was the approach taken by DDSD with Calpine for providing recycled water service to DEC / LMEC. To reimburse the power plant for its initial investment, the project partners could:

- Reimburse the power plant by offering reduced water rates
- Offer a "gain-share" agreement to share in revenue if future users are able to use the pipeline financed by the power plant

Project funding subsidies through grant funding or low-interest loans would be desired even if the power plant developer is providing the bulk of project funds. The project partners are currently receiving funding for the preparation of this Plan through the Water Recycling Funding Program (WRFP). Administered by the SWRCB, the WRFP provides funding of 50% of eligible planning costs up to $75,000 to public agencies to Plan the feasibility of water recycling and to prepare a facilities plan documenting the analyses and conclusions of the investigation. A summary of potential outside funding sources for the Project is provided in **Table 5-7**.

Table 5-7: Potential Funding Sources

Funding Program	Amount Available	Comments
Grant Funding		
SWRCB Recycled Water Funding Program[1]	25% of construction cost up to $5M million	$8M available in FY 07/08 and possibly in FY 08/09
USBR Title XVI Program[2]	Up to 25% of construction cost with maximum of $20M	Funding dependant on earmarks by Congress
USBR Water 2025: Challenge Grant Program[3]	Up to $300,000 (with 50% matching funds)	Grants awarded annually and available once per project.
DWR Prop 84[4]	No limit on a single project	Project must be included in regional package. First round in 2009.
Loan Sources		
SWRCB SRF[5]	Up to $25 million -possible increase to $50M with approval by SWRCB	Priority list made yearly. $285M available in FY 07/08. Loan available once per recipient per year.
Municipal Bonds	Bonds could supplement other funding sources for Project capital costs. Different types of bonds (e.g., revenue bonds, general obligation bonds, certificate of participation) should be considered.	

Notes:

1. Water Recycling Funding Program Guidelines (SWRCB, 2004); www.swrcb.ca.gov/recycling/docs/guidelines2004.pdf
2. Guidelines for Preparing, Reviewing, and Processing Water Reclamation and Reuse Project Proposals under Title XVI (USBR, 1992); www.swrcb.ca.gov/recycling/docs/guidelines2004.pdf
3. Water 2025 Challenge Grant Program website; www.doi.gov/water2025/grant.html
4. Proposition 84; http://www.grantsloans.water.ca.gov
5. SWRCB SRF; www.waterboards.ca.gov/water_issues/programs/grants_loans/srf

Grant funding is limited and its receipt is speculative so the cash flow analysis (Appendix D) is presented as a best-case and worst-case scenario. The best-case scenario assumes 25% State grant funding and 25% Federal grant funding as well as all necessary capital funding sources would be acquired through a low interest loan under the SWRCB SRF Loan Program. The best case scenario assumptions were based on existing DDSD recycled water projects Pittsburg and Antioch. The Pittsburg project is under construction

and is being financed on the basis of 50% local cost share, 25% funding from State grants, and the remaining 25% are expected from Federal grants. (The Federal funds have been authorized but have not been appropriated). Also, DDSD is currently pursuing a similar cost share for the Antioch recycled water project as well as securing a loan from the SWRCB State Revolving Fund for the local share with an interest rate of approximately 2.5%.

As shown in **Table 5-8,** applying 50% grant funding and a SRF low-interest loan to the recommended alternatives would lower the unit cost by up to 50%.

Table 5-8: Benefits of Grant Funding and Low-Interest Loans

	Alt A2 (3.6 MGD)			Alt P2x (6.0 MGD)		
Costs	**Current**	**With Grant [2]**	**Grant & Loan [2,3]**	**Current**	**With Grant [2]**	**Grant & Loan [2,3]**
Project Capital Cost ($ Million) [1]	**$24.66**	**$12.33**	**$12.33**	**$44.67**	**$22.34**	**$22.34**
Annual Costs ($ Million)						
Annualized Capital Cost	$2.15	$1.08	$0.79	$3.89	$1.95	$1.43
Total O&M Cost	$0.94	$0.94	$0.94	$1.12	$1.12	$1.12
Total Annual Cost	**$3.09**	**$2.02**	**$1.73**	**$5.02**	**$3.07**	**$2.56**
Unit Costs ($/AF)						
Average Annual Production [4]	2,350 afy			4,030 afy		
Unit Cost	**$1,310**	**$850**	**$730**	**$1,250**	**$760**	**$630**
Potential Duplication of Service Fee [5,6]	$315/af			$315/af		
Unit Cost	**$1,625**	**$1,165**	**$1,045**	**$1,565**	**$1,075**	**$945**

Notes:
1. CCWD connection fees have not been included.
2. Grant assumes 50% of all capital costs are reimbursed through grant funding.
3. Loan assumes 2.5% over 20 years (compared with 6.0% over 20 years).
4. For base-load power plant assuming annual operations at 60% of capacity.
5. Recycled water projects implemented within the CCWD service area may include duplication of service fees to recover costs incurred by CCWD for system improvements needed to serve its customers. The duplication of service issues are addressed on a case-by-case basis.
6. The current fee was recently estimated as $315/af (CCWD, October 2008).

5.2.2 Environmental Documentation

A CEQA document must be prepared to provide project-level coverage for construction and operation of recycled water pipelines and non-potable reuse applications as identified in this report. For the Recommended Projects, the CEC, who approves all new power plants proposed in California, is the lead agency under the CEQA and the process is documented in an “Application for Certification”, which is equivalent to a CEQA EIR. This document addresses the environmental impact of the project on water resources. CEQA coverage for the recycled water treatment and conveyance facilities can be included in this document but may also be covered under a separate CEQA document that is led by the recycled water supplier.

A separate document may be prepared if details of the water supply project are not available when the Application for Certification is submitted. The document could be an EIR, Mitigated Negative

Declaration (MND), or Negative Declaration (ND). The Recommended Project could probably qualify for an MND; however, an Initial Study would need to be prepared to confirm this assumption.

Either way, CEQA-Plus[10] environmental review process is recommended in case low-interest loans from the SRF Construction Loan program are ultimately pursued (as discussed in the previous section).

5.2.3 Interagency Agreements

The recycled water supplier would need to enter into a Recycled Water Agreement with CCWD to serve recycled water within the CCWD service area (due to duplication of service) because CCWD has invested in facilities to support water service for existing and future customers.

A copy of the General Recycled Water Agreement between DDSD and CCWD that was developed for implementation of DDSD's landscape irrigation projects in Antioch and Pittsburg is in Appendix E. This agreement should form the basis of a future agreement for the Recommended Projects.

5.2.4 User Assurances

New power plants would be the primary customers for the recommended recycled water projects and the recycled water projects would not be constructed without construction of a new power plant. Therefore, user assurances for this Plan can be demonstrated by power plant developers participating as project partners in the development of this Plan and by the high likelihood that new power plants will be implemented in Pittsburg and/or Antioch in the next 10 years.

In addition, Mirant provided a letter of intent (in Appendix F) that affirmed their interest in considering recycled water for new power plants in the study area. Also, PG&E provided a letter (in Appendix F) stating their interest in the use of recycled water for potential new power plants within the study area.

The Study Team anticipates that user agreements between the recycled water supplier and power plant owner will be based on the existing agreement between DDSD and Calpine for supply of recycled water primarily for cooling water supply to DEC and LMEC, which are two Calpine power plants in Pittsburg (see Section 3.2.1). A copy of the existing DDSD/Calpine agreement is included in Appendix G. The Study Team anticipates that this agreement will form the basis of a future agreement for the Recommended Projects.

5.2.5 Public Outreach

Public support of any new project is important so, as a first step, DDSD held a presentation to the public during September 9, 2009 Board meeting. The presentation covered the potential project alternatives, the recommended recycled water projects, including the financial impacts and environmental factors, and a listing of next steps to be taken by the project partners. No comments were received. A copy of the Board meeting agenda and Plan presentation agenda item are included in Appendix H.

Further public outreach will occur at a minimum, as part of the CEC review process and, if conducted separately, the CEQA process led by the recycled water supplier.

5.2.6 Implementation Schedule

The project partners have been working in close coordination to develop these projects and prepare for their implementation. The implementation schedule for the recommended alternatives is dependent upon

[10] From SWRCB Guidelines: The SRF Loan Program is partially funded by the U.S. Environmental Protection Agency (USEPA) and subject to federal environmental regulations, including the Endangered Species Act (ESA), the National Historic Preservation Act (NHPA), and the General Conformity Rule for the Clean Air Act (CAA). USEPA has chosen to use CEQA as the compliance base for California's SRF Loan Program, in addition to compliance with ESA, NHPA and CAA. Collectively, the SWRCB calls these requirements CEQA-Plus. Additional federal regulations also may apply.

the implementation schedule for the new power plants, which is dependent on a variety of factors. In particular, the timing of the need for new power supplies (expressed through a PG&E RFO or decommissioning of an existing power plant) as well as acceptance of the proposed power supply by PG&E and/or the CEC. Therefore, a conceptual implementation schedule was developed that demonstrates that a roughly five year period is required to implement the water supply project once power plant implementation has begun, as shown in **Figure 5-3**.

Figure 5-3: Conceptual Implementation Schedule

	Year 1				Year 2				Year 3				Year 4				Year 5			
Task	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
Recycled Water Supply																				
Preliminary Design			■	■	■	■	■	■												
Environmental Doc.							■	■	■	■										
Final Design									■	■	■	■								
Bidding													■							
Construction														■	■	■	■	■	■	■
Power Plant																				
Preliminary Design	■	■	■	■																
CEC Review					■	■	■	■	■	■										
Final Design									■	■	■	■								
Bidding													■							
Construction														■	■	■	■	■	■	■

Note: Does not include time to resolve CEC, institutional and cost issues for exchange alternatives. These would need to be addressed prior to the start of preliminary design of the power plant.

The estimated approval dates for the proposed power plants will be difficult to determine until a PG&E RFO is released. The next RFO release date is not known but is projected to occur sometime in 2010. Based on the schedule provided in Figure 5-3 and assuming that the power plant started preliminary design in the first quarter of 2010, the power plants would be approved in 2012 and the recommended alternatives would commence delivery of recycled water in 2015.

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Appendix A - Hydraulic Model Spreadsheets

East County Industrial Reuse Project
User Information

System Area	Type of Use	Retailer	Customer Name	Site Location	End User	Demand AF/Y	Customer Subtotal	User Assurance	Comments
1	2	3	4	5	6	7	8	9	10
Alternative A1									
Ph 1	I1	DDSD	New Antioch Power Plant	Wilbur Avenue and Fleming Way	Y	3,080.0	3,080.0	Y	
Alternative A2									
Ph 1	I1	ISD	New Antioch Power Plant	Wilbur Avenue and Fleming Way	Y	2,020.0	2,020.0	Y	
Alternative A3									
Ph 1	I1	DDSD	New Antioch Power Plant	Wilbur Avenue and Fleming Way	Y	2,530.0	2,530.0	Y	
Ph 1	I1	ISD	New Antioch Power Plant	Wilbur Avenue and Fleming Way	Y	1,970.0	1,970.0	Y	
				Total:		4,500.0	4,500.0		
Alternative A4									
Ph 1	I1	DDSD	New Antioch Power Plant	Wilbur Avenue and Fleming Way	Y	1,350.0	1,350.0	Y	
Alternative P1									
Ph 1	I1	DDSD	New Pittsburg Power Plant	West 10th Street & Beacon Street	Y	3,080.0	3,080.0	Y	
Alternative P2									
Ph 1	I1	CCCSD	New Pittsburg Power Plant	West 10th Street & Beacon Street	Y	4,480.0	4,480.0	Y	
Alternative P3									
Ph 1	I1	DDSD	New Pittsburg Power Plant	West 10th Street & Beacon Street	Y	2,080.0	2,080.0	Y	
Alternative X1									
Ph 1	I1	CCCSD	Shell Refinery	Solano Way & Monsanto Way	Y	4,480.0	4,480.0	--	
Alternative X2									
Ph 1	I1	CCCSD	Tesoro Refinery	Flare South Road & Howe Road	Y	4,480.0	4,480.0	--	

Table C: Codes for Water Retailers

DDSD	Delta Diable Sanitation District
ISD	Ironhouse Sanitation District
CCCSD	Central Contra Costa Sanitary District
Mirant	Mirant Corporation
PG&E	Pacific Gas and Electric Company

East County Industrial Reuse Project

CALCULATIONS OF HOURLY DEMAND FOR
AVERAGE DAY OF THE PEAK MONTH

Use Type	Annual Demand AF	Peaking Factor	Average Day, Peak Mo. AF	Average Day, Peak Mo. MG	Schedule START	Schedule END	Demand Hours	Hourly Demand GPM
1	2	3	4	5	6	7	8	9
Alternative A1								
Industrial Use (1) -all day	3,080	1.68	14.1764	4.61941	0000	2400	24	3,207.9
Alternative A2								
Industrial Use (1) -all day	2,020	1.68	9.2975	3.02961	0000	2400	24	2,103.9
Alternative A3								
Industrial Use (1) -all day	4,500	1.67	20.5890	6.70896	0000	2400	24	4,659.0
Alternative A4								
Industrial Use (1) -all day	1,350	1.67	6.1767	2.01269	0000	2400	24	1,397.7
Alternative P1								
Industrial Use (1) -all day	3,080	1.68	14.1764	4.61941	0000	2400	24	3,207.9
Alternative P2								
Industrial Use (1) -all day	4,480	1.68	20.6203	6.71914	0000	2400	24	4,666.1
Alternative P3								
Industrial Use (1) -all day	2,080	1.67	9.5167	3.10103	0000	2400	24	2,153.5
Alternative X1								
Industrial Use (1) -all day	4,480	1.68	20.6203	6.71914	0000	2400	24	4,666.1
Alternative X2								
Industrial Use (1) -all day	4,480	1.68	20.6203	6.71914	0000	2400	24	4,666.1

Alternative A1

State Water Resources Control Board
Office of Water Recycling

East County Industrial Reuse Project
ANALYSIS OF TREATMENT AND STORAGE CAPACITIES FOR AVERAGE DAY OF PEAK MONTH

ASSUMPTIONS

Demand = Average day of peak month

Treatment/Pump capacity = 5.50 MGD = 3819 GPM

Storage = 0 gallons

PROJECT DEMAND

Table F: Design parameters/assumptions

Design Parameters		
variable	magnitude	units
S	0	gallons
V	5.50	mgd
Cur Q	5.500	mgd
Proj Q	5.500	mgd

V (gpm)	3,819	gpm

Table G: Treatment Plant flow supplied

Supply					
		Treatment Plant Flow			In-Plant Losses
Hr	Multiplying Factor	Current (a)		Projected (b)	
		MGD	GPM	GPM	GPM
1	2	3	4	5	6
1	1.000	5.50	3,819	3,819	0
2	1.000	5.50	3,819	3,819	0
3	1.000	5.50	3,819	3,819	0
4	1.000	5.50	3,819	3,819	0
5	1.000	5.50	3,819	3,819	0
6	1.000	5.50	3,819	3,819	0
7	1.000	5.50	3,819	3,819	0
8	1.000	5.50	3,819	3,819	0
9	1.000	5.50	3,819	3,819	0
10	1.000	5.50	3,819	3,819	0
11	1.000	5.50	3,819	3,819	0
12	1.000	5.50	3,819	3,819	0
13	1.000	5.50	3,819	3,819	0
14	1.000	5.50	3,819	3,819	0
15	1.000	5.50	3,819	3,819	0
16	1.000	5.50	3,819	3,819	0
17	1.000	5.50	3,819	3,819	0
18	1.000	5.50	3,819	3,819	0
19	1.000	5.50	3,819	3,819	0
20	1.000	5.50	3,819	3,819	0
21	1.000	5.50	3,819	3,819	0
22	1.000	5.50	3,819	3,819	0
23	1.000	5.50	3,819	3,819	0
24	1.000	5.50	3,819	3,819	0
Average		5.50	3,819	3,819	0

Table H: Treatment Plant flow demanded

Demand							
Hr	Landscape Irrig		Industrial Use		Agricultural Use	Total	Other
	(night)	(day)	(24 hrs)	(day)	(TBD)		GPM
1	2	3	4	5	6	7	8
1	0.0		3,207.9		0	3,207.9	0
2	0.0		3,207.9		(TBD)	3,207.9	0
3	0.0		3,207.9		(TBD)	3,207.9	0
4	0.0		3,207.9		(TBD)	3,207.9	0
5	0.0		3,207.9		(TBD)	3,207.9	0
6		0.0	3,207.9		(TBD)	3,207.9	0
7		0.0	3,207.9		(TBD)	3,207.9	0
8		0.0	3,207.9	0.0	(TBD)	3,207.9	0
9		0.0	3,207.9	0.0	(TBD)	3,207.9	0
10		0.0	3,207.9	0.0	(TBD)	3,207.9	0
11		0.0	3,207.9	0.0	(TBD)	3,207.9	0
12		0.0	3,207.9	0.0	(TBD)	3,207.9	0
13		0.0	3,207.9	0.0	(TBD)	3,207.9	0
14		0.0	3,207.9	0.0	(TBD)	3,207.9	0
15		0.0	3,207.9	0.0	(TBD)	3,207.9	0
16		0.0	3,207.9	0.0	(TBD)	3,207.9	0
17		0.0	3,207.9	0.0	(TBD)	3,207.9	0
18		0.0	3,207.9	0.0	(TBD)	3,207.9	0
19		0.0	3,207.9		(TBD)	3,207.9	0
20		0.0	3,207.9		(TBD)	3,207.9	0
21	0.0		3,207.9		(TBD)	3,207.9	0
22	0.0		3,207.9		(TBD)	3,207.9	0
23	0.0		3,207.9		(TBD)	3,207.9	0
24	0.0		3,207.9		(TBD)	3,207.9	0

Table I: Project flow master table

Hr	Supply						Demand			Operation			
	Treatment Plant Flow			In-Plant Losses	Available Flow		Project GPM	Other GPM	Total GPM	Pumping Gal	Storage Gal	Potable Gal	Remain. Storage Gallons
	Current (a)		Projected (b)		Treated	Pumped (c)							
	MGD	GPM	GPM	GPM	GPM	GPM	(d)	(e)		(f)			(g)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
2	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
3	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
4	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
5	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
6	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
7	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
8	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
9	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
10	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
11	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
12	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
13	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
14	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
15	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
16	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
17	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
18	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
19	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
20	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
21	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
22	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
23	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
24	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
	5.50	3,819	3,819	0	5,499,360	5,499,360	4,619,407	0	4,619,407	4,619,407	0	0	
	Average				Total, Gallons								

Alternative A1

Table J: Treatment plant operational supply and demand summary

Operational Flow			
Hr	Supply	Demand	Storage
	GPM	GPM	Gallons
1	2	3	4
1	3819	3,208	0
2	3819	3,208	0
3	3819	3,208	0
4	3819	3,208	0
5	3819	3,208	0
6	3819	3,208	0
7	3819	3,208	0
8	3819	3,208	0
9	3819	3,208	0
10	3819	3,208	0
11	3819	3,208	0
12	3819	3,208	0
13	3819	3,208	0
14	3819	3,208	0
15	3819	3,208	0
16	3819	3,208	0
17	3819	3,208	0
18	3819	3,208	0
19	3819	3,208	0
20	3819	3,208	0
21	3,819	3,208	0
22	3,819	3,208	0
23	3,819	3,208	0
24	3,819	3,208	0
1	3,819	3,208	0

Figure J-1: Hourly Supply and Demand

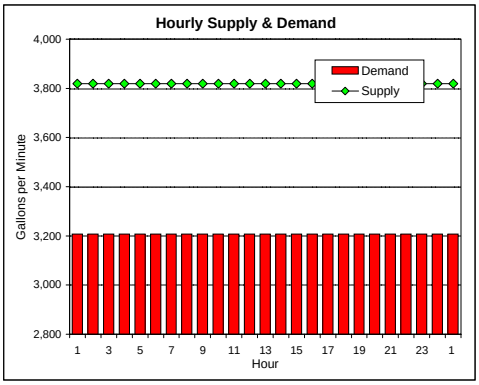

Figure J-2: Water Storage by hour (gallons)

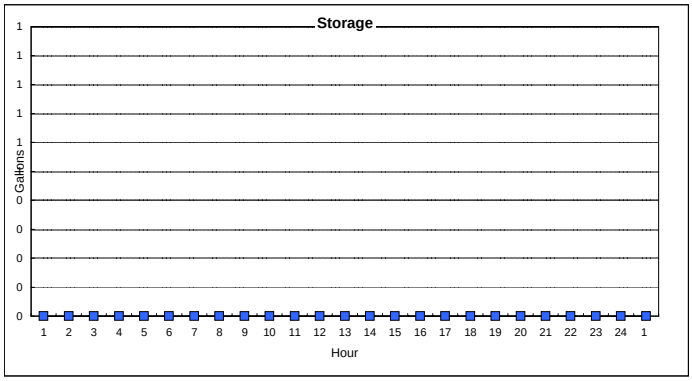

Table K: Project summary

SUMMARY			
Amount of storage used:		0	Gallons
Amount of potable used:		0	Gallons
Based on-			
Treatment capacity of:		5.50	MGD
Pumping capacity of:		3819	GPM
Supply/Demand Ratio of:		1.19	GPM

Remarks:

(a) DDSD current secondary flow is 14.0 MGD (2007).
DDSD current tertiary capacity is 12.8 MGD, surplus of 2.1 MGD (2007).

(b) Same as current flow

(c) Max. amount to be pumped, limited by either avail. flow or treatment/pumping capacity of

(d) Project industrial demand

(e) N/A

(f) Maximum amount to be treated and pumped, limited by tertiary/pumping capacity and demand

(g) Calculations based on starting with full storage at hour ##

10/15/08

Alternative A2

State Water Resources Control Board
Office of Water Recycling

East County Industrial Reuse Project
ANALYSIS OF TREATMENT AND STORAGE CAPACITIES FOR AVERAGE DAY OF PEAK MONTH

ASSUMPTIONS

Demand = Average day of peak month

Treatment/Pump capacity = 3.60 MGD = 2500 GPM

Storage = 0 gallons

PROJECT DEMAND

Table F: Design parameters/assumptions

Design Parameters		
variable	magnitude	units
S	0	gallons
V	3.60	mgd
Cur Q	3.600	mgd
Proj Q	3.600	mgd

V (gpm)	2,500	gpm

Table G: Treatment Plant flow supplied

Supply					
		Treatment Plant Flow			In-Plant Losses
Hr	Multiplying Factor	Current (a)		Projected (b)	
		MGD	GPM	GPM	GPM
1	2	3	4	5	6
1	1.000	3.60	2,500	2,500	0
2	1.000	3.60	2,500	2,500	0
3	1.000	3.60	2,500	2,500	0
4	1.000	3.60	2,500	2,500	0
5	1.000	3.60	2,500	2,500	0
6	1.000	3.60	2,500	2,500	0
7	1.000	3.60	2,500	2,500	0
8	1.000	3.60	2,500	2,500	0
9	1.000	3.60	2,500	2,500	0
10	1.000	3.60	2,500	2,500	0
11	1.000	3.60	2,500	2,500	0
12	1.000	3.60	2,500	2,500	0
13	1.000	3.60	2,500	2,500	0
14	1.000	3.60	2,500	2,500	0
15	1.000	3.60	2,500	2,500	0
16	1.000	3.60	2,500	2,500	0
17	1.000	3.60	2,500	2,500	0
18	1.000	3.60	2,500	2,500	0
19	1.000	3.60	2,500	2,500	0
20	1.000	3.60	2,500	2,500	0
21	1.000	3.60	2,500	2,500	0
22	1.000	3.60	2,500	2,500	0
23	1.000	3.60	2,500	2,500	0
24	1.000	3.60	2,500	2,500	0
Average		3.60	2,500	2,500	0

Table H: Treatment Plant flow demanded

Demand							
Hr	Landscape Irrig		Industrial Use		Agricultural Use	Total	Other
	(night)	(day)	(24 hrs)	(day)	(TBD)		GPM
1	2	3	4	5	6	7	8
1	0.0		2,103.9		0	2,103.9	0
2	0.0		2,103.9		(TBD)	2,103.9	0
3	0.0		2,103.9		(TBD)	2,103.9	0
4	0.0		2,103.9		(TBD)	2,103.9	0
5	0.0		2,103.9		(TBD)	2,103.9	0
6		0.0	2,103.9		(TBD)	2,103.9	0
7		0.0	2,103.9		(TBD)	2,103.9	0
8		0.0	2,103.9	0.0	(TBD)	2,103.9	0
9		0.0	2,103.9	0.0	(TBD)	2,103.9	0
10		0.0	2,103.9	0.0	(TBD)	2,103.9	0
11		0.0	2,103.9	0.0	(TBD)	2,103.9	0
12		0.0	2,103.9	0.0	(TBD)	2,103.9	0
13		0.0	2,103.9	0.0	(TBD)	2,103.9	0
14		0.0	2,103.9	0.0	(TBD)	2,103.9	0
15		0.0	2,103.9	0.0	(TBD)	2,103.9	0
16		0.0	2,103.9	0.0	(TBD)	2,103.9	0
17		0.0	2,103.9	0.0	(TBD)	2,103.9	0
18		0.0	2,103.9	0.0	(TBD)	2,103.9	0
19		0.0	2,103.9		(TBD)	2,103.9	0
20		0.0	2,103.9		(TBD)	2,103.9	0
21	0.0		2,103.9		(TBD)	2,103.9	0
22	0.0		2,103.9		(TBD)	2,103.9	0
23	0.0		2,103.9		(TBD)	2,103.9	0
24	0.0		2,103.9		(TBD)	2,103.9	0

Table I: Project flow master table

Hr	Supply						Demand			Operation			
	Treatment Plant Flow			In-Plant Losses	Available Flow		Project	Other	Total	Pumping	Storage	Potable	Remain. Storage
	Current (a)		Projected (b)		Treated	Pumped (c)	GPM	GPM	GPM	Gal	Gal	Gal	Gallons
	MGD	GPM	GPM	GPM	GPM	GPM	(d)	(e)		(f)			(g)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
2	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
3	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
4	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
5	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
6	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
7	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
8	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
9	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
10	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
11	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
12	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
13	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
14	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
15	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
16	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
17	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
18	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
19	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
20	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
21	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
22	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
23	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
24	3.60	2,500	2,500	0	2,500	2,500	2,104	0	2,104	126,234	0	0	0
	3.60	2,500	2,500	0	3,600,000	3,600,000	3,029,611	0	3,029,611	3,029,611	0	0	
	Average				Total, Gallons								

Alternative A2

Table J: Treatment plant operational supply and demand summary

Operational Flow			
Hr	Supply	Demand	Storage
	GPM	GPM	Gallons
1	2	3	4
1	2500	2,104	0
2	2500	2,104	0
3	2500	2,104	0
4	2500	2,104	0
5	2500	2,104	0
6	2500	2,104	0
7	2500	2,104	0
8	2500	2,104	0
9	2500	2,104	0
10	2500	2,104	0
11	2500	2,104	0
12	2500	2,104	0
13	2500	2,104	0
14	2500	2,104	0
15	2500	2,104	0
16	2500	2,104	0
17	2500	2,104	0
18	2500	2,104	0
19	2500	2,104	0
20	2500	2,104	0
21	2,500	2,104	0
22	2,500	2,104	0
23	2,500	2,104	0
24	2,500	2,104	0
1	2,500	2,104	0

Figure J-1: Hourly Supply and Demand

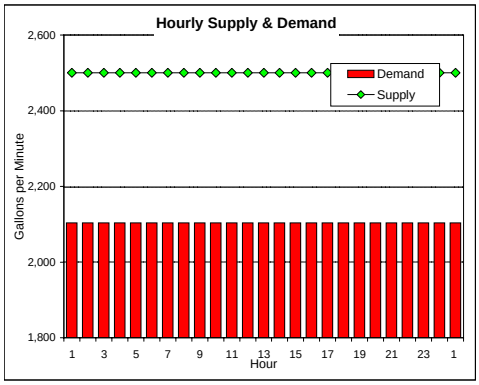

Figure J-2: Water Storage by hour (gallons)

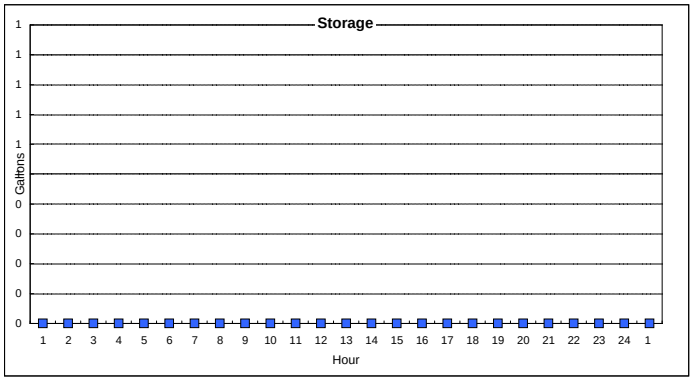

Table K: Project summary

SUMMARY			
Amount of storage used:		0	Gallons
Amount of potable used:		0	Gallons
Based on-			
Treatment capacity of:		3.60	MGD
Pumping capacity of:		2500	GPM
Supply/Demand Ratio of:		1.19	GPM

Remarks:

(a) ISD current secondary flow estimated at 2.6 MGD (2007).
(b) Same as current flow
(c) Max. amount to be pumped, limited by either avail. flow or treatment/pumping capacity of
(d) Project industrial demand
(e) N/A
(f) Maximum amount to be treated and pumped, limited by tertiary/pumping capacity and demand
(g) Calculations based on starting with full storage at hour ##

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Alternative A3

State Water Resources Control Board
Office of Water Recycling

East County Industrial Reuse Project
ANALYSIS OF TREATMENT AND STORAGE CAPACITIES FOR AVERAGE DAY OF PEAK MONTH

ASSUMPTIONS
Demand = Average day of peak month
Treatment/Pump capacity = 8.00 MGD = 5556 GPM
Storage = 0 gallons

PROJECT DEMAND

Table F: Design parameters/assumptions

Design Parameters		
variable	magnitude	units
S	0	gallons
V	8.00	mgd
Cur Q	8.000	mgd
Proj Q	8.000	mgd

V (gpm)	5,556	gpm

Table G: Treatment Plant flow supplied

Supply					
		Treatment Plant Flow			In-Plant Losses
Hr	Multiplying Factor	Current (a)		Projected (b)	
		MGD	GPM	GPM	GPM
1	2	3	4	5	6
1	1.000	8.00	5,556	5,556	0
2	1.000	8.00	5,556	5,556	0
3	1.000	8.00	5,556	5,556	0
4	1.000	8.00	5,556	5,556	0
5	1.000	8.00	5,556	5,556	0
6	1.000	8.00	5,556	5,556	0
7	1.000	8.00	5,556	5,556	0
8	1.000	8.00	5,556	5,556	0
9	1.000	8.00	5,556	5,556	0
10	1.000	8.00	5,556	5,556	0
11	1.000	8.00	5,556	5,556	0
12	1.000	8.00	5,556	5,556	0
13	1.000	8.00	5,556	5,556	0
14	1.000	8.00	5,556	5,556	0
15	1.000	8.00	5,556	5,556	0
16	1.000	8.00	5,556	5,556	0
17	1.000	8.00	5,556	5,556	0
18	1.000	8.00	5,556	5,556	0
19	1.000	8.00	5,556	5,556	0
20	1.000	8.00	5,556	5,556	0
21	1.000	8.00	5,556	5,556	0
22	1.000	8.00	5,556	5,556	0
23	1.000	8.00	5,556	5,556	0
24	1.000	8.00	5,556	5,556	0
Average		8.00	5,556	5,556	0

Table H: Treatment Plant flow demanded

Demand							
Hr	Landscape Irrig		Industrial Use		Agricultural Use	Total	Other
	(night)	(day)	(24 hrs)	(day)	(TBD)		GPM
1	2	3	4	5	6	7	8
1	0.0		4,659.0		0	4,659.0	0
2	0.0		4,659.0		(TBD)	4,659.0	0
3	0.0		4,659.0		(TBD)	4,659.0	0
4	0.0		4,659.0		(TBD)	4,659.0	0
5	0.0		4,659.0		(TBD)	4,659.0	0
6		0.0	4,659.0		(TBD)	4,659.0	0
7		0.0	4,659.0		(TBD)	4,659.0	0
8		0.0	4,659.0	0.0	(TBD)	4,659.0	0
9		0.0	4,659.0	0.0	(TBD)	4,659.0	0
10		0.0	4,659.0	0.0	(TBD)	4,659.0	0
11		0.0	4,659.0	0.0	(TBD)	4,659.0	0
12		0.0	4,659.0	0.0	(TBD)	4,659.0	0
13		0.0	4,659.0	0.0	(TBD)	4,659.0	0
14		0.0	4,659.0	0.0	(TBD)	4,659.0	0
15		0.0	4,659.0	0.0	(TBD)	4,659.0	0
16		0.0	4,659.0	0.0	(TBD)	4,659.0	0
17		0.0	4,659.0	0.0	(TBD)	4,659.0	0
18		0.0	4,659.0	0.0	(TBD)	4,659.0	0
19		0.0	4,659.0		(TBD)	4,659.0	0
20		0.0	4,659.0		(TBD)	4,659.0	0
21	0.0		4,659.0		(TBD)	4,659.0	0
22	0.0		4,659.0		(TBD)	4,659.0	0
23	0.0		4,659.0		(TBD)	4,659.0	0
24	0.0		4,659.0		(TBD)	4,659.0	0

Table I: Project flow master table

Hr	Supply						Demand			Operation			
	Treatment Plant Flow			In-Plant Losses	Available Flow		Project	Other	Total	Pumping	Storage	Potable	Remain. Storage
	Current (a)		Projected (b)		Treated	Pumped (c)	GPM	GPM	GPM	Gal	Gal	Gal	Gallons
	MGD	GPM	GPM	GPM	GPM	GPM	(d)	(e)		(f)			(g)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
2	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
3	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
4	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
5	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
6	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
7	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
8	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
9	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
10	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
11	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
12	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
13	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
14	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
15	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
16	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
17	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
18	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
19	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
20	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
21	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
22	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
23	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
24	8.00	5,556	5,556	0	5,556	5,556	4,659	0	4,659	279,540	0	0	0
	8.00	5,556	5,556	0	8,000,640	8,000,640	6,708,960	0	6,708,960	6,708,960	0	0	
	Average				Total, Gallons								

Alternative A3

Table J: Treatment plant operational supply and demand summary

Operational Flow			
Hr	Supply	Demand	Storage
	GPM	GPM	Gallons
1	2	3	4
1	5556	4,659	0
2	5556	4,659	0
3	5556	4,659	0
4	5556	4,659	0
5	5556	4,659	0
6	5556	4,659	0
7	5556	4,659	0
8	5556	4,659	0
9	5556	4,659	0
10	5556	4,659	0
11	5556	4,659	0
12	5556	4,659	0
13	5556	4,659	0
14	5556	4,659	0
15	5556	4,659	0
16	5556	4,659	0
17	5556	4,659	0
18	5556	4,659	0
19	5556	4,659	0
20	5556	4,659	0
21	5,556	4,659	0
22	5,556	4,659	0
23	5,556	4,659	0
24	5,556	4,659	0
1	5,556	4,659	0

Figure J-1: Hourly Supply and Demand

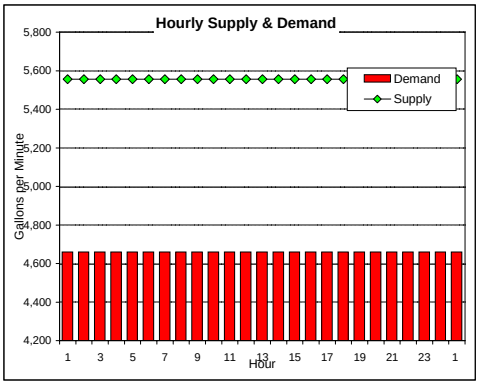

Figure J-2: Water Storage by hour (gallons)

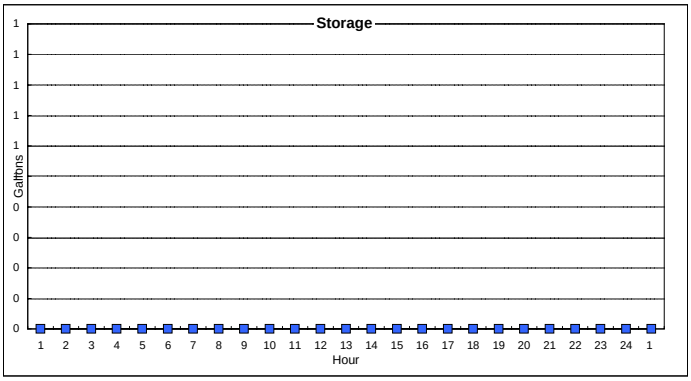

Table K: Project summary

SUMMARY			
Amount of storage used:		0	Gallons
Amount of potable used:		0	Gallons
Based on-			
Treatment capacity of:		8.00	MGD
Pumping capacity of:		5556	GPM
Supply/Demand Ratio of:		1.19	GPM

Remarks:

(a) DDSD current secondary flow is 14.0 MGD (2007).
DDSD current tertiary capacity is 12.8 MGD, surplus of 2.1 MGD (2007).
ISD current secondary flow is 2.6 MGD (2007).

(b) Same as current flow

(c) Max. amount to be pumped, limited by either avail. flow or treatment/pumping capacity of

(d) Project industrial demand

(e) N/A

(f) Maximum amount to be treated and pumped, limited by tertiary/pumping capacity and demand

(g) Calculations based on starting with full storage at hour ##

10/15/08

Alternative A4

State Water Resources Control Board
Office of Water Recycling

East County Industrial Reuse Project
ANALYSIS OF TREATMENT AND STORAGE CAPACITIES FOR AVERAGE DAY OF PEAK MONTH

ASSUMPTIONS
Demand = Average day of peak month
Treatment/Pump capacity = 2.40 MGD = 1667 GPM
Storage = 0 gallons

PROJECT DEMAND

Table F: Design parameters/assumptions

Design Parameters		
variable	magnitude	units
S	0	gallons
V	2.40	mgd
Cur Q	2.400	mgd
Proj Q	2.400	mgd

V (gpm)	1,667	gpm

Table G: Treatment Plant flow supplied

Supply					
		Treatment Plant Flow			In-Plant Losses
Hr	Multiplying Factor	Current (a)		Projected (b)	
		MGD	GPM	GPM	GPM
1	2	3	4	5	6
1	1.000	2.40	1,667	1,667	0
2	1.000	2.40	1,667	1,667	0
3	1.000	2.40	1,667	1,667	0
4	1.000	2.40	1,667	1,667	0
5	1.000	2.40	1,667	1,667	0
6	1.000	2.40	1,667	1,667	0
7	1.000	2.40	1,667	1,667	0
8	1.000	2.40	1,667	1,667	0
9	1.000	2.40	1,667	1,667	0
10	1.000	2.40	1,667	1,667	0
11	1.000	2.40	1,667	1,667	0
12	1.000	2.40	1,667	1,667	0
13	1.000	2.40	1,667	1,667	0
14	1.000	2.40	1,667	1,667	0
15	1.000	2.40	1,667	1,667	0
16	1.000	2.40	1,667	1,667	0
17	1.000	2.40	1,667	1,667	0
18	1.000	2.40	1,667	1,667	0
19	1.000	2.40	1,667	1,667	0
20	1.000	2.40	1,667	1,667	0
21	1.000	2.40	1,667	1,667	0
22	1.000	2.40	1,667	1,667	0
23	1.000	2.40	1,667	1,667	0
24	1.000	2.40	1,667	1,667	0
Average		2.40	1,667	1,667	0

Table H: Treatment Plant flow demanded

Demand							
Hr	Landscape Irrig		Industrial Use		Agricultural Use	Total	Other
	(night)	(day)	(24 hrs)	(day)	(TBD)		GPM
1	2	3	4	5	6	7	8
1	0.0		1,397.7		0	1,397.7	0
2	0.0		1,397.7		(TBD)	1,397.7	0
3	0.0		1,397.7		(TBD)	1,397.7	0
4	0.0		1,397.7		(TBD)	1,397.7	0
5	0.0		1,397.7		(TBD)	1,397.7	0
6		0.0	1,397.7		(TBD)	1,397.7	0
7		0.0	1,397.7		(TBD)	1,397.7	0
8		0.0	1,397.7	0.0	(TBD)	1,397.7	0
9		0.0	1,397.7	0.0	(TBD)	1,397.7	0
10		0.0	1,397.7	0.0	(TBD)	1,397.7	0
11		0.0	1,397.7	0.0	(TBD)	1,397.7	0
12		0.0	1,397.7	0.0	(TBD)	1,397.7	0
13		0.0	1,397.7	0.0	(TBD)	1,397.7	0
14		0.0	1,397.7	0.0	(TBD)	1,397.7	0
15		0.0	1,397.7	0.0	(TBD)	1,397.7	0
16		0.0	1,397.7	0.0	(TBD)	1,397.7	0
17		0.0	1,397.7	0.0	(TBD)	1,397.7	0
18		0.0	1,397.7	0.0	(TBD)	1,397.7	0
19		0.0	1,397.7		(TBD)	1,397.7	0
20		0.0	1,397.7		(TBD)	1,397.7	0
21	0.0		1,397.7		(TBD)	1,397.7	0
22	0.0		1,397.7		(TBD)	1,397.7	0
23	0.0		1,397.7		(TBD)	1,397.7	0
24	0.0		1,397.7		(TBD)	1,397.7	0

Table I: Project flow master table

Hr	Supply						Demand			Operation			
	Treatment Plant Flow			In-Plant Losses	Available Flow		Project	Other	Total	Pumping	Storage	Potable	Remain. Storage
	Current (a)		Projected (b)		Treated	Pumped (c)	GPM	GPM	GPM	Gal	Gal	Gal	Gallons
	MGD	GPM	GPM	GPM	GPM	GPM	(d)	(e)		(f)			(g)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
2	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
3	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
4	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
5	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
6	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
7	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
8	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
9	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
10	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
11	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
12	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
13	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
14	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
15	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
16	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
17	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
18	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
19	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
20	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
21	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
22	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
23	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
24	2.40	1,667	1,667	0	1,667	1,667	1,398	0	1,398	83,862	0	0	0
	2.40	1,667	1,667	0	2,400,480	2,400,480	2,012,688	0	2,012,688	2,012,688	0	0	
	Average				Total, Gallons								

Alternative A4

Table J: Treatment plant operational supply and demand summary

Operational Flow			
Hr	Supply	Demand	Storage
	GPM	GPM	Gallons
1	2	3	4
1	1667	1,398	0
2	1667	1,398	0
3	1667	1,398	0
4	1667	1,398	0
5	1667	1,398	0
6	1667	1,398	0
7	1667	1,398	0
8	1667	1,398	0
9	1667	1,398	0
10	1667	1,398	0
11	1667	1,398	0
12	1667	1,398	0
13	1667	1,398	0
14	1667	1,398	0
15	1667	1,398	0
16	1667	1,398	0
17	1667	1,398	0
18	1667	1,398	0
19	1667	1,398	0
20	1667	1,398	0
21	1,667	1,398	0
22	1,667	1,398	0
23	1,667	1,398	0
24	1,667	1,398	0
1	1,667	1,398	0

Figure J-1: Hourly Supply and Demand

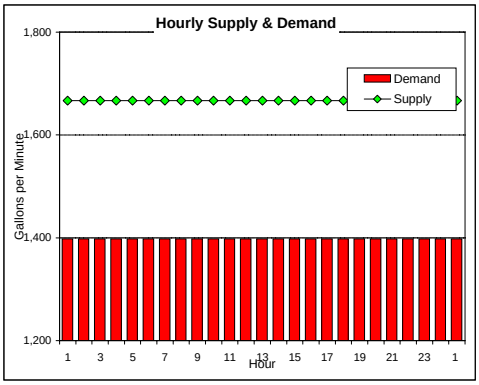

Figure J-2: Water Storage by hour (gallons)

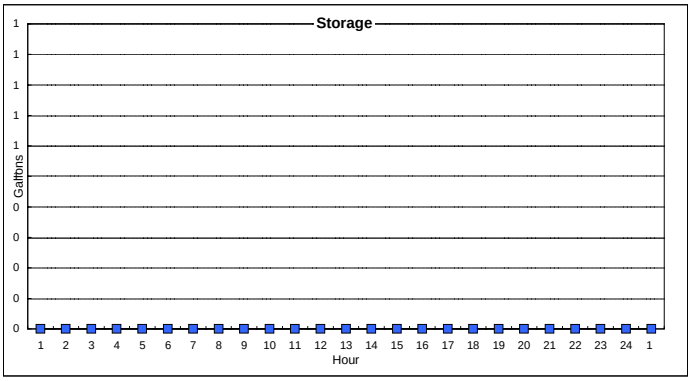

Table K: Project summary

SUMMARY			
Amount of storage used:		0	Gallons
Amount of potable used:		0	Gallons
Based on-			
Treatment capacity of:		2.40	MGD
Pumping capacity of:		1667	GPM
Supply/Demand Ratio of:		1.19	GPM

Remarks:

(a) Bridgehead Pump Station current raw flow is 2.1 MGD (2007).
(b) Same as current flow
(c) Max. amount to be pumped, limited by either avail. flow or treatment/pumping capacity of
(d) Project industrial demand
(e) N/A
(f) Maximum amount to be treated and pumped, limited by tertiary/pumping capacity and demand
(g) Calculations based on starting with full storage at hour ##

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Alternative P1

State Water Resources Control Board
Office of Water Recycling

East County Industrial Reuse Project
ANALYSIS OF TREATMENT AND STORAGE CAPACITIES FOR AVERAGE DAY OF PEAK MONTH

ASSUMPTIONS
Demand = Average day of peak month
Treatment/Pump capacity = 5.50 MGD = 3819 GPM
Storage = 0 gallons

PROJECT DEMAND

Table F: Design parameters/assumptions

Design Parameters		
variable	magnitude	units
S	0	gallons
V	5.50	mgd
Cur Q	5.500	mgd
Proj Q	5.500	mgd

V (gpm)	3,819	gpm

Table G: Treatment Plant flow supplied

Supply					
		Treatment Plant Flow			In-Plant Losses
Hr	Multiplying Factor	Current (a)		Projected (b)	
		MGD	GPM	GPM	GPM
1	2	3	4	5	6
1	1.000	5.50	3,819	3,819	0
2	1.000	5.50	3,819	3,819	0
3	1.000	5.50	3,819	3,819	0
4	1.000	5.50	3,819	3,819	0
5	1.000	5.50	3,819	3,819	0
6	1.000	5.50	3,819	3,819	0
7	1.000	5.50	3,819	3,819	0
8	1.000	5.50	3,819	3,819	0
9	1.000	5.50	3,819	3,819	0
10	1.000	5.50	3,819	3,819	0
11	1.000	5.50	3,819	3,819	0
12	1.000	5.50	3,819	3,819	0
13	1.000	5.50	3,819	3,819	0
14	1.000	5.50	3,819	3,819	0
15	1.000	5.50	3,819	3,819	0
16	1.000	5.50	3,819	3,819	0
17	1.000	5.50	3,819	3,819	0
18	1.000	5.50	3,819	3,819	0
19	1.000	5.50	3,819	3,819	0
20	1.000	5.50	3,819	3,819	0
21	1.000	5.50	3,819	3,819	0
22	1.000	5.50	3,819	3,819	0
23	1.000	5.50	3,819	3,819	0
24	1.000	5.50	3,819	3,819	0
Average		5.50	3,819	3,819	0

Table H: Treatment Plant flow demanded

Demand							
Hr	Landscape Irrig		Industrial Use		Agricultural Use	Total	Other
	(night)	(day)	(24 hrs)	(day)	(TBD)		GPM
1	2	3	4	5	6	7	8
1	0.0		3,207.9		0	3,207.9	0
2	0.0		3,207.9		(TBD)	3,207.9	0
3	0.0		3,207.9		(TBD)	3,207.9	0
4	0.0		3,207.9		(TBD)	3,207.9	0
5	0.0		3,207.9		(TBD)	3,207.9	0
6		0.0	3,207.9		(TBD)	3,207.9	0
7		0.0	3,207.9		(TBD)	3,207.9	0
8		0.0	3,207.9	0.0	(TBD)	3,207.9	0
9		0.0	3,207.9	0.0	(TBD)	3,207.9	0
10		0.0	3,207.9	0.0	(TBD)	3,207.9	0
11		0.0	3,207.9	0.0	(TBD)	3,207.9	0
12		0.0	3,207.9	0.0	(TBD)	3,207.9	0
13		0.0	3,207.9	0.0	(TBD)	3,207.9	0
14		0.0	3,207.9	0.0	(TBD)	3,207.9	0
15		0.0	3,207.9	0.0	(TBD)	3,207.9	0
16		0.0	3,207.9	0.0	(TBD)	3,207.9	0
17		0.0	3,207.9	0.0	(TBD)	3,207.9	0
18		0.0	3,207.9	0.0	(TBD)	3,207.9	0
19		0.0	3,207.9		(TBD)	3,207.9	0
20		0.0	3,207.9		(TBD)	3,207.9	0
21	0.0		3,207.9		(TBD)	3,207.9	0
22	0.0		3,207.9		(TBD)	3,207.9	0
23	0.0		3,207.9		(TBD)	3,207.9	0
24	0.0		3,207.9		(TBD)	3,207.9	0

Table I: Project flow master table

Hr	Supply						Demand			Operation			
	Treatment Plant Flow			In-Plant Losses	Available Flow		Project	Other	Total	Pumping	Storage	Potable	Remain. Storage
	Current (a)		Projected (b)		Treated	Pumped (c)	GPM	GPM	GPM	Gal	Gal	Gal	Gallons
	MGD	GPM	GPM	GPM	GPM	GPM	(d)	(e)		(f)			(g)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
2	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
3	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
4	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
5	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
6	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
7	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
8	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
9	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
10	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
11	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
12	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
13	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
14	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
15	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
16	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
17	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
18	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
19	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
20	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
21	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
22	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
23	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
24	5.50	3,819	3,819	0	3,819	3,819	3,208	0	3,208	192,475	0	0	0
	5.50	3,819	3,819	0	5,499,360	5,499,360	4,619,407	0	4,619,407	4,619,407	0	0	
	Average				Total, Gallons								

Alternative P1

Table J: Treatment plant operational supply and demand summary

Operational Flow			
Hr	Supply	Demand	Storage
	GPM	GPM	Gallons
1	2	3	4
1	3819	3,208	0
2	3819	3,208	0
3	3819	3,208	0
4	3819	3,208	0
5	3819	3,208	0
6	3819	3,208	0
7	3819	3,208	0
8	3819	3,208	0
9	3819	3,208	0
10	3819	3,208	0
11	3819	3,208	0
12	3819	3,208	0
13	3819	3,208	0
14	3819	3,208	0
15	3819	3,208	0
16	3819	3,208	0
17	3819	3,208	0
18	3819	3,208	0
19	3819	3,208	0
20	3819	3,208	0
21	3,819	3,208	0
22	3,819	3,208	0
23	3,819	3,208	0
24	3,819	3,208	0
1	3,819	3,208	0

Figure J-1: Hourly Supply and Demand

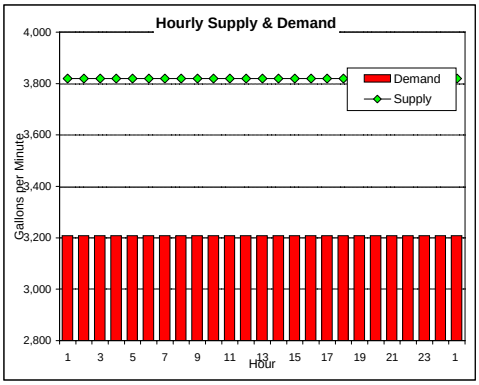


Figure J-2: Water Storage by hour (gallons)

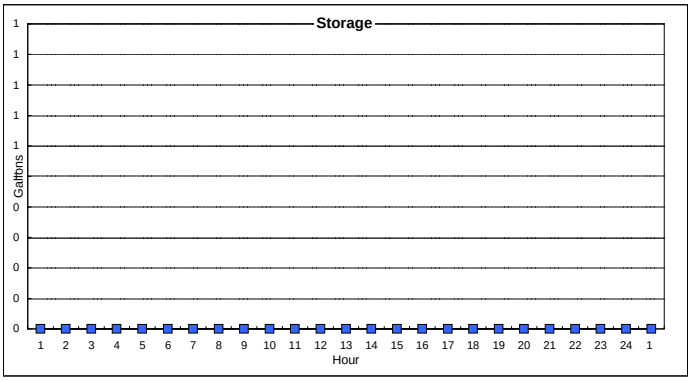


Table K: Project summary

SUMMARY			
Amount of storage used:		0	Gallons
Amount of potable used:		0	Gallons
Based on-			
Treatment capacity of:		5.50	MGD
Pumping capacity of:		3819	GPM
Supply/Demand Ratio of:		1.19	GPM

Remarks:

(a) DDSD current secondary flow is 14.0 MGD (2007).
DDSD current tertiary capacity is 12.8 MGD, surplus of 2.1 MGD (2007).

(b) Same as current flow

(c) Max. amount to be pumped, limited by either avail. flow or treatment/pumping capacity of

(d) Project industrial demand

(e) N/A

(f) Maximum amount to be treated and pumped, limited by tertiary/pumping capacity and demand

(g) Calculations based on starting with full storage at hour ##

10/15/08

Alternative P2

State Water Resources Control Board
Office of Water Recycling

East County Industrial Reuse Project
ANALYSIS OF TREATMENT AND STORAGE CAPACITIES FOR AVERAGE DAY OF PEAK MONTH

ASSUMPTIONS
Demand = Average day of peak month
Treatment/Pump capacity = 8.00 MGD = 5556 GPM
Storage = 0 gallons

PROJECT DEMAND

Table F: Design parameters/assumptions

Design Parameters		
variable	magnitude	units
S	0	gallons
V	8.00	mgd
Cur Q	8.000	mgd
Proj Q	8.000	mgd

V (gpm)	5,556	gpm

Table G: Treatment Plant flow supplied

Supply					
		Treatment Plant Flow			In-Plant Losses
Hr	Multiplying Factor	Current (a)		Projected (b)	
		MGD	GPM	GPM	GPM
1	2	3	4	5	6
1	1.000	8.00	5,556	5,556	0
2	1.000	8.00	5,556	5,556	0
3	1.000	8.00	5,556	5,556	0
4	1.000	8.00	5,556	5,556	0
5	1.000	8.00	5,556	5,556	0
6	1.000	8.00	5,556	5,556	0
7	1.000	8.00	5,556	5,556	0
8	1.000	8.00	5,556	5,556	0
9	1.000	8.00	5,556	5,556	0
10	1.000	8.00	5,556	5,556	0
11	1.000	8.00	5,556	5,556	0
12	1.000	8.00	5,556	5,556	0
13	1.000	8.00	5,556	5,556	0
14	1.000	8.00	5,556	5,556	0
15	1.000	8.00	5,556	5,556	0
16	1.000	8.00	5,556	5,556	0
17	1.000	8.00	5,556	5,556	0
18	1.000	8.00	5,556	5,556	0
19	1.000	8.00	5,556	5,556	0
20	1.000	8.00	5,556	5,556	0
21	1.000	8.00	5,556	5,556	0
22	1.000	8.00	5,556	5,556	0
23	1.000	8.00	5,556	5,556	0
24	1.000	8.00	5,556	5,556	0
Average		8.00	5,556	5,556	0

Table H: Treatment Plant flow demanded

Demand							
Hr	Landscape Irrig		Industrial Use		Agricultural Use	Total	Other
	(night)	(day)	(24 hrs)	(day)	(TBD)		GPM
1	2	3	4	5	6	7	8
1	0.0		4,666.1		0	4,666.1	0
2	0.0		4,666.1		(TBD)	4,666.1	0
3	0.0		4,666.1		(TBD)	4,666.1	0
4	0.0		4,666.1		(TBD)	4,666.1	0
5	0.0		4,666.1		(TBD)	4,666.1	0
6		0.0	4,666.1		(TBD)	4,666.1	0
7		0.0	4,666.1		(TBD)	4,666.1	0
8		0.0	4,666.1	0.0	(TBD)	4,666.1	0
9		0.0	4,666.1	0.0	(TBD)	4,666.1	0
10		0.0	4,666.1	0.0	(TBD)	4,666.1	0
11		0.0	4,666.1	0.0	(TBD)	4,666.1	0
12		0.0	4,666.1	0.0	(TBD)	4,666.1	0
13		0.0	4,666.1	0.0	(TBD)	4,666.1	0
14		0.0	4,666.1	0.0	(TBD)	4,666.1	0
15		0.0	4,666.1	0.0	(TBD)	4,666.1	0
16		0.0	4,666.1	0.0	(TBD)	4,666.1	0
17		0.0	4,666.1	0.0	(TBD)	4,666.1	0
18		0.0	4,666.1	0.0	(TBD)	4,666.1	0
19		0.0	4,666.1		(TBD)	4,666.1	0
20		0.0	4,666.1		(TBD)	4,666.1	0
21	0.0		4,666.1		(TBD)	4,666.1	0
22	0.0		4,666.1		(TBD)	4,666.1	0
23	0.0		4,666.1		(TBD)	4,666.1	0
24	0.0		4,666.1		(TBD)	4,666.1	0

Table I: Project flow master table

Hr	Supply						Demand			Operation			
	Treatment Plant Flow			In-Plant Losses	Available Flow		Project	Other	Total	Pumping	Storage	Potable	Remain. Storage
	Current (a)		Projected (b)		Treated	Pumped (c)	GPM	GPM	GPM	Gal	Gal	Gal	Gallons
	MGD	GPM	GPM	GPM	GPM	GPM	(d)	(e)		(f)			(g)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
2	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
3	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
4	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
5	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
6	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
7	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
8	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
9	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
10	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
11	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
12	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
13	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
14	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
15	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
16	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
17	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
18	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
19	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
20	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
21	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
22	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
23	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
24	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
	8.00	5,556	5,556	0	8,000,640	8,000,640	6,719,137	0	6,719,137	6,719,137	0	0	
	Average				Total, Gallons								

Alternative P2

Table J: Treatment plant operational supply and demand summary

Operational Flow			
Hr	Supply	Demand	Storage
	GPM	GPM	Gallons
1	2	3	4
1	5556	4,666	0
2	5556	4,666	0
3	5556	4,666	0
4	5556	4,666	0
5	5556	4,666	0
6	5556	4,666	0
7	5556	4,666	0
8	5556	4,666	0
9	5556	4,666	0
10	5556	4,666	0
11	5556	4,666	0
12	5556	4,666	0
13	5556	4,666	0
14	5556	4,666	0
15	5556	4,666	0
16	5556	4,666	0
17	5556	4,666	0
18	5556	4,666	0
19	5556	4,666	0
20	5556	4,666	0
21	5,556	4,666	0
22	5,556	4,666	0
23	5,556	4,666	0
24	5,556	4,666	0
1	5,556	4,666	0

Figure J-1: Hourly Supply and Demand

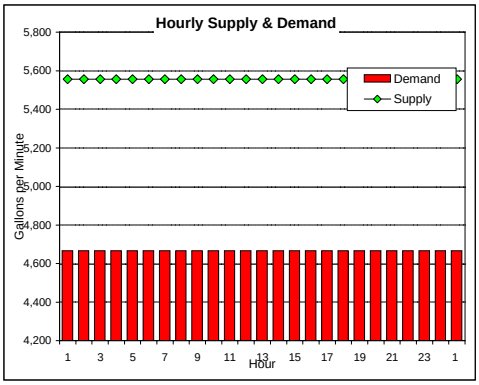


Figure J-2: Water Storage by hour (gallons)

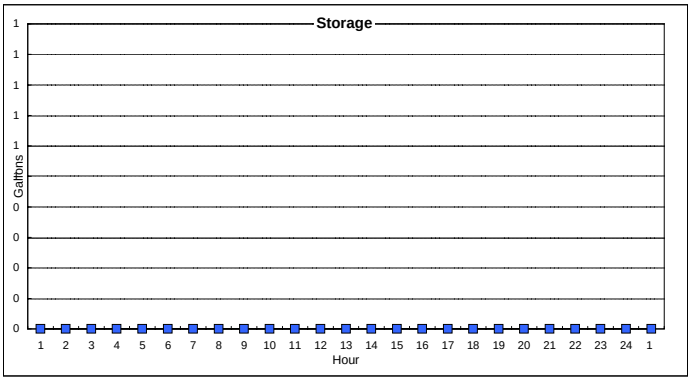


Table K: Project summary

SUMMARY			
Amount of storage used:		0	Gallons
Amount of potable used:		0	Gallons
Based on-			
Treatment capacity of:		8.00	MGD
Pumping capacity of:		5556	GPM
Supply/Demand Ratio of:		1.19	GPM

Remarks:

(a) CCCSD current secondary flow is 41.1 MGD (2007).
CCCSD current tertiary capacity is 3.8 MGD (2007).

(b) Same as current flow

(c) Max. amount to be pumped, limited by either available flow or treatment/pumping capacity of

(d) Project industrial demand

(e) N/A

(f) Maximum amount to be treated and pumped, limited by tertiary/pumping capacity and demand

(g) Calculations based on starting with full storage at hour ##

10/15/08

Alternative P3

State Water Resources Control Board
Office of Water Recycling

East County Industrial Reuse Project
ANALYSIS OF TREATMENT AND STORAGE CAPACITIES FOR AVERAGE DAY OF PEAK MONTH

ASSUMPTIONS
Demand = Average day of peak month
Treatment/Pump capacity = 3.70 MGD = 2569 GPM
Storage = 0 gallons

PROJECT DEMAND

Table F: Design parameters/assumptions

Design Parameters		
variable	magnitude	units
S	0	gallons
V	3.70	mgd
Cur Q	3.700	mgd
Proj Q	3.700	mgd

V (gpm)	2,569	gpm

Table G: Treatment Plant flow supplied

Supply					
		Treatment Plant Flow			In-Plant Losses
Hr	Multiplying Factor	Current (a)		Projected (b)	
		MGD	GPM	GPM	GPM
1	2	3	4	5	6
1	1.000	3.70	2,569	2,569	0
2	1.000	3.70	2,569	2,569	0
3	1.000	3.70	2,569	2,569	0
4	1.000	3.70	2,569	2,569	0
5	1.000	3.70	2,569	2,569	0
6	1.000	3.70	2,569	2,569	0
7	1.000	3.70	2,569	2,569	0
8	1.000	3.70	2,569	2,569	0
9	1.000	3.70	2,569	2,569	0
10	1.000	3.70	2,569	2,569	0
11	1.000	3.70	2,569	2,569	0
12	1.000	3.70	2,569	2,569	0
13	1.000	3.70	2,569	2,569	0
14	1.000	3.70	2,569	2,569	0
15	1.000	3.70	2,569	2,569	0
16	1.000	3.70	2,569	2,569	0
17	1.000	3.70	2,569	2,569	0
18	1.000	3.70	2,569	2,569	0
19	1.000	3.70	2,569	2,569	0
20	1.000	3.70	2,569	2,569	0
21	1.000	3.70	2,569	2,569	0
22	1.000	3.70	2,569	2,569	0
23	1.000	3.70	2,569	2,569	0
24	1.000	3.70	2,569	2,569	0
Average		3.70	2,569	2,569	0

Table H: Treatment Plant flow demanded

Demand							
Hr	Landscape Irrig		Industrial Use		Agricultural Use	Total	Other
	(night)	(day)	(24 hrs)	(day)	(TBD)		GPM
1	2	3	4	5	6	7	8
1	0.0		2,153.5		0	2,153.5	0
2	0.0		2,153.5		(TBD)	2,153.5	0
3	0.0		2,153.5		(TBD)	2,153.5	0
4	0.0		2,153.5		(TBD)	2,153.5	0
5	0.0		2,153.5		(TBD)	2,153.5	0
6		0.0	2,153.5		(TBD)	2,153.5	0
7		0.0	2,153.5		(TBD)	2,153.5	0
8		0.0	2,153.5	0.0	(TBD)	2,153.5	0
9		0.0	2,153.5	0.0	(TBD)	2,153.5	0
10		0.0	2,153.5	0.0	(TBD)	2,153.5	0
11		0.0	2,153.5	0.0	(TBD)	2,153.5	0
12		0.0	2,153.5	0.0	(TBD)	2,153.5	0
13		0.0	2,153.5	0.0	(TBD)	2,153.5	0
14		0.0	2,153.5	0.0	(TBD)	2,153.5	0
15		0.0	2,153.5	0.0	(TBD)	2,153.5	0
16		0.0	2,153.5	0.0	(TBD)	2,153.5	0
17		0.0	2,153.5	0.0	(TBD)	2,153.5	0
18		0.0	2,153.5	0.0	(TBD)	2,153.5	0
19		0.0	2,153.5		(TBD)	2,153.5	0
20		0.0	2,153.5		(TBD)	2,153.5	0
21	0.0		2,153.5		(TBD)	2,153.5	0
22	0.0		2,153.5		(TBD)	2,153.5	0
23	0.0		2,153.5		(TBD)	2,153.5	0
24	0.0		2,153.5		(TBD)	2,153.5	0

Table I: Project flow master table

Hr	Supply						Demand			Operation			
	Treatment Plant Flow			In-Plant Losses	Available Flow		Project	Other	Total	Pumping	Storage	Potable	Remain. Storage
	Current (a)		Projected (b)		Treated	Pumped (c)	GPM	GPM	GPM	Gal	Gal	Gal	Gallons
	MGD	GPM	GPM	GPM	GPM	GPM	(d)	(e)		(f)			(g)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
2	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
3	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
4	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
5	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
6	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
7	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
8	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
9	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
10	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
11	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
12	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
13	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
14	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
15	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
16	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
17	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
18	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
19	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
20	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
21	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
22	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
23	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
24	3.70	2,569	2,569	0	2,569	2,569	2,153	0	2,153	129,210	0	0	0
	3.70	2,569	2,569	0	3,699,360	3,699,360	3,101,030	0	3,101,030	3,101,030	0	0	
	Average				Total, Gallons								

Alternative P3

Table J: Treatment plant operational supply and demand summary

Operational Flow			
Hr	Supply	Demand	Storage
	GPM	GPM	Gallons
1	2	3	4
1	2569	2,153	0
2	2569	2,153	0
3	2569	2,153	0
4	2569	2,153	0
5	2569	2,153	0
6	2569	2,153	0
7	2569	2,153	0
8	2569	2,153	0
9	2569	2,153	0
10	2569	2,153	0
11	2569	2,153	0
12	2569	2,153	0
13	2569	2,153	0
14	2569	2,153	0
15	2569	2,153	0
16	2569	2,153	0
17	2569	2,153	0
18	2569	2,153	0
19	2569	2,153	0
20	2569	2,153	0
21	2,569	2,153	0
22	2,569	2,153	0
23	2,569	2,153	0
24	2,569	2,153	0
1	2,569	2,153	0

Figure J-1: Hourly Supply and Demand

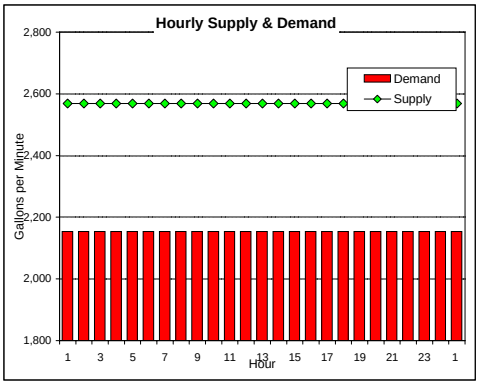


Figure J-2: Water Storage by hour (gallons)

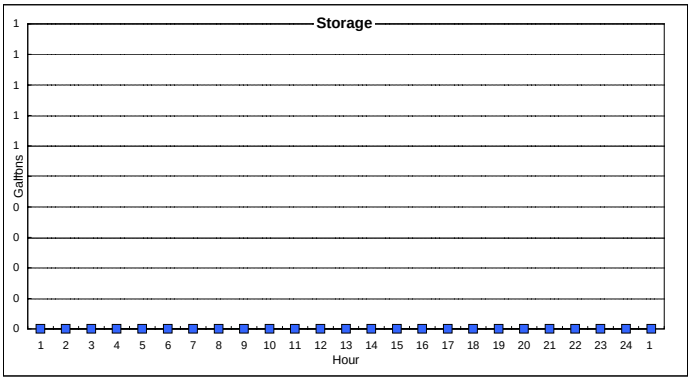


Table K: Project summary

SUMMARY			
Amount of storage used:		0	Gallons
Amount of potable used:		0	Gallons
Based on-			
Treatment capacity of:		3.70	MGD
Pumping capacity of:		2569	GPM
Supply/Demand Ratio of:		1.19	GPM

Remarks:

(a) Pittsburg Pump Station current raw flow is 3.2 MGD (2007).
(b) Same as current flow
(c) Max. amount to be pumped, limited by either avail. flow or treatment/pumping capacity of
(d) Project industrial demand
(e) N/A
(f) Maximum amount to be treated and pumped, limited by tertiary/pumping capacity and demand
(g) Calculations based on starting with full storage at hour ##

10/15/08

Alternative X1

State Water Resources Control Board
Office of Water Recycling

East County Industrial Reuse Project
ANALYSIS OF TREATMENT AND STORAGE CAPACITIES FOR AVERAGE DAY OF PEAK MONTH

ASSUMPTIONS
Demand = Average day of peak month
Treatment/Pump capacity = 8.00 MGD = 5556 GPM
Storage = 0 gallons

PROJECT DEMAND

Table F: Design parameters/assumptions

Design Parameters		
variable	magnitude	units
S	0	gallons
V	8.00	mgd
Cur Q	8.000	mgd
Proj Q	8.000	mgd

V (gpm)	5,556	gpm

Table G: Treatment Plant flow supplied

Supply					
		Treatment Plant Flow			In-Plant Losses
Hr	Multiplying Factor	Current (a)		Projected (b)	
		MGD	GPM	GPM	GPM
1	2	3	4	5	6
1	1.000	8.00	5,556	5,556	0
2	1.000	8.00	5,556	5,556	0
3	1.000	8.00	5,556	5,556	0
4	1.000	8.00	5,556	5,556	0
5	1.000	8.00	5,556	5,556	0
6	1.000	8.00	5,556	5,556	0
7	1.000	8.00	5,556	5,556	0
8	1.000	8.00	5,556	5,556	0
9	1.000	8.00	5,556	5,556	0
10	1.000	8.00	5,556	5,556	0
11	1.000	8.00	5,556	5,556	0
12	1.000	8.00	5,556	5,556	0
13	1.000	8.00	5,556	5,556	0
14	1.000	8.00	5,556	5,556	0
15	1.000	8.00	5,556	5,556	0
16	1.000	8.00	5,556	5,556	0
17	1.000	8.00	5,556	5,556	0
18	1.000	8.00	5,556	5,556	0
19	1.000	8.00	5,556	5,556	0
20	1.000	8.00	5,556	5,556	0
21	1.000	8.00	5,556	5,556	0
22	1.000	8.00	5,556	5,556	0
23	1.000	8.00	5,556	5,556	0
24	1.000	8.00	5,556	5,556	0
Average		8.00	5,556	5,556	0

Table H: Treatment Plant flow demanded

Demand							
Hr	Landscape Irrig		Industrial Use		Agricultural Use	Total	Other
	(night)	(day)	(24 hrs)	(day)	(TBD)		GPM
1	2	3	4	5	6	7	8
1	0.0		4,666.1		0	4,666.1	0
2	0.0		4,666.1		(TBD)	4,666.1	0
3	0.0		4,666.1		(TBD)	4,666.1	0
4	0.0		4,666.1		(TBD)	4,666.1	0
5	0.0		4,666.1		(TBD)	4,666.1	0
6		0.0	4,666.1		(TBD)	4,666.1	0
7		0.0	4,666.1		(TBD)	4,666.1	0
8		0.0	4,666.1	0.0	(TBD)	4,666.1	0
9		0.0	4,666.1	0.0	(TBD)	4,666.1	0
10		0.0	4,666.1	0.0	(TBD)	4,666.1	0
11		0.0	4,666.1	0.0	(TBD)	4,666.1	0
12		0.0	4,666.1	0.0	(TBD)	4,666.1	0
13		0.0	4,666.1	0.0	(TBD)	4,666.1	0
14		0.0	4,666.1	0.0	(TBD)	4,666.1	0
15		0.0	4,666.1	0.0	(TBD)	4,666.1	0
16		0.0	4,666.1	0.0	(TBD)	4,666.1	0
17		0.0	4,666.1	0.0	(TBD)	4,666.1	0
18		0.0	4,666.1	0.0	(TBD)	4,666.1	0
19		0.0	4,666.1		(TBD)	4,666.1	0
20		0.0	4,666.1		(TBD)	4,666.1	0
21	0.0		4,666.1		(TBD)	4,666.1	0
22	0.0		4,666.1		(TBD)	4,666.1	0
23	0.0		4,666.1		(TBD)	4,666.1	0
24	0.0		4,666.1		(TBD)	4,666.1	0

Table I: Project flow master table

Hr	Supply						Demand			Operation			
	Treatment Plant Flow			In-Plant Losses	Available Flow		Project	Other	Total	Pumping	Storage	Potable	Remain. Storage
	Current (a)		Projected (b)		Treated	Pumped (c)	GPM	GPM	GPM	Gal	Gal	Gal	Gallons
	MGD	GPM	GPM	GPM	GPM	GPM	(d)	(e)		(f)			(g)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
2	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
3	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
4	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
5	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
6	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
7	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
8	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
9	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
10	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
11	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
12	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
13	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
14	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
15	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
16	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
17	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
18	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
19	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
20	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
21	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
22	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
23	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
24	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
	8.00	5,556	5,556	0	8,000,640	8,000,640	6,719,137	0	6,719,137	6,719,137	0	0	
	Average				Total, Gallons								

Alternative X1

Table J: Treatment plant operational supply and demand summary

Operational Flow			
Hr	Supply	Demand	Storage
	GPM	GPM	Gallons
1	2	3	4
1	5556	4,666	0
2	5556	4,666	0
3	5556	4,666	0
4	5556	4,666	0
5	5556	4,666	0
6	5556	4,666	0
7	5556	4,666	0
8	5556	4,666	0
9	5556	4,666	0
10	5556	4,666	0
11	5556	4,666	0
12	5556	4,666	0
13	5556	4,666	0
14	5556	4,666	0
15	5556	4,666	0
16	5556	4,666	0
17	5556	4,666	0
18	5556	4,666	0
19	5556	4,666	0
20	5556	4,666	0
21	5,556	4,666	0
22	5,556	4,666	0
23	5,556	4,666	0
24	5,556	4,666	0
1	5,556	4,666	0

Figure J-1: Hourly Supply and Demand

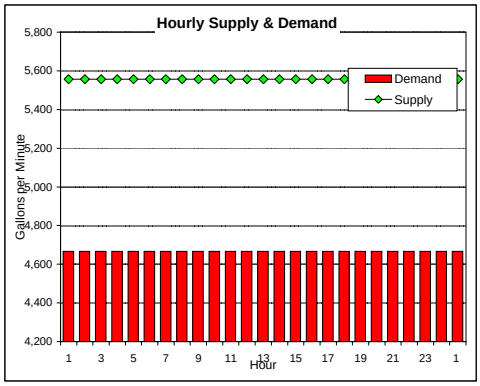


Figure J-2: Water Storage by hour (gallons)

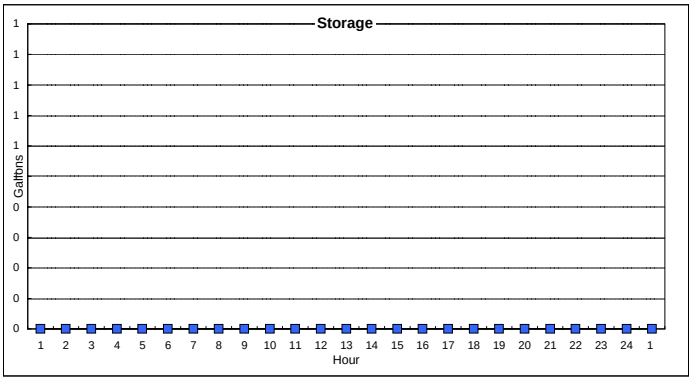


Table K: Project summary

SUMMARY			
Amount of storage used:		0	Gallons
Amount of potable used:		0	Gallons
Based on-			
Treatment capacity of:		8.00	MGD
Pumping capacity of:		5556	GPM
Supply/Demand Ratio of:		1.19	GPM

Remarks:

Remarks:

CCCSD current tertiary capacity is 3.8 MGD (2007).

(b) Same as current flow

(c) Max. amount to be pumped, limited by either avail. flow or treatment/pumping capacity of

(d) Project industrial demand

(e) N/A

(f) Maximum amount to be treated and pumped, limited by tertiary/pumping capacity and demand

(g) Calculations based on starting with full storage at hour ##

10/15/08

Alternative X2

State Water Resources Control Board
Office of Water Recycling

East County Industrial Reuse Project
ANALYSIS OF TREATMENT AND STORAGE CAPACITIES FOR AVERAGE DAY OF PEAK MONTH

ASSUMPTIONS
Demand = Average day of peak month
Treatment/Pump capacity = 8.00 MGD = 5556 GPM
Storage = 0 gallons

PROJECT DEMAND

Table F: Design parameters/assumptions

Design Parameters		
variable	magnitude	units
S	0	gallons
V	8.00	mgd
Cur Q	8.000	mgd
Proj Q	8.000	mgd

V (gpm)	5,556	gpm

Table G: Treatment Plant flow supplied

Supply					
		Treatment Plant Flow			In-Plant Losses
Hr	Multiplying Factor	Current (a)		Projected (b)	
		MGD	GPM	GPM	GPM
1	2	3	4	5	6
1	1.000	8.00	5,556	5,556	0
2	1.000	8.00	5,556	5,556	0
3	1.000	8.00	5,556	5,556	0
4	1.000	8.00	5,556	5,556	0
5	1.000	8.00	5,556	5,556	0
6	1.000	8.00	5,556	5,556	0
7	1.000	8.00	5,556	5,556	0
8	1.000	8.00	5,556	5,556	0
9	1.000	8.00	5,556	5,556	0
10	1.000	8.00	5,556	5,556	0
11	1.000	8.00	5,556	5,556	0
12	1.000	8.00	5,556	5,556	0
13	1.000	8.00	5,556	5,556	0
14	1.000	8.00	5,556	5,556	0
15	1.000	8.00	5,556	5,556	0
16	1.000	8.00	5,556	5,556	0
17	1.000	8.00	5,556	5,556	0
18	1.000	8.00	5,556	5,556	0
19	1.000	8.00	5,556	5,556	0
20	1.000	8.00	5,556	5,556	0
21	1.000	8.00	5,556	5,556	0
22	1.000	8.00	5,556	5,556	0
23	1.000	8.00	5,556	5,556	0
24	1.000	8.00	5,556	5,556	0
Average		8.00	5,556	5,556	0

Table H: Treatment Plant flow demanded

Demand							
Hr	Landscape Irrig		Industrial Use		Agricultural Use	Total	Other
	(night)	(day)	(24 hrs)	(day)	(TBD)		GPM
1	2	3	4	5	6	7	8
1	0.0		4,666.1		0	4,666.1	0
2	0.0		4,666.1		(TBD)	4,666.1	0
3	0.0		4,666.1		(TBD)	4,666.1	0
4	0.0		4,666.1		(TBD)	4,666.1	0
5	0.0		4,666.1		(TBD)	4,666.1	0
6		0.0	4,666.1		(TBD)	4,666.1	0
7		0.0	4,666.1		(TBD)	4,666.1	0
8		0.0	4,666.1	0.0	(TBD)	4,666.1	0
9		0.0	4,666.1	0.0	(TBD)	4,666.1	0
10		0.0	4,666.1	0.0	(TBD)	4,666.1	0
11		0.0	4,666.1	0.0	(TBD)	4,666.1	0
12		0.0	4,666.1	0.0	(TBD)	4,666.1	0
13		0.0	4,666.1	0.0	(TBD)	4,666.1	0
14		0.0	4,666.1	0.0	(TBD)	4,666.1	0
15		0.0	4,666.1	0.0	(TBD)	4,666.1	0
16		0.0	4,666.1	0.0	(TBD)	4,666.1	0
17		0.0	4,666.1	0.0	(TBD)	4,666.1	0
18		0.0	4,666.1	0.0	(TBD)	4,666.1	0
19		0.0	4,666.1		(TBD)	4,666.1	0
20		0.0	4,666.1		(TBD)	4,666.1	0
21	0.0		4,666.1		(TBD)	4,666.1	0
22	0.0		4,666.1		(TBD)	4,666.1	0
23	0.0		4,666.1		(TBD)	4,666.1	0
24	0.0		4,666.1		(TBD)	4,666.1	0

Table I: Project flow master table

Hr	Supply						Demand			Operation			
	Treatment Plant Flow			In-Plant Losses	Available Flow		Project	Other	Total	Pumping	Storage	Potable	Remain. Storage
	Current (a)		Projected (b)		Treated	Pumped (c)	GPM	GPM	GPM	Gal	Gal	Gal	Gallons
	MGD	GPM	GPM	GPM	GPM	GPM	(d)	(e)		(f)			(g)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
2	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
3	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
4	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
5	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
6	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
7	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
8	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
9	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
10	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
11	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
12	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
13	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
14	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
15	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
16	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
17	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
18	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
19	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
20	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
21	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
22	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
23	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
24	8.00	5,556	5,556	0	5,556	5,556	4,666	0	4,666	279,964	0	0	0
	8.00	5,556	5,556	0	8,000,640	8,000,640	6,719,137	0	6,719,137	6,719,137	0	0	
	Average				Total, Gallons								

Alternative X2

Table J: Treatment plant operational supply and demand summary

Operational Flow			
Hr	Supply	Demand	Storage
	GPM	GPM	Gallons
1	2	3	4
1	5556	4,666	0
2	5556	4,666	0
3	5556	4,666	0
4	5556	4,666	0
5	5556	4,666	0
6	5556	4,666	0
7	5556	4,666	0
8	5556	4,666	0
9	5556	4,666	0
10	5556	4,666	0
11	5556	4,666	0
12	5556	4,666	0
13	5556	4,666	0
14	5556	4,666	0
15	5556	4,666	0
16	5556	4,666	0
17	5556	4,666	0
18	5556	4,666	0
19	5556	4,666	0
20	5556	4,666	0
21	5,556	4,666	0
22	5,556	4,666	0
23	5,556	4,666	0
24	5,556	4,666	0
1	5,556	4,666	0

Figure J-1: Hourly Supply and Demand

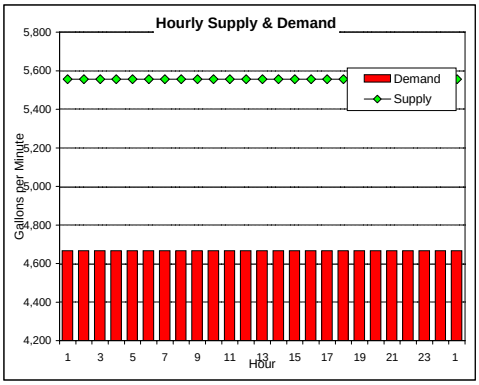


Figure J-2: Water Storage by hour (gallons)

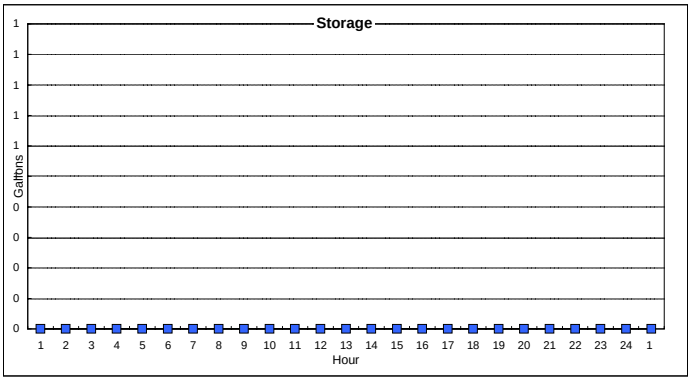


Table K: Project summary

SUMMARY			
Amount of storage used:		0	Gallons
Amount of potable used:		0	Gallons
Based on-			
Treatment capacity of:		8.00	MGD
Pumping capacity of:		5556	GPM
Supply/Demand Ratio of:		1.19	GPM

Remarks:

(a) CCCSD current secondary flow is 41.1 MGD (2007).
CCCSD current tertiary capacity is 3.8 MGD (2007).

(b) Same as current flow

(c) Max. amount to be pumped, limited by either avail. flow or treatment/pumping capacity of

(d) Project industrial demand

(e) N/A

(f) Maximum amount to be treated and pumped, limited by tertiary/pumping capacity and demand

(g) Calculations based on starting with full storage at hour ##

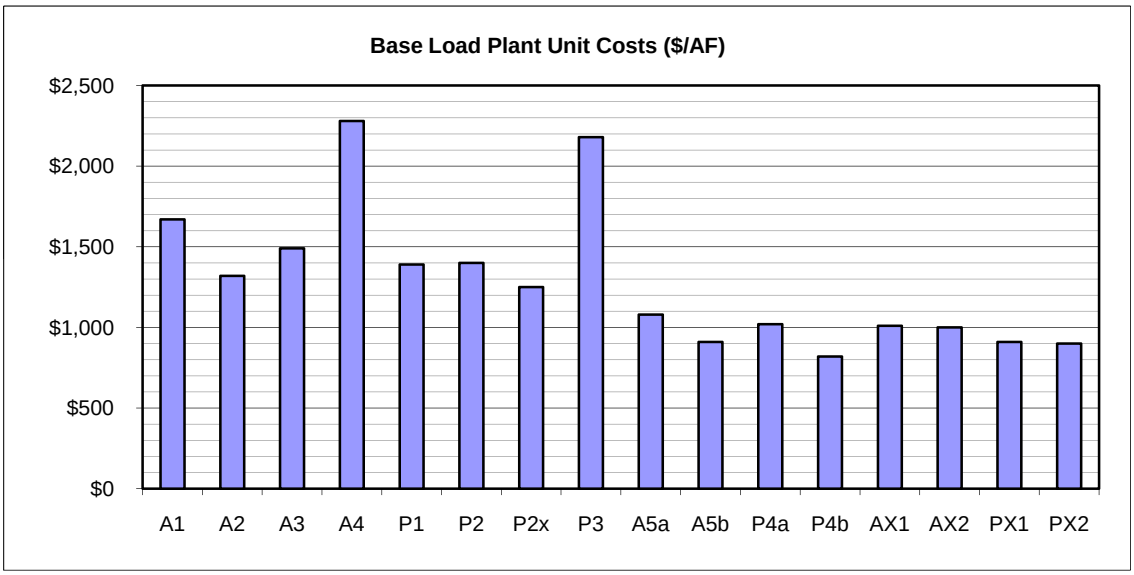
10/15/08

Appendix B - Detailed Cost Estimates

ALTERNATIVE COST SUMMARY

Alt	Supply Source	2015 ADWF	Capital Cost	Base Load Plant
Antioch Recycled Water Alternatives		**MGD**	**$ M**	**Cost per AF***
A1	DDSD RWF	5.5	$60.9	$1,670
A2	ISD RWF	3.5	$24.7	$1,320
A3	ISD RWF & DDSD RWF	8.0	$74.2	$1,490
A4	Satellite at Bridgehead	2.4	$34.7	$2,280
Pittsburg Recycled Water Alternatives				
P1	DDSD RWF	5.5	$49.0	$1,390
P2	CCCSD RWF	8.0	$69.1	$1,400
P2x	*CCCSD RWF with Slipliner*	*6.0*	*$44.7*	*$1,250*
P3	Satellite at Pittsburg	3.7	$51.0	$2,180
Canal Alternatives				
A5a	CCWD CC Canal	2.4	$9.8	$1,080
A5b	CCWD CC Canal	8.0	$23.4	$910
P4a	CCWD CC Canal	3.7	$13.5	$1,020
P4b	CCWD CC Canal	8.0	$17.6	$820
Exchange Alternatives				
AX1	RW to Shell & Canal to Antioch	8.0	$43.8	$1,010
AX2	RW to Tesoro & Canal to Antioch	8.0	$41.4	$1,000
PX1	RW to Shell & Canal to Pitt	8.0	$38.0	$910
PX2	RW to Tesoro & Canal to Pitt	8.0	$35.6	$900

* CCWD Duplication of Service fee ($315/af) and Connection fee are not included.



Project: East County Industrial Recycled Water Facilities Plan

Aspect: Unit Costs

Estimate Type: Planning Level

Date: July 17, 2009
Project Number: 0013-015.00

Prepared by: MP, RM
Checked by: JT
Check Date: September 5, 2008

Item	Size	Units	Unit Cost (May 2008$)	ENR CCI Ref Date	Reference	Notes
			Capital Costs			
Distribution						
Pipeline, Paved						
6-inch, PVC		LF	$108		DDSD 2007, PAMV 2007	$18/in-LF
8-inch, PVC		LF	$144		DDSD 2007, PAMV 2007	$18/in-LF
10-inch, PVC		LF	$180		DDSD 2007, PAMV 2007	$18/in-LF
12-inch, PVC		LF	$216		DDSD 2007, PAMV 2007	$18/in-LF
14-inch, PVC		LF	$252		DDSD 2007, PAMV 2007	$18/in-LF
16-inch, DI		LF	$288		DDSD 2007, PAMV 2007	$18/in-LF
18-inch, DI		LF	$324		DDSD 2007, PAMV 2007	$18/in-LF
20-inch, DI		LF	$360		DDSD 2007, PAMV 2007	$18/in-LF
24-inch, DI		LF	$432		DDSD 2007, PAMV 2007	$18/in-LF
30-inch, DI		LF	$540		DDSD 2007, PAMV 2007	$18/in-LF
Pipeline, Unpaved						
6-inch, PVC		LF	$90		DDSD 2007, PAMV 2007	$15/in-LF; See Note 1
8-inch, PVC		LF	$120		DDSD 2007, PAMV 2007	$15/in-LF; See Note 1
10-inch, PVC		LF	$150		DDSD 2007, PAMV 2007	$15/in-LF; See Note 1
12-inch, PVC		LF	$180		DDSD 2007, PAMV 2007	$15/in-LF; See Note 1
14-inch, PVC		LF	$210		DDSD 2007, PAMV 2007	$15/in-LF; See Note 1
16-inch, DI		LF	$240		DDSD 2007, PAMV 2007	$15/in-LF; See Note 1
18-inch, DI		LF	$270		DDSD 2007, PAMV 2007	$15/in-LF; See Note 1
24-inch, DI		LF	$360		DDSD 2007, PAMV 2007	$15/in-LF; See Note 1
30-inch, DI		LF	$450		DDSD 2007, PAMV 2007	$15/in-LF; See Note 1
Appurtenances			10%			Percentage of pipeline cost
Railroad/Highway Crossing - Trenchless Pipe Construction						
Trenchless construction		in-dia/ft	$40			Based on recent construction cost
Trenchless pipe construction: Jacking Pit		EA	$75,000			Based on recent construction cost
Trenchless pipe construction: Receiving Pit		EA	$30,000			Based on recent construction cost
CCCSD Existing Pipeline						
Industrial Pipeline - Modifications		LS	$262,900	Feb-02	RBF, 2002	6,500' of 42" cement motar-lined steel pipe. Assumes no significant corrosion
Industrial Pipeline - Replacement Value		LS	$4,095,000			Used to calculate O&M estimates
CCWD Existing Pipelines						
Depreciated Value (to determine purchase price)						
CCCSD to Shell Property		LS	$3,228,370		CCWD, 2008	12,506 ft of 20" to 24" pipe
CCCSD to Tesoro Property		LS	$1,785,270		CCWD, 2008	5,890 ft of 20" to 21" pipe
Two Storage Tanks		LS	$5,129,020		CCWD, 2008	2, 3-MG tanks
Replacement Value (to calculate O&M costs)						
CCCSD to Shell Property		LS	$6,616,620		CCWD, 2008	12,506 ft of 20" to 24" pipe
CCCSD to Tesoro Property		LS	$2,813,760		CCWD, 2008	5,890 ft of 20" to 21" pipe
Two Storage Tanks		LS	$11,126,700		CCWD, 2008	2, 3-MG tanks
CCWD Canal						
CCWD Connection Fee - Primary Supply			*Not Available*			See Note 2
CCWD Connection Fee - Backup Supply			*Not Available*			See Note 2
Gaylord East Lateral Purchase		LS	$5,000,000			

Item	Size	Units	Unit Cost (May 2008$)	ENR CCI Ref Date	Reference	Notes
Recycled Water Treatment						
DDSD						
DDSD RWF Tertiary Treatment Train WRP	6.4	MGD	$13,390,000	Oct-00	RMC, 2007	As-built construction cost
Satellite MBR / UV Treatment Plant	1	MGD	$5,900,000	May-04	RMC, 2006	Ref cost for 3 MGD
CCCSD						
RWF Tertiary Treatment Upgrade	8	MGD	$5,062,000		RBF, 2002; CCCSD, 2004; MWH, 2004; MWH, 2006	
Upgrade with Ammonia Removal	8	MGD	$7,592,000		RBF, 2002; CCCSD, 2004; MWH, 2004; MWH, 2006	
Pump Stations						
Service Water Pump Staion (for Recycled Water)						
Base Cost		LS	$509,900		Sanks, 1998	Figure 29-6, interpolated trendline
Cost per MGD		MGD	$114,800		Sanks, 1998	Figure 29-6, interpolated trendline
Booster Pump Station (for Blowdown System)						
Base Cost		LS	$318,500		Sanks, 1998	Figure 29-7, interpolated trendline
Cost per MGD		MGD	$213,900		Sanks, 1998	Figure 29-7, interpolated trendline
O&M Costs						
Water Purchase						
CCWD Canal Water		AF	$500			
Pump Station						
Pump Station Power Cost		kWh	$0.13			
Pump Station Maintenance Cost			5%			Of pump station cost
Distribution						
Distribution O&M Costs			1%			Of total pipeline cost
Treatment						
CCCSD Tertiary Treatment	1	MG	$330	Feb-02	RBF, 2002	Reference cost for 8 MGD
CCCSD Tertiary Trmt + Ammonia Removal	1	MG	$410	Feb-02	RBF, 2002	
Tertiary Treatment Plant (for DDSD)	1	MG	$410		Watsonville, 2007	Reference cost for 5 MGD
ISD MBR / UV Treatment Plant	1	MG	$880	May-05	ISD, 2005	Reference cost for 4.3 MGD
Satellite MBR / UV Treatment Plant	1	MG	$960	May-04	RMC, 2006	Ref cost for 3 MGD
Cost Estimate Basis						
Contingency						
Construction Contingency		25%				
Allowances for Construction Costs						
Engineering						
Design		10%				
Construction		10%				
Administration/Legal		5%				
Environmental		5%				

ENR CCI:

Sanks, 1998		4,500
Feb-00	20 Cities Average	6,160
Oct-00	20 Cities Average	6,259
Feb-02	20 Cities Average	6,462
Sep-02	Los Angeles	7,416
May-04	San Francisco	8,106
May-05	San Francisco	8,260
Aug-06	San Francisco	9,072
Apr-07	Los Angeles	8,875
Jul-08	**San Francisco**	**9,286**

References:

RBF, 2002	CCCSD Preliminary Cost Estimate for the Industrial RW Project
CH:CDM, 2002	City of Los Angeles Integrated Resources Plan
CCWD, 2008	Spreadsheet provided by Kimberly Lin; RE: Depreciated Value of Recycled Water Pipelines
DDSD, 2007	Bid Results for DDSD/Pittsburg, May 2007; Used for 6",8",12",14" Pipes
ISD, 2005	O&M Cost Estimate for 4.3 MGD MBR/UV
MWH, 2004	Filter Plant Optimization Study; April 2004
MWH, 2006	Filter Capacity Evaluation, March 24, 2006
PAMV, 2007	Bid Results for Palo Alto Mountain View RW Pipeline, June 07; For 6", 12", 18", 24", 30" pipes
RMC, 2006	San Francisco PUC Recycled Water Master Plan Basis of Cost TM
RMC, 2007	Antioch/DDDSD Recycled Water Project Facilities Plan
RS Means	2008 RS Means
Sanks, 1998	Pumping Station Design, 2nd Edition
Watsonville, 2007	Average of multiple O&M estimates for Watsonville WWTP

Note 1: Unpaved pipeline installation does not require AC pavement ($6/sf), cutting/demolitian($0.7/sf), and less aggregate base($2.5/sf). Unit costs are based on 2008 RS Means and include 8.25% tax. Assuming a 5'x1' trench, unpaved restoration cost is $3/in-dia/LF (16" pipe) less than a paved pipeline installation.

Note 2: CCWD was unable to provide connection fees for scenarios requiring meter sizes greater than 12 inches and for backup supplies because these are unique situations that are addressed on a case-by-case basis. For DEC/LMEC, the connection fee was $3.5M for a 1.5 MGD primary supply connection. The 9 MGD back-up was $250,000, but was limited to no more than 3 days in a month, and no more than 15 days in a year.

RMC Water and Environment

Project: East County Industrial Recycled Water Facilities Plan

Aspect: Antioch Power Plant Summary

Estimate Type: Preliminary Planning

Date: July 17, 2009
Project Number: 0013-015.00

Prepared by: MP, RM
Checked by: JT
Check Date: September 5, 2008

Capital Costs	A1 (5.5 MGD)	A2 (3.5 MGD)	A3 (8.0 MGD)	A4 (2.4 MGD)	A5a (2.4 MGD)	A5b (8.0 MGD)	Notes
Construction Costs							
Raw Construction Costs	$ 37,466,000	$ 15,176,000	$ 45,676,000	$ 21,374,000	$ 6,008,000	$ 14,425,000	
Recycled Water Supply	$ 23,775,000	$ 7,795,000	$ 31,455,000	$ 15,366,000	$ -	$ -	
Blowdown	$ 7,485,000	$ 6,431,000	$ 7,671,000	$ 5,216,000	$ 5,216,000	$ 7,875,000	
Canal Water Supply	$ 6,206,000	$ 950,000	$ 6,550,000	$ 792,000	$ 792,000	$ 6,550,000	
Conceptual Design Level Conting. (25%)	$ 9,367,000	$ 3,794,000	$ 11,419,000	$ 5,344,000	$ 1,502,000	$ 3,606,000	
Construction Cost Subtotal	**$ 46,833,000**	**$ 18,970,000**	**$ 57,095,000**	**$ 26,718,000**	**$ 7,510,000**	**$ 18,031,000**	
Project Planning Costs							
Pre-Construction (15%)	$ 7,025,000	$ 2,846,000	$ 8,564,000	$ 4,008,000	$ 1,127,000	$ 2,705,000	Eng/Design, Env. Docs, etc.
During Construction (15%)	$ 7,025,000	$ 2,846,000	$ 8,564,000	$ 4,008,000	$ 1,127,000	$ 2,705,000	CM, ESDC, Legal
Project Planning Cost Subtotal	**$ 14,050,000**	**$ 5,692,000**	**$ 17,128,000**	**$ 8,016,000**	**$ 2,254,000**	**$ 5,410,000**	
Project Cost Total	**$ 60,883,000**	**$ 24,662,000**	**$ 74,223,000**	**$ 34,734,000**	**$ 9,764,000**	**$ 23,441,000**	

Annual Costs	A1 (5.5 MGD)	A2 (3.5 MGD)	A3 (8.0 MGD)	A4 (2.4 MGD)	A5a (2.4 MGD)	A5b (8.0 MGD)	
Annualized Capital Cost	$ 5,308,100	$ 2,150,100	$ 6,471,100	$ 3,028,300	$ 851,300	$ 2,043,700	See financing info below
Total O&M Cost	$ 889,000	$ 942,000	$ 1,548,000	$ 646,000	$ 892,000	$ 2,871,000	
Recycled Water Supply	$ 756,000	$ 836,000	$ 1,393,000	$ 559,000	$ -	$ -	
Blowdown	$ 122,000	$ 97,000	$ 141,000	$ 80,000	$ 80,000	$ 167,000	
Canal Water Supply	$ 11,000	$ 9,000	$ 14,000	$ 7,000	$ 812,000	$ 2,704,000	
Total Annual Cost	**$ 6,197,100**	**$ 3,092,100**	**$ 8,019,100**	**$ 3,674,300**	**$ 1,743,300**	**$ 4,914,700**	
Base Load Plant							Base load plant water demand assumes plant capacity factor of 60%
Average Annual Production (AFY)	3,700	2,350	5,380	1,610	1,610	5,380	
Unit Cost ($ / AF)	**$1,670**	**$1,320**	**$1,490**	**$2,280**	**$1,080**	**$910**	
CCWD Duplication of Service Fee	$315	$315	$315	$315	$0	$0	
Adjusted Unit Cost ($ / AF)	**$1,990**	**$1,640**	**$1,810**	**$2,600**	**$1,080**	**$910**	

Notes:

CCWD Connection fee is not included.
All capital costs are rounded to the nearest thousand.
All annual costs are rounded to the nearest hundred.

0.06 = Financing Rate
20 = Financing Term (Years)

Project: East County Industrial Recycled Water Facilities Plan

Aspect: Alternative A1: DDSD RWF (5.5 MGD)

Estimate Type: Planning Level

Date: July 17, 2009
Project Number: 0013-015.00

Prepared by: MP, RM
Checked by: JT
Check Date: September 5, 2008

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
CAPITAL COSTS							
Distribution							
Pipeline							
Recycled Water Supply							
16-inch, DI, Paved			27,100	LF	$288	$7,804,800	
Blowdown							
12-inch, PVC, Paved			27,100	LF	$216	$5,853,600	
Canal Water Suppy							
14-inch, PVC, Paved			4,350	LF	$252	$1,096,200	
Subtotal						*$14,754,600*	
Appurtenances			$14,754,600	LS	10%	$1,475,500	Percentage of pipeline cost
Railroad/Highway/Stream Crossing - Trenchless Pipe Construction							
Recycled Water Supply							
Trenchless construction	16	in	700	LF	$40	$448,000	Bridge (150') and Railroad (550') Crossing
Trenchless pipe construction: Jacking Pit			2	EA	$75,000	$150,000	
Trenchless pipe construction: Receiving Pit			2	EA	$30,000	$60,000	
Subtotal						*$658,000*	
Blowdown							
Trenchless construction	12	in	700	LF	$40	$336,000	Bridge (150') and Railroad (550') Crossing
Trenchless pipe construction: Jacking Pit			0	EA	$75,000	$0	Included with installation of the Recycled Water
Trenchless pipe construction: Receiving Pit			0	EA	$30,000	$0	supply pipeline.
Subtotal						*$336,000*	
CCWD Canal							
CCWD Connection Fee - Backup Supply						$0	
Gaylord East Lateral Purchase			1.0	LS	$5,000,000	$5,000,000	
Subtotal						*$5,000,000*	
Distribution Subtotal						**$22,224,100**	
Recycled Water Treatment							
DDSD							
DDSD RWF Tertiary Treatment Train WRP			6.4	MGD	$13,390,000	$13,390,000	Cost for full 6.4 MGD treatment train, but not all capacity is needed.
Subtotal						*$13,390,000*	
Recycled Water Treatment Subtotal						**$13,390,000**	
Pump Stations							
Wet Well-Dry Well Wastewater Pump Station							
Recycled Water Supply							
Base Cost			1	LS	$509,900	$509,900	
Cost per MGD			5.5	MGD	$114,800	$631,400	
Subtotal						*$1,141,300*	
Booster Pump Station							
Blowdown							
Base Cost			1	LS	$318,500	$318,500	
Cost per MGD			1.8	MGD	$213,900	$391,400	
Subtotal						*$709,900*	
Pump Station Subtotal						**$1,851,200**	
Recycled Water Capital Costs						**$23,775,000**	
Blowdown Capital Costs						**$7,485,000**	
Canal Water Capital Costs						**$6,206,000**	
TOTAL CAPITAL COSTS						**$37,466,000**	

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
O&M COSTS							
Water Purchase							
CCWD Canal Water			0	AF	$500	$0	Back-up supply
Subtotal						*$0*	
Pump Station							
Pump Station Power Cost							
Recycled Water Pump Station			957,400	kWh	$0.13	$124,500	
Blowdown Pump Station			217,400	kWh	$0.13	$28,300	
Subtotal						*$152,800*	
Pump Station Maintenance Cost							
Recycled Water Pump Station			$1,141,300		5%	$57,100	Of pump station cost
Blowdown Pump Station			$709,900		5%	$35,500	Of pump station cost
Subtotal						*$92,600*	
Distribution							
Recycled Water Pipeline			$7,804,800		1%	$78,000	Of total pipeline cost
Blowdown Pipeline			$5,853,600		1%	$58,500	Of total pipeline cost
Canal Water Pipeline			$1,096,200		1%	$11,000	Of total pipeline cost
Subtotal						*$147,500*	
Treatment							
Tertiary Treatment Plant			1,210	MG	$410	$496,100	
Subtotal						*$496,100*	
Recycled Water O&M Costs						**$756,000**	
Blowdown O&M Costs						**$122,000**	
Canal Water O&M Costs						**$11,000**	
TOTAL O&M COSTS						**$889,000**	

Pump Station Calculations

HP Calculation hp = (gpm * TDH)/(3960 * eff) TDH = Total Dynamic Head (ft)

Power for Pumping 1 hp = 0.746 kW efficiency (eff) = 75%

	RW Pipeline	Blowdown Pipeline	Canal Lateral	Notes
Peak Flow (mgd):	5.5	1.8	5.5	
Peak Flow (gpm):	3,820	1,270	3,820	
Avg Day of Peak Month (gpm):	3,210	1,070	3,210	
Annual Avg Flow (gpm):	2,290	760	2,290	
Annual Avg Flow (AFY):	3,700	1,230	3,690	
Peak TDH (ft):	240	160	NA	
Avg Day of Peak Month TDH (ft):	190	130	NA	
Design HP:	310	70	NA	Calculated based on Peak Flow and Peak TDH.
Annual kWh:	957,400	217,400	NA	Based on Annual Average Flow and Average Day of Peak Month TDH.

Project: East County Industrial Recycled Water Facilities Plan

Aspect: Alternative A2: ISD RWF (3.5 MGD)

Estimate Type: Planning Level

Date: July 17, 2009
Project Number: 0013-015.00

Prepared by: MP, RM
Checked by: JT
Check Date: September 5, 2008

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
CAPITAL COSTS							
Distribution							
Pipeline							
Recycled Water Supply							
14-inch, PVC, Paved			21,170	LF	$252	$5,334,800	
Blowdown							
10-inch, PVC, Paved			27,100	LF	$180	$4,878,000	
Canal Water Suppy							
12-inch, PVC, Paved			4,000	LF	$216	$864,000	
Subtotal						*$11,076,800*	
Appurtenances			$11,076,800	LS	10%	$1,107,700	Percentage of pipeline cost
Railroad/Highway/Stream Crossing - Trenchless Pipe Construction							
Recycled Water Supply							
Trenchless construction	14	in	1,250	LF	$40	$700,000	Two Railroad (500'; 100') and Highway 4 (650') Crossing
Trenchless pipe construction: Jacking Pit			3	EA	$75,000	$225,000	
Trenchless pipe construction: Receiving Pit			3	EA	$30,000	$90,000	
Subtotal						*$1,015,000*	
Blowdown							
Trenchless construction	10	in	700	LF	$40	$280,000	Bridge (150') and Railroad (550') Crossing
Trenchless pipe construction: Jacking Pit			2	EA	$75,000	$150,000	
Trenchless pipe construction: Receiving Pit			2	EA	$30,000	$60,000	
Subtotal						*$490,000*	
CCWD Canal							
CCWD Connection Fee - Backup Supply						$0	
Gaylord East Lateral Purchase				LS	$5,000,000	$0	
Subtotal						*$0*	
Distribution Subtotal						**$13,689,500**	
Pump Stations							
Wet Well-Dry Well Wastewater Pump Station							
Recycled Water Supply							
Base Cost			1	LS	$509,900	$509,900	
Cost per MGD			3.5	MGD	$114,800	$401,800	
Subtotal						*$911,700*	
Booster Pump Station							
Blowdown							
Base Cost			1	LS	$318,500	$318,500	
Cost per MGD			1.2	MGD	$213,900	$256,700	
Subtotal						*$575,200*	
Pump Station Subtotal						**$1,486,900**	
Recycled Water Capital Costs						**$7,795,000**	
Blowdown Capital Costs						**$6,431,000**	
Canal Water Capital Costs						**$950,000**	
TOTAL CAPITAL COSTS						**$15,176,000**	

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
O&M COSTS							
Water Purchase							
CCWD Canal Water			0	AF	$500	$0	Back-up supply
Subtotal						*$0*	
Pump Station							
Pump Station Power Cost							
Recycled Water Pump Station			456,200	kWh	$0.13	$59,300	
Blowdown Pump Station			145,600	kWh	$0.13	$18,900	
Subtotal						*$78,200*	
Pump Station Maintenance Cost							
Recycled Water Pump Station			$911,700		5%	$45,600	Of pump station cost
Blowdown Pump Station			$575,200		5%	$28,800	Of pump station cost
Subtotal						*$74,400*	
Distribution							
Recycled Water Pipeline			$5,334,800		1%	$53,300	Of total pipeline cost
Blowdown Pipeline			$4,878,000		1%	$48,800	Of total pipeline cost
Canal Water Pipeline			$864,000		1%	$8,600	Of total pipeline cost
Subtotal						*$110,700*	
Treatment							
ISD MBR / UV Treatment Plant			770	MG	$880	$677,600	
Subtotal						*$677,600*	
Recycled Water O&M Costs						**$836,000**	
Blowdown O&M Costs						**$97,000**	
Canal Water O&M Costs						**$9,000**	
TOTAL O&M COSTS						**$942,000**	

Pump Station Calculations

HP Calculation hp = (gpm * TDH)/(3960 * eff) TDH = Total Dynamic Head (ft)

Power for Pumping 1 hp = 0.746 kW efficiency (eff) = 75%

	RW Pipeline	Blowdown Pipeline	Canal Lateral	Notes
Peak Flow (mgd):	3.5	1.2	3.5	
Peak Flow (gpm):	2,430	810	2,430	
Avg Day of Peak Month (gpm):	2,040	680	2,040	
Annual Avg Flow (gpm):	1,460	490	1,460	
Annual Avg Flow (AFY):	2,350	780	2,350	
Peak TDH (ft):	180	170	NA	
Avg Day of Peak Month TDH (ft):	140	140	NA	
Design HP:	150	50	NA	Calculated based on Peak Flow and Peak TDH.
Annual kWh:	456,200	145,600	NA	Based on Annual Average Flow and Average Day of Peak Month TDH.

Project: East County Industrial Recycled Water Facilities Plan

Aspect: Alternative A3: DDSD (4.5 MGD) and ISD (3.5 MGD)

Estimate Type: Planning Level

Date: July 17, 2009
Project Number: 0013-015.00

Prepared by: MP, RM
Checked by: JT
Check Date: September 5, 2008

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
CAPITAL COSTS							
Distribution							
Pipeline							
Recycled Water Supply							
14-inch, PVC, Paved			21,170	LF	$252	$5,334,800	ISD Pipeline
16-inch, DI, Paved			27,100	LF	$288	$7,804,800	DDSD Pipeline
Blowdown							
12-inch, PVC, Paved			27,100	LF	$216	$5,853,600	To DDSD
Canal Water Suppy							
18-inch, DI, Paved			4,350	LF	$324	$1,409,400	
Subtotal						*$20,402,600*	
Appurtenances			$20,402,600	LS	10%	$2,040,300	Percentage of pipeline cost
Railroad/Highway/Stream Crossing - Trenchless Pipe Construction							
Recycled Water Supply							
ISD RWF							
Trenchless construction	14	in	1,250	LF	$40	$700,000	Two Railroad (500'; 100') and Highway 4 (650') Crossing
Trenchless pipe construction: Jacking Pit			3	EA	$75,000	$225,000	
Trenchless pipe construction: Receiving Pit			3	EA	$30,000	$90,000	
Subtotal						*$1,015,000*	
DDSD RWF							
Trenchless construction	16	in	700	LF	$40	$448,000	Bridge (150') and Railroad (550') Crossing
Trenchless pipe construction: Jacking Pit			2	EA	$75,000	$150,000	
Trenchless pipe construction: Receiving Pit			2	EA	$30,000	$60,000	
Subtotal						*$658,000*	
Blowdown							
Trenchless construction	12	in	700	LF	$40	$336,000	Bridge (150') and Railroad (550') Crossing
Trenchless pipe construction: Jacking Pit			0	EA	$75,000	$0	Included with installation of the DDSD Recycled Water supply pipeline.
Trenchless pipe construction: Receiving Pit			0	EA	$30,000	$0	
Subtotal						*$336,000*	
CCWD Canal							
CCWD Connection Fee - Backup Supply						$0	
Gaylord East Lateral Purchase			1.0	LS	$5,000,000	$5,000,000	
Subtotal						*$5,000,000*	
Distribution Subtotal						**$29,451,900**	
Recycled Water Treatment							
DDSD							
DDSD RWF Tertiary Treatment Train WRP			4.5	MGD	$13,390,000	$13,390,000	Cost for full 6.4 MGD treatment train, but not all capacity is needed.
Recycled Water Treatment Subtotal						**$13,390,000**	
Pump Stations							
Wet Well-Dry Well Wastewater Pump Station							
Recycled Water Supply							
ISD RWF							
Base Cost			1	LS	$509,900	$509,900	
Cost per MGD			3.5	MGD	$114,800	$401,800	
Subtotal						*$911,700*	
DDSD RWF							
Base Cost			1	LS	$509,900	$509,900	
Cost per MGD			4.5	MGD	$114,800	$516,600	
Subtotal						*$1,026,500*	
Booster Pump Station							
Blowdown							
Base Cost			1	LS	$318,500	$318,500	
Cost per MGD			2.7	MGD	$213,900	$577,500	
Subtotal						*$896,000*	
Pump Station Subtotal						**$2,834,200**	
Recycled Water Capital Costs						**$31,455,000**	
Blowdown Capital Costs						**$7,671,000**	
Canal Water Capital Costs						**$6,550,000**	
TOTAL CAPITAL COSTS						**$45,676,000**	

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
O&M COSTS							
Water Purchase							
CCWD Canal Water			0	AF	$500	$0	Back-up supply
Subtotal						*$0*	
Pump Station							
Pump Station Power Cost							
ISD Recycled Water Pump Station			449,700	kWh	$0.13	$58,500	
DDSD Recycled Water Pump Station			583,300	kWh	$0.13	$75,800	
Blowdown Pump Station			293,100	kWh	$0.13	$38,100	
Subtotal						*$172,400*	
Pump Station Maintenance Cost							
Recycled Water Pump Station			$1,938,200		5%	$96,900	Of pump station cost
Blowdown Pump Station			$896,000		5%	$44,800	Of pump station cost
Subtotal						*$141,700*	
Distribution							
Recycled Water Pipeline			$7,804,800		1%	$78,000	Of total pipeline cost
Blowdown Pipeline			$5,853,600		1%	$58,500	Of total pipeline cost
Canal Water Pipeline			$1,409,400		1%	$14,100	Of total pipeline cost
Subtotal						*$150,600*	
Treatment							
DDSD Tertiary Treatment Plant			990	MG	$410	$405,900	
ISD Tertiary Treatment Plant			770	MG	$880	$677,600	
Subtotal						*$1,083,500*	
Recycled Water O&M Costs						**$1,393,000**	
Blowdown O&M Costs						**$141,000**	
Canal Water O&M Costs						**$14,000**	
TOTAL O&M COSTS						**$1,548,000**	

Pump Station Calculations

HP Calculation hp = (gpm * TDH)/(3960 * eff) TDH = Total Dynamic Head (ft)

Power for Pumping 1 hp = 0.746 kW efficiency (eff) = 75%

	ISD RW Pipeline	DDSD RW Pipeline	Blowdown Pipeline	Canal Lateral	Notes
Peak Flow (mgd):	3.5	4.5	2.7	8.0	
Peak Flow (gpm):	2,430	3130	1,850	5,560	
Avg Day of Peak Month (gpm):	2,040	2,630	1,550	4,670	
Annual Avg Flow (gpm):	1,460	1,880	1,110	3,340	
Annual Avg Flow (AFY):	2,350	3,030	1,790	5,380	
Peak TDH (ft):	180	180	150	NA	
Avg Day of Peak Month TDH (ft):	140	140	120	NA	
Design HP:	150	190	90	NA	Calculated based on Peak Flow and Peak TDH.
Annual kWh:	449,700	583,300	293,100	NA	Based on Annual Average Flow and Average Day of Peak Month
Total AFY:	5,380				TDH.

Project: East County Industrial Recycled Water Facilities Plan

Aspect: Alt A4: Satellite Treatment at Bridgehead (2.4 MGD)

Estimate Type: Planning Level

Date: July 17, 2009
Project Number: 0013-015.00

Prepared by: MP, RM
Checked by: JT
Check Date: September 5, 2008

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
CAPITAL COSTS							
Distribution							
Pipeline							
Recycled Water Supply							
10-inch, PVC, Paved			2,125	LF	$180	$382,500	
Blowdown							
8-inch, PVC, Paved			27,100	LF	$144	$3,902,400	
Canal Water Suppy							
10-inch, PVC, Paved			4,000	LF	$180	$720,000	
Subtotal						$5,004,900	
Appurtenances			$5,004,900		10%	$500,500	Percentage of pipeline cost
Railroad/Highway Crossing - Trenchless Pipe Construction							
Blowdown							
Trenchless construction	8	in	700	LF	$40	$224,000	Bridge (150') and Railroad (550') Crossing
Trenchless pipe construction: Jacking Pit			2	EA	$75,000	$150,000	
Trenchless pipe construction: Receiving Pit			2	EA	$30,000	$60,000	
Subtotal						*$434,000*	
CCWD Canal							
CCWD Connection Fee - Backup Supply						$0	
Gaylord East Lateral Purchase				LS	$5,000,000	$0	
Subtotal						*$0*	
Distribution Subtotal						**$5,939,400**	
Recycled Water Treatment							
DDSD							
Satellite MBR Treatment Plant			2.4	MGD	$5,900,000	$14,160,000	
Recycled Water Treatment Subtotal						**$14,160,000**	
Pump Stations							
Wet Well-Dry Well Wastewater Pump Station							
Recycled Water Supply							
Base Cost			1	LS	$509,900	$509,900	
Cost per MGD			2.4	MGD	$114,800	$275,500	
Subtotal						*$785,400*	
Booster Pump Station							
Blowdown							
Base Cost			1	LS	$318,500	$318,500	
Cost per MGD			0.8	MGD	$213,900	$171,100	
Subtotal						*$489,600*	
Pump Station Subtotal						**$1,275,000**	
Recycled Water Capital Costs						**$15,366,000**	
Blowdown Capital Costs						**$5,216,000**	
Canal Water Capital Costs						**$792,000**	
TOTAL CAPITAL COSTS						**$21,374,000**	

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
O&M COSTS							
Water Purchase							
CCWD Canal Water			0	AF	$500	$0	Back-up supply
Subtotal						*$0*	
Pump Station							
Pump Station Power Cost							
Recycled Water Pump Station			127,600	kWh	$0.13	$16,600	
Blowdown Pump Station			126,400	kWh	$0.13	$16,400	
Subtotal						*$33,000*	
Pump Station Maintenance Cost							
Recycled Water Pump Station			$785,400		5%	$39,300	Of pump station cost
Blowdown Pump Station			$489,600		5%	$24,500	Of pump station cost
Subtotal						*$63,800*	
Distribution							
Recycled Water Pipeline			$382,500		1%	$3,800	Of total pipeline cost
Blowdown Pipeline			$3,902,400		1%	$39,000	Of total pipeline cost
Canal Water Pipeline			$720,000		1%	$7,200	Of total pipeline cost
Subtotal						*$50,000*	
Treatment							
Satellite MBR Treatment Plant			520	MG	$960	$499,200	
Recycled Water O&M Costs						**$559,000**	
Blowdown O&M Costs						**$80,000**	
Canal Water O&M Costs						**$7,000**	
TOTAL O&M COSTS						**$646,000**	

Pump Station Calculations

HP Calculation hp = (gpm * TDH)/(3960 * eff)

Power for Pumping 1 hp = 0.746 kW

TDH = Total Dynamic Head (ft)

efficiency (eff) = 75%

	RW Pipeline	Blowdown Pipeline	Canal Lateral	Notes
Peak Flow (mgd):	2.4	0.8	2.4	
Peak Flow (gpm):	1,670	560	1,670	
Avg Day of Peak Month (gpm):	1,400	470	1,400	
Annual Avg Flow (gpm):	1,000	340	1,000	
Annual Avg Flow (AFY):	1,610	540	1,610	
Peak TDH (ft):	70	210	NA	
Avg Day of Peak Month TDH (ft):	60	170	NA	
Design HP:	40	40	NA	Calculated based on Peak Flow and Peak TDH.
Annual kWh:	127,600	126,400	NA	Based on Annual Average Flow and Average Day of Peak Month TDH.

Project: East County Industrial Recycled Water Facilities Plan

Aspect: Alternative A5a: CCWD Canal (2.4 MGD)

Estimate Type: Planning Level

Date: July 17, 2009
Project Number: 0013-015.00

Prepared by: MP, RM
Checked by: JT
Check Date: September 5, 2008

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
CAPITAL COSTS							
Distribution							
Pipeline							
Blowdown							
8-inch, PVC, Paved			27,100	LF	$144	$3,902,400	
Canal Water Suppy							
10-inch, DI, Paved			4,000	LF	$180	$720,000	
Subtotal						*$4,622,400*	
Appurtenances			$4,622,400	LS	10%	$462,240	Percentage of pipeline cost
Railroad/Highway/Stream Crossing - Trenchless Pipe Construction							
Blowdown							
Trenchless construction	8	in	700	LF	$40	$224,000	
Trenchless pipe construction: Jacking Pit			2	EA	$75,000	$150,000	Bridge (150') and Railroad (550') Crossing
Trenchless pipe construction: Receiving Pit			2	EA	$30,000	$60,000	
Subtotal						*$434,000*	
CCWD Canal							
CCWD Connection Fee - Primary Supply						$0	
Gaylord East Lateral Purchase			0.0	LS	$5,000,000	$0	
Subtotal						*$0*	
Distribution Subtotal						**$5,518,600**	
Pump Stations							
Booster Pump Station							
Blowdown							
Base Cost			1	LS	$318,500	$318,500	
Cost per MGD			0.8	MGD	$213,900	$171,200	
Subtotal						*$489,700*	
Pump Station Subtotal						**$489,700**	
Blowdown O&M Costs						**$5,216,000**	
Canal Water O&M Costs						**$792,000**	
TOTAL CAPITAL COSTS						**$6,008,000**	

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
O&M COSTS							
Water Purchase							
CCWD Canal Water			1,610	AF	$500	$805,000	
Pump Station							
Pump Station Power Cost							
Blowdown Pump Station			126,400	kWh	$0.13	$16,400	
Subtotal						*$16,400*	
Pump Station Maintenance Cost							
Blowdown Pump Station			$489,700		5%	$24,500	Of pump station cost
Subtotal						*$24,500*	
Distribution							
Blowdown Pipeline			$3,902,400		1%	$39,000	Of total pipeline cost
Canal Water Pipeline			$720,000		1%	$7,200	Of total pipeline cost
Subtotal						*$46,200*	
Blowdown O&M Costs						**$80,000**	
Canal Water O&M Costs						**$812,000**	
TOTAL O&M COSTS						**$892,000**	

Pump Station Calculations

HP Calculation hp = (gpm * TDH)/(3960 * eff) TDH = Total Dynamic Head (ft)

Power for Pumping 1 hp = 0.746 kW efficiency (eff) = 75%

	Blowdown Pipeline	Canal Lateral	Notes
Peak Flow (mgd):	0.8	2.4	
Peak Flow (gpm):	560	1,670	
Avg Day of Peak Month (gpm):	470	1,400	
Annual Avg Flow (gpm):	340	1,000	
Annual Avg Flow (AFY):	540	1,610	
Peak TDH (ft):	210	NA	
Avg Day of Peak Month TDH (ft):	170	Na	
Design HP:	40	NA	Calculated based on Peak Flow and Peak TDH.
Annual kWh:	126,400	NA	Based on Annual Average Flow and Average Day of Peak Month TDH.

Project: East County Industrial Recycled Water Facilities Plan

Aspect: Alternative A5b: CCWD Canal (8 MGD)

Estimate Type: Planning Level

Date: July 17, 2009
Project Number: 0013-015.00

Prepared by: MP, RM
Checked by: JT
Check Date: September 5, 2008

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
CAPITAL COSTS							
Distribution							
Pipeline							
Blowdown							
12-inch, PVC, Paved			27,100	LF	$216	$5,853,600	
Canal Water Suppy							
18-inch, DI, Paved			4,350	LF	$324	$1,409,400	
Subtotal						*$7,263,000*	
Appurtenances			$7,263,000	LS	10%	$726,300	Percentage of pipeline cost
Railroad/Highway/Stream Crossing - Trenchless Pipe Construction							
Blowdown							
Trenchless construction	12	in	700	LF	$40	$336,000	
Trenchless pipe construction: Jacking Pit			2	EA	$75,000	$150,000	Bridge (150') and Railroad (550') Crossing
Trenchless pipe construction: Receiving Pit			2	EA	$30,000	$60,000	
Subtotal						*$546,000*	
CCWD Canal							
CCWD Connection Fee - Primary Supply						$0	
Gaylord East Lateral Purchase			1.0	LS	$5,000,000	$5,000,000	
Subtotal						*$5,000,000*	
Distribution Subtotal						**$13,535,300**	
Pump Stations							
Booster Pump Station							
Blowdown							
Base Cost			1	LS	$318,500	$318,500	
Cost per MGD			2.7	MGD	$213,900	$571,200	
Subtotal						*$889,700*	
Pump Station Subtotal						**$889,700**	
Blowdown O&M Costs						**$7,875,000**	
Canal Water O&M Costs						**$6,550,000**	
TOTAL CAPITAL COSTS						**$14,425,000**	

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
O&M COSTS							
Water Purchase							
CCWD Canal Water			5,380	AF	$500	$2,690,000	
Pump Station							
Pump Station Power Cost							
Blowdown Pump Station			490,900	kWh	$0.13	$63,800	
Subtotal						*$63,800*	
Pump Station Maintenance Cost							
Blowdown Pump Station			$889,700		5%	$44,500	Of pump station cost
Subtotal						*$44,500*	
Distribution							
Blowdown Pipeline			$5,853,600		1%	$58,500	Of total pipeline cost
Canal Water Pipeline			$1,409,400		1%	$14,100	Of total pipeline cost
Subtotal						*$72,600*	
Blowdown Capital Costs						**$167,000**	
Canal Water Capital Costs						**$2,704,000**	
TOTAL O&M COSTS						**$2,871,000**	

Pump Station Calculations

HP Calculation	hp = (gpm * TDH)/(3960 * eff)	TDH = Total Dynamic Head (ft)	
Power for Pumping	1 hp = 0.746 kW	efficiency (eff) = 75%	

	Blowdown Pipeline	Canal Lateral	Notes
Peak Flow (mgd):	2.7	8.0	
Peak Flow (gpm):	1,850	5,560	
Avg Day of Peak Month (gpm):	1,550	4,670	
Annual Avg Flow (gpm):	1,110	3,340	
Annual Avg Flow (AFY):	1,790	5,380	
Peak TDH (ft):	250	NA	
Avg Day of Peak Month TDH (ft):	200	NA	
Design HP:	160	NA	Calculated based on Peak Flow and Peak TDH.
Annual kWh:	490,900	NA	Based on Annual Average Flow and Average Day of Peak Month TDH.

RMC Water and Environment

Project: East County Industrial Recycled Water Facilities Plan

Aspect: Pittsburg Power Plant Summary

Estimate Type: Preliminary Planning

Date: July 17, 2009
Project Number: 0013-015.00

Prepared by: MP, RM
Checked by: JT
Check Date: September 5, 2008

Capital Costs	P1 (5.5 MGD)	P2 (8.0 MGD)	P2x (6.0 MGD)	P3 (3.7 MGD)	P4a (3.7 MGD)	P4b (8.0 MGD)	Notes
Construction Costs							
Raw Construction Costs	$ 30,171,000	$ 42,520,000	$ 27,490,000	$ 31,396,900	$ 8,303,000	$ 10,861,000	
Recycled Water Supply	$ 20,756,000	$ 31,590,000	$ 18,040,000	$ 23,087,900	$ -	$ -	
Blowdown	$ 4,601,000	$ 5,570,000	$ 4,640,000	$ 4,472,000	$ 4,466,000	$ 5,559,000	
Canal Water Supply	$ 4,814,000	$ 5,360,000	$ 4,810,000	$ 3,837,000	$ 3,837,000	$ 5,302,000	
Conceptual Design Level Conting. (25%)	$ 7,543,000	$ 10,630,000	$ 6,873,000	$ 7,849,000	$ 2,076,000	$ 2,715,000	
Construction Cost Subtotal	**$ 37,714,000**	**$ 53,150,000**	**$ 34,363,000**	**$ 39,246,000**	**$ 10,379,000**	**$ 13,576,000**	
Project Planning Costs							
Pre-Construction: Eng/Design, Env. Docs, etc. (15%)	$ 5,657,000	$ 7,973,000	$ 5,154,000	$ 5,887,000	$ 1,557,000	$ 2,036,000	
During Construction: CM, ESDC, Legal (15%)	$ 5,657,000	$ 7,973,000	$ 5,154,000	$ 5,887,000	$ 1,557,000	$ 2,036,000	
Project Planning Cost Subtotal	**$ 11,314,000**	**$ 15,946,000**	**$ 10,308,000**	**$ 11,774,000**	**$ 3,114,000**	**$ 4,072,000**	
Project Cost Total	**$ 49,028,000**	**$ 69,096,000**	**$ 44,671,000**	**$ 51,019,900**	**$ 13,493,000**	**$ 17,648,000**	

Annual Costs	P1 (5.5 MGD)	P2 (8.0 MGD)	P2x (6.0 MGD)	P3 (3.7 MGD)	P4a (3.7 MGD)	P4b (8.0 MGD)	
Annualized Capital Cost	$ 4,274,000	$ 6,024,000	$ 3,895,000	$ 4,448,000	$ 1,176,000	$ 1,539,000	See financing info below
Total O&M Cost	$ 846,000	$ 1,533,000	$ 1,123,000	$ 962,000	$ 1,345,000	$ 2,861,700	
Recycled Water Supply	$ 704,000	$ 1,361,000	$ 981,000	$ 856,000	$ -	$ -	
Blowdown	$ 111,000	$ 138,000	$ 111,000	$ 82,000	$ 81,000	$ 137,700	
Canal Water Supply	$ 31,000	$ 34,000	$ 31,000	$ 24,000	$ 1,264,000	$ 2,724,000	
Total Annual Cost	**$ 5,120,000**	**$ 7,557,000**	**$ 5,018,000**	**$ 5,410,000**	**$ 2,521,000**	**$ 4,400,700**	
Base Load Plant							Base load plant water demand assumes plant capacity factor of 60%
Average Annual Production (AFY)	3,690	5,380	4,030	2,480	2,480	5,380	
Unit Cost ($ / AF)	**$1,390**	**$1,400**	**$1,250**	**$2,180**	**$1,020**	**$820**	
CCWD Duplication of Service Fee	$315	$315	$315	$315	$0	$0	
Adjusted Unit Cost ($ / AF)	**$1,710**	**$1,720**	**$1,570**	**$2,500**	**$1,020**	**$820**	

Notes:

CCWD Connection fee is not included.
All capital costs are rounded to the nearest thousand.
All annual costs are rounded to the nearest hundred.

0.06 = Financing Rate
20 = Financing Term (Years)

Project: East County Industrial Recycled Water Facilities Plan

Aspect: Alternative P1: DDSD RWF (5.5 MGD)

Estimate Type: Planning Level

Date: July 17, 2009
Project Number: 0013-015.00

Prepared by: MP, RM
Checked by: JT
Check Date: September 5, 2008

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
CAPITAL COSTS							
Distribution							
Pipeline							
Recycled Water Supply							
16-inch, DI, Paved			19,650	LF	$288	$5,659,200	
Blowdown							
10-inch, PVC, Paved			19,650	LF	$180	$3,537,000	
Canal Water Suppy							
18-inch, DI, Paved			9,500	LF	$324	$3,078,000	
Subtotal						*$12,274,200*	
Appurtenances			$12,274,200	LS	10%	$1,227,400	Percentage of pipeline cost
Railroad/Highway Crossing - Trenchless Pipe Construction							
Canal Water Supply							
Trenchless construction	18	in	1,400	LF	$40	$1,008,000	Roads (180', 200'), Highway 4 (400') and Railroad (620') Crossing
Trenchless pipe construction: Jacking Pit			4	EA	$75,000	$300,000	
Trenchless pipe construction: Receiving Pit			4	EA	$30,000	$120,000	
Subtotal						*$1,428,000*	
CCWD Canal							
CCWD Connection Fee - Backup Supply						$0	
Subtotal						*$0*	
Distribution Subtotal						**$14,930,000**	
Recycled Water Treatment							
DDSD							
DDSD RWF Tertiary Treatment Train WRP			6.4	MGD	$13,390,000	$13,390,000	Cost for full 6.4 MGD treatment train, but not all capacity is needed.
Subtotal						*$13,390,000*	
Recycled Water Treatment Subtotal						**$13,390,000**	
Pump Stations							
Wet Well-Dry Well Wastewater Pump Station							
Recycled Water Supply							
Base Cost			1	LS	$509,900	$509,900	
Cost per MGD			5.5	MGD	$114,800	$631,400	
Subtotal						*$1,141,300*	
Booster Pump Station							
Blowdown							
Base Cost			1	LS	$318,500	$318,500	
Cost per MGD			1.8	MGD	$213,900	$391,500	
Subtotal						*$710,000*	
Pump Station Subtotal						**$1,851,300**	
Recycled Water Capital Costs						**$20,756,000**	
Blowdown Capital Costs						**$4,601,000**	
Canal Water Capital Costs						**$4,814,000**	
TOTAL CAPITAL COSTS						**$30,171,000**	

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
O&M COSTS							
Water Purchase							
CCWD Canal Water			0	AF	$500	$0	Back-up supply
Subtotal						*$0*	
Pump Station							
Pump Station Power Cost							
Recycled Water Pump Station			755,800	kWh	$0.13	$98,300	
Blowdown Pump Station			306,000	kWh	$0.13	$39,800	
Subtotal						*$138,100*	
Pump Station Maintenance Cost							
Recycled Water Pump Station			$1,141,300		5%	$57,100	Of pump station cost
Blowdown Pump Station			$710,000		5%	$35,500	Of pump station cost
Subtotal						*$92,600*	
Distribution							
Recycled Water Pipeline			$5,659,200		1%	$56,600	Of total pipeline cost
Blowdown Pipeline			$3,537,000		1%	$35,400	Of total pipeline cost
Canal Water Pipeline			$3,078,000		1%	$30,800	Of total pipeline cost
Subtotal						*$122,800*	
Treatment							
Tertiary Treatment Plant			1,200	MG	$410	$492,000	
Subtotal						*$492,000*	
Recycled Water O&M Costs						**$704,000**	
Blowdown O&M Costs						**$111,000**	
Canal Water O&M Costs						**$31,000**	
TOTAL O&M COSTS						**$846,000**	

Pump Station Calculations

HP Calculation hp = (gpm * TDH)/(3960 * eff) TDH = Total Dynamic Head (ft)

Power for Pumping 1 hp = 0.746 kW efficiency (eff) = 75%

	RW Pipeline	Blowdown Pipeline	Canal Lateral	Notes
Peak Flow (gpm):	5.5	1.8	5.5	
Peak Flow (gpm):	3,820	1,270	3,820	
Avg Day of Peak Month (gpm):	3,210	1,070	3,210	
Annual Avg Flow (gpm):	2,290	760	2,290	
Annual Avg Flow (AFY):	3,690	1,230	3,690	
Peak TDH (ft):	190	230	NA	
Avg Day of Peak Month TDH (ft):	150	180	NA	
Design HP:	240	100	NA	Calculated based on Peak Flow and Peak TDH.
Annual kWh:	755,800	306,000	NA	Based on Annual Average Flow and Average Day of Peak Month TDH.

Project: East County Industrial Recycled Water Facilities Plan

Aspect: Alternative P2: CCCSD RWF (8.0 MGD)

Estimate Type: Planning Level

Date: July 17, 2009
Project Number: 0013-015.00

Prepared by: MP, RM
Checked by: JT
Check Date: September 5, 2008

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
CAPITAL COSTS							
Distribution							
Pipeline							
Recycled Water Supply							
18-inch, DI, Paved			19,460	LF	$324	$6,305,000	
18-inch, DI, Unpaved			48,460	LF	$270	$13,084,000	
Blowdown							
12-inch, PVC, Paved			19,650	LF	$216	$4,244,400	
Canal Water Suppy							
21-inch, DI, Paved			9,500	LF	$360	$3,420,000	
Subtotal						*$27,053,400*	
Appurtenances			$27,053,400	LS	10%	$2,705,000	Percentage of pipeline cost
Railroad/Highway/Stream Crossing - Trenchless Pipe Construction							
Recycled Water Supply							
Trenchless construction	18	in	1,400	LF	$40	$1,008,000	
Trenchless pipe construction: Jacking Pit			7	EA	$75,000	$525,000	Channel (300', 550', 90', 160'); CCWD Pipe
Trenchless pipe construction: Receiving Pit			7	EA	$30,000	$210,000	(70') and Railroad (100', 200') Crossing
Subtotal						*$1,743,000*	
Canal Water Supply							
Trenchless construction	21	in	1,400	LF	$40	$1,176,000	Roads (180', 200'), Highway 4 (400') and
Trenchless pipe construction: Jacking Pit			4	LS	$75,000	$300,000	Railroad (620') Crossing
Trenchless pipe construction: Receiving Pit			4	LS	$30,000	$120,000	
Subtotal						*$1,596,000*	
CCWD Canal							
CCWD Connection Fee - Backup Supply						$0	
Subtotal						*$0*	
Distribution Subtotal						**$33,097,400**	
Recycled Water Treatment							
CCCSD							
RWF Tertiary Treatment Upgrade			8.0	8.0 MGD	$5,062,000	$5,062,000	
Recycled Water Treatment Subtotal						**$5,062,000**	
Pump Stations							
Wet Well-Dry Well Wastewater Pump Station							
Recycled Water Supply							
Base Cost			1	LS	$509,900	$510,000	
Cost per MGD			8.0	MGD	$114,800	$918,000	
Subtotal						*$1,428,000*	
Booster Pump Station							
Recycled Water Supply							
Base Cost			1	LS	$318,500	$319,000	
Cost per MGD			8.0	MGD	$213,900	$1,711,000	
Subtotal						*$2,030,000*	
Blowdown							
Base Cost			1	LS	$318,500	$319,000	
Cost per MGD			2.7	MGD	$213,900	$578,000	
Subtotal						*$897,000*	
Pump Station Subtotal						**$4,355,000**	
Recycled Water Capital Costs						**$31,590,000**	
Blowdown Capital Costs						**$5,570,000**	
Canal Water Capital Costs						**$5,360,000**	
TOTAL CAPITAL COSTS						**$42,510,000**	

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
O&M COSTS							
Water Purchase							
CCWD Canal Water			0	AF	$500	$0	Back-up supply
Subtotal						*$0*	
Pump Station							
Pump Station Power Cost							
Recycled Water Pump Station at CCCSD			1,881,400	kWh	$0.13	$244,600	
Recycled Water Pump Station			1,322,800	kWh	$0.13	$172,000	
Blowdown Pump Station			390,800	kWh	$0.13	$50,800	
Subtotal						*$467,400*	
Pump Station Maintenance Cost							
Recycled Water Pump Station at CCCSD			$1,428,000		5%	$71,400	Of pump station cost
Recycled Water Pump Station			$2,030,000		5%	$101,500	Of pump station cost
Blowdown Pump Station			$897,000		5%	$44,900	Of pump station cost
Subtotal						*$217,800*	
Distribution							
Recycled Water Pipeline			$19,389,000		1%	$193,900	Of total pipeline cost
Blowdown Pipeline			$4,244,400		1%	$42,400	Of total pipeline cost
Canal Water Pipeline			$3,420,000		1%	$34,200	Of total pipeline cost
Subtotal						*$270,500*	
Treatment							
CCCSD 8 MGD Expansion			1,750	MG	$330	$577,500	
Subtotal						*$577,500*	
Recycled Water O&M Costs						**$1,361,000**	
Blowdown O&M Costs						**$138,000**	
Canal Water O&M Costs						**$34,000**	
TOTAL O&M COSTS						**$1,533,000**	

Pump Station Calculations

HP Calculation hp = (gpm * TDH)/(3960 * eff) TDH = Total Dynamic Head (ft)

Power for Pumping 1 hp = 0.746 kW efficiency (eff) = 75%

	RW Pipeline	RW Pipeline	Blowdown Pipeline	Canal Lateral	Notes
Peak Flow (gpm):	8.0	8.0	2.7	8.0	
Peak Flow (gpm):	5,560	5,560	1,850	5,560	
Avg Day of Peak Month (gpm):	4,670	4,670	1,550	4,670	
Annual Avg Flow (gpm):	3,340	3,340	1,110	3,340	
Annual Avg Flow (AFY):	5,380	5,380	1,790	5,380	
Peak TDH (ft):	290	220	200	NA	
Avg Day of Peak Month TDH (ft):	260	180	160	NA	
Design HP:	550	400	120	NA	Calculated based on Peak Flow and Peak TDH.
Annual kWh:	1,881,400	1,322,800	390,800	NA	Based on Annual Average Flow and Average Day of Peak Month TDH.

Project: East County Industrial Recycled Water Facilities Plan

Aspect: Alternative P2: CCCSD RWF (6.0 MGD; with Slipliner)

Estimate Type: Planning Level

Date: July 17, 2009
Project Number: 0013-015.00

Prepared by: MP, RM
Checked by: JT
Check Date: September 5, 2008

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
CAPITAL COSTS							
Distribution							
Pipeline							
Recycled Water Supply							
16-inch, DI, Paved			19,460	LF	$288	$5,604,000	
16-inch, DI, Unpaved			9,690	LF	$240	$2,326,000	
15" Slipliner			38,770	LF	$45	$1,745,000	
Slipliner Access Points			26	EA	$8,000	$207,000	
Blowdown							
10-inch, PVC, Paved			19,650	LF	$180	$3,537,000	
Canal Water Suppy							
18-inch, DI, Paved			9,500	LF	$324	$3,078,000	
Subtotal						*$14,545,000*	
Appurtenances			$14,545,000	LS	10%	$1,455,000	Percentage of pipeline cost
Railroad/Highway/Stream Crossing - Trenchless Pipe Construction							
Recycled Water Supply							
Trenchless construction	16	in	700	LF	$40	$448,000	
Trenchless pipe construction: Jacking Pit			3	EA	$75,000	$225,000	Channel (300', 550', 90', 160'); CCWD Pipe
Trenchless pipe construction: Receiving Pit			3	EA	$30,000	$90,000	(70') and Railroad (100', 200') Crossing
Subtotal						*$763,000*	
Canal Water Supply							
Trenchless construction	18	in	1,400	LF	$40	$1,008,000	Roads (180', 200'), Highway 4 (400') and
Trenchless pipe construction: Jacking Pit			4	LS	$75,000	$300,000	Railroad (620') Crossing
Trenchless pipe construction: Receiving Pit			4	LS	$30,000	$120,000	
Subtotal						*$1,428,000*	
CCWD Canal							
CCWD Connection Fee - Backup Supply						$0	
Subtotal						*$0*	
Distribution Subtotal						**$20,143,000**	
Recycled Water Treatment							
CCCSD							
RWF Tertiary Treatment Upgrade			6.0	8.0 MGD	$5,062,000	$3,797,000	
Recycled Water Treatment Subtotal						**$3,797,000**	
Pump Stations							
Wet Well-Dry Well Wastewater Pump Station							
Recycled Water Supply							
Base Cost			1	LS	$509,900	$510,000	
Cost per MGD			6.0	MGD	$114,800	$689,000	
Subtotal						*$1,199,000*	
Booster Pump Station							
Recycled Water Supply							
Base Cost			1	LS	$318,500	$319,000	
Cost per MGD			6.0	MGD	$213,900	$1,283,000	
Subtotal						*$1,602,000*	
Blowdown							
Base Cost			1	LS	$318,500	$319,000	
Cost per MGD			2.0	MGD	$213,900	$428,000	
Subtotal						*$747,000*	
Pump Station Subtotal						**$3,548,000**	
Recycled Water Capital Costs						**$18,040,000**	
Blowdown Capital Costs						**$4,640,000**	
Canal Water Capital Costs						**$4,810,000**	
TOTAL CAPITAL COSTS						**$27,490,000**	

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
O&M COSTS							
Water Purchase							
CCWD Canal Water			0	AF	$500	$0	Back-up supply
Subtotal						*$0*	
Pump Station							
Pump Station Power Cost							
Recycled Water Pump Station at CCCSD			1,408,200	kWh	$0.13	$183,100	
Recycled Water Pump Station			990,100	kWh	$0.13	$128,700	
Blowdown Pump Station			292,200	kWh	$0.13	$38,000	
Subtotal						*$349,800*	
Pump Station Maintenance Cost							
Recycled Water Pump Station at CCCSD			$1,199,000		5%	$60,000	Of pump station cost
Recycled Water Pump Station			$1,602,000		5%	$80,100	Of pump station cost
Blowdown Pump Station			$747,000		5%	$37,400	Of pump station cost
Subtotal						*$177,500*	
Distribution							
Recycled Water Pipeline			$9,675,000		1%	$96,800	Of total pipeline cost
Blowdown Pipeline			$3,537,000		1%	$35,400	Of total pipeline cost
Canal Water Pipeline			$3,078,000		1%	$30,800	Of total pipeline cost
Subtotal						*$163,000*	
Treatment							
CCCSD 8 MGD Expansion			1,310	MG	$330	$432,300	
Subtotal						*$432,300*	
Recycled Water O&M Costs						**$981,000**	
Blowdown O&M Costs						**$111,000**	
Canal Water O&M Costs						**$31,000**	
TOTAL O&M COSTS						**$1,123,000**	

Pump Station Calculations

HP Calculation hp = (gpm * TDH)/(3960 * eff) TDH = Total Dynamic Head (ft)

Power for Pumping 1 hp = 0.746 kW efficiency (eff) = 75%

	RW Pipeline	RW Pipeline	Blowdown Pipeline	Canal Lateral	Notes
Peak Flow (gpm):	6.0	6.0	2.0	6.0	
Peak Flow (gpm):	4,167	4,167	1,390	4,167	
Avg Day of Peak Month (gpm):	3,500	3,500	1,170	3,500	
Annual Avg Flow (gpm):	2,500	2,500	830	2,500	
Annual Avg Flow (AFY):	4,030	4,030	1,340	4,030	
Peak TDH (ft):	290	220	200	NA	
Avg Day of Peak Month TDH (ft):	260	180	160	NA	
Design HP:	410	300	90	NA	Calculated based on Peak Flow and Peak TDH.
Annual kWh:	1,408,200	990,100	292,200	NA	Based on Annual Average Flow and Average Day of Peak Month TDH.

Project: East County Industrial Recycled Water Facilities Plan

Aspect: Alt P3: Satellite Treatment at Pittsburg (3.7 MGD)

Estimate Type: Planning Level

Date: July 17, 2009
Project Number: 0013-015.00

Prepared by: MP, RM
Checked by: JT
Check Date: September 5, 2008

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
CAPITAL COSTS							
Distribution							
Pipeline							
Recycled Water Supply							
12-inch, PVC, Paved			1,360	LF	$216	$293,800	
Blowdown							
10-inch, PVC, Paved			19,650	LF	$180	$3,537,000	
Canal Water Suppy							
14-inch, PVC, Paved			9,500	LF	$252	$2,394,000	
Subtotal						*$6,224,800*	
Appurtenances			$6,224,800	LS	10%	$622,500	Percentage of pipeline cost
Railroad/Highway Crossing - Trenchless Pipe Construction							
Canal Water Supply							
Trenchless construction	14	in	1,400	LF	$40	$784,000	Roads (180', 200'), Highway 4 (400') and
Trenchless pipe construction: Jacking Pit			4	EA	$75,000	$300,000	Railroad (620') Crossing
Trenchless pipe construction: Receiving Pit			4	EA	$30,000	$120,000	
Subtotal						*$1,204,000*	
CCWD Canal							
CCWD Connection Fee - Backup Supply						$0	
Subtotal						*$0*	
Distribution Subtotal						**$8,051,300**	
Recycled Water Treatment							
DDSD							
Satellite MBR / UV Treatment Plant			3.7	MGD	$5,900,000	$21,830,000	
Recycled Water Treatment Subtotal						**$21,830,000**	
Pump Stations							
Wet Well-Dry Well Wastewater Pump Station							
Recycled Water Supply							
Base Cost			1	LS	$509,900	$509,900	
Cost per MGD			3.7	MGD	$114,800	$424,800	
Subtotal						*$934,700*	
Booster Pump Station							
Blowdown							
Base Cost			1	LS	$318,500	$318,500	
Cost per MGD			1.2	MGD	$213,900	$263,100	
Subtotal						*$581,600*	
Pump Station Subtotal						**$1,516,300**	
Recycled Water Capital Costs						**$23,087,900**	
Blowdown Capital Costs						**$4,472,000**	
Canal Water Capital Costs						**$3,837,000**	
TOTAL CAPITAL COSTS						**$31,398,000**	

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
O&M COSTS							
Water Purchase							
CCWD Canal Water			0	AF	$500	$0	Back-up supply
Subtotal						*$0*	
Pump Station							
Pump Station Power Cost							
Recycled Water Pump Station			220,300	kWh	$0.13	$28,600	
Blowdown Pump Station			131,600	kWh	$0.13	$17,100	
Subtotal						*$45,700*	
Pump Station Maintenance Cost							
Recycled Water Pump Station			$934,700		5%	$46,700	Of pump station cost
Blowdown Pump Station			$581,600		5%	$29,100	Of pump station cost
Subtotal						*$75,800*	
Distribution							
Recycled Water Pipeline			$293,800		1%	$2,900	Of total pipeline cost
Blowdown Pipeline			$3,537,000		1%	$35,400	Of total pipeline cost
Canal Water Pipeline			$2,394,000		1%	$23,900	Of total pipeline cost
Subtotal						*$62,200*	
Treatment							
Satellite MBR / UV Treatment Plant			810	MG	$960	$777,600	
Subtotal						*$777,600*	
Recycled Water O&M Costs						**$856,000**	
Blowdown O&M Costs						**$82,000**	
Canal Water O&M Costs						**$24,000**	
TOTAL O&M COSTS						**$961,000**	

Pump Station Calculations

HP Calculation hp = (gpm * TDH)/(3960 * eff) TDH = Total Dynamic Head (ft)

Power for Pumping 1 hp = 0.746 kW efficiency (eff) = 75%

	RW Pipeline	Blowdown Pipeline	Canal Lateral	Notes
Peak Flow (gpm):	3.7	1.2	3.7	
Peak Flow (gpm):	2,570	860	2,570	
Avg Day of Peak Month (gpm):	2,160	720	2,160	
Annual Avg Flow (gpm):	1,540	520	1,540	
Annual Avg Flow (AFY):	2,480	830	2,480	
Peak TDH (ft):	70	140	NA	
Avg Day of Peak Month TDH (ft):	70	120	NA	
Design HP:	60	40	NA	Calculated based on Peak Flow and Peak TDH.
Annual kWh:	220,300	131,600	NA	Based on Annual Average Flow and Average Day of Peak Month TDH.

Project: East County Industrial Recycled Water Facilities Plan

Aspect: Alternative P4a: CCWD Canal (3.7 MGD)

Estimate Type: Planning Level

Date: July 17, 2009
Project Number: 0013-015.00

Prepared by: MP, RM
Checked by: JT
Check Date: September 5, 2008

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
CAPITAL COSTS							
Distribution							
Pipeline							
Blowdown							
10-inch, PVC, Paved			19,650	LF	$180	$3,537,000	
Canal Water Suppy							
14-inch, DI, Paved			9,500	LF	$252	$2,394,000	
Subtotal						*$5,931,000*	
Appurtenances			$5,931,000	LS	10%	$593,100	Percentage of pipeline cost
Railroad/Highway Crossing - Trenchless Pipe Construction							
Canal Water Supply							
Trenchless construction	14	in	1,400	LF	$40	$784,000	Roads (180', 200'), Highway 4 (400') and Railroad (620') Crossing
Trenchless pipe construction: Jacking Pit			4	0	$75,000	$300,000	
Trenchless pipe construction: Receiving Pit			4	in-dia/ft	$30,000	$120,000	
Subtotal						*$1,204,000*	
CCWD Canal							
CCWD Connection Fee - Primary Supply						$0	
Subtotal						*$0*	
Distribution Subtotal						**$7,728,100**	
Pump Stations							
Booster Pump Station							
Blowdown							
Base Cost			1	LS	$318,500	$318,500	
Cost per MGD			1.2	MGD	$213,900	$256,700	
Subtotal						*$575,200*	
Pump Station Subtotal						**$575,200**	
Blowdown Capital Costs						**$4,466,000**	
Canal Water Capital Costs						**$3,837,000**	
TOTAL CAPITAL COSTS						**$8,303,000**	

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
O&M COSTS							
Water Purchase							
CCWD Canal Water			2,480	AF	$500	$1,240,000	
Pump Station							
Pump Station Power Cost							
Blowdown Pump Station			131,600	kWh	$0.13	$17,100	
Subtotal						*$17,100*	
Pump Station Maintenance Cost							
Blowdown Pump Station			$575,200		5%	$28,800	Of pump station cost
Subtotal						*$28,800*	
Distribution							
Blowdown Pipeline			$3,537,000		1%	$35,400	Of total pipeline cost
Canal Water Pipeline			$2,394,000		1%	$23,900	Of total pipeline cost
Subtotal						*$59,300*	
Blowdown O&M Costs						**$81,000**	
Canal Water O&M Costs						**$1,264,000**	
TOTAL O&M COSTS						**$1,345,000**	

Pump Station Calculations

HP Calculation hp = (gpm * TDH)/(3960 * eff) TDH = Total Dynamic Head (ft)

Power for Pumping 1 hp = 0.746 kW efficiency (eff) = 75%

	Blowdown Pipeline	Canal Lateral	Notes
Peak Flow (mgd):	1.2	3.7	
Peak Flow (gpm):	860	2,570	
Avg Day of Peak Month (gpm):	720	2,160	
Annual Avg Flow (gpm):	520	1,540	
Annual Avg Flow (AFY):	830	2,480	
Peak TDH (ft):	140	NA	
Avg Day of Peak Month TDH (ft):	120	NA	
Design HP:	40	NA	Calculated based on Peak Flow and Peak TDH.
Annual kWh:	131,600	NA	Based on Annual Average Flow and Average Day of Peak Month TDH.

Project: East County Industrial Recycled Water Facilities Plan

Aspect: Alternative P4b: CCWD Canal (8 MGD)

Estimate Type: Planning Level

Date: July 17, 2009
Project Number: 0013-015.00

Prepared by: MP, RM
Checked by: JT
Check Date: September 5, 2008

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
CAPITAL COSTS							
Distribution							
Pipeline							
Blowdown							
12-inch, PVC, Paved			19,650	LF	$216	$4,244,400	
Canal Water Suppy							
20-inch, DI, Paved			9,500	LF	$360	$3,420,000	
Subtotal						*$7,664,400*	
Appurtenances			$7,664,400	LS	10%	$766,440	Percentage of pipeline cost
Railroad/Highway Crossing - Trenchless Pipe Construction							
Canal Water Supply							
Trenchless construction	20	in	1,400	LF	$40	$1,120,000	Roads (180', 200'), Highway 4 (400') and Railroad (620') Crossing
Trenchless pipe construction: Jacking Pit			4	0	$75,000	$300,000	
Trenchless pipe construction: Receiving Pit			4	in-dia/ft	$30,000	$120,000	
Subtotal						*$1,540,000*	
CCWD Canal							
CCWD Connection Fee - Primary Supply						$0	
Subtotal						*$0*	
Distribution Subtotal						**$9,970,800**	
Pump Stations							
Booster Pump Station							
Blowdown							
Base Cost			1	LS	$318,500	$318,500	
Cost per MGD			2.7	MGD	$213,900	$571,200	
Subtotal						*$889,700*	
Pump Station Subtotal						**$889,700**	
Blowdown O&M Costs						**$5,559,000**	
Canal Water O&M Costs						**$5,302,000**	
TOTAL CAPITAL COSTS						**$10,861,000**	

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
O&M COSTS							
Water Purchase							
CCWD Canal Water			5,380	AF	$500	$2,690,000	
Pump Station							
Pump Station Power Cost							
Blowdown Pump Station			390,800	kWh	$0.13	$50,800	
Subtotal						*$50,800*	
Pump Station Maintenance Cost							
Blowdown Pump Station			$889,700		5%	$44,500	Of pump station cost
Subtotal						*$44,500*	
Distribution							
Blowdown Pipeline			$4,244,400		1%	$42,400	Of total pipeline cost
Canal Water Pipeline			$3,420,000		1%	$34,200	Of total pipeline cost
Subtotal						*$76,600*	
Blowdown Capital Costs						**$137,700**	
Canal Water Capital Costs						**$2,724,000**	
TOTAL O&M COSTS						**$2,862,000**	

Pump Station Calculations

HP Calculation hp = (gpm * TDH)/(3960 * eff) TDH = Total Dynamic Head (ft)

Power for Pumping 1 hp = 0.746 kW efficiency (eff) = 75%

	Blowdown Pipeline	Canal Lateral	Notes
Peak Flow (mgd):	2.7	8.0	
Peak Flow (gpm):	1,850	5,560	
Avg Day of Peak Month (gpm):	1,550	4,670	
Annual Avg Flow (gpm):	1,110	3,340	
Annual Avg Flow (AFY):	1,790	5,380	
Peak TDH (ft):	200	NA	
Avg Day of Peak Month TDH (ft):	160	NA	
Design HP:	120	NA	Calculated based on Peak Flow and Peak TDH.
Annual kWh:	390,800	NA	Based on Annual Average Flow and Average Day of Peak Month TDH.

RMC Water and Environment

Project: East County Industrial Recycled Water Facilities Plan

Aspect: CCCSD / CCWD Exchange Concept Summary (all 8.0 MGD)

Estimate Type: Preliminary Planning

Date: July 17, 2009
Project Number: 0013-015.00

Prepared by: MP, RM
Checked by: JT
Check Date: September 5, 2008

Capital Costs	X1	X2	AX1	AX2	PX1	PX2	Notes
Construction Costs							
Raw Construction Costs	$ 12,512,000	$ 11,068,000	$ 26,937,000	$ 25,493,000	$ 23,373,000	$ 21,929,000	
Recycled Water Supply	$ 12,512,000	$ 11,068,000	$ 12,512,000	$ 11,068,000	$ 12,512,000	$ 11,068,000	
Blowdown	$ -	$ -	$ 7,875,000	$ 7,875,000	$ 5,559,000	$ 5,559,000	
Canal Water Supply	$ -	$ -	$ 6,550,000	$ 6,550,000	$ 5,302,000	$ 5,302,000	
Conceptual Design Level Conting. (25%)	$ 3,128,000	$ 2,767,000	$ 6,734,000	$ 6,373,000	$ 5,843,000	$ 5,482,000	
Construction Cost Subtotal	**$ 15,640,000**	**$ 13,835,000**	**$ 33,671,000**	**$ 31,866,000**	**$ 29,216,000**	**$ 27,411,000**	
Project Planning Costs							
Pre-Construction: Eng/Design, Env. Docs, etc. (15%)	$ 2,346,000	$ 2,075,000	$ 5,051,000	$ 4,780,000	$ 4,382,000	$ 4,112,000	
During Construction: CM, ESDC, Legal (15%)	$ 2,346,000	$ 2,075,000	$ 5,051,000	$ 4,780,000	$ 4,382,000	$ 4,112,000	
Project Planning Cost Subtotal	**$ 4,692,000**	**$ 4,150,000**	**$ 10,102,000**	**$ 9,560,000**	**$ 8,764,000**	**$ 8,224,000**	
Project Cost Total	**$ 20,332,000**	**$ 17,985,000**	**$ 43,773,000**	**$ 41,426,000**	**$ 37,980,000**	**$ 35,635,000**	

Annual Costs	X1	X2	AX1	AX2	PX1	PX2	
Annualized Capital Cost	$ 1,772,600	$ 1,568,000	$ 3,816,300	$ 3,611,700	$ 3,311,300	$ 3,106,800	See financing info below
Total O&M Cost	$ 1,261,000	$ 1,414,000	$ 1,609,000	$ 1,762,000	$ 1,570,700	$ 1,723,700	
Recycled Water Supply	$ 990,000	$ 876,000	$ 990,000	$ 876,000	$ 990,000	$ 876,000	
Blowdown	$ -	$ -	$ 167,000	$ 167,000	$ 137,700	$ 137,700	
Canal Water Supply	$ 271,000	$ 538,000	$ 452,000	$ 719,000	$ 443,000	$ 710,000	Includes 20% of Canal water purchase cost
Total Annual Cost	**$ 3,033,600**	**$ 2,982,000**	**$ 5,425,300**	**$ 5,373,700**	**$ 4,882,000**	**$ 4,830,500**	
Base Load Plant							Base load plant water demand assumes plant capacity factor of 60%
Average Annual Production (AFY)	5,380	5,380	5,380	5,380	5,380	5,380	
Unit Cost ($ / AF)	**$560**	**$550**	**$1,010**	**$1,000**	**$910**	**$900**	
CCWD Duplication of Service Fee	$315	$315	$315	$315	$315	$315	
Adjusted Unit Cost ($ / AF)	**$880**	**$870**	**$1,330**	**$1,320**	**$1,230**	**$1,220**	

Notes:

CCWD Connection fee is not included.
All capital costs are rounded to the nearest thousand.
All annual costs are rounded to the nearest hundred.

0.06 = Financing Rate
20 = Financing Term (Years)

Project: East County Industrial Recycled Water Facilities Plan

Aspect: Alt X1: Exchange - Shell Refinery (8.0 MGD)

Estimate Type: Planning Level

Date: June 12, 2008
Project Number: 0113-015.00

Prepared by: MLP
Checked by: RAM
Check Date:

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
CAPITAL COSTS							
Distribution							
Recycled Water Supply							
CCCSD Existing Pipeline							
Industrial Pipeline - Modifications			1	LS	$262,900	$262,900	
CCWD Existing Pipelines							
CCCSD to Shell Property			1	LS	$3,228,370	$3,228,400	
CCCSD to Tesoro Property				LS	$1,785,270	$0	
Two Storage Tanks				LS	$5,129,020	$0	
Distribution Subtotal						**$3,491,300**	
Recycled Water Treatment							
CCCSD							
RWF Tertiary Treatment Upgrade			8.0	MGD	$7,592,000	$7,592,000	
Recycled Water Treatment Subtotal						**$7,592,000**	
Pump Stations							
Service Water Pump Staion							
Recycled Water Supply							
Base Cost			1	LS	$509,900	$509,900	
Cost per MGD			8.0	MGD	$114,800	$918,400	
Subtotal						*$1,428,300*	New pump station assumed
Pump Station Subtotal						**$1,428,300**	
Recycled Water Capital Costs						**$12,512,000**	
TOTAL CAPITAL COSTS						**$12,512,000**	
O&M COSTS							
Water Purchase							
CCWD Canal Water			1,076	AF	$500	$538,000	Includes 20% of Canal water purchase cost as incentive for refineries to convert to RW
Pump Station Power Cost							
Recycled Water Pump Station			1,028,900	kWh	$0.13	$133,800	
Subtotal						*$133,800*	
Pump Station Maintenance Cost							
Recycled Water Pump Station			$1,428,300		5%	$71,400	Of pump station cost
Subtotal						*$71,400*	
Distribution							
Recycled Water Pipeline			$6,616,620		1%	$66,200	Of total pipeline cost
Subtotal						*$66,200*	
Treatment							
CCCSD Tertiary Trmt + Ammonia Removal			1,753	MG	$410	$718,900	
Subtotal						*$718,900*	
Recycled Water O&M Costs						**$990,000**	
Recycled Water O&M Costs						**$271,000**	
TOTAL O&M COSTS						**$1,261,000**	

Pump Station Calculations

HP Calculation hp = (gpm * TDH)/(3960 * eff)
Power for Pumping 1 hp = 0.746 kW

TDH = Total Dynamic Head (ft)
efficiency (eff) = 75%

	RW Pipeline	Notes
Peak Flow (mgd):	8.0	
Peak Flow (gpm):	5,560	
Avg Day of Peak Month (gpm):	4,670	
Annual Avg Flow (gpm):	3,340	
Annual Avg Flow (AFY):	5,380	
Peak TDH (ft):	150	
Avg Day of Peak Month TDH (ft):	140	
Design HP:	280	Calculated based on Peak Flow and Peak TDH.
Annual kWh:	1,028,900	Based on Annual Average Flow and Average Day of Peak Month TDH.

Project: East County Industrial Recycled Water Facilities Plan

Aspect: Alt X2: Exchange - Tesoro Refinery (8.0 MGD)

Estimate Type: Planning Level

Date: June 12, 2008
Project Number: 0113-015.00

Prepared by: MLP
Checked by: RAM
Check Date:

Item	Size	Units	Size	Units	Unit Cost	Extended Cost	Notes
CAPITAL COSTS							
Distribution							
Recycled Water Supply							
CCCSD Existing Pipeline							
Industrial Pipeline - Modifications			1	LS	$262,900	$262,900	
CCWD Existing Pipelines							
CCCSD to Shell Property				LS	$3,228,370	$0	
CCCSD to Tesoro Property			1	LS	$1,785,270	$1,785,270	
Two Storage Tanks				LS	$5,129,020	$0	
Distribution Subtotal						**$2,048,170**	
Recycled Water Treatment							
CCCSD							
RWF Tertiary Treatment Upgrade			8.0	MGD	$7,592,000	$7,592,000	
Recycled Water Treatment Subtotal						**$7,592,000**	
Pump Stations							
Service Water Pump Staion							
Recycled Water Supply							
Base Cost			1	LS	$509,900	$509,900	
Cost per MGD			8.0	MGD	$114,800	$918,400	
Subtotal						*$1,428,300*	New pump station assumed
Pump Station Subtotal						**$1,428,300**	
Recycled Water Capital Costs						**$11,068,000**	
TOTAL CAPITAL COSTS						**$11,068,000**	
O&M COSTS							
Water Purchase							
CCWD Canal Water			1,076	AF	$500	$538,000	Includes 20% of Canal water purchase cost as incentive for refineries to convert to RW
Pump Station							
Pump Station Power Cost							
Recycled Water Pump Station			440,900	kWh	$0.13	$57,300	
Subtotal						*$57,300*	
Pump Station Maintenance Cost							
Recycled Water Pump Station			$1,428,300		5%	$71,400	Of pump station cost
Subtotal						*$71,400*	
Distribution							
Recycled Water Pipeline			$2,813,760		1%	$28,100	Of total pipeline cost
Subtotal						*$28,100*	
Treatment							
CCCSD Tertiary Trmt + Ammonia Removal			1,753	MG	$410	$718,900	
Subtotal						*$718,900*	
Recycled Water O&M Costs						**$876,000**	
Recycled Water O&M Costs						**$538,000**	
TOTAL O&M COSTS						**$1,414,000**	

Pump Station Calculations

HP Calculation hp = (gpm * TDH)/(3960 * eff) TDH = Total Dynamic Head (ft)
Power for Pumping 1 hp = 0.746 kW efficiency (eff) = 75%

	RW Pipeline	Notes
Peak Flow (mgd):	8.0	
Peak Flow (gpm):	5,560	
Avg Day of Peak Month (gpm):	4,670	
Annual Avg Flow (gpm):	3,340	
Annual Avg Flow (AFY):	5,380	
Peak TDH (ft):	70	
Avg Day of Peak Month TDH (ft):	60	
Design HP:	130	Calculated based on Peak Flow and Peak TDH.
Annual kWh:	440,900	Based on Annual Average Flow and Average Day of Peak Month TDH.

Appendix C - Cost Evaluation Sensitivity Analysis

DRAFT Memorandum

East County Industrial Reuse Facilities Plan

Subject:	**Sensitivity Analysis for Unit Costs of Alternatives**
Prepared For:	Project Partners (Antioch, CCCSD, CCWD, DDSD, ISD, Mirant, PG&E, Pittsburg)
Prepared by:	Rob Morrow, RMC
Reviewed by:	Dave Richardson, RMC
Date:	February 6, 2008

1 Background

The East County Industrial Recycled Water Facilities Plan (Plan) evaluates a range of recycled water and non-recycled water alternatives to serve potential new power plants in Pittsburg and/or Antioch. One evaluation criterion considered was cost effectiveness and was represented by the unit cost (per acre-foot) of each alternative.

The Plan's detailed cost estimates attempted to define all appropriate capital and operating costs for each alternative; however, some costs and sources of outside funding were not able to be defined at this stage in the planning process. In particular, Contra Costa Water District's (CCWD) connection fee estimates for primary and backup supplies from the Contra Costa Canal (Canal) are site specific (not pre-established) and are developed on a case-by-case basis.

In addition, grant funding has the potential to reduce the capital cost for each alternative and, similarly, could decrease the unit costs by a margin that would possibly alter the cost effectiveness evaluation. The Plan was partially funded by a State Water Resources Control Board (SWRCB) Water Recycling Funding Program (WRFP) planning grant and the recycled water portion of the project that serves new power plants in Pittsburg or Antioch has the potential to receive up to 25% of construction cost from the same grant program. For example, Delta Diablo Sanitation District's (DDSD) recycled water project in Pittsburg that is under construction is being financed on the basis of 50% local cost share, 25% funding from State grants, and the remaining 25% are expected from Federal grants. (The Federal funds have been authorized but have not been appropriated). DDSD is currently pursuing a similar cost share for the Antioch recycled water project as well as securing a loan from the SWRCB State Revolving Fund for the local share with an interest rate of approximately 2.5%.

2 Purpose & Approach

The purpose of this memo was to present an analysis of project costs incorporating the following adjustment items that could have an impact on the final actual cost of the project.

- CCWD Connection Fee (Case-by-Case) for Primary and Backup Supplies
- CCWD Duplication of Service Fee
- State and Federal grants
- Low interest loan from State Revolving Fund

The impact of each line item on each alternative's unit costs is evaluated in the following sections by incorporating an assumed connection fee comparable to the Delta Energy Center / Los Medanos Energy Center (DEC/LMEC) example, duplication of service cost, and possible grant funding into the derivation

of each alternative's unit costs. The fees and grant funding estimates were incorporated so that unit costs could be adjusted and then compared to see the impacts of including the unknown costs.

3 Adjustment Items

Contra Costa Water District Connection Fee

CCWD was unable to provide precise connection fee estimates for the alternatives because these applications are unique situations that are addressed on a case-by-case basis according to CCWD's Code of Regulations. Therefore, the fee was not included in the detailed cost estimates for each alternative included in the body of the report.

The power plant facilities for each alternative are similar to the recently constructed DEC/LMEC facilities so fees that were charged for DEC/LMEC were used in the analysis as an example. DEC/LMEC paid CCWD connection fees for primary raw water supply capacity from the Canal as well as backup supply capacity. The fees were negotiated among the parties involved and represent a resolution of a number of issues. Fees for future projects may or may not be similar because circumstances would most likely have changed. The connection fees are determined on a case-by-case basis.

DEC/LMEC's primary water supply is used for process water demands and the backup supply capacity for evaporative cooling demands. Recycled water is the primary water supply for evaporative cooling demands. The supply capacities and CCWD connection fees in the case of DEC/LMEC are summarized in **Table 1**.

Table 1: CCWD Connection Fees for DEC / LMEC

Item	Supply Capacity	Connection Fee [1]	Equivalent Capital Cost [2]	Equivalent Annual Cost [3]	Equivalent Unit Cost [4]
Primary Supply	1.5 mgd	$3,500,000	$2.3 M / mgd	$170 K / mgd	$247 / af
Backup Supply [5]	9.0 mgd	$250,000	$28 K / mgd	$2 K / mgd	$3 / af

Notes:
1. Fees were developed by CCWD specifically for DEC / LMEC in 2001.
2. Calculated by dividing the Connection Fee by the supply capacity.
3. Calculated by applying financing criteria used for all alternatives (5% over 25 years).
4. Assumes base load plant, which is similar to DEC / LMEC, operating at 60% of capacity. For example, a plant with 1.0 mgd supply capacity would use 670 afy [= 1.0 mgd * (1,120 afy / mgd) * 0.60].
5. Backup supply was limited to no more than 3 days in a month and no more than 15 days in a year.

Contra Costa Water District Duplication of Service

Recycled water projects implemented within CCWD's service area may include duplication of service fees to recover costs incurred by CCWD for system improvements needed to serve its customers. The duplication of service issues are addressed on a case-by-case basis. The current fee was recently estimated as $315/af (CCWD, October 2008).

State & Federal Funding

The Plan is partially funded by a SWRCB WRFP planning grant. The planning grant reimburses 50% of the study cost up to $150,000 so the grant can provide up to $75,000 for any single study. In addition to the planning grants, the SWRCB awards construction grants for recycled water projects through the WRFP. The construction grant reimburses 25% of the construction cost associated with recycled water facilities up to $20.0 million so the construction grant could provides up to $5.0 million for any single project. Another potential State funding source is Proposition 84 (The Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006), which does not have maximum funding limits and has a low local match requirement (10 to 15%).

Based on the availability of these two State funding opportunities and likely Federal funding opportunities, grant funds equal to 50% of the capital costs for recycled water projects and exchange projects is assumed. The grant funding is assumed to apply to recycled water alternatives and exchange alternatives but not to the Canal alternatives.

State Revolving Fund Low-Interest Loans

The Plan is partially funded by a SWRCB WRFP planning grant. The planning grant reimburses 50% of the study cost up to $150,000 so the grant can provide up to $75,000 for any single study. In addition to

4 Impact of Adjustments

This section incorporates the cost adjustments discussed in the previous section into the costs for each alternative. The alternatives are presented as groups (recycled water alternatives, Canal alternatives, and exchange alternatives) since the adjustments only apply to some groups.

Recycled Water Alternatives

Applicable adjustments for the recycled water alternatives include State and Federal grant funding to offset capital costs, SRF low-interest loan, CCWD backup supply connection fee, and CCWD duplication of service fee. The impact of incorporating these items is shown in **Table 2**.

Table 2: Adjusted Capital and Annual Costs for Recycled Water Alternatives

Items	A1	A2	A3	A4	P1	P2	P3
Recycled Water Supply (mgd)	*5.5*	*3.5*	*8.0*	*2.4*	*5.5*	*8.0*	*3.7*
Yield (afy)	*3,690*	*2,350*	*5,380*	*1,610*	*3,690*	*5,380*	*2,480*
Unadjusted Unit Costs	**$1,410**	**$1,150**	**$1,270**	**$1,930**	**$1,170**	**$1,200**	**$1,850**
Capital Costs							
Unadjusted Capital Costs	$60.9	$24.7	$74.2	$34.7	$49.0	$69.1	$51.0
State & Federal Grant Funding (50%)	$30.4	$12.3	$37.1	$17.4	$24.5	$34.5	$25.5
Adjusted Capital Costs	$30.4	$12.3	$37.1	$17.4	$24.5	$34.5	$25.5
Annual Costs							
Adjusted Annualized Capital	$1.9	$0.8	$2.4	$1.1	$1.6	$2.2	$1.6
Unadjusted Annual O&M	$0.9	$0.9	$1.6	$0.6	$0.8	$1.5	$1.0
Adjusted Annual Costs Total	**$2.8**	**$1.7**	**$3.9**	**$1.8**	**$2.4**	**$3.7**	**$2.6**
Unit Costs							
Adjusted Unit Cost w/o CCWD Fees	**$770**	**$740**	**$730**	**$1,090**	**$650**	**$700**	**$1,050**
Backup Supply Connection Fee				$3/af			
Duplication of Service Fee				$315/af			
Adjusted Unit Cost w/ CCWD Fees	**$1,090**	**$1,060**	**$1,050**	**$1,410**	**$970**	**$1,020**	**$1,370**

Incorporation of the grant funding decreases the unit costs of the recycled water alternatives up to 27%. The grant funding values ranged from $12.3 million (for Alternative A2) to $34.5 million (for Alternative P2). The larger grant funding values were realized by the alternatives with larger capital costs. Similarly, application of grant funding had the greatest impact to unit costs of the recycled water alternatives with the highest capital costs but addition of the CCWD fees (connection and duplication of service) also had on the alternatives with the lowest unit costs.

Canal Alternatives

In **Table 3**, the Canal alternatives incorporated the hypothetical CCWD connection fees (*extrapolated by RMC based upon a relatively recent past project*). The CCWD duplication of service fees and State and Federal grant funding were not applied to these alternatives.

Table 3: Unit Costs for Canal Alternatives Adjusted by Extrapolated Connection Fees

Item	A5a	A5b	P4a	P4b
Water Supply (mgd)	*2.4*	*8.0*	*3.7*	*8.0*
Annual Yield (afy)	*1,610*	*5,380*	*2,480*	*5,380*
Unadjusted Unit Cost	**$980**	**$840**	**$930**	**$760**
CCWD Connection Fee	$250 / af			
Adjusted Unit Cost	**$1,230**	**$1,090**	**$1,180**	**$1,010**

Incorporation of the connection fee increased the unit costs of the Canal alternatives by up to 33%. However, it is uncertain exactly what those fees will entail and the only purpose for showing these adjustments is to evaluate the potential range of possibilities based on a previous project in the area.

Exchange Alternatives

In **Table 4**, the exchange alternatives incorporated the estimated CCWD connection fee, State and Federal grant funding, and SRF low-interest loan. The CCWD duplication of service fee was assumed not to apply to the exchange alternatives. Note that the exchange alternatives assume raw surface water from the Canal as the primary supply for the new facility and recycled water for an existing CCWD customer.

Table 4: Adjusted Capital and Annual Costs for Exchange Alternatives

Items	AX1	AX2	PX1	PX2
Recycled Water Supply (mgd)	*8.0*	*8.0*	*8.0*	*8.0*
Yield (afy)	*5,380*	*5,380*	*5,380*	*5,380*
Unadjusted Unit Costs	$880	$870	$790	$790
Capital Costs ($ M)				
Unadjusted Capital Costs	$43.8	$41.4	$38.0	$35.6
State & Federal Grant Funding (50%)	$21.9	$20.7	$19.0	$17.8
Adjusted Capital Costs	$21.9	$20.7	$19.0	$17.8
Annual Costs ($ M)				
Adjusted Annualized Capital	$1.4	$1.3	$1.2	$1.1
Unadjusted Annual O&M	$1.6	$1.8	$1.6	$1.7
Adjusted Annual Costs Total	**$3.0**	**$3.1**	**$2.8**	**$2.9**
Unit Costs ($/af)				
Adjusted Unit Cost w/o CCWD Fees	**$560**	**$570**	**$520**	**$530**
Backup Supply Connection Fee	$250/af			
Adjusted Unit Cost w/ CCWD Fees	**$810**	**$820**	**$770**	**$780**

Incorporation of the adjusted decreased the unit costs of the Exchange alternatives by up to 8%.

5 Analysis & Conclusions

The Plan's alternatives evaluation includes unit cost as a criterion. Inclusion of the hypothetical CCWD connection fee (*extrapolated by RMC based upon a relatively recent past project*), estimated duplication

of service fee, potential State and Federal grant funding, and SRF low-interest loans could change the unit costs if included in the evaluation. A sensitivity analysis was conducted of the cost evaluation by comparing the unit costs of each alternative with the applicable fees and subsidies included. This was not intended to represent what the likely actual project cost but rather was done to provide an example of how the unit costs might vary depending on these other factors. The adjusted and unadjusted unit costs are tabulated in **Table 5.**

Table 5: Impact of Adjusted Costs

Alt	Primary Supply	Yield (afy)	Unit Cost ($ /af)			
			Unadjusted	Adjusted	$ Increase ($ Decrease)	% Increase (% Decrease)
Recycled Water Alternatives						
A1	DDSD RWF	3,690	$1,410	$1,090	($320)	(23%)
A2	ISD RWF	2,350	$1,150	$1,060	($90)	(8%)
A3	DDSD + ISD RWFs	5,380	$1,270	$1,050	($220)	(17%)
A4	DDSD Satellite	1,610	$1,930	$1,410	($520)	(27%)
P1	DDSD RWF	3,690	$1,170	$970	($200)	(17%)
P2	CCCSD RWF	5,380	$1,200	$1,020	($180)	(15%)
P3	DDSD Satellite	2,480	$1,850	$1,370	($480)	(26%)
Canal Alternatives						
A5a	Canal	1,610	$980	$1,230	$250	26%
A5b	Canal	5,380	$840	$1,090	$250	30%
P4a	Canal	2,480	$930	$1,180	$250	27%
P4b	Canal	5,380	$760	$1,010	$250	33%
Exchange Alternatives						
AX1	Canal / CCCSD	5,380	$880	$810	($70)	(8%)
AX2	Canal / CCCSD	5,380	$870	$820	($50)	(6%)
PX1	Canal / CCCSD	5,380	$790	$770	($20)	(3%)
PX2	Canal / CCCSD	5,380	$790	$780	($10)	(1%)

Appendix D - Cash Flow Analysis

Appendix D - Cash Flow Analysis
Antioch Power Plant
No Grant Funding

Project Element	Estimated Cost	Year 1 Q1	Year 1 Q2	Year 1 Q3	Year 1 Q4	Year 2 Q1	Year 2 Q2	Year 2 Q3	Year 2 Q4	Year 3 Q1	Year 3 Q2	Year 3 Q3	Year 3 Q4
Project Costs[1]		**Power Plant Planning**		**Design / Environmental Documentation**									
Pre-Construction Activities[2]	$2,850,000			$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000
Facilities Construction[3]	$33,040,000												
Construction Support Activities[4]	$2,850,000												
Total Quarterly Cost	***$38,740,000***	*$0*	*$0*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*
Cumulative Costs		**$0**	**$0**	**$259,000**	**$518,000**	**$777,000**	**$1,036,000**	**$1,295,000**	**$1,554,000**	**$1,813,000**	**$2,072,000**	**$2,331,000**	**$2,590,000**
Project Funds[1]		**Power Plant Planning**		**Design / Environmental Documentation**									
Ironhouse S.D.	$38,740,000			$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000
Federal Funding	$0												
SWRCB Construction Grant	$0												
Total Quarterly Income	***$38,740,000***	*$0*	*$0*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*
Cumulative Income		**$0**	**$0**	**$259,000**	**$518,000**	**$777,000**	**$1,036,000**	**$1,295,000**	**$1,554,000**	**$1,813,000**	**$2,072,000**	**$2,331,000**	**$2,590,000**
Cumulative Project Balance	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Project Element		Year 4 Q1	Year 4 Q2	Year 4 Q3	Year 4 Q4	Year 5 Q1	Year 5 Q2	Year 5 Q3	Year 5 Q4	Year 6 Q1	Year 6 Q2		Remaining Payments
Project Costs[1]		**Bid/Award**	**Construction**							**Operations**			**(thru 2032)**
Pre-Construction Activities[2]		$259,000											
Facilities Construction[3]			$413,000	$413,000	$413,000	$413,000	$413,000	$413,000	$413,000	$413,000	$413,000		$29,323,000
Construction Support Activities[4]			$356,000	$356,000	$356,000	$356,000	$356,000	$356,000	$356,000	$356,000			
Total Quarterly Cost		*$259,000*	*$769,000*	*$769,000*	*$769,000*	*$769,000*	*$769,000*	*$769,000*	*$769,000*	*$769,000*	*$413,000*		*$29,323,000*
Cumulative Costs		**$2,849,000**	**$3,618,000**	**$4,387,000**	**$5,156,000**	**$5,925,000**	**$6,694,000**	**$7,463,000**	**$8,232,000**	**$9,001,000**	**$9,414,000**		**$29,323,000**
Project Funds[1]		**Bid/Award**	**Construction**							**Operations**			
Ironhouse S.D.		$33,299,000	$356,000	$356,000	$356,000	$356,000	$356,000	$356,000	$356,000	$356,000			
Federal Funding													
SWRCB Construction Grant													
Total Quarterly Income		*$33,299,000*	*$356,000*	*$356,000*	*$356,000*	*$356,000*	*$356,000*	*$356,000*	*$356,000*	*$356,000*	*$0*		*$0*
Cumulative Income		**$35,889,000**	**$36,245,000**	**$36,601,000**	**$36,957,000**	**$37,313,000**	**$37,669,000**	**$38,025,000**	**$38,381,000**	**$38,737,000**	**$38,737,000**		**$0**
Cumulative Project Balance		**$33,040,000**	**$32,627,000**	**$32,214,000**	**$31,801,000**	**$31,388,000**	**$30,975,000**	**$30,562,000**	**$30,149,000**	**$29,736,000**	**$29,323,000**		**$0**

Project Costs[1]	**July 2008 Dollars**	**Total Construction Financing**	**Quarterly Financing Payment**
Pre-Construction Activities[2]	$2,846,000		
Facilities Construction[3]	$18,970,000	$33,040,000	$413,000
Construction Support Activities[4]	$2,846,000		
Total Capital Cost	**$21,816,000**		

Notes:

1. All monetary values are in July 2008 dollars.
2. Includes Facilities Design, Environmental Documentation, Bid/Award, etc.
3. Includes the cost of financing the construction costs at 6% over 20 years. The non-construction costs were assumed to be paid for without financing.
4. Construction Management, Engineering Services during Construction, etc.

Appendix D - Cash Flow Analysis
Antioch Power Plant
With Grant Funding & SRF Low-Interest Loan

Project Element	Estimated Cost	Year 1 Q1	Year 1 Q2	Year 1 Q3	Year 1 Q4	Year 2 Q1	Year 2 Q2	Year 2 Q3	Year 2 Q4	Year 3 Q1	Year 3 Q2	Year 3 Q3	Year 3 Q4
Project Costs[1]		**Power Plant Planning**		**Design / Environmental Documentation**									
Pre-Construction Activities[2]	$2,850,000			$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000
Facilities Construction[3]	$24,320,000												
Construction Support Activities[4]	$2,850,000												
Total Quarterly Cost	***$30,020,000***	*$0*	*$0*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*
Cumulative Costs		**$0**	**$0**	**$259,000**	**$518,000**	**$777,000**	**$1,036,000**	**$1,295,000**	**$1,554,000**	**$1,813,000**	**$2,072,000**	**$2,331,000**	**$2,590,000**
Project Funds[1]		**Power Plant Planning**		**Design / Environmental Documentation**									
Ironhouse S.D.	$20,500,000			$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000
Federal Funding	$4,100,000												
SWRCB Construction Grant	$4,100,000												
Total Quarterly Income	***$30,020,000***	*$0*	*$0*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*
Cumulative Income		**$0**	**$0**	**$259,000**	**$518,000**	**$777,000**	**$1,036,000**	**$1,295,000**	**$1,554,000**	**$1,813,000**	**$2,072,000**	**$2,331,000**	**$2,590,000**
Cumulative Project Balance	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Project Element		Year 4 Q1	Year 4 Q2	Year 4 Q3	Year 4 Q4	Year 5 Q1	Year 5 Q2	Year 5 Q3	Year 5 Q4	Year 6 Q1	Year 6 Q2		Remaining Payments
Project Costs[1]		**Bid/Award**	**Construction**							**Operations**			**(thru 2032)**
Pre-Construction Activities[2]		$259,000											
Facilities Construction[3]			$304,000	$304,000	$304,000	$304,000	$304,000	$304,000	$304,000	$304,000	$304,000		$21,584,000
Construction Support Activities[4]			$356,000	$356,000	$356,000	$356,000	$356,000	$356,000	$356,000	$356,000			
Total Quarterly Cost		*$259,000*	*$660,000*	*$660,000*	*$660,000*	*$660,000*	*$660,000*	*$660,000*	*$660,000*	*$660,000*	*$304,000*		*$21,584,000*
Cumulative Costs		**$2,849,000**	**$3,509,000**	**$4,169,000**	**$4,829,000**	**$5,489,000**	**$6,149,000**	**$6,809,000**	**$7,469,000**	**$8,129,000**	**$8,433,000**		**$21,584,000**
Project Funds[1]		**Bid/Award**	**Construction**							**Operations**			
Ironhouse S.D.		$24,579,000	$356,000	$356,000	$356,000	$356,000	$356,000	$356,000	$356,000	$356,000			($9,520,000)
Federal Funding			$1,360,000		$1,360,000		$1,360,000		$1,360,000				
SWRCB Construction Grant				$1,360,000		$1,360,000		$1,360,000					
Total Quarterly Income		*$24,579,000*	*$1,716,000*	*$1,716,000*	*$1,716,000*	*$1,716,000*	*$1,716,000*	*$1,716,000*	*$1,716,000*	*$356,000*	*$0*		*($9,520,000)*
Cumulative Income		**$27,169,000**	**$28,885,000**	**$30,601,000**	**$32,317,000**	**$34,033,000**	**$35,749,000**	**$37,465,000**	**$39,181,000**	**$39,537,000**	**$39,537,000**		**($9,520,000)**
Cumulative Project Balance		**$24,320,000**	**$25,376,000**	**$26,432,000**	**$27,488,000**	**$28,544,000**	**$29,600,000**	**$30,656,000**	**$31,712,000**	**$31,408,000**	**$31,104,000**		**$0**

Project Costs[1]	July 2008 Dollars	Total Construction Financing	Quarterly Financing Payment
Pre-Construction Activities[2]	$2,846,000		
Facilities Construction[3]	$18,970,000	$24,320,000	$304,000
Construction Support Activities[4]	$2,846,000		
Total Capital Cost	**$21,816,000**		

Notes:

1. All monetary values are in July 2008 dollars.
2. Includes Facilities Design, Environmental Documentation, Bid/Award, etc.
3. Includes the cost of financing the construction costs assuming an SRF loan at 2.5% over 20 years. The non-construction costs were assumed to be paid for without financing.
4. Construction Management, Engineering Services during Construction, etc.

Appendix D - Cash Flow Analysis
Pittsburg Power Plant
No Grant Funding

Project Element	Estimated Cost	Year 1				Year 2				Year 3			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Project Costs[1]		**Power Plant Planning**		**Design / Environmental Documentation**									
Pre-Construction Activities[2]	$2,850,000			$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000
Facilities Construction[3]	$33,040,000												
Construction Support Activities[4]	$2,850,000												
Total Quarterly Cost	***$38,740,000***	*$0*	*$0*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*
Cumulative Costs		**$0**	**$0**	**$259,000**	**$518,000**	**$777,000**	**$1,036,000**	**$1,295,000**	**$1,554,000**	**$1,813,000**	**$2,072,000**	**$2,331,000**	**$2,590,000**
Project Funds[1]		**Power Plant Planning**		**Design / Environmental Documentation**									
Ironhouse S.D.	$38,740,000			$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000
Federal Funding	$0												
SWRCB Construction Grant	$0												
Total Quarterly Income	***$38,740,000***	*$0*	*$0*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*
Cumulative Income		**$0**	**$0**	**$259,000**	**$518,000**	**$777,000**	**$1,036,000**	**$1,295,000**	**$1,554,000**	**$1,813,000**	**$2,072,000**	**$2,331,000**	**$2,590,000**
Cumulative Project Balance	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Project Element		Year 4				Year 5				Year 6			Remaining Payments
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2		
Project Costs[1]		**Bid/Award**	**Construction**							**Operations**			**(thru 2032)**
Pre-Construction Activities[2]		$259,000											
Facilities Construction[3]			$413,000	$413,000	$413,000	$413,000	$413,000	$413,000	$413,000	$413,000	$413,000		$29,323,000
Construction Support Activities[4]			$356,000	$356,000	$356,000	$356,000	$356,000	$356,000	$356,000	$356,000			
Total Quarterly Cost		*$259,000*	*$769,000*	*$769,000*	*$769,000*	*$769,000*	*$769,000*	*$769,000*	*$769,000*	*$769,000*	*$413,000*		*$29,323,000*
Cumulative Costs		**$2,849,000**	**$3,618,000**	**$4,387,000**	**$5,156,000**	**$5,925,000**	**$6,694,000**	**$7,463,000**	**$8,232,000**	**$9,001,000**	**$9,414,000**		**$29,323,000**
Project Funds[1]		**Bid/Award**	**Construction**							**Operations**			
Ironhouse S.D.		$33,299,000	$356,000	$356,000	$356,000	$356,000	$356,000	$356,000	$356,000	$356,000			
Federal Funding													
SWRCB Construction Grant													
Total Quarterly Income		*$33,299,000*	*$356,000*	*$356,000*	*$356,000*	*$356,000*	*$356,000*	*$356,000*	*$356,000*	*$356,000*	*$0*		*$0*
Cumulative Income		**$35,889,000**	**$36,245,000**	**$36,601,000**	**$36,957,000**	**$37,313,000**	**$37,669,000**	**$38,025,000**	**$38,381,000**	**$38,737,000**	**$38,737,000**		**$0**
Cumulative Project Balance		**$33,040,000**	**$32,627,000**	**$32,214,000**	**$31,801,000**	**$31,388,000**	**$30,975,000**	**$30,562,000**	**$30,149,000**	**$29,736,000**	**$29,323,000**		**$0**

Project Costs[1]	**July 2008 Dollars**	**Total Construction Financing**	**Quarterly Financing Payment**
Pre-Construction Activities[2]	$2,846,000		
Facilities Construction[3]	$18,970,000	$33,040,000	$413,000
Construction Support Activities[4]	$2,846,000		
Total Capital Cost	**$21,816,000**		

Notes:

1. All monetary values are in July 2008 dollars.
2. Includes Facilities Design, Environmental Documentation, Bid/Award, etc.
3. Includes the cost of financing the construction costs at 6% over 20 years. The non-construction costs were assumed to be paid for without financing.
4. Construction Management, Engineering Services during Construction, etc.

Appendix D - Cash Flow Analysis
Pittsburg Power Plant
With Grant Funding & SRF Low-Interest Loan

Project Element	Estimated Cost	Year 1				Year 2				Year 3			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Project Costs[1]		**Power Plant Planning**		**Design / Environmental Documentation**									
Pre-Construction Activities[2]	$2,850,000			$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000
Facilities Construction[3]	$24,320,000												
Construction Support Activities[4]	$2,850,000												
Total Quarterly Cost	***$30,020,000***	*$0*	*$0*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*
Cumulative Costs		**$0**	**$0**	**$259,000**	**$518,000**	**$777,000**	**$1,036,000**	**$1,295,000**	**$1,554,000**	**$1,813,000**	**$2,072,000**	**$2,331,000**	**$2,590,000**
Project Funds[1]		**Power Plant Planning**		**Design / Environmental Documentation**									
Ironhouse S.D.	$20,500,000			$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000	$259,000
Federal Funding	$4,100,000												
SWRCB Construction Grant	$4,100,000												
Total Quarterly Income	***$30,020,000***	*$0*	*$0*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*	*$259,000*
Cumulative Income		**$0**	**$0**	**$259,000**	**$518,000**	**$777,000**	**$1,036,000**	**$1,295,000**	**$1,554,000**	**$1,813,000**	**$2,072,000**	**$2,331,000**	**$2,590,000**
Cumulative Project Balance	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Project Element		Year 4				Year 5				Year 6			Remaining Payments
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2		
Project Costs[1]		**Bid/Award**	**Construction**							**Operations**			**(thru 2032)**
Pre-Construction Activities[2]		$259,000											
Facilities Construction[3]			$304,000	$304,000	$304,000	$304,000	$304,000	$304,000	$304,000	$304,000	$304,000		$21,584,000
Construction Support Activities[4]			$356,000	$356,000	$356,000	$356,000	$356,000	$356,000	$356,000	$356,000			
Total Quarterly Cost		*$259,000*	*$660,000*	*$660,000*	*$660,000*	*$660,000*	*$660,000*	*$660,000*	*$660,000*	*$660,000*	*$304,000*		*$21,584,000*
Cumulative Costs		**$2,849,000**	**$3,509,000**	**$4,169,000**	**$4,829,000**	**$5,489,000**	**$6,149,000**	**$6,809,000**	**$7,469,000**	**$8,129,000**	**$8,433,000**		**$21,584,000**
Project Funds[1]		**Bid/Award**	**Construction**							**Operations**			
Ironhouse S.D.		$24,579,000								$356,000			($7,028,000)
Federal Funding			$1,360,000		$1,360,000		$1,360,000		$1,360,000				
SWRCB Construction Grant				$1,360,000		$1,360,000		$1,360,000					
Total Quarterly Income		*$24,579,000*	*$1,360,000*	*$1,360,000*	*$1,360,000*	*$1,360,000*	*$1,360,000*	*$1,360,000*	*$1,360,000*	*$356,000*	*$0*		*($7,028,000)*
Cumulative Income		**$27,169,000**	**$28,529,000**	**$29,889,000**	**$31,249,000**	**$32,609,000**	**$33,969,000**	**$35,329,000**	**$36,689,000**	**$37,045,000**	**$37,045,000**		**($7,028,000)**
Cumulative Project Balance		**$24,320,000**	**$25,020,000**	**$25,720,000**	**$26,420,000**	**$27,120,000**	**$27,820,000**	**$28,520,000**	**$29,220,000**	**$28,916,000**	**$28,612,000**		**$0**

Project Costs[1]	**July 2008 Dollars**	**Total Construction Financing**	**Quarterly Financing Payment**
Pre-Construction Activities[2]	$2,846,000		
Facilities Construction[3]	$18,970,000	$24,320,000	$304,000
Construction Support Activities[4]	$2,846,000		
Total Capital Cost	**$21,816,000**		

Notes:

1. All monetary values are in July 2008 dollars.
2. Includes Facilities Design, Environmental Documentation, Bid/Award, etc.
3. Includes the cost of financing the construction costs assuming an SRF loan at 2.5% over 20 years. The non-construction costs were assumed to be paid for without financing.
4. Construction Management, Engineering Services during Construction, etc.

Appendix E - Example Agreement with CCWD

DUPLICATE
ORIGINAL

GENERAL RECYCLED WATER AGREEMENT BETWEEN DELTA DIABLO SANITATION DISTRICT AND CONTRA COSTA WATER DISTRICT

This General Agreement is made on June 16, 2004 (the "Effective Date") between Delta Diablo Sanitation District (DDSD), a county sanitation district organized and existing under Chapter 3 of Division 5 of the California Health and Safety Code (commencing with Section 4700), and Contra Costa Water District (CCWD), a county water district organized and existing under Division 12 of the California Water Code (commencing with Section 30000), in order to resolve disputes as to the use and delivery of recycled water from DDSD's existing or future recycled water facilities given CCWD's responsibility as a water provider for the area served by DDSD.

RECITALS

a. Whereas, on March 19, 1997, CCWD's Board of Directors approved a document entitled, "Principles For General Recycled Water Agreement ("Principles"), and subsequently on April 9, 1997, DDSD's Board of Directors also approved these same Principles;

b. Whereas, on April 12, 2000, CCWD, DDSD, Calpine Corporation, (Calpine) and Bechtel Enterprise Holdings, Inc. (Bechtel) signed the agreement entitled, "Agreement Relating to Purveyorship of Recycled Water" ("April 12, 2000 Purveyorship Agreement"), and under Section 6 (b) of this April 12, 2000 Purveyorship Agreement, CCWD and DDSD agreed to cooperate and work together in good faith in order to resolve all remaining issues relating to the sale and purveyorship of recycled water, duplication of service, and related matters, in a fair and equitable manner consistent with all applicable laws;

c. Whereas, DDSD desires to utilize the full capacity of its current and future facilities for recycling wastewater within the overlapping areas of CCWD and DDSD's Service Area, independent of CCWD or jointly with CCWD, to provide recycled water to additional users who were not included in the April 12, 2000 Purveyorship Agreement;

d. Whereas, CCWD and DDSD are not in agreement regarding the potential applicability and effect of Public Utilities Code Sections 1501 et seq. on recycled water projects covered by this General Agreement, and this General Agreement is intended to provide the basis for the development of project specific agreements that would avoid or minimize disputes related to recycled water projects between CCWD and DDSD;

e. Whereas CCWD and DDSD agree that neither District wishes to create any financial harm either directly or indirectly to the other District by implementing a recycled water project;

f. Whereas CCWD and DDSD recognize that there are numerous legal requirements applicable to recycled water use in the State of California and that the statutes and policies related to recycled water use that may be applicable to this General Agreement include but are not limited to the following: California Water Code Sections 100, 275, 461, 13500 et seq., 13550 et seq., 13575 et seq., Government Code Sections 65601 et seq., and California State Water Resources Control Board Resolutions 75-58 and 77-1; and

g. Whereas CCWD and DDSD recognize that there are several statutes dealing with service duplication issues in the State of California, and that the statutes that may be applicable to this General Agreement include but are not limited to the following: Public Utilities Code Section 1501 et seq., Health & Safety Code Section 4767, and California Water Code Sections 31053 – 31054.

NOW, THEREFORE, IT IS AGREED THAT:

1. GENERAL PURPOSE AND INTENT

The purpose of this General Agreement is to provide a general framework of understanding and agreement between CCWD and DDSD for their independent or joint development of recycled water projects within DDSD's Service Area. For the purposes of this General Agreement, the following shall apply:

a. Subsequent agreement(s) between CCWD and DDSD regarding specific recycled water projects within DDSD's Service Area shall be implemented in accordance with this General Agreement. CCWD and DDSD recognize that it is necessary to negotiate additional project specific agreements relating to specific recycled water projects pursuant to the provisions of this General Agreement.

b. CCWD and DDSD agree to negotiate project specific agreements in good faith, and approval of such agreements shall not be unreasonably withheld by either District. Each project specific agreement will include a section on cost and revenue sharing for the project. At a minimum, any bonded indebtedness cost CCWD has incurred or may incur in the future for system improvements to serve customers in the CCWD Service Area, and any other costs not recovered as a result of the recycled water project, will be addressed in the cost and revenue sharing section. CCWD will seek compensation for that portion of CCWD's bonded indebtedness costs and any other fixed costs that CCWD could otherwise recover in the absence of the recycled water project, except as otherwise noted in Section 1c and 5b herein. In determining the amount of compensation CCWD will seek, CCWD and DDSD will evaluate on a case by case basis the recycled

water project for avoided costs that may offset against CCWD bonded indebtedness costs and examples of the factors to be considered when determining avoided costs and overall cost and revenue sharing for a recycled water project are described in Exhibit B.

c. Any compensation for CCWD bonded indebtedness for recycled water customers that represent water demands that materially alter the assumptions in CCWD's Future Water Supply Study (i.e., similar to the Calpine Project addressed in the April 12, 2000 Purveyorship Agreement) will be evaluated on a case-by-case basis.

d. CCWD and DDSD will coordinate planning activities related to the provision of recycled water service within DDSD Service Area, and each may identify projects that can be implemented incrementally.

e. CCWD and DDSD enter into this General Agreement recognizing that it may be appropriate to consider modifying this General Agreement in a mutually acceptable manner to maintain a fair and positive business relationship, particularly when legal, statutory, or regulatory changes materially affect the ability to produce or purvey recycled water.

2. DEFINITIONS

When used in this General Agreement, the terms described below shall have the meanings as set forth in this section:

a. "Future Water Supply Study (FWSS)" means the most recent update of CCWD's plan for water supply and water demands in its service area.

b. "Potable water" means water that conforms to federal, state and local agency standards for human consumption.

c. "Project specific agreement" means any future agreement entered into by both CCWD and DDSD that defines the rights and responsibilities of both Districts regarding recycled water production, economic impacts, and other project specific issues pursuant to this General Agreement.

d. "Recycled water customer" means a property owner within DDSD's Service Area identified by DDSD as a possible customer of recycled water service who has signed a letter of intent or other instrument indicating a willingness to be provided with recycled water.

e. "Recycled water facilities" includes any existing or new facilities for the purpose of producing, delivering, and/or distributing recycled water.

f. "Recycled water project" means a project that, when completed, results in recycled water being delivered to recycled water customers.

g. "Recycled water" means water which as a result of treatment of waste, is suitable for a direct beneficial use or a controlled use that would not otherwise occur and is, therefore, considered a valuable resource. (See California Water Code Section 13050(n).)

3. PRIOR RECYCLED WATER AGREEMENTS

a. To the extent that any provision of the Principles, as adopted by both CCWD and DDSD in 1997, conflicts with this General Agreement, then the provisions of this General Agreement shall govern and any such conflicting provision in the Principles is hereby superceded by this General Agreement.

b. The April 12, 2000 Purveyorship Agreement remains in full force and effect.

c. CCWD and DDSD agree that all obligations under the August 2, 2000 Agreement between the Districts entitled, "Agreement for Disposal of Contra Costa Water District's Recycled Water Facilities at Delta Diablo Sanitation District Treatment Plant Site," have been met and said August 2, 2000 Agreement is terminated as of the effective date of this General Agreement.

4. DEVELOPMENT OF FUTURE PROJECTS

The following subsections describe the process by which recycled water projects shall be implemented by CCWD and DDSD:

a. Recycled water projects may be developed jointly by DDSD and CCWD, or independently by either District within DDSD's Service Area. CCWD and DDSD shall continuously inform each other of their planning activities regarding future recycled water projects. Joint planning efforts may be undertaken by the Districts through mutual agreement.

b. If either CCWD or DDSD develops or otherwise proposes a future recycled water project within DDSD's Service Area, that District shall promptly notify the other District of such project, and shall prepare and provide a business plan containing information regarding the items outlined in Exhibit A to this General Agreement. Upon receipt of this business plan, the receiving District shall promptly inform the other District as to whether it desires to participate in the recycled water project.

c. After consideration of the business plan, CCWD and DDSD will enter into good faith negotiations to develop a project specific agreement. Any issues that cannot be resolved through good faith negotiations will be resolved through the dispute resolution process described in Section 13 of this General Agreement. A project

specific agreement is required for each recycled water project except the near term landscaping projects described in Section 5 of this General Agreement. The project specific agreement will include, as a minimum, definition of the roles and responsibilities of each agency based on the business plan and a cost and revenue sharing section. CCWD and DDSD agree that the project specific agreement will require that any recycled water customer who continues to receive water service either directly or indirectly from CCWD, shall remain subject to CCWD's applicable water service regulations as amended from time to time, and shall be responsible for all rates and charges provided for therein. CCWD and DDSD also agree there may be economic and non-economic benefits associated with use of recycled water instead of raw water or potable water supply and that such benefits could defray costs of a recycled water project for one District or the other. The potential avoided costs shall be considered in each project specific agreement, including but not limited to the following:

1. Purchase of additional water supply for dry year supplies or future water demands as described in the FWSS.

2. Time value of delaying capital improvements to provide the capacity needed to serve future customers through the Contra Costa Canal.

3. Energy savings associated with not pumping like amounts of Delta diversions into Los Vaqueros Reservoir.

4. Additional available supplies of higher quality blending water in Los Vaqueros Reservoir for other uses.

5. Spreading fixed costs of recycled water facilities operation over a larger rate base.

6. Reduced treated wastewater effluent discharged and associated contaminant mass released into the receiving water.

7. Costs due to obligations imposed by Federal or State law.

Exhibit B to this General Agreement provides example calculations for the consideration of avoided cost in the analysis of cost and revenue sharing for a recycled water project.

d. If DDSD proposes a future recycled water project and CCWD declines to participate in such a project, then (i) DDSD shall assume all recycled water service responsibilities and obligations for the proposed recycled water customers; and (ii) DDSD and CCWD shall promptly commence good faith negotiations to reach a project specific agreement regarding any compensation that either party may seek from the other party.

e. If CCWD proposes a future recycled water project within the DDSD Service Area, and DDSD declines to participate in the project, then CCWD and DDSD shall promptly commence good faith negotiations to reach a project specific agreement regarding: (i) the transfer to CCWD of the recycled water purveyorship authority established by existing agreements between DDSD and the Cities of Antioch and Pittsburg or any future agreement within the unincorporated community of Bay Point; and (ii) any compensation that either District may seek from the other District and the availability of effluent from DDSD's facilities for use by CCWD.

f. If CCWD proposes a project to replace or supplement a raw water customer with recycled water from DDSD, and DDSD declines to participate in such a project, then DDSD and CCWD shall promptly commence good faith negotiations to reach a project specific agreement regarding: (i) any compensation that either District may seek from the other District; and (ii) the availability of effluent from DDSD's facilities for use by CCWD.

5. NEAR TERM LANDSCAPE IRRIGATION EXTENSION PROJECTS

a. DDSD intends to develop within its Service Area in the near term, recycled water projects involving recycled water service from DDSD's existing or future recycled water facilities to landscape irrigation sites within the cities of Pittsburg, Antioch, and the community of Bay Point. The average annual demand for the recycled water service included in these projects and a preliminary customer list is in Exhibit C to this General Agreement. DDSD has involved CCWD in the planning effort for these projects and CCWD has elected not to participate at this time. Project specific agreements are not required for projects listed in Exhibit C. DDSD will provide notification to CCWD prior to serving recycled water to each customer on the list. DDSD's notification will include, at a minimum, the information identified in Exhibit A. CCWD will review the information and provide any comments or responses within 30 days of receiving such notification.

b. In consideration of the limited quantity of recycled water to be served to these near term recycled water projects, CCWD shall not seek any compensation from DDSD for bonded indebtedness or other fixed cost coverage as may be allowed under the law for the projects listed in Exhibit C, provided that the volume of recycled water delivery for each project does not vary significantly from the planning level estimate as indicated in Exhibit C. CCWD and DDSD agree that any recycled water customer who continues to receive water service either directly or indirectly from CCWD shall remain subject to CCWD's applicable water service regulations as amended from time to time, and shall be responsible for all rates and charges provided for therein.

6. TERM

This General Agreement shall become effective on the Effective Date stated above and shall continue in effect unless terminated as set forth in Section 14 below.

7. RESPONSIBILITY FOR COMPLIANCE WITH LAWS AND REGULATIONS

CCWD and DDSD agree to follow all laws, rules and regulations including but not limited to:

a. Compliance with all laws, statutes, ordinances, orders and/or regulations for purveying recycled water.

b. Compliance with any Regional Water Quality Control Board (RWQCB) permits that may be required.

c. DDSD shall comply with CCWD Regulation 5.56 (Prevention of Contamination) by providing proper backflow prevention devices on all non-recycled water service lines to premises where recycled water is provided.

d. Both parties shall promptly inform the other should they learn of any violation of laws or regulations, and the other party shall promptly correct any violation of laws and/or regulations.

8. EFFECT OF AGREEMENT

This General Agreement is the product of negotiations between CCWD and DDSD with regard to which the Districts have had ample opportunity to consult with their respective attorneys, and CCWD and DDSD therefore agree that the rule of construction that documents are construed against the drafter thereof shall have no application to this General Agreement. This General Agreement is entered into under and shall be governed by and interpreted under California law. Captions and headings in this General Agreement are solely for convenience in locating provisions, and they are not to be construed as limiting, expanding, or otherwise affecting the provisions of this General Agreement.

9. SUCCESSORS AND ASSIGNS

Neither CCWD nor DDSD may assign or delegate any right or obligation hereunder without first having received the written consent duly executed of the other District. This General Agreement shall bind and shall inure to the benefit of any successors or assigns of either District following such consent but shall not otherwise create duties or obligations to or rights in third parties not parties to this General Agreement, nor shall this General Agreement affect the legal liability of either District by imposing any standard of care different from that otherwise imposed by law.

10. NOTICES

All notices or communications of any kind which either CCWD or DDSD may desire or be required to give or serve upon the other District under this General Agreement, shall be in writing and either (i) delivered personally, or (ii) sent by facsimile transmission to the Fax numbers set forth below with the original deposited in the U.S. mail, postage pre-paid, first class, addressed as set forth below, or (iii) sent by Certified Mail, return receipt requested, postage pre-paid, first class, addressed as set forth below. Such notices shall be deemed effective upon personal delivery or transmission by telefacsimile; a notice sent only by Certified Mail shall be deemed effective upon date received as set forth in the respective receipts. Each District shall be entitled at any time to designate a different address, facsimile number, or telephone number for receipt of communications.

CONTRA COSTA WATER DISTRICT
General Manager
Contra Costa Water District
P.O. Box H20
1331 Concord Avenue
Concord, CA 94524
Telephone: (925) 688-8034
Facsimile: (925) 688-8197

DELTA DIABLO SANITATION DISTRICT
General Manager
Delta Diablo Sanitation District
2500 Pittsburg-Antioch Highway
Antioch, CA 94509
Telephone: (925) 778-4040
Facsimile: (925) 778-8513

11. INDEMNIFICATION

Each party agrees to protect, defend, indemnify, and hold harmless the other party, its directors, officers, agents, servants, employees and consultants from and against any and all losses, claims, liens, demands and causes of action of every kind and character that are asserted by non-parties to this General Agreement, without limitation by enumeration, occurring or in any way incident to, connected with, or arising directly or indirectly out of the performance or non-performance by the indemnifying party hereunder. These mutual indemnity provisions are continuing in nature and shall survive any termination of this General Agreement unless otherwise agreed to by both parties.

12. INSURANCE

The following insurance requirements shall apply to the near term landscaping projects:

DDSD shall comply with CCWD's Worker's Compensation, general liability and automobile liability insurance coverage requirements applicable to consultants as described below, or shall be self insured pursuant to applicable law for such coverage.

DDSD shall provide and maintain the following insurance coverages at all times during the performance of the Agreement. Certificates of insurance and endorsements to the policy shall be provided to CCWD evidencing the coverage afforded is primary, naming CCWD,

its directors, officers, and employees as an additional insured, except as to insurance in subdivisions a and b, and requiring 30-days' prior written notice to CCWD of policy lapse, cancellation, or material change in coverage.

a. Worker's Compensation and Employer's Liability Insurance for protection of DDSD's employees as required by law and as will protect DDSD from loss or damage because of personal injuries, including death to any of its employees. DDSD shall require any subcontractor to provide it with evidence of such insurance as required by the State of California.

b. Comprehensive Automobile Liability Insurance. DDSD agrees to carry a Comprehensive Automobile Liability Policy providing bodily injury and property damage liability. This policy shall protect DDSD against all liability arising out of the use of automobiles, both passenger and commercial, whether owned by DDSD or not. Limits of liability for Comprehensive Automobile Liability Insurance shall not be less than $1,000,000 Combined Single Limit and $2,000,000 aggregate.

c. Commercial General Liability Insurance to protect the CCWD, its directors, officers, and employees, from any and all claims for damages or personal injuries, including death, which may be suffered by persons, or for damages to or destruction to the property of others, which may arise from DDSD's operations under the- Agreement, which insurance shall name CCWD, its directors, officers, and employees, as additional insured, and said policy shall cover the indemnity provisions under the Agreement; said insurance shall provide a minimum of $1,000,000 Combined Single Limit coverage for personal injury, bodily injury, and property damage for each occurrence and $2,000,000 aggregate. Such insurance shall insure CCWD, its directors, officers, and employees from any and all claims arising from the following:

(i) Bodily injury;

(ii) Property damage;

(iii) Personal injury;

(iv) Automobiles, trucks, and other vehicles and equipment (owned, not owned, or hired, licensed or unlicensed for road use);

(v) Broad form property damage;

(vi) Independent contractors;

(vii) Blanket contractual liability;

(viii) Explosion, collapse, and underground hazards;

(ix) Products and completed operations.

d. DDSD agrees to maintain such insurance at DDSD's expense in full force and effect in a company or companies satisfactory to CCWD. All coverage shall remain in effect until completion of the Agreement except as specified in Article 14. CCWD shall have the right to examine DDSD's insurance policies, in DDSD's home office at any time during normal business hours.

e. DDSD shall be responsible for requiring insurance coverage by Subconsultants. The DDSD and CCWD shall determine the amount and adequacy of such coverage. Within 30 days after the Agreement is executed by CCWD, DDSD shall submit to CCWD for its information a list of the public liability and other insurance coverage provided by each Consultant, including the amount of such coverages and the insurers.

f. The preceding insurance requirements will be incorporated in project specific agreements as applicable, and will be modified as appropriate to apply in favor of one party or the other depending upon the nature of the specific project.

13. DISPUTE RESOLUTION

a. Mediation. The parties agree to first submit any dispute arising out of or in connection with this General Agreement to a mutually acceptable professional mediator and to negotiate in good faith toward reaching an agreement with respect to the dispute. In such event, neither party shall proceed with arbitration until the completion of the mediation, the mediation being an express condition precedent to further remedies. The parties may, however, agree in writing to proceed directly to arbitration. The parties shall pay an equal share of the costs of retaining the professional mediator, but shall bear their own costs, including, but not limited to, their own attorney's fees associated with participating in any mediation.

b. Binding Arbitration. Should the parties be unable or unwilling to resolve their dispute through the mediation process provided in Section 13.a above, either party may give written notice to the other party and elect to have the matter resolved by final and binding arbitration in accordance with the rules and procedures of the arbitrator selected in accordance with this Section 13.b (the "Arbitrator"). The party seeking arbitration shall set forth in its notice the particulars of its claims and shall state with specificity the issue(s) to be submitted to arbitration and the relief sought. Within thirty (30) days of the date of the election to arbitrate, the parties shall select a single, mutually agreeable arbitrator. If the parties are unable to agree, they shall request that the Judicial Arbitration and Mediation Service, Inc. ("JAMS") if such entity is then in existence, appoint an Arbitrator in accordance with then-current procedures. The arbitrator shall be a retired judge of the Superior Court of California, or the Court of Appeal of California, or a retired judge of the United States District Court sitting in California. If JAMS is not in existence, the Presiding Judge of the

Contra Costa Consolidated Court of Unlimited Jurisdiction shall appoint an Arbitrator in accordance with its then-current procedures.

The rules and procedures for arbitration shall be as follows:

i. The Arbitrator shall be selected and arbitration shall be conducted within a reasonable time, but in no event later than ninety (90) days after the date upon which the demand for arbitration is filed.

ii. The arbitration proceedings shall be conducted in Contra Costa County, California, at a time and location as agreed to in writing by the parties, or in absence of an agreement, as designated by the Arbitrator.

iii. Subject to the same rules pertaining to privileged communications and attorney work product that would apply if the proceeding was filed in the courts of the State of California, the Arbitrator shall have the authority to make all decisions regarding the relevance, materiality, and admissibility of all evidence offered at the arbitration.

iv. The Arbitrator may issue any remedy or relief, whether provisional or permanent, including but not limited to a default judgment, which the parties could have obtained under the law applicable in courts of the State of California under the same factual circumstances, and the Arbitrator shall follow and otherwise employ the standards for issuing such relief as defined by California law; provided, however, that the Arbitrator shall have no authority or jurisdiction to enter an award for consequential, special, exemplary or punitive damages. The Arbitrator may also grant such ancillary relief as is necessary to make effective the award.

v. Both parties may conduct discovery as if the matter were pending before a Superior Court of the State of California and the Arbitrator shall have the full power of the State of California to issue and enforce subpoenas and to award sanctions. Either party shall have the right to demand in writing that the other party provide a list of witnesses it intends to call at the hearing, designating which witnesses will be called as expert witnesses, and a list of documents it intends to introduce at hearing. The responding party's list(s) shall be served personally or by registered or certified mail on the requesting party, with a copy to the Arbitrator, at least thirty (30) days before the hearing.

vi. Each party shall have the right to be represented by counsel.

vii. No later than sixty (60) days following closing of the arbitration hearing, the Arbitrator shall make an award and issue a written opinion consisting of findings of fact and conclusions of law and setting forth the bases of the award. The Arbitrator may include in his or her award pre-award interest and post-award interest at the legal rate where authorized by law. The party against whom the

award is made or remedy or relief ordered shall have thirty (30) days after receipt of the award or order to commence and thereafter diligently pursue to completion any action or proceeding in any court of the State of California of appropriate jurisdiction located in the County of Contra Costa to obtain judicial review of the award or order. If the award of order is mailed, it shall be deemed to be received within five days after deposit in the mail.

viii. If no such action or proceeding is timely commenced, the award or order shall thereupon immediately become final. The party against whom the award is made or remedy or relief ordered shall within thirty (30) days after the award or order becomes final make full payment and/or commence and thereafter diligently pursue to completion any other action required by the award or order. The party in whose favor the award is made may request and obtain from any court of the State of California of appropriate jurisdiction located in the County of Contra Costa a Judgment upon the award rendered by the Arbitrator, which may thereafter be entered in the records of said court.

ix. If an action or proceeding is timely filed in any court of the State of California of appropriate jurisdiction located in the County of Contra Costa to obtain judicial review of the award or order, the parties shall have the right to seek vacation or modification of any portion of the award that is based in whole, or in part, on an incorrect or erroneous ruling of law, in addition to the limited statutory right to seek vacation or modification of an award pursuant to the law applicable to non-judicial arbitration. The findings of fact of the Arbitrator shall be binding on all parties and shall not be subject to further review except as otherwise allowed by the law applicable to non-judicial arbitration.

x. The Arbitrator shall be paid a per diem or hourly charge as established at the time of appointment. Each party shall bear its own attorneys' fees and costs in presenting its case. All other actual costs of conducting the arbitration, including without limitation the administrative fee and the Arbitrator's compensation, shall be shared equally.

xi. This arbitration clause shall be interpreted under the arbitration laws of the State of California and not the Federal Arbitration Act, 9 U.S.C.§ 1. Except as otherwise provided in this General Agreement, any motion, application, complaint or proceeding arising out of or relating to this arbitration clause shall be determined in accordance with the law of the State of California.

xii. Unless otherwise provided in this General Agreement or otherwise agreed in writing, the parties shall continue to perform their respective obligations under this General Agreement during the pendency of arbitration proceedings.

xiii. Except as modified or stated to the contrary in this Section 13, the rules and procedures of the Arbitrator in effect at the time of the arbitration shall apply to the arbitration procedure.

14. TERMINATION

This General Agreement shall be terminated only upon written agreement of CCWD and DDSD.

15. AMENDMENTS

Both CCWD and DDSD enter into this General Agreement recognizing that it may be appropriate to consider modifying and amending this General Agreement in a mutually acceptable manner to maintain a fair and positive business relationship, particularly when legal, statutory, or regulatory changes materially affect the ability to produce or purvey recycled water. This General Agreement may be modified or amended only by written agreement between CCWD and DDSD.

CONTRA COSTA WATER DISTRICT

By:_____
Joseph L. Campbell
President - Board of Directors

ATTEST:

By:_____
District Secretary

APPROVED AS TO FORM:

By:_____
Legal Counsel

DELTA DIABLO SANITATION DISTRICT

By:_____
Donald P. Freitas
Chair - Board of Directors

ATTEST:

By:_____
District Secretary

APPROVED AS TO FORM:

By:_____
Legal Counsel

JB/rlr-3

Exhibit A

General Recycled Water Agreement between
Delta Diablo Sanitation District and Contra Costa Water District

BUSINESS PLAN CONTENTS

The business plan referenced in Section 4.b shall contain, as a minimum, the following information:

1. Project Characteristics

   - Project description
   - Implementation schedule
   - Potential customers including signed requests from customers for recycled water service
   - Technical requirements (e.g., pressure, flow, head loss, velocity, pumping stations and storage reservoir design assumptions including redundancy requirements)
   - Special regulatory requirements for use of recycled water including cross connection prevention
   - Water quality requirements of the customer and a discussion of how the recycled water will meet the requirements
   - Existing water service capacity replaced by recycled water service (e.g., average and maximum day, peak hour, etc.)
   - Expected duration of recycled water service
   - Billing arrangements if the recycled water customer is a customer of CCWD at the time this information is prepared

2. Recycled Water Service Reliability

   - Assessment of reliability
   - Mitigation measures as needed
   - An attachment recognizing and accepting the then current process to be followed, and costs to be incurred, in the event the customer wishes to resume or initiate non-recycled water service as provided by CCWD at a later date

3. Emergency Back-up Supply from CCWD

   - Define requirements for anticipated supply needed from CCWD in addition to recycled water supplies

4. Economic and Financial Assessment

   - Planning level costs estimates (e.g., capital, O&M, life cycle, total cost per acre-foot on annualized and present worth cost basis)

- Financing assumptions
- Customer water rates assumptions for recycled water

5. Insurance Requirements

The notification referenced in Section 5.a for near term landscaping projects shall contain, at a minimum, the following information:

1. Project Characteristics

   - Project description
   - Implementation schedule
   - Potential customers including signed requests from customers for recycled water service
   - Technical requirements (e.g., pressure, flow, head loss, velocity, pumping stations and storage reservoir design assumptions including redundancy requirements)
   - Special regulatory requirements for use of recycled water including cross connection prevention
   - Water quality requirements of the customer and a discussion of how the recycled water will meet the requirements
   - Existing water service capacity replaced by recycled water service (e.g., average and maximum day, peak hour, etc.)
   - Expected duration of recycled water service
   - Billing arrangements if the recycled water customer is a customer of CCWD at the time of notification

2. Recycled Water Service Reliability

   - Assessment of reliability
   - Mitigation measures as needed
   - An attachment recognizing and accepting the then current process to be followed, and costs to be incurred, in the event the customer wishes to resume or initiate non-recycled water service as provided by CCWD at a later date

3. Emergency Back-up Supply from CCWD

   - Define requirements for anticipated supply needed from CCWD in addition to recycled water supplies

4. Insurance Requirements

Exhibit B

CONSIDERATIONS FOR THE DEVELOPMENT OF THE COST AND REVENUE SHARING SECTION OF THE PROJECT SPECIFIC AGREEMENT

The purpose of this exhibit is to provide examples of the factors to be considered when determining potential avoided costs and the overall cost and revenue sharing associated with a recycled water project. Any avoided costs for a particular recycled water project would need to be determined on a case-by-case basis and will be addressed in the project specific agreement. The General Agreement establishes that both parties commit to reviewing potential avoided costs for each recycled water project and to develop a comprehensive cost and revenue sharing arrangement for the project based on a mutually agreeable analysis. Consideration for other elements of cost and revenue sharing would need to be addressed independent of the potential avoided cost issues discussed below.

1. Purchase of additional dry year water supply.

A recycled water project may offset or reduce the quantity of supplemental water CCWD needs to purchase to achieve the level of reliability established in the FWSS for dry years. If CCWD's CVP dry year allocations are based on historical use and if the CVP contract allows historical use to include new water recycling then CCWD may be able to avoid purchasing an amount of supplemental water in dry years in which there is a shortage in allocations because the CVP allocation for CCWD could allow a greater allocation in the presence of a recycled water project than without the project. The avoided cost could be as much as the difference between the cost of supplemental water and the cost of CVP water for the additional amount of water made available under the CVP contract.

Example calculation of avoided cost per acre-foot of water recycled (note: the amount of supplemental water avoided would be a percentage of the recycled water historical use, not the full amount of recycled water. The percentage would be the same as the percentage of historical use applied for the purposes of determining CCWD's CVP dry year allocation)

CCWD's current unit cost of CVP water on an average basis excluding power:
$54/AF. (includes a fixed cost component that may not be an avoided cost)

Estimated unit cost of supplemental supply in dry year (based on recent contracts with ECCID and YCWA): $54/AF to $125/AF.

Estimated Avoided Cost of Supplemental Water Purchase for Dry Year when shortages are applied that would result in additional water purchases to meet demands: $0/AF to $71/AF

Note that supplemental water cost is not incurred in non-dry years and therefore would only be avoided when supplemental water would otherwise have been purchased by CCWD (i.e. supplemental purchases would occur only when CVP shortages are declared and but for the recycled water project CCWD would have been required to purchase supplemental water to meet demands).

Other conditions that would need to be considered in the analysis:

a. Any existing contractual requirements that commit CCWD to pay for all or some of the dry year water whether it is needed or not.
b. Any fixed costs that are paid regardless of water allocation or whether or not shortage water is purchased.
c. The recycled water customers need for backup supply from CCWD.
d. Implementation of recycled water projects are intended to provide water supply benefits to CCWD and DDSD customers. To avoid subsidizing benefits to others outside DDSD and CCWD, compensation may be sought for any incidental benefits to other parties including but not limited to compensation for capital and operating costs, costs of stranded assets, debt service of stranded assets, bonded indebtedness, stand-by service costs, fixed costs of assets rendered unusable or having reduced use as a result of the project.

2. Time value of delaying capital improvements to provide the capacity needed to serve future customers through the Contra Costa Canal.

Recycled water projects that serve existing CCWD customers have the potential to delay costs of construction of additional capacity needed to serve future customers through the Contra Costa Canal. Recycled water projects that require a "back up" supply from CCWD could not be considered because the capacity must still be reserved to serve the demand.

As a hypothetical example of how the savings associated with delaying capacity improvements might be calculated, assume that a $30M (2004 dollars) pump station expansion on the Canal System is required in 2008 based on current conditions. Assume a recycled water project (average annual demand of 5,000 AF/yr with peak demand of 15 cfs) is located and operated in such way that existing canal capacity is freed up and delays the need for the capital improvement by 3 years.

Assumptions

Discount Rate:	5%
Construction Inflation Rate:	3%
Term:	30 years

Example calculation of avoided cost per acre-foot of water recycled.

Present value of principal and interest if pump station is constructed in 2008: $30,232,271 (2004 dollars)

Present value of principal and interest if pump station if constructed in 2011: $28,829,712 (2004 dollars)

Total cost savings associated with delayed construction: $1,402,559 (2004 dollars)

Estimated Number of Future CCWD 5/8" Connections Benefiting (2002 FWSS Update: 75,000

Estimated Avoided Cost of Delaying Canal Capacity Project: $19/connection

If CCWD collects an FRC and a project that has not been constructed which is being funded by the FRC is delayed because of a recycled water project, then an avoided cost may exist and could be considered. If a project funded by the FRC could be delayed because of a recycled water project but it has already been constructed, then there would be no avoided cost.

3. Energy savings associated with not pumping like amounts of Delta diversions into Los Vaqueros Reservoir.

Recycled water projects have the potential to reduce the quantity of water quality blending water released from the Los Vaqueros Reservoir by reducing the demand on the Contra Costa Canal. For the period of time that releases are reduced from Los Vaqueros, the cost of pumping to refill the reservoir in the subsequent year may be avoided. It is estimated that approximately 20% of the water delivered by CCWD that would be offset by a recycled water project is conveyed through the Los Vaqueros Reservoir, if the water is served on a schedule similar to average use in CCWD.

Example calculation of avoided cost per acre-foot of water recycled.

Reduction in Los Vaqueros Releases:	0.20 AF
Unit power cost of refilling Los Vaqueros:	$41/AF
Avoided cost per AF of recycled water:	$8.20/AF

4. Additional available supplies of higher quality blending water in Los Vaqueros Reservoir for other uses.

Recycled water projects have the potential to result in additional supplies of higher quality blending water being available in Los Vaqueros Reservoir by reducing the amount of blending water that must be released from the reservoir. By using an alternate source of supply, the water saved in Los Vaqueros may be utilized by CCWD to improve water quality for other customers.

It is difficult to estimate the avoided cost of improved water quality for other CCWD customers. For example, having additional supply in Los Vaqueros could mean customers receive water with chlorides of 65 mg/l instead of 67 mg/l. This is an intangible benefit that may be considered in the review of potential avoided costs but is not quantifiable at this time.

This avoided cost would only apply in years when CCWD would exhaust its Los Vaqueros blending water supply in the year (without the recycled water project), but has additional water available in Los Vaqueros because of the recycled water project. Also note that if a water quality benefit is assigned to a recycled water project then the avoided cost of pumping to refill (item #3 above) would not apply.

It is the intent of CCWD and DDSD to implement recycled water projects in a way that do not degrade water quality, including Delta water quality. CCWD and DDSD agree that should a project result in degraded water quality, the costs for remediation shall be included in the analysis of avoided cost.

5. Spreading fixed costs of recycled water facilities operation over a larger rate base.

It is not the intent of CCWD or DDSD to "profit" from recycled water service by charging customers of recycled water in excess of reasonable costs of service. Revenues from recycled water service shall be equitably shared and described in the cost and revenue sharing section of the project specific agreement, ensuring that the full costs to both parties, including but not limited to capital and operating costs, costs of stranded assets, debt service of stranded assets, bonded indebtedness, standby-service costs, fixed costs of assets rendered unusable or having reduced use as a result of the project, are paid to the respective parties prior to revenue retention by either party from the recycled project that is in excess of that party's reasonable costs of service.

Increased production of recycled water from existing facilities represents additional revenue because the fixed costs of operating the facility are a function of the facility capacity and not a function of the amount of water produced. Therefore any additional revenue generated through increased production (i.e. new recycled water users) using existing facilities may be available for revenue sharing.

As a hypothetical example,

<u>Example calculation of avoided cost per acre-foot of water recycled.</u>

Maximum Facility Capacity: 10,000 AF/yr
Amount of Recycled Water Currently Served: 5,000 AF/yr
Annual Fixed Cost: $200,000
Annual Variable Cost: $1,000,000 ($200/AF)
Total Revenue: $1,200,000 ($240/AF)

Amount of Recycled Water Served With Additional Customers: 10,000 AF/yr
Total Revenue: $2,400,000 ($240/AF)
Annual Fixed Cost: $200,000
Annual Variable Cost: $2,000,000 ($200/AF)
Amount Available for Revenue Sharing: $200,000 ($20/AF)

6. Reduced treated wastewater effluent discharged and associated contaminant mass released into the receiving water.

Avoided costs resulting from reduced treated wastewater discharges will need to be determined on a case-by-case basis. Examples of avoided costs for the recycled water purveyor include reduction in permit fees resulting from the reduction in mass released into the receiving water, or the reduction in cost or elimination of capital improvements that may be required to meet future regulations governing discharge of treated wastewater.

Treated wastewater discharged from DDSD's Service Area may provide at times a statewide beneficial use (rediversion by others or as an increment of Delta outflow). This beneficial use is currently being recognized by operators of the State and Federal water projects in their consideration to reduce or eliminate the carriage water assessed on water transfers through the Delta to CCWD. Recycled water projects may reduce freshwater inflow to the Delta and may increase CCWD's water costs by increasing the carriage water that is assessed. Impacts resulting from reduced treated wastewater effluent must be determined on a case-by-case basis and will be addressed in the project specific agreements.

Exhibit C

Preliminary Customer Information

	Potential Customer (Use Area)	Existing Water	Note	Average Annual Demand[1]
				(ac-ft/y)
	Delta Business Park (common area grounds)	Treated	a	9.2
	Caltrans (Highway 4 landscaping)	None	a	16.8
	Antioch Babe Ruth League (baseball fields)	Treated	e	42.0
	City of Antioch (Maintenance Center grounds)	Treated	a	3.4
	City of Antioch (Police Facility grounds)	Treated	a	3.4
	City of Antioch (Somersville Rd. medians)	Treated	a	0.1
	City of Antioch (W. 10th Street medians)	Treated	a	0.1
	City of Antioch (Sixth St. Park grounds)	Treated	a	2.5
	City of Antioch (Future Parks)	Treated	f	84.0
	City of Antioch Municipal Golf Course	Varies	c	588.1
	Golf 'n Games (landscaping)	Treated	a	0.1
	City of Pittsburg (Railroad Ave. medians)	Treated	a	0.1
	Pittsburg Unified School District (school grounds at W. 10th St. and Diamond St.)	Treated	a	0.8
	City of Pittsburg (Harbor St. medians)	Treated	a	0.1
	City of Pittsburg (City Park grounds)	Treated	a	37.8
	City of Pittsburg (City Center grounds)	Treated	e	84.0
	City of Pittsburg (Future Parks)	None	f	84.0
	Los Medanos College	Treated	b	0.3
	Stone Harbor POA (community grounds)	Treated	a	15.1
	Pittsburg Unified School District (Pittsburg High School grounds)	Treated	a	22.7
	Pittsburg Unified School District (El Pueblo Elementary School grounds)	Treated	a	3.4
	Pittsburg Unified School District (Martin Luther King, Jr. School grounds)	Treated	a	15.1
	Pittsburg Municipal Golf Course	Varies	c	588.1
	Ambrose Park and Recreation District (Community Center, Anuta Park, Ambrose Park)	Treated	d	37.8
	Mt Diablo School District (Pacifica Park/Riverview Middle School)	None	d	15.1
		Totals		1,654.0

Note

a	Recycled Water Facility Evaluation, Table 2-4, RMC, June 1999
b	Irrigation Customers identified in Water Reclamation Study, Table 2-1, James M. Montgomery, June 1989
c	Recent Evaluation by City of Pittsburg
d	Parks in the Bay Point Community (acreage from Ambrose web site, Mt Diablo School assumed to be equivalent to Martin Luther School)
e	RMC June 1999, increased to account for new fields added since study
f	James M. Montgomery June 1989, adjusted.

[1] The quantities are estimates based on the best information available. Project quantities will change based on the actual needs at the time a project is designed and implemented

Appendix F - Potential Customer Letters for Recycled Water Use

Pacific Gas and Electric Company

Michael L. Jones
Director
Power Generation

245 Market Street
San Francisco, CA 94105

Mailing Address
Mail Code N11E
P.O. Box 770000
San Francisco, CA 94177

August 11, 2009

Mr. Gary W. Darling, General Manager
Delta Diablo Sanitation District
2500 Pittsburg-Antioch Highway
Antioch, CA 94509-1373

Re: PG&E's interest in and intent to utilize recycled water on future potential power plant projects in East County Industrial Corridor

Dear East County Team:

The purpose of this letter is to express our interest in the use of recycled water for potential new power plants within the study area of the East County Industrial Recycled Water Facilities Plan (Plan). The Plan has considered recycled water supplies from Delta Diablo Sanitation District, Ironhouse Sanitation District and Central Contra Costa Sanitary District for service to potential new power plants located within the industrial corridors of the cities of Antioch and Pittsburg.

PG&E does not currently have any projects under development in the corridor, so we cannot commit to using recycled water on a specific project. However, as a partner in the Facility Planning effort for recycled water use in power plant applications, we are confident that the important issues for proper use and disposal of recycled water have been addressed. When a PG&E power project development opportunity emerges, we are in a position to quickly evaluate how recycled water service will be incorporated into such a project.

Use of recycled water will be considered as the water supply component of both wet and dry cooling applications that might be undertaken in the future. Use of wet cooling technologies and recycled water will be based on a technical, economic and environmental comparison with dry cooling technologies. Use of recycled water for process water in the power plant for both wet and dry-cooled plants will also apply technical, economic and environmental factors in our evaluation. The use of recycled water for cooling and/or process water will be contingent upon the timely receipt of high quality water and the ability to discharge blowdown in an environmentally acceptable and economically feasible manner.

PG&E has appreciated the opportunity to partner with the wastewater agencies, water purveyors, and cities that participated in development of the Plan. We look forward to working with you in the future.

Sincerely,

Pacific Gas and Electric Company

Michael Jones

MLJ2/msp

Mirant Americas, Inc.
696 W. 10th St.
U.S. Mail: P.O. Box 192
Pittsburg, California 94565
P: (925) 427-3517
F: (925) 427-3518

October 8, 2009

Mr. Gary Darling
General Manager
Delta Diablo Sanitation District
2500 Pittsburg-Antioch Highway
Antioch, CA 94509-1373

Subject: Letter of Intent for East County Industrial Recycled Water Facilities Plan

Dear Mr. Darling:

The purpose of the letter is for Mirant Americas, Inc. ("Mirant") to affirm interest in evaluating the use of recycled water for new power plants within the study area of the East County Industrial Recycled Water Facilities Plan (Plan). The Plan considered recycled water supplies from Delta Diablo Sanitation District, Ironhouse Sanitation District and Central Contra Costa Sanitary District for service to new power plants located within the industrial corridors of the cities of Antioch and Pittsburg.

As Mirant continues to develop new power projects within the area of the Plan, Mirant will continue to evaluate the use of recycled water as the water supply component for steam cycle cooling and associated process applications. The use of recycled water in new power plant projects for cooling and process purposes will be based on an economic, technical, reliability, and environmental evaluation.

Mirant Willow Pass, LLC, a Mirant subsidiary, currently has pending before the California Energy Commission (CEC) an Application for Certification for a project to be located in Pittsburg, CA that proposes the use of recycled water as the process water supply at its proposed dry-cooled new power plant, the Willow Pass Generating Station. The CEC has yet to rule on this project.

Of course, ultimately, the decision to use recycled water at any new power plant project is contingent upon a number of factors in addition to those outlined above including certainty of supply of high quality water and the ability to discharge blowdown in an environmentally acceptable and economically feasible manner.

Mirant appreciated the opportunity to partner with the wastewater agencies, water purveyors, and cities that participated in development of the Plan. We look forward to working with you in the future.

Sincerely,

John Chillemi
Vice President

Appendix G - Example User Agreement for Power Plants

AGREEMENT FOR THE PURCHASE AND RETURN OF RECYCLED WATER (DEC PROJECT)

THIS AGREEMENT FOR THE PURCHASE AND RETURN OF RECYCLED WATER (DEC PROJECT) (this "**Agreement**") is made and entered into as of this 12th day of April, 2000 (the "**Effective Date**"), between, on the one hand, Delta Diablo Sanitation District, a county sanitation district organized and existing under the laws of the State of California ("**District**"), and, on the other hand, Calpine Corporation, a corporation organized and existing under the laws of the State of Delaware ("**Calpine**") and Delta Energy Center, LLC, a limited liability company organized and existing under the laws of the State of Delaware ("**DEC LLC**" and, together with Calpine, collectively, the "**Buyer**") (District and Buyer are hereinafter sometimes referred to individually as a "**Party**" and collectively as the "**Parties**"), with reference to the following:

RECITALS

A. Buyer is the developer of, and is currently in the process of planning and developing, the Delta Energy Center, an approximately 880 megawatt high efficiency, natural gas fueled combined-cycle electric generating facility, to be located in Pittsburg, California, as delineated in California Energy Commission docket number AFC-98-3.

B. District currently provides sewage treatment services to the communities of Pittsburg, Bay Point and Antioch in northern California. District's existing sewage treatment plant is located on Arcy Lane between Pittsburg and Antioch and currently has the capacity to provide treatment for up to an average dry weather flow of 16.5 mgd of wastewater. The sewage treatment plant's secondary effluent currently is discharged into the San Joaquin River pursuant to a National Pollution Discharge Elimination System permit issued to District by the San Francisco Bay Regional Water Quality Control Board.

C. Pursuant to an Agreement for the Development of a Recycled Water Facility, dated as of the date hereof, between District and Calpine, Calpine agreed, among other things, to develop, design, construct and install a recycled water facility on the District's premises, and certain related pipeline facilities, all to be owned, operated and maintained by District, so that the District could use its existing secondary effluent stream to produce recycled water in order to supply the recycled water needs of the Delta Energy Center, the Los Medanos Energy Center (as hereinafter described), and certain other District customers.

NOW, THEREFORE, in consideration of the foregoing (including Calpine's willingness to enter into the aforesaid Agreement for the Development of a Recycled Water Facility), and the mutual covenants, representations and conditions herein set forth, the Parties, intending to be legally bound, hereby agree as follows:

ARTICLE 1

DEFINITIONS

1.1 Defined Terms.

Capitalized terms used in this Agreement without other definition shall have the meanings specified in this Section 1.1, unless the context clearly requires otherwise.

"**Additional Priority Customers**" means (1) the City of Pittsburg, California, and (2) the District itself.

"**Affiliate**" of a specified Person means any other Person that directly, or indirectly through one or more intermediaries, controls, is controlled by or is under common control with the Person specified. For purposes of the foregoing, "control," "controlled by" and "under common control with," with respect to any Person, shall mean the possession, directly or indirectly, of the power to direct or cause the direction of the management and policies of such Person, whether through the ownership of voting securities or by contract or otherwise.

"**Agreement**" means this Agreement for the Purchase and Return of Recycled Water (DEC Project), together with all exhibits hereto.

"**Buyer**" means, collectively, Calpine and DEC LLC.

"**Calpine**" means Calpine Corporation, a corporation organized and existing under the laws of the State of Delaware.

"**Commercial Operation Date**" means the date established as such pursuant to Development Agreement Section 4.2.4.

"**CCWD**" means Contra Costa Water District.

"**DEC LLC**" means Delta Energy Center, LLC, a limited liability company organized and existing under the laws of the State of Delaware.

"**DEC Project**" means an approximately 880 megawatt high efficiency, natural gas fueled combined-cycle electric generating facility, currently known as the Delta Energy Center, to be located in Pittsburg, California, as delineated in CEC docket number AFC-98-3.

"**Delivery Point**" means the delivery point for Recycled Water delivered from District to Buyer hereunder, as specified in **Exhibit C**.

"**Development Agreement**" means the Agreement for the Development of a Recycled Water Facility, dated as of the date hereof, between District and Calpine.

"**Dispute**" means any dispute arising out of or relating to this Agreement.

"**District**" means Delta Diablo Sanitation District, a county sanitation district organized and existing under the laws of the State of California.

"**Effective Date**" means the date of this Agreement, as set forth in the Preamble hereto.

"**Effluent**" means the secondary effluent discharged from the Sewage Treatment Plant's secondary clarification process prior to disinfection and discharge into the San Joaquin River.

"**Fees and Charges**" means the District's fees and charges in effect from time to time relating to District's sale of Recycled Water, acceptance of Return Water and provision of other services hereunder, as established in accordance with the provisions of Section 5.2 and the Rate Memorandum.

"**Financing**" means any construction and long-term financing or other type of financing as may be necessary for the DEC Project, the LMEC Project and/or the Recycled Water Facility (excluding any such financing arranged by or through District), in each case as Buyer may determine.

"**Force Majeure Event**" means any cause beyond the reasonable control of, and not due to the fault or negligence of, the affected Party, including drought, flood, earthquake, storm, fire, lightning, epidemic, war, riot, civil disturbance, sabotage, explosions, strikes or labor disputes, delays or failures in transportation or shipwreck, orders or judgments of any governmental authority, the absence, suspension, termination, interruption, denial, delay in issuance, or failure of renewal of any Permit, or any changes in Laws; provided that events originating within the Recycled Water Facility or other facilities of the District (such as equipment failures or explosions or fires) will not be Force Majeure Events unless caused by a Force Majeure Event. Force Majeure Events include the failure of a contractor, subcontractor or vendor to furnish labor, services, materials or equipment in accordance with its contractual obligations (but solely to the extent such failure is itself due to a Force Majeure Event of the type described in this paragraph).

"**Governmental Authority**" means any federal, state or local government, authority, agency, court or other body, officer or entity, including any zoning authority, building inspector, health or safety inspector or fire marshal, and any governmental regulatory body or commission.

"**Indemnitees**" means, with respect to either Party, such Party along with its Affiliates, and all of their directors, officers, shareholders, partners, members, contractors, agents and employees.

"**Law**" means any federal, state, local or other constitution, charter, act, statute, law, ordinance, code, rule, regulation or order or other applicable legislative or administrative action of any Governmental Authority, department, political subdivision or other instrumentality thereof, or a final decree, judgment or order of a court.

"**Lenders**" means providers from time to time of Financing.

"**Liability**" means any loss, damage, expense, liability, penalty and/or other claim, including reasonable attorneys' fees and costs.

"**Lien**" means any lien, mortgage, encumbrance, charge, pledge, security interest, claim, or other similar interest.

"**LMEC**" means Calpine Construction Finance Company, L.P., a Delaware limited partnership.

"**LMEC Agreement**" means that certain Agreement for the Purchase and Return of Recycled Water (LMEC Project), dated as of the date hereof, between LMEC and District.

"**LMEC Project**" means an approximately 508 megawatt high efficiency, natural gas fueled combined-cycle electric generating facility, currently known as the Los Medanos Energy Center (formerly the Pittsburg District Energy Facility), to be located in Pittsburg, California, as delineated in CEC docket number AFC-98-1.

"**mgd**" means million gallons per day.

"**Non-Peak Hours**" means 8:00 P.M. until 6:00 A.M, 365 days per year.

"**NPDES Permit**" means the National Pollution Discharge Elimination System permit issued to District by the San Francisco Bay Regional Water Quality Control Board, including any amendments, renewals, replacements or substitute Permit therefor.

"**Party**" and "**Parties**" have the meaning set forth in the Preamble of this Agreement.

"**Permits**" means all federal, state, local and regional permits, approvals, certifications, licenses, findings, agreements, and other governmental actions of any Governmental Authority required to be obtained, taken or completed under applicable Laws prior to undertaking any particular activity contemplated by this Agreement.

"**Person**" means an individual, firm, corporation, partnership, limited liability company, trust, Governmental Authority or other organization or entity having legal capacity.

"**Project**" means the overall transactions involving the Recycled Water Facility contemplated by the Development Agreement, this Agreement and the LMEC Agreement.

"**Purveyorship Agreement**" means that certain Agreement Relating to Purveyorship of Recycled Water dated as of April 12, 2000, executed by CCWD, Calpine, Bechtel Enterprises Holdings, Inc., and District.

"**Rate Memorandum**" means the Delta Diablo Sanitation District Recycled Water Enterprise Rate Setting Philosophy attached hereto as **Exhibit A**.

"**Raw Water**" means water purchased by Buyer or its Affiliates or designees from CCWD at an interconnection point located at or in the vicinity of Arcy Lane, in Pittsburg.

"**Recycled Water**" means water that meets the definition of "Recycled Water" within the meaning of California Water Code Section 13050(n), and is produced by the Recycled Water Facility.

"**Recycled Water Facility**" or "**RWF**" means the recycled water facility developed, constructed and installed pursuant to the Development Agreement.

"**Recycled Water Permit**" means the Recycled Water Permit issued by District pursuant to District ordinance to any and all Recycled Water customers.

"**Return Point**" means the delivery point for Return Water delivered from Buyer to District hereunder, as specified in **Exhibit C**.

"**Return Water**" means blow down water resulting from Buyer's use at the DEC Project of Recycled Water, Raw Water or other water, consisting primarily of cooling tower blowdown, which in any such case Buyer delivers to District hereunder pursuant to and in conformance with the Waste Discharge Permit issued by District to Buyer. For the avoidance of doubt, Return Water does not include domestic sewage generated on the DEC Project site.

"**RWF Output**" means, for any given period, or at any given time, the actual total output of Recycled Water from the Recycled Water Facility.

"**Sewage Treatment Plant**" means all of the sewage treatment works and related facilities owned and operated by District at the Premises.

"**Technical Advisory Committee**" or "**TAC**" means a committee of four (4) members, two (2) of which shall be appointed by District, one (1) of which shall be appointed by Buyer, and one of which shall be appointed by LMEC, as contemplated by Section 2.2. If for any reason the LMEC Agreement is terminated during the Term hereof, the TAC position previously appointed by LMEC shall thereafter be appointed by Buyer. The TAC hereunder is the same committee as the TAC established under the Development Agreement.

"**Term**" means the period commencing on the Effective Date and continuing until the thirtieth (30th) anniversary of the Commercial Operation Date.

1.2 Principles of Construction. The following principles of construction shall apply to this Agreement, unless the context clearly requires otherwise:

1.2.1 The terms "herein," "herewith," "hereof" and "hereunder" are references to this Agreement, taken as a whole.

1.2.2 The terms "include," "includes" or "including" shall mean "including, but not limited to."

1.2.3 References to an "Article," "Section," "subsection," "clause," "Exhibit," "Appendix," "Schedule," "Annex" or "Attachment" shall mean an Article, Section, subsection, clause, Exhibit, Appendix, Schedule, Annex or Attachment of this Agreement (including all paragraphs and provisions therein), as the case may be.

1.2.4 Exhibits, appendices, schedules, annexes or attachments to any document shall be deemed incorporated by reference in such document.

1.2.5 All references to or definitions of any agreement, instrument or other document (a) shall include all documents, instruments or agreements issued or executed in replacement thereof, and (b) except as otherwise expressly provided, shall mean such agreement, instrument or document, or replacement or predecessor thereto, as modified, amended, supplemented and restated through the date as of which such reference is made.

1.2.6 All references to a Law shall include any amendment or modification thereof.

1.2.7 A reference to a Person includes its successors and permitted assigns.

1.2.8 The singular shall include the plural and the masculine shall include the feminine, and vice versa.

1.2.9 References to "days" shall mean calendar days, and references to a time of day shall mean such time in Pittsburg, California, unless otherwise specified.

ARTICLE 2

COOPERATION OF PARTIES AND TECHNICAL ADVISORY COMMITTEE

2.1 Cooperation of Parties. During the Term, each Party shall work together with the other Party in good faith using its best reasonable efforts in order to carry out the intent of this Agreement consistent with the purposes of the Project. To this end, each Party agrees to (a) cooperate with the other Party in all material respects; (b) use its best reasonable efforts to identify and resolve all Project problems relating to this Agreement, including any problems affecting the ability of the District to deliver Recycled Water or Raw Water to Buyer, or to accept Return Water from Buyer, in the manner contemplated hereby; (c) keep the other Party informed as to its Project activities relating to this Agreement; and (d) otherwise take all reasonable steps and perform all reasonable actions necessary to accomplish the purposes of this Agreement.

2.2 Technical Advisory Committee.

2.2.1 Generally. The Parties acknowledge that the TAC shall initially be established pursuant to the Development Agreement. For purposes of this Agreement, the TAC shall be the mechanism by which the Parties hereto and LMEC coordinate technical and other Project matters relating to this Agreement and the LMEC Agreement. No decision by the TAC shall be binding upon the Parties unless the decision is unanimously approved by all TAC members. Without limiting the generality of the foregoing, the TAC shall develop procedures for the use of Raw Water hereunder and the opening and closing of the Raw Water access valves.

2.2.2 Alternates; Removal. In the absence or unavailability of any member of the TAC, the Party that appointed such member may in writing designate an alternate to act for such absent or unavailable member. A member may be removed from the TAC at any time by the Person that appointed such member, and such Person shall forthwith appoint the successor of such removed member. Each Party shall provide written notice to the other Party, the TAC and LMEC of the designation and removal of TAC members, and appointment of alternate members. For purposes of this Agreement, the term "representative" or "member," when used with reference to the TAC, shall include any alternate member of the TAC.

2.2.3 Procedures, Meetings and Records. The TAC shall specify procedures for the frequency and conduct of its meetings, the recording of minutes, the appointment of sub-committees (if necessary) and any other similar matters designated by the TAC. The Parties acknowledge that, except as expressly provided herein, the TAC shall have no authority in any manner to modify or otherwise alter the rights and obligations of the Parties under this Agreement. The TAC shall implement procedures to keep orderly records of this Agreement (and all amendments hereto) and all TAC decisions, orders and other determinations applicable to the administration of this Agreement and the operation of the Facility.

2.2.4 Failure to Obtain Quorum for Meetings. If either of the parties to this Agreement are not able or willing to appoint or reappoint it's required member(s) to the TAC within two (2) weeks from notification of any removal, then the TAC shall continue to conduct it's business with the remaining members to the TAC.

ARTICLE 3

WATER PRODUCTION, DELIVERY AND RETURN MATTERS

3.1 Operation of RWF and Production of Recycled Water. Commencing on the Commercial Operation Date and through the end of the Term, District shall use its best reasonable efforts to operate and maintain the RWF, the Sewage Treatment Plant and District's related facilities in a manner that maximizes the RWF Output up to such amount of Recycled Water, in the aggregate, as is demanded by Buyer hereunder, by LMEC under the LMEC Agreement, and by District's other customers from time to time for Recycled Water.

3.2 Buyer's Right to Purchase Recycled Water. Subject to Sections 3.5.1 and 3.5.2 and other applicable provisions hereof, nothing herein shall prohibit District from selling delivering any and all quantities or Recycled Water to any Persons; provided, however, that the Parties acknowledge the provisions of the Purveyorship Agreement, and District agrees that notwithstanding any other provision hereof, if District enters into or proposes to enter into any Excluded Transaction (as defined in the Purveyorship Agreement), District shall defend, indemnify and hold harmless Buyer from any and all costs, liabilities and other damages of any type, including reasonable attorneys' fees, arising out of or relating to such Excluded Transaction or proposed Excluded Transaction (and District shall not directly or indirectly seek reimbursement from or otherwise pass through to Buyer (through Fees and Charges or otherwise) any such costs, liabilities, or other damages.

3.3 Notices and Coordination of Production and Deliveries. The TAC shall establish and oversee the implementation of procedures by which the Parties estimate and report to one another on an annual, quarterly, monthly, daily and/or other periodic basis the District's estimated and actual RWF Output and the Buyer's estimated and actual demands for Recycled Water and discharge of Return Water, as well as immediate notifications of any unanticipated changes in any such estimates.

3.4 No Obligation To Purchase; Other Sources. Notwithstanding any other provision in this Agreement, (i) in no event shall the delivery by Buyer of any estimates, schedules or notices hereunder obligate Buyer to purchase any amount of Recycled Water hereunder (provided that Buyer's election to reduce or curtail deliveries of Recycled Water shall not excuse Buyer's obligation to pay any fixed Fees and Charges otherwise payable) and (ii) District acknowledges and agrees that this Agreement shall in no way prohibit or otherwise limit Buyer from obtaining Recycled Water or other water from any other Person or source.

3.5 Recycled Water Priorities.

3.5.1 General Priorities. If during any period the RWF Output is insufficient to meet the demands of Buyer, LMEC and each of District's other customers for Recycled Water, then the actual RWF Output available shall be allocated solely to Buyer and LMEC up to the full amount of their demands (and if such RWF Output is insufficient to meet the demands of Buyer and LMEC, then 60% to Buyer and 40% to LMEC), and thereafter to other District customers in such order of priority as District shall determine; provided that if any such insufficiency occurs during Non-Peak Hours, then, the District may allocate and supply up to one percent (1.0%) of the RWF Output, on the same priority as to Buyer and LMEC, to any Additional Priority Customers, with a proportional reduction in the aforesaid priority percentages of Buyer and LMEC during any such periods to 59.4% and 39.6%, respectively.

3.5.2 Reallocation Between Buyer and LMEC. Buyer shall have the right at any time, and from time to time, to dedicate all or any portion of its percentage entitlement under Section 3.5.1 to LMEC, and to receive from LMEC all or any portion of LMEC's percentage entitlement, all in accordance with such reasonable notification and related procedures as are specified from time to time by the TAC.

3.5.3 District Right to Sell to Other Customers; Purveyorship Agreement.

(a) Subject to Section 3.5.1 and 3.5.2 and other applicable provisions hereof, nothing herein shall prohibit District from selling or delivering any and all quantities of Recycled Water to any Persons; provided, however, that the Parties acknowledge the provisions of the Purveyorship Agreement, and District agrees that notwithstanding any other provision hereof, if District enters into or proposes to enter into any Excluded Transaction (as defined in the Purveyorship Agreement), District shall defend, indemnify and hold harmless Buyer from any and all costs, liabilities and other damages of any type, including reasonable attorneys' fees, arising out of or relating to such Excluded Transaction or proposed Excluded Transaction (and District shall not directly or indirectly seek reimbursement from or otherwise pass through to Buyer (through Fees and Charges or otherwise) any such costs, liabilities or other damages).

(b) The Parties acknowledge that because of the provisions in this Section 3.5, it may be difficult or impossible for District to market Recycled Water to customers other than Buyer, LMEC or other Persons coming within Included Transactions (as defined in the Purveyorship Agreement), and, if in fact possible, then only on an interruptible basis. The Parties further acknowledge that during the Term, if there are extended periods during which Buyer and LMEC anticipate they will not need the entire RWF Output, it may be in their interests to authorize District to sell portions of the RWF Output on a firm priority basis to other customers. The TAC shall monitor the market for such other potential customers, and the long terms needs of Buyer and LMEC, and shall make recommendations to the Parties from time to time on such matters, it being agreed however, that the TAC shall have no authority to amend this Agreement or otherwise implement procedures inconsistent with the provisions of Section 3.5.1 or 3.5.2 (or other applicable provisions hereof) without the prior written consent of both Parties.

3.5.4 Expansion of RWF. If, following the Commercial Operation Date, the District desires to increase or expand the capacity of the RWF (through the addition of an additional train or otherwise) and to seek additional customers for the additional Recycled Water to be generated by such expansion, Buyer agrees to cooperate in good faith with District to negotiate a modification to the priority allocation provisions of this Section 3.5 and any other affected provisions of this Agreement (excluding the proviso to Section 3.5.3(a)) so as to enable other customers of District to have priority to the Recycled Water produced as a result of such expansion, provided that Buyer shall have no obligation to agree to any such modification that Buyer reasonably believes might have an inequitable and material adverse effect on Buyer's rights and priority to Recycled Water from the Recycled Water Facility. The Parties hereby authorize the TAC to consider all matters arising under this Section 3.5.4 and to make recommendations to the Parties relating to such matters, provided that the TAC shall no authority to amend this Agreement or otherwise implement procedures inconsistent with the provisions of Section 3.5.1 or 3.5.2 (or other applicable provisions hereof) without the prior written consent of both Parties. Buyer acknowledges that Buyer may not refuse to provide any consents otherwise required to be provided under this paragraph relating to new potential customers solely because such potential customer is a competitor of Buyer, and that any such refusal would be unreasonable and in bad faith.

3.6 Raw Water

3.6.1 Certain Acknowledgments. The Parties acknowledge the following:

(a) Buyer and/or its Affiliates have arranged for and have the full responsibility for Raw Water for the DEC Project and LMEC Project in the event of a shortage of Recycled Water and/or for other related purposes for the DEC Project and the LMEC Project.

(b) Raw Water will be supplied from CCWD to Buyer and/or its Affiliates at or in the vicinity of District's premises, and certain pipeline and related infrastructure will be installed in order to connect the Raw Water interconnection directly to the RWF and to the LMEC Project.

(c) Raw Water may in certain circumstances (i) be used as an input to the RWF, either as a substitute for Effluent, or on a blended basis with Effluent, where Effluent is not available in sufficient quantity or quality to produce Recycled Water in quantities sufficient to satisfy the needs of Buyer or LMEC, (ii) be transported directly from the CCWD interconnection to the LMEC Project or the DEC Project through pipelines owned and operated by the District and/or others, or (iii) be used for other purposes under this Agreement as is agreed by the Parties.

3.6.2 Cooperation. The Parties agree to cooperate to carry out the intentions expressed in Section 3.6.1, and hereby authorize the TAC to establish and implement procedures and related details to accomplish the same; provided that, unless otherwise expressly agreed by both Parties and permitted by Law, Raw Water supplied to the RWF shall be used solely for the benefit of Buyer and LMEC (and not other District customers), and Buyer and/or its Affiliates (and not District) shall be solely responsible for the payment of all amounts payable and related liabilities owed to CCWD for Raw Water.

3.7 Return Water. Subject to Section 6.2 and the applicable provisions of Buyer's Waste Discharge Permit, District agrees to accept from Buyer all Return Water delivered by Buyer at the Return Point. Notwithstanding the foregoing, the Parties acknowledge that District's Sewage Treatment Plant may be physically unable to receive and/or process all Return Water (i) during certain periods in quantities exceeding the quantities of Recycled Water provided during such periods or (ii) in certain circumstances where Return Water results from the direct use of Raw Water or other supplies of water, other than Recycled Water. Therefore, to avoid overloading District's facilities and other quality related problems involving Return Water, the Parties shall coordinate through the TAC to develop procedures (i) to monitor and report on the flow of Return Water, (ii) to identify periods when quantity or quality limitations or complete suspension may be required on Return Water, (iii) to provide for written, telephonic or other communications between the Parties relating to the foregoing and (iv) such other related matters as the TAC may deem appropriate.

3.8 Use of Recycled Water and Recycled Water Permit. Buyer shall use Recycled Water only for those uses and purposes which are permissible under applicable Laws

and Permits (including Buyer's Recycled Water Permit). Buyer shall not resell Recycled Water. District shall ensure that the Recycled Water Permit that District issues to Buyer, and any other similar Permit issued by or on behalf of District to Buyer, are consistent with the provisions of this Agreement, and do not provide any more onerous restrictions on Buyer than are set forth under applicable Laws (including Title 22 of the California Code of Regulations) and are applied to all customers of the RWF and/or the Sewage Treatment Plant for the purpose of operational integrity or to meet future waste load allocations of the Sewage Treatment Plant.

ARTICLE 4

DELIVERY AND RETURN POINTS AND METERING

4.1 Delivery and Return Points Recycled Water and Raw Water shall be delivered from District to Buyer at the Delivery Point, at which point title, control, responsibility for, and risk of loss shall pass from District to Buyer. Return Water shall be delivered from Buyer to district at the Return Point, at which point title, control, responsibility for, and risk of loss shall pass from Buyer to District.

4.2 Meters. Meters acceptable to and approved by District shall be installed at the expense of Buyer at the Delivery Point and the Return Point (or other points agreed by the Parties) in order to measure the quantities (and any other parameters deemed appropriate) of Recycled Water and Return Water delivered hereunder. Such meters shall be tested, inspected and adjusted in accordance with District's applicable ordinances and rules and otherwise in accordance with such procedures as are designated by the TAC. If any meter test shows a measurement error of more than five percent (5%), a retroactive correction shall be made on applicable bills for the period during which such meter was in error or, if the period of error cannot be reasonably ascertained, correction shall be made for one-half (1/2) of the period elapsed since the last test date. Buyer shall provide to District copies of all meter testing results received by Buyer within fifteen (15) days of receipt of said reports.

4.3 Raw Water Meter. A raw water meter also shall be installed at the expense of Buyer in order to measure the amount of Raw Water supplied to the RWF. District shall have the right to approve the final location of the Raw Water meter before it is installed. Buyer shall be responsible for all necessary easements and rights-of-way necessary for the installation of the Raw Water meter. The data from such meter shall be reported to Buyer and District in accordance with such procedures and for such purposes as is determined by the TAC. Buyer shall have full responsibility for all matters related to the Raw Water supply and to CCWD as a result of the provision of Raw Water service.

ARTICLE 5

PAYMENTS AND BILLING

5.1 Application of Fees and Charges. As compensation in full to District for the supply of Recycled Water, the acceptance of Return Water, the transportation and other services related to Raw Water, and District's other services hereunder, Buyer shall pay District the applicable Fees and Charges in effect from time to time.

5.2 Determination of Fees and Charges. The Fees and Charges in effect from time to time shall be set by the District in accordance with applicable Law and the Rate Memorandum attached as **Exhibit A**, it being acknowledged and agreed, however, that:

5.2.1 The Fees and Charges shall be determined based upon, and shall not exceed, the cost of service provided by District, as determined in accordance with all applicable Laws. District's revenues derived from Fees and Charges shall not exceed the funds required to provide services hereunder, and shall not be used for any purpose other than that for which the Fees or Charges are imposed. The amount of Fees and Charges imposed upon Buyer shall not exceed the District's proportional cost of services provided to Buyer hereunder.

5.2.2 Fees and Charges (including all changes and adjustments thereto), shall be set and approved from time to time by the District only after a public hearing before the District Board of Directors at which time Buyer shall have the opportunity to testify about the proposed Fees and Charges. Notices of all proposed hearings and a District staff report setting forth proposed Fees and Charges shall be provided to each member of the TAC no less than forty-five days before a hearing.

5.2.3 District staff shall on a reasonably timely basis keep the TAC advised of all material developments affecting the Fees and Charges, shall seek input from and consult with the TAC on all material matters relating to the setting, changing and adjustment of the Fees and Charges applicable hereunder, and shall in good faith consider all reasonable recommendations from TAC members with respect to Fees and Charges.

5.2.4 The TAC, by unanimous decision made in writing, shall have the authority from time to time to amend the Rate Memorandum to the extent reasonably necessary as a result of a change in Law or other change in circumstances necessitating such an amendment.

5.3 Billing Statements and Payments. Following the last day of each month (or other period set by the TAC), District shall send Buyer a billing statement for such period setting forth the applicable meter readings for such period and the calculation of the Fees and Charges applicable to such period hereunder. Buyer shall pay all such billing statements within fifteen (15) days after the receipt thereof and, if Buyer disputes the correctness of any portion of any billing statement, Buyer shall pay the undisputed portion in accordance with the foregoing, and provide District a written statement detailing the nature of any such dispute on or prior to the

date payment was due. Billing and payment procedures shall otherwise comply with District's ordinances and rules in effect from time to time and/or as otherwise prescribed by the TAC.

5.4 Interest. Amounts not paid when due under any provision of this Agreement, including the provisions of this Article 5, shall bear interest, from the date payment was due to and including the date of payment, at a per annum rate of interest equal to the lesser of (a) the Local Agency Investment Fund rate plus 2.5% and (b) the maximum rate permitted by applicable Law.

5.5 Waiver of Connection Fees. District hereby waives all connection fees that might otherwise be required for Buyer to connect to the RWF or the Sewage Treatment Plant pursuant to District Code and Ordinance (excluding any connection fee for a domestic waste water connection).

5.6 Consideration for Agreement. The District has entered into this Agreement in consideration of the transfer of ownership of the Recycled Water Facility from Calpine to District, and for the other reasons set forth in the Recitals hereto, the Recitals in the Development Agreement, and the provisions of the District's Board Resolution authorizing this Agreement and the related transactions.

5.7 Tax Matters. If any Governmental Authority requires District to pay a tax (other than any income tax imposed upon District or its assignee) resulting from the operation of the Recycled Water Facility or the sale of Recycled Water or the acceptance of Return Water, then the Fees and Charges for such service under the above provisions shall be increased by the amount of such tax on the date imposed on District, provided that if District assigns the Recycled Water Facility or this Agreement to any other Person or shall cease to be a governmental entity, said increase shall not be made with respect to any amount of tax that would not have been owed had the assignment or change in status not occurred. If written claim is made against District for any amounts for which Buyer is responsible under this Section, District shall promptly notify Buyer in writing. Buyer may in good faith (at its expense) contest, or if such contest is procedurally required to be made by the District, then the Buyer may cause District to contest (at Buyer's expense), in any reasonable manner, the imposition of any such taxes. District agrees to assist and cooperate with Buyer in regard to any such taxes, including with respect to any such contest, and will timely file any tax returns it is required to file, provide to Buyer any information necessary to complete any returns Buyer must file and provide to Buyer or to any Governmental Authority any certificates or other items to qualify for any available exemption from or reduction of any tax.

ARTICLE 6

QUALITY AND TESTING

6.1 Recycled Water. District shall ensure that Recycled Water delivered hereunder meets all applicable Laws, including all applicable requirements of Title 22 of the

California Code of Regulations. Additionally, Buyer has requested that District use its best reasonable efforts to ensure that Recycled Water delivered hereunder meets the Power Plant Recycled Water Specifications specified in **Exhibit B** hereto. District shall perform regular tests on the Recycled Water to determine compliance with the foregoing, and shall immediately notify Buyer and the TAC of any noncompliance. District shall use its best reasonable efforts to expeditiously correct the problem causing any such noncompliance and, in any event, shall not deliver any such noncomplying Recycled Water unless Buyer requests delivery thereof in writing and such delivery is permitted by Law. Upon written request, and at a mutually agreeable time, District shall make available for inspection by Buyer the results of any Recycled Water testing performed by District.

6.2 Return Water.

6.2.1 Generally. Subject to Section 6.2.2, Buyer shall ensure that the Return Water delivered hereunder satisfies such standards such that, when discharged by District pursuant to District's NPDES Permit, will not result in a violation of District's NPDES Permit. However, Buyer shall be excused from satisfying any such standard to the extent that Buyer's failure to satisfy such standard arises out of Buyer's receipt of Recycled Water which, when delivered to Buyer, did not comply with such standard. District shall make all determinations as to the compliance with such standards, in order to protect District operations and to ensure compliance with the requirements of District's NPDES Permit.

6.2.2 TAC Procedures Regarding Return Water. The Parties acknowledge that circumstances may from time to time exist where a potential violation of District's NPDES Permit that might result from the immediate discharge of specified quantities of Return Water may be avoided through, among other procedures, (i) the blending of such Return Water with other wastewater in the Sewage Treatment Plant and subsequent processing of such Return Water through the Sewage Treatment Plant, (ii) the blending of such Return Water with discharge water or other water delivered to District by LMEC or other Persons or (iii) other similar procedures. Therefore, in order to achieve the Parties' goal of maximizing the amount of Return Water that District may accept from Buyer, the Parties authorize the TAC to establish and implement procedures consistent with the preceding sentence for the monitoring of Return Water deliveries and the blending, processing or other treatment of such Return Water in order to ensure District's compliance with its NPDES Permit. Such procedures shall be coordinated with the procedures issued by the TAC under Section 3.7. Notwithstanding the foregoing, the Parties acknowledge and agree that District shall not be obligated to receive or accept any Return Water that would result in a violation of District's NPDES Permit as contemplated by Section 6.2.1, and Buyer shall immediately cease delivery of any such Return Water.

6.2.3 Waste Discharge Permit. District shall ensure that the Waste Discharge Permit that District issues to Buyer, and any other similar Permit issued by or on behalf of District to Buyer, are consistent with the provisions of this Section 6.2, and do not provide any more onerous restrictions on Buyer than are set forth in this Section 6.2, unless so required by Law and are applied to all customers of the RWF and/or the Sewage Treatment Plant for the purpose of operational integrity or to meet future waste load allocations of the Sewage Treatment Plant.

6.2.4 District's Use of Return Water. Upon acceptance thereof at the Return Point, District shall have the right to dispose of or to use Return Water in any manner at its sole discretion.

ARTICLE 7

LAWS AND PERMITS

7.1 Compliance. Each Party shall obtain and maintain all Permits necessary for the performance of its obligations and related activities under this Agreement, and each Party shall comply with all applicable Permits and all applicable Laws in the performance of its obligations and related activities hereunder.

7.2 Cooperation; Required Notifications. Buyer and District each shall assist and cooperate with the other as may be requested from time to time in order to obtain and maintain the Permits referred to in Section 7.1. District shall provide the TAC and Buyer with prompt notice of any material developments relating to the NPDES Permit that might reasonably be expected to have a material impact on the transactions contemplated by this Agreement. Buyer shall provide the TAC and District with prompt notice of any material developments relating to the DEC Project (including matters involving the California Energy Commission, the Independent System Operator or any other Governmental Authority) that might reasonably be expected to have a material impact on the transactions contemplated by this Agreement.

7.3 Title 22 Requirements. Buyer shall, in accordance with all applicable requirements of Title 22 of the California Code of Regulations: (i) identify to District any "representatives" required under Title 22 and provide certification from such representatives of their understanding of Title 22 requirements for the DEC Project, (ii) provide District evidence of Buyers' acceptance of any applicable Title 22 District water manual(s) regarding Title 22 water use and (iii) comply with all other applicable requirements of Title 22 (as now or hereafter in effect) related to the acceptance and use of Recycled Water and the discharge of Return Water.

7.4 District Codes and Ordinances. In the event of any inconsistency between the terms and provisions of this Agreement and any term or provision of any of the District codes, ordinances, orders or other District rules or regulations in effect from time to time, the terms and provisions of this Agreement shall prevail, except to the extent that any such District code, ordinance, order or other District rule or regulation is mandated by an applicable Law passed by a Governmental Authority other than the District.

ARTICLE 8

TERM

8.1 Term. This Agreement shall remain in effect for the Term, unless cancelled or terminated early pursuant to the express provisions hereof. Except as provided in this Agreement, the District currently has no obligation to serve the DEC Project with Recycled Water service following the end of the Term.

8.2 Cancellation Prior to Commercial Operation Date. Notwithstanding any provision to the contrary set forth in this Agreement, this Agreement shall automatically be cancelled in the event that the Project is terminated pursuant to the Development Agreement prior to the Commercial Operation Date, in which case neither Party shall have any continuing liabilities or obligations arising under or relating to this Agreement following any such cancellation.

8.3 Buyer Termination for Convenience. Buyer shall have the right at any time in its sole election, upon one-hundred eighty (180) days prior written notice to District, to terminate this Agreement for any reason. Following the date of any such termination, neither Party shall have any continuing liabilities or obligations arising under or relating to this Agreement, except for any payment obligations or other liabilities that arise out of performances hereunder prior to the effective date of such termination, and except that Buyer shall reimburse District for its reasonable internal administrative costs necessary to close out this Agreement.

ARTICLE 9

DISPUTES AND DEFAULTS

9.1 Disputes Referred to Technical Advisory Committee. Any and all Disputes, including any Dispute relating to an alleged default or breach hereunder, shall be resolved exclusively in accordance with this Article 9. Prior to exercising any other rights in connection with a Dispute, the Parties agree to make a diligent, good faith attempt to resolve such Dispute through an initial referral thereof to the TAC, and each Party hereby authorizes the TAC to consider all reasonable approaches to resolving such Dispute. No decision by the TAC shall be binding upon the Parties unless the decision is unanimously approved by all TAC members. Either Party claiming a Dispute shall provide written notice thereof to the other Party and the TAC setting forth the details of the Dispute.

9.2 Disputes Referred to Senior Management. If a Dispute has not been finally resolved by the TAC in accordance with Section 9.1 within twenty (20) days after the date of the written notice referred to in Section 9.1 (or such longer period as may be agreed to by the TAC), the Parties agree to make a diligent, good faith attempt to resolve any such Dispute

through negotiation by senior management members designated by the Parties before either Party exercises its rights under Section 9.3. The Parties each hereby authorize and direct their senior management members so designated to make a diligent, good faith attempt to resolve such Dispute, and to consider all reasonable approaches to resolving such Dispute. Senior management shall mean, in the case of Buyer, any person(s) at or above the vice-president level in Buyer's organization and, in the case of District, any one or more District Board members or the designee(s) of the Board.

9.3 Other Remedies. If a Dispute has not been finally resolved by the Parties' senior management in accordance with Section 9.2 within thirty (30) days after the date either Party requests referral thereof to such senior management in writing (or such longer period as may be agreed to by such senior management), then, subject to Section 17.2, either Party may thereafter pursue any other recourse, right or remedy available to such Party under this Agreement or under applicable Laws or equity relating to such Dispute (including a judgment or decree of specific performance and/or injunctive relief to enforce the terms of this Agreement), all of which shall be cumulative. Additionally, it is acknowledged and agreed that Buyer may recover damages if District (1) intentionally fails: (a) to deliver Recycled Water, (b) to cooperate with respect to the delivery of Raw Water, or (c) to accept Return Water, all as provided herein, or (2) fails to use its reasonable best efforts to restore its ability to perform the services listed in preceding clause (1) following the occurrence of any event or circumstance that adversely impairs such ability. And it is acknowledged and agreed that District may recover penalties and/or damages from Buyer in accordance with applicable District ordinances or rules if Buyer causes a violation of District's NPDES Permit.

ARTICLE 10

REPRESENTATIONS, WARRANTIES AND ADDITIONAL COVENANTS OF DISTRICT

District hereby represents, warrants and covenants to Buyer as follows:

10.1 Due Authorization, Etc. District is duly organized, validly existing and in good standing under the laws of the State of California and has all requisite power and authority to execute and deliver this Agreement, and to consummate the transactions contemplated hereby without further action. The execution, delivery and performance of this Agreement by District and the consummation of the transactions contemplated hereby have been duly and validly authorized by all necessary board action and/or other proceedings of District. When executed, this Agreement will constitute a legal, valid and binding obligation of District enforceable against District in accordance with its terms, except to the extent that enforceability may be limited by applicable bankruptcy, insolvency, reorganization, moratorium or similar Laws and subject to general equitable principles. District has duly taken all actions, obtained all consents and approvals of all Persons (including third parties), and satisfied all requirements (under applicable Law or otherwise), in each case necessary or appropriate for District to duly,

validly and legally authorize, execute, deliver, perform and otherwise consummate this Agreement and the transactions contemplated hereunder and to make this Agreement the legal, valid and binding obligation of District enforceable in accordance with its terms as provided above. The execution, delivery and performance by District of this Agreement do not, and the consummation of the transactions contemplated hereby will not, result in the breach of, or constitute a default under any provision of, the organizational documents or enabling Laws pertaining to District or any contract or other instrument to which District is a party.

10.2 No Violation of Law; No Litigation. District is not in violation of any applicable Law or applicable Permit, or judgment or order entered by any Governmental Authority, which violations, individually or in the aggregate, could materially and adversely affect its performance of any obligations under this Agreement. There are no legal or arbitration proceedings or any proceeding by or before any Governmental Authority, now pending or (to the best knowledge of District) threatened against District which, if adversely determined, could reasonably be expected to have a material adverse effect on the operations or business, as a whole, of District, or its ability to perform under this Agreement.

10.3 No Adverse Actions. During the term of this Agreement, the District covenants that (a) it (or its assignees hereunder) shall continue to own (and shall not, without the consent of the TAC, create or suffer any Liens on) the Recycled Water Facility and shall continue to operate, maintain, repair and manage its business and assets either directly, or indirectly by separate contract or agreement, all in a prudent manner so as to reasonably assure the District's continued ability to perform its obligations hereunder and (b) shall not enter into any transaction, agreement or other arrangement or otherwise take any actions of any type that would have, or that would reasonably be expected to have, a material adverse effect on the Recycled Water Facility, on the continued ability of the District to continue to perform its obligations hereunder in accordance with the provisions hereof, or on the rights and benefits provided to the Buyer hereunder.

ARTICLE 11

REPRESENTATIONS, WARRANTIES AND ADDITIONAL COVENANTS OF BUYER

Buyer hereby represents, warrants and covenants to District a follows:

11.1 Due Authorization, Etc. Calpine is a corporation duly organized, validly existing and in good standing under the laws of its state of Delaware, duly authorized to do business in California, and has all requisite power and authority to execute and deliver this Agreement, and to consummate the transactions contemplated hereby without further action. DEC LLC is a limited liability company duly organized, validly existing and in good standing under the laws of its state of Delaware, duly authorized to do business in California, and has all requisite power and authority to execute and deliver this Agreement, and to consummate the transactions contemplated hereby without further action. On the date hereof, DEC LLC is

owned, indirectly, 100% by Bechtel Enterprises Holdings, Inc. The execution, delivery and performance of this Agreement by Buyer and the consummation of the transactions contemplated hereby have been duly and validly authorized by all necessary corporate and/or other proceedings of Buyer. When executed, this Agreement will constitute a legal, valid and binding obligation of Buyer enforceable against Buyer in accordance with its terms, except to the extent that enforceability may be limited by applicable bankruptcy, insolvency, reorganization, moratorium or similar Laws and subject to general equitable principles. Buyer has duly taken all actions, obtained all consents and approvals of all Persons (including third parties), and satisfied all requirements (under applicable Law or otherwise), in each case necessary or appropriate for Buyer to duly, validly and legally authorize, execute, deliver, perform and otherwise consummate this Agreement and the transactions contemplated hereunder and to make this Agreement the legal, valid and binding obligation of Buyer enforceable in accordance with its terms as provided above. The execution, delivery and performance by Buyer of this Agreement do not, and the consummation of the transactions contemplated hereby will not, result in the breach of, or constitute a default under any provision of, the organizational documents of Buyer or any contract or other instrument to which it is a party.

11.2 No Violation of Law; No Litigation. Buyer is not in violation of any applicable Law or applicable Permit, or judgment or order entered by any Governmental Authority, which violations, individually or in the aggregate, could affect its performance of any obligations under this Agreement. Except for pending Permit applications with respect to the DEC Project, there are no legal or arbitration proceedings or any proceeding by or before any Governmental Authority, now pending or (to the best knowledge of Buyer) threatened against Buyer which, if adversely determined, could reasonably be expected to have a material adverse effect on the operations or business, as a whole, of Buyer, or its ability to perform under this Agreement.

11.3 No Adverse Actions. During the term of this Agreement, Buyer covenants that it shall continue to operate, maintain, repair and manage the pipeline and related infrastructure located (or to be located) on Buyer's premises that are used for the transportation of Recycled Water, Raw Water and Return Water in a prudent manner so as to reasonably assure Buyer's continued ability to perform its obligations hereunder.

11.4 Provision of Information. Buyer agrees to provide District with such publicly available information relating to Calpine and /or the DEC Project (e.g. Calpine annual reports, etc.) that may be reasonably requested from time to time by District.

ARTICLE 12

ASSIGNMENT

12.1 Agreement Binding. This Agreement shall be binding upon, and shall inure to the benefit of, the Parties hereto and their respective successors and permitted assigns.

12.2 Permitted Assignment. This Agreement shall not be assignable by either Buyer or District, in whole or in part, without the prior written consent of the other Party, which consent shall not be unreasonably withheld or delayed, except that: (a) Calpine and/or DEC LLC may enter into the assignments and related transactions contemplated under Article 13, (b) Calpine and/or DEC LLC may, upon notice to District, assign this Agreement without the prior written consent of District to any entity or entities designated by Buyer to own the DEC Project or any purchasers or other transferees of the DEC Project and (c) Calpine and/or DEC LLC may, upon notice to District, assign this Agreement without the prior written consent of District to any other reasonably creditworthy Person, and upon any such assignment referred to in clauses (a), (b) or (c) above, and the assumption by the assignee of all obligations hereunder arising after the date of the assignment, the then current "Buyer" hereunder, as the case may be, shall automatically be released and discharged from any and all liability and obligations arising out of or relating to this Agreement that arise after the date of such assignment. Any assignment which does not comply with the provisions of this Section 12.2 shall be null and void. In the event of an assignment by Buyer pursuant to preceding clause (c) to a Person who requests a change in the Delivery Point or Return Point hereunder, the District shall reasonably negotiate in good faith regarding such change, including the installation of additional pipeline and related infrastructure necessary to accommodate such change, provided that Buyer or such Person bears all the costs and expenses thereof. Upon any assignment under preceding clause (b) or (c), the TAC shall meet as soon as possible to determine any changes in the operating plans and profiles of the assignee, and upon any such assignment, District shall have the right to re-evaluate the assignee's compliance with insurance requirements of Section 14.1, as well as any payment deposit requirements and other related payment procedures applicable to the assignee under applicable District ordinances and rules, as well as the Waste Discharge Permit requirements applicable to the assignee (it being acknowledged that no such assignment shall be effective until the issuance to the assignee of an applicable Waste Discharge Permit, although District agrees to reasonably cooperate to issue such Waste Discharge Permit).

ARTICLE 13

FINANCING PROVISIONS

The Parties acknowledge that the development and installation of the DEC Project and/or the Recycled Water Facility may be financed by the Buyer, or by a special purpose company formed by Calpine and/or DEC LLC, through the Financing provided by the Lenders. Both Parties agree to consider and to negotiate in good faith changes or additions to this Agreement that may be reasonably requested by the Lenders in order to support the Financing. The Parties also agree that Calpine and/or DEC LLC may assign this Agreement to the Lenders as collateral to support the Financing. In connection with any such assignment, District agrees to enter into an agreement directly with the Lenders under which District shall consent to such assignment and will agree to other customary and reasonable provisions for the benefit of the Lenders (including reasonable provisions under which the Lenders or their designees (i) may assume the rights of Buyer under this Agreement, (ii) shall be entitled to receive copies of certain notices hereunder relating to defaults and other similar matters that District might provide to

Buyer, (iii) shall have reasonable extended cure periods to cure any defaults by Buyer hereunder and (iv) shall be provided other similar or related benefits or protections as reasonably requested by the Lenders and accepted by District to support the Financing). Without limiting the generality of the foregoing, in connection with any collateral assignment by Calpine and/or DEC LLC of this Agreement to a Lender as set forth above, District further agrees to furnish the Lenders with such other documents as may be reasonably requested by the Lenders, including an opinion of counsel to District with respect to the matters represented by District in Section 10.1 above, and board orders of District's board authorizing the execution and delivery of this Agreement and the aforementioned agreement with the Lenders.

ARTICLE 14

INSURANCE AND INDEMNITY

14.1 General. At all times following the Commercial Operation Date, each Party agrees to obtain and maintain property/casualty insurance, liability insurance, workers compensation insurance, excess/umbrella insurance and other appropriate insurances in such amounts and on such terms and conditions as such Party determines to be reasonable, customary and prudent given the nature of such Party's business, assets and activities, and giving due regard to District's status as a Government Authority. Such insurance may be provided through self-insurance or other similar programs.

14.2 RWF Property Insurance. Notwithstanding the generality of Section 14.1, on or prior to the Commercial Operation Date, and for the remainder of the Term, the District shall obtain and maintain property insurance covering the RWF and the pipeline infrastructure connecting the RWF to the DEC Project, all on such specific terms and conditions and with deductible amounts and other provisions as mutually agreed by the TAC, but in any event with a coverage limit no less than the full estimated replacement value thereof. During the Term, either Party may recommend different requirements for, or alternatives to, such property insurance, which shall be considered by the TAC, provided that the District shall comply with the requirements of the preceding sentence unless and until the TAC unanimously approves any change(s) thereto.

14.3 General Indemnity. To the fullest extent permitted by applicable Law, but subject to Article 9 and Section 17.5, each Party shall defend, indemnify and hold harmless the other and the other's Indemnitees from and against all Liabilities arising out of or relating to injury to or death of persons, damage to or loss of property, or violation of Law or Permit, caused by or arising out of the negligence, willful misconduct or default or breach of this Agreement by such Party.

ARTICLE 15

FORCE MAJEURE AND RELATED EVENTS

15.1 Force Majeure.

15.1.1 Generally. Each Party shall be excused from performance and shall not be considered to be in default with respect to any obligation hereunder, except the obligation to pay money in a timely manner, if and to the extent that its failure or delay in performance is due to a Force Majeure Event; provided that:

(a) Such Party gives the other Party written notice describing the particulars of the Force Majeure Event as soon as is reasonably practicable (provided that the failure of a Party to provide any such notice in a timely manner shall preclude such party from claiming relief from such Force Majeure Event hereunder only if and to the extent that such failure actually prejudices the other Party);

(b) The suspension of performance is of no greater scope and of no longer duration than are reasonably required by the Force Majeure Event;

(c) The Party uses best reasonable efforts to overcome or mitigate the effects of such occurrence; and

(d) When the Party is able to resume performance of its obligations under this Agreement, such Party provides the other Party written notice to that effect and promptly resumes performance hereunder.

15.1.2 Extension of Term. Buyer shall have the option, exercisable by written notice(s) to District from time to time, to extend the Term of this Agreement on a day-for-day basis for the duration of any Force Majeure Event(s) hereunder that last(s) longer than four (4) months, and that have the effect of reducing the quantities of Recycled Water that District is able to supply to Buyer.

15.2 Casualty Events. In the event of any casualty or similar other event involving damage or destruction of all or any portion of the RWF or any other District assets that impact District's ability to provide it services and perform it obligations hereunder, the TAC shall immediately confer to consider alternative solutions for repair or replacement of the same, and the District shall then use its reasonable best efforts to repair or replace the same as expeditiously as is reasonably possible in order to restore District's ability to resume full performance of its services and obligations hereunder, using all RWF operations and maintenance funds (and insurance proceeds) as may be available to the District to accomplish the same. If sufficient funds therefor are not available, and District is unable to raise the same on a reasonably expeditious basis through the issuance of bonds or other similar means, then Buyer shall have the right and option (but no obligation) to provide any such funds on such reasonable terms and conditions as may be determined by the TAC.

15.3 Condemnation, Etc. If all or any portion of the RWF or any other District assets that affect District's ability to provide its services and perform its obligations hereunder is taken by any Governmental Authority under any Law or by right of taking, condemnation, eminent domain or other proceeding, then, in each such case, (i) the Parties shall promptly confer and cooperate to attempt to agree upon and implement a plan to replace such assets or otherwise mitigate the affects of such proceeding and (ii) in any event, Buyer shall have the right, at its expense, to appear in any such proceeding to receive a separate award in respect of its compensable interests as they appear, for the value of any rights, benefits or other compensable interests of Buyer that have been materially adversely impacted thereby. To the extent District receives any amounts or proceeds in connection with such proceedings which are payable in respect of Buyer's compensable interests, District agrees to hold any such amounts received by District in trust for Buyer and to promptly pay the same to Buyer.

15.4 Changes in Law. In the event of any change in Law, Permit requirement or other action of a Governmental Authority occurring after the Commercial Operation Date, which in any such case requires a modification to the RWF, the TAC shall immediately confer to consider alternative solutions thereto and to agree upon the solution. Following agreement on the solution, the District shall then use its reasonable best efforts to carry out any such agreed modifications or other solutions as expeditiously as is reasonably possible in order to enable the District to continue full performance of its services and obligations hereunder, using all RWF operations and maintenance funds as may be available to the District to accomplish the same. If sufficient funds therefor are not available, and District is unable to raise the same on a reasonably expeditious basis through the issuance of bonds or other similar means, then Buyer shall have the right and option (but no obligation) to provide any such funds on such reasonable terms and conditions as may be determined by the TAC. For the avoidance of doubt, the Parties acknowledge that, notwithstanding any change in Law, Permit requirement or other action of a Governmental Authority, District shall have no obligation to accept Return Water from Buyer that would result in a violation of District's NPDES Permit, all in accordance with Sections 3.7 and 6.2.

ARTICLE 16

NOTICES

16.1 Writing. Any notice, demand, offer or other written instrument required or permitted to be given pursuant to this Agreement shall be in writing signed by the Party giving such notice and shall, to the extent reasonably practicable, be sent by telefax, and if not reasonably practicable to send by telefax, then by hand delivery, overnight courier, telegram or registered mail, to the other Party at such address as set forth below:

<u>If to District</u>:

Delta Diablo Sanitation District
2500 Pittsburg Antioch Highway
Antioch, CA 94509

Telephone: 925-778-4040
Fax: 925-778-8513
Attention: General Manager/District Engineer

If to Buyer:

Calpine Corporation
6700 Koll Center Parkway
Pleasanton, CA 94566
Telephone: (925) 600-2000
Fax: (925) 600-8925

Attention: General Counsel

and

Delta Energy Center, LLC
c/o Bechtel Enterprises Holdings, Inc.
50 California Street
San Francisco, CA 94111
Telephone: 415-768-2185
Fax: 415-733-0313
Attention: General Counsel

Each Party shall have the right to change the place to which notices shall be sent or delivered, in either case by similar notice sent or delivered in like manner to the other Party.

16.2 Timing of Receipt. Without limiting any other means by which a Party may be able to prove that a notice has been received by the other Party, a notice shall be deemed to be duly received:

(a) If delivered by hand, overnight courier or telegram, the date when left at the address of the recipient;

(b) If sent by registered mail, the date of the return receipt; or

(c) If sent by telefax, upon receipt by the sender of an acknowledgment or transmission report generated by the machine from which the telefax was sent indicating that the telefax was sent in its entirety to the recipient's telefax number.

ARTICLE 17

MISCELLANEOUS

17.1 Complete Agreement; Amendment. This Agreement, including the Exhibits attached hereto, constitutes the entire agreement and understanding of the parties as of the Effective Date with respect to the subject matter hereof and supersedes any and all prior negotiations, agreements, understandings and representations relating thereto. This Agreement may not be amended, modified or changed except as mutually agreed in a writing executed by each Party and specifying that such writing is intended to be an amendment to this Agreement.

17.2 GOVERNING LAW; CONSENT TO JURISDICTION. THIS AGREEMENT SHALL BE GOVERNED BY, CONSTRUED UNDER AND ENFORCED IN ACCORDANCE WITH THE LAWS OF THE STATE OF CALIFORNIA. ANY LEGAL ACTION OR PROCEEDING BY OR AGAINST ANY PARTY HERETO ARISING UNDER THIS AGREEMENT SHALL BE BROUGHT IN THE COURTS OF THE STATE OF CALIFORNIA IN AND FOR THE COUNTY OF CONTRA COSTA. BY THE EXECUTION AND DELIVERY OF THIS AGREEMENT, EACH OF THE PARTIES HERETO ACCEPTS FOR ITSELF THE EXCLUSIVE JURISDICTION OF THE AFORESAID COURTS.

17.3 Relationship of Parties. Nothing contained in this Agreement shall be construed to create an association, joint venture, trust or partnership, or impose a trust or partnership obligation or liability on or with regard to any of the Parties. Buyer and District shall each be individually responsible for its own covenants, obligations and liabilities under the Agreement. Except where otherwise expressly approved by the other Party, each Party shall act hereunder only on an individual and several basis and shall not be authorized to act as agent or representative of the other Party nor have the power or authority to bind the other Party for any purpose. No Party shall so bind the other Party, or represent to anyone that it has the authority to bind such other Party, or make any other representation about or on behalf of such other Party.

17.4 No Unspecified Third Party Beneficiaries. Except with respect to the Lenders or LMEC to the extent set forth herein, this Agreement shall not be construed to create rights in, or to grant remedies to, any third party as a beneficiary of any duty, obligation or undertaking established herein.

17.5 Waiver of Consequential Damages. Notwithstanding any other provision of this Agreement (except to the extent expressly set forth in the last sentence of Section 9.3 relating to District's NPDES Permit), in no event, whether as a result of breach of contract, tort liability (including negligence), strict liability or any other cause of action, and whether arising before or after the Commercial Operation Date, shall any Party be liable to the other Party for special, indirect, incidental, punitive, exemplary or consequential damages of any nature whatsoever, including losses or damages caused by reason of loss of use, loss of profits or revenue, interest charges, cost of capital or claims of either Party's customers, and each Party hereby expressly releases the other Party therefrom.

17.6 No Waiver. Any failure of either Party to enforce any of the provisions of this Agreement or to require compliance with any of its terms at any time during the pendency of this Agreement shall in no way affect the validity of this Agreement, or any part hereof, and shall not be deemed a waiver of the right of such Party thereafter to enforce any and each of such provisions.

17.7 Joint Effort. Preparation of this Agreement has been a joint effort of the Parties and the resulting document shall not be construed more severely against one of the Parties than against the other.

17.8 Captions. The captions contained in this Agreement are for convenience and reference only and in no way define, describe, extend or limit the scope or intent of this Agreement or the intent of any provision contained herein.

17.9 Severability. The invalidity of one or more phrases, sentences, clauses, Sections or Articles contained in this Agreement shall not affect the validity of the remaining portions of this Agreement so long as the material purposes of this Agreement can be determined and effectuated.

17.10 Further Actions. In addition to the acts specifically required in this Agreement, Buyer and District each agree to perform or cause to be performed any and all such further acts and to provide such further assurances as may be reasonably necessary to effect the transactions contemplated hereby, including the execution, delivery and, if applicable, filing of such additional documents and instruments as may be reasonably requested by such other Party.

17.11 Survival. The indemnity and hold harmless provisions of Sections 14.3 and shall survive the expiration or early termination of this Agreement with respect to any event or occurrence arising on or prior to such expiration or earlier termination.

17.12 Non-Recourse Obligations. The obligations of each Party under this Agreement shall be without recourse to any of the officers, board members, partners, shareholders, members, employees, agents, or Affiliates of such Party or of any of the foregoing. With respect to the obligations of Buyer hereunder, recourse may be had by District only to the DEC Project and any assets of Buyer directly associated with the DEC Project. Without limiting the generality of the foregoing, in the event Buyer owns one or more power generation projects in addition to the DEC Project, it is expressly understood by District that it shall have no recourse to such additional projects or any associated assets.

[Signature Page Follows]

ARTICLE 18

AGREEMENT EXECUTION

IN WITNESS WHEREOF, the Parties have caused this Agreement to be executed as of the Effective Date by their duly authorized representatives as follows:

DISTRICT:
Delta Diablo Sanitation District

By: _____
Name: Federal D. Glover
Title: Chairperson

BUYER:
Calpine Corporation,
a Delaware corporation

By: _____
Name: Ann B. Curtis
Title Executive Vice President

By: _____
Name: Lisa M. Bodensteiner
Title: Assistant Secretary

Delta Energy Center, LLC,
a Delaware limited liability company

By: _____
Name: Douglas B. Brown
Title: Vice President

By: _____
Name: Steven T. Dixon
Title: Assistant Secretary

[District Board Secretary Attestation]

By: _____
Name: Joseph E. Canciamilla
Title: District Secretary

[Approved as to Form by County Attorney]

By: _____
Name: Silvano B. Marchesi
Title: District Counsel

Exhibit A

DELTA DIABLO SANITATION DISTRICT
RECYCLED WATER ENTERPRISE

RATE SETTING PHILOSOPHY
April, 2000

1. Recycled Water rates, including all fees and charges, shall be based on the District's cost of service. There shall be both (1) flat rates (i.e., fixed amounts to recover fixed costs of operations) and (2) variable rates (to recover variable costs of operations), all as determined by the TAC.

2. The RWF shall be operated as a separate fund on the District's financial books, and all revenues and expenditures shall be separately accounted for from other District operations.

3. All rates shall conform with the latest versions of the following:

   a. Article XIII-D, State of California Constitution
   b. California Health and Safety Code Section 4730 et seq
   c. Governmental Accounting Standards Board Standard 34
   d. State Water Resources Control Board Revenue Program Guidelines

4. All RWF funds shall be annually audited pursuant to State of California Controller's requirements.

5. Any funds unspent in a given year shall be carried over and used in the next year's budget.

6. The RWF enterprise shall operate from four (4) separate funds as follows:

   a. Operation and maintenance
   b. Capital Asset Replacement
   c. Capital Asset Acquisition
   d. RWF Expansion

7. All assets or other items that are shared by the RWF enterprise and by the Wastewater Treatment Plant enterprise (or any other enterprise of the District) shall be charged to the RWF on a proportional use basis, using average costs.

8. Prior to each fiscal year (July 1 to June 30), District shall prepare an RWF Budget, including all operations, maintenance and other costs for such year, and including all amounts proposed to be collected for any reserve funds (if any) in such year, for review and approval by the TAC. A preliminary form of such Budget for the first such year is attached hereto as Rate Setting Philosophy Attachment 1. The Parties acknowledge that such pro forma budget contains estimates and preliminary line item designations only, and is intended only as an example of the type of budget to be prepared and approved by the TAC for each such year.

9. Capital asset replacement shall be funded for equipment with a useful life of 25 years or less on such terms as is approved by the TAC. The TAC will determine the useful life of those assets. The fund will be calculated using a sinking fund approach. The replacement fund will be reviewed annually by the TAC to determine if the fund is generating an appropriate amount of funds for replacement.

10. In lieu of including assets with a useful life of greater than 25 years in the capital asset replacement fund, all costs associated with repair, replacement and upgrade of structures and pipelines shall be handled on a proportionate share "direct-bill" basis to RWF customers (including LMEC/DEC), as and when needed, on such terms and conditions as is approved by the TAC.

11. LMEC/DEC shall receive a credit, for the capital construction costs of the RWF and attendant pipeline infrastructure constructed by Calpine and dedicated to District, from the full cost rate-based revenues of all other customers.

12. Capital Asset acquisition expenditures shall be as approved in the Recycled Water Capital Improvement Program and the funding shall either be through the rate structure or through direct payment by LMEC/DEC, all on such terms and conditions as are approved by the TAC.

13. All RWF expansion shall be funded from future customers of the Recycled Water Enterprise.

14. Debt service for the flow equalization basin and hypochlorite facility projects shall be included in the annual operations and maintenance budget, based on the proportional cost of the facilities financed with the debt. The debt service for these facilities will be allocated between the RWF and the Wastewater Treatment Plant based on the RWF use of the facilities.

15. Return Water which results from the use of Recycled Water produced with District Sewage Treatment Plant effluent shall be accepted by District without charge unless it can be shown that the full cost of disposal of the Return Water (including chlorination, dechlorination and all outfall operations and any future additional disposal facilities required for discharge to river) exceeds the then current cost of wastewater disinfection and disposal.

16. Pipeline and pumping facilities constructed to serve only LMEC shall have separate rates prepared for the operation, maintenance and replacement of these assets.

17. Uses of the RWF by DDSD for additional treatment just prior to disposal through the District's outfall shall be paid for by the DDSD wastewater enterprise at the price of treatment of the recycled water and shall be charged in the proportion of DDSD treatment to total treatment through the RWF.

18. No commodity charges or other amounts shall be charged to the RWF Enterprise (or its customers) for effluent supplied by the Sewage Treatment Plant to the RWF.

19. For purposes of proper planning and in order to carry out the LMEC/DEC intent not to fund large reserve balances, including for structures, storage tanks, pipelines and assets with a useful life of greater than 25 years, the Parties agree to the following:

a. After the 23rd anniversary of the Commercial Operations Date of LMEC and prior to the 24th anniversary, District shall cause to be conducted an assessment of all facilities to determine the need for replacement and rehabilitation. This Facilities Assessment shall outline improvement needs and shall estimate the costs of making those improvements.

b. Not later than such 25th anniversary, the then Buyers shall provide the District with a written Notice of Intention Regarding Recycled Water Supply Agreement evidencing one of the following options:

i. Intentions to terminate and have no further need for recycled water service following the 30th anniversary; OR

ii. An intention to continue service under the Supply Agreement. If this option is chosen Buyer shall indicate its intention to fund its portion of the capital asset replacement responsibilities after the 30th anniversary by either of the following alternatives:

(1) Continue the Supply Agreement as written and provide for Capital Asset Replacement of the assets with a greater than 25 year useful life on a pay-as-you go funding; OR

(2) Agree to add the full Capital Asset Replacement costs into the rate structure as of the 35th year, allowing a ten (10) year funding provision to make the replacement fund whole for past sinking fund payments not made by Buyer.

Pro Forma Budget

TABLE A-1
Recycled Water Fund
Draft Budget

	Cost Category	Year 1	Year 2	Year 3	Basis for Calculations
Revenues					
	Service Charges				
	Recycled Water				
	Return Water				
	Utility Rebates	$8,000			
	Interest	5,000			
	Miscellaneous Income	1,000			
Expenditures					
	Operations and Maintenance				
5101	Regular Salaries	160,000			Based on allocated staff hours to the plant
5105	Overtime Salaries	2,000			Based allocated staff hours to the plant
	Overhead Allocation	240,000			Based on total expenditures for the District
5115	Part-time Salaries	0			Based on employees assigned to the plant
5201	Director's Fees and Expenses	1,000			
5203	Office Expenses	5,000			
5205	Insurance	200,000			Based on RWF operation
5207	Claims Paid	2,000			
5209	Memberships & Dues	5,000			
5211	Licenses & Fees	10,000			
5213	Public Notices & Relations	25,000			Related to RWF Facilities
5217	Employee Recognition	3,000			
5219	Travel & Meetings	3,000			
5221	Rents & Leases	1,000			
5223	Utilities	400,000			Direct Usage
5225	Repairs & Maintenance	25,000			Based on RWF equipment
5227	Operating Expenses	50,000			
5229	Gas/Fuel/Oil	25,000			Direct Usage
5231	Chemicals	200,000			Direct Usage
5233	Uniforms & Safety Supplies	0			
5235	Tools & Equipment	5,000			shared tools will be included in overhead
5237	Research & Monitoring	10,000			Direct costs
5238	Sludge Disposal	25,000			Based on WWTP user rates
5301	Contractual/Professional Services	10,000			
	Land Payments	45,000			Based on District purchase price
5721	Interest on Debt	300,000			Proportional share of equalization basin and hypo-chlorite system
5731	Contingency Allowances	200,000			
	Capital Asset Replacement	450,000			Based on equipment value and life for equipment with life less than 25 years (TAC agrees on appropriate equipment life)
	Capital Asset Acquisition				Improvements agreed upon by TAC
	RWF Expansion				Improvements agreed upon by TAC
Total					

The Draft form is based on the initial estimates of the District. These costs will be updated once actual costs are known or better estimates are prepared. Additional line items maybe added or deleted by the TAC.

Exhibit B

Power Plant Recycled Water Specifications*

1. Toxic substances not exceeding one third of the values listed in Table 1 of Section 6 of the District's NPDES Permit in effect from time to time.

2. Total dissolved solids (TDS) not exceeding 1,200 mg/l

3. Total hardness not exceeding 275 mg/l (as $CaCO_3$)

4. Alkalinity not exceeding 250 mg/l (as $CaCO_3$)

5. Chloride not exceeding 230 mg/l

6. Sulfate not exceeding 200 mg/l

7. Silica (dissolved) not exceeding 30 mg/l (as SiO_2)

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* The Parties acknowledge that the District's ability to meet the above standards is in part dependent upon the quality of the sewage received by District from sewage dischargers to the Sewage Treatment Plant. However, the Parties also acknowledge that Recycled Water may not be useable by Buyer if the Recycled Water does not meet such standards. Therefore, the Parties shall cooperate through the TAC to monitor the Recycled Water's compliance with such standards, and the Parties agree to use best reasonable efforts to find and implement solutions in the event Recycled Water characteristics are outside the ranges set forth above (including considering the imposition by District of restrictions in Waste Discharge Permits, as may be necessary and lawful) in order to attempt to meet such standards.

Exhibit C

DELIVERY AND RETURN POINT SPECIFICATIONS

DEC PROJECT: The Delivery Point and Return Point shall be on the property boundary line between the DEC Project site and the District's premises, with the specific location(s) to be agreed between the Parties at or around the time of installation of the relevant piping and related infrastructure.

LMEC PROJECT: The Delivery Point and Return Point shall be on the property boundary line of the LMEC Project site, which site is the subject of a Lease Agreement with USS Posco Industries, with the specific location(s) to be agreed between the Parties at or around the time of installation of the relevant piping and related infrastructure.

Appendix H - Record of Public Workshop

AGENDA

SPECIAL BOARD OF DIRECTORS MEETING
DELTA DIABLO SANITATION DISTRICT

2500 Pittsburg-Antioch Highway
Antioch, California

WEDNESDAY, SEPTEMBER 9, 2009
4:30 P.M.

A. DAVIS, PARENT, GLOVER

B. PLEDGE OF ALLEGIANCE

C. PUBLIC COMMENTS

D. RECOGNITION

1) Adopt Resolution Commending and Congratulating Gary Lucido, Operator I, on His Retirement from the District (Dominguez)

2) Commend Wayne Rebstock, Operator III, on Passing the State of California Grade IV Wastewater Treatment Plant Operator Certification Exam (Dominguez)

3) Commend Christopher Phillips, Operator I, on Passing the State of California Grade III Wastewater Treatment Plant Operator Certification Exam (Dominguez)

E. PUBLIC HEARING

1) Receive Report and Conduct Public Hearing on East County Regional Industrial Recycled Water Facilities Plan (Eckerson)

F. CONSENT CALENDAR

1) Approve Minutes of July 8, 2009 (Jones)

2) Approve District Monthly Check Registers, June and July 2009 (Harris)

3) Approve Fiscal Year 2008/2009 Fourth Quarter District Investment Report (Harris)

4) Receive Notes from Personnel Committee Meeting, August 26, 2009 (Jones)

5) Approve Second Amendment to First Conformed Employment Agreement between Delta Diablo Sanitation District and Gary W. Darling, General Manager (Glover)

Note: The District will provide reasonable accommodations for persons with disabilities planning to participate in Board (or committee) meetings who contact the Office Manager/Secretary to the Board at (925) 756-1927 at least 24 hours prior to the scheduled meeting.

Any disclosable public records related to an open session item on a regular meeting agenda and distributed by the District to a majority of members of the Board of Directors less than 72 hours prior to that meeting are available for public inspection at 2500 Pittsburg-Antioch Highway, Antioch, CA 94509 during normal working business hours.

6) Authorize General Manager to Execute Agreement with Contra Costa Clean Water Program to Provide Stormwater Inspections, Antioch, Pittsburg and Oakley (Cain)

7) Adopt Resolution Authorizing Investment of Monies in the Local Agency Investment Fund (Ustin)

8) Authorize General Manager to Execute Temporary Construction Permit with Contra Costa Water District and United States Bureau of Reclamation, State Route 4 Widening, Project No. 10087 (Vo)

9) Authorize General Manager to Execute Amendment No. 2 to Consulting Services Agreement in Amount Not to Exceed $15,000, RMC Water and Environment, Regional Industrial Recycled Water, Project No. 10038 (Eckerson)

10) Authorize Rejection of All Bids, Aeration System Improvements, Project No. 10037 (O'Sullivan)

11) Authorize New Project and Transfer $350,000 from Capital Asset Replacement Reserves to New Project No. 10127, Replacement of Arcy Lane Influent Junction Structures (Chapman)

G. DELIBERATION ITEMS: *The Board will consider and take action on the following:*

1) Receive Presentation and Adopt Resolution Supporting Extended Producer Responsibility, California Product Stewardship Council (Wong Roa)

H. PRESENTATIONS AND REPORTS: *The Board may consider and take action on the following:*

1) Receive Presentation of Peak Performance Award from National Association of Clean Water Agencies (Gonzalez)

2) Receive Annual Report on Capital Facilities Capacity Charge Collections, Fiscal Year 2008/2009 (Ustin)

3) Receive Presentation on Community Street Sweeping Services (Dixon)

4) Receive Year-End Delta Household Hazardous Waste Collection Facility Report, July 2008 through June 2009 (Wong Roa)

I. MANAGER'S COMMENTS

J. DIRECTORS' COMMENTS

K. CORRESPONDENCE

Note: The District will provide reasonable accommodations for persons with disabilities planning to participate in Board (or committee) meetings who contact the Office Manager/Secretary to the Board at (925) 756-1927 at least 24 hours prior to the scheduled meeting.

Any disclosable public records related to an open session item on a regular meeting agenda and distributed by the District to a majority of members of the Board of Directors less than 72 hours prior to that meeting are available for public inspection at 2500 Pittsburg-Antioch Highway, Antioch, CA 94509 during normal working business hours.

1) Receive Monthly Reports dated July 31, 2009 and August 28, 2009, Federal Advocates, Inc., Bay Area Recycled Water Coalition, Project No. 6100 (Strommer)

2) Receive Monthly Federal Lobbying Reports dated July and August 2009, ENS Resources, Inc., Bay Area Biosolids to Energy Coalition, Project No. 10089 (Quinn)

3) Receive Monthly State Lobbying Report dated July 2009, Edelstein, Gilbert, Robson & Smith, Bay Area Regional Biosolids to Energy Coalition, Project No. 10089 (Quinn)

L. CLOSED SESSION

None

M. ADJOURNMENT

The meeting will adjourn to the Delta Household Hazardous Waste Collection Facility Expansion Celebration at 2550 Pittsburg-Antioch Highway, Pittsburg, CA 94565.

The next regular monthly meeting will be Wednesday, October 14, 2009, at 5:30 p.m.

Note: The District will provide reasonable accommodations for persons with disabilities planning to participate in Board (or committee) meetings who contact the Office Manager/Secretary to the Board at (925) 756-1927 at least 24 hours prior to the scheduled meeting.

Any disclosable public records related to an open session item on a regular meeting agenda and distributed by the District to a majority of members of the Board of Directors less than 72 hours prior to that meeting are available for public inspection at 2500 Pittsburg-Antioch Highway, Antioch, CA 94509 during normal working business hours.

ITEM E/1

September 9, 2009

RECEIVE REPORT AND CONDUCT PUBLIC HEARING ON EAST COUNTY REGIONAL INDUSTRIAL RECYCLED WATER FACILITIES PLAN

RECOMMENDATION
Receive report, receive comments, and file.

Background Information
In 2001, the Delta Diablo Sanitation District (District) completed construction of a 12.8-million gallon per day (mgd) Recycled Water Facility (RWF). Upon completion of construction, the District began providing approximately 7 mgd of recycled water on average to the two Calpine Corporation power plants as one of the largest industrial recycled water uses in the State. This RWF also provides tertiary recycled water for landscape irrigation at several Pittsburg municipal parks. In 2004, the District applied for and received a recycled water planning grant through the State Water Resources Control Board (SWRCB) to evaluate the feasibility of expanding recycled water use within the service area. A Recycled Water Facilities Plan was completed for the Pittsburg area in 2005, and a similar plan was completed for the Antioch area in 2007. The primary focus of each plan was the development of irrigation reuse projects to serve municipal parks, golf courses, schools and other landscape areas. The District, in partnership with each City, then began a phased implementation of the recycled water distribution expansion projects outlined in each plan. In Pittsburg, this work includes the recently completed project to provide recycled water to the Delta View Golf Course and three additional municipal parks. In Antioch, construction of new distribution and storage facilities began in August to provide recycled water to the Lone Tree Golf Course and four municipal parks in 2010. While each of these Facilities Plans evaluated potential future landscape irrigation needs, they specifically stated additional evaluation would be required to develop future industrial water reuse projects, and also determined additional recycled water supply sources may be required to serve the potential industrial demands.

In 2007, the District formed a regional partnership of Cooperating Agencies including Central Contra Costa Sanitary District, Ironhouse Sanitary District, Contra Costa Water District, and the Cities of Pittsburg and Antioch, Pacific Gas & Electric, and Mirant Corporation for preparation of the East County Regional Industrial Recycled Water Facilities Plan (Plan). The Plan identifies and examines recycled water availability and conveyance/treatment alternatives in the Pittsburg/Antioch/Oakley industrial corridor, where power companies are considering the development of new power generating facilities in the future. A portion of the Plan's cost was funded by a Planning grant administered through the SWRCB in the amount of $75,000, and the balance was funded by the Cooperating Agencies and businesses. The draft Plan has been reviewed and is expected to be finalized and submitted to the SWRCB in October 2009 for approval.

Analysis
East County is a rapidly growing and diverse region on the southwestern edge of the Delta. Although this is a relatively isolated region with a distinct set of water management challenges, activities in East County have ramifications for the entire State water supply. With the exception of limited groundwater supplies, the large majority of water supply for the region derives from the Delta and its contributing watersheds. Earlier this year, Mirant Corporation submitted applications to the State for the development and construction of two new power generating facilities in the District's service area near existing industries. The viability of these and other similar industrial projects is contingent upon securing a reliable, cost effective, and drought-tolerant water supply.

The Plan includes a detailed cost analysis of various project alternatives, and a feasibility study for constructing regional industrial water reuse projects to serve new industrial demands in the District's service area, in comparison with surface water alternatives. The regional projects considered for meeting these new demands included the necessary facilities to convey recycled water from two adjacent wastewater districts; Central Contra Costa Sanitary District to the west and Ironhouse Sanitary District to the east, as potential sources of additional recycled water supplies for delivery in the District's service area.

In order to quantify potential future industrial water demands, the Plan includes a recycled water market assessment. The goal of this assessment is to identify both near-term and long-term industrial uses of recycled water, including a detailed examination of supply availability, water quality needs, and other implementation issues. The potential future industrial customers in the District's service area are primarily new power plants with significant water demands for evaporative cooling systems, and boilers. Raw water delivered by the Contra Costa Water District was the primary surface water alternative identified in the study.

A total of seven recycled water alternatives were evaluated, along with four surface water alternatives, to supply up to 8.0 mgd of water at either Antioch or Pittsburg. A recommended recycled water project, along with a detailed implementation schedule, is identified for each site. The recommended Antioch project could provide up to 3.5 mgd of recycled water from the Ironhouse Sanitary District at a total estimated capital cost of $24.7 million. The recommended Pittsburg project could provide up to 6.0 mgd of recycled water from Central Contra Costa Sanitary District at a total estimated capital cost of $44.7 million. Additional details for the recommended projects, including implementation and financing plans, will be presented to the Board during the meeting.

Promoting the use of recycled water for industrial applications as identified n this Plan, as well as for landscape irrigation purposes, appears to provide the greatest long-term benefits for our service area and the region. Developing a broad range of recycled water uses helps ensure a more consistent and balanced year-round demand, allowing for more effective and efficient development and operation of the necessary capital infrastructure. Accordingly, the District has begun drafting a prioritization policy for recycled water as a guidance document for the development and expansion of the current program, consistent with the Strategic Business Plan. The goal of the policy is maximize the benefits associated with the use of this critical resource, through future development and build out of the District's service area. Future implementation of the recycled water alternatives indentified in this Plan would be consistent with this goal.

Financial Impact

The District's cost share for completion of the East County Regional Industrial Recycled Water Facilities Plan was previously appropriated by the Board.

Attachments

None

Signature: _____

Dean Eckerson, Principal Engineer

cc: Project File P.10038.03.05

ATTACHMENT DR52-1

ISD's June 2007 Report of Waste Discharge

ISD staff has met numerous times over the past several years with Central Valley RWQCB staff to discuss the proposed project. The most recent meeting occurred on March 19, 2007, when the following important issues were discussed:

- Proposed project.
- Issuance of a new NPDES permit for a new WWTP where no effluent data is available.
- Permitting Schedule
- Exact location of outfall in the San Joaquin River.
- Compliance with mercury limits.
- Compliance with salinity standards.

3.3.1 Projected Effluent Quality

With the exception of electrical conductivity (EC) and some conventional parameters that are removed through biological treatment (i.e., BOD and TSS), no data exist to evaluate effluent quality of the proposed wastewater facilities. However, ISD collected a sample of the wastewater inflow to its existing facility in August 2004 to support the environmental assessments needed for the DSEIR. A full suite of inorganic and organic analyses were conducted on the August 2004 sample. However, analysis of iron and manganese was inadvertently not conducted. Consequently, ISD analyzed iron and manganese in an influent sample in May 2007. In preparation for completion of this Report of Waste Discharge, ISD discussed with Regional Water Board staff the issue of how to address issuance of a new NPDES permit for a new WWTP where no effluent data is available. It was determined that ISD would use the available influent data and provide an estimate of the future effluent quality based on known, or best professional judgment analysis of, constituent removal performance from existing treatment plants (Appendix I). Data were obtained for treatment plants in California of similar design characteristics and evaluated to determine average removal efficiencies for particular constituents of concern. The observed constituent removal efficiencies were applied to ISD's influent sample to provide a reasonable estimate of future effluent quality. All detected and non-detected data in ISD's influent sample are provided as part of the NPDES Form 2A Application. The analysis of those constituents detected, and supplemental analysis using treatment removal efficiencies from other WWTPs, is summarized below.

Existing Wastewater Influent Quality

ISD conducted a full analytical screening of priority California Toxics Rule (CTR) constituents and non-CTR constituents in the August 2004 influent sample, and analyzed a sample for iron and manganese in May 2007. Table 3-2 identifies the list of constituents that were detected in the influent, along with the lowest adopted regulatory criteria for each constituent. Constituents with influent concentrations exceeding the respective criteria were carried forward to Section 3.3.1.2 (below) for further analysis as having the potential to exceed the applicable criteria relevant to the proposed San Joaquin River discharge location.

Table 3-2
Constituents Detected in ISD's Wastewater Influent

Constituent	Units	Influent Concentration	Lowest Regulatory Criteria
Inorganics			
pH	Std.	7.6	6.5 – 8.5 [a]
Ammonia (as N)	mg/L	35	Variable [b]
Chloride	mg/L	160	150 [c]
Cyanide, total	µg/L	2.3	5.2 [d]
EC	µmhos/cm	1,197	450 [e]
Fluoride, total	µg/L	1,000	2000 [f]
Hardness (as $CaCO_3$)	mg/L	180	n/a
Iron, total	µg/L	1,800	300 [g]
Manganese, total	µg/L	150	50 [g]
Phosphate as P, total	mg/L	0.8	n/a
Sulfate (as SO_4)	mg/L	71	250 [g]
Sulfide (as S)	mg/L	1.2	n/a
Sulfite (as SO_3)	mg/L	1	n/a
Surfactants (MBAS)	mg/L	12	n/a
TDS	mg/L	603	500 [g]
Metals			
Aluminum	µg/L	1,800	200 [g]
Antimony	µg/L	0.2	14 [h]
Arsenic	µg/L	2.2	10 [f]
Barium	µg/L	71	100 [a]
Cadmium	µg/L	0.5	1.2 [d]
Chromium (total)	µg/L	2.5	90 [d]
Copper	µg/L	31	4.4 [d]
Lead	µg/L	2.4	0.99 [d]
Mercury, total	µg/L	0.15	0.050 [h]
Nickel	µg/L	4.1	25 [d]
Selenium	µg/L	1	5 [d]
Silver	µg/L	0.6	0.81 [d]
Thallium	µg/L	0.1	2 [f]
Zinc	µg/L	96	57 [i]
Volatile Organic Compounds			
1,4-Dichlorobenzene	µg/L	3.1	5 [f]
Chloroform	µg/L	1.1	80 [h]
Toluene	µg/L	2.2	150 [f]
Semi-Volatile Organic Compounds			
Bis(2-ethylhexyl)phthalate	µg/L	34	1.8 [h]
Diethyl phthalate	µg/L	14	23,000 [h]
Dioxin and Furan Compounds			
1,2,3,4,6,7,8-HpCDD	pg/l	0.408	n/a
OCDD	pg/l	0.0385	n/a
1,2,3,4,6,7,8-HpCDF	pg/l	0.228	n/a

Table 3-2
Constituents Detected in ISD's Wastewater Influent

Constituent	Units	Influent Concentration	Lowest Regulatory Criteria
OCDF	pg/l	0.0068	n/a

[1] ISD influent sample data for August 2004.
[2] Design treatment removal percentage, unless otherwise specified.
[3] Projected effluent quality based on design removal and August 2004 ISD influent concentration, unless otherwise specified.
[4] EStimated value.
[5] Average of August 2004 and March 2007 sample concentrations.
[6] ISD influent sample data for March 2007.
[7] Average of weekly ISD effluent samples collected from 2003 to 2005.
[8] Concentrations of individual dioxin congeners converted to Toxicity Equivalent (TEQ) values based on State Implementation Plan (SIP) conversion factors.

[a] Basin Plan objective
[b] Variable U.S. EPA chronic 30-day average receiving water criteria based on pH and temperature.
[c] Lowest maximum mean daily chloride objective at Jersey Point specified in 2006 Bay-Delta Water Quality Control Plan (Table 1). Criteria must be met for specific number of days per year, and must be provide in intervals of not less than 2-week duration. Criteria depend on water year type.
[d] California Toxics Rule (CTR) chronic criteria concentration (CCC). Criteria for hardness-dependent metals based on lowest observed receiving water hardness in San Francisco Estuary Institute's Regional Monitoring Program (RMP) dataset of 43 mg/L as $CaCO_3$.
[e] Lowest 14-day moving average conductivity objective at Jersey Point specified in 2006 Bay-Delta Water Quality Control Plan for April 1 through August 15 (Table 2). Criteria depend on water year type.
[f] California Department of Health Services (DHS) primary maximum contaminant level.
[g] California DHS secondary maximum contaminant level.
[h] CTR human health objective for consumption of water and organisms.
[i] CTR acute criteria maximum concentration (CMC) based on lowest observed receiving water hardness in RMP dataset of 43 mg/L as $CaCO_3$.

Projected Effluent Quality

To evaluate removal efficiencies observed from other similar WWTPs, ISD contacted all of the California wastewater utilities that participated with the recent survey of advanced wastewater treatment process efficiency conducted by the Central Valley Clean Water Association, and that were known to have collected influent and effluent quality data. In addition, ISD contacted five other utilities where it was known that influent and effluent data had been collected. Influent and effluent data were obtained for twelve (12) facilities and all but one facility produces a filtered effluent. Appendix I provides summary statistics for constituent concentrations from each facility and the calculated average removal. The average constituent removal performance among these WWTP facilities was applied to ISD's measured influent concentrations to estimate the concentrations of these constituents in ISD's future effluent. Table 3-3 shows the constituents for which undiluted influent concentrations could exceed applicable criteria from Table 3-2 and are not removed through treatment design, and projected effluent quality calculated as the influent quality multiplied by the average removal efficiency. No removal coefficient was applied to salinity parameters (i.e., chloride, EC, TDS) because the mass and/or concentration of these parameters are generally conservative in a treatment plant and not removed. Chemical coagulants may contribute a small increment of salinity to the final effluent.

Based on the results of the assessment of other similar facilities, it is expected that constituent removal in a treatment plant providing filtration will be sufficient to substantially reduce constituent concentrations in the wastewater. Based on measured influent concentrations and estimated average removal rates, the concentrations of aluminum, copper, iron, lead, mercury, and zinc in undiluted effluent would be expected to be reduced to levels that would meet the lowest regulatory criteria. As a conservative parameter, the future undiluted effluent EC level would not be expected to change appreciably from the average undiluted effluent EC of 1,197 µmhos/cm, and thus would exceed the lowest applicable Delta salinity objective of 450 µmhos/cm. The future undiluted effluent manganese concentration may also exceed the applicable secondary drinking water MCL of 50 µg/L based on ISD's influent concentration and application of the average removal efficiency of 65.4% observed in other facilities. While the observed removal efficiencies for bis(2-ethylhexyl)phthalate were consistently high in all of the facilities data, the concentration of ISD's influent was elevated to a level that would not be expected to comply with the applicable CTR human health criterion for consumption of water and organisms. It remains uncertain whether the influent value reported for bis(2-ethylhexyl)phthalate is affected by contamination during sampling and/or laboratory analyses, which is a common problem for this constituent.

Table 3-3
Projected ISD Effluent Quality Based On Existing Wastewater Influent Quality

Constituent	Units	Influent Concentration	Constituent Removal (avg)	Anticipated Effluent Quality	Applicable Criteria
Inorganics					
Chloride	mg/L	160	n/a	160	150
EC	µmhos /cm	1,197	n/a	1,197	450
Iron, total	µg/L	1,800	92.4%	137	300
Manganese, total	µg/L	150	65.4%	52	50
TDS	mg/L	603	n/a	603	500
Metals					
Aluminum	µg/L	1,800	91.9%	146	200
Copper	µg/L	31	91.2%	2.1	4.4
Lead	µg/L	2.4	64.2%	0.86	0.99
Mercury, total	µg/L	0.15	96.9%	0.005	0.050
Zinc	µg/L	96	70.4%	28	57
Semi-Volatile Organic Compounds					
Bis(2-ethylhexyl)phthalate	µg/L	34	86.7%	4.5	1.8

3.3.2 Outfall Location

ISD has proposed discharge of treated effluent into the San Joaquin River off the north shore of Jersey Island. At this time, ISD is proposing to locate the outfall west of the salt monitoring station, where there is an approximate 350 foot shelf, 20 to 25 feet deep. The outfall will also be located in the vicinity of the existing Jersey Island dewatering pumps that are owned, operated, and maintained by Reclamation District 830. The Department of Water Resources (DWR)

ATTACHMENT DR55-1

ISD's Waste Discharge Requirements

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

CENTRAL VALLEY REGION

11020 Sun Center Drive #200, Rancho Cordova, California 95670-6114
Phone (916) 464-3291 • FAX (916) 464-4645
http://www.waterboards.ca.gov/centralvalley

ORDER NO. R5-2008-0057
NPDES NO. CA0085260

WASTE DISCHARGE REQUIREMENTS FOR THE IRONHOUSE SANITARY DISTRICT WASTEWATER TREATMENT PLANT CONTRA COSTA COUNTY

The following Discharger is subject to waste discharge requirements as set forth in this Order:

Table 1. Discharger Information

Discharger	Ironhouse Sanitary District
Name of Facility	Ironhouse Sanitary District Wastewater Treatment Plant, Oakley, CA
Facility Address	450 Walnut Meadows Drive
	Oakley, CA 94561
	Contra Costa County
The U.S. Environmental Protection Agency (USEPA) and the Regional Water Quality Control Board have classified this discharge as a **major** discharge.	

The discharge by the Ironhouse Sanitary District from the discharge points identified below is subject to waste discharge requirements as set forth in this Order:

Table 2. Discharge Location

Discharge Point	Effluent Description	Discharge Point Latitude	Discharge Point Longitude	Receiving Water
001	Domestic Wastewater	N38º,02',40.74939" N	121º, 41',40.21180" W	San Joaquin River

Table 3. Administrative Information

This Order was adopted by the Regional Water Quality Control Board on:	**25 April 2008**
This Order shall become effective on:	**14 June 2008**
This Order shall expire on:	**1 April 2013**
The Discharger shall file a Report of Waste Discharge in accordance with title 23, California Code of Regulations, as application for issuance of new waste discharge requirements no later than:	**180 days prior to the Order expiration date**

I, PAMELA C. CREEDON, Executive Officer, do hereby certify that this Order with all attachments is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Valley Region, on **25 April 2008**.

PAMELA C. CREEDON, Executive Officer

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I. FACILITY INFORMATION

The following Discharger is subject to waste discharge requirements as set forth in this Order:

Table 4. Facility Information

Discharger	Ironhouse Sanitary District
Name of Facility	Ironhouse Sanitary District Wastewater Treatment Plant
Facility Address	450 Walnut Meadows Drive
	Oakley, CA 94561
	Contra Costa County
Facility Contact, Title, and Phone	Ms. Jennifer Skrel, District Engineer
Mailing Address	Same
Type of Facility	Publicly Owned Treatment Works
Facility Design Flow	4.3 mgd (ADWF)

II. FINDINGS

The California Regional Water Quality Control Board, Central Valley Region (hereinafter Regional Water Board), finds:

A. Background.

The Ironhouse Sanitary District (hereinafter Discharger) owns and operates the Ironhouse Sanitary District Wastewater Treatment Plant (WWTP) and provides sewerage service for the communities of Oakley, Bethel Island and unincorporated areas in between, serving a population of approximately 31,200. The current WWTP consists of headworks, aerated ponds, and two effluent storage ponds. The Discharger disposes of disinfected secondary treated wastewater through irrigation of agricultural lands for production of hay and pastureland for grazing cattle. The effluent is dosed with sodium hypochlorite for disinfection prior to discharge to the irrigation fields. The current average dry weather flow (ADWF) is 2.64 mgd and the treatment ADWF capacity is 2.7 mgd.

The Discharger submitted a Report of Waste Discharge, dated 11 June 2007**,** and applied for a National Pollutant Discharge Elimination System (NPDES) permit authorization to discharge up to 4.3 mgd, ADWF, of treated wastewater, from a new WWTP to be constructed, to the San Joaquin River, within the Sacramento-San Joaquin Delta (Delta). The Discharger requested a year-round surface water discharge due to lack of adequate storage and disposal capacity. The application was deemed complete.

For the purposes of this Order, references to the “discharger” or “permittee” in applicable federal and state laws, regulations, plans, or policy are held to be equivalent to references to the Discharger herein.

B. **Facility Description.** The Discharger has designed the new WWTP (hereinafter Facility) to produce tertiary treated effluent with ultraviolet (UV) light disinfection and have a capacity of 4.3 mgd ADWF. The effluent from this Facility will be discharged in accordance with this Order through a new dedicated pipeline that will convey effluent to the San Joaquin River off of Jersey Island. The Discharger would continue to maximize land disposal and water reclamation with tertiary, nitrified and denitrified effluent. The Discharger expects to begin construction August 2008 with funding from the State Revolving Fund (SRF) loan program.

The Discharger proposes to discharge from Discharge 001 (see table on cover page) to the San Joaquin River, within the legal boundaries of the Delta, a water of the United States. Attachment B provides a map of the area around the Facility. Attachment C provides a flow schematic of the Facility.

This Order will only regulate surface water discharges to the San Joaquin River. The regulation of the wastewater treatment plant, storage and land disposal of wastewater effluent is provided by separate Waste Discharge Requirements (WDR) Order No. 5-01-237 or subsequent Waste Discharge Requirements.

C. Legal Authorities. This Order is issued pursuant to section 402 of the federal Clean Water Act (CWA) and implementing regulations adopted by the U.S. Environmental Protection Agency (USEPA) and chapter 5.5, division 7 of the California Water Code (commencing with section 13370). It shall serve as a NPDES permit for point source discharges from this facility to surface waters. This Order also serves as Waste Discharge Requirements (WDRs) pursuant to article 4, chapter 4, division 7 of the Water Code (commencing with section 13260).

D. Background and Rationale for Requirements. The Regional Water Board developed the requirements in this Order based on information submitted as part of the application, through monitoring and reporting programs, and other available information. The Fact Sheet (Attachment F), which contains background information and rationale for Order requirements, is hereby incorporated into this Order and constitutes part of the Findings for this Order. Attachments A through F are also incorporated into this Order.

E. California Environmental Quality Act (CEQA). Under Water Code section 13389, this action to adopt an NPDES permit is exempt from the provisions of CEQA, Public Resources Code sections 21100-21177.

The Discharger prepared and circulated a Notice of Preparation and a Supplemental EIR describing the proposed treatment plant expansion and discharge to the San Joaquin River. The Supplemental EIR was circulated 18 October 2006 and a public hearing was held to hear comments on 5 December 2006. The Notice of Determination accepting the SEIR was filed with the State Clearinghouse 18 January 2007. CEQA requirements under Water Code section 13389 have been met.

F. Technology-based Effluent Limitations. Section 301(b) of the CWA and implementing USEPA permit regulations at section 122.44, title 40 of the Code of Federal Regulations (CFR)[1] require that permits include conditions meeting applicable technology-based requirements at a minimum, and any more stringent effluent limitations necessary to meet applicable water quality standards. The discharge authorized by this Order must meet minimum federal technology-based requirements based on Secondary Treatment Standards at Part 133 and Best Professional Judgment (BPJ) in accordance with Part 125, section 125.3. A detailed discussion of the technology-based effluent limitations development is included in the Fact Sheet (Attachment F).

G. Water Quality-based Effluent Limitations. Section 301(b) of the CWA and section 122.44(d) require that permits include limitations more stringent than applicable federal technology-based requirements where necessary to achieve applicable water quality standards. This Order contains requirements, expressed as a technology equivalence requirement, more stringent than secondary treatment requirements that are necessary to meet applicable water quality standards. The Regional Water Board has considered the factors listed in CWC Section 13241 in establishing these requirements. The rationale for these requirements, which consist of tertiary treatment or equivalent requirements, is discussed in the Fact Sheet.

Section 122.44(d)(1)(i) mandates that permits include effluent limitations for all pollutants that are or may be discharged at levels that have the reasonable potential to cause or contribute to an exceedance of a water quality standard, including numeric and narrative objectives within a standard. Where reasonable potential has been established for a pollutant, but there is no numeric criterion or objective for the pollutant, water quality-based effluent limitations (WQBELs) must be established using: (1) EPA criteria guidance under CWA section 304(a), supplemented where necessary by other relevant information; (2) an indicator parameter for the pollutant of concern; or (3) a calculated numeric water quality criterion, such as a proposed State criterion or policy interpreting the State's narrative criterion, supplemented with other relevant information, as provided in 40 CFR section 122.44(d)(1)(vi).

H. Water Quality Control Plans. The Regional Water Board adopted a *Water Quality Control Plan, Fourth Edition (Revised August 2006), for the Sacramento and San Joaquin River* (hereinafter Basin Plan) that designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for all waters addressed through the plan. In addition, the Basin Plan implements State Water Resources Control Board (State Water Board) Resolution No. 88-63, which established state policy that all waters, with certain exceptions, should be considered suitable or potentially suitable for municipal or domestic supply. Beneficial uses applicable to San Joaquin River are as follows:

[1] All further statutory references are to title 40 of the Code of Federal Regulations unless otherwise indicated.

Table 5. Basin Plan Beneficial Uses

Discharge Point	Receiving Water Name	Beneficial Use(s)
001	**San Joaquin River**	Existing: municipal and domestic supply; agricultural supply, including stock watering; industrial service supply; industrial process supply; navigation; water contact recreation: non-contact water recreation, including aesthetic enjoyment; commercial and sport fishing; aquaculture; warm freshwater habitat; cold freshwater habitat; warm migration of aquatic organisms; cold migration of aquatic organisms; warm spawning, reproduction, and/or early development; and wildlife habitat.

The Basin Plan includes a list of Water Quality Limited Segments (WQLSs), which are defined as "…*those sections of lakes, streams, rivers or other fresh water bodies where water quality does not meet (or is not expected to meet) water quality standards even after the application of appropriate limitations for point sources (40 CFR 130, et seq.)*." The Basin Plan also states, "*Additional treatment beyond minimum federal standards will be imposed on dischargers to WQLSs. Dischargers will be assigned or allocated a maximum allowable load of critical pollutants so that water quality objectives can be met in the segment.*" The Western Delta is listed as a WQLS for Chlorpyrifos, DDT, Diazinon, electrical conductivity, exotic species, group A pesticides, mercury and unknown toxicity in the 303(d) list of impaired water bodies.

The State Water Board adopted a *Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Water and Enclosed Bays and Estuaries of California* (Thermal Plan) on 18 May 1972, and amended this plan on 18 September 1975. This plan contains temperature objectives applicable to the Delta. Requirements of this Order implement the Thermal Plan.

Requirements of this Order specifically implement the applicable Water Quality Control Plans.

I. **National Toxics Rule (NTR) and California Toxics Rule (CTR).** USEPA adopted the NTR on 22 December 1992, and later amended it on 4 May 1995 and 9 November 1999. About forty criteria in the NTR applied in California. On 18 May 2000, USEPA adopted the CTR. The CTR promulgated new toxics criteria for California and, in addition, incorporated the previously adopted NTR criteria that were applicable in the state. The CTR was amended on 13 February 2001. These rules contain water quality criteria for priority pollutants.

J. **State Implementation Policy.** On 2 March 2000, the State Water Board adopted the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (State Implementation Policy or SIP). The SIP became effective on 28 April 2000 with respect to the priority pollutant criteria

promulgated for California by the USEPA through the NTR and to the priority pollutant objectives established by the Regional Water Board in the Basin Plan. The SIP became effective on 18 May 2000 with respect to the priority pollutant criteria promulgated by the USEPA through the CTR. The State Water Board adopted amendments to the SIP on 24 February 2005 that became effective on 13 July 2005. The SIP establishes implementation provisions for priority pollutant criteria and objectives and provisions for chronic toxicity control. Requirements of this Order implement the SIP.

K. Compliance Schedules and Interim Requirements. In general, an NPDES permit must include final effluent limitations that are consistent with Clean Water Act section 301 and with 40 CFR 122.44(d). There are exceptions to this general rule. The State Water Board has concluded that where the Regional Water Board's Basin Plan allows for schedules of compliance and the Regional Water Board is newly interpreting a narrative standard, it may include schedules of compliance in the permit to meet effluent limits that implement a narrative standard. See In the Matter of Waste Discharge Requirements for Avon Refinery (State Board Order WQ 2001-06 at pp. 53-55). See also Communities for a Better Environment et al. v. State Water Resources Control Board, 34 Cal.Rptr.3d 396, 410 (2005). The Basin Plan for the Sacramento and San Joaquin Rivers includes a provision that authorizes the use of compliance schedules in NPDES permits for water quality objectives that are adopted after the date of adoption of the Basin Plan, which was 25 September 1995 (See Basin Plan at page IV-16). Consistent with the State Water Board's Order in the CBE matter, the Regional Water Board has the discretion to include compliance schedules in NPDES permits when it is including an effluent limitation that is a "new interpretation" of a narrative water quality objective. This conclusion is also consistent with the United States Environmental Protection Agency policies and administrative decisions. See, e.g., Whole Effluent Toxicity (WET) Control Policy. The Regional Water Board, however, is not required to include a schedule of compliance, but may issue a Time Schedule Order pursuant to Water Code section 13300 or a Cease and Desist Order pursuant to Water Code section 13301 where it finds that the discharger is violating or threatening to violate the permit. The Regional Water Board will consider the merits of each case in determining whether it is appropriate to include a compliance schedule in a permit, and, consistent with the Basin Plan, should consider feasibility of achieving compliance, and must impose a schedule that is as short as practicable to achieve compliance with the objectives, criteria, or effluent limit based on the objective or criteria.

For CTR constituents, Section 2.1 of the SIP provides that, based on a Discharger's request and demonstration that it is infeasible for an existing Discharger to achieve immediate compliance with an effluent limitation derived from a CTR criterion, compliance schedules may be allowed in an NPDES permit. Unless an exception has been granted under section 5.3 of the SIP, a compliance schedule may not exceed 5 years from the date that the permit is issued or reissued, nor may it extend beyond 10 years from the effective date of the SIP (or 18 May 2010) to establish and comply with CTR criterion-based effluent limitations. Where a compliance schedule for a final effluent limitation that exceeds 1 year, the Order must include interim numeric limitations for that constituent or parameter. Where allowed by the Basin Plan, compliance schedules and interim effluent limitations or discharge specifications may

also be granted to allow time to implement a new or revised water quality objective. Since this Order is for a new discharger, no compliance schedules have been allowed.

L. Alaska Rule. On 30 March 2000, USEPA revised its regulation that specifies when new and revised state and tribal water quality standards (WQS) become effective for CWA purposes. (40 C.F.R. § 131.21; 65 Fed. Reg. 24641 (27 April 2000).) Under the revised regulation (also known as the Alaska rule), new and revised standards submitted to USEPA after 30 May 2000, must be approved by USEPA before being used for CWA purposes. The final rule also provides that standards already in effect and submitted to USEPA by May 30, 2000 may be used for CWA purposes, whether or not approved by USEPA.

M. Stringency of Requirements for Individual Pollutants. This Order contains both technology-based and water quality-based effluent limitations for individual pollutants. The technology-based effluent limitations consist of restrictions on BOD_5 and TSS. The water quality-based effluent limitations consist of restrictions on turbidity and pathogens. This Order's technology-based pollutant restrictions implement the minimum, applicable federal technology-based requirements. In addition, this Order contains effluent limitations more stringent than the minimum, federal technology-based requirements that are necessary to meet water quality standards. These limitations are more stringent than required by the CWA. Specifically, this Order includes effluent limitations for BOD, TSS, turbidity and pathogens that are more stringent than applicable federal standards, but that are nonetheless necessary to meet numeric objectives or protect beneficial uses. The rationale for including these limitations is explained in the Fact Sheet. In addition, the Regional Water Board has considered the factors in Water Code section 13241 in establishing these requirements.

Water quality-based effluent limitations have been scientifically derived to implement water quality objectives that protect beneficial uses. Both the beneficial uses and the water quality objectives have been approved pursuant to federal law and are the applicable federal water quality standards. To the extent that toxic pollutant water quality-based effluent limitations were derived from the CTR, the CTR is the applicable standard pursuant to 40 CFR section 131.38. The scientific procedures for calculating the individual water quality-based effluent limitations are based on the CTR-SIP, which was approved by USEPA on 1 May 2001. All beneficial uses and water quality objectives contained in the Basin Plan were approved under state law and submitted to and approved by USEPA prior to 30 May 2000. Any water quality objectives and beneficial uses submitted to USEPA prior to 30 May 2000, but not approved by USEPA before that date, are nonetheless "*applicable water quality standards for purposes of the [Clean Water] Act*" pursuant to 40 CFR section 131.21(c)(1). Collectively, this Order's restrictions on individual pollutants are no more stringent than required to implement the technology-based requirements of the CWA and the applicable water quality standards for purposes of the CWA.

On 5 February 2008, the Discharger submitted economic information indicating that the cost of complying with this Order would be $18.0 million. The Regional Water Board has considered the specific costs identified in the Discharger's submittal. As discussed

in the Fact Sheet, IV. 2. C (3)(q), the individual pollutant restrictions are reasonably necessary to protect beneficial uses identified in the Basin Plan, and the economic information related to costs of compliance are not sufficient, in the Regional Water Board's determination, to justify failing to protect beneficial uses. Where appropriate, the Time Schedule Order provides additional time to achieve the pollutant-specific restriction.

N. Antidegradation Policy. Section 131.12 requires that the state water quality standards include an antidegradation policy consistent with the federal policy. The State Water Board established California's antidegradation policy in State Water Board Resolution No. 68-16. Resolution No. 68-16 is consistent with the federal antidegradation policy where the federal policy applies under federal law. Resolution No. 68-16 requires that existing quality of waters be maintained unless degradation is justified based on specific findings. The Regional Water Board's Basin Plan implements, and incorporates by reference, both the state and federal antidegradation policies. As discussed in detail in the Fact Sheet the permitted discharge is consistent with the antidegradation provision of section 131.12 and State Water Board Resolution No. 68-16.

O. Anti-Backsliding Requirements. Sections 402(o)(2) and 303(d)(4) of the CWA and federal regulations at title 40, Code of Federal Regulations section 122.44(l) prohibit backsliding in NPDES permits. These anti-backsliding provisions require effluent limitations in a reissued permit to be as stringent as those in the previous permit, with some exceptions where limitations may be relaxed. Since this Order is a new NPDES permit for a new discharge, the anti-backsliding requirements are not applicable.

P. Endangered Species Act. This Order does not authorize any act that results in the taking of a threatened or endangered species or any act that is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code sections 2050 to 2097) or the Federal Endangered Species Act (16 U.S.C.A. sections 1531 to 1544). This Order requires compliance with effluent limits, receiving water limits, and other requirements to protect the beneficial uses of waters of the state. The discharger is responsible for meeting all requirements of the applicable Endangered Species Act.

Q. Monitoring and Reporting. Section 122.48 requires that all NPDES permits specify requirements for recording and reporting monitoring results. Water Code sections 13267 and 13383 authorizes the Regional Water Board to require technical and monitoring reports. The Monitoring and Reporting Program establishes monitoring and reporting requirements to implement federal and State requirements. This Monitoring and Reporting Program is provided in Attachment E.

R. Standard and Special Provisions. Standard Provisions, which apply to all NPDES permits in accordance with section 122.41, and additional conditions applicable to specified categories of permits in accordance with section 122.42, are provided in Attachment D. The discharger must comply with all standard provisions and with those additional conditions that are applicable under section 122.42. The Regional Water Board has also included in this Order special provisions applicable to the Discharger. A

rationale for the special provisions contained in this Order is provided in the attached Fact Sheet.

S. Provisions and Requirements Implementing State Law – Not Applicable.

T. Notification of Interested Parties. The Regional Water Board has notified the Discharger and interested agencies and persons of its intent to prescribe Waste Discharge Requirements for the discharge and has provided them with an opportunity to submit their written comments and recommendations. Details of notification are provided in the Fact Sheet of this Order.

U. Consideration of Public Comment. The Regional Water Board, in a public meeting, heard and considered all comments pertaining to the discharge. Details of the Public Hearing are provided in the Fact Sheet of this Order.

IT IS HEREBY ORDERED, that in order to meet the provisions contained in division 7 of the Water Code (commencing with section 13000) and regulations adopted thereunder and the provisions of the federal Clean Water Act (CWA) and regulations and guidelines adopted thereunder, the Discharger shall comply with the requirements in this Order.

III. DISCHARGE PROHIBITIONS

A. Discharge of wastewater at a location or in a manner different from that described in the Findings is prohibited.

B. The by-pass or overflow of wastes to surface waters is prohibited, except as allowed by Federal Standard Provisions I.G. and I.H. (Attachment D).

C. Neither the discharge nor its treatment shall create a nuisance as defined in Section 13050 of the California Water Code.

D. The Discharger shall not allow pollutant-free wastewater to be discharged into the collection, treatment, and disposal system in amounts that significantly diminish the system's capability to comply with this Order. Pollutant-free wastewater means rainfall, groundwater, cooling waters, and condensates that are essentially free of pollutants.

IV. EFFLUENT LIMITATIONS AND DISCHARGE SPECIFICATIONS

A. Effluent Limitations – Discharge Point 001

1. Final Effluent Limitations – Discharge Point 001

The Discharger shall maintain compliance with the following effluent limitations at Discharge Point 001, with compliance measured at Monitoring Location EFF-001 as described in the attached MRP (Attachment E):

a. The Discharger shall maintain compliance with the effluent limitations specified in Table 6:

Table 6. Effluent Limitations

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
5-day Biochemical Oxygen Demand	mg/L	10	15	20	---	---
	lbs/day[1]	359	537	717	---	---
Total Suspended Solids	mg/L	10	15	20	---	---
	lbs/day[1]	359	537	717	---	---
Settleable solids	ml/L	0.1	--	0.2	---	---
pH	std units	--	--	--	6.5	8.5
Oil and Grease	mg/L	10		15		
Turbidity	NTU	---	---	---	---	10
Total Coliform	MPN/100 mL	---	---	---	---	240
Ammonia as N (total)	mg/L	1.1	---	2.1	---	
	lbs/day[1]	39.4		75.3	---	---
Nitrate + Nitrite as N (total)	mg/L	10	--	--	--	--
Aluminum (Total Recoverable)	µg/L	71	---	143	---	---
Copper, Total	µg/L	8.5		17		
Fluoride	mg/L	19.6	---	---	---	---
Lead, Total	µg/L	3.4		6.9		
Total Residual Chlorine	mg/L	0.01	---	0.02	---	---

[1] Based on a design average dry weather flow of 4.3 mgd.

b. **Percent Removal:** The average monthly percent removal of BOD 5-day 20°C and total suspended solids shall not be less than 85 percent.

c. **Acute Whole Effluent Toxicity.** Survival of aquatic organisms in 96-hour bioassays of undiluted waste shall be no less than:

   i. 70%, minimum for any one bioassay; and
   ii. 90%, median for any three consecutive bioassays.

d. **Temperature.** The maximum temperature of the discharge shall not exceed the natural receiving water temperature by more than 20°F.

e. **Turbidity.** Effluent turbidity shall not exceed:

   i. 2 NTU, as a daily average; and
   ii. 5 NTU, more than 5% of the time within a 24-hour period.

f. **Total Coliform Organisms.** Effluent total coliform organisms shall not exceed:

i. 2.2 most probable number (MPN) per 100 mL, as a 7-day median; and
ii. 23 MPN/100 mL, more than once in any 30-day period.

g. **Average Dry Weather Discharge Flow.** The Average Dry Weather Discharge Flow shall not exceed 4.3 mgd.

h. **Total Recoverable Iron.** Effluent total recoverable iron concentrations shall not exceed 300 µg/L, as an annual average.

i. **Total Recoverable Manganese.** Effluent total recoverable manganese concentrations shall not exceed 50 µg/L, as an annual average.

j. **Foaming Agents (MBAS).** Effluent MBAS concentrations shall not exceed 340 mg/L, as an annual average.

k. **Salinity**.

i. From 16 August through 31 March, the effluent electrical conductivity shall not exceed 1,505 µmhos/cm, as a monthly average.

ii. From 1 April through 15 August, the Discharger shall maintain compliance with the salinity effluent limitations specified below:

(a) If the 14-day running average electrical conductivity of the San Joaquin River at Jersey Point is less than or equal to the concentrations identified in Table 8 below, the effluent electrical conductivity shall not exceed 1,505 µmhos/cm, as a monthly average.

(b) If the 14-day running average electrical conductivity of the San Joaquin River at Jersey Point is greater than the concentrations identified in Table 8 below, the effluent electrical conductivity shall not exceed the concentrations specified in Table 7, below, for the specific water year type and dates shown.

Table 7. Electrical Conductivity Effluent Limitations Based on Water Year Type[1], as a monthly average (µmhos/cm)

	Water Year Type				
Date	**Wet**	**Above Normal**	**Below Normal**	**Dry**	**Critical**
1 April – 31 May	440	440	440	440	1505
1 June – 14 June	450	450	450	1350	1505
15 June – 19 June	450	450	450	1350	1505
20 June – 15 August	450	450	740	1350	1505

[1] The Water Year Type is based on the State Water Board's Sacramento Valley 40-30-30 Index.

Table 8. Electrical Conductivity Concentrations Demonstrating Assimilative Capacity Basin Plan Water Quality Objectives – San Joaquin River at Jersey Point, Based on Water Year Type (µmhos/cm)

Date	Water Year Type				
	Wet	Above Normal	Below Normal	Dry	Critical
1 April – 31 May	436	436	436	436	N/A[1]
1 June – 14 June	446	446	446	1346	N/A[1]
15 June – 19 June	446	446	446	1346	N/A[1]
20 June – 15 August	446	446	736	1346	N/A[1]

[1] Not Applicable - During a critical water year, the effluent EC shall not exceed 1505 µmhos/cm, regardless of the receiving water EC concentration.

2. Interim Effluent Limitations – Not Applicable

B. Land Discharge Specifications – Not Applicable

Discharges to land are regulated by separate waste discharge requirements.

C. Reclamation Specifications – Not Applicable

Discharges to land are regulated by separate waste discharge requirements.

V. RECEIVING WATER LIMITATIONS

A. Surface Water Limitations

Receiving water limitations are based on water quality objectives contained in the Basin Plan and are a required part of this Order. The discharge shall not cause the following in San Joaquin River:

1. **Bacteria**. The fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, to exceed a geometric mean of 200 MPN/100 mL, nor more than ten percent of the total number of fecal coliform samples taken during any 30-day period to exceed 400 MPN/100 mL.

2. **Biostimulatory Substances**. Water to contain biostimulatory substances which promote aquatic growths in concentrations that cause nuisance or adversely affect beneficial uses.

3. **Chemical Constituents**. Chemical constituents to be present in concentrations that adversely affect beneficial uses.

4. **Color**. Discoloration that causes nuisance or adversely affects beneficial uses.

5. **Dissolved Oxygen**: The dissolved oxygen concentration to be reduced below 5.0 mg/L at any time.

6. **Floating Material**. Floating material to be present in amounts that cause nuisance or adversely affect beneficial uses.

7. **Oil and Grease**. Oils, greases, waxes, or other materials to be present in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses.

8. **pH**. The pH to be depressed below 6.5 or raised above 8.5. Furthermore, the pH to be changed by more than 0.5 on an annual average.

9. **Pesticides**:

    a. Pesticides to be present, individually or in combination, in concentrations that adversely affect beneficial uses;
    b. Pesticides to be present in bottom sediments or aquatic life in concentrations that adversely affect beneficial uses;
    c. Total identifiable persistent chlorinated hydrocarbon pesticides to be present in the water column at concentrations detectable within the accuracy of analytical methods approved by USEPA or the Executive Officer.
    d. Pesticide concentrations to exceed those allowable by applicable antidegradation policies (see State Water Board Resolution No. 68-16 and 40 CFR §131.12.).
    e. Pesticide concentrations to exceed the lowest levels technically and economically achievable.
    f. Pesticides to be present in concentration in excess of the maximum contaminant levels set forth in California Code of Regulations, Title 22, Division 4, Chapter 15**.**
    g. Thiobencarb to be present in excess of 1.0 µg/L.

10. **Radioactivity**:

    a. Radionuclides to be present in concentrations that are harmful to human, plant, animal, or aquatic life nor that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life.
    b. Radionuclides to be present in excess of the maximum contaminant levels specified in Table 4 (MCL Radioactivity) of Section 64443 of Title 22 of the California Code of Regulations.

11. **Salinity**.

a. To exceed the maximum mean daily chloride concentration of 150 mg/L for at least the number of days shown during the Calendar Year. Must be provided in intervals of not less than two weeks duration (Percentage of Calendar Year shown in parenthesis)

Year Type	No. days each cal. Year < 150 mg/L Cl^-
Wet	240 (66%)
Above Normal	190 (52%)
Below Normal	175 (48%)
Dry	165 (45%)
Critical	155 (42%)

b. To exceed the maximum 14-day running average of mean daily EC of 440 μmhos/cm from April 1 to May 31 during all Water Year Types, except critical, or to exceed the maximum 14- day running average of mean daily EC in μmhos/cm in the table below:

Water Year Type	450 EC April 1 to	EC from date shown to August 15
Wet	Aug 15	---
Above Normal	Aug 15	---
Below Normal	June 20	740
Dry	June 15	1350
Critical	---	2200

12. **Suspended Sediments**. The suspended sediment load and suspended sediment discharge rate of surface waters to be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

13. **Settleable Substances**. Substances to be present in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses.

14. **Suspended Material**. Suspended material to be present in concentrations that cause nuisance or adversely affect beneficial uses.

15. **Taste and Odors**. Taste- or odor-producing substances to be present in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses.

16. **Temperature**. The Thermal Plan is applicable to this discharge. The Thermal Plan requires that the discharge shall not cause the following in the San Joaquin River:

    a. The creation of a zone, defined by water temperatures of more than 1°F above natural receiving water temperature, which exceeds 25 percent of the cross-sectional area of the river channel at any point.

    b. A surface water temperature rise greater than 4°F above the natural temperature of the receiving water at any time or place.

17. **Toxicity**. Toxic substances to be present, individually or in combination, in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.

18. **Turbidity**. The turbidity to increase as follows:

    a. More than 1 Nephelometric Turbidity Unit (NTU) where natural turbidity is between 0 and 5 NTUs.
    b. More than 20 percent where natural turbidity is between 5 and 50 NTUs.
    c. More than 10 NTU where natural turbidity is between 50 and 100 NTUs.
    d. More than 10 percent where natural turbidity is greater than 100 NTUs.

B. Groundwater Limitations – Not Applicable

Discharges to land are regulated by separate waste discharge requirements.

VI. PROVISIONS

A. Standard Provisions

1. The Discharger shall comply with all Standard Provisions included in Attachment D of this Order.

2. The Discharger shall comply with the following provisions:

    a. If the Discharger's wastewater treatment plant is publicly owned or subject to regulation by California Public Utilities Commission, it shall be supervised and operated by persons possessing certificates of appropriate grade according to Title 23, CCR, Division 3, Chapter 26.

    b. After notice and opportunity for a hearing, this Order may be terminated or modified for cause, including, but not limited to:

i. violation of any term or condition contained in this Order;

ii. obtaining this Order by misrepresentation or by failing to disclose fully all relevant facts;

iii. a change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge; and

iv. a material change in the character, location, or volume of discharge.

The causes for modification include:

- *New regulations.* New regulations have been promulgated under Section 405(d) of the Clean Water Act, or the standards or regulations on which the permit was based have been changed by promulgation of amended standards or regulations or by judicial decision after the permit was issued.

- *Land application plans.* When required by a permit condition to incorporate a land application plan for beneficial reuse of sewage sludge, to revise an existing land application plan, or to add a land application plan.

- *Change in sludge use or disposal practice.* Under 40 Code of Federal Regulations (CFR) 122.62(a)(1), a change in the Discharger's sludge use or disposal practice is a cause for modification of the permit. It is cause for revocation and reissuance if the Discharger requests or agrees.

The Regional Water Board may review and revise this Order at any time upon application of any affected person or the Regional Water Board's own motion.

c. If a toxic effluent standard or prohibition (including any scheduled compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the CWA, or amendments thereto, for a toxic pollutant that is present in the discharge authorized herein, and such standard or prohibition is more stringent than any limitation upon such pollutant in this Order, the Regional Water Board will revise or modify this Order in accordance with such toxic effluent standard or prohibition.

The Discharger shall comply with effluent standards and prohibitions within the time provided in the regulations that establish those standards or prohibitions, even if this Order has not yet been modified.

d. This Order shall be modified, or alternately revoked and reissued, to comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a)(2) of the CWA, if the effluent standard or limitation so issued or approved:

i. contains different conditions or is otherwise more stringent than any effluent limitation in the Order; or

ii. controls any pollutant limited in the Order.

The Order, as modified or reissued under this paragraph, shall also contain any other requirements of the CWA then applicable.

e. The provisions of this Order are severable. If any provision of this Order is found invalid, the remainder of this Order shall not be affected.

f. The Discharger shall take all reasonable steps to minimize any adverse effects to waters of the State or users of those waters resulting from any discharge or sludge use or disposal in violation of this Order. Reasonable steps shall include such accelerated or additional monitoring as necessary to determine the nature and impact of the non-complying discharge or sludge use or disposal.

g. The Discharger shall ensure compliance with any existing or future pretreatment standard promulgated by USEPA under Section 307 of the CWA, or amendment thereto, for any discharge to the municipal system.

h. The discharge of any radiological, chemical or biological warfare agent or high-level, radiological waste is prohibited.

i. A copy of this Order shall be maintained at the discharge facility and be available at all times to operating personnel. Key operating personnel shall be familiar with its content.

j. Safeguard to electric power failure:

i. The Discharger shall provide safeguards to assure that, should there be reduction, loss, or failure of electric power, the discharge shall comply with the terms and conditions of this Order.

ii. Upon written request by the Regional Water Board the Discharger shall submit a written description of safeguards. Such safeguards may include alternate power sources, standby generators, retention capacity, operating procedures, or other means. A description of the safeguards provided shall include an analysis of the frequency, duration, and impact of power failures experienced over the past five years on effluent quality and on the capability of the Discharger to comply with the terms and conditions of the Order. The adequacy of the safeguards is subject to the approval of the Regional Water Board.

iii. Should the treatment works not include safeguards against reduction, loss, or failure of electric power, or should the Regional Water Board not approve the existing safeguards, the Discharger shall, within ninety days of having been advised in writing by the Regional Water Board that the existing safeguards are inadequate, provide to the Regional Water Board and USEPA a schedule of compliance for providing safeguards such that in the event of reduction, loss, or failure of electric power, the Discharger shall comply with the terms

and conditions of this Order. The schedule of compliance shall, upon approval of the Regional Water Board, become a condition of this Order.

k. The Discharger, upon written request of the Regional Water Board, shall file with the Board a technical report on its preventive (failsafe) and contingency (cleanup) plans for controlling accidental discharges, and for minimizing the effect of such events. This report may be combined with that required under Regional Water Board Standard Provision VI.A.2.m.

   The technical report shall:

   i. Identify the possible sources of spills, leaks, untreated waste by-pass, and contaminated drainage. Loading and storage areas, power outage, waste treatment unit outage, and failure of process equipment, tanks and pipes should be considered.

   ii. Evaluate the effectiveness of present facilities and procedures and state when they became operational.

   iii. Predict the effectiveness of the proposed facilities and procedures and provide an implementation schedule containing interim and final dates when they will be constructed, implemented, or operational.

   The Regional Water Board, after review of the technical report, may establish conditions which it deems necessary to control accidental discharges and to minimize the effects of such events. Such conditions shall be incorporated as part of this Order, upon notice to the Discharger.

l. A publicly owned treatment works (POTW) whose waste flow has been increasing, or is projected to increase, shall estimate when flows will reach hydraulic and treatment capacities of its treatment and disposal facilities. The projections shall be made in January, based on the last three years' average dry weather flows, peak wet weather flows and total annual flows, as appropriate. When any projection shows that capacity of any part of the facilities may be exceeded in four years, the Discharger shall notify the Regional Water Board by 31 January. A copy of the notification shall be sent to appropriate local elected officials, local permitting agencies and the press. Within 120 days of the notification, the Discharger shall submit a technical report showing how it will prevent flow volumes from exceeding capacity or how it will increase capacity to handle the larger flows. The Regional Water Board may extend the time for submitting the report.

m. The Discharger shall submit technical reports as directed by the Executive Officer. All technical reports required herein that involve planning, investigation, evaluation, or design, or other work requiring interpretation and proper application of engineering or geologic sciences, shall be prepared by or under the direction of persons registered to practice in California pursuant to California Business and Professions Code, sections 6735, 7835, and 7835.1. To

demonstrate compliance with Title 16, CCR, sections 415 and 3065, all technical reports must contain a statement of the qualifications of the responsible registered professional(s). As required by these laws, completed technical reports must bear the signature(s) and seal(s) of the registered professional(s) in a manner such that all work can be clearly attributed to the professional responsible for the work.

n. Laboratories that perform sample analyses must be identified in all monitoring reports submitted to the Regional Water Board and USEPA.

o. The Discharger shall conduct analysis on any sample provided by USEPA as part of the Discharge Monitoring Quality Assurance (DMQA) program. The results of any such analysis shall be submitted to USEPA's DMQA manager.

p. Effluent samples shall be taken downstream of the last addition of wastes to the treatment or discharge works where a representative sample may be obtained prior to mixing with the receiving waters. Samples shall be collected at such a point and in such a manner to ensure a representative sample of the discharge.

q. All monitoring and analysis instruments and devices used by the Discharger to fulfill the prescribed monitoring program shall be properly maintained and calibrated as necessary, at least yearly, to ensure their continued accuracy.

r. The Discharger shall file with the Regional Water Board technical reports on self-monitoring performed according to the detailed specifications contained in the Monitoring and Reporting Program attached to this Order.

s. The results of all monitoring required by this Order shall be reported to the Regional Water Board, and shall be submitted in such a format as to allow direct comparison with the limitations and requirements of this Order. Unless otherwise specified, discharge flows shall be reported in terms of the monthly average and the daily maximum discharge flows.

t. The Regional Water Board is authorized to enforce the terms of this permit under several provisions of the CWC, including, but not limited to, sections 13385, 13386, and 13387.

u. For POTWs, prior to making any change in the point of discharge, place of use, or purpose of use of treated wastewater that results in a decrease of flow in any portion of a watercourse, the Discharger must file a petition with the State Water Board, Division of Water Rights, and receive approval for such a change. (CWC section 1211).

v. In the event the Discharger does not comply or will be unable to comply for any reason, with any prohibition, maximum daily effluent limitation, 1-hour average effluent limitation, or receiving water limitation contained in this Order, the Discharger shall notify the Regional Water Board by telephone (916) 464-3291 within 24 hours of having knowledge of such noncompliance, and shall confirm

this notification in writing within five days, unless the Regional Water Board waives confirmation. The written notification shall include the information required by Attachment D, Section V.E.1 [40 CFR section 122.41(l)(6)(i)].

B. Monitoring and Reporting Program (MRP) Requirements

1. The Discharger shall comply with the MRP, and future revisions thereto, in Attachment E of this Order.

C. Special Provisions

1. Reopener Provisions

a. This Order may be reopened for modification, or revocation and reissuance, as a result of the detection of a reportable priority pollutant generated by special conditions included in this Order. These special conditions may be, but are not limited to, fish tissue sampling, whole effluent toxicity, monitoring requirements on internal waste stream(s), and monitoring for surrogate parameters. Additional requirements may be included in this Order as a result of the special condition monitoring data.

b. Conditions that necessitate a major modification of a permit are described in 40 CFR section 122.62, including:

   i. If new or amended applicable water quality standards are promulgated or approved pursuant to Section 303 of the CWA, or amendments thereto, this permit may be reopened and modified in accordance with the new or amended standards.

   ii. When new information, that was not available at the time of permit issuance, would have justified different permit conditions at the time of issuance.

c. **Mercury.** If a TMDL program is adopted for total or methyl mercury, this Order shall be reopened and the total mercury interim mass effluent limitation modified (higher or lower) or an effluent concentration limitation for total and/or methyl mercury imposed.

d. Pollution Prevention. This Order requires the Discharger prepare pollution prevention plans following CWC section 13263.3(d)(3) for salinity and mercury. Based on a review of the pollution prevention plans, this Order may be reopened for addition and/or modification of effluent limitations and requirements for these constituents.

e. **Whole Effluent Toxicity.** As a result of a Toxicity Reduction Evaluation (TRE), this Order may be reopened to include a chronic toxicity limitation, a new acute toxicity limitation, and/or a limitation for a specific toxicant identified in the TRE. Additionally, if the State Water Board revises the SIP's toxicity control provisions

that would require the establishment of numeric chronic toxicity effluent limitations, this Order may be reopened to include a numeric chronic toxicity effluent limitation based on the new provisions.

f. **Water Effects Ratios (WER) and Metal Translators.** A default WER of 1.0 has been used in this Order for calculating CTR criteria for applicable priority pollutant inorganic constituents and for aluminum. In addition, default dissolved-to-total metal translators have been used to convert water quality objectives from dissolved to total recoverable when developing effluent limitations for iron, manganese, and aluminum. If the Discharger performs studies to determine site-specific WERs and/or site-specific dissolved-to-total metal translators, this Order may be reopened to modify the effluent limitations for the applicable inorganic constituents.

g. **Constituent Study.** If after review of the study results it is determined that the discharge has reasonable potential to cause or contribute to an exceedance of a water quality objective this Order may be reopened and effluent limitations added for the subject constituents. Based on the results of this study and after the plant has operated and evaluated its performance this Order may be reopened to establish a more stringent performance-based limits.

h. **Bis(2-ethylhexyl)phthalate**. This Order requires the Discharger to collect and analyze effluent bis(2-ethylhexyl)phthalate samples using a clean technique. Should the results of that sampling show bis(2-ethylhexyl)phthalate in concentrations that exceed the applicable water quality criteria, this Order may be reopened to establish new effluent limitations.

i. **Diazinon, chloropyrifos, and EC TMDL**. This Order may be reopened, as necessary, and establish new final effluent limitations for diazinon, chloropyrifos, and EC based upon a waste load allocation derived from TMDLs established for the western Delta.

j. **Water Reclamation**. This Order requires the Discharger to continue its ongoing evaluation water reclamation alternative for existing and future users in the Delta Diablo Sanitation District service area. Should the evaluation demonstrate potential reuse, the Order may be reopened to modify the permit as necessary.

k. **Hardness-Dependent Metals Criteria.** The Discharger only supplied one hardness data point of the influent as an estimate of the proposed effluent hardness. In order to utilize the procedures outlined in Section IV.C.2.b. (Attachment F) for calculating water quality-based effluent limitations (WQBELs) for metals with hardness-dependent CTR criteria, it is necessary to have sufficient effluent hardness data to ensure that protective WQBELs are calculated. A conservative measurement of hardness was used in the calculation of the WQBELs for copper and lead (see Section IV.C.2.b.) A study is required to monitor the influent hardness for one-year to provide sufficient data to calculate the WQBELs. This Order may be reopened to modify the WQBELs

for metals with hardness-dependent CTR criteria based on the results of the study.

l. **Mixing Zone Validation Study.** This Order requires the Discharger to conduct a mixing zone validation study to verify the actual dilution at the boundaries of the mixing zones. This Order may be reopened to modify the dilution credits based on the results of the study.

2. Special Studies, Technical Reports and Additional Monitoring Requirements

a. **Chronic Whole Effluent Toxicity.** For compliance with the Basin Plan's narrative toxicity objective, this Order requires the Discharger to conduct chronic whole effluent toxicity testing, as specified in the Monitoring and Reporting Program (Attachment E, Section V.). Furthermore, this Provision requires the Discharger to investigate the causes of, and identify corrective actions to reduce or eliminate effluent toxicity. If the discharge exhibits a pattern of toxicity exceeding the toxicity numeric monitoring trigger established in this Provision, the Discharger is required to initiate a Toxicity Reduction Evaluation (TRE), in accordance with an approved TRE Work Plan, and take actions to mitigate the impact of the discharge and prevent reoccurrence of toxicity. A TRE is a site-specific study conducted in a stepwise process to identify the source(s) of toxicity and the effective control measures for effluent toxicity. TREs are designed to identify the causative agents and sources of whole effluent toxicity, evaluate the effectiveness of the toxicity control options, and confirm the reduction in effluent toxicity. This Provision includes requirements for the Discharger to develop and submit a TRE Work Plan and includes procedures for accelerated chronic toxicity monitoring and TRE initiation.

i. **Toxicity Reduction Evaluation (TRE) Work Plan. Within 90 days of the effective date of this Order,** the Discharger shall submit to the Regional Water Board a TRE Work Plan for approval by the Executive Officer. The TRE Work Plan shall outline the procedures for identifying the source(s) of effluent toxicity, and the procedures for reducing or eliminating effluent toxicity. The TRE Work Plan shall be developed in accordance with EPA guidance[2] and be of adequate detail to allow the Discharger to immediately initiate a TRE as required in this Provision.

ii. **Accelerated Monitoring and TRE Initiation.** When the numeric toxicity monitoring trigger is exceeded during regular chronic toxicity monitoring, and the testing meets all test acceptability criteria, the Discharger shall initiate accelerated monitoring as required in the Accelerated Monitoring Specifications. WET testing results exceeding the monitoring trigger during accelerated monitoring demonstrate a pattern of toxicity and require the Discharger to initiate a TRE to address the effluent toxicity.

[2] See Attachment F (Fact Sheet) Section VII.B.2.a. for a list of EPA guidance documents that must be considered in development of the TRE Workplan.

iii. **Numeric Monitoring Trigger.** The numeric toxicity monitoring trigger is > **16 TUc** (where TUc = 100/NOEC). The monitoring trigger is not an effluent limitation; it is the toxicity threshold at which the Discharger is required to begin accelerated monitoring and initiate a TRE when the effluent exhibits a pattern of toxicity.

iv. **Accelerated Monitoring Specifications.** If the monitoring trigger is exceeded during regular chronic toxicity testing, within 14-days of notification by the laboratory of the test results, the Discharger shall initiate accelerated monitoring. Accelerated monitoring shall consist of four (4) chronic toxicity tests in a six-week period (i.e. one test every two weeks) using the species that exhibited toxicity. The following protocol shall be used for accelerated monitoring and TRE initiation:

a) If the results of four (4) consecutive accelerated monitoring tests do not exceed the monitoring trigger, the Discharger may cease accelerated monitoring and resume regular chronic toxicity monitoring. However, notwithstanding the accelerated monitoring results, if there is adequate evidence of a pattern of effluent toxicity, the Executive Officer may require that the Discharger initiate a TRE.

b) If the source(s) of the toxicity is easily identified (i.e. temporary plant upset), the Discharger shall make necessary corrections to the facility and shall continue accelerated monitoring until four (4) consecutive accelerated tests do not exceed the monitoring trigger. Upon confirmation that the effluent toxicity has been removed, the Discharger may cease accelerated monitoring and resume regular chronic toxicity monitoring.

c) If the result of any accelerated toxicity test exceeds the monitoring trigger, and the source(s) of the toxicity are not easily identified as described in item b of this subsection, the Discharger shall cease accelerated monitoring and initiate a TRE to investigate the cause(s) of, and identify corrective actions to reduce or eliminate effluent toxicity. Within thirty (30) days of notification by the laboratory of the test results exceeding the monitoring trigger during accelerated monitoring, the Discharger shall submit a TRE Action Plan to the Regional Water Board including, at minimum:

1) Specific actions the Discharger will take to investigate and identify the cause(s) of toxicity, including TRE WET monitoring schedule;

2) Specific actions the Discharger will take to mitigate the impact of the discharge and prevent the recurrence of toxicity; and

3) A schedule for these actions.

b. **Constituent Study**. Upon initiation of the discharge to the San Joaquin River, the Discharger shall conduct twelve (12) months of effluent and receiving water

monitoring to better characterize the quality of the discharge and receiving water. The study shall include monitoring of all constituents described in Attachment G – Constituents to be Monitored. The Discharger shall conduct twice monthly effluent monitoring at EFF-001 for the first three (3) months, and shall conduct monthly effluent monitoring the remainder of the Study. The monitoring of the receiving water shall be at RSW-001 and RSW-004 and shall be conducted monthly. Dioxin and Furan sampling shall be performed only twice during the year, as described in Attachment G. The Discharger shall comply with the following time schedule in conducting the study:

Task	Compliance Date
Submit Workplan and Time Schedule	**Within 6 months** following Order adoption
Begin Study	Initiation of Discharge to the San Joaquin River
Submit First Quarter Monitoring Results	Within 45-days of the final first quarter sampling event
Complete Study	One Year after initiation of Study
Submit Study Report with Summary of all Monitoring Results	Within 14 months after Initiation of Study

c. **Reclamation Study**. The Discharger shall conduct a wastewater regional reuse study. The study should identify existing and potential industrial recycled water users and include an economic analysis of recycling wastewater to these users. The Discharger shall complete and submit the study no later than **31 December 2008**. The Discharger shall also update its past reuse study to look at reuse opportunities (landscape, golf course irrigation, etc) within the Discharger's service area during the term of this Order. The updated reuse study shall be submitted to the Regional Water Board no later than **180 days prior to the expiration date of this Order**.

d. **Influent Hardness Study**. For one year, the Discharger shall conduct twice monthly hardness monitoring (as $CaCO_3$) of the influent to the existing wastewater treatment plant to better estimate the hardness of the effluent that will be discharged to the San Joaquin River. This Order may be reopened to modify the effluent limitations for metals with hardness-based CTR criteria. **The Discharger shall submit the results of the study within 18 months following adoption of this Order.**

e. **Mixing Zone Validation Study.** After initiation of the discharge to the San Joaquin River, the Discharger shall conduct a mixing zone study to validate the predicted dilution of the water quality modeling. The study shall evaluate the

actual dilution at the boundaries of the acute/chronic mixing zone and the human health mixing zone. The study shall be conducted during low flow conditions in the San Joaquin River. The Discharger shall comply with the following schedule for conducting the study:

Task	Compliance Date
Submit Work Plan and Time Schedule	Within 24 months from adoption of this Order
Conduct study	Within 12 months from initiation of the discharge
Submit Final Report	Within 4 months from completion of the study

3. Best Management Practices and Pollution Prevention

a. **Pollution Prevention Plan for salinity and mercury.** The Discharger shall prepare and implement a pollution prevention plan for salinity and mercury in accordance with CWC section 13263.3(d)(3). The minimum requirements for the pollution prevention plan are outlined in the Fact Sheet, Attachment F, VII (3). A work plan and time schedule for preparation of the pollution prevention plan shall be completed and submitted **within 6 months of the effective date of this Order** for approval by the Executive Officer. The Pollution Prevention Plan shall be completed and submitted to the Regional Water Board **within one(1) year following completion of the Constituent Study**, and progress reports shall be submitted in accordance with the Monitoring and Reporting Program (Attachment E, Section X.D.1.).

4. Construction, Operation and Maintenance Specifications – Not Applicable

5. Special Provisions for Municipal Facilities (POTWs Only)

a. **Collection System.** On 2 May 2006, the State Water Board adopted State Water Board Order 2006-0003, a Statewide General WDR for Sanitary Sewer Systems. The Discharger shall be subject to the requirements of Order 2006-0003 and any future revisions thereto. Order 2006-0003 requires that all public agencies that currently own or operate sanitary sewer systems apply for coverage under the General WDR. The Discharger has applied for and has been approved for coverage under State Water Board Order 2006-0003 for operation of its wastewater collection system in October 2006.

Regardless of the coverage obtained under Order 2006-0003, the Discharger's collection system is part of the treatment system that is subject to this Order. As such, pursuant to federal regulations, the Discharger must properly operate and maintain its collection system [40 CFR section 122.41(e)], report any non-compliance [40 CFR section 122.41(l)(6) and (7)], and mitigate any discharge from the collection system in violation of this Order [40 CFR. section 122.41(d)].

6. Other Special Provisions

a. Wastewater shall be oxidized, coagulated, filtered, and adequately disinfected pursuant to the California Department of Public Health reclamation criteria, California Code of Regulations, Title 22, Division 4, Chapter 3, (Title 22), or equivalent.

b. In the event of any change in control or ownership of land or waste discharge facilities presently owned or controlled by the Discharger, the Discharger shall notify the succeeding owner or operator of the existence of this Order by letter, a copy of which shall be immediately forwarded to the Regional Water Board.

   To assume operation under this Order, the succeeding owner or operator must apply in writing to the Executive Officer requesting transfer of the Order. The request must contain the requesting entity's full legal name, the State of incorporation if a corporation, address and telephone number of the persons responsible for contact with the Regional Water Board and a statement. The statement shall comply with the signatory and certification requirements in the Federal Standard Provisions (Attachment D, Section V.B.) and state that the new owner or operator assumes full responsibility for compliance with this Order. Failure to submit the request shall be considered a discharge without requirements, a violation of the California Water Code. Transfer shall be approved or disapproved in writing by the Executive Officer.

7. Compliance Schedules

a. **Initiation of Surface Water Discharge.** The surface water discharge to the San Joaquin River is contingent upon compliance with the following conditions:

   i. **Outfall Diffuser.** The Discharger shall design, acquire necessary permits by appropriate agencies, and construct an outfall and diffuser to the San Joaquin River at Discharge Point EFF-001.

   ii. **Facility Upgrades.** The Discharger shall have constructed the necessary Facility upgrades as described in Section VI.C.4.

   iii. **Waste Discharge Requirements (WDRs)**. The Discharger shall submit a Report of Waste Discharge for land disposal and reclamation based on the new Facility at least 6 months prior to initiating surface water discharge..

   iv. **Request for Surface Water Discharge.** The Discharger shall submit to the Regional Water Board a request for a surface water discharge to the San Joaquin River, which demonstrates compliance with items i. through iii., above. The surface water discharge is prohibited until the Executive Officer verifies compliance with Special Provisions VI.C.7.a., and approves the Discharger's request.

VII. COMPLIANCE DETERMINATION

Compliance with the effluent limitations contained in section IV of this Order will be determined as specified below:

A. **BOD and TSS Effluent Limitations**. Compliance with the final effluent limitations for BOD and TSS required in sections IV.A.1.a shall be ascertained by 24-hour composite samples. Compliance with effluent limitations IV.A.1.b for percent removal shall be calculated using the arithmetic mean of 20°C BOD (5-day) and total suspended solids in effluent samples collected over a monthly period as a percentage of the arithmetic mean of the values for influent samples collected at approximately the same times during the same period.

B. **Aluminum Effluent Limitations**. Compliance with the final effluent limitations for aluminum can be demonstrated using either total or acid-soluble (inductively coupled plasma/atomic emission spectrometry or inductively coupled plasma/mass spectrometry) analysis methods, as supported by US EPA's Ambient Water Quality Criteria for Aluminum document (EPA 440/5-86-008), or other standard methods that exclude aluminum silicate particles as approved by the Executive Officer.

C. **Average Daily Discharge Flow Effluent Limitations**. The Average Daily Discharge Flow represents the average dry weather flow discharged by the Facility (i.e. daily average flow when groundwater is at or near normal and runoff is not occurring). Compliance with the Average Daily Discharge Flow effluent limitations will be determined annually based on the average daily flow over three consecutive dry weather months (e.g., July, August, and September).

D. **Total Coliform Organisms Effluent Limitations (Section IV.A.1.h)**. For each day that an effluent sample is collected and analyzed for total coliform organisms, the 7-day median shall be determined by calculating the median concentration of total coliform bacteria in the effluent utilizing the bacteriological results of the last seven days for which analyses have been completed. If the 7-day median of total coliform organisms exceeds a most probable number (MPN) of 2.2 per 100 milliliters, the Discharger will be considered out of compliance for that parameter for that 1 day only within the reporting period.

E. **Mass Effluent Limitations.** Compliance with the mass effluent limitations will be determined during average dry weather periods only when groundwater is at or near normal and runoff is not occurring.

ATTACHMENT A – DEFINITIONS

Arithmetic Mean (μ), also called the average, is the sum of measured values divided by the number of samples. For ambient water concentrations, the arithmetic mean is calculated as follows:

Arithmetic mean = $\mu = \Sigma x / n$ where: Σx is the sum of the measured ambient water concentrations, and n is the number of samples.

Average Monthly Effluent Limitation (AMEL): the highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

Average Weekly Effluent Limitation (AWEL): the highest allowable average of daily discharges over a calendar week (Sunday through Saturday), calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week.

Best Practicable Treatment or Control (BPTC): BPTC is a requirement of State Water Resources Control Board Resolution 68-16 – "Statement of Policy with Respect to Maintaining High Quality of Waters in California" (referred to as the "Antidegradation Policy"). BPTC is the treatment or control of a discharge necessary to assure that, *"(a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."* Pollution is defined in CWC Section 13050(l). In general, an exceedance of a water quality objective in the Basin Plan constitutes "pollution".

Bioaccumulative pollutants are those substances taken up by an organism from its surrounding medium through gill membranes, epithelial tissue, or from food and subsequently concentrated and retained in the body of the organism.

Carcinogenic pollutants are substances that are known to cause cancer in living organisms.

Coefficient of Variation (*CV*) is a measure of the data variability and is calculated as the estimated standard deviation divided by the arithmetic mean of the observed values.

Daily Discharge: Daily Discharge is defined as either: (1) the total mass of the constituent discharged over the calendar day (12:00 am through 11:59 pm) or any 24-hour period that reasonably represents a calendar day for purposes of sampling (as specified in the permit), for a constituent with limitations expressed in units of mass or; (2) the unweighted arithmetic mean measurement of the constituent over the day for a constituent with limitations expressed in other units of measurement (e.g., concentration).

The daily discharge may be determined by the analytical results of a composite sample taken over the course of one day (a calendar day or other 24-hour period defined as a day) or by the

arithmetic mean of analytical results from one or more grab samples taken over the course of the day.

For composite sampling, if 1 day is defined as a 24-hour period other than a calendar day, the analytical result for the 24-hour period will be considered as the result for the calendar day in which the 24-hour period ends.

Detected, but Not Quantified (DNQ) are those sample results less than the RL, but greater than or equal to the laboratory's MDL.

Dilution Credit is the amount of dilution granted to a discharge in the calculation of a water quality-based effluent limitation, based on the allowance of a specified mixing zone. It is calculated from the dilution ratio or determined through conducting a mixing zone study or modeling of the discharge and receiving water.

Effluent Concentration Allowance (ECA) is a value derived from the water quality criterion/objective, dilution credit, and ambient background concentration that is used, in conjunction with the coefficient of variation for the effluent monitoring data, to calculate a long-term average (LTA) discharge concentration. The ECA has the same meaning as waste load allocation (WLA) as used in U.S. EPA guidance (Technical Support Document For Water Quality-based Toxics Control, March 1991, second printing, EPA/505/2-90-001).

Enclosed Bays means indentations along the coast that enclose an area of oceanic water within distinct headlands or harbor works. Enclosed bays include all bays where the narrowest distance between the headlands or outermost harbor works is less than 75 percent of the greatest dimension of the enclosed portion of the bay. Enclosed bays include, but are not limited to, Humboldt Bay, Bodega Harbor, Tomales Bay, Drake's Estero, San Francisco Bay, Morro Bay, Los Angeles-Long Beach Harbor, Upper and Lower Newport Bay, Mission Bay, and San Diego Bay. Enclosed bays do not include inland surface waters or ocean waters.

Estimated Chemical Concentration is the estimated chemical concentration that results from the confirmed detection of the substance by the analytical method below the ML value.

Estuaries means waters, including coastal lagoons, located at the mouths of streams that serve as areas of mixing for fresh and ocean waters. Coastal lagoons and mouths of streams that are temporarily separated from the ocean by sandbars shall be considered estuaries. Estuarine waters shall be considered to extend from a bay or the open ocean to a point upstream where there is no significant mixing of fresh water and seawater. Estuarine waters include~~d~~, but are not limited to, the Sacramento-San Joaquin Delta, as defined in Water Code section 12220, Suisun Bay, Carquinez Strait downstream to the Carquinez Bridge, and appropriate areas of the Smith, Mad, Eel, Noyo, Russian, Klamath, San Diego, and Otay rivers. Estuaries do not include inland surface waters or ocean waters.

Inland Surface Waters are all surface waters of the State that do not include the ocean, enclosed bays, or estuaries.

Instantaneous Maximum Effluent Limitation: the highest allowable value for any single grab sample or aliquot (i.e., each grab sample or aliquot is independently compared to the instantaneous maximum limitation).

Instantaneous Minimum Effluent Limitation: the lowest allowable value for any single grab sample or aliquot (i.e., each grab sample or aliquot is independently compared to the instantaneous minimum limitation).

Maximum Daily Effluent Limitation (MDEL) means the highest allowable daily discharge of a pollutant, over a calendar day (or 24-hour period). For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the daily discharge is calculated as the arithmetic mean measurement of the pollutant over the day.

Median is the middle measurement in a set of data. The median of a set of data is found by first arranging the measurements in order of magnitude (either increasing or decreasing order). If the number of measurements (n) is odd, then the median = $X_{(n+1)/2}$. If n is even, then the median = $(X_{n/2} + X_{(n/2)+1})/2$ (i.e., the midpoint between the $n/2$ and $n/2+1$).

Method Detection Limit (MDL) is the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero, as defined in title 40 of the Code of Federal Regulations, Part 136, Attachment B, revised as of July 3, 1999.

Minimum Level (ML) is the concentration at which the entire analytical system must give a recognizable signal and acceptable calibration point. The ML is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all the method specified sample weights, volumes, and processing steps have been followed.

Mixing Zone is a limited volume of receiving water that is allocated for mixing with a wastewater discharge where water quality criteria can be exceeded without causing adverse effects to the overall water body.

Not Detected (ND) are those sample results less than the laboratory's MDL.

Ocean Waters are the territorial marine waters of the State as defined by California law to the extent these waters are outside of enclosed bays, estuaries, and coastal lagoons. Discharges to ocean waters are regulated in accordance with the State Water Board's California Ocean Plan.

Persistent pollutants are substances for which degradation or decomposition in the environment is nonexistent or very slow.

Pollutant Minimization Program (PMP) means waste minimization and pollution prevention actions that include, but are not limited to, product substitution, waste stream recycling, alternative waste management methods, and education of the public and businesses. The

goal of the PMP shall be to reduce all potential sources of a priority pollutant(s) through pollutant minimization (control) strategies, including pollution prevention measures as appropriate, to maintain the effluent concentration at or below the water quality-based effluent limitation. Pollution prevention measures may be particularly appropriate for persistent bioaccumulative priority pollutants where there is evidence that beneficial uses are being impacted. The Regional Water Board may consider cost effectiveness when establishing the requirements of a PMP. The completion and implementation of a Pollution Prevention Plan, if required pursuant to Water Code section 13263.3(d), shall be considered to fulfill the PMP requirements.

Pollution Prevention means any action that causes a net reduction in the use or generation of a hazardous substance or other pollutant that is discharged into water and includes, but is not limited to, input change, operational improvement, production process change, and product reformulation (as defined in Water Code section 13263.3). Pollution prevention does not include actions that merely shift a pollutant in wastewater from one environmental medium to another environmental medium, unless clear environmental benefits of such an approach are identified to the satisfaction of the State or Regional Water Board.

Reporting Level (RL) is the ML (and its associated analytical method) chosen by the Discharger for reporting and compliance determination from the MLs included in this Order. The MLs included in this Order correspond to approved analytical methods for reporting a sample result that are selected by the Regional Water Board either from Appendix 4 of the SIP in accordance with section 2.4.2 of the SIP or established in accordance with section 2.4.3 of the SIP. The ML is based on the proper application of method-based analytical procedures for sample preparation and the absence of any matrix interferences. Other factors may be applied to the ML depending on the specific sample preparation steps employed. For example, the treatment typically applied in cases where there are matrix-effects is to dilute the sample or sample aliquot by a factor of ten. In such cases, this additional factor must be applied to the ML in the computation of the RL.

Satellite Collection System is the portion, if any, of a sanitary sewer system owned or operated by a different public agency than the agency that owns and operates the wastewater treatment facility that a sanitary sewer system is tributary to.

Source of Drinking Water is any water designated as municipal or domestic supply (MUN) in a Regional Water Board Basin Plan.

Standard Deviation (σ) is a measure of variability that is calculated as follows:

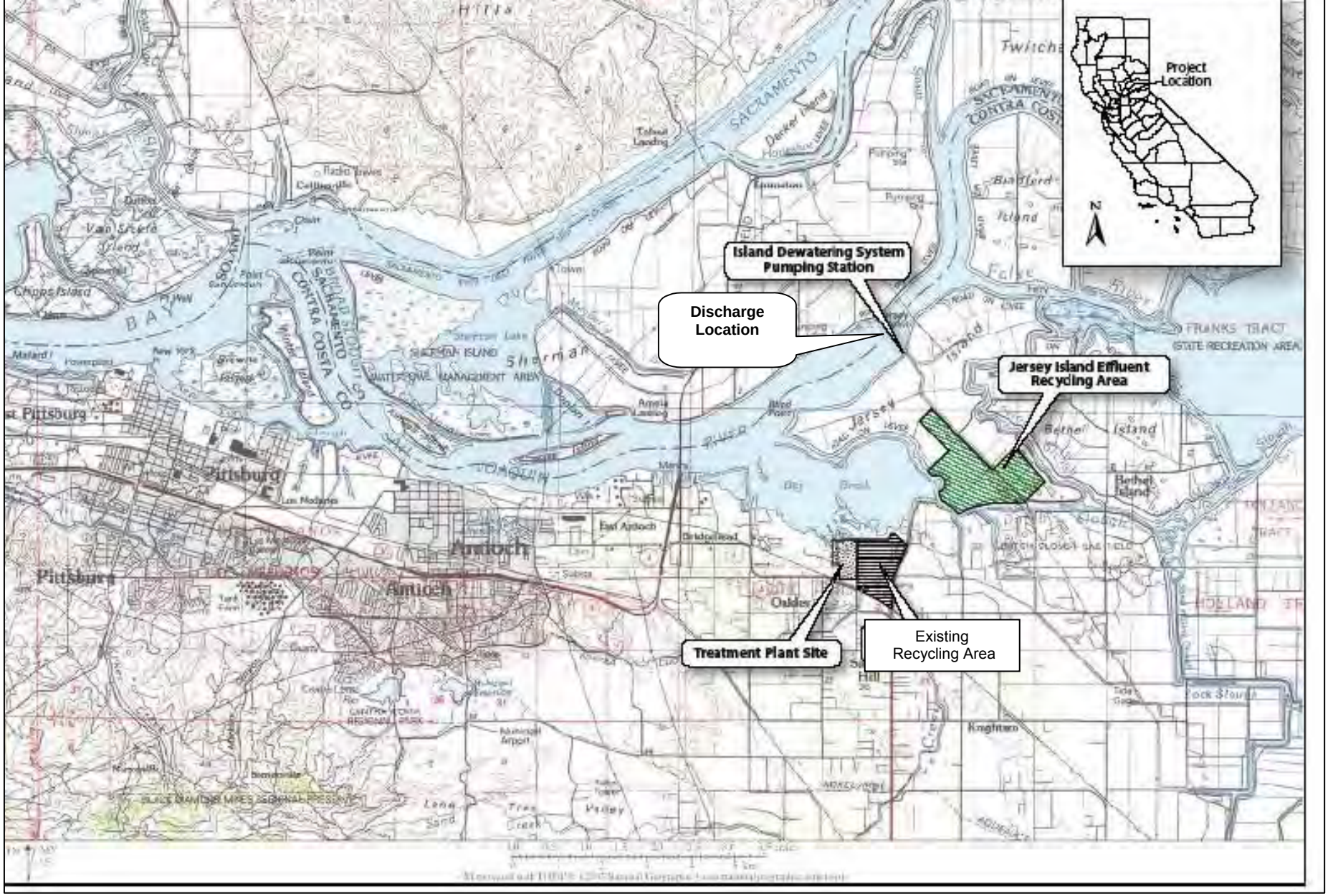
$$\sigma = (\sum[(x - \mu)^2]/(n - 1))^{0.5}$$

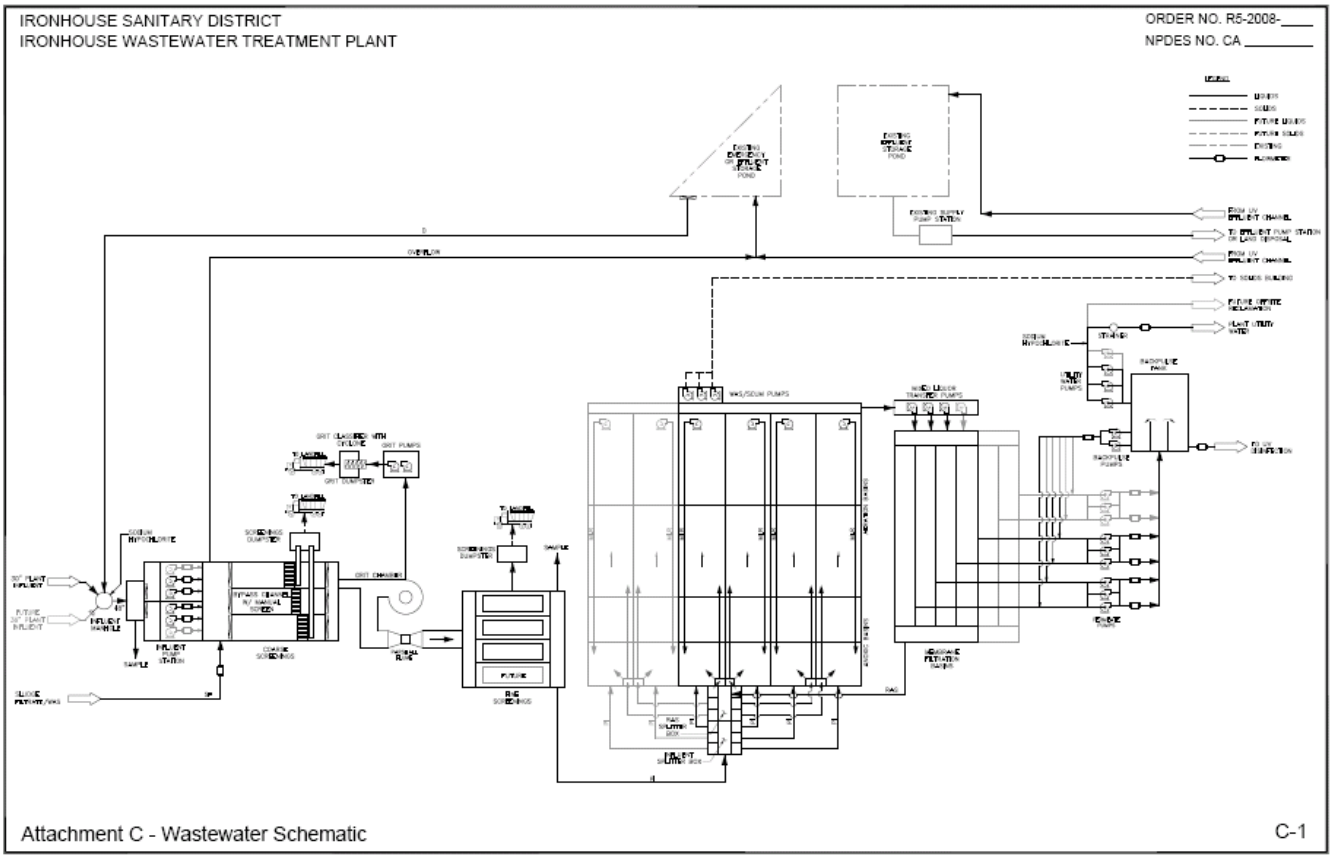
where:

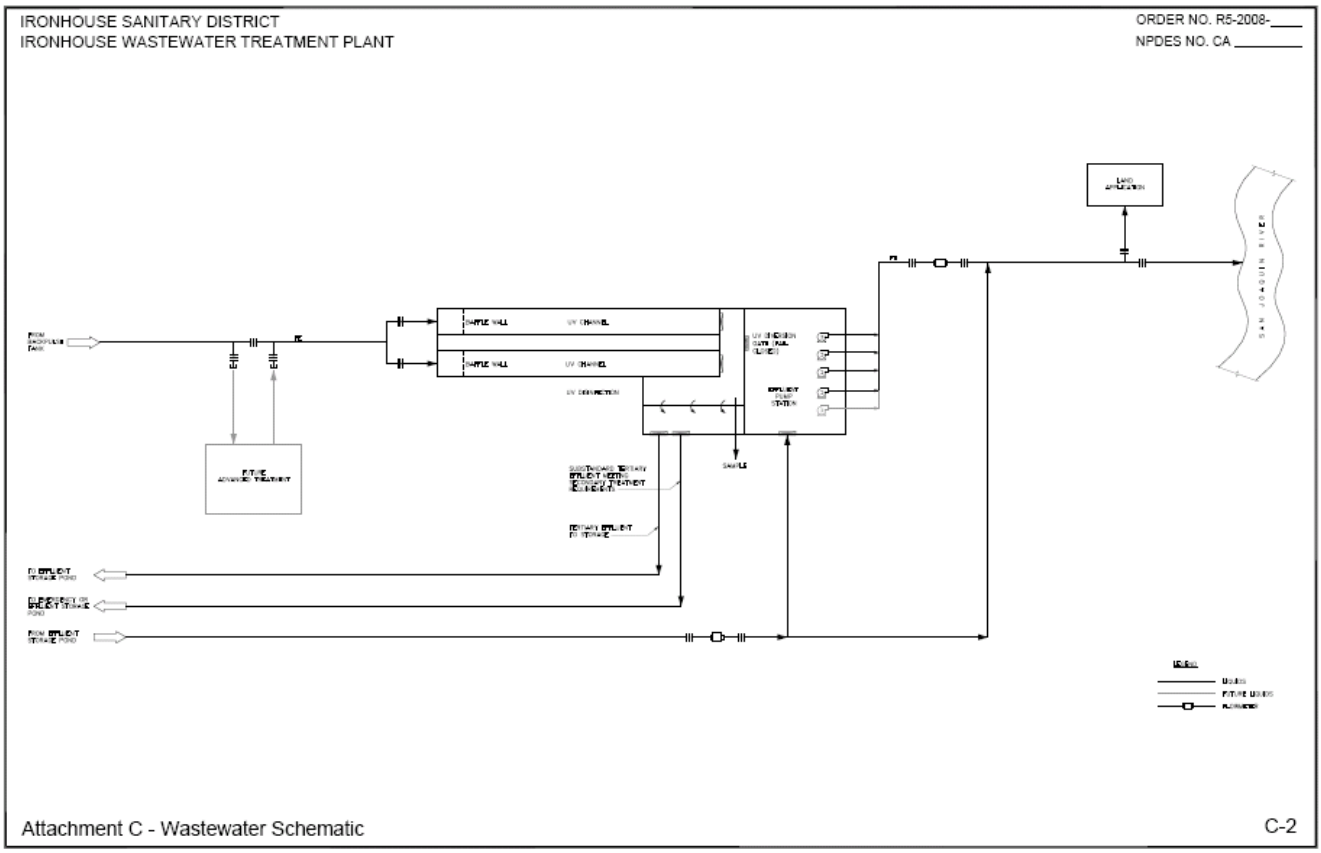
x is the observed value;
μ is the arithmetic mean of the observed values; and
n is the number of samples.

Toxicity Reduction Evaluation (TRE) is a study conducted in a step-wise process designed to identify the causative agents of effluent or ambient toxicity, isolate the sources of toxicity,

evaluate the effectiveness of toxicity control options, and then confirm the reduction in toxicity. The first steps of the TRE consist of the collection of data relevant to the toxicity, including additional toxicity testing, and an evaluation of facility operations and maintenance practices, and best management practices. A Toxicity Identification Evaluation (TIE) may be required as part of the TRE, if appropriate. (A TIE is a set of procedures to identify the specific chemical(s) responsible for toxicity. These procedures are performed in three phases (characterization, identification, and confirmation) using aquatic organism toxicity tests.)


Project Location
N
Island Dewatering System Pumping Station
Discharge Location
Jersey Island Effluent Recycling Area
Existing Recycling Area
Treatment Plant Site
Pittsburg
Antioch
Oakley
Bethel Island
Jersey Island
Sherman Island
FRANKS TRACT STATE RECREATION AREA
SACRAMENTO
CONTRA COSTA
SOLANO
BAY


IRONHOUSE SANITARY DISTRICT
IRONHOUSE WASTEWATER TREATMENT PLANT
ORDER NO. R5-2008-____
NPDES NO. CA _____
Attachment C - Wastewater Schematic
C-1


IRONHOUSE SANITARY DISTRICT
IRONHOUSE WASTEWATER TREATMENT PLANT
ORDER NO. R5-2008-____
NPDES NO. CA _____
Attachment C - Wastewater Schematic
C-2

ATTACHMENT D –STANDARD PROVISIONS

I. STANDARD PROVISIONS – PERMIT COMPLIANCE

A. Duty to Comply

1. The Discharger must comply with all of the conditions of this Order. Any noncompliance constitutes a violation of the Clean Water Act (CWA) and the California Water Code and is grounds for enforcement action, for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application. (40 C.F.R. § 122.41(a).)

2. The Discharger shall comply with effluent standards or prohibitions established under Section 307(a) of the CWA for toxic pollutants and with standards for sewage sludge use or disposal established under Section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions, even if this Order has not yet been modified to incorporate the requirement. (40 C.F.R. § 122.41(a)(1).)

B. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a Discharger in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this Order. (40 C.F.R. § 122.41(c).)

C. Duty to Mitigate

The Discharger shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this Order that has a reasonable likelihood of adversely affecting human health or the environment. (40 C.F.R. § 122.41(d).)

D. Proper Operation and Maintenance

The Discharger shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Discharger to achieve compliance with the conditions of this Order. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems that are installed by a Discharger only when necessary to achieve compliance with the conditions of this Order. (40 C.F.R. § 122.41(e).)

E. Property Rights

1. This Order does not convey any property rights of any sort or any exclusive privileges. (40 C.F.R. § 122.41(g).)

2. The issuance of this Order does not authorize any injury to persons or property or invasion of other private rights, or any infringement of state or local law or regulations. (40 C.F.R. § 122.5(c).)

F. Inspection and Entry

The Discharger shall allow the Regional Water Board, State Water Board, United States Environmental Protection Agency (USEPA), and/or their authorized representatives (including an authorized contractor acting as their representative), upon the presentation of credentials and other documents, as may be required by law, to (40 C.F.R. § 122.41(i); Wat. Code, § 13383):

1. Enter upon the Discharger's premises where a regulated facility or activity is located or conducted, or where records are kept under the conditions of this Order (40 C.F.R. § 122.41(i)(1));

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Order (40 C.F.R. § 122.41(i)(2));

3. Inspect and photograph, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Order (40 C.F.R. § 122.41(i)(3)); and

4. Sample or monitor, at reasonable times, for the purposes of assuring Order compliance or as otherwise authorized by the CWA or the Water Code, any substances or parameters at any location. (40 C.F.R. § 122.41(i)(4).)

G. Bypass

1. Definitions

   a. “Bypass” means the intentional diversion of waste streams from any portion of a treatment facility. (40 C.F.R. § 122.41(m)(1)(i).)

   b. “Severe property damage” means substantial physical damage to property, damage to the treatment facilities, which causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production. (40 C.F.R. § 122.41(m)(1)(ii).)

2. Bypass not exceeding limitations. The Discharger may allow any bypass to occur which does not cause exceedances of effluent limitations, but only if it is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions listed in Standard Provisions – Permit Compliance I.G.3, I.G.4, and I.G.5 below. (40 C.F.R. § 122.41(m)(2).)

3. Prohibition of bypass. Bypass is prohibited, and the Regional Water Board may take enforcement action against a Discharger for bypass, unless (40 C.F.R. § 122.41(m)(4)(i)):

    a. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage (40 C.F.R. § 122.41(m)(4)(i)(A));

    b. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance (40 C.F.R. § 122.41(m)(4)(i)(B)); and

    c. The Discharger submitted notice to the Regional Water Board as required under Standard Provisions – Permit Compliance I.G.5 below. (40 C.F.R. § 122.41(m)(4)(i)(C).)

4. The Regional Water Board may approve an anticipated bypass, after considering its adverse effects, if the Regional Water Board determines that it will meet the three conditions listed in Standard Provisions – Permit Compliance I.G.3 above. (40 C.F.R. § 122.41(m)(4)(ii).)

5. Notice

    a. Anticipated bypass. If the Discharger knows in advance of the need for a bypass, it shall submit a notice, if possible at least 10 days before the date of the bypass. (40 C.F.R. § 122.41(m)(3)(i).)

    b. Unanticipated bypass. The Discharger shall submit notice of an unanticipated bypass as required in Standard Provisions - Reporting V.E below (24-hour notice). (40 C.F.R. § 122.41(m)(3)(ii).)

H. Upset

Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the Discharger. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation. (40 C.F.R. § 122.41(n)(1).)

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of Standard Provisions – Permit Compliance I.H.2 below are met. No determination made during administrative review of claims that noncompliance was

caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review. (40 C.F.R. § 122.41(n)(2).).

2. Conditions necessary for a demonstration of upset. A Discharger who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs or other relevant evidence that (40 C.F.R. § 122.41(n)(3)):

   a. An upset occurred and that the Discharger can identify the cause(s) of the upset (40 C.F.R. § 122.41(n)(3)(i));

   b. The permitted facility was, at the time, being properly operated (40 C.F.R. § 122.41(n)(3)(ii));

   c. The Discharger submitted notice of the upset as required in Standard Provisions – Reporting V.E.2.b below (24-hour notice) (40 C.F.R. § 122.41(n)(3)(iii)); and

   d. The Discharger complied with any remedial measures required under Standard Provisions – Permit Compliance I.C above. (40 C.F.R. § 122.41(n)(3)(iv).)

3. Burden of proof. In any enforcement proceeding, the Discharger seeking to establish the occurrence of an upset has the burden of proof. (40 C.F.R. § 122.41(n)(4).)

II. STANDARD PROVISIONS – PERMIT ACTION

A. General

This Order may be modified, revoked and reissued, or terminated for cause. The filing of a request by the Discharger for modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any Order condition. (40 C.F.R. § 122.41(f).)

B. Duty to Reapply

If the Discharger wishes to continue an activity regulated by this Order after the expiration date of this Order, the Discharger must apply for and obtain a new permit. (40 C.F.R. § 122.41(b).)

C. Transfers

This Order is not transferable to any person except after notice to the Regional Water Board. The Regional Water Board may require modification or revocation and reissuance of the Order to change the name of the Discharger and incorporate such other requirements as may be necessary under the CWA and the Water Code. (40 C.F.R. § 122.41(l)(3); § 122.61.)

III. STANDARD PROVISIONS – MONITORING

A. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. (40 C.F.R. § 122.41(j)(1).)

B. Monitoring results must be conducted according to test procedures under Part 136 or, in the case of sludge use or disposal, approved under Part 136 unless otherwise specified in Part 503 unless other test procedures have been specified in this Order. (40 C.F.R. § 122.41(j)(4); § 122.44(i)(1)(iv).)

IV. STANDARD PROVISIONS – RECORDS

A. Except for records of monitoring information required by this Order related to the Discharger's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by Part 503), the Discharger shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this Order, and records of all data used to complete the application for this Order, for a period of at least three (3) years from the date of the sample, measurement, report or application. This period may be extended by request of the Regional Water Board Executive Officer at any time. (40 C.F.R. § 122.41(j)(2).)

B. Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements (40 C.F.R. § 122.41(j)(3)(i));

2. The individual(s) who performed the sampling or measurements (40 C.F.R. § 122.41(j)(3)(ii));

3. The date(s) analyses were performed (40 C.F.R. § 122.41(j)(3)(iii));

4. The individual(s) who performed the analyses (40 C.F.R. § 122.41(j)(3)(iv));

5. The analytical techniques or methods used (40 C.F.R. § 122.41(j)(3)(v)); and

6. The results of such analyses. (40 C.F.R. § 122.41(j)(3)(vi).)

C. Claims of confidentiality for the following information will be denied (40 C.F.R. § 122.7(b)):

1. The name and address of any permit applicant or Discharger (40 C.F.R. § 122.7(b)(1)); and

2. Permit applications and attachments, permits and effluent data. (40 C.F.R. § 122.7(b)(2).)

V. STANDARD PROVISIONS – REPORTING

A. Duty to Provide Information

The Discharger shall furnish to the Regional Water Board, State Water Board, or USEPA within a reasonable time, any information which the Regional Water Board, State Water Board, or USEPA may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this Order or to determine compliance with this Order. Upon request, the Discharger shall also furnish to the Regional Water Board, State Water Board, or USEPA copies of records required to be kept by this Order. (40 C.F.R. § 122.41(h); Wat. Code, § 13267.)

B. Signatory and Certification Requirements

1. All applications, reports, or information submitted to the Regional Water Board, State Water Board, and/or USEPA shall be signed and certified in accordance with Standard Provisions – Reporting V.B.2, V.B.3, V.B.4, and V.B.5 below. (40 C.F.R. § 122.41(k).)

2. All permit applications shall be signed by either a principal executive officer or ranking elected official. For purposes of this provision, a principal executive officer of a federal agency includes: (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of USEPA). (40 C.F.R. § 122.22(a)(3).).

3. All reports required by this Order and other information requested by the Regional Water Board, State Water Board, or USEPA shall be signed by a person described in Standard Provisions – Reporting V.B.2 above, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a. The authorization is made in writing by a person described in Standard Provisions – Reporting V.B.2 above (40 C.F.R. § 122.22(b)(1));

   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.) (40 C.F.R. § 122.22(b)(2)); and

   c. The written authorization is submitted to the Regional Water Board and State Water Board. (40 C.F.R. § 122.22(b)(3).)

4. If an authorization under Standard Provisions – Reporting V.B.3 above is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Standard Provisions – Reporting V.B.3 above must be submitted to the Regional Water Board and State Water Board prior to or together with any reports, information, or applications, to be signed by an authorized representative. (40 C.F.R. § 122.22(c).)

5. Any person signing a document under Standard Provisions – Reporting V.B.2 or V.B.3 above shall make the following certification:

   "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations." (40 C.F.R. § 122.22(d).)

C. Monitoring Reports

1. Monitoring results shall be reported at the intervals specified in the Monitoring and Reporting Program (Attachment E) in this Order. (40 C.F.R. § 122.22(l)(4).)

2. Monitoring results must be reported on a Discharge Monitoring Report (DMR) form or forms provided or specified by the Regional Water Board or State Water Board for reporting results of monitoring of sludge use or disposal practices. (40 C.F.R. § 122.41(l)(4)(i).)

3. If the Discharger monitors any pollutant more frequently than required by this Order using test procedures approved under Part 136 or, in the case of sludge use or disposal, approved under Part 136 unless otherwise specified in Part 503, or as specified in this Order, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by the Regional Water Board. (40 C.F.R. § 122.41(l)(4)(ii).)

4. Calculations for all limitations, which require averaging of measurements, shall utilize an arithmetic mean unless otherwise specified in this Order. (40 C.F.R. § 122.41(l)(4)(iii).)

D. Compliance Schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this Order, shall be submitted no later than 14 days following each schedule date. (40 C.F.R. § 122.41(l)(5).)

E. Twenty-Four Hour Reporting

1. The Discharger shall report any noncompliance that may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the Discharger becomes aware of the circumstances. A written submission shall also be provided within five (5) days of the time the Discharger becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. (40 C.F.R. § 122.41(l)(6)(i).)

2. The following shall be included as information that must be reported within 24 hours under this paragraph (40 C.F.R. § 122.41(l)(6)(ii)):

   a. Any unanticipated bypass that exceeds any effluent limitation in this Order. (40 C.F.R. § 122.41(l)(6)(ii)(A).)

   b. Any upset that exceeds any effluent limitation in this Order. (40 C.F.R. § 122.41(l)(6)(ii)(B).)

3. The Regional Water Board may waive the above-required written report under this provision on a case-by-case basis if an oral report has been received within 24 hours. (40 C.F.R. § 122.41(l)(6)(iii).)

F. Planned Changes

The Discharger shall give notice to the Regional Water Board as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required under this provision only when (40 C.F.R. § 122.41(l)(1)):

1. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in section 122.29(b) (40 C.F.R. § 122.41(l)(1)(i)); or

2. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants that are not subject to effluent limitations in this Order. (40 C.F.R. § 122.41(l)(1)(ii).)

3. The alteration or addition results in a significant change in the Discharger's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan. (40 C.F.R.§ 122.41(l)(1)(iii).)

G. Anticipated Noncompliance

The Discharger shall give advance notice to the Regional Water Board or State Water Board of any planned changes in the permitted facility or activity that may result in noncompliance with General Order requirements. (40 C.F.R. § 122.41(l)(2).)

H. Other Noncompliance

The Discharger shall report all instances of noncompliance not reported under Standard Provisions – Reporting V.C, V.D, and V.E above at the time monitoring reports are submitted. The reports shall contain the information listed in Standard Provision – Reporting V.E above. (40 C.F.R. § 122.41(l)(7).)

I. Other Information

When the Discharger becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Regional Water Board, State Water Board, or USEPA, the Discharger shall promptly submit such facts or information. (40 C.F.R. § 122.41(l)(8).)

VI. STANDARD PROVISIONS – ENFORCEMENT

A. The Regional Water Board is authorized to enforce the terms of this permit under several provisions of the Water Code, including, but not limited to, sections 13385, 13386, and 13387.

VII. ADDITIONAL PROVISIONS – NOTIFICATION LEVELS

A. Publicly-Owned Treatment Works (POTWs)

All POTWs shall provide adequate notice to the Regional Water Board of the following (40 C.F.R. § 122.42(b)):

1. Any new introduction of pollutants into the POTW from an indirect discharger that would be subject to sections 301 or 306 of the CWA if it were directly discharging those pollutants (40 C.F.R. § 122.42(b)(1)); and

2. Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of adoption of the Order. (40 C.F.R. § 122.42(b)(2).)

3. Adequate notice shall include information on the quality and quantity of effluent introduced into the POTW as well as any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW. (40 C.F.R. § 122.42(b)(3).)

ATTACHMENT E – MONITORING AND REPORTING PROGRAM

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ATTACHMENT E – MONITORING AND REPORTING PROGRAM (MRP)

The Code of Federal Regulations section 122.48 requires that all NPDES permits specify monitoring and reporting requirements. Water Code Sections 13267 and 13383 also authorize the Regional Water Quality Control Board (Regional Water Board) to require technical and monitoring reports. This MRP establishes monitoring and reporting requirements, which implement the federal and state regulations.

I. GENERAL MONITORING PROVISIONS

A. Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring locations specified below and, unless otherwise specified, before the monitored flow joins or is diluted by any other waste stream, body of water, or substance. Monitoring locations shall not be changed without notification to and the approval of this Regional Water Board.

B. Chemical, bacteriological, and bioassay analyses shall be conducted at a laboratory certified for such analyses by the California Department of Public Health (CDPH). In the event a certified laboratory is not available to the Discharger, analyses performed by a non-certified laboratory will be accepted provided a Quality Assurance-Quality Control Program is instituted by the laboratory. A manual containing the steps followed in this program must be kept in the laboratory and shall be available for inspection by Regional Water Board staff. The Quality Assurance-Quality Control Program must conform to USEPA guidelines or to procedures approved by the Regional Water Board.

C. All analyses shall be performed in a laboratory certified to perform such analyses by the CDPH. Laboratories that perform sample analyses shall be identified in all monitoring reports.

D. Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. All monitoring instruments and devices used by the Discharger to fulfill the prescribed monitoring program shall be properly maintained and calibrated as necessary to ensure their continued accuracy. All flow measurement devices shall be calibrated at least once per year to ensure continued accuracy of the devices.

E. Monitoring results, including noncompliance, shall be reported at intervals and in a manner specified in this Monitoring and Reporting Program.

F. Monitoring will begin at initiation of the surface water discharge, however, reporting will begin with adoption of this Order.

II. MONITORING LOCATIONS

The Discharger shall establish the following monitoring locations to demonstrate compliance with the effluent limitations, discharge specifications, and other requirements in this Order:

Table E-1. Monitoring Station Locations

Discharge Point Name	Monitoring Location Name	Monitoring Location Description
--	**INF-001**	Facility influent, prior to any treatment.
001	**EFF-001**	Discharge from the Facility to the San Joaquin River at Jersey Island (38º 02' 40.75" N, Latitude;121º 41' 40.21" W, Longitude)
--	**RSW-001**	San Joaquin River, approximately 7 miles upstream from Discharge Point 001
--	**RSW-002**	San Joaquin River, 500 feet upstream from Discharge Point 001
--	**RSW-003**	San Joaquin River, 500 feet downstream from Discharge Point 001
--	**RSW-004**	San Joaquin River, approximately 3 miles downstream from Discharge Point 001, at the Antioch Bridge.
--	**WS-001**	Municipal Water Supply

III. INFLUENT MONITORING REQUIREMENTS

A. Monitoring Location INF-001

1. The Discharger shall monitor influent to the facility at INF-001 as follows:

Table E-2. Influent Monitoring

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
Flow	mgd	Meter	Continuous	
BOD 5-day 20°C	mg/L	24-hr Composite[1]	5 days/week	
Total Suspended Solids	mg/L	24-hr Composite[1]	5 days/week	
pH	pH units	Grab	5 days/week	
TDS	mg/L	24-hr Composite[1]	1/month	
Electrical Conductivity @ 25°C	µmhos/cm	24-hr Composite[1]	5 days/week	

[1] 24-hour flow proportional composite

IV. EFFLUENT MONITORING REQUIREMENTS

A. Monitoring Location EFF-001

1. The Discharger shall monitor Ironhouse Wastewater Treatment Plant effluent at EFF-001 as follows:

Table E-3. Effluent Monitoring

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method and (Minimum Level, units), respectively
Flow	mgd	Meter	Continuous	
Total Residual Chlorine[1]	mg/L	Grab	2/day[8]	
Turbidity	NTU	Meter	Continuous	
Temperature	°F	Meter	Continuous	
pH	pH units	Meter	Continuous	
BOD 5-day 20°C	mg/L	24-hr Composite[6]	5 days/week	
Total Suspended Solids	mg/L	24-hr Composite[6]	5 days/week	
Total Coliform Organisms	MPN/100 mL	Grab	5 days/week	
Settleable Solids	mL/L	Grab	1/month	
Dissolved Oxygen	mg/L	Grab	5 days/week	
Electrical Conductivity @ 25°C	µmhos/cm	24-hr Composite[6]	5 days/week[9]	
Ammonia (as N) [2,3]	mg/L	Grab	1/week	
Nitrate (as N)	mg/L	Grab	1/month	
Nitrite (as N)	mg/L	Grab	1/month	
Total Dissolved Solids	mg/L	24-hr Composite[6]	1/month	
Iron	µg/L	24-hr Composite[6]	1/month	
Aluminum	µg/L	24-hr Composite[6]	1/month	
MBAS	µg/L	24-hr Composite[6]	1/month	
Fluoride	mg/L	24-hr Composite[6]	1/month	
Copper	µg/L	24-hr Composite[6]	1/month	
Lead	µg/L	24-hr Composite[6]	1/month	
Manganese	µg/L	24-hr Composite[6]	1/month	
Chloride	mg/L	24-hr Composite[6]	1/month	
Oil and Grease	mg/L	Grab	1/month	
Mercury, total	ng/L	grab	1/month	[7]

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method and (Minimum Level, units), respectively
Mercury, methyl	ng/L	grab	1/month	[7]
Standard Minerals[5]	mg/L	24-hr Composite[6]	1/year	
Radionuclides		24-hr Composite[6]	1/year	

1 Total chlorine residual must be monitored with a method sensitive to and accurate at the permitted level of 0.01 mg/L.

2 Concurrent with biotoxicity monitoring

3 Report as total.

4 For priority pollutant constituents with effluent limitations, detection limits shall be below the effluent limitations. If the lowest minimum level (ML) published in Appendix 4 of the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (State Implementation Plan or SIP) is not below the effluent limitation, the detection limit shall be the lowest ML. For priority pollutant constituents without effluent limitations, the detection limits shall be equal to or less than the lowest ML published in Appendix 4 of the SIP. Hardness sampling to place concurrently with priority pollutant monitoring.

5 Standard minerals shall include the following: boron, calcium, iron, magnesium, potassium, sodium, chloride, manganese, phosphorus, total alkalinity (including alkalinity series), and hardness, and include verification.

6 24-hour flow proportioned composite

7 Unfiltered methyl mercury and total mercury samples shall be taken using clean hands/dirty hands procedures, as described in U.S. EPA method 1669: Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels, for collection of equipment blanks (section 9.4.4.2), and shall be analyzed by U.S. EPA method 1630/1631 (Revision E) with a method detection limit of 0.02 ng/l for methylmercury and 0.2 ng/l for total mercury.

8 Total residual chlorine monitoring only required when chlorine used for maintenance or other purposes at the Facility. Continuous monitoring in lieu of grab sample is also permitted.

9 For each day, the Discharger shall report the 14-day running average EC measured at the D-1641 Salinity Compliance Monitoring Station D-15 –San Joaquin River at Jersey Point, for the previous 14-day period. In addition, the Discharger shall report with each monthly self-monitoring report the Water Year Type as defined by the State Water Board's Sacramento Valley 40-30-30 Index.

V. WHOLE EFFLUENT TOXICITY TESTING REQUIREMENTS

A. **Acute Toxicity Testing.** The Discharger shall conduct acute toxicity testing to determine whether the effluent is contributing acute toxicity to the receiving water. The Discharger shall meet the following acute toxicity testing requirements:

1. *Monitoring Frequency* – the Discharger shall perform weekly acute toxicity testing, concurrent with effluent ammonia sampling. If the discharge does not exceed the acute toxicity effluent limitations during the first six (6) months following initiation of discharge, the monitoring frequency may be reduced to monthly.

2. *Sample Types* – For static non-renewal and static renewal testing, the samples shall be flow proportional 24-hour composites and shall be representative of the volume

and quality of the discharge. The effluent samples shall be taken at the effluent monitoring location EFF-001.

3. *Test Species* – Test species shall be rainbow trout (*Oncorhchus mykiss*).

4. *Methods* – The acute toxicity testing samples shall be analyzed using EPA-821-R-02-012, Fifth Edition and its subsequent amendments or revisions. Temperature, total residual chlorine, and pH shall be recorded at the time of sample collection. No pH adjustment may be made unless approved by the Executive Officer.

5. *Test Failure* – If an acute toxicity test does not meet all test acceptability criteria, as specified in the test method, the Discharger must re-sample and re-test as soon as possible, not to exceed 7 days following notification of test failure.

B. **Chronic Toxicity Testing**. The Discharger shall conduct three species chronic toxicity testing to determine whether the effluent is contributing chronic toxicity to the receiving water. The Discharger shall meet the following chronic toxicity testing requirements:

1. *Monitoring Frequency* – the Discharger shall perform monthly three species chronic toxicity testing. If the Discharger is not required to initiate a Toxicity Reduction Evaluation during the first twelve (12) months following initiation of discharge (per Section VI.C.2.a. of the Limitations and Discharge Specifications), the monitoring frequency may be reduced to quarterly.

2. *Sample Types* – Effluent samples shall be flow proportional 24-hour composites and shall be representative of the volume and quality of the discharge. The effluent samples shall be taken at the effluent monitoring location specified in the Monitoring and Reporting Program. The receiving water control shall be a grab sample obtained from the RSW-003U sampling location, as identified in the Monitoring and Reporting Program.

3. *Sample Volumes* – Adequate sample volumes shall be collected to provide renewal water to complete the test in the event that the discharge is intermittent.

4. *Test Species* – Chronic toxicity testing measures sub-lethal (e.g. reduced growth, reproduction) and/or lethal effects to test organisms exposed to an effluent compared to that of the control organisms. The Discharger shall conduct chronic toxicity tests with:

   - The cladoceran, water flea, *Ceriodaphnia dubia* (survival and reproduction test);
   - The fathead minnow, *Pimephales promelas* (larval survival and growth test); and
   - The green alga, *Selenastrum capricornutum* (growth test).

5. *Methods* – The presence of chronic toxicity shall be estimated as specified in *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters*

to Freshwater Organisms, Fourth Edition, EPA/821-R-02-013, October 2002 and its subsequent amendments or revisions.

6. *Reference Toxicant* – As required by the SIP, all chronic toxicity tests shall be conducted with concurrent testing with a reference toxicant and shall be reported with the chronic toxicity test results.

7. *Dilutions* – The chronic toxicity testing shall be performed using the dilution series identified in Table E-4, below. The receiving water control shall be used as the diluent (unless the receiving water is toxic). If the receiving water is toxic, laboratory water may be used as the diluent, in which case, the receiving water must still be sampled and tested to provide evidence of toxicity.

8. *Test Failure* –The Discharger must re-sample and re-test as soon as possible, but no later than fourteen (14) days after receiving notification of a test failure. A test failure is defined as follows:

   a. The reference toxicant test or the effluent test does not meet all test acceptability criteria as specified in the *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition*, EPA/821-R-02-013, October 2002 (Method Manual), and its subsequent amendments or revisions; or

   b. The percent minimum significant difference (PMSD) measured for the test exceeds the upper PMSD bound variability criterion in Table 6 on page 52 of the Method Manual. (A retest is only required in this case if the test results do not exceed the monitoring trigger specified in Special Provisions VI. 2.C.a.iii.)

Table E-4. Chronic Toxicity Testing Dilution Series

Sample	Dilutions (%)					Controls	
	100	25	12.5	6.25	3.125	Receiving Water	Laboratory Water
% Effluent	100	25	12.5	6.25	3.125	0	0
% Receiving Water	0	75	87.5.	93.75	96.875	100	0
% Laboratory Water	0	0	0	0	0	0	100

C. **WET Testing Notification Requirements**. The Discharger shall notify the Regional Water Board within 24-hrs after the receipt of test results exceeding the monitoring trigger during regular or accelerated monitoring, or an exceedance of the acute toxicity effluent limitation.

D. **WET Testing Reporting Requirements**. All toxicity test reports shall include the contracting laboratory's complete report provided to the Discharger and shall be in accordance with the appropriate "Report Preparation and Test Review" sections of the

method manuals. At a minimum, whole effluent toxicity monitoring shall be reported as follows:

1. **Chronic WET Reporting.** Regular chronic toxicity monitoring results shall be reported to the Regional Water Board within 30 days following completion of the test, and shall contain, at minimum:
   a. The results expressed in TUc, measured as 100/NOEC, and also measured as $100/LC_{50}$, $100/EC_{25}$, $100/IC_{25}$, and $100/IC_{50}$, as appropriate.
   b. The statistical methods used to calculate endpoints;
   c. The statistical output page, which includes the calculation of the percent minimum significant difference (PMSD);
   d. The dates of sample collection and initiation of each toxicity test; and
   e. The results compared to the numeric toxicity monitoring trigger.

   Additionally, the monthly discharger self-monitoring reports shall contain an updated chronology of chronic toxicity test results expressed in TUc, and organized by test species, type of test (survival, growth or reproduction), and monitoring frequency, i.e., either quarterly, monthly, accelerated, or TRE.

2. **Acute WET Reporting.** Acute toxicity test results shall be submitted with the monthly discharger self-monitoring reports and reported as percent survival.

3. **TRE Reporting.** Reports for Toxicity Reduction Evaluations shall be submitted in accordance with the schedule contained in the Discharger's approved TRE Work Plan.

4. **Quality Assurance (QA).** The Discharger must provide the following information for QA purposes:
   a. Results of the applicable reference toxicant data with the statistical output page giving the species, NOEC, LOEC, type of toxicant, dilution water used, concentrations used, PMSD, and dates tested.
   b. The reference toxicant control charts for each endpoint, which include summaries of reference toxicant tests performed by the contracting laboratory.
   c. Any information on deviations or problems encountered and how they were dealt with.

VI. LAND DISCHARGE MONITORING REQUIREMENTS – NOT APPLICABLE

Discharges to land are regulated by separate waste discharge requirements.

VII. RECLAMATION MONITORING REQUIREMENTS– NOT APPLICABLE

Discharges to land are regulated by separate waste discharge requirements.

VIII. RECEIVING WATER MONITORING REQUIREMENTS – SURFACE WATER AND GROUNDWATER

A. Monitoring Location RSW-002 and RSW-003

1. The Discharger shall monitor San Joaquin River at RSW-002and RSW-003 as follows:

Table E-5. Receiving Water Monitoring Requirements

Parameter	Units	Sample Type	Minimum Sampling Frequency[1]	Required Analytical Test Method
Dissolved Oxygen	mg/L	Grab	1/month[2]	
pH	Standard Units	Grab	1/month[2]	
Temperature	°F (°C)	Grab	1/month[2]	
Electrical Conductivity @ 25°C	µmhos/ cm	Grab	1/month[2]	
Turbidity	NTUs	Grab	1/month[2]	
Total Dissolved Solids	mg/L	Grab	1/month[2]	

[1] In the event that unsafe conditions exist (e.g. small craft advisories in effect) on scheduled sampling days, sampling shall be rescheduled. Should unsafe conditions prohibit the collection of samples at the frequency defined in this table, this shall be noted in the self monitoring report and sampling shall resume at the frequency defined in this table as soon as conditions allow.

[2] The monitoring frequency may be reduced to quarterly after the first year of monitoring following initiation of the discharge to the San Joaquin River.

IX. OTHER MONITORING REQUIREMENTS

A. Biosolids – Not Applicable

Discharges to land are regulated by separate waste discharge requirements.

B. Municipal Water Supply

1. **Monitoring Location WS-001**

   The Discharger shall monitor the Municipal Water Supply at WS-001 as follows. A sampling station shall be established where a representative sample of the municipal water supply can be obtained. Water supplies for less than 250 population can be excluded from the sampling. Municipal water supply samples shall be collected at approximately the same time as effluent samples.

Table E-6. Municipal Water Supply Monitoring Requirements

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
Total Dissolved Solids	mg/L	Grab	1/year	
Electrical Conductivity @ 25°C[1]	µmhos/cm	Grab	1/year	
Standard Minerals[2]	mg/L	Grab	1/year	

[1] If the water supply is from more than one source, the EC shall be reported as a weighted average and include copies of supporting calculations

[2] Standard minerals shall include the following: boron, calcium, iron, magnesium, potassium, sodium, chloride, manganese, phosphorus, total alkalinity (including alkalinity series), and hardness, and include verification.

X. REPORTING REQUIREMENTS

A. General Monitoring and Reporting Requirements

1. The Discharger shall comply with all Standard Provisions (Attachment D) related to monitoring, reporting, and recordkeeping.

1. Upon written request of the Regional Water Board, the Discharger shall submit a summary monitoring report. The report shall contain both tabular and graphical summaries of the monitoring data obtained during the previous year(s).

2. **Compliance Time Schedules.** For compliance time schedules included in the Order, the Discharger shall submit to the Regional Water Board, on or before each compliance due date, the specified document or a written report detailing compliance or noncompliance with the specific date and task. If noncompliance is reported, the Discharger shall state the reasons for noncompliance and include an estimate of the date when the Discharger will be in compliance. The Discharger shall notify the Regional Water Board by letter when it returns to compliance with the compliance time schedule.

3. The Discharger shall report to the Regional Water Board any toxic chemical release data it reports to the State Emergency Response Commission within 15 days of reporting the data to the Commission pursuant to section 313 of the "Emergency Planning and Community Right to Know Act of 1986.

4. **Reporting Protocols.** The Discharger shall report with each sample result the applicable Reporting Level (RL) and the current Method Detection Limit (MDL), as determined by the procedure in Part 136.

   The Discharger shall report the results of analytical determinations for the presence of chemical constituents in a sample using the following reporting protocols:

   a. Sample results greater than or equal to the RL shall be reported as measured by

the laboratory (i.e., the measured chemical concentration in the sample).

b. Sample results less than the RL, but greater than or equal to the laboratory's MDL, shall be reported as "Detected, but Not Quantified," or DNQ. The estimated chemical concentration of the sample shall also be reported.

   For the purposes of data collection, the laboratory shall write the estimated chemical concentration next to DNQ as well as the words "Estimated Concentration" (may be shortened to "Est. Conc."). The laboratory may, if such information is available, include numerical estimates of the data quality for the reported result. Numerical estimates of data quality may be percent accuracy (± a percentage of the reported value), numerical ranges (low to high), or any other means considered appropriate by the laboratory.

c. Sample results less than the laboratory's MDL shall be reported as "Not Detected," or ND.

d. Dischargers are to instruct laboratories to establish calibration standards so that the ML value (or its equivalent if there is differential treatment of samples relative to calibration standards) is the lowest calibration standard. At no time is the Discharger to use analytical data derived from *extrapolation* beyond the lowest point of the calibration curve.

5. **Multiple Sample Data.** When determining compliance with an AMEL, AWEL, or MDEL for priority pollutants and more than one sample result is available, the Discharger shall compute the arithmetic mean unless the data set contains one or more reported determinations of "Detected, but Not Quantified" (DNQ) or "Not Detected" (ND). In those cases, the Discharger shall compute the median in place of the arithmetic mean in accordance with the following procedure:

   a. The data set shall be ranked from low to high, ranking the reported ND determinations lowest, DNQ determinations next, followed by quantified values (if any). The order of the individual ND or DNQ determinations is unimportant.

   b. The median value of the data set shall be determined. If the data set has an odd number of data points, then the median is the middle value. If the data set has an even number of data points, then the median is the average of the two values around the middle unless one or both of the points are ND or DNQ, in which case the median value shall be the lower of the two data points where DNQ is lower than a value and ND is lower than DNQ.

B. Self Monitoring Reports (SMRs)

1. At any time during the term of this permit, the State or Regional Water Board may notify the Discharger to electronically submit Self-Monitoring Reports (SMRs) using the State Water Board's California Integrated Water Quality System (CIWQS) Program Web site (http://www.waterboards.ca.gov/ciwqs/index.html). Until such notification is given, the Discharger shall submit hard copy SMRs. The CIWQS Web site will provide additional directions for SMR submittal in the event there will be service interruption for electronic submittal.

2. Monitoring results shall be submitted to the Regional Water Board by the **first day** of the second month following sample collection. Quarterly and annual monitoring results shall be submitted by the **first day of the second month following each calendar quarter, semi-annual period, and year**, respectively.

3. In reporting the monitoring data, the Discharger shall arrange the data in tabular form so that the date, the constituents, and the concentrations are readily discernible. The data shall be summarized in such a manner to illustrate clearly whether the discharge complies with waste discharge requirements. The highest daily maximum for the month, monthly and weekly averages, and medians, and removal efficiencies (%) for BOD and Total Suspended Solids, shall be determined and recorded as needed to demonstrate compliance.

4. With the exception of flow, all constituents monitored on a continuous basis (metered), shall be reported as daily maximums, daily minimums, and daily averages; flow shall be reported as the total volume discharged per day for each day of discharge.

5. If the Discharger monitors any pollutant at the locations designated herein more frequently than is required by this Order, the results of such monitoring shall be included in the calculation and reporting of the values required in the discharge monitoring report form. Such increased frequency shall be indicated on the discharge monitoring report form.

6. A letter transmitting the self-monitoring reports shall accompany each report. Such a letter shall include a discussion of requirement violations found during the reporting period, and actions taken or planned for correcting noted violations, such as operation or facility modifications. If the Discharger has previously submitted a report describing corrective actions and/or a time schedule for implementing the corrective actions, reference to the previous correspondence will be satisfactory. The transmittal letter shall contain the penalty of perjury statement by the Discharger, or the Discharger's authorized agent, as described in the Standard Provisions.

7. SMRs must be submitted to the Regional Water Board, signed and certified as required by the Standard Provisions (Attachment D), to the address listed below:

   Regional Water Quality Control Board
   Central Valley Region
   11020 Sun Center Dr., Suite #200
   Rancho Cordova, CA 95670-6114

8. Monitoring periods and reporting for all required monitoring shall be completed according to the following schedule:

Table E-7. Monitoring Periods and Reporting Schedule

Sampling Frequency	Monitoring Period Begins On…	Monitoring Period	SMR Due Date
Continuous	Initiation of discharge	All	Submit with monthly SMR
Hourly	Initiation of discharge	Hourly	Submit with monthly SMR
Daily	Initiation of discharge	(Midnight through 11:59 PM) or any 24-hour period that reasonably represents a calendar day for purposes of sampling.	Submit with monthly SMR
Weekly	Initiation of discharge	Sunday through Saturday	Submit with monthly SMR
Monthly	First day of calendar month following initiation of discharge	1st day of calendar month through last day of calendar month	First day of second calendar month following month of sampling
Quarterly	Closest of January 1, April 1, July 1, or October 1 after (or on) first day of calendar month following initiation of discharge	January 1 through March 31 April 1 through June 30 July 1 through September 30 October 1 through December 31	May 1 of same year August 1 of same year November 1 of same year February 1 of next year
Semiannually	Closest of January 1 or July 1 after (or on) first day of calendar month following initiation of discharge	January 1 through June 30 July 1 through December 31	August 1 of same year February 1 of the next year
Annually	January 1 after (or on) first day of calendar month following initiation of discharge	January 1 through December 31	February 1 of the next year

C. Discharge Monitoring Reports (DMRs)

1. As described in Section X.B.1 above, at any time during the term of this permit, the State or Regional Water Board may notify the Discharger to electronically submit SMRs that will satisfy federal requirements for submittal of Discharge Monitoring Reports (DMRs). Until such notification is given, the Discharger shall submit DMRs in accordance with the requirements described below.

2. DMRs must be signed and certified as required by the standard provisions (Attachment D). The Discharger shall submit the original DMR and one copy of the DMR to the address listed below:

Standard Mail	FedEx/UPS/ Other Private Carriers
State Water Resources Control Board Division of Water Quality c/o DMR Processing Center PO Box 100 Sacramento, CA 95812-1000	State Water Resources Control Board Division of Water Quality c/o DMR Processing Center 1001 I Street, 15th Floor Sacramento, CA 95814

3. All discharge monitoring results must be reported on the official USEPA pre-printed DMR forms (EPA Form 3320-1). Forms that are self-generated cannot be accepted unless they follow the exact same format as EPA form 3320-1.

D. Other Reports

1. **Progress Reports.** As specified in the compliance time schedules required in Special Provisions VI, progress reports shall be submitted in accordance with the following reporting requirements. At minimum, the progress reports shall include a discussion of the status of final compliance, whether the Discharger is on schedule to meet the final compliance date, and the remaining tasks to meet the final compliance date.

Table E-8. Reporting Requirements for Special Provisions Progress Reports

Special Provision	Reporting Requirements
Pollution Prevention Plans for Salinity and Mercury (Special Provisions VI.C.3.a.)	**1 June**, annually**,** after approval of work plan until final compliance

2. Within **60 days** of permit adoption, the Discharger shall submit a report outlining minimum levels, method detection limits, and analytical methods for approval, with a goal to achieve detection levels below applicable water quality criteria. At a minimum, the Discharger shall comply with the monitoring requirements for CTR constituents as outlined in Section 2.3 and 2.4 of the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California*, adopted 2 March 2000 by the State Water Resources Control Board.

3. The Discharger's sanitary sewer system collects wastewater using sewers, pipes, pumps, and/or other conveyance systems and directs the raw sewage to the wastewater treatment plant. A "sanitary sewer overflow" is defined as a discharge to ground or surface water from the sanitary sewer system at any point upstream of the wastewater treatment plant. Sanitary sewer overflows are prohibited by this Order. All violations must be reported as required in Standard Provisions. Facilities (such as wet wells, regulated impoundments, tanks, highlines, *etc*.) may be part of a sanitary sewer system and discharges to these facilities are not considered sanitary sewer overflows, provided that the waste is fully contained within these temporary storage facilities.

4. **Annual Operations Report**. By **30 January** of each year, the Discharger shall submit a written report to the Executive Officer containing the following:

   a. The names, certificate grades, and general responsibilities of all persons employed at the Facility.

   b. The names and telephone numbers of persons to contact regarding the plant for emergency and routine situations.

   c. A statement certifying when the flow meter(s) and other monitoring instruments and devices were last calibrated, including identification of who performed the calibration.

d. A statement certifying whether the current operation and maintenance manual, and contingency plan, reflect the wastewater treatment plant as currently constructed and operated, and the dates when these documents were last revised and last reviewed for adequacy.

e. The Discharger may also be requested to submit an annual report to the Regional Water Board with both tabular and graphical summaries of the monitoring data obtained during the previous year. Any such request shall be made in writing. The report shall discuss the compliance record. If violations have occurred, the report shall also discuss the corrective actions taken and planned to bring the discharge into full compliance with the waste discharge requirements.

5. Annual Pretreatment Reporting Requirements – Not Applicable

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ATTACHMENT F – FACT SHEET

As described in section II of this Order, this Fact Sheet includes the legal requirements and technical rationale that serve as the basis for the requirements of this Order.

This Order has been prepared under a standardized format to accommodate a broad range of discharge requirements for Dischargers in California. Only those sections or subsections of this Order that are specifically identified as "not applicable" have been determined not to apply to this Discharger. Sections or subsections of this Order not specifically identified as "not applicable" are fully applicable to this Discharger.

I. PERMIT INFORMATION

The following table summarizes administrative information related to the facility.

Table F-1. Facility Information

WDID	
Discharger	Ironhouse Sanitary District
Name of Facility	Ironhouse Sanitary District Wastewater Treatment Plant
Facility Address	450 Walnut Meadows
	Oakley, CA 94561
	Contra Costa County
Facility Contact, Title and Phone	Jennifer Skrel, District Engineer, (925) 625-2279
Authorized Person to Sign and Submit Reports	Jennifer Skrel, District Engineer, (925) 625-2279
Mailing Address	SAME
Billing Address	SAME
Type of Facility	POTW
Major or Minor Facility	Major
Threat to Water Quality	1
Complexity	A
Pretreatment Program	N
Reclamation Requirements	None
Facility Permitted Flow	4.3 mgd ADWF
Facility Design Flow	4.3 mgd ADWF
Watershed	San Joaquin Delta Hydrologic Unit
Receiving Water	San Joaquin River
Receiving Water Type	Sacramento-San Joaquin Delta

A. Ironhouse Sanitary District (hereinafter Discharger) is the owner and operator of the Ironhouse Wastewater Treatment Plant (hereinafter Facility), a Publicly Owned Treatment Works (POTW).

For the purposes of this Order, references to the "discharger" or "permittee" in applicable federal and state laws, regulations, plans, or policy are held to be equivalent to references to the Discharger herein.

B. The Discharger currently operates the Facility with land disposal only. This permit allows a new discharge to surface water. The Facility is permitted to discharge wastewater to San Joaquin River within the legal boundaries of the Sacramento – San Joaquin Delta, a water of the United States, and is currently regulated by Order 5-01-237, Waste Discharge Requirements, which was adopted on 7 September 2001.

C. The Discharger filed a report of waste discharge and submitted an application for new Waste Discharge Requirements (WDRs) and National Pollutant Discharge Elimination System (NPDES) permit on 11 June 2007. Based on requests by Regional Water Board staff, supplemental information was submitted to the Regional Water Board on 7, 14, 17, and 18 December 2007and 7 January 2008. A site visit was conducted on 29 November 2007, to observe operations and collect additional data to develop permit limitations and conditions.

II. FACILITY DESCRIPTION

The Discharger owns and operates the Ironhouse Sanitary District Wastewater Treatment Facility (hereafter "Facility") and provides sewerage service for the communities of Oakley, Bethel Island, and the unincorporated areas in between serving a population of approximately 31,200. The Facility consists of headworks, 7.5 acres of aerated ponds and 2 effluent storage ponds with a capacity of approximately 350 acre-feet (114 million gallons). Prior to discharge to irrigation fields, the effluent is dosed with sodium hypochlorite for disinfection. The Discharger disposes of the effluent through irrigation of agricultural lands for production of hay and pastureland for grazing cattle. Approximately 162 acres of land is located adjacent to the Facility on the mainland and an additional 425 acres on Jersey Island, one of eight western Delta islands. The current average dry weather flow (ADWF) is 2.64 mgd and the treatment capacity is 2.7 mgd. Due to a lack of adequate storage, and disposal capacity, the Discharger requested a year-round surface water discharge of tertiary treated effluent with ultraviolet (UV) light disinfection to the San Joaquin River off of Jersey Island. The Discharger would continue to maximize land disposal with tertiary, nitrified and denitrified effluent. The Discharger expects to begin construction of a new wastewater treatment plant in August 2008 with funding from the State Revolving Fund (SRF) loan program.

The Discharger proposes to construct a tertiary treatment facility with an initial capacity of 4.3 mgd (ADWF) and a build-out capacity of 8.6 mgd (ADWF). The facilities would include: coarse screening, grit removal, fine screening, anoxic basins, aeration basins, membrane filtration and UV disinfection. The effluent would be nitrified and denitrified and meet California Code of Regulations Title 22 disinfection requirements for both the surface water discharge and land disposal. The Discharger would continue to maximize land discharge to Jersey Island and water reclamation but discontinue land discharge on the mainland next to the Facility. The Discharger proposes to discharge from

Discharge 001 (see table on cover page) to the San Joaquin River, within the legal boundaries of the Delta, a water of the United States. Attachment B provides a map of the area around the Facility. Attachment C provides a flow schematic of the Facility.

This Order only regulates surface water discharges to the San Joaquin River. Currently, Waste Discharge Requirements (WDR) Order No. 5-01-237 regulates the storage and land disposal of wastewater effluent.

A. Description of Wastewater and Biosolids Treatment or Controls

The treatment system at the facility consists of preliminary treatment of coarse screening, grit removal, and fine screening. Biological treatment is by activated sludge, through anoxic and aeration basins including nitrification and denitrification. Tertiary treatment is by membrane filtration with ultraviolet light disinfection. Sludge is dewatered using a belt filter press. Dried biosolids are hauled to a landfill or land applied. The design average daily flow capacity is 4.3 mgd and current daily flows are 2.6 mgd.

B. Discharge Points and Receiving Waters

1. The Facility is located as shown in Attachment B (Figure B-1), a part of this Order.

2. Treated municipal wastewater is discharged at Discharge Point 001 to San Joaquin River within the Sacramento-San Joaquin Delta, a water of the United States at a point Latitude N38^{o}, 02’, 40.74939” N and longitude 120°, 41’, 40.21180” W.

C. Summary of Existing Requirements and Self-Monitoring Report (SMR) Data

Effluent limitations and Discharge Specifications contained in the existing WDR Order for land only discharges are not applicable to this Order.

D. Compliance Summary – Not Applicable

E. Planned Changes

The Discharger proposes to construct a tertiary treatment facility with an initial capacity of 4.3 mgd (ADWF) and a build-out capacity of 8.6 mgd (ADWF). The facilities would include: coarse screening, grit removal, fine screening, anoxic basins, aeration basins, membrane filtration and UV disinfection. The effluent would be nitrified and denitrified and meet Title 22 disinfection requirements.

III. APPLICABLE PLANS, POLICIES, AND REGULATIONS

The requirements contained in this Order are based on the applicable plans, policies, and regulations identified in section II of the Limitations and Discharge Requirements (Findings). This section provides supplemental information, where appropriate, for the plans, policies, and regulations relevant to the discharge.

A. Legal Authority

See Limitations and Discharge Requirements - Findings, Section II.C.

B. California Environmental Quality Act (CEQA)

See Limitations and Discharge Requirements - Findings, Section II.E.

C. State and Federal Regulations, Policies, and Plans

1. **Water Quality Control Plans**. The Regional Water Board adopted a *Water Quality Control Plan, Fourth Edition (Revised August 2006), for the Sacramento and San Joaquin River Basins* (Basin Plan) that designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for all waters addressed through the plan. In addition, State Water Board Resolution No. 88-63 requires that, with certain exceptions, the Regional Water Board assign the municipal and domestic supply use to water bodies that do not have beneficial uses listed in the Basin Plan. The beneficial uses of the San Joaquin River downstream of the discharge are municipal and domestic supply, agricultural irrigation, agricultural stock watering, industrial process water supply, industrial service supply, water contact recreation, other non-contact water recreation, warm freshwater aquatic habitat, cold freshwater aquatic habitat, warm fish migration habitat, cold fish migration habitat, warm spawning habitat, wildlife habitat, and navigation.

   The Basin Plan on page II-1.00 states: "*Protection and enhancement of existing and potential beneficial uses are primary goals of water quality planning…*" and with respect to disposal of wastewaters states that "*...disposal of wastewaters is [not] a prohibited use of waters of the State; it is merely a use which cannot be satisfied to the detriment of beneficial uses.*"

   The federal CWA section 101(a)(2), states: "*it is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and for recreation in and on the water be achieved by July 1, 1983.*" Federal Regulations, developed to implement the requirements of the CWA, create a rebuttable presumption that all waters be designated as fishable and swimmable. Federal Regulations, 40 CFR sections 131.2 and 131.10, require that all waters of the State regulated to protect the beneficial uses of public water supply, protection and propagation of fish, shell fish

and wildlife, recreation in and on the water, agricultural, industrial and other purposes including navigation. Section 131.3(e), 40 CFR, defines existing beneficial uses as those uses actually attained after November 28, 1975, whether or not they are included in the water quality standards. Federal Regulation, 40 CFR section 131.10 requires that uses be obtained by implementing effluent limitations, requires that all downstream uses be protected and states that in no case shall a state adopt waste transport or waste assimilation as a beneficial use for any waters of the United States.

This Order contains Effluent Limitations requiring a tertiary level of treatment, or equivalent, which is necessary to protect the beneficial uses of the receiving water. The Regional Water Board has considered the factors listed in CWC section 13241 in establishing these requirements, as discussed in more detail in the Fact Sheet, Attachment F, B.2.a.

2. **Thermal Plan.** The State Water Board adopted a *Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Water and Enclosed Bays and Estuaries of California* (Thermal Plan) on May 18, 1972, and amended this plan on September 18, 1975. This plan contains temperature objectives for surface waters. The Thermal Plan applies to all discharges to the Sacramento-San Joaquin Delta. The Ironhouse Sanitary District discharge is a "new elevated temperature waste" as described in the Thermal Plan. Thus, the discharge must meet 5.B(1) and includes 5.A. (2) of the Plan and are described as follows:

   a. The maximum temperature shall not exceed the natural receiving water temperature by more than 20°F.

   b. Elevated temperature waste discharge either individually or combined with other discharges shall not create a zone, defined by water temperatures of more than 1°F above natural receiving water temperature, which exceeds 25 percent of the cross-sectional area of a main river channel at any point.

   c. No discharge shall cause a surface water temperature rise greater than 4°F above the natural temperature of the receiving waters at any time or place.

   d. Additional limitations shall be imposed when necessary to assure protection of beneficial uses.

   The Antidegradation Analysis shows the effluent will not increase the receiving water temperature by more than 1.3^{o}F within the zone of initial mixing. And since the diffuser is 150 feet long at the San Joaquin River where it is 3300 feet wide, the discharge will not cause a 1°F increase for more than 25% of the river cross-section.

3. **Bay-Delta Plan.** The *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* (Bay-Delta Plan) was adopted in December 2006 by the State Water Board superseding the 1995 Bay-Delta Plan. The Bay-Delta Plan identifies the beneficial uses of the estuary and includes objectives for flow, salinity, and endangered species protection.

The Bay-Delta Plan attempts to create a management plan that is acceptable to the stakeholders while at the same time is protective of beneficial uses of the San Joaquin River. The State Water Board adopted Decision 1641 (D-1641) on December 29, 1999. D-1641 implements flow objectives for the Bay-Delta Estuary, approves a petition to change points of diversion of the Central Valley Project and the State Water Project in the Southern Delta, and approves a petition to change places of use and purposes of use of the Central Valley Project. The water quality objectives of the Bay-Delta Plan are implemented as part of this Order.

4. **Antidegradation Policy.** Section 131.12 requires that the state water quality standards include an antidegradation policy consistent with the federal policy. The State Water Board established California's antidegradation policy in State Water Board Resolution No. 68-16. Resolution No. 68-16 incorporates the federal antidegradation policy where the federal policy applies under federal law. Resolution No. 68-16 requires that existing water quality be maintained unless degradation is justified based on specific findings. The Regional Water Board's Basin Plan implements, and incorporates by reference, both the State and federal antidegradation policies. As discussed in detail in the Fact Sheet (Attachment F, Section IV.D.4.) the discharge is consistent with the antidegradation provisions of 40 CFR section 131.12 and State Water Board Resolution 68-16.

5. **Anti-Backsliding Requirements.** Sections 402(o)(2) and 303(d)(4) of the CWA and federal regulations at title 40, Code of Federal Regulations section 122.44(l) prohibit backsliding in NPDES permits. These anti-backsliding provisions require that effluent limitations in a reissued permit must be as stringent as those in the previous permit, with some exceptions in which limitations may be relaxed. Compliance with the Anti-Backsliding requirements is discussed in Section IV.D.3.

6. **Emergency Planning and Community Right to Know Act**. Section 13263.6(a), California Water Code, requires that "*the Regional Water Board shall prescribe effluent limitations as part of the waste discharge requirements of a POTW for all substances that the most recent toxic chemical release data reported to the state emergency response commission pursuant to Section 313 of the Emergency Planning and Community Right to Know Act of 1986 (42 U.S.C. Sec. 11023) (EPCRKA) indicate as discharged into the POTW, for which the State Water Board or the Regional Water Board has established numeric water quality objectives, and has determined that the discharge is or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to, an excursion above any numeric water quality objective*".

   The Regional Water Board has adopted a numeric receiving water objective for arsenic, barium, copper, cyanide, iron, manganese, silver, and zinc that apply to the Sacramento-San Joaquin River Delta. The most recent toxic chemical data report does not indicate any reportable off-site releases or discharges to the collection system for this facility. Therefore, a reasonable potential analysis based on information from Emergency Planning and Community Right to Know Act (EPCRA)

cannot be conducted. Based on information from EPCRA, there is no reasonable potential to cause or contribute to an excursion above any numeric water quality objectives included within the Basin Plan or in any State Water Board plan, so no effluent limitations are included in this permit pursuant to CWC section 13263.6(a).

However, as detailed elsewhere in this Order, available monitoring data indicate that there are constituents that may be present in the effluent that have a reasonable potential to cause or contribute to an exceedance of water quality standards and require inclusion of effluent limitations based on federal and state laws and regulations.

7. **Stormwater Requirements.** USEPA promulgated Federal Regulations for storm water on 16 November 1990 in 40 CFR Parts 122, 123, and 124. The NPDES Industrial Storm Water Program regulates storm water discharges from wastewater treatment facilities. Wastewater treatment plants are applicable industries under the stormwater program and are obligated to comply with the Federal Regulations.

8. **Delta Beneficial Uses Protection Resolution**. The Central Valley Regional Water Quality Control Board adopted Resolution No. R5-2007-0161 – Water Boards' Actions to Protect Beneficial Uses of the San Francisco Bay/Sacramento-San Joaquin Delta Estuary on 6 December 2007 that describes actions for the Water Boards to take to protect the beneficial uses of the Delta. Specific actions are included in this Order but are not limited to: assessing unknown toxicity in the Delta (weekly toxicity testing for discharge); remedy the impacts of once-through cooling water intake structures on marine and estuarine life (evaluate use of the Dischargers tertiary effluent for cooling water); and require characterization of discharges to and from Delta islands for water quality purposes (assure irrigation of Jersey Island with effluent is not impacting surface water quality through dewatering Jersey Island.

9. **Water Reuse Policy.** The Basin Plan's Water Reuse Policy states, "*The Regional Water Board encourages the reclamation and reuse of wastewater…and requires as part of a Report of Waste Discharge an evaluation of reuse and land disposal options as alternative disposal methods. Reuse options should include consideration of the following, where appropriate, based on the quality of the wastewater and the required quality for the specific reuses: industrial and municipal supply, crop irrigation, landscape irrigation, ground water recharge, and wetland restoration*." The purpose of the Water Reuse Policy is to evaluate alternative methods of disposal to prevent unnecessary discharges to surface water.

   Also, in December 2007, the Governor's Blue Ribbon Task Force developed a durable vision for sustaining management of the Delta with the goal of managing the Delta over the long term to restore and maintain identified functions and values that are determined to be important to the environmental quality of the Delta and the economic and social well being of the people of the state. Included in the twelve (12) recommendations to the Governor, is number 7. "A revitalized Delta ecosystem will require reduced diversions- or changes in patterns and timing of the diversions

upstream, within the Delta, and exported from the Delta – at critical times." Water reuse can contribute to this recommendation.

The Discharger developed a technical memorandum, dated 17 July 2006, that evaluated the feasibility of long-term land disposal of treated effluent. The technical memorandum evaluated the feasibility of 100 percent land disposal using Discharger-owned land, and furthermore, did not find additional land suitable for reclamation in the vicinity. Regional Water Board staff requested additional information to further evaluate the feasibility of a seasonal surface water discharge and requested clarification of the factors related to the suitability of the land on Jersey Island for irrigation. The following is a summary of the findings provided by the Discharger.

Land Only Discharge -The Discharger is currently permitted to discharge up to 3 mgd of disinfected secondary treated wastewater by irrigating pastureland and fodder crops adjacent to the treatment facilities (mainland) and on Jersey Island. . Based on studies, groundwater degradation beneath ISD's wastewater treatment plant and irrigated lands on the mainland property has the potential to occur or may have already occurred due to unlined storage and irrigation with non-nitrified/denitrified secondary effluent. In addition, there are concerns of potential impacts to the beneficial uses of the Contra Costa Canal. Additional disposal land adjacent to the treatment plant for treatment and disposal is limited due to proposed enhancement wetlands. Although the Discharger owns substantial land, over 3400 acres on Jersey Island, all of the island is below the level of the San Joaquin River, requiring continuous dewatering of the island with groundwater discharge to the San Joaquin River. The dewatering system maintains the groundwater level between 2 – 4 feet below ground surface. During winter, the groundwater level can be less than 1 foot below ground surface.

The Discharger completed a water balance for its ultimate capacity of 8.6 mgd that shows substantial storage would be required to keep the discharge on land (3,343 acre-feet). All storage ponds must be built on the mainland, since Jersey Island is below river level. However, much of the Discharger's land available on the mainland is committed to a restoration project, including the creation of 100 acres of tidal marsh and riparian habitat funded by an Integrated Regional Water Management grant by the State Water Board. Based on the Discharger's water balance, it is infeasible to only discharge to land at the ultimate capacity.

The water balance for the Phase I expansion (4.3 mgd) shows land disposal only with no surface water discharge is also infeasible. Storage requirements would be over 1300 acre-feet. The difficultly lies in operating an extensive year-round irrigation program on Jersey Island when groundwater is close to the ground surface. Only parts of Jersey Island could take effluent without ponding during winter months. Due to these concerns, 100% land disposal is not a feasible option for the Phase I expansion.

Seasonal Discharge – The Basin Plan and Bay-Delta Plan have restrictions on EC during April through August for protection of agriculture and fisheries. The EC limit can be as low as 440 µhmos/cm depending on the month and water year. Thus, at the request of Regional Water Board staff, the Discharger submitted several water balances identifying the feasibility of a seasonal discharge to the San Joaquin River. According to water balances provided by the Discharger, effluent storage during April and May appear to be the limiting factor for a seasonal discharge. Based on these water balances, it appears that a seasonal discharge that prohibits surface water discharges during April and May is not feasible.

100% Recycle to Contra Costa Power Plant for Cooling Water –The Mirant Delta Contra Costa Power Plant is within five miles of the Facility and is currently discharging once through cooling water into the San Joaquin River. Its NPDES permit allows discharges up to 450 mgd. The East County Regional Industrial Reuse Planning Grant, funded by the State Board, evaluates six (6) different water recycling alternatives including use of treated wastewater for cooling water. However, the feasilibity study will not conclude until Fall 2008. An advantage to using wastewater for cooling water is less water pumped from the San Joaquin River and less aquatic life entrained/impinged by the pumps. This Order requires the Discharger to submit a study detailing possible wastewater reclamation sites and economic analyses to reclaim its wastewater.

Based on the information submitted by the Discharger, it has adequately demonstrated that it is infeasible to maintain 100 percent land disposal using Discharger-owned land, and the Discharger has adequately demonstrated that additional reclamation land is not currently available in the vicinity. In addition, the Discharger has previously evaluated recycled water use in the 1991 and 2005 Wastewater Facilities Expansion Plan reports. The only potential existing customer or recycled water is the Bethel Island Golf Course, approximately 6 miles from the Facility. Costs to transport reclaimed water to this user are cost prohibitive. Currently the Discharger is exploring opportunities for reuse in the Delta Diablo Sanitation District service area as the proposed facilities will produce Title 22 tertiary effluent suitable for future recycled water reuse. This Order includes a compliance schedule for initiating a surface water discharge that requires the Discharger to complete its on-going reuse study and provide the results of the study to the Regional Water Board. This Order may be reopened based on the results of the reclamation study.

D. Impaired Water Bodies on CWA 303(d) List

1. Under Section 303(d) of the 1972 Clean Water Act, states, territories and authorized tribes are required to develop lists of water quality limited segments. The waters on these lists do not meet water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology. On July 25, 2003 USEPA gave final approval to California's 2002 Section 303(d) List of Water Quality Limited Segments. The Basin Plan references this list of Water Quality Limited Segments (WQLSs), which are defined as "…*those sections of lakes,*

streams, rivers or other fresh water bodies where water quality does not meet (or is not expected to meet) water quality standards even after the application of appropriate limitations for point sources (40 CFR 130, et seq.)." The Basin Plan also states, "*Additional treatment beyond minimum federal standards will be imposed on dischargers to [WQLSs]. Dischargers will be assigned or allocated a maximum allowable load of critical pollutants so that water quality objectives can be met in the segment.*" The listing for the San Joaquin River, Western portion of the Sacramento-San Joaquin Delta includes: Chloropyrifos, DDT, Diazinon, Electrical Conductivity, Mercury, Group A pesticides, and Unknown Toxicity .

2. **Total Maximum Daily Loads.** The US EPA requires the Regional Water Board to develop total maximum daily loads (TMDLs) for each 303(d) listed pollutant and water body combination. The Basin Plan amendment for the Control of Diazinon and Chlorpyrifos Runoff into the Sacramento-San Joaquin Delta was adopted by the Central Valley Water Board on 23 June 2006. In order for the Amendment to become final, it must be approved by the State Water Resources Control Board, the Office of Administrative Law, and the U. S. EPA.

   A Basin Plan amendment for mercury is scheduled for adoption in 2008 by the Regional Water Board. A reopener provision is included in this Order to allow the permit to be reopened to implement the TMDL.

E. Other Plans, Polices and Regulations

1. The discharge authorized herein and the treatment and storage facilities associated with the discharge of treated municipal wastewater, except for discharges of residual sludge and solid waste, are exempt from the requirements of Title 27, California Code of Regulations (CCR), section 20005 *et seq*. (hereafter Title 27). The exemption, pursuant to Title 27 CCR section 20090(a), is based on the following:

   a. The waste consists primarily of domestic sewage and treated effluent;

   b. The waste discharge requirements are consistent with water quality objectives; and

   c. The treatment and storage facilities described herein are associated with a municipal wastewater treatment plant.

2. The State Water Board adopted the *Water Quality Control Policy for the Enclosed Bays and Estuaries of California*. The requirements within this Order are consistent with the Policy.

IV. RATIONALE FOR EFFLUENT LIMITATIONS AND DISCHARGE SPECIFICATIONS

Effluent limitations and toxic and pretreatment effluent standards established pursuant to Sections 301 (Effluent Limitations), 302 (Water Quality Related Effluent Limitations), 304 (Information and Guidelines), and 307 (Toxic and Pretreatment Effluent Standards)

of the Clean Water Act (CWA) and amendments thereto are applicable to the discharge.

The Federal CWA mandates the implementation of effluent limitations that are as stringent as necessary to meet water quality standards established pursuant to state or federal law [33 U.S.C., § 1311(b)(1)(C); 40 CFR, § 122.44(d)(1)]. NPDES permits must incorporate discharge limits necessary to ensure that water quality standards are met. This requirement applies to narrative criteria as well as to criteria specifying maximum amounts of particular pollutants. Pursuant to Federal Regulations, 40 CFR Section 122.44(d)(1)(i), NPDES permits must contain limits that control all pollutants that "*are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality*." Federal Regulations, 40 CFR, §122.44(d)(1)(vi), further provide that "[w]*here a state has not established a water quality criterion for a specific chemical pollutant that is present in an effluent at a concentration that causes, has the reasonable potential to cause, or contributes to an excursion above a narrative criterion within an applicable State water quality standard, the permitting authority must establish effluent limits.*"

The CWA requires point source discharges to control the amount of conventional, non-conventional, and toxic pollutants that are discharged into the waters of the United States. The control of pollutants discharged is established through effluent limitations and other requirements in NPDES permits. There are two principal bases for effluent limitations: 40 CFR §122.44(a) requires that permits include applicable technology-based limitations and standards, and 40 CFR §122.44(d) requires that permits include water quality-based effluent limitations to attain and maintain applicable numeric and narrative water quality criteria to protect the beneficial uses of the receiving water where numeric water quality objectives have not been established. The Regional Water Board's Basin Plan, page IV-17.00, contains an implementation policy ("Policy for Application of Water Quality Objectives" that specifies that the Regional Water Board "*will, on a case-by-case basis, adopt numerical limitations in orders which will implement the narrative objectives*." This Policy complies with 40 CFR §122.44(d)(1). With respect to narrative objectives, the Regional Water Board must establish effluent limitations using one or more of three specified sources, including (1) EPA's published water quality criteria, (2) a proposed state criterion (*i.e*., water quality objective) or an explicit state policy interpreting its narrative water quality criteria (*i.e*., the Regional Water Board's "Policy for Application of Water Quality Objectives")(40 CFR 122.44(d)(1)(vi) (A), (B) or (C)), or (3) an indicator parameter. The Basin Plan contains a narrative objective requiring that: "*All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life*" (narrative toxicity objective). The Basin Plan requires the application of the most stringent objective necessary to ensure that surface water and groundwater do not contain chemical constituents, discoloration, toxic substances, radionuclides, or taste and odor producing substances that adversely affect beneficial uses. The Basin Plan states that material and relevant information, including numeric criteria, and recommendations from other agencies and scientific literature will be utilized in evaluating compliance with the narrative toxicity objective. The Basin Plan also limits chemical constituents in concentrations that adversely affect surface water

beneficial uses. For waters designated as municipal, the Basin Plan specifies that, at a minimum, waters shall not contain concentrations of constituents that exceed Maximum Contaminant Levels (MCL) of CCR Title 22. The Basin Plan further states that, to protect all beneficial uses, the Regional Water Board may apply limits more stringent than MCLs.

A. Discharge Prohibitions

1. *As stated in section I.G of Attachment D, Standard Provisions, this Order prohibits bypass from any portion of the treatment facility. Federal Regulations, 40 CFR 122.41 (m), define "bypass" as the intentional diversion of waste streams from any portion of a treatment facility. This section of the Federal Regulations, 40 CFR 122.41 (m)(4), prohibits bypass unless it is unavoidable to prevent loss of life, personal injury, or severe property damage. In considering the Regional Water Board's prohibition of bypasses, the State Water Board adopted a precedential decision, Order No. WQO 2002-0015, which cites the Federal Regulations, 40 CFR 122.41(m), as allowing bypass only for essential maintenance to assure efficient operation.*

B. Technology-Based Effluent Limitations

1. Scope and Authority

Regulations promulgated in section 125.3(a)(1) require technology-based effluent limitations for municipal Dischargers to be placed in NPDES permits based on Secondary Treatment Standards or Equivalent to Secondary Treatment Standards.

The Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) established the minimum performance requirements for POTWs [defined in section 304(d)(1)]. Section 301(b)(1)(B) of that Act requires that such treatment works must, as a minimum, meet effluent limitations based on secondary treatment as defined by the USEPA Administrator.

Based on this statutory requirement, USEPA developed secondary treatment regulations, which are specified in Part 133. These technology-based regulations apply to all municipal wastewater treatment plants and identify the minimum level of effluent quality attainable by secondary treatment in terms of biochemical oxygen demand (BOD_5), total suspended solids (TSS), and pH.

2. Applicable Technology-Based Effluent Limitations

a. **BOD_5 and TSS.** Federal Regulations, 40 CFR, Part 133, establish the minimum weekly and monthly average level of effluent quality attainable by secondary treatment for BOD_5 and TSS. Tertiary treatment is necessary to protect the beneficial uses of the receiving stream and the final effluent limitations for BOD_5 and TSS are based on the technical capability of the tertiary process. BOD_5 is a measure of the amount of oxygen used in the biochemical oxidation of organic

matter. The secondary and tertiary treatment standards for BOD_5 and TSS are indicators of the effectiveness of the treatment processes. The principal design parameter for wastewater treatment plants is the daily BOD_5 and TSS loading rates and the corresponding removal rate of the system. In applying 40 CFR Part 133 for weekly and monthly average BOD_5 and TSS limitations, the application of tertiary treatment processes results in the ability to achieve lower levels for BOD_5 and TSS than the secondary standards currently prescribed; the 30-day average BOD_5 and TSS limitations have been revised to 10 mg/L, which is technically based on the capability of a tertiary system. In addition to the average weekly and average monthly effluent limitations, a daily maximum effluent limitation for BOD_5 and TSS is included in the Order to ensure that the treatment works are not organically overloaded and operate in accordance with design capabilities. See Table F-3 for final technology-based effluent limitations required by this Order. In addition, 40 CFR 133.102, in describing the minimum level of effluent quality attainable by secondary treatment, states that the 30-day average percent removal shall not be less than 85 percent. If 85 percent removal of BOD_5 and TSS must be achieved by a secondary treatment plant, it must also be achieved by a tertiary (i.e., treatment beyond secondary level) treatment plant. This Order contains a limitation requiring an average of 85 percent removal of BOD_5 and TSS over each calendar month.

b. **Flow.** The wastewater treatment plant was designed to provide a tertiary level of treatment for up to a design flow of 4.3 mgd (ADWF). Therefore, this Order contains an Average Dry Weather Discharge Flow effluent limit of 4.3 mgd.

c. **pH.** Federal Regulations, 40 CFR Part 133, also establish technology-based effluent limitations for pH. The secondary treatment standards require the pH of the effluent to be no lower than 6.0 and no greater than 9.0 standard units.

Summary of Technology-based Effluent Limitations
Discharge Point 001

Table F-2. Summary of Technology-based Effluent Limitations

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Flow	mgd			4.3[1]		
BOD	mg/L	10	15	20		
	lbs/day	359	538	717		
TSS	mg/L	10	15	20		
	lbs/day	359	538	717		
pH[2]	SU				6.0	9.0

[1] The average dry weather discharge flow shall not exceed 4.3 mgd.
[2] More stringent water quality-based effluent limitations are applicable to the discharge and are included in this Order.

C. Water Quality-Based Effluent Limitations (WQBELs)

1. Scope and Authority

As specified in section 122.44(d)(1)(i), permits are required to include WQBELs for pollutants (including toxicity) that are or may be discharged at levels that cause, have reasonable potential to cause, or contribute to an in-stream excursion above any state water quality standard. The process for determining reasonable potential and calculating WQBELs when necessary is intended to protect the designated uses of the receiving water as specified in the Basin Plan, and achieve applicable water quality objectives and criteria that are contained in other state plans and policies, or any applicable water quality criteria contained in the CTR and NTR.

2. Applicable Beneficial Uses and Water Quality Criteria and Objectives

a. **Receiving Water.** The San Joaquin River Basin covers over 15,000 square miles, and includes the entire drainage area to the San Joaquin River. Most of the valley floor is agricultural land, with an agricultural history dating to the 1870's. The San Joaquin River originates from the Sierra Nevada Mountain Range and flows through the northern portion of the San Joaquin Valley to its terminus in the Sacramento-San Joaquin Bay estuary. The River extends approximately 134 miles from Friant Dam to Stevenson where flows are intermittent, and from Stevenson to Vernalis, approximately 60 miles, where flows are perennial. Runoff from rain events occurring in the San Joaquin Valley provide short-term increases in River flows. River flow during the summer is primarily composed of dam releases of snow-melt water for agricultural, urban, recreational and wildlife purposes, and agricultural wastewater. At the points of discharge from the Facility, the San Joaquin River is within the boundary of the Sacramento - San Joaquin Delta.

The San Joaquin River in the vicinity of the Facility is strongly influenced by both tidal and river flows. The river flow is westerly during ebb tides and periods of high Delta outflow. During strong flood (incoming) tides, the river flow reverses towards the east. Tides in the Bay Area are classified as mixed semidiurnal, with two flood tides and two ebb tides of unequal range occurring over a 24.8-hour period. Mean tidal range about is 3 feet. Currents in the commercial shipping channel can be as high as 1.1 to 1.5 feet per second (fps).

The magnitude of tidal influence in the area fluctuates with gravitational influences (solar and lunar) and with freshwater outflow from the Delta. Freshwater outflow varies seasonally as well as in extended cycles. Low levels of inflow are considered to be 3.5 to 5 million cubic feet per second (cfs), while higher levels may range from 7.5 to 15 million cfs. Water diversions by the State Water Project (SWP) and the Central Valley Project (CVP) have had increasingly pronounced effects on freshwater outflows in the Delta, especially during years with below average precipitation. Salinity levels in the vicinity of the discharge

increase under such conditions. Saltwater intrusion and influence in the area increases during periods of low freshwater flow. As more water is diverted from the San Joaquin River for human use, the zone of saltwater intrusion extends farther upstream. Prior to 1984, this zone, termed the transition, entrapment, or null zone, was typically located in Suisun Bay during much of the year (October through March). Since 1984, the transition zone has shifted more or less permanently to the channels of the Sacramento and San Joaquin rivers.

b. **Hardness.** While no effluent limitation for hardness is necessary in this Order, hardness is critical to the assessment of the need for, and the development of, effluent limitations for certain metals. The *California Toxics Rule* and the *National Toxics Rule* contain water quality criteria for seven metals that vary as a function of hardness, the lower the hardness the lower the water quality criteria. The hardness-dependent metals include cadmium, copper, chromium III, lead, nickel, silver, and zinc. The general equation describing the CTR criteria is as follows:

$$\text{CTR Criterion (expressed as dissolved)} = \text{WER} \times \text{CF} \times e^{m[\ln(H)]+b} \qquad \text{(Equation 1)}$$

Where:

WER = water-effect ratio (default of 1.0 used in this Order)

CF = total-to-dissolved conversion factor

m = criterion-specific constant

H = site Hardness

b = criterion-specific constant

The constants “m” and “b” are specific to both the metal under consideration, and the type of criterion (i.e. acute or chronic).

Effluent limitations for the discharge must be set to protect the beneficial uses of the receiving water for all discharge conditions. In the absence of the option of including condition-dependent, “floating” effluent limitations that are reflective of actual conditions at the time of discharge, effluent limitations must be set using a reasonable worst-case condition in order to protect beneficial uses for all discharge conditions. Recent studies indicate that using the receiving water lowest hardness for establishing water quality criteria is not the most protective for the receiving water. The Regional Water Board has evaluated these studies and concurs that for some parameters the beneficial uses of the receiving water are best protected using the lowest hardness value of the effluent, while for some parameters, the use of both the lowest hardness value of the receiving water and the lowest hardness value of the effluent is the most protective, provided sufficient hardness data for the effluent and receiving water are available.

Because of the non-linearity of the criterion equation, the relationship can be either concave downward or concave upward depending on the criterion-specific constants. For those contaminants whereby the regulatory criteria exhibit a concave downward relationship as a function of hardness (e.g. acute and chronic copper, chromium III, nickel, and zinc, and chronic cadmium), use of the lowest recorded effluent hardness for establishment of water quality objectives is fully protective of all beneficial uses regardless of whether the effluent or receiving water hardness is higher.

Since the Discharger has provided only one influent hardness data point, for purposes of establishing water quality-based effluent limitations, a conservative hardness from the major water supplier was used to estimate the lowest effluent hardness. This is a conservative assumption, because the hardness of the water supply typically increases by the time it reaches the wastewater treatment plant, due to consumptive uses. The Diablo Water District supplies approximately 81% of the water in the Discharger's service area. In mid 2006, the Diablo Water District began to supplement Contra Costa Water District water with groundwater supplies, which has caused an increase in the hardness. For purposes of calculating WQBELs for hardness dependent metals, the lowest water supply hardness from January 2007 through August 2007 (124 mg/L as $CaCO_3$) was used to estimate the Discharger's effluent hardness. This Order requires the Discharge to conduct an influent hardness study to better characterize the estimated effluent hardness of the new Facility. This Order may be reopened to modify the effluent limitations for metals with hardness-dependent CTR criteria. A lowest measured receiving water hardness of 36 mg/L (as $CaCO_3$) was used for the lowest receiving water hardness.

c. **Assimilative Capacity/Mixing Zones.** The effluent discharge will be to the San Joaquin River at Jersey Island, which is within the tidal estuary of the Delta. The tidal zone in this area of the San Joaquin River includes flood and ebb tides that move the river 5 miles upstream and downstream, and slack tides occur with no river movement for about 1 hour, twice each day. Multiple dosing of the receiving water with effluent occurs as the tide moves the water column upstream and downstream past the point of discharge. The complex dynamics of the stream flow, the tidal flows, the slack flows and the state and federal pumping operations must be considered in an evaluation of the available dilution for the discharge. The San Joaquin River is approximately 3300 feet wide at the proposed location for the outfall diffuser. The Discharger is proposing to construct a 150-foot outfall diffuser that will be at a depth of at least 20 to 30 feet and extends 550 feet off shore. The average tidal flow is 150,000 cubic feet/second (cfs) and the design capacity of the discharge is 6.5 cfs. Based on these factors, the dilution at the edge of the zone of initial mixing will be 20:1 and the dilution at the edge of the tidal mixing zone will be 1,000:1. The Discharger analyzed mixing zones for application of the acute aquatic life criteria, chronic aquatic life criteria, and long-term human health criteria by simulating the effluent concentration in different mixing zones.

i. **Assimilative Capacity.** The assimilative capacity of the receiving water was determined by evaluating background water quality data for the San Joaquin River in the vicinity of the proposed discharge. This data was collected from several sources. The Discharger sampled the river four times in 2007. The San Francisco Estuary Institute has a Regional Monitoring Program and has collected data since 1993 at sample point, BG30, within five miles of the discharge. Also within five miles of the discharge are the GWF Power Systems Site IV power Plant and the Mirant Delta Contra Costa power plant that discharge cooling water and collect ambient water quality data. Thus, four sources of water quality data were used in determining assimilative capacity in the receiving water. Based on the available data there is no assimilative capacity for copper, lead, manganese, iron, and aluminum. A discussion of the assimilative capacity for electrical conductivity and chloride is provided in Section IV.C.3.s. below.

ii. **Water Quality Modeling.** Jones and Stokes prepared an analysis of the mixing and transport of ISD effluent within the Delta for the October 2006 Supplemental Environmental Impact Report. To evaluate the tidal dilution of the discharge, the Department of Water Resources (DWR)'s Delta Simulation Model II (DSM2) was used with baseline flows for reservoir operations based on CALSIM results for the 2020 Operations Criteria and Plan. The DWR DSM2 model is a one-dimensional mathematical model for dynamic simulation of one-dimensional hydrodynamics (HYDRO), water quality (QUAL) and particle tracking (PTM) that provides a simulation package for analysis of complex hydrodynamic, water quality and ecological conditions in river and estuarine systems. The DSM2 model uses the 1976-1991 period as representative of tidal flows and salinity. The future Delta flow operations used in the DSM2 model are based on the United States Bureau of Reclamation CALSIM model and uses monthly hydrology during 1922 – 1991 to simulate the future Central Valley Project (CVP) and State Water Project (SWP) operations. The 2020 Operations Criteria and Plan of CVP and SWP operations was developed by the Bureau in 2004.

iii. **Acute (1-hour) Aquatic Life Criteria Dilution –** The worst-case condition for evaluating the acute (1-hour) dilution is during slack tide, in which there is no river movement for approximately one hour, twice each day. During this period tidal mixing is assumed to be zero. Therefore, the acute dilution is based solely on the jet dilution from the outfall diffuser. The diffuser will be placed perpendicular to the shoreline, be 150 feet long, and will be placed approximately starting at 400 feet and ending 550 feet offshore. The diffuser will consist of 16 duck-billed flexible ports located between 20 – 30 feet in depth. The ports will be orientated about 30º from the bottom and alternating upstream and downstream. Due to the design of the ports, each port will maintain a jet velocity of 5 feet per second (fps) allowing for turbulent mixing and rapid river water entrainment. Jet dilution occurs until the plume reaches the water surface. At a depth of 20 feet and a jet velocity of 5 fps, the plume would reach the surface approximately 40 feet from the outfall, resulting in a

minimum dilution of 20:1. During slack tide, the jet momentum will carry the mixed effluent plume beyond the initial 40-foot mixing zone, extending to about 150 feet in both directions from the diffuser. Therefore, the acute 1-hour mixing zone is 150 feet wide by 175 long, with a minimum 20:1 dilution at the edge of the mixing zone.

iv. **Chronic (4-day) Aquatic Life Criteria Dilution –** The chronic aquatic life criteria dilution is controlled by the tidal flows in the San Joaquin River. The dilution was estimated using the DSM2 model. The average tidal flow is about 150,000 cfs for about 4 hours during each ebb and flood tide. The average tidal volume passing the diffuser is approximately 50,000 acre-feet, with a tidal excursion of about 5 miles. As the tidal cycle repeats throughout each day, every day, the time-averaged effluent concentration near the diffuser in the receiving water under chronic conditions, at the worst-case scenario, slack tide, the effluent concentration is 3.53 percent. Based on the modeling at 4.3 mgd, the chronic aquatic life criteria mixing zone is 150 feet wide with a minimum dilution of 28:1 at the edge of the mixing zone.

v. **Human Health Criteria Dilution -** The maximum effluent discharge of 8.6 mgd was used for the EIR analysis to determine the fraction of effluent that would reach the Contra Costa Water District's water supply intakes both upstream and downstream of the discharge as well as the City of Antioch's water intake downstream of the discharge. Tidal flows at Jersey point average 150,000 cfs. To provide the worst-case condition, 15 cfs instead of 13 cfs (8.6 mgd) was used in the analysis along with simulating the low monthly net flow of –375 cfs in August 1976. The greatest concentration of effluent at 8.6 mgd is 0.25% at the Antioch water supply intake. Two important changes to conclusions when the discharge is decreased to 4.3 mgd are the mixing zone for slack tide is reduced to 175 feet and far-field effluent concentration is decreased to an average effluent concentration of 0.1%. The long-term human health tidal mixing zone extends 5 miles upstream and downstream of the discharge with a minimum dilution of 1000:1.

The effluent concentrations and mixing zone dimensions for the various water quality criteria are summarized in Table F-3 below:

Table F-3: Dilution and Mixing Zones

Criteria/Beneficial Use	Effluent Contribution to Receiving Water Concentration	Mixing Zone Dimensions	Representative Effluent & Receiving Water Quality
Acute (1-hour) aquatic life criteria (at slack tide)	5.19%[1]	150 ft wide by 175 ft	Maximum Concentration
Chronic (4-day) aquatic life criteria	3.53%[1]	150 ft wide by 175 ft	Maximum Concentration
Long-term human health criteria	0.1%[2]	5 miles upstream and down stream	Mean Concentration

[1] – Maximum effluent contribution
[2] – Average effluent contribution

Additional information on the mixing zones and dilution is available in the Antidegradation Analysis, December 2007 by Robertson-Bryan, Inc. and Appendix B of the 2006 Supplemental EIR.

This Order requires the Discharger to conduct a study after initiation of the discharge to validate the predicted dilution at the boundaries of the mixing zones. This Order may be reopened to modify the dilution credits based on the results of the study.

3. Determining the Need for WQBELs

a. CWA section 301 (b)(1) requires NPDES permits to include effluent limitations that achieve technology-based standards and any more stringent limitations necessary to meet water quality standards. Water quality standards include Regional Water Board Basin Plan beneficial uses and narrative and numeric water quality objectives, State Water Board-adopted standards, and federal standards, including the CTR and NTR. The Basin Plan includes numeric site-specific water quality objectives and narrative objectives for toxicity, chemical constituents, and tastes and odors. The narrative toxicity objective states: "*All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.*" (Basin Plan at III-8.00.) With regards to the narrative chemical constituents objective, the Basin Plan states that waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses. At minimum, "…*water designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels (MCLs)*" in Title 22 of CCR. The narrative tastes and odors objective states: "*Water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses.*"

b. Federal regulations require effluent limitations for all pollutants that are or may be discharged at a level that will cause or have the reasonable potential to cause, or contribute to an in-stream excursion above a narrative or numerical water quality standard. Based on information submitted as part of the application, in studies, and as directed by monitoring and reporting programs, the Regional Water Board finds that the discharge has a reasonable potential to cause or contribute to an in-stream excursion above a water quality standard for aluminum, ammonia, manganese, chloride, electrical conductivity, total dissolved solids, fluoride, MBAS, iron, nitrate, nitrite, settleable solids, oil and grease, chlorine residual, lead, and copper. Water quality-based effluent limitations (WQBELs) for these constituents are included in this Order. A detailed discussion of the RPA for each constituent is provided below.

c. The Regional Water Board conducted the RPA in accordance with Section 1.3 of the SIP. Although the SIP applies directly to the control of CTR priority

pollutants, the State Water Board has held that the Regional Water Board may use the SIP as guidance for water quality-based toxics control.[1] The SIP states in the introduction "*The goal of this Policy is to establish a standardized approach for permitting discharges of toxic pollutants to non-ocean surface waters in a manner that promotes statewide consistency."* Therefore, in this Order the RPA procedures from the SIP were used to evaluate reasonable potential for both CTR and non-CTR constituents.

d. No effluent data is available since the tertiary wastewater treatment plant has not been constructed. The MEC was estimated using the results of one influent sample and an estimated performance removal. The estimated performance removal is based on the Central Valley Clean Water Association survey of eleven advanced wastewater treatment plants and their process efficiencies. The minimum constituent removal performance was used to determine reasonable potential. The WQBELs were calculated in accordance with section 1.4 of the SIP, as described in Attachment F, Section IV.C.4., except the MEC is estimated based on the expected treatment performance. Receiving water data collected by dischargers in the vicinity of the proposed discharge location were used in the RPA.

e. **Aluminum***.* USEPA developed National Recommended Ambient Water Quality Criteria for protection of freshwater aquatic life for aluminum. The recommended four-day average (chronic) and one-hour average (acute) criteria for aluminum are 87 µg/L and 750 µg/L, respectively, for waters with a pH of 6.5 to 9.0. USEPA recommends that the ambient criteria are protective of the aquatic beneficial uses of receiving waters in lieu of site-specific criteria. Recent research on the applicability of the USEPA chronic criteria for aluminum in the Central Valley is under review by the staff of the State and Regional Water Boards. The USEPA chronic criteria will be used pending any other decision. The receiving stream has been measured to have a low hardness—typically 42 mg/L as $CaCO_3$. This condition is supportive of the applicability of the ambient water quality criteria for aluminum, according to USEPA's development document.

The estimated MEC for aluminum is 158 µg/L, based on 3 influent samples collected on August 2004 and August 2007, while the maximum observed upstream receiving water aluminum concentration was 4760 µg/L, based on 75 samples collected between January 2002 and March 2007. Therefore, aluminum in the discharge has a reasonable potential to cause or contribute to an in-stream excursion above a level necessary to protect aquatic life resulting in a violation of the Basin Plan's narrative toxicity objective. Since the receiving water exceeds the acute and chronic toxicity criteria, no assimilative capacity for aluminum is available and a dilution credit cannot be allowed. This Order contains final Average Monthly Effluent Limitations (AMEL) and Maximum Daily Effluent Limitations (MDEL) for aluminum of 71 µg/L and 143 µg/L, respectively, based on

[1] See, Order WQO 2001-16 (Napa) and Order WQO 2004-0013 (Yuba City)

USEPA's National Ambient Water Quality Criteria for the protection of freshwater aquatic life (See Attachment F, Table F-7 for WQBEL calculations).

In USEPA's *Ambient Water Quality Criteria for Aluminum—1988* [EPA 440/5-86-008], USEPA states that "[a]*cid-soluble aluminum…is probably the best measurement at the present…*"; however, USEPA has not yet approved an acid-soluble test method for aluminum. Replacing the ICP/AES portion of the analytical procedure with ICP/MS would allow lower detection limits to be achieved. Based on USEPA's discussion of aluminum analytical methods, this Order allows the use of the alternate aluminum testing protocol described above to meet monitoring requirements.

Based on the sample results in the effluent, the limitations appear to put the Discharger in immediate non-compliance.

f. **Ammonia.** Untreated domestic wastewater contains ammonia. Nitrification is a biological process that converts ammonia to nitrite and nitrite to nitrate. Denitrification is a process that converts nitrate to nitrite or nitric oxide and then to nitrous oxide or nitrogen gas, which is then released to the atmosphere. The Discharger's proposed Facility will use nitrification to remove ammonia from the waste stream. However, inadequate or incomplete nitrification may result in the discharge of ammonia to the receiving stream. Ammonia is known to cause toxicity to aquatic organisms in surface waters. Discharges of ammonia would violate the Basin Plan narrative toxicity objective. Applying 40 CFR section122.44(d)(1)(vi)(B), it is appropriate to use USEPA's Ambient National Water Quality Criteria for the Protection of Freshwater Aquatic Life for ammonia, which was developed to be protective of aquatic organisms.

USEPA's *Ambient Water Quality Criteria for the Protection of Freshwater Aquatic Life*, for total ammonia, recommends acute (1-hour average; criteria maximum concentration) standards based on pH and chronic (30-day average, criteria continuous concentration) standards based on pH and temperature. It also recommends a maximum four-day average concentration of 2.5 times the criteria continuous concentration. USEPA found that as pH increased, both the acute and chronic toxicity of ammonia increased. Salmonids were more sensitive to acute toxicity effects than other species. However, while the acute toxicity of ammonia was not influenced by temperature, it was found that invertebrates and young fish experienced increasing chronic toxicity effects with increasing temperature. Because the San Joaquin River has a beneficial use of cold freshwater habitat and the presence of salmonids and early fish life stages in the San Joaquin River is well-documented, the recommended criteria for waters where salmonids and early life stages are present were used. USEPA's recommended criteria are show below:

$$CCC_{30-day} = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}} \right) \times MIN\left(2.85, 1.45 \cdot 10^{0.028(25-T)}\right)$$, and

$$CMC = \left(\frac{0.275}{1+10^{7.204-pH}} + \frac{39.0}{1+10^{pH-7.204}} \right),$$

where *T* is in degrees Celsius

The maximum permitted effluent pH is 8.5. The Basin Plan objective for pH in the receiving stream is the range of 6.5 to 8.5. No temperature data for effluent is available. Therefore the maximum observed 30-day R-1 temperature was 75.4ºF (24.1 C), for the 30-day period ending August 2007 is used to calculate a CCC of 1.13 mg/L ammonia as N, while the maximum effluent pH limitation (8.5) was used to calculate a CMC of 2.14 mg/L ammonia as N. Water quality-based effluent limitations based on these criteria, with the allowed dilution credits discussed above, are 8.0 mg/L (as N) for the AMEL and 16.0 mg/L (as N) for the MDEL. However, the Discharger's Antidegradation analysis was based on a fully nitrified effluent with no dilution credit applied for establishing effluent limitations. Since the Discharger is constructing treatment facilities that will fully nitrify the wastewater, which removes ammonia, and the Antidegradation analysis did not consider dilution, effluent Limitations for ammonia have been calculated without the benefit of dilution. This Order includes an AMEL and MDEL of 1.1 mg/L and 2.1 mg/L, respectively, to assure the treatment process adequately nitrifies the waste stream to protect the aquatic habitat beneficial uses.

g. **Bis (2-ethylhexyl) phthalate.** Bis (2-ethyl-hexyl) phthalate is used primarily as one of several plasticizers in polyvinyl chloride (PVC) resins for fabricating flexible vinyl products. According to the Consumer Product Safety Commission, USEPA, and the Food and Drug Administration, these PVC resins are used to manufacture many products, including soft squeeze toys, balls, raincoats, adhesives, polymeric coatings, components of paper and paperboard, defoaming agents, animal glue, surface lubricants, and other products that must stay flexible and non-injurious for the lifetime of their use. The State MCL for bis(2-ethylhexyl)phthalate is 4 µg/l and the USEPA MCL is 6 µg/l. The NTR criterion for Human health protection for consumption of water and aquatic organisms is 1.8 µg/l and for consumption of aquatic organisms only is 5.9 µg/l.

   The estimated MEC for bis (2-ethyl-hexyl) phthalate was 16.6 µg/L, based on 1 influent sample collected in August 2004, while the maximum observed upstream receiving water bis(2-ethyl-hexyl) phthalate concentration was 8.0 µg/L, based on 8 samples collected between January 2002 and March 2007. However, recent research indicates sampling and laboratory techniques may result in false positives in detecting bis(2-ethylhexyl) phthalate. Therefore, this Order requires the Discharger to sample for bis(2-ethylhexyl) phthalate using a clean technique. If the results show concentrations exceeding water quality criteria, this Order may be reopened to establish new effluent limitations.

h. **Chloroform.** The Basin Plan contains the *Policy for Application of Water Quality Objectives*, which provides that narrative objectives may be translated using numerical limits published by other agencies and organizations. The California

Environmental Protection Agency (Cal/EPA) Office of Environmental Health Hazard Assessment (OEHHA) has published the Toxicity Criteria Database, which contains cancer potency factors for chemicals, including chloroform, that have been used as a basis for regulatory actions by the boards, departments and offices within Cal/EPA. The OEHHA cancer potency value for oral exposure to chloroform is 0.031 milligrams per kilogram body weight per day (mg/kg-day). By applying standard toxicological assumptions used by OEHHA and USEPA in evaluating health risks via drinking water exposure of 70 kg body weight and two liters per day water consumption, this cancer potency factor is equivalent to a concentration in drinking water of 1.1 µg/L (ppb) at the one-in-a-million cancer risk level. This risk level is consistent with that used by the California Department of Public Health (CDPH) to set *de minimis* risks from involuntary exposure to carcinogens in drinking water in developing MCLs and Action Levels and by OEHHA to set negligible cancer risks in developing Public Health Goals for drinking water. The one-in-a-million cancer risk level is also mandated by USEPA in applying human health protective criteria contained in the NTR and the CTR to priority toxic pollutants in California surface waters.

The observed influent chloroform based on one influent sample collected in August 2004 was 11 µg/L. No treatment performance removal percentage for chloroform was applied to the influent sample because chloroform was not one of the constituents surveyed by the Discharger. Chloroform is a byproduct of chlorination and can be formed during the treatment process if chlorine is used to disinfect the wastewater. Chlorine will not be used for disinfection, but limited quantities may used to backwash filters. Therefore, reasonable potential is difficult to determine with the limited data available. Chloroform will be monitored and evaluated during the first year of operation of the wastewater treatment plant. If the results show concentrations exceeding water quality criteria, this Order may be reopened to establish effluent limitations for chloroform.

i. **Copper.** The CTR includes hardness-dependent criteria for the protection of freshwater aquatic life for copper. The criteria for copper are presented in dissolved concentrations. USEPA recommends conversion factors to translate dissolved concentrations to total concentrations. The USEPA default conversion factors for copper in freshwater are 0.96 for both the acute and the chronic criteria. The RPA for copper was performed using the lowest receiving water hardness of 36 mg/L (as $CaCO_3$) and the USEPA recommended dissolved-to-total translator, the applicable chronic criterion (maximum four-day average concentration) is 3.7 µg/L and the applicable acute criterion (maximum one-hour average concentration) is 5.1 µg/L, as total recoverable.

The estimated MEC for total copper was 4.7 µg/L, based on 1 sample collected August 2004, while the maximum observed upstream receiving water total copper concentration was 6.2 µg/L, based on 48 samples collected between March 1993 and March 2007. Therefore, the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the CTR criteria

The procedures outlined in Section IV.C.2.b. of the Attachment F were used to calculate WQBELs for copper. The CTR criteria for copper exhibits a concave downward relationship, therefore, the lowest estimated effluent hardness was used to calculate the WQBELs, as discussed above in Section IV.C.2.b. An AMEL and MDEL for total copper of 8.5 µg/L and 17 µg/L, respectively, are included in this Order based on CTR criteria for the protection of freshwater aquatic life (See Attachment F, Table F-6 for WQBEL calculations). Based on the sample results in the effluent, it appears the Discharger can meet these new limitations.

j. **Electrical Conductivity. (see Subsection u. Salinity)**

k. **Iron.** The Secondary MCL - Consumer Acceptance Limit for iron is 300 µg/L. The estimated MEC for iron was 288 µg/L, based on 1 influent sample collected in August 2004, while the maximum observed upstream receiving water iron concentration was 2800 µg/L, based on 65 samples collected between January 2003 and March 2007. Therefore, the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the Secondary MCL for iron. The receiving water has exceeded the Secondary MCL for iron. Therefore, no assimilative capacity is available in the receiving water for iron. An annual average effluent limitation of 300 µg/L for iron is included in this Order based on protection of the Basin Plan's narrative chemical constituents objective.

   Based on the sample results in the effluent, the limitations appear to put the Discharger in immediate non-compliance. New or modified control measures may be necessary in order to comply with the effluent limitations.

l. **Lead**. The CTR includes hardness-dependent standards for the protection of freshwater aquatic life for lead. The standards for metals are presented in dissolved concentrations. USEPA recommends conversion factors to translate dissolved concentrations to total concentrations. The conversion factors for lead in freshwater are 1.46203-[0.145712 X ln(hardness)] for both the acute and the chronic criteria. The RPA for lead was performed using the lowest receiving water hardness of 36 mg/L (as $CaCO_3$) and the USEPA recommended dissolved-to-total translator, the applicable chronic criterion (maximum four-day average concentration) is 0.87 µg/L and the applicable acute criterion (maximum one-hour average concentration) is 22 µg/L, as total recoverable.

   The estimated MEC for total lead was 1.4 µg/L, based on 1 influent sample collected August 2004, while the maximum observed upstream receiving water total lead concentration was 1.3 µg/L, based on 48 samples collected between March 1993 and March 2007. Therefore, the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the CTR criteria

for lead. In accordance with 40 CFR 122.44(d), effluent limitations for lead are required.

The procedures outlined in Section IV.C.2.b. of the Attachment F were used to calculate WQBELs for lead. The CTR criteria for lead exhibits a concave upward relationship, therefore, the lowest estimated effluent hardness and the lowest receiving water hardness were used to calculate the WQBELs, as discussed above in Section IV.C.2.b. An AMEL and MDEL for total lead of 3.4 µg/L and 6.9 µg/L, respectively, are included in this Order based on CTR criteria for the protection of freshwater aquatic life (See Attachment F, Table F-6 for WQBEL calculations). Based on the sample results in the effluent, it appears the Discharger can meet these new limitations.

m. **Fluoride**. The primary MCL for fluoride is 2000 µg/L. The agricultural water quality goal, that would apply the narrative chemical constituents objective, is 1000 µg/L as a long-term average based on Water Quality for Agriculture, Food and Agriculture Organization of the United Nations—Irrigation and Drainage Paper No. 29, Rev. 1 (R.S. Ayers and D.W. Westcot, Rome, 1985). The 1000 µg/L agricultural water quality goal is intended to prevent reduction in crop yield, i.e. a restriction on use of water, for salt-sensitive crops, such as beans, carrots, turnips, and strawberries. These crops are either currently grown in the area or may be grown in the future. The estimated MEC for fluoride is 1000 µg/L based on 1 influent sample. This level is at the applicable objectives. The background receiving water maximum fluoride is 72 µg/L in 46 sampling events collected by the Discharger and other agencies from January 2003 through March 2007. These data show that the receiving water has assimilative capacity for fluoride. The human health dilution factor of 1000:1 is not appropriate for fluoride because fluoride is not a carcinogen. Thus a dilution factor of 20:1, based on the 150 foot mixing zone and Best Professional Judgment, the AMEL is 19,560 µg/L or 19.6 mg/L (See Attachment F, Table F-9 for WQBEL calculations). The Discharger may conduct a site-specific study and present additional information and the permit may be reopened. Based on the sample results in the effluent, it appears the Discharger can meet this new limitation. After the plant has operated and evaluated its performance this Order may be reopened to establish a more stringent performance-based limit.

n. **Manganese***.* The Secondary MCL - Consumer Acceptance Limit for manganese is 50 µg/L. The estimated MEC for manganese was 73 µg/L, based on 2 influent samples collected between August 2004 and August 2007, while the maximum observed upstream receiving water manganese concentration was 98 µg/L, based on 29 samples collected between February 2000 and March 2007. Therefore, the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the Secondary MCL for manganese. The receiving water has exceeded the Secondary MCL for manganese. Therefore, no assimilative capacity is available in the receiving water for manganese. An average annual effluent limitation of 50 µg/L for manganese is included in this

Order based on protection of the Basin Plan's narrative chemical constituents objective.

Based on the sample results in the effluent, the limitations appear to put the Discharger in immediate non-compliance. New or modified control measures may be necessary in order to comply with the effluent limitations.

o. **Mercury.** The current USEPA Ambient Water Quality Criteria for Protection of Freshwater Aquatic Life, continuous concentration, for mercury is 0.77 µg/L (30-day average, chronic criteria). The CTR contains a human health criterion of 0.050 µg/L for waters from which both water and aquatic organisms are consumed. Both values are controversial and subject to change. In 40 CFR Part 131, USEPA acknowledges that the human health criteria may not be protective of some aquatic or endangered species and that "…*more stringent mercury limits may be determined and implemented through use of the State's narrative criterion.*" In the CTR, USEPA reserved the mercury criteria for freshwater and aquatic life and may adopt new criteria at a later date. The maximum estimated effluent mercury concentration is 0.007 µg/L. The Western Sacramento-San Joaquin Delta has been listed as an impaired water body pursuant to Section 303(d) of the Clean Water Act because of mercury. The Regional Water Board is nearing completion of a methylmercury TMDL, it is scheduled for adoption in 2008. Mercury bioaccumulates in fish tissue and, therefore, discharge of mercury to the receiving water is likely to contribute to an exceedance of the narrative toxicity objective and impacts on beneficial uses. Because the Western Sacramento-San Joaquin Delta has been listed as an impaired water body for mercury, the discharge must not cause or contribute to increased mercury levels. If a TMDL program is adopted for total or methyl mercury or USEPA develops new water quality standards for total and/or methyl mercury, this Order shall be reopened as necessary.

p. **Methylene blue active substances (MBAS).** The Secondary Maximum Contaminant Level (MCL)-Consumer Acceptance Limit of for foaming agents (MBAS) is 0.500 mg/L. The estimated MEC for MBAS was 3.7 mg/L, based on 1 sample collected between August 2004, while the maximum observed upstream receiving water MBAS concentration was 0.016 mg/L, based on 16 samples collected between November 2003 and March 2007. Therefore, the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the Secondary MCL for MBAS. A dilution factor of 1000:1 is allowed for this constituent, therefore, an average annual effluent limitation of 340 mg/L for MBAS is included in this Order based on protection of the Basin Plan's narrative chemical constituents objective. After the plant has operated and evaluated its performance this Order may be reopened to establish a more stringent performance-based limit.

q. **Nitrite and Nitrate.** Untreated domestic wastewater contains ammonia. Nitrification is a biological process that converts ammonia to nitrite and nitrite to nitrate. Denitrification is a process that converts nitrate to nitrite or nitric oxide and then to nitrous oxide or nitrogen gas, which is then released to the

atmosphere. Nitrate and nitrite are known to cause adverse health effects in humans. The California DPH has adopted Primary MCLs at Title 22 of the California Code of Regulations (CCR), Table 64431-A, for the protection of human health for nitrite and nitrate that are equal to 1 mg/L and 10 mg/L (measured as nitrogen), respectively. Title 22 CCR, Table 64431-A, also includes a primary MCL of 10 mg/L for the sum of nitrate and nitrite, measured as nitrogen.

USEPA has developed a primary MCL and an MCL goal of 1,000 µg/L for nitrite (as nitrogen). For nitrate, USEPA has developed Drinking Water Standards (10 mg/L as Primary Maximum Contaminant Level) and Ambient Water Quality Criteria for protection of human health (10 mg/L for non-cancer health effects). Recent toxicity studies have indicated a possibility that nitrate is toxic to aquatic organisms.

Inadequate or incomplete denitrification may result in the discharge of nitrate and/or nitrite to the receiving stream. The conversion of ammonia to nitrites and the conversion of nitrites to nitrates present a reasonable potential for the discharge to cause or contribute to an in-stream excursion above the Primary MCLs for nitrite and nitrate. A human health dilution factor of 1000 is not allowed for nitrate plus nitrite, because the environmental effects of nitrate may occur over short durations. Therefore, a dilution factor of 20 was considered for this constituent and an AMEL of 205 mg/L for nitrate plus nitrite. However, the Dischargers Antidegradation Analysis was based on the USEPA primary MCL of 10 mg/L. Based on the Discharger's Antidegradation analysis and due to the fact that the Facility will include denitrification, an AMEL of 10 mg/L is included in this Order to ensure compliance with Resolution 68-16. This effluent limitation is included in this Order to assure the treatment process adequately denitrifies the waste stream to protect the beneficial use of municipal and domestic supply. After the plant has operated and evaluated its performance this Order may be reopened to establish a more stringent performance-based limit.

r. **Oil and Grease.** Untreated domestic wastewater contains oil and grease. The Basin Plan includes a water quality objective for oil and grease in surface waters, which states: "*Waters shall not contain oils, greases, waxes, or other materials in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses*". This Order includes numeric monthly average and daily maximum Effluent Limitations of 10 mg/l and 15 mg/l, respectively, to implement the Basin Plan's narrative objective for oil and grease. These effluent limitations are based on best professional judgment (BPJ) and Regional Water Board staff's experience with wastewater treatment plant capabilities and levels necessary to meet the Basin Plan objective for oil and grease. A daily maximum effluent limitation for oil and grease is included in the Order, in lieu of a weekly average, to ensure that the treatment works operate in accordance with design capabilities. The daily maximum effluent limitation will also ensure that the Discharger requires proper removal and disposal of oil and grease from

commercial food service sources and properly operates and maintains the collection system to minimize plugging from oil and grease. The Discharger can also maintain compliance through educating the public on the impacts of discharging oil and grease into the collection system.

s. **Pathogens**. The beneficial uses of the San Joaquin River in the Sacramento-San Joaquin Delta include municipal and domestic supply, water contact recreation, and agricultural irrigation supply. To protect these beneficial uses, the Regional Water Board finds that the wastewater must be disinfected and adequately treated to prevent disease. The principal infectious agents (pathogens) that may be present in raw sewage may be classified into three broad groups: bacteria, parasites, and viruses. Tertiary treatment, consisting of chemical coagulation, sedimentation, and filtration, has been found to remove approximately 99.5% of viruses. Filtration is an effective means of reducing viruses and parasites from the waste stream. The wastewater must be treated to tertiary standards (filtered), or equivalent, to protect contact recreational, municipal and domestic supply, and food crop irrigation uses.

Typically the Regional Water Board requires Title 22 or equivalent tertiary treatment when there is less than 20:1 dilution, based on recommendations by the CDPH. However, as discussed above in the Fact Sheet at Section IV.C.2.c., the discharge has at least 20:1 dilution at all times. Although there is 20:1 dilution, tertiary level treatment is required based on the following:

a. The Discharger developed its EIR and antidegradation analysis based on a Title 22 or equivalent tertiary treatment facility.

b. There are four water intakes within ten miles of the discharge. Therefore, providing a high level of disinfection is appropriate to protect the MUN beneficial use.

c. This is a new discharge to the Delta. With the significant pelagic organism decline, the fragile nature of the Delta, unknown Delta stressors and recent legal decisions on water supply diversions within the Delta, it is prudent to require a high level of treatment for new discharges.

The CDPH has developed reclamation criteria, CCR, Division 4, Chapter 3 (Title 22), for the reuse of wastewater. Title 22 requires that for spray irrigation of food crops, parks, playgrounds, schoolyards, and other areas of similar public access, wastewater be adequately disinfected, oxidized, coagulated, clarified, and filtered, and that the effluent total coliform levels not exceed 2.2 MPN/100 m*l* as a 7-day median. As coliform organisms are living and mobile, it is impracticable to quantify an exact number of coliform organisms and to establish weekly average limitations. Instead, coliform organisms are measured as a most probable number and regulated based on a 7-day median limitation.

Title 22 also requires that recycled water used as a source of water supply for non-restricted recreational impoundments be disinfected tertiary recycled water

that has been subjected to conventional treatment. A non-restricted recreational impoundment is defined as "*…an impoundment of recycled water, in which no limitations are imposed on body-contact water recreational activities.*" Title 22 is not directly applicable to surface waters; however, the Regional Water Board finds that it is appropriate to apply an equivalent level of treatment to that required by CDPH's reclamation criteria because the receiving water is used for irrigation of agricultural land and for contact recreation purposes. The stringent disinfection criteria of Title 22 are appropriate since the undiluted effluent may be used for the irrigation of food crops and/or for body-contact water recreation. Coliform organisms are intended as an indicator of the effectiveness of the entire treatment train and the effectiveness of removing other pathogens. The method of treatment is not prescribed by this Order; however, wastewater must be treated to a level equivalent to that recommended by CDPH.

In addition to coliform testing, a turbidity effluent limitation has been included as a second indicator of the effectiveness of the treatment process and to assure compliance with the required level of treatment. The tertiary treatment process, or equivalent, is capable of reliably meeting a turbidity limitation of 2 nephelometric turbidity units (NTU) as a daily average. Failure of the filtration system such that virus removal is impaired would normally result in increased particles in the effluent, which result in higher effluent turbidity. Turbidity has a major advantage for monitoring filter performance, allowing immediate detection of filter failure and rapid corrective action. Coliform testing, by comparison, is not conducted continuously and requires several hours, to days, to identify high coliform concentrations. Therefore, to ensure compliance with the CDPH recommended Title 22 disinfection criteria, weekly average effluent limitations are impracticable for turbidity.

This Order contains effluent limitations and a tertiary level of treatment, or equivalent, necessary to protect the beneficial uses of the receiving water. In accordance with CWC section 13241, the Regional Water Board has considered the following:

i. The past, present and probable future beneficial uses of the receiving stream include municipal and domestic supply, agricultural irrigation, agricultural stock watering, industrial process water supply, industrial service supply, body contact water recreation, other non-body contact water recreation, warm freshwater aquatic habitat, cold freshwater aquatic habitat, warm fish migration habitat, cold fish migration habitat, warm spawning habitat, wildlife habitat, and navigation.

ii. The environmental characteristics of the hydrographic unit, including the quality of the available water, will be improved by the requirement to provide tertiary treatment for this wastewater discharge. Tertiary treatment will allow for the reuse of the undiluted wastewater for food crop irrigation and contact recreation activities that would otherwise be unsafe according to recommendations from the (CDPH).

iii. Fishable and swimmable water quality conditions can be reasonably achieved through the coordinated control of all factors that affect water quality in the area.

iv. The economic impact of requiring an increased level of treatment has been considered. The Discharger has estimated that the increased level of treatment will cost approximately $18.0 million. The loss of beneficial uses within downstream waters, without the tertiary treatment requirement, which includes prohibiting the irrigation of food crops and prohibiting public access for contact recreational purposes, would have a detrimental economic impact. In addition to pathogen removal to protect irrigation and recreation, tertiary treatment may also aid in meeting discharge limitations for other pollutants, such as heavy metals, reducing the need for advanced treatment specific for those pollutants.

v. The requirement to provide tertiary treatment for this discharge will not adversely impact the need for housing in the area. The potential for developing housing in the area will be facilitated by improved water quality, which protects the contact recreation and irrigation uses of the receiving water. CDPH recommends that, in order to protect the public health, relatively undiluted wastewater effluent must be treated to a tertiary level for contact recreational and food crop irrigation uses. Without tertiary treatment, the downstream waters could not be safely utilized for contact recreation or the irrigation of food crops.

vi. It is the Regional Water Board's policy, (Basin Plan, page IV-12.00, Policy 2) to encourage the reuse of wastewater. The Regional Water Board requires dischargers to evaluate how reuse or land disposal of wastewater can be optimized. The need to develop and use recycled water is facilitated by providing a tertiary level of wastewater treatment that will allow for a greater variety of uses in accordance with CCR, Title 22.

vii. The Regional Water Board has considered the factors specified in CWC section 13263, including considering the provisions in CWC section 13241, in adopting the disinfection and filtration requirements under Title 22 criteria. The Regional Water Board finds, on balance, that these requirements are necessary to protect the beneficial uses of The San Joaquin River in the Western Sacramento-San Joaquin Delta, including water contact recreation and irrigation uses.

t. **pH.** The Basin Plan includes a water quality objective for surface waters (except for Goose Lake) that the "…*pH shall not be depressed below 6.5 nor raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 in fresh waters with designated COLD or WARM beneficial uses.*" Effluent Limitations for pH are included in this Order based on the Basin Plan objectives for pH.

u. **Salinity.** The discharge contains total dissolved solids (TDS), chloride, sulfate, and electrical conductivity (EC). These are water quality parameters that are indicative of the salinity of the water. Their presence in water can be growth limiting to certain agricultural crops and can affect the taste of water for human consumption. The Basin Plan contains a chemical constituent objective that incorporates State MCLs, contains a narrative objective, and contains numeric water quality objectives for EC and Chloride in the vicinity of the discharge.

The Basin Plan contains site-specific water quality objectives for the San Joaquin River in the vicinity of the discharge based on the *2006 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* (Bay-Delta Plan). The Bay-Delta Plan was adopted in May 1995 by the State Water Board and was revised in December 2006. The Bay-Delta Plan identifies the beneficial uses of the estuary and includes objectives for flow, salinity, and endangered species protection. The Bay-Delta Plan is reviewed periodically in compliance with CWC section 13240 and federal CWA section 303(d).

In December 1999 and March 2000, the State Water Board adopted and revised Water Rights Decision 1641 (D-1641) as part of the State Water Board's implementation of the Bay-Delta Plan. Many of the objectives in the Bay-Delta Plan are best implemented by making changes in the flow of water of in the operation of facilities that move water. Accordingly, this decision amends certain water rights by assigning responsibilities to the persons or entities holding those rights to help meet the objectives. Although the Bay-Delta Plan's purpose is for regulating flow for water right holders, the water quality objectives apply to dischargers as well.

The Basin Plan site-specific water quality objectives are described below under sections on Chloride and Electrical Conductivity.

i. **Chloride**. The secondary MCL for chloride is 250 mg/L, as recommended level, 500 mg/L as an upper level, and 600 mg/L as a short-term maximum. The recommended agricultural water quality goal for chloride, that would apply the narrative chemical constituent objective, is 106 mg/L as a long-term average based on Water Quality for Agriculture, Food and Agriculture Organization of the United Nations—Irrigation and Drainage Paper No. 29, Rev. 1 (R.S. Ayers and D.W. Westcot, Rome, 1985). The 106 mg/L water quality goal is intended to protect against adverse effects on sensitive crops when irrigated via sprinklers.

The Basin Plan contains site-specific water quality objectives for chloride at the Antioch Water Works Intake, based on the 2006 Bay-Delta Plan, described as follows:

The maximum mean daily chloride concentration of 150 mg/L for at least the number of days shown during the Calendar Year. Must be provided in

intervals of not less than two weeks duration (Percentage of Calendar Year shown in parenthesis)

Year Type	No. days each cal. Year < 150 mg/L Cl^-
Wet	240 (66%)
Above Normal	190 (52%)
Below Normal	175 (48%)
Dry	165 (45%)
Critical	155 (42%)

Chloride concentrations in the effluent are estimated to be 160 mg/L based on one sample collected August 2004. The maximum background concentrations in the San Joaquin River was 1200 mg/L, with an average of 171 mg/L, for 75 samples collected by the Discharger and others from January 2003 through March 2007. Based on modeling performed by the Discharger, the maximum incremental increase of chloride caused by the discharge when the receiving water is at 150 mg/L (i.e. the most stringent Basin Plan objective) is estimated to be only 0.022 mg/L. Although this is an insignificant increase, the effluent and receiving water chloride concentrations demonstrate that the effluent had a reasonable potential to cause or contribute to an exceedance of the Basin Plan's site-specific objectives for chloride.

ii. **Electrical Conductivity (EC)**. The secondary MCL for EC is 900 µmhos/cm as a recommended level, 1600 µmhos/cm as an upper level, and 2200 µmhos/cm as a short-term maximum. The agricultural water quality goal, that would apply the narrative chemical constituents objective, is 700 µmhos/cm as a long-term average based on Water Quality for Agriculture, Food and Agriculture Organization of the United Nations—Irrigation and Drainage Paper No. 29, Rev. 1 (R.S. Ayers and D.W. Westcot, Rome, 1985). The 700 µmhos/cm agricultural water quality goal is intended to prevent reduction in crop yield, i.e. a restriction on use of water, for salt-sensitive crops, such as beans, carrots, turnips, and strawberries. These crops are either currently grown in the area or may be grown in the future. Most other crops can tolerate higher EC concentrations without harm, however, as the salinity of the irrigation water increases, more crops are potentially harmed by the EC, or extra measures must be taken by the farmer to minimize or eliminate any harmful impacts.

As discussed above, there are specific salinity requirements established in the Basin Plan for the San Joaquin River at Jersey Point, based on the 2006 Bay-Delta Plan. The water quality objective is at times 450 µmhos/cm for protection of agricultural use and 440 µmhos/cm for protection of striped bass spawning. The EC limits vary depending on the type of water year and are detailed in Table F-4, below:

Table F-4. Basin Plan Water Quality Objectives for Electrical Conductivity – San Joaquin River at Jersey Point, Based on Water Year Type (maximum 14- day running average of mean daily EC in μmhos/cm)

Date	Water Year Type				
	Wet	Above Normal	Below Normal	Dry	Critical
1 April – 31 May	440	440	440	440	2200
1 June – 14 June	450	450	450	1350	2200
15 June – 19 June	450	450	450	1350	2200
20 June – 15 August	450	450	740	1350	2200

Compliance with the Bay-Delta Plan's EC objectives is met through reservoir operations by the Department of Water Resources and the Bureau of Reclamation. The EC of the San Joaquin River at Jersey Point fluctuates throughout the year, primarily based on the outflow of the river to the San Francisco Bay. As discussed in detail in the Discharger's Antidegradation Analysis report, the San Joaquin River at Jersey Point has generally been in compliance with the objectives. An evaluation of historical compliance from 1984 to 2005 was performed and the results of the evaluation are summarized in the Table F-5 below.

Table F-5: Historical Compliance with Electrical Conductivity Objectives at Jersey Point (Water Years 1984-2005)

Water Year Type	Number of Years of this Type	Number of Years with Exceedances	Year with Exceedances (number of days)	Applicable Objectives[1] (μhmos/cm)
Wet	7	0	N/A	450
Above Normal	4	1	2005 (3)	450
Below Normal	1	1	2004 (12)[2]	450/740
Dry	5	1	1987 (37)	450/1350
Critically Dry	5	0	N/A	2200

Notes:
[1] Objectives apply from April 1 through August 15 as 14-day running daily averages. Objectives change in certain water years partway through June (see Figure 2).
[2] The Jones Tract levee break occurred on June 3, 2004, and was closed on June 30, 2004; the exceedances of criteria, 450 μmhos/cm as 14-day running averages, occurred from June 10–21, 2004.
N/A = not applicable

The expected annual average effluent EC is 1376 μhmos/cm, and at times the receiving water exceeds the Basin Plan's site-specific objectives for EC. Therefore, there is reasonable potential for the discharge to cause or contribute to an exceedance of the objectives. Based on the modeling by the Discharger, the estimated maximum incremental increase in EC that may be caused by the discharge is 3 μhmos/cm, which is offset by a decrease in EC due to the discharge increasing the outflow of the San Joaquin River. The net worst-case increase is estimated to be approximately 2 μhmos/cm.

iii. **Sulfate**. The secondary MCL for sulfate is 250 mg/L as recommended level, 500 mg/L as an upper level, and 600 mg/L as a short-term maximum. The

estimated MEC sulfate concentration is 71mg/L based on a sample collect August 2004. Background concentrations in San Joaquin River ranged from 9.3 mg/L to 160 mg/L, with an average of 41 mg/L, for 4 samples collected by the Discharger from January 2003 through March 2007. The effluent does not exceed the secondary MCL recommended level of 250 mg/L. Therefore, the discharge does not a reasonable potential to cause or contribute to an exceedance of the applicable water quality objectives for sulfate.

iv. **Total Dissolved Solids (TDS).** The secondary MCL for TDS is 500 mg/L as a recommended level, 1000 mg/L as an upper level, and 1500 mg/L as a short-term maximum. The recommended agricultural water quality goal for TDS, that would apply the narrative chemical constituent objective, is 450 mg/L as a long-term average based on Water Quality for Agriculture, Food and Agriculture Organization of the United Nations—Irrigation and Drainage Paper No. 29, Rev. 1 (R.S. Ayers and D.W. Westcot, Rome, 1985). Water Quality for Agriculture evaluates the impacts of salinity levels on crop tolerance and yield reduction, and establishes water quality goals that are protective of the agricultural uses. The 450 mg/L water quality goal is intended to prevent reduction in crop yield, i.e. a restriction on use of water, for salt-sensitive crops. Only the most salt sensitive crops require irrigation water of 450 mg/L or less to prevent loss of yield. Most other crops can tolerate higher TDS concentrations without harm, however, as the salinity of the irrigation water increases, more crops are potentially harmed by the TDS, or extra measures must be taken by the farmer to minimize or eliminate any harmful impacts.

Background concentrations in San Joaquin River ranged from 87 mg/L to 2200 mg/L, with an average of 477 mg/L, for 65 samples collected by the Discharger from January 2003 through March 2007. These concentrations exceed the applicable water quality objectives. Therefore, the discharge has a reasonable potential to cause or contribute to an exceedance of the applicable water quality objectives for TDS.

v. **Salinity Effluent Limitations.** As discussed above, the effluent has a reasonable potential to cause or contribute to an in-stream excursion of the applicable water quality objectives for chloride, EC, and TDS. Therefore, water quality-based effluent limitations are required in accordance with federal regulations. The receiving water often has assimilative capacity for salinity and significant dilution is available. During periods when the ambient salinity is adequately below water quality standards (i.e. assimilative capacity exists), an EC effluent limitation of 1505 µhmos/cm is required in this Order, which allows for some dilution. This effluent limitation is based on the EC concentration used in the Discharger's antidegradation analysis. During periods when there is no assimilative capacity, the discharge must meet the Basin Plan's site-specific water quality objectives for the San Joaquin River at Jersey Point at the end-of-pipe, without the benefit of dilution.

Compliance with the effluent limitation for EC will be protective of the chloride, and TDS recommended levels, therefore, no effluent limitations are included for chloride and TDS. Monitoring is required for these constituents to ensure that EC is a satisfactory indicator parameter for salinity.

v. **Settleable Solids.** For inland surface waters, the Basin Plan states that "[w]ater shall not contain substances in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses." This Order contains average monthly and average daily effluent limitations for settleable solids.

Because the amount of settleable solids is measured in terms of volume per volume without a mass component, it is impracticable to calculate mass limitations for inclusion in this Order. A daily maximum effluent limitation for settleable solids is included in the Order, in lieu of a weekly average, to ensure that the treatment works operate in accordance with design capabilities.

w. **Temperature**. The Thermal Plan requires that, "*The maximum temperature shall not exceed the natural receiving water temperature by more than 20°F.*" Therefore, to ensure compliance with the Thermal Plan an effluent limitation for temperature is included in this Order.

x. **Toxicity.** See Section IV.C.5. of the Fact Sheet regarding whole effluent toxicity.

4. WQBEL Calculations

a. Effluent limitations for aluminum, ammonia, nitrate, manganese, MBAS, and fluoride were calculated in accordance with section 1.4 of the SIP. The following paragraphs describe the methodology used for calculating effluent limitations.

b. **Effluent Limitation Calculations.** In calculating maximum effluent limitations, the ECA is calculated as follows:

$$ECA_{acute} = CMC + D(CMC - B)$$
$$ECA_{chronic} = CCC + D(CCC - B)$$

For the human health, agriculture, or other long-term criterion/objective, the ECA is calculated as follows:

$$ECA_{HH} = HH + D(HH - B)$$

where:

ECA_{acute} = effluent concentration allowance for acute (one-hour average) toxicity criterion

$ECA_{chronic}$ = effluent concentration allowance for chronic (four-day average) toxicity criterion

ECA_{HH} = effluent concentration allowance for human health, agriculture, or other long-term criterion/objective

CMC = criteria maximum concentration (one-hour average)

CCC = criteria continuous concentration (four-day average, unless otherwise noted)

HH = human health, agriculture, or other long-term criterion/objective

D = dilution credit

B = maximum receiving water concentration

Acute and chronic toxicity ECAs were then converted to equivalent long-term averages (LTA) using statistical multipliers and the lowest is used. Additional statistical multipliers were then used to calculate the maximum daily effluent limitation (MDEL) and the average monthly effluent limitation (AMEL).

The AMEL's are set equal to the human health ECAs and a statistical multiplier is used to calculate the MDEL.

$$AMEL = mult_{AMEL}\left[\min\left(\overbrace{M_A ECA_{acute}}^{LTA_{acute}}, M_C ECA_{chronic}\right)\right]$$

$$MDEL = mult_{MDEL}\left[\min\left(M_A ECA_{acute}, \underbrace{M_C ECA_{chronic}}_{LTA_{chronic}}\right)\right]$$

$$MDEL_{HH} = \left(\frac{mult_{MDEL}}{mult_{AMEL}}\right) AMEL_{HH}$$

where: $mult_{AMEL}$ = statistical multiplier converting minimum LTA to AMEL
$mult_{MDEL}$ = statistical multiplier converting minimum LTA to MDEL
M_A = statistical multiplier converting CMC to LTA
M_C = statistical multiplier converting CCC to LTA

Water quality-based effluent limitations were calculated for aluminum, ammonia, copper, fluoride, and lead as follows in Tables F-6 through F-9, below.

Table F-6. WQBEL calculations for CTR constituents

Description	Copper		Lead	
Effluent Concentrations				
At least 80% of data ND?	No		No	
Sample Count	1		1	
MEC (µg/l)	4.7		1.4	
Mean (µg/l)	NA		NA	
Std. Deviation (µg/l)	NA		NA	
Coeff of Variation (CV) (µg/l)	0.60		0.60	
Background Concentrations				
Sample Count	1		1	
Max Background (µg/l)	6.2		1.1	
Avg Background (µg/l)	NA		NA	
Criteria	acute	chronic	acute	chronic
CTR Criteria (µg/l, dissolved)	16.5	10.8	69.5	3.18
Translator	0.96	0.96	0.76	0.76
Criteria (µg/l, total recoverable)	17.1	11.2	91.4	4.18
Effluent Limit Calculations				
Dilution Credit[7]	0	0	0	0
ECA[(1)](µg/l)	17.1	11.2	91.4	4.18
σ^2	0.31		0.31	
σ_4^2	0.09		0.09	
ECA Multiplier [(2)]	0.321	0.527	0.321	0.527
Long-Term Average (LTA)	5.5	5.9	29.4	2.2
AMEL Multiplier [(3)(4)]	1.6	[6]	[6]	1.55
AMEL	**8.5**	**[6]**	**[8]**	**3.4**
MDEL Multiplier [(5)]	3.1	[6]	[8]	3.11
MDEL	**17**	**[6]**	**[8]**	**6.9**

(1) ECA calculated per Section 1.4.B, Step 2 of SIP. This allows for the consideration of dilution.
(2) Acute and Chronic ECA Multipliers calculated at 99th percentile per Section 1.4.B, Step 3 of SIP.
(3) Assumes sampling frequency n is equal or less than 4.
(4) The probability basis for AMEL is 95th percentile per Section 1.4.B, Step 5 of SIP
(5) The probability basis for MDEL is 99th percentile per Section 1.4.B, Step 5 of SIP
(6) Not applicable as acute criterion LTA is more stringent
(7) No assimilative capacity = no dilution
(8) Not applicable as chronic criterion LTA is more stringent

Table F-7 WQBEL Calculations for Aluminium

	Acute	Chronic
Criteria (µg/L) [1]	750	87
Dilution Credit	No assimilative capacity	No assimilative capacity
ECA	750	87
ECA Multiplier	0.321	0.527
LTA	240.8	45.9
AMEL Multiplier (95th%)	(2)	1.55
AMEL (µg/L)	(2)	**71**
MDEL Multiplier (99th%)	(2)	3.11
MDEL (µg/L)	(2)	**143**

(1) USEPA Ambient Water Quality Criteria
(2) Limitations based on chronic LTA (Chronic LTA < Acute LTA)

Table F-8 WQBEL Calculations for Ammonia

	Acute	Chronic 30-day	Chronic 4-day
pH [1]	8.5	8.1	
Temperature °C [2]	N/A	24.1	
Criteria (mg/L) [3]	2.14	1.13	2.83
Dilution Credit	0	0	0
ECA	2.14	1.13	2.83
ECA Multiplier	0.321	0.780	0.527
LTA [4]	0.69	0.88	1.49
AMEL Multiplier (95th%)	1.55[5]	[5]	[5]
AMEL (mg/L)	**1.1[5]**	[5]	[5]
MDEL Multiplier (99th%)	3.11[5]	[5]	[5]
MDEL (mg/L)	**2.1[5]**	[5]	[5]

(1) Acute design pH = 8.5 (max. allowed effluent pH), Chronic design pH = median receiving stream pH
(2) Temperature = Maximum 30-day average seasonal effluent temperature
(3) USEPA Ambient Water Quality Criteria
(4) LTA developed based on Acute and Chronic ECA Multipliers calculated at 99th percentile level per sections 5.4.1 and 5.5.4 of TSD.
(5) Limitations based on acute LTA (LTA_{acute} < $LTA_{chronic}$< $LTA_{chronic}$ 4-day)

Table F-9 WQBEL Calculations for Fluoride

	Basin Plan
Criteria (mg/L) [1]	1.0
Dilution Credit	20
ECA	19.6
AMEL (mg/L)	19.6

(1) Agricultural Water Quality Goal (Ayers and Westcot)

Summary of Water Quality-based Effluent Limitations
Discharge Point 001

Table F-10. Summary of Water Quality-based Effluent Limitations

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Ammonia	mg/L	1.1		2.1	---	---
	lbs/day	39.4		75.3	---	---
Nitrate + Nitrite	mg/L	10	---	---	---	---
Aluminum	µg/L	71	---	143	---	---
Manganese	µg/L	50[1]	---	---	---	---
MBAS	mg/L	340[1]	---	---	---	---
Iron	µg/L	300[1]				
Copper, Total	µg/L	8.5		17		
Fluoride	mg/L	19.6	---	---	---	---
Lead, Total	µg/L	3.4		6.9		
Settleable solids	ml/L	0.1	--	0.2	---	---
pH	std units	--	--	--	6.5	8.5
Oil and Grease	mg/L	10		15		
Turbidity[2]	NTU	---	5	2	---	10
Total Residual Chlorine	mg/L	0.01	---	0.02	---	---
Total Coliform[3]	MPN/100 mL	---	---	2.2	---	240
Temperature[4]	ºF					
Acute Toxicity[5]	% survival					
Electrical Conductivity	µmhos/cm	1,505[6]				

1 Annual average effluent limitation
2 Effluent turbidity shall not exceed 2 NTU, as a daily average; 5 NTU, more than 5% of the time within a 24-hour period, and 10 NTU at any time.
3 Effluent total coliform organisms shall not exceed 2.2 MPN/100mL as a 7-day median, 23 MPN/100mL more than once in a 30-day period, and 240 MPN/100mL at any time.
4 Effluent temperature shall not exceed the receiving water temperature by more than 20ºF.
5 Survival of aquatic organisms in 96-hour bioassays of undiluted waste shall be no less than 70%, minimum for any one bioassay; and 90%, median for any three consecutive bioassays.
6 Effluent limitation for EC dependent on assimilative capacity in San Joaquin River at Jersey Point.

5. Whole Effluent Toxicity (WET)

For compliance with the Basin Plan's narrative toxicity objective, this Order requires the Discharger to conduct whole effluent toxicity testing for acute and chronic toxicity, as specified in the Monitoring and Reporting Program (Attachment E, Section V.). This Order also contains effluent limitations for acute toxicity and requires the Discharger to implement best management practices to investigate the causes of, and identify corrective actions to reduce or eliminate effluent toxicity.

a. **Acute Aquatic Toxicity.** The Basin Plan contains a narrative toxicity objective that states, "*All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.*" (Basin Plan at III-8.00) The Basin Plan also states that, "…*effluent limits based upon acute biotoxicity tests of effluents will be prescribed where appropriate*…". USEPA Region 9 provided guidance for the development of acute toxicity effluent limitations in the absence of numeric water quality objectives for toxicity in its document titled "Guidance for NPDES Permit Issuance", dated February 1994. In section B.2. "Toxicity Requirements" (pgs. 14-15) it states that, "*In the absence of specific numeric water quality objectives for acute and chronic toxicity, the narrative criterion 'no toxics in toxic amounts' applies. Achievement of the narrative criterion, as applied herein, means that ambient waters shall not demonstrate for acute toxicity: 1) less than 90% survival, 50% of the time, based on the monthly median, or 2) less than 70% survival, 10% of the time, based on any monthly median. For chronic toxicity, ambient waters shall not demonstrate a test result of greater than 1 TUc."* Accordingly, effluent limitations for acute toxicity have been included in this Order as follows:

Acute Toxicity. Survival of aquatic organisms in 96-hour bioassays of undiluted waste shall be no less than:

Minimum for any one bioassays ----------	70%
Median for any three or more consecutive bioassays ---------	90%

b. **Chronic Aquatic Toxicity.** The Basin Plan contains a narrative toxicity objective that states, "All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life." (Basin Plan at III-8.00.) Adequate WET data is not available to determine if the discharge has reasonable potential to cause or contribute to an in-stream excursion above of the Basin Plan's narrative toxicity objective. Attachment E of this Order requires quarterly chronic WET monitoring for demonstration of compliance with the narrative toxicity objective.

In addition to WET monitoring, Special Provisions VI.C.2.a. requires the Discharger to submit to the Regional Water Board an Initial Investigative TRE Work Plan for approval by the Executive Officer, to ensure the Discharger has a plan to immediately move forward with the initial tiers of a TRE, in the event effluent toxicity is encountered in the future. The provision also includes a numeric toxicity monitoring trigger and requirements for accelerated monitoring, as well as, requirements for TRE initiation if a pattern of toxicity is demonstrated.

D. Final Effluent Limitations

1. Mass-based Effluent Limitations.

Title 40 CFR 122.45(f)(1) requires effluent limitations be expressed in terms of mass, with some exceptions, and 40 CFR 122.45(f)(2) allows pollutants that are limited in terms of mass to additionally be limited in terms of other units of measurement. This Order includes effluent limitations expressed in terms of mass and concentration. In addition, pursuant to the exceptions to mass limitations provided in 40 CFR 122.45(f)(1), some effluent limitations are not expressed in terms of mass, such as pH and temperature, and when the applicable standards are expressed in terms of concentration (e.g. CTR criteria and MCLs) and mass limitations are not necessary to protect the beneficial uses of the receiving water.

Mass-based effluent limitations were calculated based upon the design average dry weather flow of 4.3 mgd.

2. Averaging Periods for Effluent Limitations.

Title 40 CFR 122.45 (d) requires average weekly and average monthly discharge limitations for publicly owned treatment works (POTWs) unless impracticable. However, for toxic pollutants and pollutant parameters in water quality permitting, the US EPA recommends the use of a maximum daily effluent limitation in lieu of average weekly effluent limitations for two reasons. "*First, the basis for the 7-day average for POTWs derives from the secondary treatment requirements. This basis is not related to the need for assuring achievement of water quality standards. Second, a 7-day average, which could comprise up to seven or more daily samples, could average out peak toxic concentrations and therefore the discharge's potential for causing acute toxic effects would be missed.*" (TSD, pg. 96) This Order utilizes maximum daily effluent limitations in lieu of average weekly effluent limitations for ammonia, aluminum, , oil and grease, and total residual chlorine as recommended by the TSD for the achievement of water quality standards and for the protection of the beneficial uses of the receiving stream. Furthermore, for BOD, TSS, pH, coliform, and turbidity, weekly average effluent limitations have been replaced or supplemented with effluent limitations utilizing shorter averaging periods. The rationale for using shorter averaging periods for these constituents is discussed in Attachment F, Section IV.C.3., above.

For effluent limitations based on Primary and Secondary MCLs, except nitrate and nitrite, this Order includes annual average effluent limitations. The Primary and Secondary MCLs are drinking water standards contained in Title 22 of the California Code of Regulations. Title 22 requires compliance with these standards on an annual average basis (except for nitrate and nitrite), when sampling at least quarterly. Since it is necessary to determine compliance on an annual average

basis, it is impracticable to calculate average weekly and average monthly effluent limitations.

3. Satisfaction of Anti-Backsliding Requirements.

Since this Order is a new NPDES permit for a new discharge, the anti-backsliding requirements are not applicable.

4. Satisfaction of Antidegradation Policy

The Discharger developed a report titled, *Antidegradation Analysis for the Ironhouse Sanitary District Wastewater Treatment Plant, December 2007*, (Robertson-Bryan Inc.), that provides a complete antidegradation analysis following the guidance provided by State Water Board APU 90-004. Pursuant to the guidelines, the Report evaluated whether changes in water quality resulting from the proposed new discharge to the San Joaquin River at Jersey Point (4.3 mgd tertiary treated wastewater) are consistent with the maximum benefit to the people of the state, will not unreasonably affect beneficial uses, will not cause water quality to be less than water quality objectives, and that the discharge provides protection for existing in-stream uses and water quality necessary to protect those uses. The Regional Water Board concurs with the Antidegradation Analysis.

a. Water quality parameters and beneficial uses which will be affected by this Order and the extent of the impact. This Order does not adversely impact beneficial uses of the receiving water or downstream receiving waters. All beneficial uses will be maintained and protected. This Order provides for an increase in the volume and mass of pollutants discharged directly to the receiving water. Code of Federal Regulations 40 CFR 131.12 defines the following tier designations to describe water quality in the receiving water body.

Tier 1 Designation: *Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected. (40 CFR 131.12)*

Tier 2 Designation*: Where the quality of waters exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the State finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the State's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the State shall assure water quality adequate to protect existing uses fully. Further, the State shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control. (40 CFR 131.12)*

The tier designation is assigned on a pollutant-by-pollutant basis. The following is the potential effect on water quality parameters regulated in this Order, and was assessed in the Antidegradation Analysis:

- The water quality of San Joaquin River off Jersey Island, with respect to chemical constituents, pH, DO, and turbidity would be minimally affected by the discharge, and water quality necessary to protect beneficial uses would be maintained. This is also expected to be the case for temperature; however, further assessment of this parameter may be warranted in the future.

- The new discharge would use less than 10% of available assimilative capacity for all constituents assessed. The discharge also would negligibly increase loading of bioaccumulative constituents. No beneficial uses of San Joaquin River are anticipated to be adversely affected by the planned action.

b. Scientific Rationale for Determining Potential Lowering of Water Quality. The rationale used in the Antidegradation Analysis is based on Code of Federal Regulation, Section 131.12 (40 CFR 131.12), USEPA memorandum Regarding Tier 2 Antidegradation Reviews and Significance Thresholds (USEPA 2005) USEPA Region 9 Guidance on Implementing the Antidegradation Provisions of 40 CFR 131.12 (USEPA 1987), State Water Board Resolution No. 68-16, a State Water Board 1987 policy memorandum to the Regional Water Quality Control Boards, and an Administrative Procedures Update (APU 90-004) issued by the State Water Board to the Regional Water Quality Control Boards.

The scientific rationale used in the Antidegradation Analysis to determine if the Order allows a lowering of water quality is to determine the reduction of assimilative capacity. Assimilative capacity was calculated on a mass-balanced, concentration basis and, for bioaccumulative constituents, calculated on a mass loading basis. This approach is consistent with recent USEPA guidance and addresses a key objective of the Antidegradation Analysis to “[c]ompare receiving water quality to the water quality objectives established to protect designated beneficial uses” (APU 90-004). USEPA has recommended ten (10) percent as a measure of significance for identifying those substantial lowerings of water quality that should receive a full tier 2 antidegradation review. APU 90-004 requires the consideration of “feasible alternative control measures” as part of the procedures for a complete antidegradation analysis.

The Antidegradation Analysis analyzed each pollutant detected in the effluent and receiving water to determine if the proposed discharge of 4.3 mgd authorized by this Order potentially allows significant increase of the amount of pollutants present in the upstream and downstream receiving water influenced by the proposed discharge. Pollutants that significantly increased concentration or mass downstream would have required an alternatives analysis to determine whether implementation of alternatives to the proposed action would be in the best socioeconomic interest of the people of the region, and be to the maximum

benefit of the people of the State. Details on the scientific rationale are discussed in detail in the Antidegradation Analysis. This includes a detailed discussion on calculating acute, chronic, and long-term water quality effects associated with a continuous discharge to a tidal estuary where the jet-diffuser and tidal flows provide the critical mixing and dilution.

The Regional Water Board concurs with this scientific approach.

c. **Alternative Control Measures.** The Discharger considered several alternatives that would reduce or eliminate the lowering of water quality resulting from the proposed 4.3 mgd discharge. A number of effluent disposal alternatives were assessed to determine if any alternative would substantially reduce or eliminate the lowering of water quality as a result of the proposed 4.3 mgd discharge. These plant expansion alternatives are summarized below:

1. Different levels of treatment to address constituent-specific issues (i.e., extended air oxidation ditch with deep-bed sand filtration, MBR with microfiltration, chlorination, and UV disinfection);

2. Zero discharge (100%) recycling of effluent;

3. Alternative disposal options (percolation ponds, offsite reclamation, wetland construction);

4. Winter-only discharge;

5. Connect to, and expansion of, another regional wastewater treatment plant (conveyance of raw sewage to the Delta Diablo Sanitation District Wastewater Treatment Plant);

6. Combined discharge of treated effluent with the City of Brentwood; and

7. Alternative discharge locations (New York Slough and Sacramento River off Sherman Island).

None of the alternatives evaluated would substantially reduce or eliminate significant water quality impacts of the proposed action, because the proposed action would not significantly degrade water quality. Some of the alternatives may result in water quality effects elsewhere, or other environmental impacts, that are worse than those identified for the proposed action.

d. **Socioeconomic Evaluation.** The objective of the socioeconomic analysis was to determine if the lowering of San Joaquin River water quality off Jersey Island is in the maximum interest of the people of the state. The socioeconomic evaluation considered the social benefits and costs based on the ability to accommodate socioeconomic development in the Contra Costa County General Plan and the City of Oakley General Plan.

Given the current infrastructure, future development in the City of Oakley and surrounding unincorporated Contra Costa County, would rely on the Discharger and its Facility for wastewater collection, treatment, and recycled water services. The plant expansion and new 4.3 mgd surface water discharge would accommodate planned and approved growth in the City of Oakley and surrounding areas. Should the incremental changes in San Joaquin water quality characterized herein be disallowed, such action would: (1) force future developments in the Discharger's service area to find alternative methods for disposing of wastewater; (2) require adding a reverse-osmosis treatment processes to a significant portion of flow, and possibly other plant upgrades, to eliminate the small water quality changes; or (3) prohibit planned and approved development within and adjacent to the Discharger's service area. On balance, allowing the minor degradation of water quality is in the best interest of the people of the area and the state, compared to these other options; and is necessary to accommodate important economic or social development in the area.

e. **Justification for Allowing Degradation.** Potential degradation identified in the Antidegradation Analysis and due to this Order is justified by the following considerations:

1. Implementation of alternatives does not provide important socioeconomic benefit to the people of the region, nor do they provide maximum benefit to the people of the State. The alternatives to the proposed project would inhibit socioeconomic growth making it economically infeasible for any new development to occur.

2. The Discharger's planned wastewater treatment facility will produce Title 22 tertiary treated effluent that will result in minimal water quality degradation. The Discharger's planned wastewater treatment process will meet or exceed the highest statutory and regulatory requirements which meets or exceeds best practical, treatment and control (BPTC);

3. The Order is fully protective of the beneficial uses of the San Joaquin River off Jersey Island. The anticipated water quality changes in the San Joaquin River will not reduce or impair its designated beneficial uses and is consistent with State and federal antidegradation policies;

4. No feasible alternatives currently exist to reduce the impacts; and

5. The Discharger has fully satisfied the requirements of the intergovernmental coordination and public participation provisions of the State's continuing planning process concurrent with the public participation period of this Order.

Summary of Final Effluent Limitations
Discharge Point 001

Table F-10. Summary of Final Effluent Limitations

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
BOD	mg/L	10	15	20		
	lbs/day[7]	359	537	717		
TSS	mg/L	10	15	20		
	lbs/day[7]	359	537	717		
Flow	mgd	4.3				
Ammonia	mg/L	1.1		2.1	---	---
	lbs/day	39.4		75.3	---	---
Nitrate + Nitrite	mg/L	10	---	---	---	---
Aluminum	µg/L	71	---	143	---	---
Manganese	µg/L	50[1]	---	---	---	---
MBAS	mg/L	340[1]	---	---	---	---
Iron	µg/L	300[1]				
Copper, Total	µg/L	8.5		17		
Fluoride	mg/L	19.6	---	---	---	---
Lead, Total	µg/L	3.4		6.9		
Settleable solids	ml/L	0.1	--	0.2	---	---
pH	std units	--	--	--	6.5	8.5
Oil and Grease	mg/L	10		15		
Turbidity[2]	NTU	---	5	2	---	10
Total Residual Chlorine	mg/L	0.01	---	0.02	---	---
Total Coliform[3]	MPN/100 mL	---	---	2.2	---	240
Temperature[4]	ºF					
Acute Toxicity[5]	% survival					
Electrical Conductivity	µmhos/cm	1,505[6]				

1 Annual average effluent limitation
2 Effluent turbidity shall not exceed 2 NTU, as a daily average; 5 NTU, more than 5% of the time within a 24-hour period, and 10 NTU at any time.
3 Effluent total coliform organisms shall not exceed 2.2 MPN/100mL as a 7-day median, 23 MPN/100mL more than once in a 30-day period, and 240 MPN/100mL at any time.
4 Effluent temperature shall not exceed the receiving water temperature by more than 20ºF.
5 Survival of aquatic organisms in 96-hour bioassays of undiluted waste shall be no less than 70%, minimum for any one bioassay; and 90%, median for any three consecutive bioassays.
6 Effluent limitation for EC dependent on assimilative capacity in San Joaquin River at Jersey Point.
7 Based upon a design treatment capacity of 4.3 mgd.

E. Interim Effluent Limitations – Not Applicable

F. Land Discharge Specifications – Not Applicable

1. The Land Discharge Specifications are contained in separate Wastewater Discharge Requirements

G. Reclamation Specifications - Not Applicable

V. RATIONALE FOR RECEIVING WATER LIMITATIONS

Basin Plan water quality objectives to protect the beneficial uses of surface water and groundwater include numeric objectives and narrative objectives, including objectives for chemical constituents, toxicity, and tastes and odors. The toxicity objective requires that surface water and groundwater be maintained free of toxic substances in concentrations that produce detrimental physiological responses in humans, plants, animals, or aquatic life. The chemical constituent objective requires that surface water and groundwater shall not contain chemical constituents in concentrations that adversely affect any beneficial use or that exceed the maximum contaminant levels (MCLs) in Title 22, CCR. The tastes and odors objective states that surface water and groundwater shall not contain taste- or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses. The Basin Plan requires the application of the most stringent objective necessary to ensure that surface water and groundwater do not contain chemical constituents, toxic substances, radionuclides, or taste and odor producing substances in concentrations that adversely affect domestic drinking water supply, agricultural supply, or any other beneficial use.

A. Surface Water

1. CWA section 303(a-c), requires states to adopt water quality standards, including criteria where they are necessary to protect beneficial uses. The Regional Water Board adopted water quality criteria as water quality objectives in the Basin Plan. The Basin Plan states that "*[t]he numerical and narrative water quality objectives define the least stringent standards that the Regional Board will apply to regional waters in order to protect the beneficial uses*." The Basin Plan includes numeric and narrative water quality objectives for various beneficial uses and water bodies. This Order contains Receiving Surface Water Limitations based on the Basin Plan numerical and narrative water quality objectives for biostimulatory substances, chemical constituents, color, dissolved oxygen, floating material, oil and grease, pH, pesticides, radioactivity, salinity, sediment, settleable material, suspended material, tastes and odors, temperature, toxicity, turbidity, and electrical conductivity.

   Numeric Basin Plan objectives for bacteria, dissolved oxygen, pH, temperature, and turbidity are applicable to this discharge and have been incorporated as Receiving Surface Water Limitations. Rational for these numeric receiving surface water

limitations are as follows:

a. ***Ammonia.*** The Basin Plan states that, "[w]*aters shall not contain un-ionized ammonia in amounts which adversely affect beneficial uses. In no case shall the discharge of wastes cause concentrations of un-ionized ammonia (NH_3) to exceed 0.025 mg/l (as N) in receiving waters.*"

b. ***Bacteria.*** The Basin Plan includes a water quality objective that "*[I]n water designated for contact recreation (REC-1), the fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed a geometric mean of 200/100 ml, nor shall more than ten percent of the total number of samples taken during any 30-day period exceed 400/100 ml*." Numeric Receiving Water Limitations for bacteria are included in this Order and are based on the Basin Plan objective.

c. ***Biostimulatory Substances***. The Basin Plan includes a water quality objective that "*[W]ater shall not contain biostimulatory substances which promote aquatic growths in concentrations that cause nuisance or adversely affect beneficial uses."* Receiving Water Limitations for biostimulatory substances are included in this Order and are based on the Basin Plan objective.

d. ***Color***. The Basin Plan includes a water quality objective that "*[W]ater shall be free of discoloration that causes nuisance or adversely affects beneficial uses."* Receiving Water Limitations for color are included in this Order and are based on the Basin Plan objective.

e. ***Chemical Constituents***. The Basin Plan includes a water quality objective that *"[W]aters shall not contain chemical constituents in concentrations that adversely affect beneficial uses."* Receiving Water Limitations for chemical constituents are included in this Order and are based on the Basin Plan objective.

f. ***Dissolved Oxygen.*** The Basin Plan includes a water quality objective that "*[W]ithin the legal boundaries of the Delta, the dissolved oxygen concentrations shall not be reduced below: 7.0 mg/L in the Sacramento River (below the I Street Bridge) and in all Delta waters west of the Antioch Bridge; 6.0 mg/L in the San Joaquin River (between Turner Cut and Stockton, 1 September through 30 November); and 5.0 mg/L in all other Delta waters except those bodies of water which are constructed for special purposes and from which fish have been excluded or where the fishery is not important as a beneficial use*." Numeric Receiving Water Limitations for dissolved oxygen are included in this Order and are based on the Basin Plan objective.

g. ***Floating Material***. The Basin Plan includes a water quality objective that *"[W]ater shall not contain floating material in amounts that cause nuisance or adversely affect beneficial uses."* Receiving Water Limitations for floating material are included in this Order and are based on the Basin Plan objective.

h. ***Oil and Grease**. The Basin Plan includes a water quality objective that *"[W]aters shall not contain oils, greases, waxes, or other materials in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses."* Receiving Water Limitations for oil and grease are included in this Order and are based on the Basin Plan objective.

i. ***pH.** The Basin Plan includes water quality objective that *"[T]he pH shall not be depressed below 6.5 nor raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 in fresh waters with designated COLD or WARM beneficial uses*" This Order includes receiving water limitations for both pH range and pH change.

The Basin Plan allows an appropriate averaging period for pH change in the receiving stream. Since there is no technical information available that indicates that aquatic organisms are adversely affected by shifts in pH within the 6.5 to 8.5 range, an averaging period is considered appropriate and an annual averaging period for determining compliance with the 0.5 receiving water pH limitation is included in this Order.

j. ***Pesticides**. The Basin Plan includes a water quality objective for pesticides beginning on page III-6.00. Receiving Water Limitations for pesticides are included in this Order and are based on the Basin Plan objective.

k. ***Radioactivity**. The Basin Plan includes a water quality objective that *"[R]adionuclides shall not be present in concentrations that are harmful to human, plant, animal or aquatic life nor that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal or aquatic life."* The Basin Plan states further that *"[A]t a minimum, waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of radionuclides in excess of the maximum contaminant levels (MCLs) specified in Table 4 (MCL Radioactivity) of Section 64443 of Title 22 of the California Code of Regulations…"* Receiving Water Limitations for radioactivity are included in this Order and are based on the Basin Plan objective.

l. ***Sediment.** The Basin Plan includes a water quality objective that *"[T]he suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses"* Receiving Water Limitations for suspended sediments are included in this Order and are based on the Basin Plan objective.

m. ***Settleable Material.** The Basin Plan includes a water quality objective that *"[W]aters shall not contain substances in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses."* Receiving Water Limitations for settleable material are included in this Order and are based on the Basin Plan objective.

n. ***Suspended Material.** The Basin Plan includes a water quality objective that *"[W]aters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses."* Receiving Water Limitations for suspended material are included in this Order and are based on the Basin Plan objective.

o. ***Taste and Odors**. The Basin Plan includes a water quality objective that *"[W]ater shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses."* Receiving Water Limitations for taste- or odor-producing substances are included in this Order and are based on the Basin Plan objective.

p. **Temperature.** The Thermal Plan is applicable to this discharge. The Thermal Plan requires that the discharge shall not cause the following in San Joaquin River:

i. The creation of a zone, defined by water temperatures of more than 1°F above natural receiving water temperature, which exceeds 25 percent of the cross-sectional area of the river channel at any point.

ii. A surface water temperature rise greater than 4°F above the natural temperature of the receiving water at any time or place.

Receiving Water Limitations for temperature are included in this Order and are based on the Thermal Plan requirements.

q. ***Toxicity**. The Basin Plan includes a water quality objective that *"[A]ll waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life."* Receiving Water Limitations for toxicity are included in this Order and are based on the Basin Plan objective.

r. ***Turbidity.** The Basin Plan includes a water quality objective that "*[I]ncreases in turbidity attributable to controllable water quality factors shall not exceed the following limits:*

- *Where natural turbidity is between 0 and 5 Nephelometric Turbidity Units (NTUs), increases shall not exceed 1 NTU.*
- *Where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20 percent.*
- *Where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTUs.*

- *Where natural turbidity is greater than 100 NTUs, increases shall not exceed 10 percent*."

A numeric Receiving Surface Water Limitation for turbidity is included in this Order and is based on the Basin Plan objective for turbidity.

B. Groundwater – Not Applicable

Discharges to land are regulated by separate waste discharge requirements.

VI. RATIONALE FOR MONITORING AND REPORTING REQUIREMENTS

Section 122.48 requires that all NPDES permits specify requirements for recording and reporting monitoring results. Water Code sections 13267 and 13383 authorizes the Regional Water Board to require technical and monitoring reports. The Monitoring and Reporting Program (MRP), Attachment E of this Order, establishes monitoring and reporting requirements to implement federal and state requirements. The following provides the rationale for the monitoring and reporting requirements contained in the MRP for this facility.

A. Influent Monitoring

1. Influent monitoring is required to collect data on the characteristics of the wastewater and to assess compliance with effluent limitations (*e.g.*, BOD and TSS reduction requirements).

B. Effluent Monitoring

1. Pursuant to the requirements of 40 CFR §122.44(i)(2) effluent monitoring is required for all constituents with effluent limitations. Effluent monitoring is necessary to assess compliance with effluent limitations, assess the effectiveness of the treatment process, and to assess the impacts of the discharge on the receiving stream.

2. The SIP states that if "…*all reported detection limits of the pollutant in the effluent are greater than or equal to the C* [water quality criterion or objective] *value, the RWQCB* [Regional Water Board] *shall establish interim requirements…that require additional monitoring for the pollutant….*" The Constituent Study required in Section Section 2.b. Special Studies will be completed when operational data is available and all reported detection limits for all constituents are to be less than or equal to corresponding applicable water quality criteria or objectives. Monitoring for these constituents has been included in this Order in accordance with the SIP.

C. Whole Effluent Toxicity Testing Requirements

1. **Acute Toxicity.** Weekly 96-hour bioassay testing is required to demonstrate compliance with the effluent limitation for acute toxicity. The Delta is 303(d) listed for unknown toxicity. If the discharge does not exceed the acute toxicity effluent limitations during the first 12 months following initiation of discharge, the monitoring frequency may be reduced to monthly.

2. **Chronic Toxicity.** Monthly chronic whole effluent toxicity testing is required in order to demonstrate compliance with the Basin Plan's narrative toxicity objective. If the Discharger is not required to initiate a Toxicity Reduction Evaluation during the first 12 months following initiation of discharge (per Section VI.C.2.a. of the Limitations and Discharge Specifications), the monitoring frequency may be reduced to quarterly.

D. Receiving Water Monitoring

1. Surface Water

a. Receiving water monitoring is necessary to assess compliance with receiving water limitations and to assess the impacts of the discharge on the receiving stream.

2. Groundwater – Not Applicable

E. Other Monitoring Requirements

1. **Water Supply Monitoring**

   Water supply monitoring is required to evaluate the source of constituents in the wastewater.

VII. RATIONALE FOR PROVISIONS

A. Standard Provisions

Standard Provisions, which apply to all NPDES permits in accordance with section 122.41, and additional conditions applicable to specified categories of permits in accordance with section 122.42, are provided in Attachment D. The discharger must comply with all standard provisions and with those additional conditions that are applicable under section 122.42.

Section 122.41(a)(1) and (b) through (n) establish conditions that apply to all State-issued NPDES permits. These conditions must be incorporated into the permits either

expressly or by reference. If incorporated by reference, a specific citation to the regulations must be included in the Order. Section 123.25(a)(12) allows the state to omit or modify conditions to impose more stringent requirements. In accordance with section 123.25, this Order omits federal conditions that address enforcement authority specified in sections 122.41(j)(5) and (k)(2) because the enforcement authority under the Water Code is more stringent. In lieu of these conditions, this Order incorporates by reference Water Code section 13387(e).

B. Special Provisions

1. Reopener Provisions

a. **Mercury, EC, Diazinon and Chloropyifos TMDLs.** This reopener provision allows the Regional Water Board to reopen this Order for addition and/or modification of effluent limitations and requirements for total or methyl mercury, electrical conductivity or diazinon or chloropyrfos should TMDLs be adopted by the Board,

b. **Pollution Prevention.** This Order requires the Discharger prepare pollution prevention plans following CWC section 13263.3(d)(3) for aluminum, manganese, mercury and electrical conductivity. This reopener provision allows the Regional Water Board to reopen this Order for addition and/or modification of effluent limitations and requirements for these constituents based on a review of the pollution prevention plans.

c. **Whole Effluent Toxicity.** This Order requires the Discharger to investigate the causes of, and identify corrective actions to reduce or eliminate effluent toxicity through a Toxicity Reduction Evaluation (TRE). This Order may be reopened to include a numeric chronic toxicity limitation, a new acute toxicity limitation, and/or a limitation for a specific toxicant identified in the TRE. Additionally, if a numeric chronic toxicity water quality objective is adopted by the State Water Board, this Order may be reopened to include a numeric chronic toxicity limitation based on that objective.

d. **Water Effects Ratio (WER) and Metal Translators.** A default WER of 1.0 has been used in this Order for calculating CTR criteria for applicable priority pollutant inorganic constituents. In addition, default dissolved-to-total metal translators have been used to convert water quality objectives from dissolved to total recoverable when developing effluent limitations for several constituents. If the Discharger performs studies to determine site-specific WERs and/or site-specific dissolved-to-total metal translators, this Order may be reopened to modify the effluent limitations for the applicable inorganic constituents.

e. **Constituent Study.** This Order requires the Discharger to conduct a constituent study to determine both reasonable potential and facility performance once the facility is operating. This reopener provision allows the Regional Water Board to reopen this Order for addition and/or modification of effluent limitations and requirements for any constituents based on a review of the constituent study.

f. **Bis(2-ethylhexyl)phthalate Study, EC site-specific Study.** This Order requires the Discharger to conduct a site-specific study for EC, and collect and analyze bis(2-ethlyhexyl)phthalate using a clean technique. This Order may be reopened pending the results of these studies and establish new limitations.

g. **Water Reclamation**. This Order requires the Discharger to evaluate water reclamation alternative for existing and future users in the Delta Diablo Sanitation District service area. Should the evaluation demonstrate potential reuse, the Order may be reopened to modify the permit as necessary.

h. **Hardness-Dependent Metals Criteria.** The Discharger only supplied one hardness data point of the influent as an estimate of the proposed effluent hardness. In order to utilize the procedures outlined in Section IV.C.2.b. (Attachment F) for calculating water quality-based effluent limitations (WQBELs) for metals with hardness-dependent CTR criteria, it is necessary to have sufficient effluent hardness data to ensure that protective WQBELs are calculated. A conservative measurement of hardness was used in the calculation of the WQBELs for copper and lead (see Section IV.C.2.b.) A study is required to monitor the influent hardness for one-year to provide sufficient data to calculate the WQBELs. This Order may be reopened to modify the WQBELs for metals with hardness-dependent CTR criteria based on the results of the study.

2. Special Studies and Additional Monitoring Requirements

a. **Chronic Whole Effluent Toxicity Requirements.** The Basin Plan contains a narrative toxicity objective that states, “All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.” (Basin Plan at III-8.00.) Adequate WET data is not available to determine if the discharge has reasonable potential to cause or contribute to an in-stream excursion above of the Basin Plan’s narrative toxicity objective. Attachment E of this Order requires Quarterly chronic WET monitoring for demonstration of compliance with the narrative toxicity objective.

In addition to WET monitoring, this provision requires the Discharger to submit to the Regional Water Board an Initial Investigative TRE Work Plan for approval by the Executive Officer, to ensure the Discharger has a plan to immediately move forward with the initial tiers of a TRE, in the event effluent toxicity is encountered in the future. The provision also includes a numeric toxicity monitoring trigger and requirements for accelerated monitoring, as well as, requirements for TRE initiation if a pattern of toxicity is demonstrated.

Monitoring Trigger. A numeric toxicity monitoring trigger of > 16 TUc (where TUc = 100/NOEC) is applied in the provision, because this Order does not allow

any dilution for the chronic condition. Therefore, a TRE is triggered when the effluent exhibits a pattern of toxicity at 100% effluent.

Accelerated Monitoring. The provision requires accelerated WET testing when a regular WET test result exceeds the monitoring trigger. The purpose of accelerated monitoring is to determine, in an expedient manner, whether there is a pattern of toxicity before requiring the implementation of a TRE. Due to possible seasonality of the toxicity, the accelerated monitoring should be performed in a timely manner, preferably taking no more than 2 to 3 months to complete.

The provision requires accelerated monitoring consisting of four chronic toxicity tests every two weeks using the species that exhibited toxicity. Guidance regarding accelerated monitoring and TRE initiation is provided in the *Technical Support Document for Water Quality-based Toxics Control, EPA/505/2-90-001, March 1991* (TSD). The TSD at page 118 states, "EPA recommends if toxicity is repeatedly or periodically present at levels above effluent limits more than 20 percent of the time, a TRE should be required." Therefore, four accelerated monitoring tests are required in this provision. If no toxicity is demonstrated in the four accelerated tests, then it demonstrates that toxicity is not present at levels above the monitoring trigger more than 20 percent of the time (only 1 of 5 tests are toxic, including the initial test). However, notwithstanding the accelerated monitoring results, if there is adequate evidence of a pattern of effluent toxicity (i.e. toxicity present exceeding the monitoring trigger more than 20 percent of the time), the Executive Officer may require that the Discharger initiate a TRE.

See the WET Accelerated Monitoring Flow Chart (Figure F-1), below, for further clarification of the accelerated monitoring requirements and for the decision points for determining the need for TRE initiation.

TRE Guidance. The Discharger is required to prepare a TRE Work Plan in accordance with USEPA guidance. Numerous guidance documents are available, as identified below:

- *Toxicity Reduction Evaluation Guidance for Municipal Wastewater Treatment Plants,* (EPA/833B-99/002), August 1999.

- Generalized Methodology for Conducting Industrial TREs*, (EPA/600/2-88/070), April 1989.*

- *Methods for Aquatic Toxicity Identification Evaluations: Phase I Toxicity Characterization Procedures,* Second Edition, EPA 600/6-91/005F, February 1991.

- *Toxicity Identification Evaluation: Characterization of Chronically Toxic Effluents, Phase I*, EPA 600/6-91/005F, May 1992.

- *Methods for Aquatic Toxicity Identification Evaluations: Phase II Toxicity Identification Procedures for Samples Exhibiting acute and Chronic Toxicity,* Second Edition, EPA 600/R-92/080, September 1993.

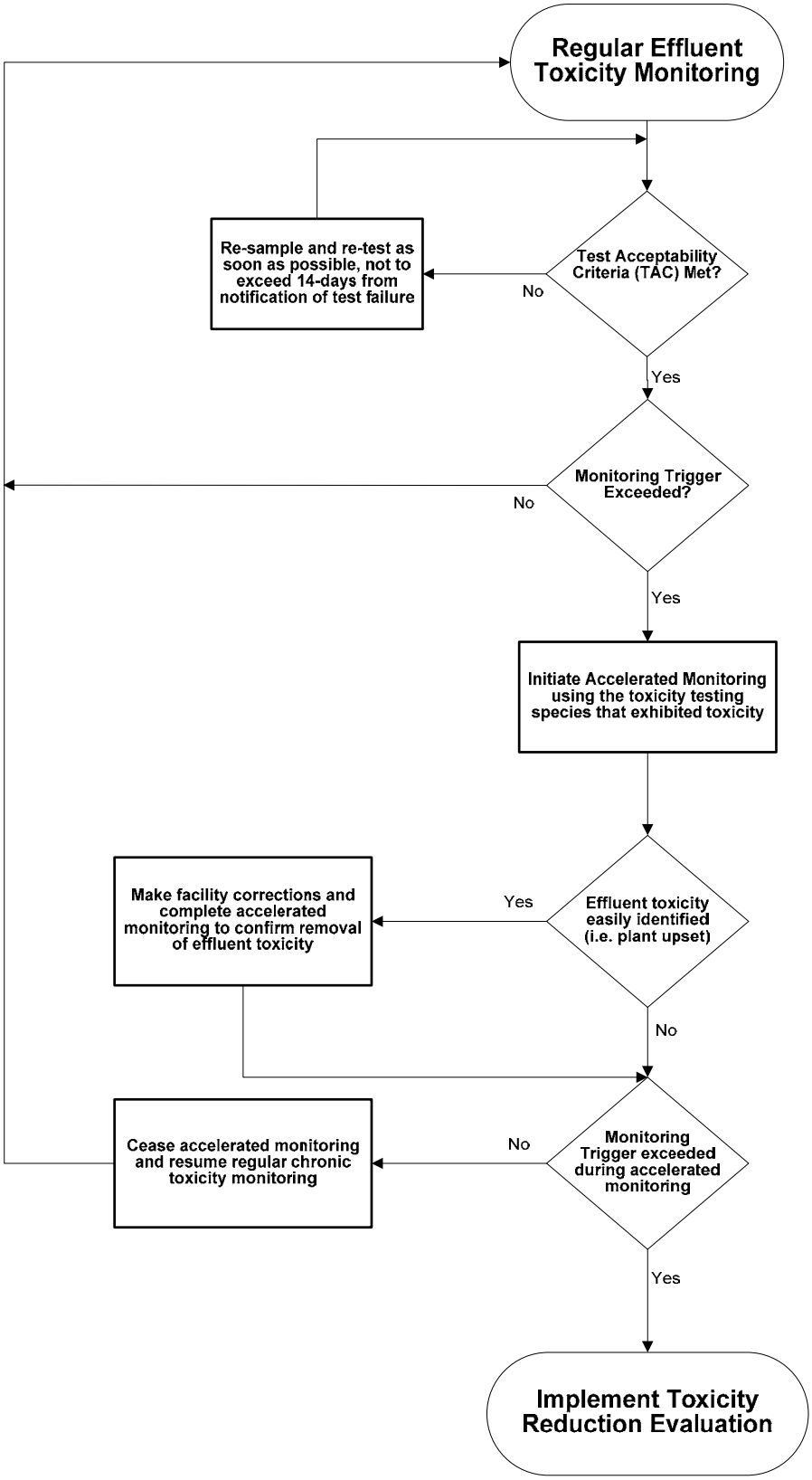
- *Methods for Aquatic Toxicity Identification Evaluations: Phase III Toxicity Confirmation Procedures for Samples Exhibiting Acute and Chronic Toxicity*, Second Edition, EPA 600/R-92/081, September 1993.

- *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, Fifth Edition, EPA-821-R-02-012, October 2002.

- *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Fourth Edition, EPA-821-R-02-013, October 2002.

- *Technical Support Document for Water Quality-based Toxics Control, EPA/505/2-90-001, March 1991*

Figure F-1
WET Accelerated Monitoring Flow Chart



c. **Constituent Study.** This Order requires the Discharger to conduct a constituent study to determine both reasonable potential and facility performance once the facility is operating. This reopener provision allows the Regional Water Board to reopen this Order for addition and/or modification of effluent limitations and requirements for any constituents based on a review of the constituent study.

f. **Reclamation Study**. The Discharger shall conduct a wastewater reclamation study. The study will identify existing and potential reclaimed water users and include an economic analysis of reclaiming wastewater. The Discharger shall complete and submit the study prior to initiating discharge to the San Joaquin River and no later than 31 December 2008.

g. **Influent Hardness Study**. For one year, the Discharger shall conduct twice monthly hardness monitoring (as $CaCO_3$) of the influent to the existing wastewater treatment plant to better estimate the hardness of the effluent that will be discharged to the San Joaquin River. This Order may be reopened to modify the effluent limitations for metals with hardness-based CTR criteria. **The Discharger shall submit the results of the study within 18 months following adoption of this Order.**

The Discharger only supplied one hardness data point of the influent as an estimate of the proposed effluent hardness. In order to utilize the procedures outlined in Section IV.C.2.b. (Attachment F) for calculating effluent limitations for metals with hardness-dependent CTR criteria, it is necessary to have sufficient effluent hardness data to ensure that protective WQBELs are calculated. A conservative measurement of hardness was used in the calculation of the WQBELs for copper and lead (see Section IV.C.2.b.) This study will provide sufficient data to calculate the WQBELs. This Order may be reopened to modify the WQBELs for metals with hardness-dependent CTR criteria based on the results of the study.

3. Best Management Practices and Pollution Prevention

a. **Pollution Prevention Plan (PPP) for salinity and mercury.** A PPP for mercury and salinity is required in this Order per CWC section 13263.3(d)(3), as outlined in subsection b., below.

b. **CWC section 13263.3(d)(3) Pollution Prevention Plans.** The pollution prevention plans required for aluminum, salinity, manganese, mercury, iron, copper, lead and chloride shall, at minimum, meet the requirements outlined in CWC section 13263.3(d)(3). The minimum requirements for the pollution prevention plans include the following:

i. An estimate of all of the sources of a pollutant contributing, or potentially contributing, to the loadings of a pollutant in the treatment plant influent.

ii. An analysis of the methods that could be used to prevent the discharge of the pollutants into the Facility, including application of local limits to industrial or commercial dischargers regarding pollution prevention techniques, public education and outreach, or other innovative and alternative approaches to reduce discharges of the pollutant to the Facility. The analysis also shall identify sources, or potential sources, not within the ability or authority of the Discharger to control, such as pollutants in the potable water supply, airborne pollutants, pharmaceuticals, or pesticides, and estimate the magnitude of those sources, to the extent feasible.

iii. An estimate of load reductions that may be attained through the methods identified in subparagraph ii.

iv. A plan for monitoring the results of the pollution prevention program.

v. A description of the tasks, cost, and time required to investigate and implement various elements in the pollution prevention plan.

vi. A statement of the Discharger's pollution prevention goals and strategies, including priorities for short-term and long-term action, and a description of the Discharger's intended pollution prevention activities for the immediate future.

vii. A description of the Discharger's existing pollution prevention programs.

viii. An analysis, to the extent feasible, of any adverse environmental impacts, including cross-media impacts or substitute chemicals that may result from the implementation of the pollution prevention program.

ix. An analysis, to the extent feasible, of the costs and benefits that may be incurred to implement the pollution prevention program.

4. Construction, Operation, and Maintenance Specifications – Not Applicable

5. **Special Provisions for Municipal Facilities (POTWs Only)**

a. Collection System. On May 2, 2006, the State Water Board adopted State Water Board Order 2006-0003, a Statewide General WDR for Sanitary Sewer Systems. The Discharger shall be subject to the requirements of Order 2006-0003 and any future revisions thereto. Order 2006-0003 requires that all public agencies that currently own or operate sanitary sewer systems apply for coverage under the General WDR. The Discharger has applied for and has been approved for coverage under State Water Board Order 2006-0003 for operation of its

wastewater collection system in October 2006.

Regardless of the coverage obtained under Order 2006-0003, the Discharger's collection system is part of the treatment system that is subject to this Order. As such, pursuant to federal regulations, the Discharger must properly operate and maintain its collection system [40 CFR section 122.41(e)], report any non-compliance [40 CFR section 122.41(l)(6) and (7)], and mitigate any discharge from the collection system in violation of this Order [40 CFR. section 122.41(d)].

6. Other Special Provisions

7. Compliance Schedules

a. **Initiation of Surface Water Discharge.** The surface water discharge to the San Joaquin River is contingent upon compliance with the following conditions:

i. **Outfall Diffuser.** The Discharger shall design, acquire necessary permits by appropriate agencies, and construct an outfall and diffuser to the San Joaquin river at Discharge Point EFF-001.

ii. **Facility Upgrades.** The Discharger shall have constructed the necessary Facility upgrades as described in Section VI.C.4.

iii. **Submit Waste Discharge Requirements (WDRs).** The Discharger shall submit a Report of Waste Discharge for land disposal and reclamation based on the new Facility.

iv. **Request for Surface Water Discharge.** The Discharger shall submit to the Regional Water Board a request for a surface water discharge to the San Joaquin River, which demonstrates compliance with items i. through iii., above. The surface water discharge is prohibited until the Executive Officer verifies compliance with Special Provisions VI.C.7.a., and approves the Discharger's request.

VIII. PUBLIC PARTICIPATION

The California Regional Water Quality Control Board, Central Valley Region (Regional Water Board) is considering the issuance of waste discharge requirements (WDRs) that will serve as a National Pollutant Discharge Elimination System (NPDES) permit for Ironhouse Sanitary District Wastewater Treatment Plant. As a step in the WDR adoption process, the Regional Water Board staff has developed tentative WDRs. The Regional Water Board encourages public participation in the WDR adoption process.

A. Notification of Interested Parties

The Regional Water Board has notified the Discharger and interested agencies and persons of its intent to prescribe waste discharge requirements for the discharge and has provided them with an opportunity to submit their written comments and recommendations. Notification was provided through the following Contra Costa Times on 14 February 2008 and the Oakley Post Office and the Bethel Island Post Office on 12 February 2009.

B. Written Comments

The staff determinations are tentative. Interested persons are invited to submit written comments concerning these tentative WDRs. Comments must be submitted either in person or by mail to the Executive Office at the Regional Water Board at the address above on the cover page of this Order.

To be fully responded to by staff and considered by the Regional Water Board, written comments should be received at the Regional Water Board offices by 5:00 p.m. on 14 March 2008.

C. Public Hearing

The Regional Water Board will hold a public hearing on the tentative WDRs during its regular Board meeting on the following date and time and at the following location:

Date:	24/25 April 2008
Time:	8:30 am
Location:	Regional Water Quality Control Board, Central Valley Region 11020 Sun Center Dr., Suite #200 Rancho Cordova, CA 95670

Interested persons are invited to attend. At the public hearing, the Regional Water Board will hear testimony, if any, pertinent to the discharge, WDRs, and permit. Oral testimony will be heard; however, for accuracy of the record, important testimony should be in writing.

Please be aware that dates and venues may change. Our Web address is http://www.waterboards.ca.gov/rwqcb5/ where you can access the current agenda for changes in dates and locations.

D. Waste Discharge Requirements Petitions

Any aggrieved person may petition the State Water Resources Control Board to review the decision of the Regional Water Board regarding the final WDRs. The petition must be submitted within 30 days of the Regional Water Board's action to the following address:

State Water Resources Control Board
Office of Chief Counsel
P.O. Box 100, 1001 I Street
Sacramento, CA 95812-0100

E. Information and Copying

The Report of Waste Discharge (RWD), related documents, tentative effluent limitations and special provisions, comments received, and other information are on file and may be inspected at the address above at any time between 8:30 a.m. and 4:45 p.m., Monday through Friday. Copying of documents may be arranged through the Regional Water Board by calling (916) 464-3281.

F. Register of Interested Persons

Any person interested in being placed on the mailing list for information regarding the WDRs and NPDES permit should contact the Regional Water Board, reference this facility, and provide a name, address, and phone number.

G. Additional Information

Requests for additional information or questions regarding this order should be directed to Kathleen Cole Harder at (916) 464-4778.

Attachment G - Constituents to be monitored

			Controlling Water Quality Criterion for Surface Waters			
CTR #	Constituent	CAS Number	Basis	Criterion Concentration (ug/L or noted) (1)	Criterion Quantitation Limit (ug/L or noted)	Suggested Test Methods
VOLATILE ORGANICS						
28	1,1-Dichloroethane	75343	Primary MCL	5	0.5	EPA 8260B
30	1,1-Dichloroethene	75354	National Toxics Rule	0.057	0.5	EPA 8260B
41	1,1,1-Trichloroethane	71556	Primary MCL	200	0.5	EPA 8260B
42	1,1,2-Trichloroethane	79005	National Toxics Rule	0.6	0.5	EPA 8260B
37	1,1,2,2-Tetrachloroethane	79345	National Toxics Rule	0.17	0.5	EPA 8260B
75	1,2-Dichlorobenzene	95501	Taste & Odor	10	0.5	EPA 8260B
29	1,2-Dichloroethane	107062	National Toxics Rule	0.38	0.5	EPA 8260B
	cis-1,2-Dichloroethene	156592	Primary MCL	6	0.5	EPA 8260B
31	1,2-Dichloropropane	78875	Calif. Toxics Rule	0.52	0.5	EPA 8260B
101	1,2,4-Trichlorobenzene	120821	Public Health Goal	5	0.5	EPA 8260B
76	1,3-Dichlorobenzene	541731	Taste & Odor	10	0.5	EPA 8260B
32	1,3-Dichloropropene	542756	Primary MCL	0.5	0.5	EPA 8260B
77	1,4-Dichlorobenzene	106467	Primary MCL	5	0.5	EPA 8260B
17	Acrolein	107028	Aquatic Toxicity	21	2	EPA 8260B
18	Acrylonitrile	107131	National Toxics Rule	0.059	2	EPA 8260B
19	Benzene	71432	Primary MCL	1	0.5	EPA 8260B
20	Bromoform	75252	Calif. Toxics Rule	4.3	0.5	EPA 8260B
34	Bromomethane	74839	Calif. Toxics Rule	48	1	EPA 8260B
21	Carbon tetrachloride	56235	National Toxics Rule	0.25	0.5	EPA 8260B
22	Chlorobenzene (mono chlorobenzene)	108907	Taste & Odor	50	0.5	EPA 8260B
24	Chloroethane	75003	Taste & Odor	16	0.5	EPA 8260B
25	2- Chloroethyl vinyl ether	110758	Aquatic Toxicity	122 (3)	1	EPA 8260B
26	Chloroform	67663	OEHHA Cancer Risk	1.1	0.5	EPA 8260B
35	Chloromethane	74873	USEPA Health Advisory	3	0.5	EPA 8260B
23	Dibromochloromethane	124481	Calif. Toxics Rule	0.41	0.5	EPA 8260B
27	Dichlorobromomethane	75274	Calif. Toxics Rule	0.56	0.5	EPA 8260B
36	Dichloromethane	75092	Calif. Toxics Rule	4.7	0.5	EPA 8260B
33	Ethylbenzene	100414	Taste & Odor	29	0.5	EPA 8260B
88	Hexachlorobenzene	118741	Calif. Toxics Rule	0.00075	1	EPA 8260B
89	Hexachlorobutadiene	87683	National Toxics Rule	0.44	1	EPA 8260B
91	Hexachloroethane	67721	National Toxics Rule	1.9	1	EPA 8260B
94	Naphthalene	91203	USEPA IRIS	14	10	EPA 8260B
38	Tetrachloroethene	127184	National Toxics Rule	0.8	0.5	EPA 8260B
39	Toluene	108883	Taste & Odor	42	0.5	EPA 8260B
40	trans-1,2-Dichloroethylene	156605	Primary MCL	10	0.5	EPA 8260B
43	Trichloroethene	79016	National Toxics Rule	2.7	0.5	EPA 8260B
44	Vinyl chloride	75014	Primary MCL	0.5	0.5	EPA 8260B
	Methyl-tert-butyl ether (MTBE)	1634044	Secondary MCL	5	0.5	EPA 8260B
	Trichlorofluoromethane	75694	Primary MCL	150	5	EPA 8260B
	1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	Primary MCL	1200	10	EPA 8260B
	Styrene	100425	Taste & Odor	11	0.5	EPA 8260B
	Xylenes	1330207	Taste & Odor	17	0.5	EPA 8260B

SEMI-VOLATILE ORGANICS						
60	1,2-Benzanthracene	56553	Calif. Toxics Rule	0.0044	5	EPA 8270C
85	1,2-Diphenylhydrazine	122667	National Toxics Rule	0.04	1	EPA 8270C
45	2-Chlorophenol	95578	Taste and Odor	0.1	2	EPA 8270C
46	2,4-Dichlorophenol	120832	Taste and Odor	0.3	1	EPA 8270C
47	2,4-Dimethylphenol	105679	Calif. Toxics Rule	540	2	EPA 8270C
49	2,4-Dinitrophenol	51285	National Toxics Rule	70	5	EPA 8270C
82	2,4-Dinitrotoluene	121142	National Toxics Rule	0.11	5	EPA 8270C
55	2,4,6-Trichlorophenol	88062	Taste and Odor	2	10	EPA 8270C
83	2,6-Dinitrotoluene	606202	USEPA IRIS	0.05	5	EPA 8270C
50	2-Nitrophenol	25154557	Aquatic Toxicity	150 (5)	10	EPA 8270C
71	2-Chloronaphthalene	91587	Aquatic Toxicity	1600 (6)	10	EPA 8270C
78	3,3'-Dichlorobenzidine	91941	National Toxics Rule	0.04	5	EPA 8270C
62	3,4-Benzofluoranthene	205992	Calif. Toxics Rule	0.0044	10	EPA 8270C
52	4-Chloro-3-methylphenol	59507	Aquatic Toxicity	30	5	EPA 8270C
48	4,6-Dinitro-2-methylphenol	534521	National Toxics Rule	13.4	10	EPA 8270C
51	4-Nitrophenol	100027	USEPA Health Advisory	60	5	EPA 8270C
69	4-Bromophenyl phenyl ether	101553	Aquatic Toxicity	122	10	EPA 8270C
72	4-Chlorophenyl phenyl ether	7005723	Aquatic Toxicity	122 (3)	5	EPA 8270C
56	Acenaphthene	83329	Taste and Odor	20	1	EPA 8270C
57	Acenaphthylene	208968	No Criteria Available		10	EPA 8270C
58	Anthracene	120127	Calif. Toxics Rule	9,600	10	EPA 8270C
59	Benzidine	92875	National Toxics Rule	0.00012	5	EPA 8270C
61	Benzo(a)pyrene (3,4-Benzopyrene)	50328	Calif. Toxics Rule	0.0044	0.1	EPA 8270C
63	Benzo(g,h,i)perylene	191242	No Criteria Available		5	EPA 8270C
64	Benzo(k)fluoranthene	207089	Calif. Toxics Rule	0.0044	2	EPA 8270C
65	Bis(2-chloroethoxy) methane	111911	No Criteria Available		5	EPA 8270C
66	Bis(2-chloroethyl) ether	111444	National Toxics Rule	0.031	1	EPA 8270C
67	Bis(2-chloroisopropyl) ether	39638329	Aquatic Toxicity	122 (3)	10	EPA 8270C
68	Bis(2-ethylhexyl) phthalate	117817	National Toxics Rule	1.8	3	EPA 8270C
70	Butyl benzyl phthalate	85687	Aquatic Toxicity	3 (7)	10	EPA 8270C
73	Chrysene	218019	Calif. Toxics Rule	0.0044	5	EPA 8270C
81	Di-n-butylphthalate	84742	Aquatic Toxicity	3 (7)	10	EPA 8270C
84	Di-n-octylphthalate	117840	Aquatic Toxicity	3 (7)	10	EPA 8270C
74	Dibenzo(a,h)-anthracene	53703	Calif. Toxics Rule	0.0044	0.1	EPA 8270C
79	Diethyl phthalate	84662	Aquatic Toxicity	3 (7)	2	EPA 8270C
80	Dimethyl phthalate	131113	Aquatic Toxicity	3 (7)	2	EPA 8270C
86	Fluoranthene	206440	Calif. Toxics Rule	300	10	EPA 8270C
87	Fluorene	86737	Calif. Toxics Rule	1300	10	EPA 8270C
90	Hexachlorocyclopentadiene	77474	Taste and Odor	1	1	EPA 8270C
92	Indeno(1,2,3-c,d)pyrene	193395	Calif. Toxics Rule	0.0044	0.05	EPA 8270C
93	Isophorone	78591	National Toxics Rule	8.4	1	EPA 8270C
98	N-Nitrosodiphenylamine	86306	National Toxics Rule	5	1	EPA 8270C
96	N-Nitrosodimethylamine	62759	National Toxics Rule	0.00069	5	EPA 8270C
97	N-Nitrosodi-n-propylamine	621647	Calif. Toxics Rule	0.005	5	EPA 8270C
95	Nitrobenzene	98953	National Toxics Rule	17	10	EPA 8270C
53	Pentachlorophenol	87865	Calif. Toxics Rule	0.28	0.2	EPA 8270C
99	Phenanthrene	85018	No Criteria Available		5	EPA 8270C
54	Phenol	108952	Taste and Odor	5	1	EPA 8270C
100	Pyrene	129000	Calif. Toxics Rule	960	10	EPA 8270C

INORGANICS						
	Aluminum	7429905	Ambient Water Quality	87	50	EPA 6020/200.8
1	Antimony	7440360	Primary MCL	6	5	EPA 6020/200.8
2	Arsenic	7440382	Ambient Water Quality	0.018	0.01	EPA 1632
15	Asbestos	1332214	National Toxics Rule/ Primary MCL	7 MFL	0.2 MFL >10um	EPA/600/R-93/116(PCM)
	Barium	7440393	Basin Plan Objective	100	100	EPA 6020/200.8
3	Beryllium	7440417	Primary MCL	4	1	EPA 6020/200.8
4	Cadmium	7440439	Public Health Goal	0.07	0.25	EPA 1638/200.8
5a	Chromium (total)	7440473	Primary MCL	50	2	EPA 6020/200.8
5b	Chromium (VI)	18540299	Public Health Goal	0.2	0.5	EPA 7199/ 1636
6	Copper	7440508	National Toxics Rule	4.1 (2)	0.5	EPA 6020/200.8
14	Cyanide	57125	National Toxics Rule	5.2	5	EPA 9012A
	Fluoride	7782414	Public Health Goal	1000	0.1	EPA 300
	Iron	7439896	Secondary MCL	300	100	EPA 6020/200.8
7	Lead	7439921	Calif. Toxics Rule	0.92 (2)	0.5	EPA 1638
8	Mercury	7439976	TMDL Development		0.0002 (11)	EPA 1669/1631
	Manganese	7439965	Secondary MCL/ Basin Plan Objective	50	20	EPA 6020/200.8
9	Nickel	7440020	Calif. Toxics Rule	24 (2)	5	EPA 6020/200.8
10	Selenium	7782492	Calif. Toxics Rule	5 (8)	5	EPA 6020/200.8
11	Silver	7440224	Calif. Toxics Rule	0.71 (2)	1	EPA 6020/200.8
12	Thallium	7440280	National Toxics Rule	1.7	1	EPA 6020/200.8
	Tributyltin	688733	Ambient Water Quality	0.063	0.002	EV-024/025
13	Zinc	7440666	Calif. Toxics Rule/ Basin Plan Objective	54/ 16 (2)	10	EPA 6020/200.8
PESTICIDES - PCBs						
110	4,4'-DDD	72548	Calif. Toxics Rule	0.00083	0.02	EPA 8081A
109	4,4'-DDE	72559	Calif. Toxics Rule	0.00059	0.01	EPA 8081A
108	4,4'-DDT	50293	Calif. Toxics Rule	0.00059	0.01	EPA 8081A
112	alpha-Endosulfan	959988	National Toxics Rule	0.056 (9)	0.02	EPA 8081A
103	alpha-Hexachlorocyclohexane (BHC)	319846	Calif. Toxics Rule	0.0039	0.01	EPA 8081A
	Alachlor	15972608	Primary MCL	2	1	EPA 8081A
102	Aldrin	309002	Calif. Toxics Rule	0.00013	0.005	EPA 8081A
113	beta-Endosulfan	33213659	Calif. Toxics Rule	0.056 (9)	0.01	EPA 8081A
104	beta-Hexachlorocyclohexane	319857	Calif. Toxics Rule	0.014	0.005	EPA 8081A
107	Chlordane	57749	Calif. Toxics Rule	0.00057	0.1	EPA 8081A
106	delta-Hexachlorocyclohexane	319868	No Criteria Available		0.005	EPA 8081A
111	Dieldrin	60571	Calif. Toxics Rule	0.00014	0.01	EPA 8081A
114	Endosulfan sulfate	1031078	Ambient Water Quality	0.056	0.05	EPA 8081A
115	Endrin	72208	Calif. Toxics Rule	0.036	0.01	EPA 8081A
116	Endrin Aldehyde	7421934	Calif. Toxics Rule	0.76	0.01	EPA 8081A
117	Heptachlor	76448	Calif. Toxics Rule	0.00021	0.01	EPA 8081A
118	Heptachlor Epoxide	1024573	Calif. Toxics Rule	0.0001	0.01	EPA 8081A
105	Lindane (gamma-Hexachlorocyclohexane)	58899	Calif. Toxics Rule	0.019	0.019	EPA 8081A
119	PCB-1016	12674112	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082
120	PCB-1221	11104282	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082

121	PCB-1232	11141165	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082
122	PCB-1242	53469219	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082
123	PCB-1248	12672296	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082
124	PCB-1254	11097691	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082
125	PCB-1260	11096825	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082
126	Toxaphene	8001352	Calif. Toxics Rule	0.0002	0.5	EPA 8081A
	Atrazine	1912249	Public Health Goal	0.15	1	EPA 8141A
	Bentazon	25057890	Primary MCL	18	2	EPA 643/ 515.2
	Carbofuran	1563662	CDFG Hazard Assess.	0.5	5	EPA 8318
	2,4-D	94757	Primary MCL	70	10	EPA 8151A
	Dalapon	75990	Ambient Water Quality	110	10	EPA 8151A
	1,2-Dibromo-3-chloropropane (DBCP)	96128	Public Health Goal	0.0017	0.01	EPA 8260B
	Di(2-ethylhexyl)adipate	103231	USEPA IRIS	30	5	EPA 8270C
	Dinoseb	88857	Primary MCL	7	2	EPA 8151A
	Diquat	85007	Ambient Water Quality	0.5	4	EPA 8340/ 549.1/HPLC
	Endothal	145733	Primary MCL	100	45	EPA 548.1
	Ethylene Dibromide	106934	OEHHA Cancer Risk	0.0097	0.02	EPA 8260B/ 504
	Glyphosate	1071836	Primary MCL	700	25	HPLC/ EPA 547
	Methoxychlor	72435	Public Health Goal	30	10	EPA 8081A
	Molinate (Ordram)	2212671	CDFG Hazard Assess.	13	2	EPA 634
	Oxamyl	23135220	Public Health Goal	50	20	EPA 8318/ 632
	Picloram	1918021	Primary MCL	500	1	EPA 8151A
	Simazine (Princep)	122349	USEPA IRIS	3.4	1	EPA 8141A
	Thiobencarb	28249776	Basin Plan Objective/ Secondary MCL	1	1	HPLC/ EPA 639
16	2,3,7,8-TCDD (Dioxin)	1746016	Calif. Toxics Rule	1.30E-08	5.00E-06	EPA 8290 (HRGC) MS
	2,4,5-TP (Silvex)	93765	Ambient Water Quality	10	1	EPA 8151A
	Diazinon	333415	CDFG Hazard Assess.	0.05	0.25	EPA 8141A/ GCMS
	Chlorpyrifos	2921882	CDFG Hazard Assess.	0.014	1	EPA 8141A/ GCMS

OTHER CONSTITUENTS						
	Ammonia (as N)	7664417	Ambient Water Quality	1500 (4)		EPA 350.1
	Chloride	16887006	Agricultural Use	106,000		EPA 300.0
	Flow			1 CFS		
	Hardness (as $CaCO_3$)			5000		EPA 130.2
	Foaming Agents (MBAS)		Secondary MCL	500		SM5540C
	Nitrate (as N)	14797558	Primary MCL	10,000	2,000	EPA 300.0
	Nitrite (as N)	14797650	Primary MCL	1000	400	EPA 300.0
	pH		Basin Plan Objective	6.5-8.5	0.1	EPA 150.1
	Phosphorus, Total (as P)	7723140	USEPA IRIS	0.14		EPA 365.3
	Specific conductance (EC)		Agricultural Use	700 umhos/cm		EPA 120.1
	Sulfate		Secondary MCL	250,000	500	EPA 300.0
	Sulfide (as S)		Taste and Odor	0.029		EPA 376.2
	Sulfite (as SO_3)		No Criteria Available			SM4500-SO3
	Temperature		Basin Plan Objective	^{o}F		
	Total Disolved Solids (TDS)		Agricultural Use	450,000		EPA 160.1

FOOTNOTES:

(1) - The Criterion Concentrations serve only as a point of reference for the selection of the appropriate analytical method. They do not indicate a regulatory decision that the cited concentration is either necessary or sufficient for full protection of beneficial uses. Available technology may require that effluent limits be set lower than these values.

(2) - Freshwater aquatic life criteria for metals are expressed as a function of total hardness (mg/L) in the water body. Values displayed correspond to a total hardness of 40 mg/L.

(3) - For haloethers

(4) - Freshwater aquatic life criteria for ammonia are expressed as a function of pH and temperature of the water body. Values displayed correspond to pH 8.0 and temperature of 22 C.

(5) - For nitrophenols.

(6) - For chlorinated naphthalenes.

(7) - For phthalate esters.

(8) - Basin Plan objective = 2 ug/L for Salt Slough and specific constructed channels in the Grassland watershed.

(9) - Criteria for sum of alpha- and beta- forms.

(10) - Criteria for sum of all PCBs.

(11) - Mercury monitoring shall utilize "ultra-clean" sampling and analytical methods. These methods include:

Method 1669: Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels, US EPA; and

Method 1631: Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluoresence, US EPA

Dioxin and Furan Sampling

Section 3 of the State Implementation Plan requires that each NPDES discharger conduct sampling and analysis of dioxin and dibenzofuran congeners. Dioxin and Furan sampling shall be conducted in the effluent and receiving water once during dry weather and once during wet weather.

Each sample shall be analyzed for the seventeen congeners listed in the table below. High Resolution GCMS Method 8290, or another method capable of individually quantifying the congeners to an equivalent detection level, shall be used for the analyses.

For each sample the discharger shall report:

- The measured or estimated concentration of each of the seventeen congeners
- The quantifiable limit of the test (as determined by procedures in Section 2.4.3, No. 5 of the SIP)
- The Method Detection Level (MDL) for the test

The TCDD equivalent concentration for each analysis calculated by multiplying the concentration of each congener by the Toxicity Equivalency Factor (TEF) in the following table, and summing the resultant products to determine the equivalent toxicity of the sample expressed as 2,3,7,8-TCDD.

Congener	TEF
2,3,7,8TetraCDD	1
1,2,3,7,8-PentaCDD	1.0
1,2,3,4,7,8-HexaCDD	0.1
1,2,3,6,7,8-HexaCDD	0.1
1,2,3,7,8,9-HexaCDD	0.1
1,2,3,4,6,7,8-HeptaCDD	0.01
OctaCDD	0.0001
2,3,7,8-TetraCDF	0.1
1,2,3,7,8-PentaCDF	0.05
2,3,4,7,8-PentaCDF	0.5
1,2,3,4,7,8-HexaCDF	0.1
1,2,3,6,7,8-HexaCDF	0.1
1,2,3,7,8,9-HexaCDF	0.1
2,3,4,6,7,8-HexaCDF	0.1
1,2,3,4,6,7,8-HeptaCDF	0.01
1,2,3,4,7,8,9-HeptaCDF	0.01
OctaCDF	0.0001

ATTACHMENT DR62-1

Construction Drainage, Erosion, and Sediment Control/Stormwater Pollution Prevention Plan

Draft

Construction Drainage, Erosion, and Sediment Control/ Stormwater Pollution Prevention Plan

for the

Oakley Generation Station

(09-AFC-4)

Submitted to the:

California Energy Commission

Submitted by:

RADBACK ENERGY

With Technical Assistance by:

CH2MHILL

Sacramento, California

March 2010

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A Construction General Permit
B Submitted Permit Registration Documents:
NOI, Risk Assessment (Construction Site Sediment and Receiving Water Risk Determination); Site Map (including vicinity map); Signed Certification Statement.
C SWPPP Amendment Log
D Submitted Changes to PRDS (due to change in ownership or acreage)
E Preliminary Stormwater Management Design
F Risk Level 1 Requirements
G Construction Schedule
H CASQA BMP Handbook Fact Sheets
I Authorized Inspection Individuals
J Construction Site Inspection Report Forms
K Training Reporting Form
L Responsible Parties
M Contractors and Subcontractors
N Construction Site Monitoring Program
O Notice of Discharge

SWPPP Certification by Qualified SWPPP Developer (QSD)

QSD Name: Mieke Sheffield

Telephone: (530) 515-7850

Qualifying Professional Registration: Certified Professional in Stormwater Quality (CPSWQ)

Date of SWPPP Preparation: 2/23/10

"I certify that this document and all attachments were prepared under my guidance, direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Printed Name of QSD: Mieke Sheffield

Signature: M. Sheffield

SECTION 1

SWPPP Requirements

1.1 Introduction

Contra Costa Generating Station, LLC, proposes to construct a state-of-the-art electrical generating plant in Oakley, Contra Costa County, California. The Oakley Generating Station (OGS) will be a natural gas-fired, combined-cycle electrical generating facility rated at a gross nominal generating capacity of 624 megawatts (MW).[1] The facility will use General Electric's (GE's) latest "F" technology platform, which provides superior operating flexibility to allow the plant to rapidly respond to loading changes that will result as more intermittent renewable resources are integrated into the grid. As presented in Figure 1.1-1 and Figure 1.1-2, the facility will be located in Oakley, Contra Costa County, California on a 21.95-acre parcel that is currently part of a larger 210-acre parcel owned by E. I. du Pont de Nemours and Company (DuPont).

This Storm Water Pollution Prevention Plan (SWPPP) has been prepared to comply with the California General Permit for *Storm Water Discharges Associated with Construction and Land Disturbance Activities* (General Permit), the State Water Resources Control Board (SWRCB) Order No. 2009-0009-DWQ for the General Permit and the Contra Costa Clean Water Program Stormwater C.3 Guidebook. A copy of the General Permit is located in Appendix A. A copy of the SWPPP and the General Permit will be kept on-site for the duration of the project. This SWPPP has also been submitted to the Regional Water Quality Control Board (RWQCB) via the Stormwater Multi Application and Report Tracking System (SMARTS). The primary objectives of the SWPPP as identified in the General Permit (Section XIV.A) are listed on the following page. This SWPPP will also be separately submitted to the California Energy Commission (CEC) to meet CEC requirements for a Drainage, Erosion and Sediment Control Plan (DESCP). Officially this document is labeled as a DESCP/SWPPP, whereas in this document it is referred to as a SWPPP.

A Qualified SWPPP Developer (QSD) must prepare SWPPPs for projects covered by the General Permit. The SWPPP applies to all areas that are directly related to the construction activity, including but not limited to staging areas, storage yards, material borrow areas, access roads, etc. In most cases, the owner will enter into a contractual agreement with the QSD for preparation and with the QSP for the implementation of the SWPPP. However, owners must be aware that regardless of the contractual agreement between the owner and contractor with respect to BMP selections and SWPPP implementation, the owner is ultimately responsible for compliance with the General Permit. It is highly recommended that the owner and contractor jointly review the SWPPP with the QSD and QSP during its development and/or during a pre-construction conference. The SWPPP is a document that addresses water pollution control during construction. The SWPPP must be prepared, submitted electronically, and available on the project site before the project owner,

[1] Approximate facility output with both combustion turbines operating at 100 percent load at average January conditions (47 degrees F, 73 percent relative humidity)

developer, or contractor begins any activity with the potential to cause water pollution. The SWPPP must be implemented year-round throughout the duration of the construction project and it must be available on site at all times.

The SWPPP shall be designed to address the following objectives:

1. All pollutants and their sources, including sources of sediment associated with construction, construction site erosion and all other activities associated with construction activity are controlled
2. Where not otherwise required to be under a RWQCB permit, all non-stormwater discharges are identified and either eliminated, controlled, or treated
3. Site Best Management Practices (BMPs) are effective and result in the reduction or elimination of pollutants in stormwater discharges and authorized non-stormwater discharges from construction activity to the Best Available Technology/Best Control Technology (BAT/BCT) standard
4. Calculations and design details as well as BMP controls for site run-on are complete and correct
5. Stabilization BMPs installed to reduce or eliminate pollutants after construction are completed

Additional SWPPP objectives are to:

- Identify post-construction BMPs, which are those measures to be installed during construction that are intended to reduce or eliminate pollutants after construction is completed (post-construction BMPs are required for all sites by Section XIII.B).
- Identify and provide methods to implement BMP inspection, visual monitoring, Rain Event Action Plan (REAP) as required, and Construction Site Monitoring Program (CSMP) requirements to comply with the General Permit.

1.2 Permit Registration Documents

Permit Registration Documents (PRDs) were submitted on [add submittal date]. To obtain coverage under the Construction General Permit, project related PRDs must be submitted to the SWRCB via SMARTS by the Legally Responsible Person (LRP).

The PRDs for this project (listed below) were submitted to SMARTS and copies of them are included in Appendix B.

1. Waste Discharge Identification (WDID) confirmation
2. Notice of Intent (NOI)
3. Risk Assessment (Construction Site Sediment and Receiving Water Risk Determination)
4. Site Map
5. Annual Fee

6. Signed Certification Statement
7. This SWPPP is also required to be filed electronically and has been submitted to the SWRCB as a PRD

1.3 SWPPP Availability and Implementation

The General Permit (Section XIV.C) requires the SWPPP be available at the construction site during working hours while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone. The SWPPP shall be implemented concurrently with the start of ground disturbing activities.

1.4 SWPPP Amendments

The General Permit requires that SWPPPs be amended or revised by a QSD (Section XIV.A) and that the SWPPP include a listing of the date of initial preparation and the date of each amendment. Amendments must be signed by a QSD (Section VII.B.6). A log of all amendments (dated) will be kept throughout the duration of the project in Appendix C.

1.5 Retention of Records

The General Permit *(Sections I.J.69 and IV.G)* requires that all dischargers maintain a paper or electronic copy of all required records for three years from the date generated or date submitted, whichever is last. These records must be available at the construction site until construction is completed. The discharger shall furnish the RWQCB, SWRCB, or US Environmental Protection Agency (EPA), within a reasonable time, any requested information to determine compliance with this General Permit. This record will be located in a separate binder, and stored onsite with the SWPPP.

1.6 Required Non-Compliance Reporting

The General Permit identifies several areas of non-compliance reporting. It is the responsibility of the permittee to properly document reportable discharges or other violations of the General Permit. Exceedances and violations should be reported using the SMARTS system. Under Risk Level 1, OGS is required to report violations through the following methods:

- Self-reporting of any discharge violations or to comply with RWQCB enforcement actions.
- Discharges which contain a hazardous substance in excess of reportable quantities established in 40 CFR §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

Any non-compliance events will be logged on the Notice of Discharge form in addition to reporting through the SMARTS system.

1.7 Annual Report

The General Permit requires that all permittees prepare, certify, and electronically submit an Annual Report no later than September 1 of each year. Reporting requirements are identified in Section XVI of the General Permit and include (but are not limited to) providing a summary of:

1. Sampling and analysis results including laboratory reports, analytical methods and reporting limits and chain of custody forms (Risk Levels 2 and 3 only)
2. Corrective actions and compliance activities, including those not implemented
3. Violations of the General Permit
4. Date, time, place, and name(s) of the inspector(s) for all sampling, inspections, and field measurement activities
5. Visual observation and sample collection exception records
6. Training documentation of all personnel responsible for General Permit compliance activities

It is the responsibility of the Qualified SWPPP Practitioner (QSP) to be responsible for overall site management, including making site personnel aware of required data collection and reporting elements of the SWPPP. The QSP is a certified individual assigned responsibility for the implementation of all elements of the SWPPP, including non-stormwater and stormwater visual observations, sampling and analysis, and preparation of Rain Event Action Plans.

1.8 Changes to Permit Coverage

In the event of a change to the permit coverage, the General Permit (Section II.C) allows a permittee to reduce or increase the total acreage covered under the General Permit when a portion of the project is complete and/or conditions for termination of coverage have been met; when ownership of a portion of the project is sold to a different entity; or when new acreage is added to the project.

To change the acreage covered, the permittee must electronically file modifications to PRDs (revised NOI, site map, SWPPP revisions as appropriate, and certification that new landowners have been notified of applicable requirements to obtain permit coverage (including name, address, phone number, and e-mail address of new landowner) in accordance with requirements of the General Permit within 30 days of a reduction or increase in total disturbed area. Include any updates to PRDs submitted via SMARTS in SWPPP Appendix D. The QSD or assigned person must document any related SWPPP revisions and/ or amendments (SectionII.C.2) in SWPPP Appendix C.

1.9 Notice of Termination

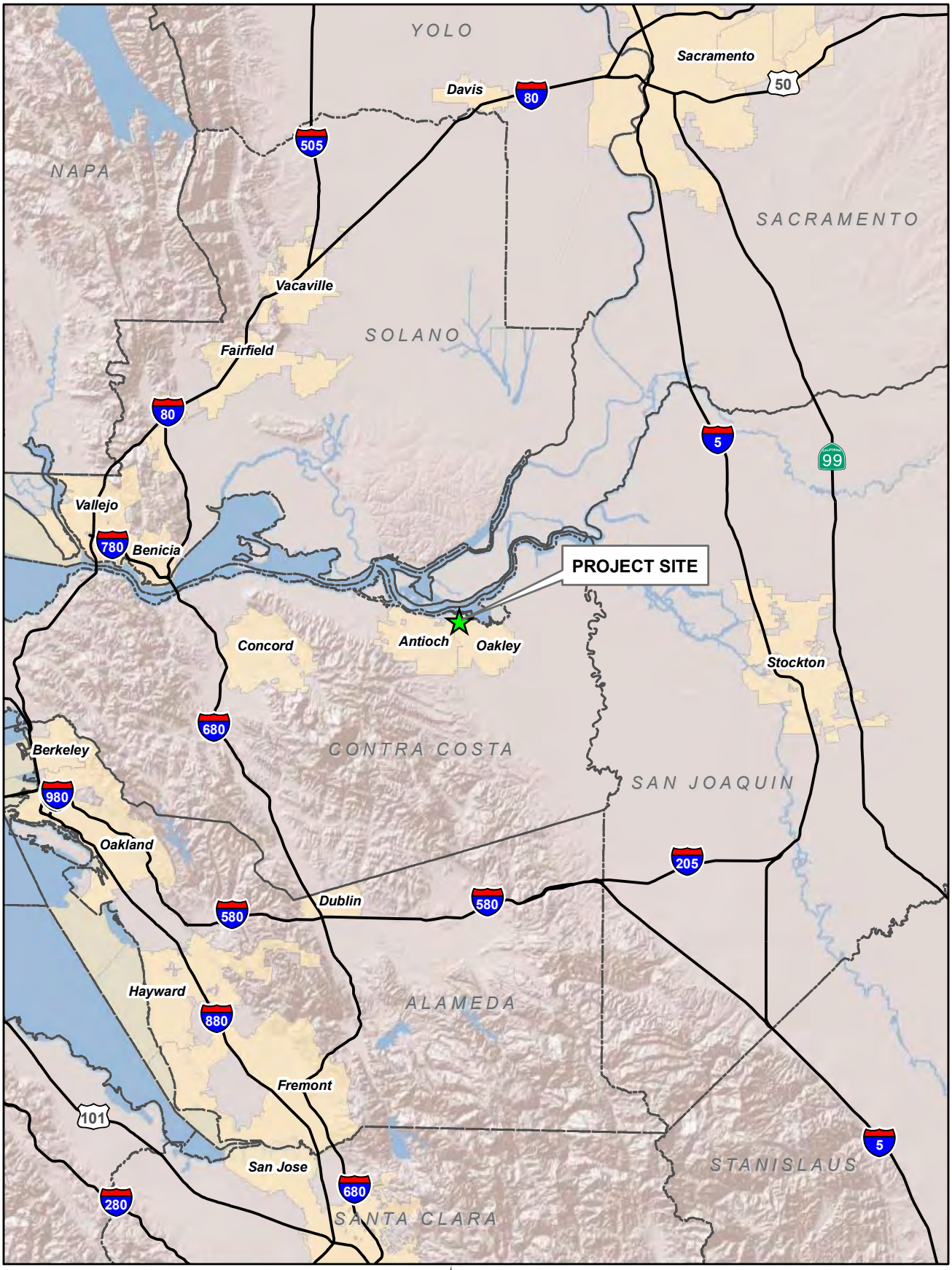
To terminate coverage under the General Permit, a Notice of Termination (NOT) must be submitted electronically via SMARTS. A "final site map" and photos are required to be submitted with the NOT. Filing a NOT certifies that all General Permit requirements have been met. The NOT is submitted when the construction project is complete and within 90 days of meeting all General Permit requirements for termination and final stabilization (Section II.D) including:

- The site will not pose any additional sediment discharge risk than it did prior to construction activity.
- All construction related equipment, materials and any temporary BMPs no longer needed are removed from the site.
- Post-construction stormwater management measures are installed and a long-term maintenance plan that is designed for a minimum of five years has been developed.

The NOT must demonstrate through photos, Revised Universal Soil Loss Equation (RUSLE) results, or results of testing and analysis that the project meets all of the requirements of Section II.D.1 of the General Permit by one of the following methods:

- 70 percent final cover method (no computational proof required)
- RUSLE/RUSLE2 method (computational proof required)
- Custom method (discharger demonstrates that site complies with final stabilization)

Figures



LEGEND

PROJECT SITE

N

0 5 10

Miles

FIGURE 1.1-1
Project Vicinity
Oakley Generating Station DESCP/SWPPP
Oakley, California

CH2MHILL

SAC\\ZION\SACGIS\PROJ\RADBACKENERGY\385962\MAPFILES\VICINITYMAP.MXD MHASKELL 6/15/2009 17:35:29
IS012010223151SAC Figure_1.1-1.ai 03.03.2010 tdaus

This map was compiled from various scale source data and maps and is intended for use as only an approximate representation of actual locations.

N

0 1,000 2,000
Feet

FIGURE 1.1-2
Site And Linear Facilities Location Map
Oakley Generating Station DESCP/SWPPP
Oakley, California

CH2MHILL

SAC\\ZION\SACGIS\PROJ\RADBACKENERGY\385962\MAPFILES\SITELOCATION.MXD MHASKELL 6/11/2009 12:39:39
IS012010223151SAC Figure_1.1-2.ai 03.03.2010 tdaus

SECTION 2

Project Information

2.1 Project and Site Description

Contra Costa Generating Station, LLC, proposes to construct a state-of-the-art electrical generating plant in Oakley, Contra Costa County, California. The OGS will be a natural gas-fired, combined-cycle electrical generating facility rated at a gross nominal generating capacity of 624 megawatts (MW).[2] The facility will use General Electric's (GE's) latest "F" technology platform, which provides superior operating flexibility to allow the plant to rapidly respond to loading changes that will result as more intermittent renewable resources are integrated into the grid.

The facility will be located in Oakley, Contra Costa County, California on a 21.95-acre parcel that is currently part of a larger 210-acre parcel owned by E. I. du Pont de Nemours and Company (DuPont) (see Figure 1.1-1). The elevation is approximately 18 ft above mean sea level.

Construction laydown and parking areas will be within existing site boundaries, on a 20-acre parcel east of the plant site. Construction access will generally be from Bridgehead Road and will be stabilized using coarse aggregate. A secondary access will be provided via the existing site entrance located further north on Bridgehead Road. Large or heavy equipment, such as the turbines, generators, step-up transformers, and HRSG modules will be delivered by rail to the existing rail siding located on the project site. Other materials and equipment will be delivered by truck.

Three areas north of the OGS site are proposed for temporary stockpiling of soil associated with the project (7.2 acres). An existing overhead utility line (2.4 miles long) will be retrofitted for the new generating facility, which will impact approximately 17 acres. The OGS site is located near the intersection of Bridgehead Road and Wilbur Avenue within the city limits of Oakley, California. Existing surrounding land uses include industrial, vacant industrial, commercial, and agricultural uses. (see Figure 1.1-2).

The generating facility will consist of two General Electric (GE) Frame 7FA combustion turbine-generators (CTGs) with a nominal rating of 213 MW each[3]- each equipped with metallurgical enhancements to improve efficiency, a single condensing steam turbine generator (STG), heat recovery steam generators (HRSGs), an air-cooled condenser to provide process cooling. CTGs will be equipped with evaporative coolers on the inlet air system and dry low oxides of nitrogen (NO_x) combustors.

Associated support equipment will include water storage tanks and an emission reduction system that will include a selective catalytic reduction (SCR) unit to control NO_x stack

[2] Approximate facility output with both combustion turbines operating at 100 percent load at average January conditions (47 degrees F, 73 percent relative humidity)

[3] Nominal output at ISO conditions. At minimum design ambient conditions (34 degrees Fahrenheit, 83 percent relative humidity), combustion turbine output we be approximately 220 MW.

emissions and an oxidation catalyst to control carbon monoxide and volatile organic compounds emissions.

Electric power produced by the facility will be transmitted to a 230-kilovolt (kV) onsite switchyard and delivered to the grid via a 2.4-mile, single-circuit, 230-kV transmission line. The 2.4 mile long 230-kV line will connect to the Pacific Gas and Electric Company (PG&E) Contra Costa Substation. The 230-kV line will be placed within the existing 80-foot wide PG&E 60-kV right-of-way that runs between the project site area and the substation. Approximately 12,672-feet of new 230-kV overhead transmission line would be necessary for this connection. Natural gas for the facility will be delivered via direct connection with the adjacent PG&E Antioch natural gas terminal for natural gas supply. The project will connect to existing onsite potable water line and sanitary sewer pipeline.

The OGS will use potable water provided by the Diablo Water District for process and potable uses. The project will access this water through a tap from an existing 27-inch-diameter distribution pipeline that runs north-south through the OGS site (just east of PG&E's Antioch Natural Gas Terminal). On an average annual basis, the total water use is estimated to be approximately 240 acre-feet per year. Process and sanitary wastewater from the OGS will be discharged to an existing Ironhouse Sanitary District (ISD) sewer line located in Bridgehead Road.

Plant makeup water will be fed directly from the Diablo Water District's service main through metering and an air gap into the service water/fire water storage tank (400,000 gallons). Water from the fire/service water tank will be used as plant service water, irrigation water, makeup to the combustion turbine inlet air evaporative coolers, and makeup to the cycle makeup water treatment system. The fire/service water storage tank will provide approximately 8 hours of operational storage and 2 hours of fire protection storage in the event of a disruption in the supply.

Makeup water for the steam cycle will be demineralized by passing service water through a reverse osmosis system followed by offsite-regenerated mixed-bed demineralizer bottles. The reject stream from the reverse osmosis system will be discharged to the plant process drain system and the demineralized water will be sent to a 130,000-gallon storage tank. The demineralized water storage tank will provide approximately 48 hours of storage at peak demand. Demineralized water will be used for steam cycle makeup and for combustion turbine washwater. Cycle makeup water will be deaerated and fed to the condensate receiver. Blowdown from the HRSGs will be discharged to an atmospheric flash tank where the flash steam will be vented to atmosphere and the condensate will be cooled prior to discharge to the plant process drain system. Wastewater from combustion turbine water washes will be collected in combustion turbine drain tanks and then trucked offsite for disposal.

Service water will be used for makeup to the combustion turbine evaporative coolers, equipment washdown, and other miscellaneous plant uses. Blowdown from the combustion turbine evaporative coolers will be discharged to the plant process drain system and ultimately discharged to the sanitary sewer. Wastewater from process areas that could potentially include oil or other lubricants will be directed to an oil-water separator for removal of accumulated oil that may result from equipment leakage or small spills and large particulate matter that may be present from equipment washdowns. Effluent from the oil-water separator will be combined with other process wastewater and sanitary

wastewater and discharged to the ISD sewer, located in Bridgehead Road. ISD is in the process of constructing a new wastewater treatment plant that will include processes to produce recycled water meeting Title 22 requirements. Accordingly, the OGS will be designed to accommodate the potential future use of recycled water by providing space in the water treatment building to add a microfiltration system. The microfilters will provide additional filtering of the recycled water prior to use as service water and makeup to the demineralized water system. Backwash water from the microfilters will be discharged to the plant process drain system and ultimately the sanitary sewer.

2.1.1 Site Description

The site, stockpile, and linear locations presented in Figure 1.1-2 and the general site arrangement presented in Figure 2.1-1, illustrate the location and size of the proposed generating facility. The OGS project area, including the OGS facility and the laydown and stockpile areas, is located on a former DuPont manufacturing facility site. The proposed location of the OGS facility is in an area of active vineyard agriculture with a central cluster of oak trees. The proposed laydown area is located east of the proposed facility that consists of two distinct sections. One of these is DuPont's former titanium dioxide disposal site, now consisting of open grasslands, that covers approximately 14 acres. The second section consists of a 6-acre area that is entirely paved. There is a row of mature eucalyptus trees between the two sections. The proposed OGS facility is also bordered to the north by a narrow row of mature eucalyptus trees that separates both the OGS site, currently a vineyard, from the rest of the former DuPont manufacturing site. The western 'panhandle' of the OGS property consists of a small conserved wetland, called Wetland E. The main project site consists of 21.95 contiguous acres, 13.5 acres of which is in agricultural production as a vineyard (see Figure 2.1-2).

Soil Stockpile Areas

DuPont has requested the use of any excess soils resulting from initial leveling and grading of the OGS site. Three areas north of the OGS site are proposed for the temporary stockpiling of soil associated with the project. Stockpiles 1 through 3 are identified in Figure 2.1-2. Stockpile 1 will be located on an existing paved surface. Stockpiles 2 and 3 are located further north in annual grassland on either side of a row of beach sheoak (*Casuarina equisetifolia*). Stockpile 2 is south of the beach sheoak and is 84 feet north of a 0.37-acre wetland. Stockpile 3 is north of the beach sheoak and is 46 feet south of a 0.38-acre wetland. DuPont plans to use the stockpiled soil during build-out of the DuPont Oakley Specific Plan. The Applicant will move the soils and create and stabilize these soil piles in accordance with all applicable BMPs. After this takes place, the soil stockpiles will be owned and maintained by DuPont in accordance with all applicable BMPs.

Laydown Area

Construction laydown and parking areas will be within existing site boundaries, on a 20-acre parcel east of and immediately adjacent to the plant site. The temporary construction laydown area will be used for equipment staging, material storage, worker parking, and temporary administrative buildings. Construction access will generally be from Bridgehead Road which will be stabilized using coarse aggregate. Large or heavy equipment, such as the turbines, generators, step-up transformers, and HRSG modules will be delivered by rail to the

existing rail siding located on the project site. Other materials and equipment will be delivered by truck. Habitat in the 14-acre unpaved portion of the construction laydown area is currently non-native annual grassland. The other six acres consists of an existing concrete pad. Site preparation of the construction laydown area will include site grading and soil berming along the perimeter of the site. The construction laydown area will be recontoured and restored to existing conditions following project construction.

Electrical Transmission Line

The proposed 230-kV transmission line will connect the OGS facility to an existing Pacific Gas and Electric Company (PG&E) substation in Antioch, approximately 1.75 miles southwest of the OGS site. Within the City of Oakley, the transmission line will be placed in areas zoned for utility and commercial uses. Within the City of Antioch, the alignment is within areas zoned as Planned Development Districts (P-D) associated with the State Route (SR) 4 Industrial Frontage Focus Area (LSA, 2003). The 230-kV transmission line would require the replacement of 17 existing steel-lattice towers with steel monopole towers. The current 60-kV towers are placed in a variety of land uses including active industrial and commercial properties, vacant lots composed of non-native annual grassland, active vineyard agricultural, landscaped residential, and inactive non-native annual grassland habitat (Figure 2.1-3). Tower footings are located in non-native annual grasslands. The Contractor will be responsible for BMPs associated with the linear transmission.

2.1.2 Site Characteristics

Land Use

The OGS site is located near the intersection of Bridgehead Road and Wilbur Avenue within the city limits of Oakley, California. Existing surrounding land uses include industrial, vacant industrial, commercial, and agricultural uses. Surrounding land uses include the former DuPont Oakley manufacturing site and marinas along the San Joaquin River to the north, power plants owned by Pacific Gas and Electric Company (PG&E) and Mirant to the west; vineyards and mixed commercial, industrial, and residential uses to the south, and vineyards and residential uses to the east. Under the City of Oakley's General Plan, the land use designation for the project site is Utility Energy.

The OGS site has recently been created from the nearly 500-acre DuPont property (which is a one-owner property with multiple Assessor's Parcel Numbers). DuPont has recently obtained a lot line adjustment to create "Parcel A," the 21.95-acre project site, and two separate neighboring parcels. The new project parcel has been created from a 210-acre parcel on the larger 500-acre DuPont property. The portion of the site on which the power plant would be constructed is within an area called the "Western Development Area" and is currently used as a vineyard. This vineyard area of the DuPont property was never developed for industrial purposes. Figure 2.1-3 shows the project site in the context of the mix of urban and suburban uses with farmland (mostly vineyards) in this area. A row of mature eucalyptus trees separates the OGS project site from the formerly developed portion of the DuPont property. The project site slopes to the west and drains into a small wetland that is part of the OGS.

Vegetation

The primary vegetation types in the project area (project site, laydown area, utility line) are agriculture, grassland and marsh. Agriculture within the area is primarily vineyard, such as is present within the OGS site and several segments of the 230-kV electrical transmission line. Discontinuous open space occurs throughout the survey area, including the far west end of the 230-kV electrical transmission line. These areas are dominated by non-native annual grassland. The three small wetland features located in the project area are isolated wetlands and do not drain to Waters of the United States.

Farmland

Construction of the proposed project will remove vineyards to build the OGS, and will permanently remove from production soils that are classified as Farmland with Statewide Importance. According to the City of Oakley General Plan, the project site is located in the Northwest Oakley Planning Area. This area north of the Burlington Northern Santa Fe railroad is designated for Business Park, Utility Energy and Light Industrial uses, and is planned to eventually become a primary employment center for the city (City of Oakley, 2002). Because agriculture is not consistent with these designated uses, farming operations are expected to diminish as development progresses in the area.

Soils

Table 2.1-1 describes the properties of the soil mapping units that are found in the vicinity of the project site. As shown in Figure 2.1-4, the entire project site, laydown area, stockpile areas, and the majority of the transmission corridor are associated with a single soil map unit—Delhi sand, 2 to 9 percent slopes (DaC). This soil formed in eolian (i.e., deposited by wind) materials derived from granitic rock sources. Delhi sands are very deep and somewhat excessively drained, with a low shrink-swell potential.

The west side of the transmission corridor crosses two other soil units: Sycamore silty clay loam (So) and Zamora silty clay loam (ZaA). These soils have finer textures than Delhi sand, somewhat lower permeability, and moderate shrink-swell potentials.

Potential for Soil Loss and Erosion

The factors that have the largest effect on soil loss include steep slopes, lack of vegetation, and erodible soils composed of large proportions of silt and fine sands. The soils found in the project area are predicted to have slopes ranging from 2 to 9 percent.

In general, Delhi soils at the project site have a sandy texture, with over 95 percent of soil particles having a diameter of 0.05 to 2 millimeters (i.e., sand particles). These soils are fairly level and excessively drained with a low runoff potential. Therefore, soils at the project site are expected to have low water erosion potential. On the other hand, Delhi soils are expected to have high wind erosion potential. It is expected that the laydown areas will be covered (by gravel or paving) immediately after grading to prevent subsequent wind erosion losses and/or other wind erosion BMPs such as watering.

TABLE 2.1-1
Soil Mapping Unit Descriptions and Characteristics

Map Unit	Description
DaC	**Delhi sand, 2 to 9 percent slopes:** The entire OGS project site, stockpile and laydown areas, and the majority of the transmission corridor are associated with this soil unit. Formation: Wind modified material weathered from granitic rock sources Typical profile: Sand to a depth of >60 inches Shrink-swell capacity: Low Depth and drainage: Very deep, somewhat excessively drained Permeability: Rapid Runoff: Negligible to low Inherent fertility: Fair Capability class: 3s (irrigated), 6e (non-irrigated) Taxonomic class: Mixed, thermic Typic Xeropsamments
So	**Sycamore silty clay loam:** A portion of the transmission corridor crosses this soil unit. Formation: Mixed sedimentary alluvium Typical profile: Silty clay loam over silt loam and stratified loamy fine sand to silty clay Shrink-swell capacity: Moderate Depth and drainage: 40-60 inches to water table, poorly drained Permeability: Moderate to moderately slow Runoff: Slow to very slow Inherent fertility: High Capability class: 1 (irrigated), 4c (non-irrigated) Taxonomic class: Fine-silty, mixed, superactive, nonacid, thermic Mollic Endoaquepts
ZaA	**Zamora silty clay loam, 0 to 2 percent slopes:** A portion of the transmission corridor crosses this soil unit. Formation: Alluvium derived from sedimentary rock Typical profile: Silty clay loam to a depth of 72 inches Shrink-swell capacity: Moderate Depth and drainage: Very deep, well drained Permeability: Moderately slow Runoff: Slow to medium Inherent fertility: High Capability class: 1 (irrigated), 4c (non-irrigated) Taxonomic class: Fine-silty, mixed, superactive, thermic Mollic Haploxeralfs

Note:
Soil characteristics are based on soil mapping descriptions provided in the online soil survey reports (http://soildatamart.nrcs.usda.gov/) and Official Soil Series Descriptions (http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdname.cgi). Soil descriptions provided above are limited to those soil units that could be directly affected by the OGS.

The silty clay loam surface horizons of the Zamora and Sycamore soils associated with a portion of the transmission corridor are not expected to be as readily transported by wind.

Other Significant Soil Characteristics

A significant soil characteristic concerning the proposed 20-acre laydown area is the presence of waste titanium dioxide. A portion of this area was historically used for disposal of titanium dioxide waste during manufacturing operations at the DuPont facilities.

Titanium dioxide (TiO_2) is an inert mineral pigment primarily used in paints, paper, and plastics, and is produced by reacting the mineral rutile, removing impurities, and oxidizing to TiO_2 (DuPont, 2003). During active manufacturing at the DuPont facility, the proposed laydown area was a TiO_2 landfill that was used for disposal of spent ore from the TiO_2 process after the material was acid-leached and settled in retention basins (DuPont, 2003). This material is estimated to be approximately 3 feet thick (DuPont, 2006); thus, soil material that is present in this area likely does not reflect characteristics of mapped soils. The fill material is not expected to present a human health or wildlife risk (DuPont, 2006). The soil map unit upon which the project will be built (DaC) contains soils with over 95 percent sand-sized particles. A geotechnical review (TRC, 2008) estimated that a moderate liquefaction potential exists at the site due to nature of subsurface soil materials; and that vibrating equipment could potentially cause settlement in these sandy soils. A design-level geotechnical study will be performed, which will specifically identify whether expansive soils are present in the project area and will include measures to mitigate the effects of these soils where they occur.

According to the official soil series description, Sycamore soils may have a seasonally high water table within the top 60 inches of the soil profile. Construction of replacement transmission towers in areas with Sycamore soils may need to include dewatering.

Hydrology

Contra Costa County has a moderate climate, similar to a Mediterranean climate. The influence of coastal fog is felt in the western and central portions of the county. The mean annual precipitation (January 1955 to December 2008) is 13.17 inches per year. The minimum and maximum annual precipitation for the period of record is 5.87 inches and 27.75 inches, respectively. Table 2.1-2 provides average historical rainfall from the meteorological station in Antioch, California.

TABLE 2.1-2
Rainfall near the Proposed Project Site (1955-2008)

Precipitation	Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average	13.17	2.78	2.39	1.96	0.9	0.37	0.09	0.02	0.04	0.19	0.65	1.58	2.2
Maximum	27.75	6.97	9.03	6.26	3.97	2.09	0.8	0.46	0.74	1.84	4.85	4.83	7.14
Minimum	5.87	0.13	0.0	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note:
Source: Western Regional Climate Center (WRCC), 2008.

Water Courses. The OGS site is located near the southern bank of the San Joaquin River, east of the Antioch (John A. Nejedly) Bridge, approximately 7 miles upstream of the confluence with the Sacramento River. Major surface water features in the vicinity of the OGS project site include the San Joaquin River and the Sacramento-San Joaquin Delta (Figure 2.1-5). The San Joaquin River is the only natural perennial surface water within 1 mile of the site. Naturally occurring wetlands are located adjacent to the San Joaquin River approximately 0.25 mile north of the project site.

Environmentally Sensitive Areas. One jurisdictional wetland called Wetland E, a 0.62-acre palustrine wetland, is present within 250 feet of the OGS site and two additional wetlands

are located within 250 feet of the soil stockpile areas. (The three wetlands are identified as "E", "F", and "D" on Figure 2.1-2)Project construction would not cause loss or fill of any wetlands; therefore these wetlands will not be impacted. Wetland E has been found by the USACE to be an isolated and non-jurisdictional wetland. Based on historical information it appears this wetland has been constructed in what was previously upland and then placed under a conservation easement as mitigation for a nearby project. Two additional 0.38-acre and 0.37-acre palustrine emergent wetlands are located within 50 feet north and south, respectively, of soil stockpile areas. These wetlands were also found by USACE to be isolated and non-jurisdictional.

Currently, the Wetland E easement area collects runoff from a 25-acre area located to the east and south of the easement. Because the OGS will occupy the majority of the 25 acres of easement runoff area, Radback proposes to maintain the existing water quality and hydraulic flow to the Wetland E easement area after the project is built, which is a requirement of the 1997 conservation easement. To accomplish this goal, Radback and their engineering design consultant, Black & Veatch Engineering, designed a stormwater management system for the OGS and submitted the plan to the California Department of Fish and Game (CDFG) on August 13, 2009. The management system was designed so that (1) the quality of stormwater draining into the wetland is not negatively affected, and (2) the OGS will not adversely alter the flow of stormwater into the wetland. In addition the OGS stormwater management design will incorporate a number of measures which are designed to enhance the functions and values of the mitigation wetland. These measures will be consistent with the intended purpose and restrictions of the easement for this property. The new design will block the overflow that drains into the wetland preserve via the existing sediment basin.

The stated purpose of the 1997 conservation easement is to "retain forever in a natural condition and to prevent any use of the property that will significantly impair or interfere with the conservation values of the property." The California Department of Fish and Game (the easement grantee) has the right to prevent any activity on or use of the property that is inconsistent with the habitat conservation purposes in the easement. Activities specifically prohibited included unseasonal watering, off-road vehicles, grazing, and surface entry for exploration and extraction of minerals. The Grantee may allow public access to property for scientific research and interpretive purposes.

Groundwater

The OGS site is within the San Joaquin Valley Basin (Figure 2.1-6). The Tracy subbasin lies in the southwestern portion of the Sacramento Basin and the northern portion of the Sacramento-San Joaquin Delta. Elevation varies from 120 feet in the northwest corner to sea level in the south. Subbasin boundaries are defined by Putah Creek on the north, the Sacramento River on the east, the North Mokelumne River on the southeast, and the San Joaquin River on the south (DWR, 2006).

The primary water-bearing formations comprising the Tracy subbasin are continental deposits of Late Tertiary to Quaternary age (DWR, 2006). Fresh water-bearing units include younger alluvium, older alluvium, flood basin deposits, and the Tulare Formation. With the exception of seasonal variation resulting from recharge and pumping, the majority of water levels in wells have remained relatively stable over the last 10 years (DWR, 2006). Well yields

in the subbasin range from 500 to 3,000 gallons per minute at an average depth of 188 feet for domestic wells and 352 feet for municipal and irrigation wells (DWR, 2006).

In general, the northern part of the subbasin is characterized by a sodium water type and the southern part of the subbasin is characterized by calcium-sodium water types (DWR, 2006). Areas of poor water quality exist throughout the subbasin. Areas of elevated chloride occur in several areas including along the San Joaquin River and areas of elevated nitrate exist in the northwestern part of the subbasin (DWR, 2006). Total dissolved solids (TDS) levels in the subbasin range from 210 to 7,800 milligrams per liter (mg/L) with an average of about 1,190 mg/L (DWR, 2006).

Unless otherwise designated by the Central Valley RWQCB or excluded based on the minimum beneficial use exception criteria, all ground waters are considered suitable or potentially suitable, at a minimum, for municipal and domestic water supply, agricultural supply, industrial service supply, and industrial process supply (Central Valley RWQCB, 1998).

The OGS would make no direct use of groundwater resources and would have no effect on groundwater quantity or quality.

2.1.3 Estimated Total Disturbed Area

The estimated area disturbed during project construction is listed in Table 2.1-3.

TABLE 2.1-3
Estimated Disturbed Area

Project Area	Acreage
Project Site	21.95 acres
Project Laydown Area	Approx. 20 acres (6 acres of which is paved)
Stockpile Areas	7.2 acres, (2.2 acres of which are paved)
Transmission Corridor, tower replacement	(17.3-acre construction corridor, 0.009-acre footprint for towers)
Transmission Laydown Area	0.5 acres
Access Roads for Stockpiles 2 & 3	0.2 acres

2.1.4 Existing Drainage

Project Area

The project site is part of a former industrial facility and previously had no buildings, process equipment, or other facilities when the industrial facility was in operation. The plant site is currently a vineyard with a row of eucalyptus trees along the northeastern corner and has been tilled about twice a year. Currently, runoff at the OGS site drains to Wetland E, on the northwest corner of the project site. Much of the construction laydown area is covered by bare soil with little vegetation; however, the northeastern portion is covered by existing pavement. The entire construction laydown area will be graded with the exception of the

existing paved area. Using the mean annual precipitation as 12.5 inches, and the current runoff rate of, based on an undeveloped site with bare soil, and a 100-year rainfall intensity, a bioswale 1,154 feet long with a volume of 7,986 cubic feet will be constructed at the center of the laydown area and the area will be graded such that runoff from the non-asphalt area is collected in the bioswale. The gravel road will be installed in a trench so that its surface will be even with the adjacent ground surface. In this way, stormwater will be able to flow over the gravel roads and be collected in the bioswale. At the eastern end of the bioswale, a pump will be installed so that if the stormwater in the bioswale exceeds its volume capacity, the extra water will be pumped out to a location offsite (Figure 2.1-7). Runoff from the pavement will flow offsite. Appendix E contains the Preliminary Stormwater Management Design for the project, which includes stormwater calculations and the pre- and post-development drainage plans.

Linear Construction Areas

The transmission line corridor encompasses 17.3 acres, but only a 0.009-acre footprint for towers will involve significant ground disturbance.

2.1.5 Proposed Drainage

Project Area

The OGS stormwater design will be governed by the stormwater management requirements of the Contra Costa Clean Water Program Stormwater C.3 Guidebook (CCCWP, 2008). The "C.3" stormwater regulations for new development currently apply to any development project which will create one acre or more of impervious area. The C.3 requirements address both flow control and treatment of stormwater. Per page 8 of the C.3 guidebook, using the Option 2 design process detailed in Chapter 4 will allow the OGS project to meet both treatment and flow control requirements.

Post-development drainage at the site will be designed to maintain the natural drainage pattern of the site. Five bioswales will be utilized to collect and infiltrate all stormwater runoff from the project site. The locations of bioswales and delineated drainage areas for each bioswale are shown on Figure 2.1-8. Drop structures DS-1 and DS-5 are located at the end of bioswales and are adjacent to the easement area. The drop structures will discharge stormwater to the bioswales via 12-inch-diameter sewer pipes that are capable of conveying stormwater from a 10-year storm event. At the eastern end of the bioswale, a pump will be installed so that if the stormwater in the bioswale exceeds its volume capacity, the extra water will be pumped out to a location offsite. Rainfall less than the design event will be contained in the bioswales and will infiltrate through the sandy soils or evaporate. The soils, plantings, and irrigation for the bioswales will be in accordance with Appendix B of the Contra Costa Clean Water Program Stormwater C.3 Guidebook. To allow stormwater to reach the easement area during rainfall events less than a C.3 design event, a perforated underdrain is located under the northern bioswale. The stormwater will be filtered through the plant roots and a biologically active soil mix within the bioswale, removing suspended solids and other potential pollutants prior to the underdrain collecting the stormwater and discharging to the easement area.

Downstream of the bioswales, 18-inch diameter sewer pipes that are capable of conveying peak runoff from a 50-year storm event, will be installed to discharge any overflow to

Wetland E, which is located downstream of the project site, in addition to the drop structures. The wetland is capable of receiving runoff from the project site for a 100-year, 24-hour storm without overflowing to adjacent properties. The stormwater system is designed so that it does not adversely affect the supply of runoff to the wetland or the quality of water flowing into it.

Runoff from the power block area will be routed through an oil/water separator before being discharged to the sanitary sewer system and will not be discharged onsite. Appendix E contains the Preliminary Stormwater Management Design for the project, which includes stormwater calculations and the pre- and post-development drainage plans.

Linear Construction Areas

The transmission line corridor encompasses 17.3 acres, but only a 0.009-acre footprint for towers will involve significant ground disturbance.

2.1.6 Construction and Maintenance Access Road

Primary access to the project site will be provided via a new entrance lane extending from Bridgehead Road, just south of the intersection of Bridgehead Road and Wilbur Avenue and will be stabilized using coarse aggregate. At the end of construction, the entrance road will be permanently paved. A secondary access will be provided via the existing site entrance located further north on Bridgehead Road. Large or heavy equipment, such as the turbines, generators, step-up transformers, and HRSG modules will be delivered by rail to the existing rail siding located on the project site. Other materials and equipment will be delivered by truck.

2.1.7 Clearing and Grading Plans/Earthwork

Plant Site Earthwork

Excavation work will consist of removal, storage, and/or disposal of earth, sand, gravel, vegetation, loose rock, and debris to the lines and grades necessary for construction. Disturbed soils will either be covered (e.g. metal plates, pavement, plastic covers over spoil piles) or stabilized by appropriate BMPs to ensure sediment does not migrate from the site. Materials suitable for backfill will be stored in stockpiles at three designated locations using proper erosion protection methods. Excess materials will be incorporated into the unused portion of the site or removed from the site and disposed of at an acceptable location.

Site areas that will be graded include the project construction site, the laydown area, except for the 6-acre portion that is concrete, and the utility line construction corridor. Grading will retain the pre-project site contours to ensure that stormwater flows either to the onsite wetland or into construction bioswale. During construction, stormwater will flow into a temporary bioswale constructed within the laydown area. At the end of construction, bare ground will be hydroseeded.

Graded areas will be smooth, compacted, free from irregular surface changes, and sloped to drain. Structures will be designed to meet appropriate seismic requirements (the site is located in Seismic Risk Zone 4) and California Building Code requirements. Areas to be backfilled will be prepared by removing unsuitable materials and rocks. The bottom of an

excavation will be examined for loose or soft areas. Such areas will be excavated fully and backfilled with compacted fill.

Backfilling will be done in layers of uniform, specified thickness. Soil in each layer will be properly moistened to facilitate compaction to achieve the specified density. To verify compaction, representative field density and moisture-content tests will be performed during compaction in accordance with ASTM standards.

Linear Construction

The OGS will connect with the existing Pacific Gas and Electric Company (PG&E) substation within an existing 1.7-mile transmission corridor. Existing steel-lattice towers will be replaced with monopole towers. A connection will be made to PG&E's existing high-pressure natural gas pipeline at the Antioch Terminal, which is immediately south of the DuPont property along Bridgehead Road. Grading will occur in the 17.3-acre utility line corridor.

2.2 Stormwater Run-On from Offsite Areas

No areas have been identified near the project site that will contribute to potential run-on during construction. If run-on is identified during construction activities, a SWPPP amendment will be completed which will explain the control methods of site run-on and the BMPs used for control. The BMP maps would also be updated as part of the amendment.

2.3 Findings of the Construction Site Sediment and Receiving Water Risk Determination

This General Permit establishes three levels of risk possible for a construction site. Risk is calculated in two parts: (1) project sediment risk (the relative amount of sediment that can be discharged, given the project and location details) and (2) receiving water risk (the risk sediment discharges pose to the receiving waters). The OGS site has been determined to be a Risk Level 1 site based on the construction site sediment and receiving water risk determination.

Sediment Risk

Project Sediment Risk is determined by multiplying the R, K, and LS factors from the Revised Universal Soil Loss Equation (RUSLE) to obtain an estimate of project-related bare ground soil loss expressed in tons/acre.

The RUSLE equation is as follows:

$$A = (R)(K)(LS)(C)(P)$$

Where: A = the rate of sheet and rill erosion
R = rainfall-runoff erosivity factor
K = soil erodibility factor
LS = length-slope factor
C = cover factor (erosion controls)

P = management operations and support practices (sediment controls)
The C and P factors are given values of 1.0 to simulate bare ground conditions.

The map option was used for this project. For the map option, the R factor for the project is calculated using the online calculator.

To determine soil loss in tons per acre, the discharger multiplies the R factor times the value for K times LS from the map.

R= 40.15
K= 0.05 (very sandy)
LS= 1.86

Watershed Erosion Estimate= (40.15) (0.05) (1.86)= 3.73 = **LOW Sediment Risk Factor.**

Receiving Water Risk

Receiving water risk is based on whether a project drains to a sediment-sensitive waterbody. A sediment-sensitive waterbody is either on the most recent 303d list for waterbodies impaired for sediment; has a USEPA-approved Total Maximum Daily Load implementation plan for sediment; or has the beneficial uses of COLD, SPAWN, and MIGRATORY.

A project that meets at least one of the three criteria has a high receiving water risk. The OGS Project does not meet any of the above listed criteria, and is therefore has a **LOW Receiving Water Risk.**

The OGS Project will comply with all Risk Level 1 requirements in Attachment C of the General Permit, included in Appendix F.

2.4 Construction Schedule

Construction of the generating facility, from site preparation and grading to commercial operation is expected to take place from the first quarter of 2011 to the fourth quarter of 2013 (33 months total). Major milestones are listed in Table 2.4. A copy of this schedule is in Appendix G.

TABLE 2.4
Project Schedule Major Milestones

Activity	Date
Begin/Construction	First quarter 2011
Startup and Test	Second quarter 2013
Commercial Operation	Fourth quarter 2013

There will be an average and peak workforce of approximately 303 and 729, respectively, of construction craft people, supervisory, support, and construction management personnel on site during construction. The peak construction site workforce level is expected to last from

month 10 through month 30 of the 33-month construction period, with the peak being month 23.

Typically, noisy construction will be scheduled to occur between 6:00 a.m. and 7:00 p.m. Monday through Saturday. Additional hours may be necessary to make up schedule deficiencies or to complete critical construction activities (for example, pouring concrete at night during hot weather, working around time-critical shutdowns and constraints). During some construction periods and during the startup phase of the project, some activities will continue 24 hours per day, 7 days per week.

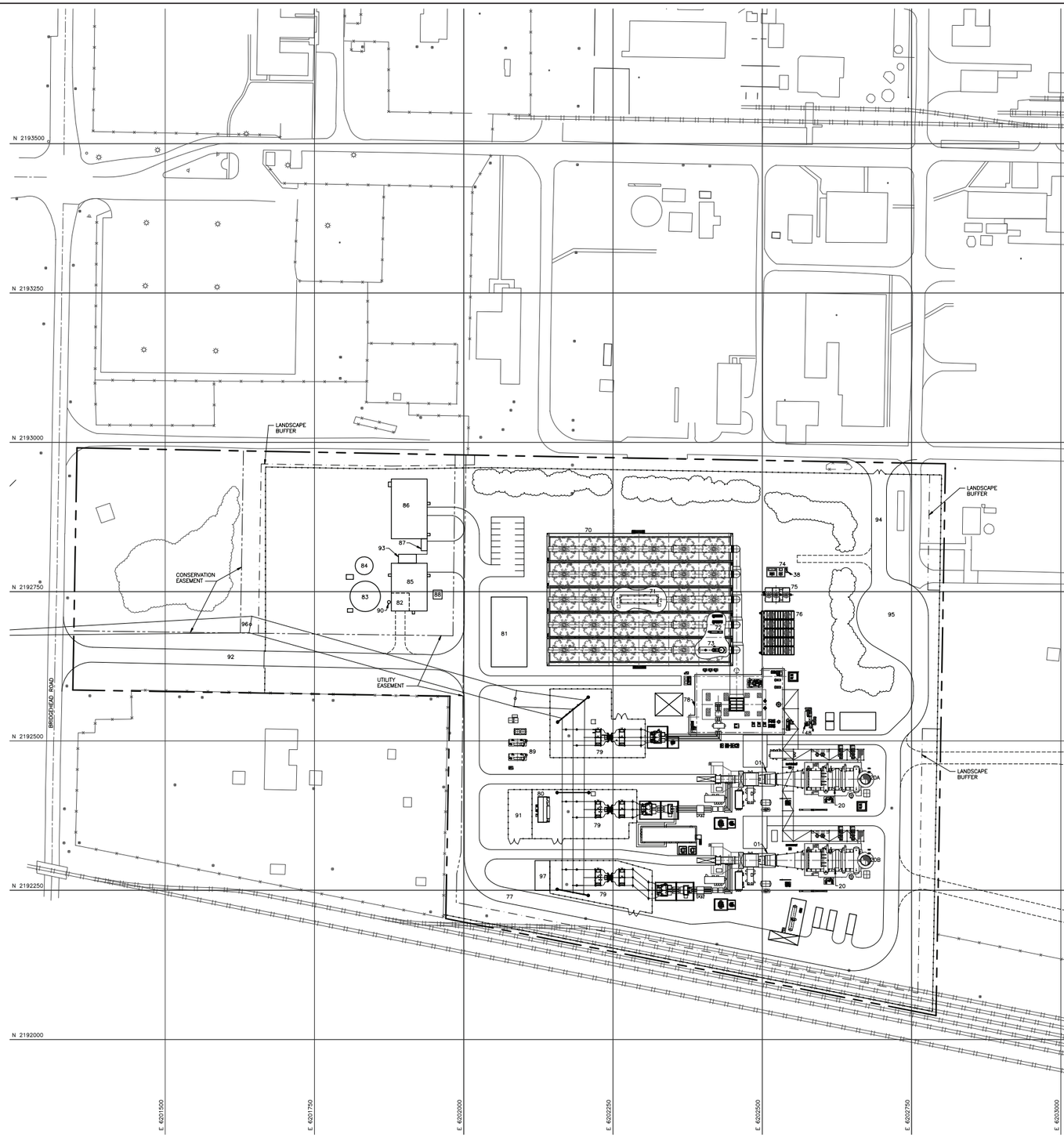
2.5 Potential Construction Site Pollutant Sources

Construction of the project will involve handling a large variety of building materials. The primary potential pollutant source for stormwater during the construction of the OGS project results from soil materials being exposed to wind and water movement. The greatest amount of soil will be exposed during preparation and site grading phases of the project. Upon completion of the foundation phase, the amount of soil exposed will be significantly reduced. Due to the controls and BMPs described in subsequent sections of this SWPPP, soils and sediments in stormwater runoff from the OGS Project site will be minimized. A number of other constituents that could contribute to non-stormwater discharges will also be onsite and are discussed below. Other chemicals that could be potentially stored and used during construction of the facility include: gasoline, diesel fuel, oil, lubricants (i.e., motor oil, transmission fluid, and hydraulic fluid), solvents, adhesives, asphalt products, and paint materials. There are no feasible alternatives to these materials for construction or operation of construction vehicles and equipment, repaving areas, pouring concrete, or for painting and caulking buildings and equipment. Material Safety Data Sheets for each chemical used will be kept onsite, and construction employees will be made aware of their location and content.

2.6 Identification of Non-Stormwater Discharges

The contractor will be responsible for assuring that the use, storage and handling of the materials listed above in Section 2.5 will comply with applicable federal, state, and local laws, ordinances, regulations, and standards (LORS), including licensing, personnel training, accumulation limits, reporting requirements, and record keeping. The contractor will also comply with the requirements contained in the General Permit Attachment C for Risk Level 1 dischargers. Attachment C is located in SWPPP Appendix F. Compliance includes recording the discharge in the SMARTS system, and logging and filing the discharge in the Notice of Discharge form located in Appendix O.

Figures



FACILITIES LEGEND

ID	FACILITY	STRUCTURE HEIGHT	TIEDOWN LOCATION NORTH	TIEDOWN LOCATION EAST	REMARKS
01	COMBUSTION TURBINE	70'	–	–	–
20	HEAT RECOVERY STEAM GENERATOR (HRSG)	103'	–	–	–
20A	HRSG EXHAUST STACK A	155'	2192436.00	6202665.00	CL EXHAUST STACK
20B	HRSG EXHAUST STACK B	155'	2192300.00	6202665.00	CL EXHAUST STACK
38	SAFETY SHOWER EYEWASH STATION	–	–	–	–
48	AUXILIARY BOILER	50'	2192527.61	6202572.26	CL EXHAUST STACK
70	AIR COOLED CONDENSER (ACC)	124'	–	–	–
71	ACC ELECTRICAL ENCLOSURE	14'	–	–	–
72	CONDENSER AIR EXTRACTION SKIDS	6'	–	–	–
73	ACC CONDENSATE COLLECTION TANK	28'	–	–	–
74	WET SURFACE AIR COOLER CHEMICAL FEED SKIDS	8'	–	–	–
75	WET SURFACE AIR COOLER	23'	2192744.67	6202523.00	CL COOLER
76	CLOSED CYCLE COOLING WATER HEAT EXCHANGER	19'	–	–	–
77	LOOP ROAD	–	–	–	–
78	STEAM TURBINE FOUNDATION	–	–	–	–
79	SWITCHYARD	18' & 45'	–	–	–
80	SWITCHYARD CONTROL ENCLOSURE	12'	–	–	–
81	CONTROL & ADMIN BUILDING	14'	–	–	–
82	FIRE WATER PUMP ROOM	20'	–	–	–
83	FIRE/SERVICE WATER STORAGE TANK	32'	–	–	–
84	DEMIN WATER STORAGE TANK	24'	–	–	–
85	WATER TREATMENT BUILDING	20'	–	–	–
86	WAREHOUSE/MAINTENANCE BUILDING	16'	–	–	–
87	LUBRICANT STORAGE SHED	10'	–	–	–
88	WASTE WATER LIFT STATION (IF REQUIRED)	–	–	–	–
89	GAS COMPRESSORS & GAS CONDITIONING	13'	–	–	–
90	DIESEL FIRE PUMP EXHAUST	16'	2192732.52	6201874.72	CL EXHAUST STACK
91	GAS METERING STATION	–	–	–	–
92	ACCESS ROAD	–	–	–	–
93	LEASED MIX BED EXCHANGER CONCRETE SLAB	–	–	–	–
94	EMERGENCY ACCESS ROAD	–	–	–	–
95	CUL DA SAC (TURNAROUND)	–	–	–	–
96	230KV POWER POLE	106'	–	–	–
97	OUTAGE MAINTENANCE TRAILERS AREA	–	–	–	–

NOTES

1. COORDINATES ARE BASED ON CALIFORNIA COORDINATE SYSTEM CCS83, ZONE 3. ELEVATION ARE BASED ON, NGVD 29 DATUM. BENCHMARK IS NATIONAL GEODETIC SURVEY BENCH MARK "W 563", LOCATED ADJACENT TO THE FLAGPOLE AT THE DUPONT PLANT ENTRANCE, ELEVATION = 11.168 FEET. TO OBTAIN DUPONT PLANT DATUM ELEVATION, ADD 0.70 FEET TO THE ELEVATIONS SHOWN. TOPOGRAPHIC DATA IS BASED ON AERIAL PHOTOGRAPH DATED JUNE 11, 2001. AERIAL SURVEY INFORMATION WAS OBTAINED BY RONALD GREENWELL & ASSOCIATES, INC.
2. SEE PLANT ARRANGEMENT DRAWING SM-2001, FOR LEGEND OF MAIN POWER BLOCK.
3. PROPERTY AND EASEMENT BOUNDARY INFORMATION IS BASED UPON DRAWING EXHIBIT D, BY RONALD GREENWELL & ASSOCIATES, INC. REVISION DATED 05/FEB/09.

GENERAL LEGEND

- NEW FENCE
- EXISTING FENCE
- PROPERTY BOUNDRY (SEE NOTE 3)
- EASEMENT BOUNDARY (SEE NOTE 3)
- LANDSCAPE BUFFER

NOT TO BE USED FOR CONSTRUCTION

Source: Black & Veatch Holding Company, 03/26/09, Drawing 163994-SS-1002 R1

60' 30' 0 60' 120'

FIGURE 2.1-1
General Site Arrangement
Oakley Generating Station DESCP/SWPPP
Oakley, California

CH2MHILL

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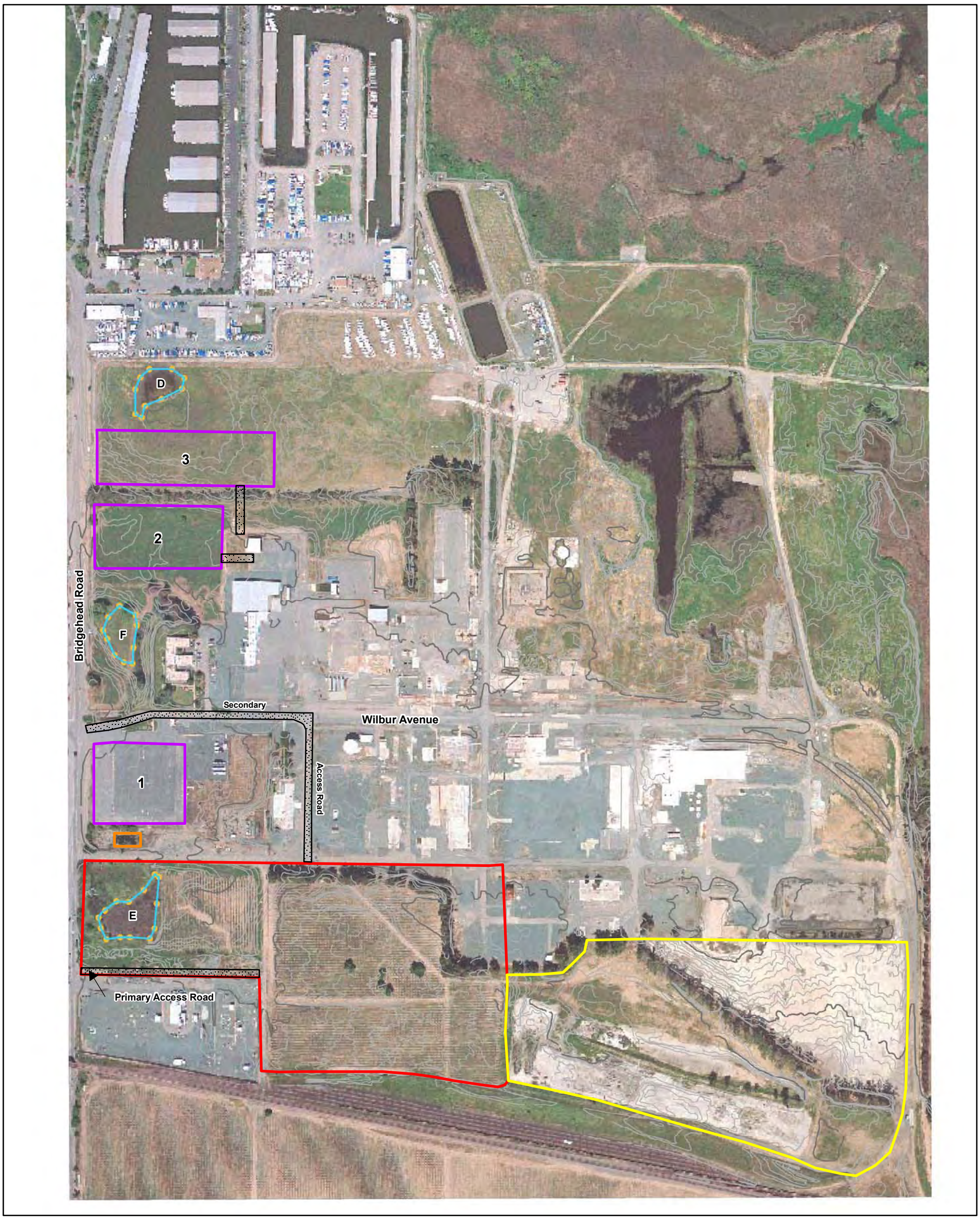

LEGEND

- Wetland
- Facility Site
- Laydown Area
- Stockpiles
- Access Road
- Existing Retention Basin

N

0 175 350
Feet

VICINITY MAP

FIGURE 2.1-2
Project Area Map
Oakley Generating Station DESCP/SWPPP
Oakley, California

CH2MHILL

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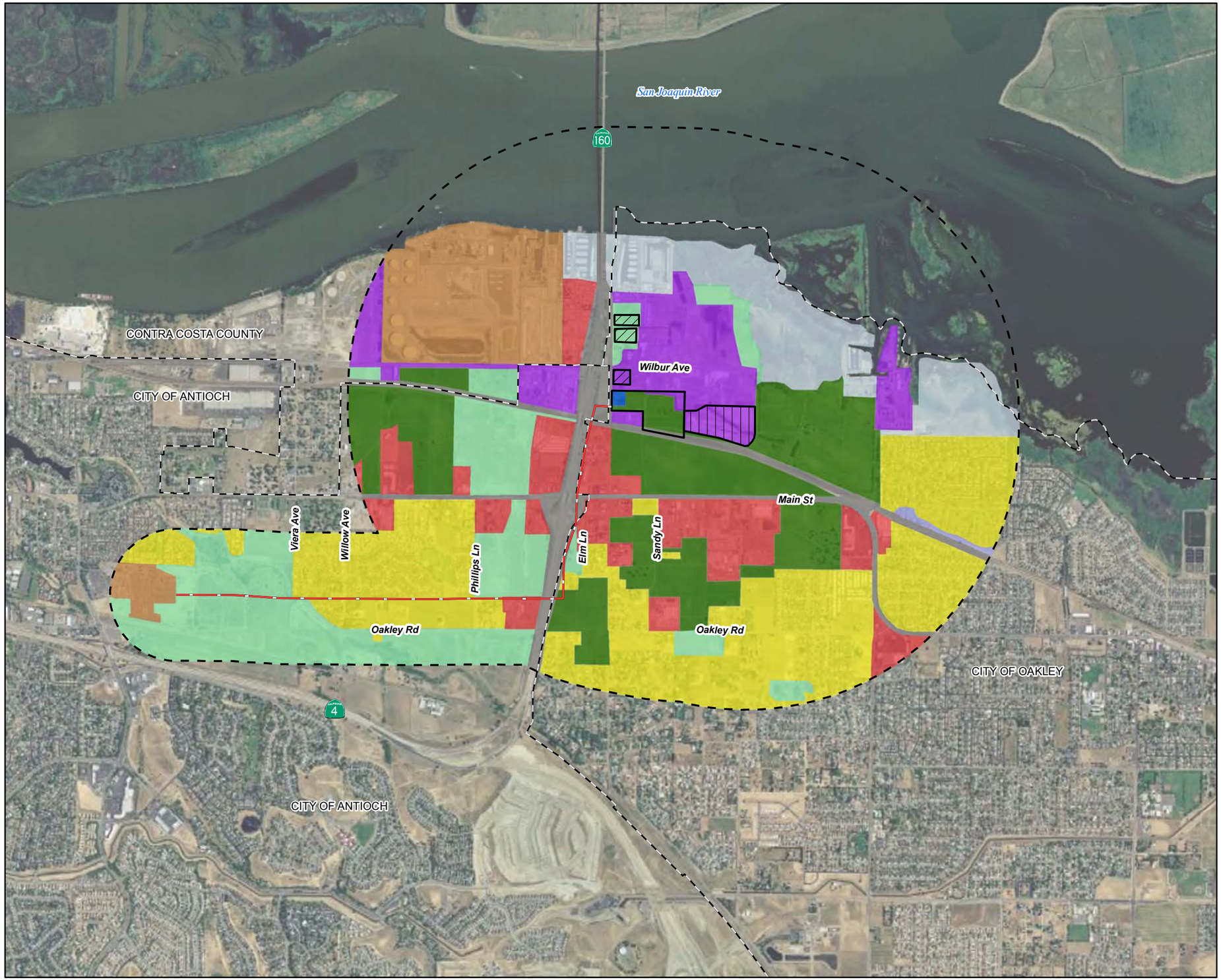

LEGEND

- EXISTING 60kV TRANSMISSION LINE
- CITY LIMITS
- BUFFER
- DIRT STOCKPILE AREAS
- LAYDOWN AREA
- PROJECT SITE

EXISTING LAND USE

- AGRICULTURAL
- COMMERCIAL
- DELTA RECREATION
- INDUSTRIAL
- OPEN SPACE
- PARKS
- RESIDENTIAL
- RIGHT-OF-WAY
- UTILITIES
- WETLAND

Notes:
1. 1 mile around Project Site, 1/4 mile around Transmisson Corridor.

This map was compiled from various scale source data and maps and is intended for use as only an approximate representation of actual locations.

N

0 1,000 2,000
Feet
1:24,000

FIGURE 2.1-3
Land Use
Oakley Generating Station DESCP/SWPPP
Oakley, California

CH2MHILL

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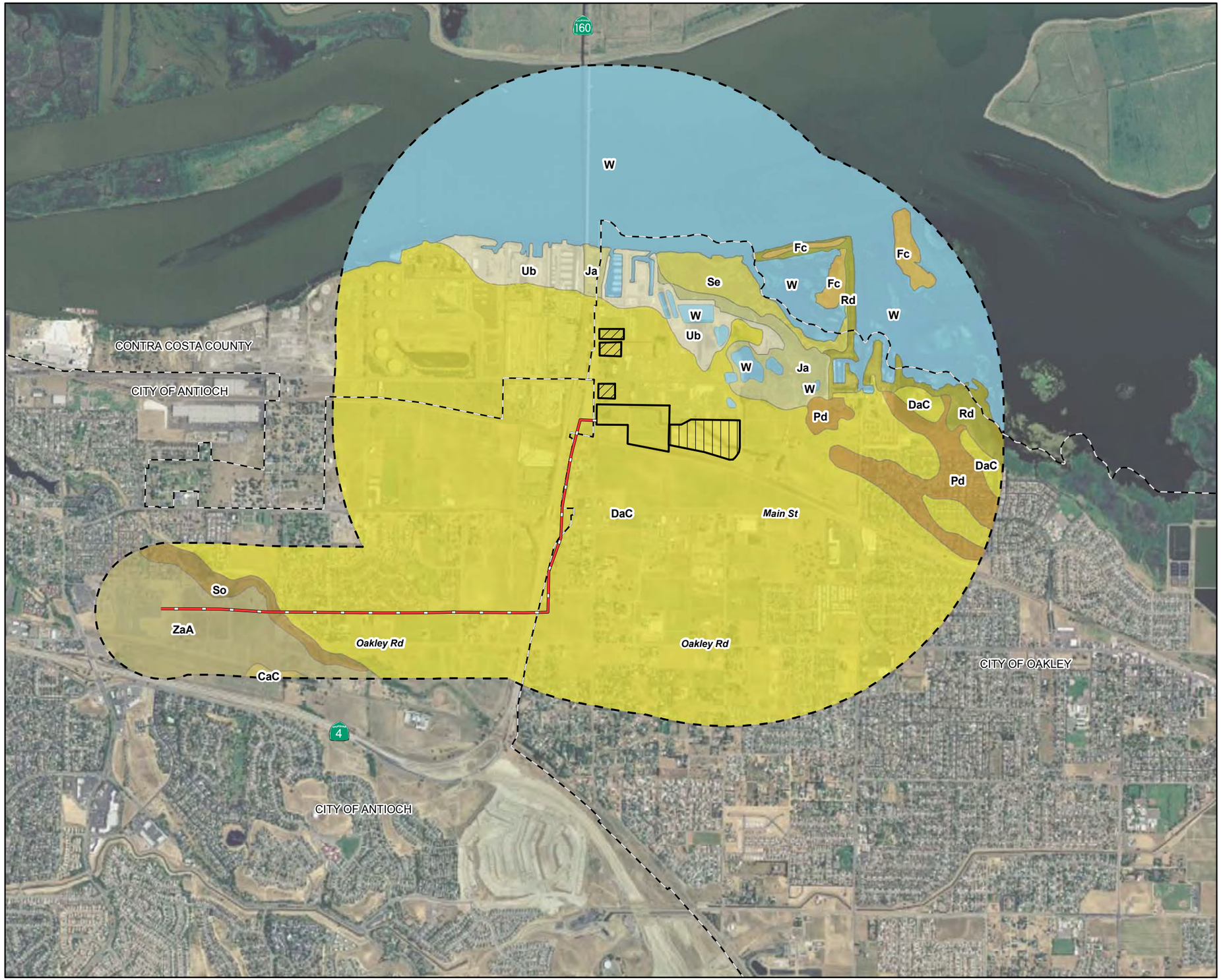

LEGEND

- EXISTING 60kV TRANSMISSION LINE
- DIRT STOCKPILE AREAS
- LAYDOWN AREA
- PROJECT SITE
- CITY LIMITS
- BUFFER

SOIL TYPES

- CaC - CAPAY CLAY, 2 TO 9 PERCENT SLOPES
- DaC - DELHI SAND, 2 TO 9 PERCENT SLOPES
- Fc - FLUVAQUENTS
- Ja - JOICE MUCK
- Pd - PIPER SAND
- Rd - RINDGE MUCK
- Se - SHIMA MUCK
- So - SYCAMORE SILTY CLAY LOAM
- Ub - URBAN LAND
- W - WATER
- ZaA - ZAMORA SILTY CLAY LOAM, 0 TO 2 PERCENT SLOPES

Notes:
1. 1 mile around Project Site, 1/4 mile around NG Pipeline and Transmisson Line.
2. Source: U.S. Department of Agriculture, Natural Resources Conservation Service, Soil Survey Geographic (SSURGO) database for Contra Costa County, California.

This map was compiled from various scale source data and maps and is intended for use as only an approximate representation of actual locations.

N

0 1,000 2,000
Feet
1:24,000

FIGURE 2.1-4
Soils
Oakley Generating Station DESCP/SWPPP
Oakley, California

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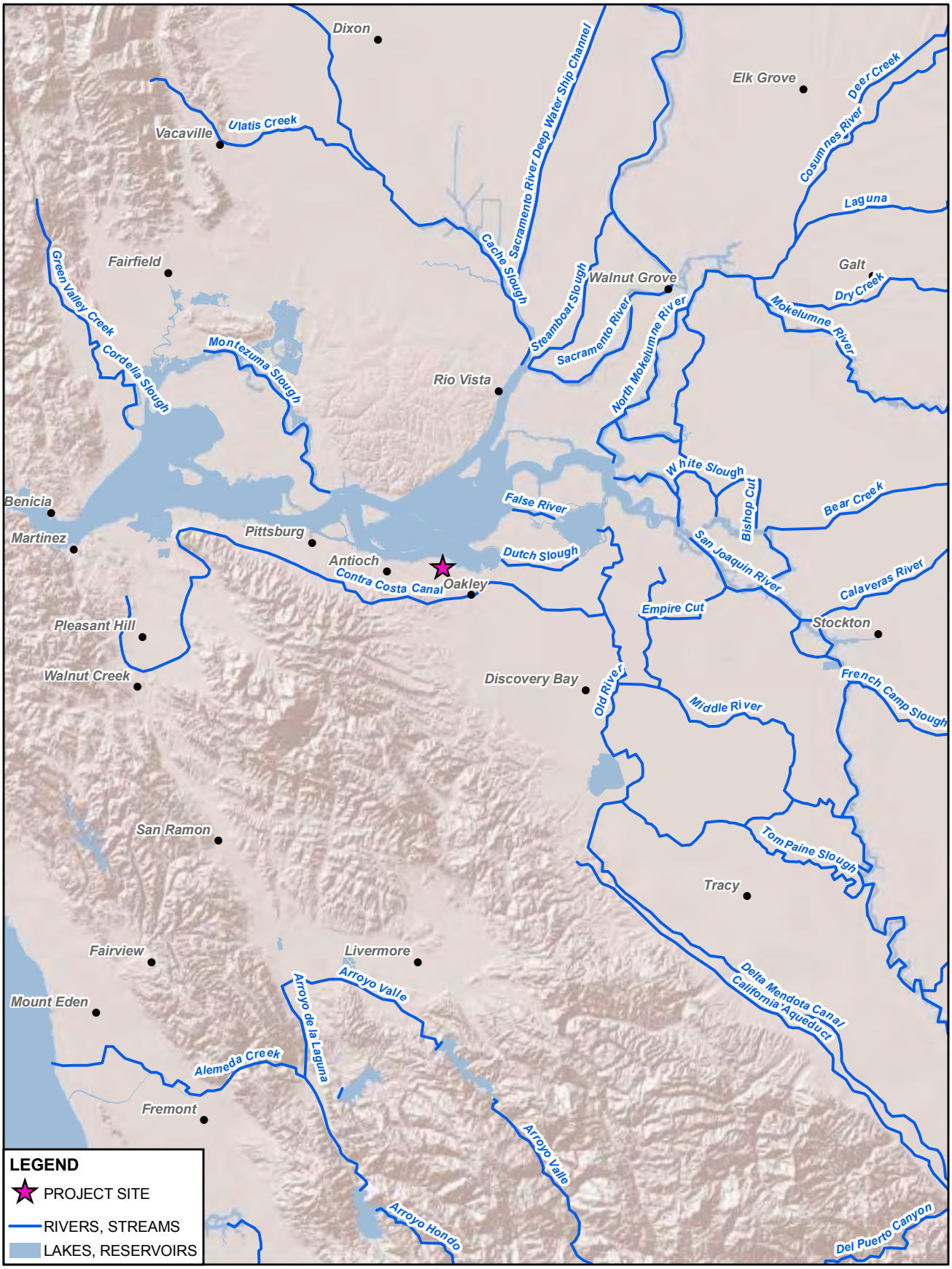

Notes:
1. Source: USGS, the National Atlas of the United States, Environmental Systems Research Institute (ESRI). Water Bodies - 2004, River and Streams - 2006.

This map was compiled from various scale source data and maps and is intended for use as only an approximate representation of actual locations.

N

0 4 8
Miles

FIGURE 2.1-5
Surface Water
Oakley Generating Station DESCP/SWPPP
Oakley, California

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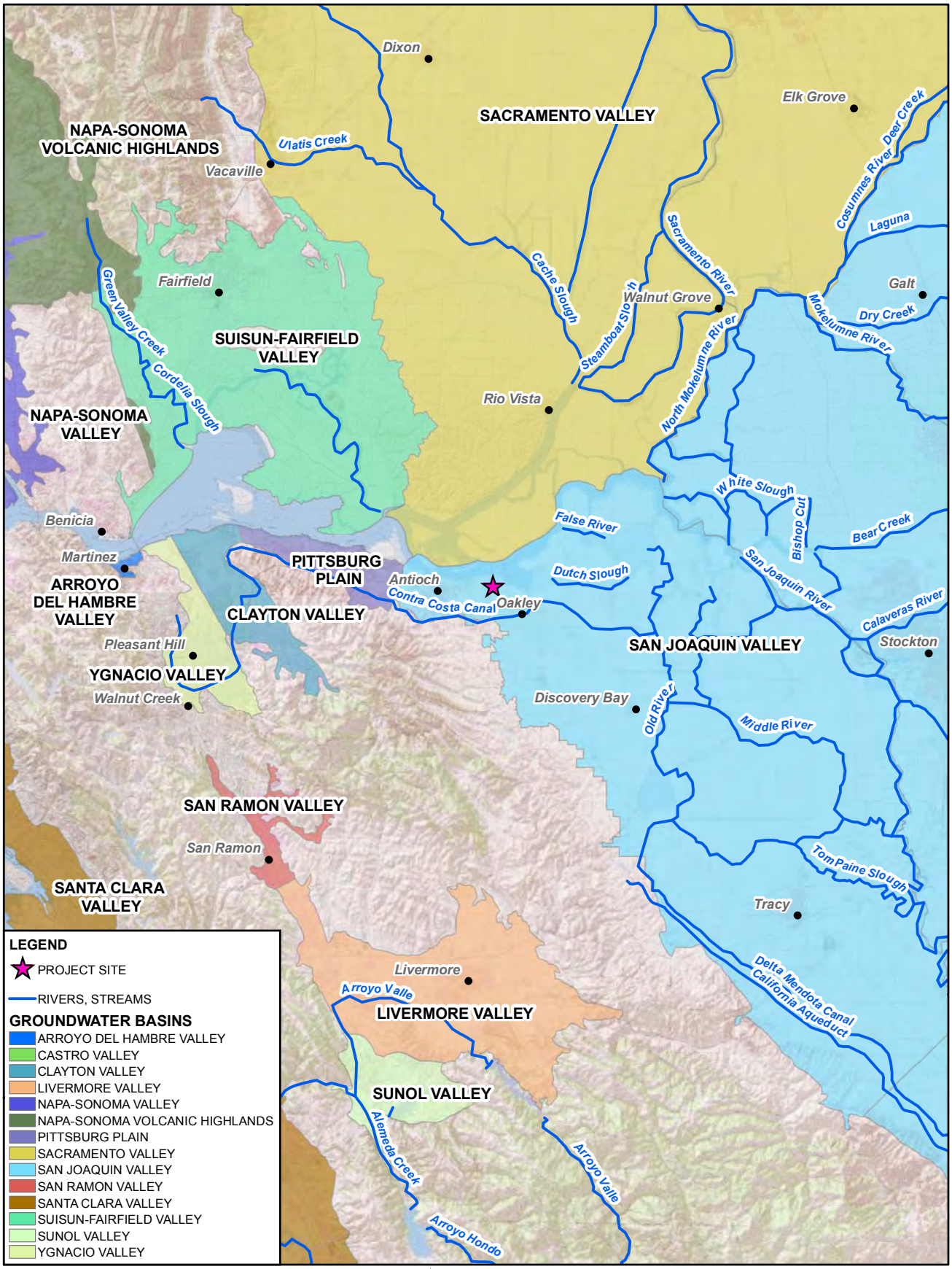

Notes:
1. Source: The Dept. of Water Resources, Groundwater Basin Map, 2004.

This map was compiled from various scale source data and maps and is intended for use as only an approximate representation of actual locations.

N

0 4 8
Miles

FIGURE 2.1-6
Groundwater Resources
Oakley Generating Station DESCP/SWPPP
Oakley, California

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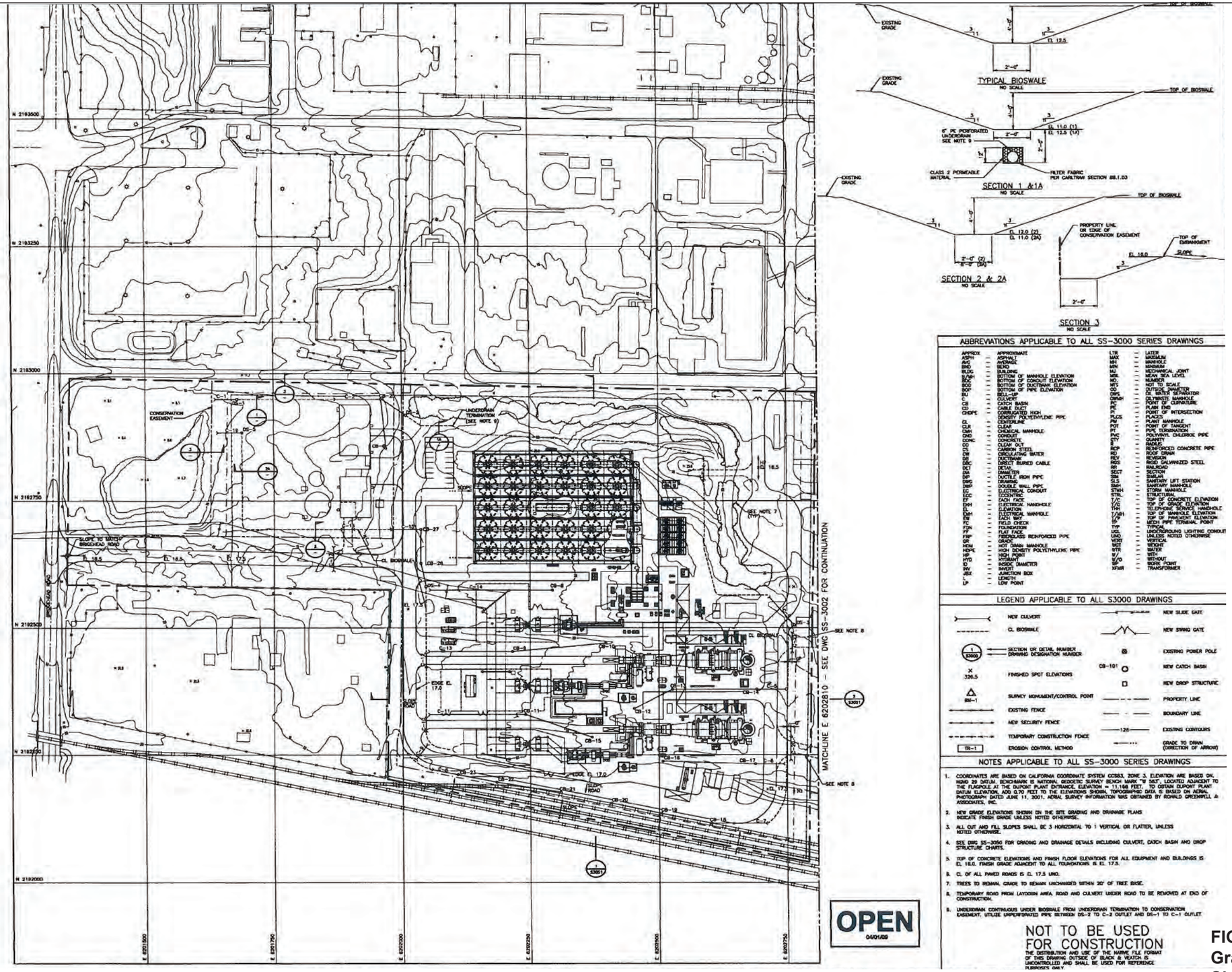


ABBREVIATIONS APPLICABLE TO ALL SS-3000 SERIES DRAWINGS

APPROX	=	APPROXIMATE	LTR	=	LATER
ASPH	=	ASPHALT	MAX	=	MAXIMUM
AVG	=	AVERAGE	MH	=	MANHOLE
BND	=	BOND	MIN	=	MINIMUM
BLDG	=	BUILDING	MJ	=	MECHANICAL JOINT
B/MH	=	BOTTOM OF MANHOLE ELEVATION	MSL	=	MEAN SEA LEVEL
BOC	=	BOTTOM OF CONDUIT ELEVATION	NO	=	NUMBER
BOD	=	BOTTOM OF DUCTBANK ELEVATION	NS	=	NOT TO SCALE
BOP	=	BOTTOM OF PIPE ELEVATION	OD	=	OUTSIDE DIAMETER
BU	=	BELL-UP	OWS	=	OIL WATER SEPARATOR
C	=	CONCRETE	OWMH	=	OILTWISTE MANHOLE
CB	=	CATCH BASIN	PC	=	POINT OF CURVATURE
CD	=	CABLE DUCT	PE	=	PLAIN END
CHDPE	=	CORRUGATED HIGH DENSITY POLYETHYLENE PIPE	PI	=	POINT OF INTERSECTION
CL	=	CENTERLINE	PLCS	=	PLACES
CLR	=	CLEAR	PM	=	PLANT MANHOLE
CMH	=	CHEMICAL MANHOLE	POT	=	POINT OF TANGENT
CND	=	CONDUIT	PT	=	PIPE TERMINATION
CONC	=	CONCRETE	PVC	=	POLYVINYL CHLORIDE PIPE
CO	=	CLEAN OUT	QTY	=	QUANTY
CS	=	CARBON STEEL	R	=	RADIUS
CW	=	CIRCULATING WATER	RCP	=	REINFORCED CONCRETE PIPE
DB	=	DUCTBANK	RD	=	ROOF DRAIN
DBC	=	DIRECT BURIED CABLE	REV	=	REVISION
DET	=	DETAIL	RGS	=	RIGID GALVANIZED STEEL
DIA	=	DIAMETER	RR	=	RAILROAD
DIP	=	DUCTILE IRON PIPE	SECT	=	SECTION
DWG	=	DRAWING	SIM	=	SIMILAR
DWP	=	DOUBLE WALL PIPE	SLS	=	SANITARY LIFT STATION
EC	=	ELECTRICAL CONDUIT	SMH	=	SANITARY MANHOLE
ECC	=	ECCENTRIC	STMH	=	STORM MANHOLE
EF	=	EACH FACE	STRL	=	STRUCTURAL
EHH	=	ELECTRICAL HANDHOLE	T/C	=	TOP OF CONCRETE ELEVATION
EL	=	ELEVATION	T/G	=	TOP OF GRADE ELEVATION
EMH	=	ELECTRICAL MANHOLE	THH	=	TELEPHONE SERVICE HANDHOLE
EW	=	EACH WAY	T/MH	=	TOP OF MANHOLE ELEVATION
FC	=	FIELD CHECK	T/P	=	TOP OF PAVEMENT ELEVATION
FDN	=	FOUNDATION	TP	=	MECH PIPE TERMINAL POINT
FF	=	FLAT FACE	TYP	=	TYPICAL
FRP	=	FIBERGLASS REINFORCED PIPE	UGL	=	UNDERGROUND LIGHTING CONDUIT
GR	=	GRADE	UND	=	UNLESS NOTED OTHERWISE
HDM	=	HOT DIPPED MANHOLE	VERT	=	VERTICAL
HDPE	=	HIGH DENSITY POLYETHYLENE PIPE	WGT	=	WEIGHT
HP	=	HIGH POINT	WTR	=	WATER
HYD	=	HYDRANT	W/	=	WITH
ID	=	INSIDE DIAMETER	W/O	=	WITHOUT
INV	=	INVERT	WP	=	WORK POINT
JBX	=	JUNCTION BOX	XFMR	=	TRANSFORMER
L	=	LENGTH			
LP	=	LOW POINT			

LEGEND APPLICABLE TO ALL S3000 DRAWINGS

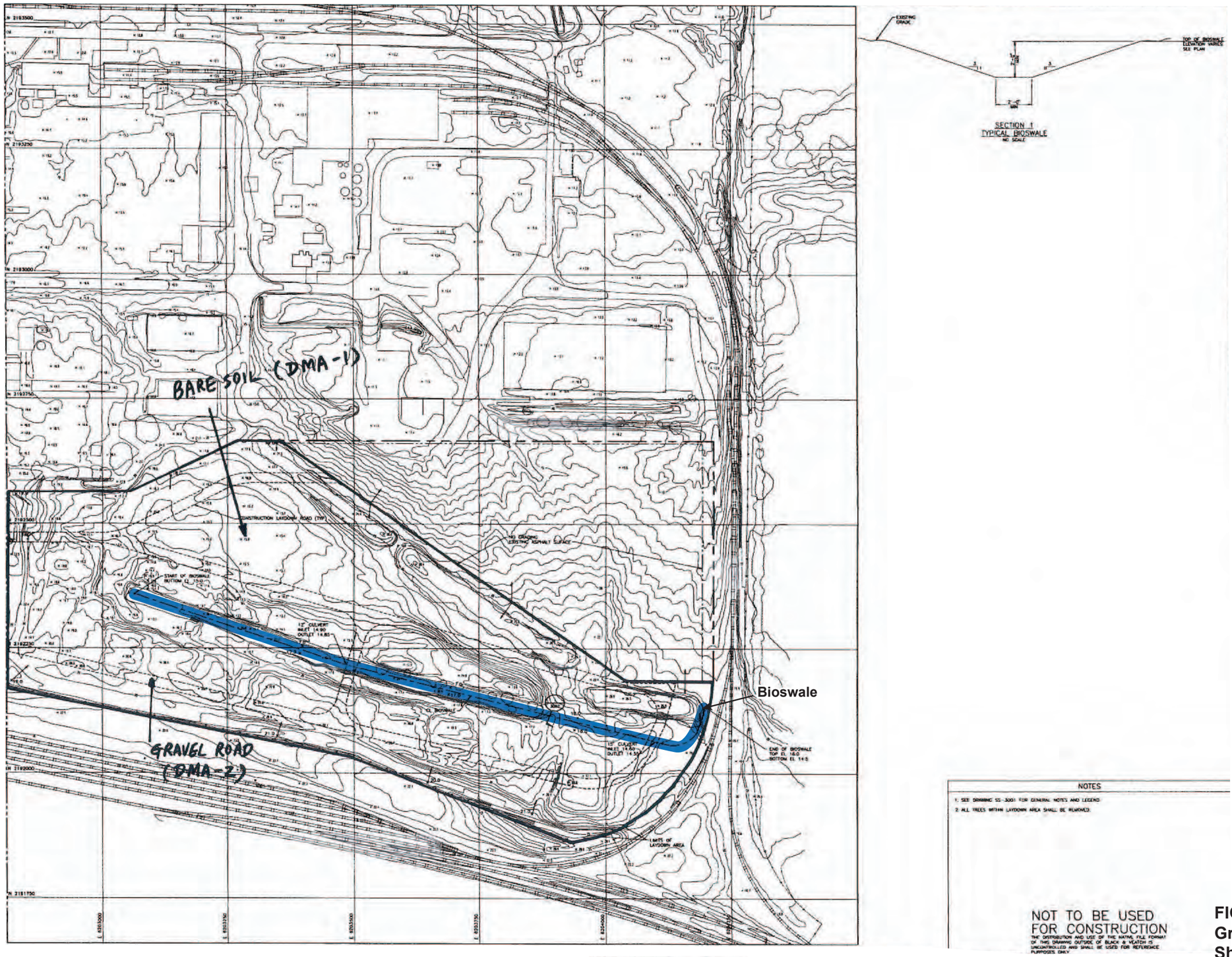
	NEW CULVERT		NEW SLIDE GATE
	CL BIOSWALE		NEW SWING GATE
1 / S3005	SECTION OR DETAIL NUMBER / DRAWING DESIGNATION NUMBER		EXISTING POWER POLE
× 326.5	FINISHED SPOT ELEVATIONS	CB-101	NEW CATCH BASIN
			NEW DROP STRUCTURE
BM-1	SURVEY MONUMENT/CONTROL POINT		PROPERTY LINE
	EXISTING FENCE		BOUNDARY LINE
	NEW SECURITY FENCE	126	EXISTING CONTOURS
	TEMPORARY CONSTRUCTION FENCE		GRADE TO DRAIN (DIRECTION OF ARROW)
TR-1	EROSION CONTROL METHOD		

NOTES APPLICABLE TO ALL SS-3000 SERIES DRAWINGS

1. COORDINATES ARE BASED ON CALIFORNIA COORDINATE SYSTEM CCS83, ZONE 3. ELEVATION ARE BASED ON, NGVD 29 DATUM. BENCHMARK IS NATIONAL GEODETIC SURVEY BENCH MARK "H 547", LOCATED ADJACENT TO THE FLAGPOLE AT THE DUPONT PLANT ENTRANCE. ELEVATION = 11.168 FEET. TO OBTAIN DUPONT PLANT DATUM ELEVATION, ADD 0.70 FEET TO THE ELEVATIONS SHOWN. TOPOGRAPHIC DATA IS BASED ON AERIAL PHOTOGRAPH DATED JUNE 11, 2001. AERIAL SURVEY INFORMATION WAS OBTAINED BY RONALD GREENWELL & ASSOCIATES, INC.
2. NEW GRADE ELEVATIONS SHOWN ON THE SITE GRADING AND DRAINAGE PLANS INDICATE FINISH GRADE UNLESS NOTED OTHERWISE.
3. ALL CUT AND FILL SLOPES SHALL BE 3 HORIZONTAL TO 1 VERTICAL OR FLATTER, UNLESS NOTED OTHERWISE.
4. SEE DWG SS-3050 FOR GRADING AND DRAINAGE DETAILS INCLUDING CULVERT, CATCH BASIN AND DROP STRUCTURE CHARTS.
5. TOP OF CONCRETE ELEVATIONS AND FINISH FLOOR ELEVATIONS FOR ALL EQUIPMENT AND BUILDINGS IS EL 18.0. FINISH GRADE ADJACENT TO ALL FOUNDATIONS IS EL 17.5.
6. CL OF ALL PAVED ROADS IS EL 17.5 UNO.
7. TREES TO REMAIN. GRADE TO REMAIN UNCHANGED WITHIN 20' OF TREE BASE.
8. TEMPORARY ROAD FROM LAYDOWN AREA. ROAD AND CULVERT UNDER ROAD TO BE REMOVED AT END OF CONSTRUCTION.
9. UNDERDRAIN CONTINUOUS UNDER BIOSWALE FROM UNDERDRAIN TERMINATION TO CONSERVATION EASEMENT. UTILIZE UNPERFORATED PIPE BETWEEN DS-2 TO C-2 OUTLET AND DS-1 TO C-1 OUTLET.

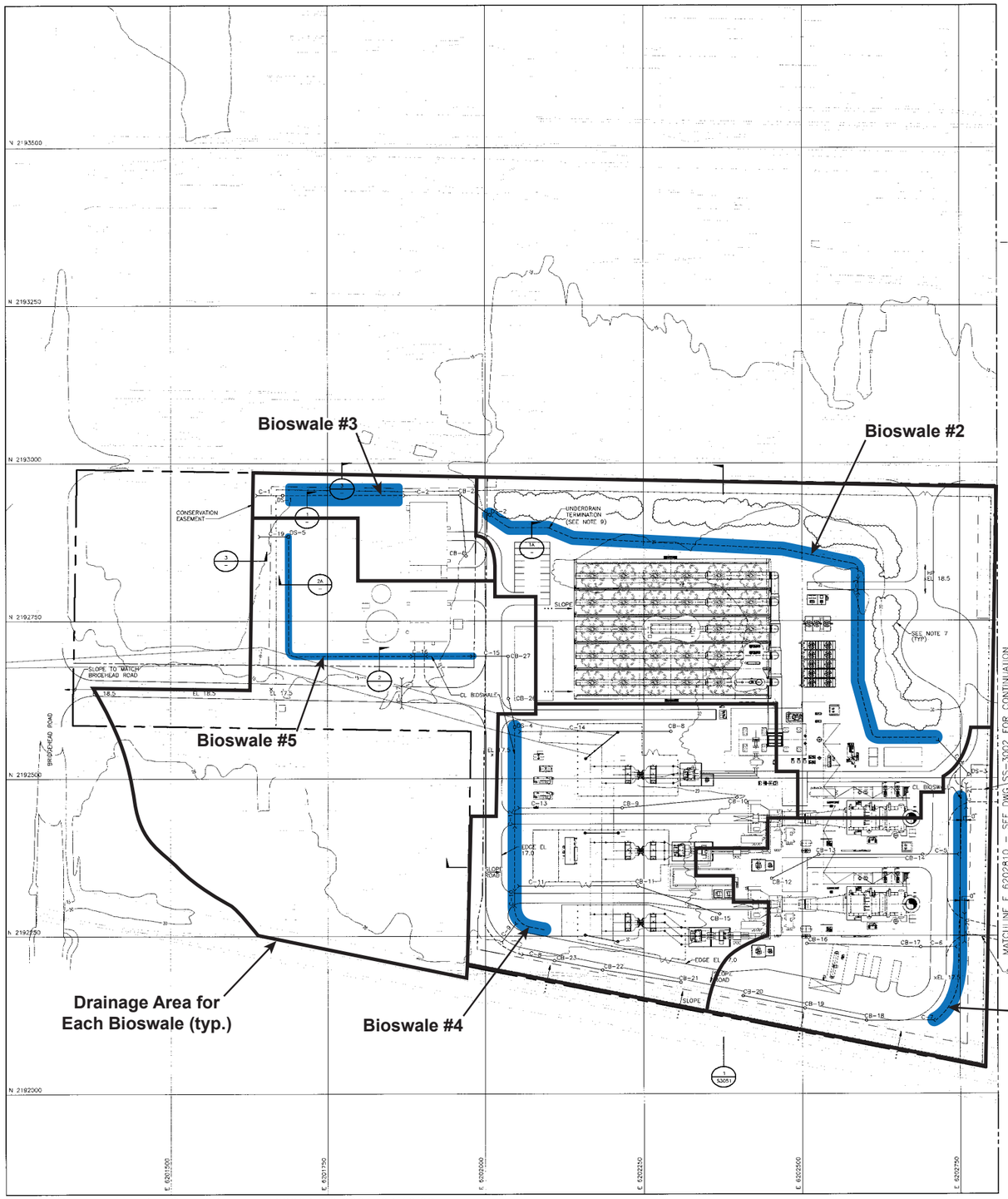
FIGURE 2.1-7
Grading And Drainage Site Plan
Sheet 1
Oakley Generating Station DESCP/SWPPP
Oakley, California

Source: Black & Veatch Holding Company, 04/18/09, Drawing 163994-SS-3001

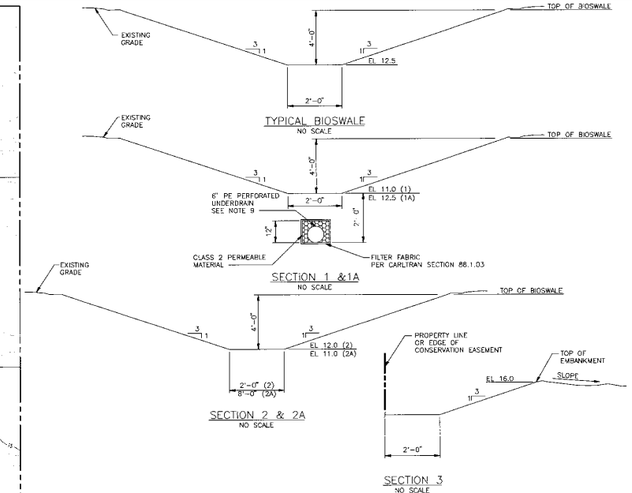


Source: Black & Veatch Holding Company, 04/18/09, Drawing 163994-SS-3002 Rev. A

FIGURE 2.1-7
Grading And Drainage Site Plan Sheet 2
Oakley Generating Station DESCP/SWPPP
Oakley, California



Source: Black and Veatch Corp., Drawing 163994-SS-3001, 04/16/09



ABBREVIATIONS APPLICABLE TO ALL SS-3000 SERIES DRAWINGS

APPROX	–	APPROXIMATE	LTR	–	LATER
ASPH	–	ASPHALT	MAX	–	MAXIMUM
AVG	–	AVERAGE	MH	–	MANHOLE
BND	–	BEND	MIN	–	MINIMUM
BLDG	–	BUILDING	MJ	–	MECHANICAL JOINT
B/MH	–	BOTTOM OF MANHOLE ELEVATION	MSL	–	MEAN SEA LEVEL
BOC	–	BOTTOM OF CONDUIT ELEVATION	NO.	–	NUMBER
BOD	–	BOTTOM OF DUCTBANK ELEVATION	NTS	–	NOT TO SCALE
BOP	–	BOTTOM OF PIPE ELEVATION	OD	–	OUTSIDE DIAMETER
BL	–	BELL–UP	OWS	–	OIL WATER SEPARATOR
C	–	CULVERT	OWMH	–	OILYWASTE MANHOLE
CB	–	CATCH BASIN	PC	–	POINT OF CURVATURE
CD	–	CABLE DUCT	PE	–	PLAIN END
CHDPE	–	CORRUGATED HIGH DENSITY POLYETHYLENE PIPE	PI	–	POINT OF INTERSECTION
CL	–	CENTERLINE	PLCS	–	PLACES
CLR	–	CLEAR	PM	–	PLANT MANHOLE
CMH	–	CHEMICAL MANHOLE	POT	–	POINT OF TANGENT
CND	–	CONDUIT	PT	–	PIPE TERMINATION
CONC	–	CONCRETE	PVC	–	POLYVINYL CHLORIDE PIPE
CO	–	CLEAN OUT	QTY	–	QUANTITY
CS	–	CARBON STEEL	R	–	RADIUS
CW	–	CIRCULATING WATER	RCP	–	REINFORCED CONCRITE PIPE
DB	–	DUCTBANK	RD	–	ROOT DRAIN
DBC	–	DIRECT BURIED CABLE	REV	–	REVISION
DET	–	DETAIL	RGS	–	RIGID GALVANIZED STEEL
DIA	–	DIAMETER	RR	–	RAILROAD
DIP	–	DUCTILE IRON PIPE	SECT	–	SECTION
DWG	–	DRAWING	SIM	–	SIMILAR
DWP	–	DOUBLE WALL PIPE	SLS	–	SANITARY LIFT STATION
EC	–	ELECTRICAL CONDUIT	SMH	–	SANITARY MANHOLE
ECC	–	ECCENTRIC	STMH	–	STORM MANHOLE
EF	–	EACH FACE	STRL	–	STRUCTURAL
EHH	–	ELECTRICAL HANDHOLE	T/C	–	TOP OF CONCRETE ELEVATION
EL	–	ELEVATION	T/G	–	TOP OF GRADE ELEVATION
EMH	–	ELECTRICAL MANHOLE	THH	–	TELEPHONE SERVICE HANDHOLE
EW	–	EACH WAY	T/MH	–	TOP OF MANHOLE ELEVATION
FC	–	FIELD CHECK	T/P	–	TOP OF PAVEMENT ELEVATION
FDN	–	FOUNDATION	TPT	–	MECH PIPE TERMINAL POINT
FF	–	FLAT FACE	TYP	–	TYPICAL
FRP	–	FIBERGLASS REINFORCED PIPE	UGL	–	UNDERGROUND LIGHTING CONDUIT
GR	–	GRADE	UNO	–	UNLESS NOTED OTHERWISE
HDM	–	HOT DRAW MANHOLE	VERT	–	VERTICAL
HDPE	–	HIGH DENSITY POLYETHYLENE PIPE	WGT	–	WEIGHT
HP	–	HOT POINT	WTR	–	WATER
HYD	–	HYDRANT	W/	–	WITH
ID	–	INSIDE DIAMETER	W/O	–	WITHOUT
INV	–	INVERT	WP	–	WORK POINT
JBX	–	JUNCTION BOX	XFMR	–	TRANSFORMER
L	–	LENGTH			
LP	–	LOW POINT			

LEGEND APPLICABLE TO ALL S3000 DRAWINGS

	NEW CULVERT		NEW SLIDE GATE
	CL BIOSWALE		NEW SWING GATE
1 / S3000	SECTION OR DETAIL NUMBER / DRAWING DESIGNATION NUMBER		EXISTING POWER POLE
× 326.5	FINISHED SPOT ELEVATIONS	CB-101	NEW CATCH BASIN
			NEW DROP STRUCTURE
BM-1	SURVEY MONUMENT/CONTROL POINT		PROPERTY LINE
	EXISTING FENCE		BOUNDARY LINE
	NEW SECURITY FENCE	126	EXISTING CONTOURS
	TEMPORARY CONSTRUCTION FENCE		GRADE TO DRAIN (DIRECTION OF ARROW)
TR-1	EROSION CONTROL METHOD		

NOTES APPLICABLE TO ALL SS-3000 SERIES DRAWINGS

1. COORDINATES ARE BASED ON CALIFORNIA COORDINATE SYSTEM CCS83, ZONE 3. ELEVATION ARE BASED ON, NGVD 29 DATUM. BENCHMARK IS NATIONAL GEODETIC SURVEY BENCH MARK "W 563", LOCATED ADJACENT TO THE FLAGPOLE AT THE DUPONT PLANT ENTRANCE. ELEVATION = 11.168 FEET. TO OBTAIN DUPONT PLANT DATUM ELEVATION, ADD 0.70 FEET TO THE ELEVATIONS SHOWN. TOPOGRAPHIC DATA IS BASED ON AERIAL PHOTOGRAPH DATED JUNE 11, 2001. AERIAL SURVEY INFORMATION WAS OBTAINED BY RONALD GREENWELL & ASSOCIATES, INC.
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NOT TO BE USED FOR CONSTRUCTION

THE DISTRIBUTION AND USE OF THE NATIVE FILE FORMAT OF THIS DRAWING OUTSIDE OF BLACK & VEATCH IS UNCONTROLLED AND SHALL BE USED FOR REFERENCE PURPOSES ONLY.

FIGURE 2.1-8
Post Development Drainage Plan
Oakley Generating Station DESCP/SWPPP
Oakley, California

SECTION 3

Best Management Practices

3.1 Schedule for BMP Implementation

3.1.1 Implementation Schedule

Construction of the generating facility, from site preparation and grading to commercial operation is expected to take place from the first quarter of 2011 to the fourth quarter of 2013 (33 months total). The construction phases of the OGS Project as they pertain to stormwater management and BMP implementation are expected to be as follows:

- **Preparation**—Most of the construction laydown area which will be used for construction worker parking and construction materials is covered by bare soil with little vegetation; however, the northeastern portion is covered by existing pavement. The entire construction laydown area will be graded with the exception of the existing paved area. A bioswale will be constructed at the center of the laydown area and the area will be graded such that runoff is collected in the bioswale. At the eastern end of the bioswale, a pump will be installed so that if the stormwater in the bioswale exceeds its volume capacity, the extra water will be pumped out to a location offsite.

  Detailed information regarding timing and sequencing of construction events and the location of the laydown and parking areas will be developed post contractor hiring and incorporated into the SWPPP as appropriate.

- **Access Road**—Primary access to the project site will be provided via a new entrance lane extending from Bridgehead Road, just south of the intersection of Bridgehead Road and Wilbur Avenue and will be stabilized using coarse aggregate. A secondary access will be provided via the existing site entrance located further north on Bridgehead Road.

- **Site Grading**— Grading on the project site will occur on approximately 22 acres and will last for two months; grading will occur on 14 acres of the project laydown area for a duration of 1 month and along the length of the transmission line (17-acre construction corridor) for a duration of 1 month. The laydown area will be covered with gravel to allow wet season use and to further minimize soil erosion potential. Heavy equipment stored on site will be placed on dunnage to protect it from ground moisture. Once construction is completed, the gravel will either be removed from the site or incorporated into onsite paving.

- **Foundation**—All underground piping and wiring will be installed, followed by installation of the foundation for the new generating facility and associated structures. Post-construction treatment of stormwater will be accomplished by directing stormwater to engineered bioswales.

- **Plant Construction**—After final site design and prior to construction, the Applicant will be required to finalize the Drainage, Erosion and Sediment Control Plan Construction SWPPP (this document). During construction, the Applicant will be required to follow

the SWPPP to prevent the offsite migration of sediment and other pollutants and to reduce the effects of runoff from the construction site. BMPs to be used at the site will be fully addressed in the Final SWPPP; the SWPPP will include the location of BMPs to be used, installation instructions, and maintenance schedules for each BMP.

- **Site Stabilization**—Permanent stormwater management fixtures will replace any temporary items at the end of project construction including the construction of the permanent bioswales on the project site and hydroseeding of bare ground.
- **Demobilization**—All temporary construction facilities will be removed. Permanent stormwater controls will then be in effect.

3.2 Erosion and Sediment Control

The combination of erosion control and sediment control is the most effective means to prevent sediment from leaving the project site and potentially entering storm drains or receiving waters. This section describes the BMPs that will be used for the project. BMP Drawings (Figure 3.2-1 through Figure 3.2-3) show the locations of the project BMPs. Figure 3.2-4 shows example installation methods for various BMPs that apply to the project (and is a part of Appendix E Preliminary Stormwater Management Design). BMP Fact Sheets are located in Appendix H.

3.2.1 Erosion Control

Erosion control is any source control measure that is designed to prevent soil particles from becoming detached by rainfall, flowing water, or wind. Erosion control consists of using project scheduling and planning to reduce soil or vegetation disturbance (particularly during the rainy season), preventing or reducing erosion potential by diverting or controlling drainage as well as preparing and stabilizing disturbed soil areas.

This construction project will implement the following practices to assure effective temporary and final soil stabilization (erosion control) during construction:

- Preserve existing vegetation where required and when feasible.
- Apply temporary soil stabilization (erosion control) to remaining active and non-active areas as required by the SWPPP BMP Manual as necessary to maintain effectiveness.
- Implement temporary soil stabilization measures at regular intervals throughout the defined rainy season to achieve and maintain the contract's disturbed soil area requirements.
- Stabilize non-active areas within 14 days of cessation of construction activities.
- Sufficient soil stabilization materials will be maintained onsite to allow implementation of requirements described in this DESC/SWPPP. This includes implementation requirements for active areas and non-active areas that require deployment before the onset of rain.

The erosion control BMPs are listed below:

- EC-1 Scheduling
- EC-2 Preservation of Existing Vegetation
- EC-4 Hydroseeding
- EC-7 Geotextiles and Mats
- EC-15 Soil Preparation/Roughening
- EC-16 Non-Vegetative Stabilization

Site preparation will consist of grading the proposed project site and the laydown area. Existing eucalyptus trees along the northern perimeter of these areas will be preserved, as will a row of eucalyptus trees bisecting the laydown area. However. six oak trees located within the footprint of the project facility will be removed. Three wetland areas (wetlands D, E, and F) and associated habitat will be preserved. Potential runoff to the wetland areas from project construction activities will be prevented by using sediment control BMPs discussed in Section 3.2.2.

Excavation work will consist of removal, storage, and/or disposal of earth, sand, gravel, vegetation, loose rock, and debris to the lines and grades necessary for construction. During construction activities, stockpile areas 2 and 3 will be bermed with soil used from the project. The berm will be placed on the perimeter of the stockpiles, and the berm will be hydroseeded to help stabilize the berm. Geotextiles and mats may be used with other BMPs on stockpiles during the rainy season and during the windy dry season (with the watering BMP) to prevent erosion of the stockpiles.

Site areas that will be graded include the project site and the construction laydown area, with the exception of the 6-acre portion of the laydown area that is concrete. Grading will retain the pre-project site contours to ensure that stormwater flows to the onsite construction bioswale located within the laydown area or into the stormwater drains. After being graded, the laydown area would be covered with gravel to allow for construction traffic and to prevent erosion. This gravelled area would be removed after construction, and the laydown area would be hydroseeded.

Graded areas will be smooth, compacted, free from irregular surface changes, and sloped to drain. Structures will be designed to meet appropriate seismic requirements (the site is located in Seismic Risk Zone 4) and California Building Code requirements. Areas to be backfilled will be prepared by removing unsuitable materials and rocks. The bottom of an excavation will be examined for loose or soft areas. Such areas will be excavated fully and backfilled with compacted fill. Backfilling will be done in layers of uniform, specified thickness. Soil in each layer will be properly moistened to facilitate compaction to achieve the specified density. To verify compaction, representative field density and moisture-content tests will be performed during compaction in accordance with ASTM standards.

Site access for construction and maintenance of the transmission line will be constructed by grading and aggregating a 17.3 acre construction corridor through existing ruderal and grassland vegetation. Aggregate will be removed after construction, and the corridor will be hydroseeded with native grasses. Prior to ground-disturbance associated with the linear construction phases, all or a combination of the BMPs listed in this section may be used. Post-grading plans will be available when site drawings are finalized.

As the foundation for the project structures are developed, temporary BMPs will be replaced with permanent BMPs. Sediments and hydrocarbons will be minimized or prevented from entering the surface collectors with storm drain inlet protection devices and rings of hydrocarbon-absorbing fabric.

A concrete washout site will be designated onsite or will occur offsite at the concrete contractor's facility. Notices will be posted to inform all drivers.

As construction nears completion, areas used for parking, storage and laydown will be stabilized. Areas that will continue to be used (for parking or storage) will have permanent stormwater collection and conveyance structures provided. All disturbed areas associated with the linear facilities will be stabilized. Figure 3.2-5 depicts the permanent site surfacing materials including asphalt surfacing, aggregate surfacing, concrete, grass, open graded stone surfacing, riprap, and natural soil.

Non-vegetation BMPs consist of five bioswales that will be built for the operation of the plant. These bioswales will be designed to maintain the natural drainage pattern of the site. All stormwater runoff from the site will be directed into the bioswales, which ultimately flow into Wetland E. A complete description of the bioswales is presented in section 3.4.

BMP Fact Sheets that will be used on this project are included in SWPPP Appendix H.

3.2.2 Sediment Controls

Sediment control is any practice that traps soil particles after they have been detached and moved by rain, flowing water, or wind. Sediment control measures are usually passive systems that rely on filtering or settling the particles out of the water or wind that is transporting them. Construction activities that have the potential to contribute sediment to storm water discharges include the following activities:

- Excavation and backfill
- Erosion control material application
- Traffic movement out of lay down area
- Steel pipe welding

The following sediment controls will be used onsite during project construction:

- SE-1 Silt Fence
- SE-2 Sediment Basin
- SE 3 Sediment Trap
- SE-5 Fiber Rolls
- SE-6 Gravel Bag Berm
- SE-7 Street Sweeping and Vacuuming
- SE-8 Sandbag Barrier
- SE-9 Straw Bale Barrier

A combination of silt fence and fiber rolls will be used on the upslope sides of the wetlands to prevent the transmittal of soil particles in runoff flowing into them. Fiber rolls will also be placed around the perimeter of stockpile 1 (located on a concrete parking area) to prevent sediment transport from the stockpile area. Additional BMPs such as Gravel Bag Berms,

Sand Bag Barriers or Straw Bale Barriers may also be used in these areas for reinforcement. Street sweeping and/or vacuuming will be implemented at the access roads entrances and exits.

3.2.3 Wind Erosion Control

Wind erosion controls shall be evaluated and implemented as needed throughout the duration of the project on all disturbed soils on the project site and linear facility sites that are subject to wind erosion, and when significant wind and dry conditions are anticipated during project construction. Wind controls will be used to prevent the transport of soil from soil-disturbed areas of the project site. The following control methods will be used for dust suppression, as necessary: The BMP used for wind control is listed below.

- WE-1 Wind Erosion Control

Additional wind control management measures will be implemented throughout the duration of construction and are listed below:

- Water aggregate roadways, parking areas and construction areas as needed.
- Cover all trucks hauling soil, sand and other loose materials offsite or require all trucks to maintain at least 18 inches of freeboard.
- Sweep adjacent streets and onsite paved roadways.
- Hydroseed or apply non-toxic soil stabilizers to inactive or completed construction areas as soon as is practical.
- Enclose, cover, water or apply non-toxic soil stabilizers to exposed stockpiles of sand, dirt, etc.
- Limit traffic speed onsite to 15 mph or less.
- Suspend excavation and grading during periods of high winds.

3.2.4 Tracking Control

Because sediment reaching public roads generally has a clear path to water bodies, controls will be in place to minimize or eliminate soils from being tracked off the project site from vehicles. Site access road and entrance/exits will be made of coarse aggregate to limit the amount of material adhering to tires. Paved roads used during the linear facilities construction phase and those located at the entrance of the construction site will be inspected daily and cleaned as necessary using manual or mechanical street sweepers (BMP SC-7).

- TC-1 Stabilized Construction Entrance/Exit
- TC-2 Stabilized Construction Roadway
- TC-3 Entrance/Outlet Tire Wash

3.3 Non-Stormwater and Materials Management

Non-stormwater management and materials management BMPs are source control BMPs that prevent pollution by limiting or reducing potential pollutants at their source or eliminating off-site discharge.

These practices involve day-to-day operations of the construction site and are also referred to as "good housekeeping practices, which include keeping a clean, orderly construction site.

Construction of the project will involve handling a large variety of building materials and chemicals associated with construction. As a Risk Level 1 site, the OGS project shall follow good site management (housekeeping) practices for construction materials and chemicals. These practices include conducting inventories of the products that will be used on-site; covering stockpiled construction materials; storing chemicals in water tight containers or in storage sheds using appropriate secondary containment to prevent any spillage or leakage; minimize exposure of construction materials with precipitation; and implementing BMPs to prevent off-site tracking of construction and landscape materials. Chemicals that could be potentially stored and used during construction of the facility include: gasoline, diesel fuel, oil, lubricants (i.e., motor oil, transmission fluid, and hydraulic fluid), solvents, adhesives, asphalt products, and paint materials. There are no feasible alternatives to these materials for construction or operation of construction vehicles and equipment, repaving areas, pouring concrete, or for painting and caulking buildings and equipment. Material Safety Data Sheets for each chemical used will be kept onsite, and construction employees will be made aware of their location and content. The contractor will be responsible for assuring that the use, storage and handling of these materials will comply with applicable federal, state, and local laws, ordinances, regulations, and standards (LORS), including licensing, personnel training, accumulation limits, reporting requirements, and record keeping.

Non-stormwater management BMPs to be used for this project are listed below:

- NS-1 Water Conservation Practices
- NS-2 Dewatering Operation
- NS-3 Paving and Grinding Operations
- NS-6 Illicit Connection/Discharge reporting
- NS-7 Potable Water/Irrigation
- NS-8 Vehicle and Equipment Cleaning
- NS-9 Vehicle and Equipment Fueling
- NS-10 Vehicle and Equipment Maintenance
- NS-11 Pile Driving Operations
- NS-12 Concrete Curing
- NS-13 Concrete Finishing
- NS-16 Temporary Batch Plant

Vehicle and equipment cleaning will occur at the access road entrance/outlet to the laydown area in the location of the tire wash or in an appropriate location per the direction of the QSD and QSP. Vehicle and Equipment Fueling shall be conducted in designated staging areas whenever possible. Leaks will be cleaned immediately and waste materials

disposed of appropriately. The QSD and QSP shall designate an appropriate vehicle and equipment fueling area, and provide appropriate BMPs. Construction of replacement transmission towers in areas of Sycamore soils may need to include dewatering.

3.3.1 Waste Management and Materials Pollution

Waste Management consists of implementing procedural and structural BMPs for handling, storing, and disposing of wastes generated by a construction project to prevent the release of waste materials into stormwater runoff or discharges through proper management of the following types of wastes:

- Solid
- Sanitary
- Concrete
- Hazardous
- Equipment-related wastes

The construction of the facility will generate various types of non-hazardous solid wastes, including debris and other materials requiring removal during site grading and excavation, excess concrete, lumber, scrap metal, and empty non-hazardous chemical containers. Management of these wastes will be the responsibility of the construction contractor(s). The generation of waste materials will be minimized through efficient and careful use of materials, and recycling when possible. Non-hazardous materials will be used where acceptable to meet construction requirements. Drummed and bagged wastes will not be stored directly on the ground, and will be covered or stored indoors where feasible. Incompatible materials will be separated, and secondary containment will be provided for liquids. Sufficient spill cleanup materials will be kept in proximity to areas where materials are stored and used.

Small quantities of hazardous wastes will be generated over the course of construction. These may include flushing and cleaning fluids, passivating fluid (to prepare pipes for use), and solvents. All hazardous wastes generated during facility construction will be handled and disposed of in accordance with applicable laws, ordinances, regulations, and standards, including licensing, personnel training, accumulation limits and times, and reporting and recordkeeping. The hazardous waste will be collected in satellite accumulation containers near the points of generation. It will be moved daily to the contractor's 90-day hazardous waste storage area, located at the site construction laydown area. The waste will be removed from the site by a certified hazardous waste collection company and delivered to an authorized hazardous waste management facility, prior to expiration of the 90-day storage limit.

Nonhazardous solid waste generated during construction will be collected in onsite dumpsters. The dumpsters will meet local and state solid waste management regulations, and be provided with solid lids or removable flexible covers. Wastes will be recycled where practical. Waste that cannot be recycled will be disposed of in a Class III landfill.

At a minimum, Risk Level 1 dischargers shall implement the following good housekeeping measures:

a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e., soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).

d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

e. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.

Risk Level 1 dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:

a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.

c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.

d. Cover waste disposal containers at the end of every business day and during a rain event.

e. Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.

f. Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.

g. Implement procedures that effectively address hazardous and nonhazardous spills.

h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities.

In the case of a spill, the project site must be prepared and have onsite equipment and materials for cleanup of spills; spills and leaks shall be cleaned up immediately and disposed of properly; and appropriate spill response personnel are assigned and trained.

Controls for common activities should be established, and preparations should be made to allow for quick response to accidents or spills including contingency plans for clean up and for sampling the contaminated stormwater.

The following waste management BMPs will be used on the project:

- WM-1 Material delivery and storage
- WM-2 Material use
- WM-3 Stockpile management
- WM-4 Spill Prevention and Control
- WM-5 Solid Waste Management (including use of covered dumpsters and containers for waste)
- WM-6 Hazardous Waste Management
- WM-8 Concrete Waste Management
- WM-9 Sanitary and septic waste management
- WM-10 Liquid Waste Management

Potential Contaminated Soil

A significant soil characteristic concerning the proposed 20-acre laydown area is the presence of waste titanium dioxide. A portion of this area was historically used for disposal of titanium dioxide waste during manufacturing operations at the DuPont facilities. As described in Section 2.2.5, during active manufacturing at the DuPont facility, the proposed laydown area was a TiO_2 landfill that was used for disposal of spent ore from the TiO_2 process (DuPont, 2003). This material is estimated to be approximately 3 feet thick (DuPont, 2006); the fill material is not expected to present a human health or wildlife risk (DuPont, 2006).

Groundwater Controls

Groundwater at the project site is currently not used for potable water, and project construction will have no effect on groundwater. The linear facilities, excavation, grading and foundation structures required for OGS would not result in any substantial change from the existing groundwater flow and conditions at the site. During construction, the project would be subject to LORS requiring standards for isolating and controlling offsite runoff and contaminants that could enter groundwater. During construction, the project would isolate all work areas using fiber, rolls, mats or similar devices to keep contaminated runoff from leaving the site.

3.4 Post-Construction Stormwater Management Measures

The OGS stormwater design will be governed by the stormwater management requirements of the Contra Costa Clean Water Program Stormwater C.3 Guidebook (CCCWP, 2008). The C.3 requirements address both flow control and treatment of stormwater. Per page 8 of the

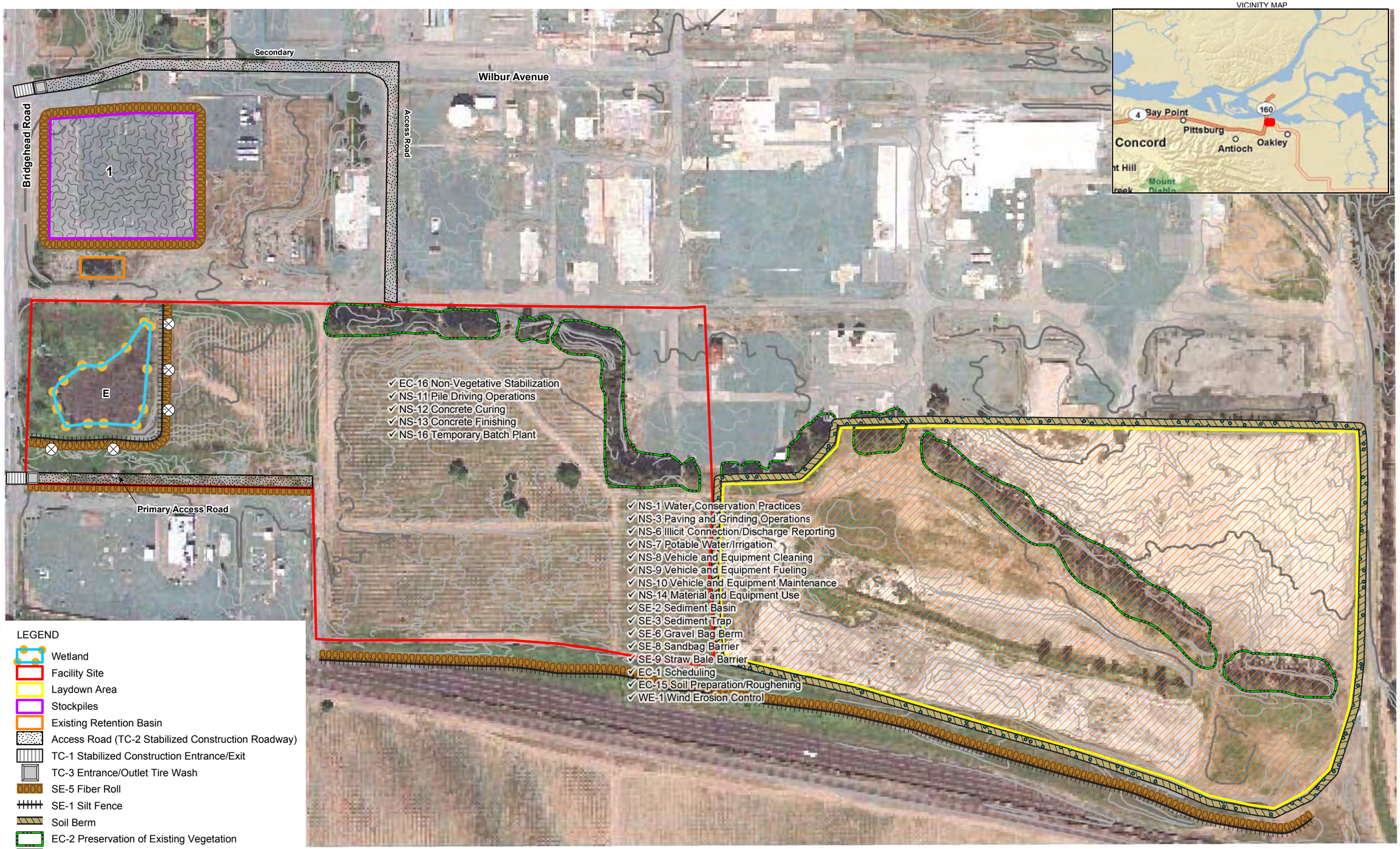
C.3 guidebook, using the Option 2 design process detailed in Chapter 4 will allow the OGS project to meet both treatment and flow control requirements.

Post-development drainage at the site will be designed to maintain the natural drainage pattern of the site. Five bioswales will be utilized to collect and infiltrate all stormwater runoff from the project site. The locations of bioswales and delineated drainage areas for each bioswale are shown on Figure 2.1-8. Drop structures DS-1 and DS-5 are located at the end of bioswales and are adjacent to the easement area. The drop structures will discharge stormwater to the bioswales via 12-inch-diameter sewer pipes that are capable of conveying stormwater from a 10-year storm event. At the eastern end of the bioswale, a pump will be installed so that if the stormwater in the bioswale exceeds its volume capacity, the extra water will be pumped out to a location offsite. Rainfall less than the design event will be contained in the bioswales and will infiltrate through the sandy soils or evaporate. The soils, plantings, and irrigation for the bioswales will be in accordance with Appendix B of the Contra Costa Clean Water Program Stormwater C.3 Guidebook. To allow stormwater to reach the easement area during rainfall events less than a C.3 design event, a perforated underdrain is located under the northern bioswale. The stormwater will be filtered through the plant roots and a biologically active soil mix within the bioswale, removing suspended solids and other potential pollutants prior to the underdrain collecting the stormwater and discharging to the easement area.

Downstream of the bioswales, 18-inch diameter sewer pipes that are capable of conveying peak runoff from a 50-year storm event, will be installed to discharge any overflow to Wetland E, which is located downstream of the project site, in addition to the drop structures. The wetland is capable of receiving runoff from the project site for a 100-year, 24-hour storm without overflowing to adjacent properties. The stormwater system is designed so that it does not adversely affect the supply of runoff to the wetland or the quality of water flowing into it. Refer to Appendix E, Preliminary Stormwater Management Design for specifics.

Runoff from the power block area will be routed through an oil/water separator before being discharged to the sanitary sewer system and will not be discharged onsite. Appendix E contains the Preliminary Stormwater Management Design for the project, which includes stormwater calculations and the pre- and post-development drainage plans. The owner of the site will operate and maintain the post-construction permanent bioswales for the life of the facility.

Figures



Note: Watering or street sweeping will occur throughout the site, for the duration of construction as needed for dust control.

FIGURE 3.2-1
Project Site And Laydown Area BMP Map
Oakley Generating Station DESCP/SWPPP
Oakley, California

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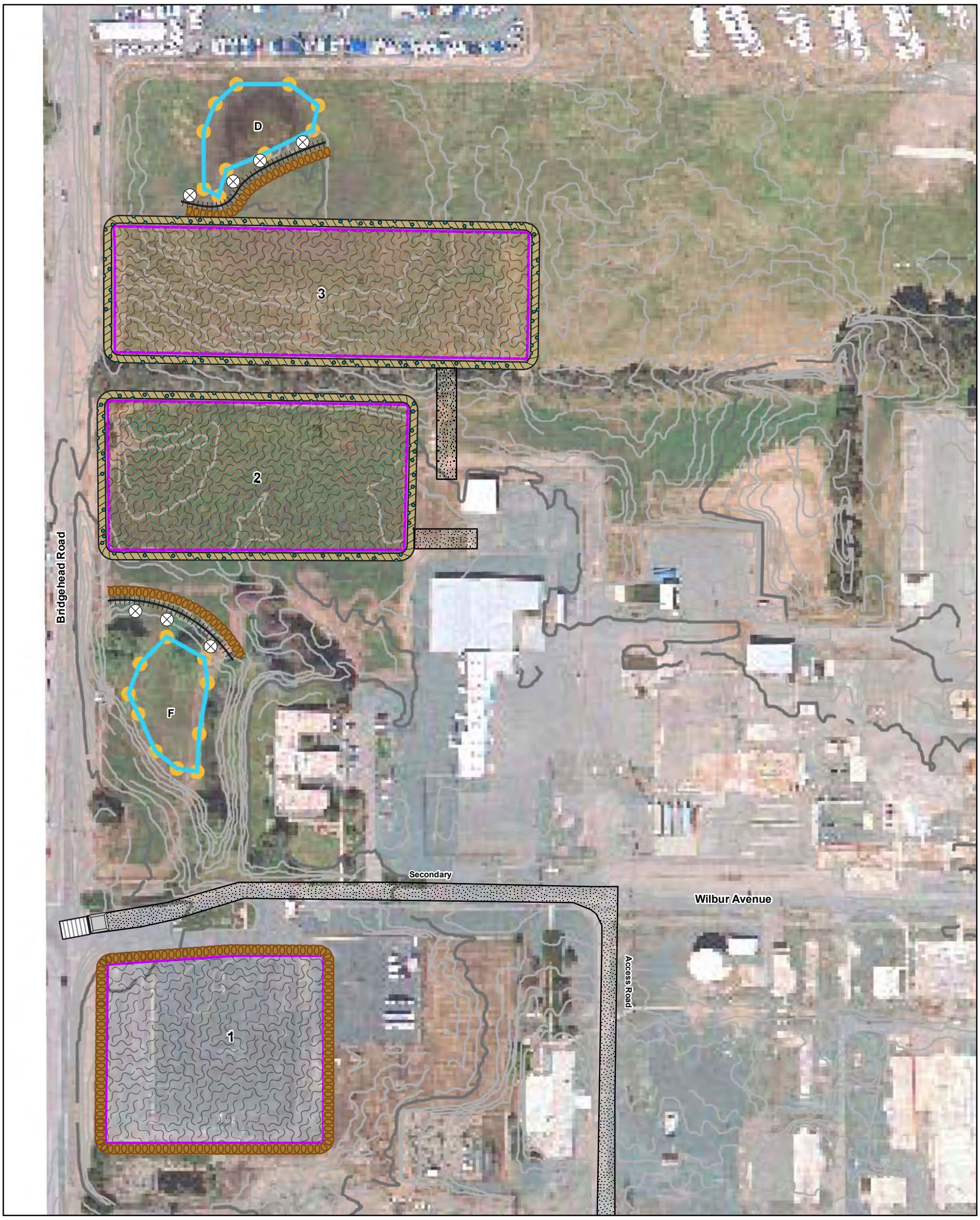

LEGEND

- Wetland
- Stockpiles
- Access Road (TC-2 Stabilized Construction Roadway)
- TC-1 Stabilized Construction Entrance/Exit
- TC-3 Entrance/Outlet Tire Wash
- SE-5 Fiber Roll
- SE-1 Silt Fence
- Soil Berm
- EC-4 Hydroseed
- EC-4 Hydroseed, Post-construction
- EC-7 Geotextiles and Mats
- "Sensitive Area" Signage

N

0 75 150
Feet

VICINITY MAP

FIGURE 3.2-2
Stockpile BMP Map
Oakley Generating Station DESCP/SWPPP
Oakley, California

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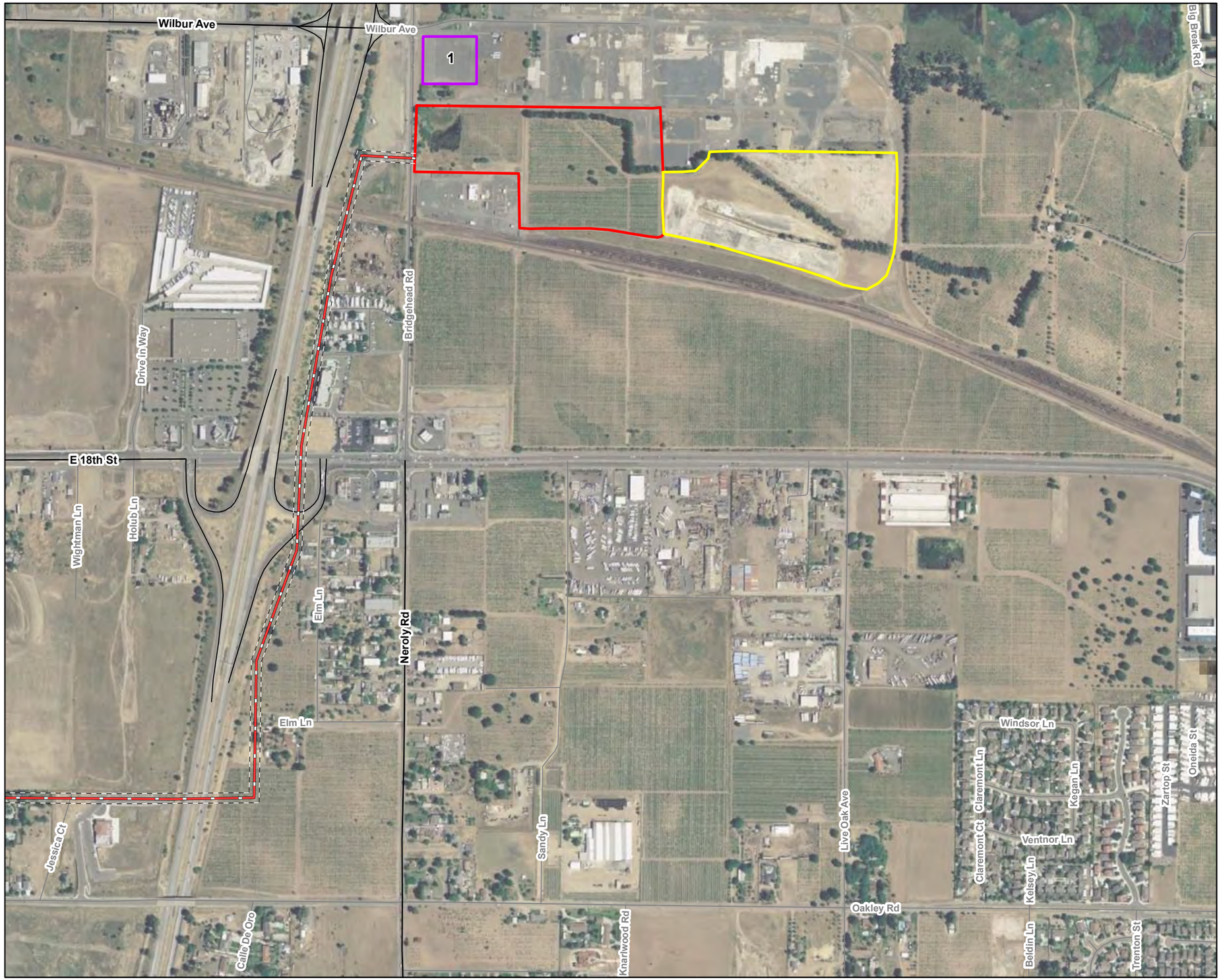
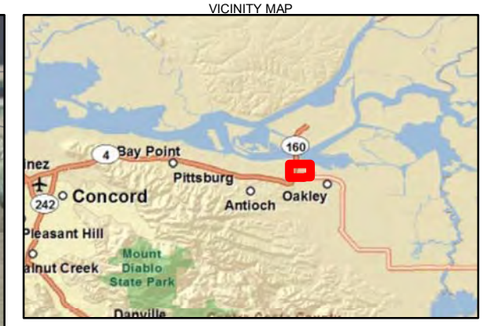


VICINITY MAP



LEGEND

- Existing 60kV Transmission Line
- Facility Site
- Laydown Area
- Stockpiles
- 30 ft. Construction Footprint

NOTE:
Transmission line BMPs to be specified and implemented by contractor.

N

0 300 600
Feet

FIGURE 3.2-3
Transmission Line/BMP Map Sheet 1
Oakley Generating Station DESCP/SWPPP
Oakley, California

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IS012010223151SAC Figure_3.2-3_S1.ai 03.03.2010 tdaus

VICINITY MAP

LEGEND

- Existing 60kV Transmission Line
- 30 ft. Construction Footprint
- Wetland Feature
- "Sensitive Area" Signage
- NS-2 Dewatering Operations

NOTE:
Transmission line BMPs to be specified and implemented by contractor.

N

0 300 600
Feet

FIGURE 3.2-3
Transmission Line/BMP Map Sheet 2
Oakley Generating Station DESCP/SWPPP
Oakley, California

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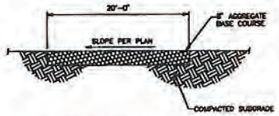
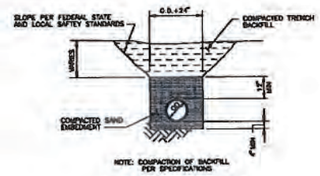
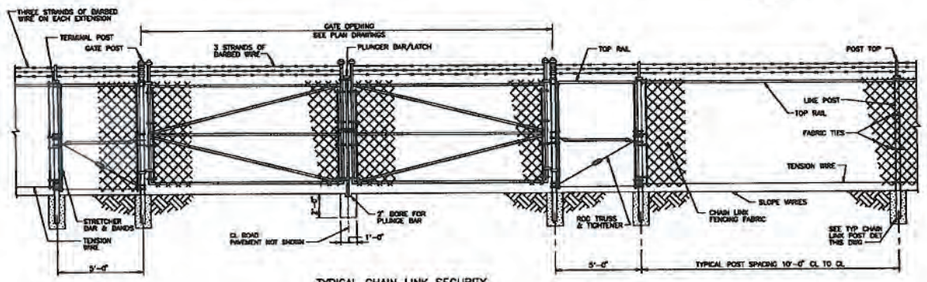
IS012010223151SAC Figure_3.2-3_S2.ai 03.03.2010 tdaus



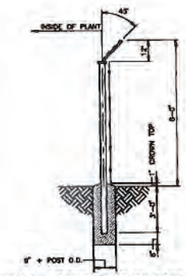
TYPICAL CONSTRUCTION LAYDOWN ROAD
NO SCALE



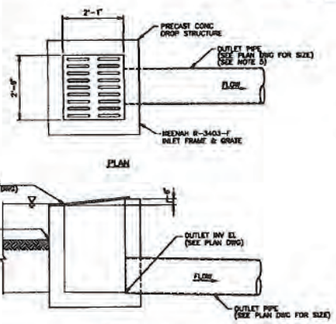
TYPICAL PIPE EMBEDMENT
NO SCALE



TYPICAL CHAIN LINK SECURITY FENCE AND GATE DETAIL
NO SCALE



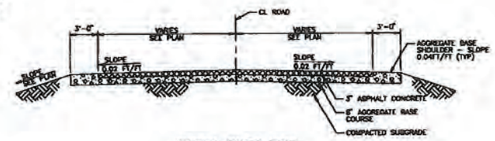
TYPICAL SECURITY FENCE POST DETAIL
NO SCALE



TYPICAL BIOSWALE DROP STRUCTURE DETAIL
NO SCALE

TYPICAL AGGREGATE SURFACING SECTION
NO SCALE

TYPICAL PERVIOUS CRUSHED STONE SURFACING SECTION
NO SCALE



TYPICAL PAVED ROAD
NO SCALE
SEE DWG SS-3201

CULVERT TABLE						
CULVERT NO.	INLET INV ELEVATION	OUTLET INV ELEVATION	LENGTH	PIPE DIAMETER	PIPE MATERIAL	REMARKS
C-1	8.2	8.0	–	18"	–	
C-2	11.8	11.5	–	18"	–	
C-3	13.0	13.0	–	18"	–	
C-4	13.2	13.0	–	18"	–	
C-5	13.1	13.0	–	12"	–	
C-6	13.1	13.0	–	12"	–	
C-7	13.3	13.0	–	12"	–	
C-8	13.2	13.0	–	12"	–	
C-9	13.0	13.0	–	12"	–	
C-10	13.0	13.0	–	15"	–	
C-11	13.4	13.0	–	12"	–	
C-12	13.0	13.0	–	18"	–	
C-13	13.4	13.0	–	12"	–	
C-14	13.5	13.0	–	12"	–	
C-15	12.8	12.5	–	18"	–	
C-16	12.5	12.5	–	18"	–	
C-17	14.7	14.4	–	12"	–	
C-19	8.7	8.5	–	18"	–	
C-20	–	–	–	18"	–	
C-21	–	–	–	18"	–	

CATCH BASIN TABLE																						
STRUCTURE NO.	CENTERLINE COORDINATES		TOP OF GRATE ELEVATION	INLET & OUTLET PIPE INFORMATION																		REMARKS
				A		B		C		D		E		F		G		H				
	NORTH	EAST		INV EL.	DIA	INV EL.	DIA	INV EL.	DIA	INV EL.	DIA	INV EL.	DIA	INV EL.	DIA	INV EL.	DIA	INV EL.	DIA			
CB-6	–	–	16.0	–	–	13.2	12"	–	–	–	–	13.2	12"	–	–	–	–	–	–			
CB-7	NOT USED																					
CB-8	–	–	17.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	13.8	12"			
CB-9	–	–	17.0	–	–	–	–	13.4	12"	–	–	–	–	–	–	13.4	12"	–	–			
CB-10	–	–	17.0	–	–	–	–	13.4	12"	–	–	–	–	–	–	–	–	–	–			
CB-11	–	–	17.0	–	–	–	–	–	–	13.4	12"	–	–	–	–	13.4	12"	–	–			
CB-12	–	–	17.0	–	–	13.8	12"	–	–	–	–	–	–	–	–	–	–	–	–			
CB-13	–	–	17.0	–	–	–	–	13.4	12"	–	–	–	–	13.4	12"	–	–	–	–			
CB-14	–	–	17.0	–	–	–	–	13.1	12"	–	–	–	–	–	–	13.1	12"	–	–			
CB-15	–	–	17.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	13.8	12"			
CB-16	–	–	17.0	–	–	–	–	13.4	12"	–	–	–	–	–	–	–	–	–	–			
CB-17	–	–	17.0	–	–	–	–	13.1	12"	–	–	–	–	–	–	13.1	12"	–	–			
CB-18	–	–	16.5	–	–	13.3	12"	–	–	–	–	–	–	–	–	13.3	12"	–	–			
CB-19	–	–	16.5	–	–	–	–	13.4	12"	–	–	–	–	–	–	13.4	12"	–	–			
CB-20	–	–	16.5	–	–	–	–	13.8	12"	–	–	–	–	–	–	–	–	–	–			
CB-21	–	–	18.5	–	–	–	–	–	–	–	–	–	–	–	–	13.6	12"	–	–			
CB-22	–	–	16.5	–	–	–	–	13.4	12"	–	–	–	–	–	–	13.4	12"	–	–			
CB-23	–	–	16.5	–	–	–	–	13.2	12"	–	–	–	–	–	–	13.2	12"	–	–			
CB-24	NOT USED																					
CB-25	–	–	15.0	–	–	–	–	–	–	11.8	18"	12.3	12"	–	–	11.8	18"	–	–			
CB-26	–	–	16.0	13.3	18"	–	–	–	–	–	–	13.3	18"	–	–	–	–	–	–			
CB-27	–	–	16.5	–	–	–	–	–	–	–	–	12.8	18"	–	–	12.8	18"	–	–			

ALL DIMENSIONS ARE IN FEET, EXCEPT DIAMETER, WHICH IS IN INCHES
FOR PIPELINE MATERIAL SEE PIPELINE LIST

DROP STRUCTURE (DS) TABLE																						
STRUCTURE NO.	CENTERLINE COORDINATES		TOP OF GRATE ELEVATION	INLET & OUTLET PIPE INFORMATION																		REMARKS
				A		B		C		D		E		F		G		H				
	NORTH	EAST		INV EL.	DIA	INV EL.	DIA	INV EL.	DIA	INV EL.	DIA	INV EL.	DIA	INV EL.	DIA	INV EL.	DIA	INV EL.	DIA			
DS-1	–	–	13.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	12.1	18"			
DS-2	–	–	15.5	–	–	–	–	–	–	–	–	–	–	–	–	11.8	18"	–	–			
DS-3	–	–	15.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	13.2	18"			
DS-4	–	–	15.5	13.5	18"	–	–	–	–	–	–	–	–	–	–	–	–	–	–			
DS-5	–	–	14.5	8.7	18"	–	–	–	–	–	–	–	–	–	–	–	–	–	–			

ALL DIMENSIONS ARE IN FEET, EXCEPT DIAMETER, WHICH IS IN INCHES
FOR PIPELINE MATERIAL SEE PIPELINE LIST

NOTES

1. FILTER FABRIC SHALL BE UV-STABILIZED NONWOVEN GEOTEXTILE HAVING A MINIMUM WEIGHT OF 135 g/M^2 PER CALTRANS SS 88-1.03.
2. SEE DWG SS-3001 FOR GENERAL NOTES AND LEGEND

OPEN
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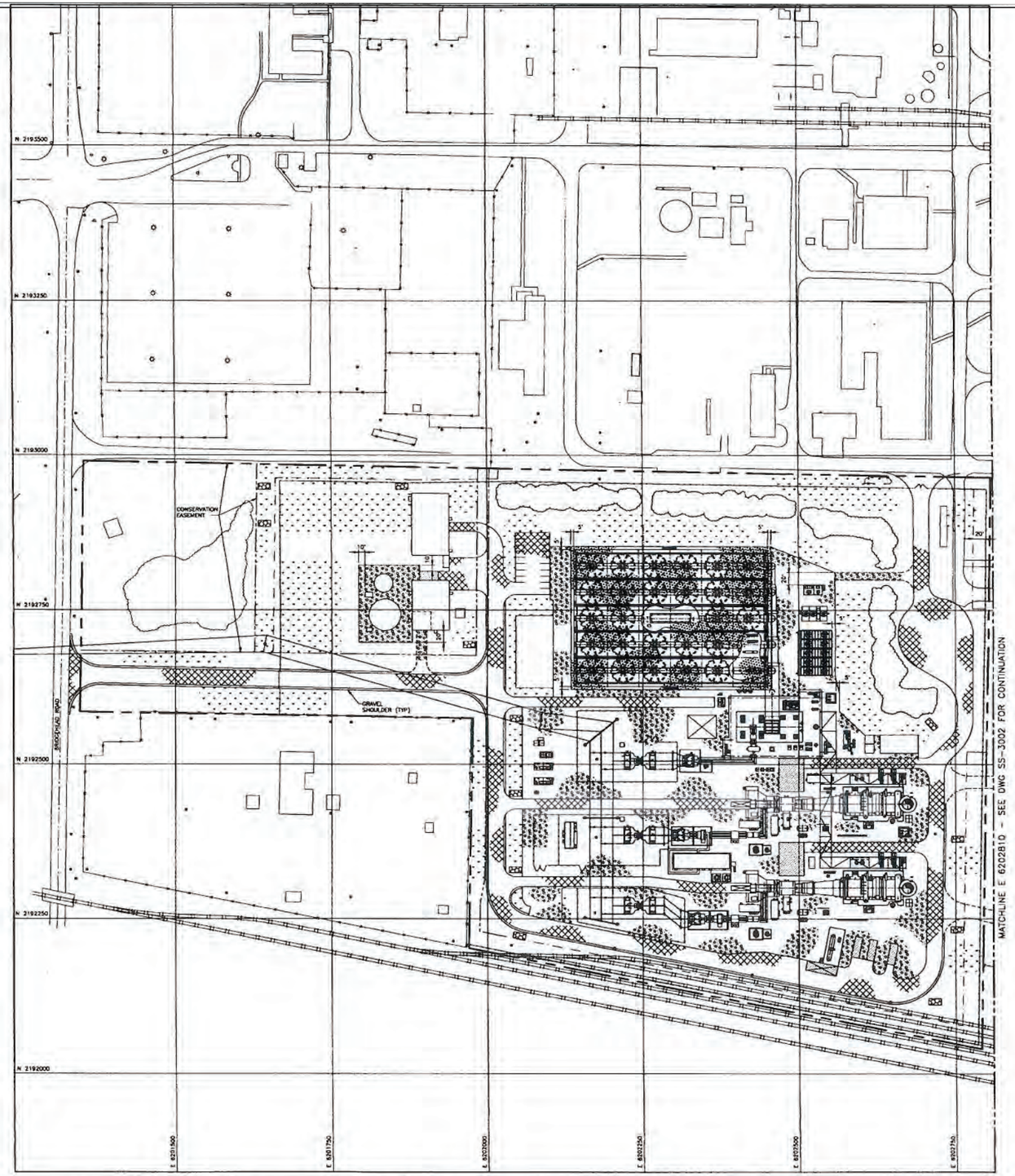
FIGURE 3.2-4
Example Installation Methods
Oakley Generating Station DESCP/SWPPP
Oakley, California



SITE SURFACING LEGEND

- ASPHALT SURFACING
- AGGREGATE SURFACING
- CONCRETE
- GRASS
- OPEN GRADED STONE SURFACING
- RIPRAP
- EXISTING FACILITY
- NEW FACILITY
- NATURAL SOIL

NOTES

1. SEE DRAWING SS-3001 FOR GENERAL NOTES AND LEGEND.

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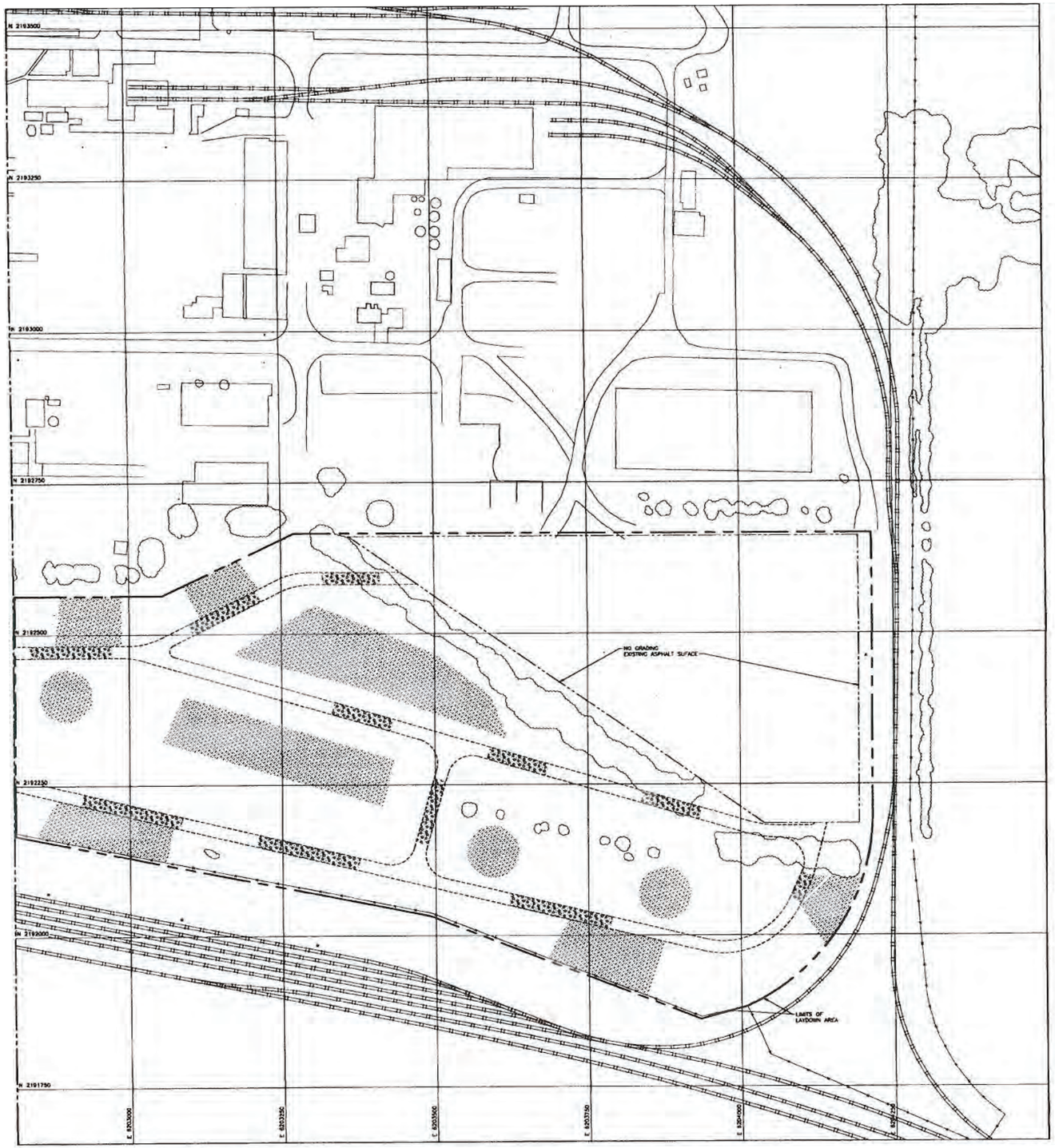
FIGURE 3.2-5
Surfacing/Fencing/Roadway Sheet 1
Oakley Generating Station DESCP/SWPPP
Oakley, California



NOTES

1. SEE DRAWING SS-3001 FOR GENERAL NOTES AND LEGEND.

NOT TO BE USED
FOR CONSTRUCTION

Source: Black & Veatch Holding Company, 04/18/09, Drawing 163994-SS-3202 Rev. A

FIGURE 3.2-5
Surfacing/Fencing/Roadway
Sheet 2
Oakley Generating Station DESCP/SWPPP
Oakley, California

SECTION 4

BMP Inspection, Maintenance, and Rain Event Action Plans

4.1 BMP Inspection and Maintenance

Risk Level 1 sites are required to ensure that all inspection, maintenance repair and sampling activities at the project location shall be performed by a QSP representing the owner. The QSP may delegate any or all of these activities to an employee trained to do the tasks appropriately. The QSP shall ensure adequate performance by the trained employee. Personnel responsible for inspections before, during and after storm events will receive additional training specific for this purpose. This can take the form of formal classroom training and/or "walk-around" with an experienced individual, who discusses the appropriate conditions and those conditions requiring action. The QSD (or designee) will maintain a list of authorized inspection individuals for the SWPPP (Appendix I), including the QSD and the QSP. Information on the list will include the name and contact information for the individual, their role on the project, date of training, and date of recorded entry as well as a copy of training certificates or other verification of training.

4.1.1 Site Inspections

Weekly inspections and observations, and at least once each 24-hour period during extended storm events, to identify BMPs that need maintenance to operative effectively, that have failed, or that could fail to operate as intend shall be performed by the QSP or employees trained by the QSP.

Upon identifying failures or other shortcomings, repairs or design changes to BMPs must be implemented within 72 hours of identification and complete the changes as soon as possible.

For each inspection required, the QSP (or designee) shall complete an inspection checklist (Appendix J). All site checklists shall be kept onsite with the SWPPP at all times. Photographs and descriptions must accompany each inspection list.

Records of SWPPP inspections will be maintained onsite for at least 3 years. An example checklist will contain, at a minimum, the following information required by the Regional Water Quality Control Board:

- Inspection date and the date the report was written.
- Weather information: best estimate of beginning of storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall (inches).
- Site information, including stage of construction, activities completed, and approximate area of the site exposed.
- Description of any inadequate BMPs.

- If possible to safely access during inclement weather, observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-stormwater controls; otherwise, result of visual inspection at relevant outfall, discharge point, or downstream location and projected required maintenance activities.
- Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.
- Corrective actions required, including any changes to SWPPP necessary and implementation dates.
- Photographs taken during the inspection.
- Inspectors name, title, and signature.

Records of all monitoring information, copies of all reports required by the general stormwater permit, and records of all data used to complete the Notice of Intent for the construction activity shall be held, retained, and kept in possession by the facility operator and/or contractor for at least 3 years.

The facility operator and/or contractor will annually certify that its construction activity is in compliance with the requirements of this general permit and it's SWPPP. Noncompliance notifications will be submitted within 30 days of identification of noncompliance to the Regional Water Quality Control Board.

Equipment, materials, and workers will be available for rapid response to failures and emergencies. All corrective maintenance to BMPs will be performed as soon as possible, depending upon worker safety.

Prior to plan commencement, names of responsible personnel will be added to this plan.

4.1.2 Maintenance

Erosion and sediment control structures must be maintained to remain effective. Features that are washed out or damaged will be repaired as soon as possible, contingent at all times on worker safety. Structures designed to accumulate sediment will have sediment removed in advance of the rainy season, and before major storm events. The following criteria will be used to determine whether erosion and sediment control features should be cleaned, repaired, or replaced:

- Sediment or other debris has accumulated to greater than one-third the height of sediment fabric fences.
- Sediment or debris has reduced the storage capacity of sediment traps by 50 percent or more.
- More than one-third of the cross-section of conveyance structures, such as drainage swales or ditches are plugged or blocked.

In addition, the following maintenance activities will be performed:

- Paved roads immediately surrounding the construction sites will be cleaned as necessary using manual or mechanical street sweepers.

- Coarse aggregate on plant access road and entrance/exit will be maintained so as to limit sediment tracking and creation of dust.
- Surfaces that are not paved or provided with gravel surfacing will be watered to limit the generation of dust (but will not be excessively watered so as to generate runoff).
- All equipment will be maintained according to manufacturers' specifications so as to prevent leaks and spills.
- Any contaminated soils resulting from spills will be dug up as quickly as possible, and then removed from the site for proper disposal.

If failing BMPs or changes to the BMP program are warranted, SWPPP amendments should be prepared by the QSD if warranted by the problem encountered and corrective action required.

4.2 Rain Event Action Plans

The Project site has been identified as a Risk Level 1 site and therefore a REAP is not required.

SECTION 5

Training

The General Permit requires (Section VII) that all elements of the SWPPP be developed by a QSD and implemented by a QSP. The QSP may delegate tasks to trained employees provided adequate supervision and oversight is provided.

Personnel at the site shall receive training appropriate for individual roles and responsibilities on the project. Appropriate personnel shall receive training on SWPPP implementation, BMP inspection and maintenance, and record keeping. All training activities will be documented (formal and informal) and retained in Appendix K. Training documentation must also be submitted in the Annual Report

SECTION 6

Responsible Parties and Operators

6.1 Responsible Parties

The General Permit requires (Section VII.B.4) that the name of any "Approved Signatory" be listed in the SWPPP, and a copy of the written agreement or other mechanism that provides this authority from the LRP be provided in the SWPPP. A list of responsible parties is provided in Appendix L.

6.2 Contractor List

The General Permit requires (Section VII.B.5) that the SWPPP include a list of names of all contractors, subcontractors, and individuals who will be directed by the QSP. This list is located in SWPPP Appendix M. Contents of the list include telephone numbers, work addresses, and the specific areas of responsibility for each contractor, and emergency contact numbers.

SECTION 7

Construction Site Monitoring Program

7.1 Purpose

The Construction General Permit requires that a written site specific Construction Site Monitoring Program (CSMP) be developed by each discharger prior to the commencement of construction activities, and be revised as necessary to reflect project revision. The CSMP is included with the SWPPP (Appendix N), and described in this section.

7.2 Applicability of Permit Requirements

The OGS CSMP is designed to meet the specific requirements and objectives identified in the General Permit for Risk Level 1 sites. These requirements are listed below in this section.

7.3 Monitoring Locations

Considerations for determining sampling locations will be proximity to the non-visible pollutant of concern, accessibility for sampling, personnel safety, and other factors in accordance with the applicable requirements in the Permit.

The locations of potential sampling and observation points within the Project Site are located in Appendix N Construction Site Monitoring Program (CSMP), Figure 1. These locations are typically located in low-lying areas, upslope of the wetlands, yet down slope of potential areas that may discharge non-visible pollutants and sediment. Sampling of wetlands shall occur throughout the entire construction period. A sampling point located near the temporary bioswale in the laydown area is also delineated and will be monitored and sampled as required during construction activities. These locations will be verified in the field prior to sampling events and may change due to field conditions. Any changes will be documented in the Amendment Section of the SWPPP (Appendix C) and in the CSMP. Sampling points along the linear utility line will be specified as site plans are developed.

A background sample location for comparison with the samples being analyzed for non-visible pollutants will be selected such that the sample will not have come in contacted with: (1) operational or storage areas associated with project materials, wastes, and activities; (2) areas in which soil amendments that have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil have been applied; or (3) disturbed soil areas.

If an operational activity or stormwater inspection conducted 24 hours prior to or during a rain event identifies the presence of a material storage, waste storage, or operations area with spills or the potential for the discharge of non-visible pollutants to surface waters or a storm sewer system that was an unplanned location, sampling locations will be selected using the same rationale as that used to identify planned locations.

7.4 Safety

Inspections shall not occur during dangerous weather conditions, or outside of scheduled business hours. If no required inspections are collected due to these exceptions, the inspector shall include an explanation in the SWPPP and in the Annual Report documenting why the inspections were not conducted.

7.5 Visual Monitoring (Inspections)

The OGS project will comply with monitoring based Risk Level 1 Projects. The requirements are listed below.

1. The QSP or designated trained employee shall visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event.
2. Dischargers shall inspect the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge operating hours.
3. Inspections shall occur during business hours only.
4. All inspections shall have recorded the time, date and rain gauge reading of all qualifying rain events.
5. Within 2 business days (48 hours) prior to each qualifying rain event the following inspections shall occur:
   - Identify any spills, leaks or uncontrolled pollutant sources. If needed, implement appropriate corrective actions.
   - Inspect all BMPs to identify whether they have been properly implemented in accordance with the SWPPP. Implement appropriate corrective actions.
   - Inspect any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.
6. For visual observations described above, inspectors shall observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors and sources of any observed pollutants.
7. Within two business days (48 hours) after each qualifying rain event, inspectors shall conduct post rain event inspections to identify whether BMPs were adequately designed, implemented and effective, and identify additional BMPs and revise the SWPPP accordingly.
8. Project personnel shall maintain on-site records of all inspections, personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

9. Inspections shall not occur during dangerous weather conditions, or outside of scheduled business hours. If no required inspections are collected due to these exceptions, the inspector shall include an explanation in the SWPPP and in the Annual Report documenting why the inspections were not conducted.

7.5.1 Non-Stormwater Discharge Monitoring Requirements

The following non-stormwater discharge monitoring requirements are listed below:

- Inspect each drainage area for the presence (or indications of prior) of unauthorized and authorized non-storm water discharges and their sources.
- Conduct one inspection quarterly in each of the following periods: January- March, April-June, July-September, and October-December. Inspections are only required during daylight hours.
- All inspections must document the presence or evidence of any non-storm water discharge (authorized or unauthorized), pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc), and source. Inspectors shall maintain on-site records indicating the personnel performing the inspection, the dates and approximate time each drainage area and non-storm water discharge was observed, and the response taken to eliminated unauthorized non-storm water discharges and to reduce or prevent pollutants from contacting non-storm water discharges.

7.6 Water Quality Sampling and Analysis

All Sites are required to monitor runoff for non-visible pollutants in the event of a BMP failure, breach, or spill. An area unaffected by the failure, breach, or spill must also be sampled to serve as the basis of comparison. Additional sampling requirements are listed below:

- Sampling must ensure that water samples are large enough to characterize the site condition. Dischargers shall collect samples at all discharge locations that can be safely accessed.
- Sampling shall occur during the first two hours of discharge from rain events that occur during business hours and which generate runoff.
- All samples shall be analyzed for all non-visible pollutant parameters indicating the presence of pollutants in the pollutant source assessment required. CSMPs will be modified to address any additional parameters in accordance with any updated SWPPP pollutant source assessment.
- Samples shall contain storm water that has not come in contact with the disturbed soils or the materials stored on-site (uncontaminated sample) for comparison with the discharge sample.
- Laboratory analysis shall be conducted to compare the uncontaminated sample to the discharge sample.

All field and analytical data shall be kept with the SWPPP document. The following are common construction materials, wastes, or activities that are potential sources of non-visible pollutants to stormwater discharges from a project. Identification, storage, use, and operational locations of the potential sources at this project will be determined, identified on site maps, and incorporated into this SWPPP at a later date.

- Vehicle batteries
- Painting products
- Contaminated soil
- Line flushing products
- Dust palliative products
- Masonry products
- Landscaping products
- Concrete curing
- Sealants
- Adhesives
- Cleaning products

Soil amendments may be used on the project sites that have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil.

7.6.1 Identification of Non-Visible Pollutants

Table 7.6-1 lists common potential sources and types of non-visible pollutants on a project site and the applicable water quality indicator constituent(s) for that pollutant.

TABLE 7.6-1
Potential Non-Visible Pollutants and Water Quality Indicator Constituents

Potential Non-Visible Pollutants based on Common Construction	Activities	Activity Potential Pollutant Source Laboratory Analysis
Water line flushing Chlorinated water Residual chlorine	Portable toilets Bacteria, disinfectants Total/fecal coliform	Concrete & Masonry Acid wash pH
Curing compounds	pH, alkalinity,	Volatile organic compounds (VOCs)
Concrete rinse water pH	Painting Resins Semi-volatile organic compounds (SVOCs)	Thinners Phenols, VOCs
Paint Strippers VOCs	Solvents Phenols, VOCs	Adhesives Phenols, SVOCs
Sealants SVOCs	Methylene Blue Activated Substances (MBAS),	phosphates

7.6.2 Sample Collection and Handling

Collection Procedures

Samples of discharge will be collected at the designated sampling locations for observed breaches, malfunctions, leakages, spills, operational areas, soil amendment application areas, and historical site usage areas that triggered the sampling event. A sampling point

will be designated at the bioswale dischare point and any other location the QSP requires based on stormwater movement and current site conditions.

Grab samples will be collected and preserved in accordance with the methods identified in the Table 7.6-1 included in Section 7.6 the Water Quality Sample and Analysis Section. Only personnel trained in proper water quality sampling will collect samples.

Samples will be collected by placing a separate lab-provided sample container directly into a stream of water downgradient and within close proximity to the potential non-visible pollutant discharge location. This separate lab-provided sample container will be used to collect water, which will be transferred to sample bottles for laboratory analysis. The upgradient and uncontaminated background samples shall be collected first prior to collecting the downgradient to minimize cross-contamination. The sampling personnel will collect the water upgradient of where they are standing. Once the separate lab-provided sample container is filled, the water sample will be poured directly into sample bottles provided by the laboratory for the analyte(s) being monitored.

To maintain sample integrity and prevent cross-contamination, sampling collection personnel will:

- Wear a clean pair of surgical gloves prior to the collection and handling of each sample at each location.
- Not contaminate the inside of the sample bottle by not allowing it to come into contact with any material other than the water sample.
- Discard sample bottles or sample lids that have been dropped onto the ground prior to sample collection.
- Not leave the cooler lid open for an extended period of time once samples are placed inside.
- Not sample near a running vehicle where exhaust fumes may impact the sample.
- Not touch the exposed end of a sampling tube, if applicable.
- Avoid allowing rainwater to drip from rain gear or other surfaces into sample bottles.
- Not eat, smoke, or drink during sample collection.
- Not sneeze or cough in the direction of an open sample bottle.
- Minimize the exposure of the samples to direct sunlight, as sunlight may cause biochemical transformation of the samples to take place.
- Decontaminate sampling equipment prior to sample collection using a TSP-soapy water wash, distilled water rinse, and final rinse with distilled water.
- Dispose of decontamination water/soaps appropriately; i.e., not discharge to the storm drain system or receiving water.

Handling Procedures

Immediately following collection, sample bottles for laboratory analytical testing will be capped, labeled, documented on a chain of custody (COC) form provided by the analytical laboratory, sealed in a re-sealable storage bag, placed in an ice-chilled cooler, at as near to 4 degrees Celsius as practicable, and delivered within 24 hours to a California state-certified laboratory to be identified at a later date.

Any samples for field analysis will be tested immediately following collected in accordance with the field instrument manufacturer's instructions and results recorded on a Sampling Activity Log.

Sample Documentation Procedures

All original data documented on sample bottle identification labels, COC forms, Sampling Activity Logs, and Inspection Checklists will be recorded using waterproof ink. These will be considered accountable documents. If an error is made on an accountable document, the individual will make corrections by lining through the error and entering the correct information. The erroneous information will not be obliterated. All corrections will be initialed and dated.

Sampling and field analysis activities will be documented using the following:

Sample Bottle Identification Labels. Sampling personnel will attach an identification label to each sample bottle. At a minimum, the following information will be recorded on the label, as appropriate:

- Project name
- Project number
- Unique sample identification number and location
- [Project Number]-[Six digit sample collection date]-[Location]
- Quality assurance/quality control (QA/QC) samples shall be identified similarly using a unique sample number or designation
- Collection date/time (No time applied to QA/QC samples)
- Analysis constituent

Sampling Activity Logs. A log of sampling events will identify:

- Sampling date
- Separate times for collected samples and QA/QC samples recorded to the nearest minute
- Unique sample identification number and location
- Analysis constituent
- Names of sampling personnel

- Weather conditions (including precipitation amount)
- Field analysis results
- Other pertinent data

Chain of Custody Forms. All samples to be analyzed by a laboratory will be accompanied by a COC form provided by the laboratory. Only the sample collectors will sign the COC form over to the lab. COC procedures will be strictly adhered to for QA/QC purposes.

All Sites are required to monitor runoff for non-visible pollutants in the event of a BMP failure, breach, or spill. An area unaffected by the failure, breach, or spill must also be sampled to serve as the basis of comparison. Additional sampling requirements are listed below:

- Sampling must ensure that water samples are large enough to characterize the site condition. Dischargers shall collect samples at all discharge locations that can be safely accessed.
- Sampling shall occur during the first two hours of discharge from rain events that occur during business hours and which generate runoff.
- All samples shall be analyzed for all non-visible pollutant parameters indication the presence of pollutants in the pollutant source assessment required. CSMPs will be modified to address any additional parameters in accordance with any updated SWPPP pollutant source assessment.
- Samples shall contain storm water that has not come in contacted with the disturbed soils or the materials stored on-site (uncontaminated sample) for comparison with the discharge sample.
- Laboratory analysis shall be conducted to compare the uncontaminated sample to the discharge sample.
- All field and analytical data shall be kept with the SWPPP document.

7.7 Watershed Monitoring Option

The OGS project site will not be participating in a qualified regional watershed-based monitoring program.

7.8 Quality Assurance and Quality Control

For an initial verification of laboratory or field analysis, duplicate samples will be collected at a rate of 10 percent or 1 duplicate per sampling event. The duplicate sample will be collected, handled, and analyzed using the same protocols as primary samples. A duplicate sample will be collected at each location immediately after the primary sample has been collected. Duplicates will be collected where contamination is likely, not on the background sample. Duplicate samples will not influence any evaluations or conclusions; however, they will be used as a check on laboratory quality assurance.

7.9 Reporting Requirements and Records Retention

The OGS project shall retain records of all storm water monitoring information and copies of all reports (including Annual Reports) for at least 3 years. All records must be retained onsite while construction is ongoing. The required records are listed below:

- Date, place, time of facility inspections, sampling, inspections, and/or measurements including precipitation
- Individual(s) who performed the facility inspections, sampling, inspections, and measurements
- Date and time of analyses
- Name of individuals who performed the analyses
- Summary of al analytical results from the last three years, the method detection limits and reporting units, and the analytical techniques or methods used
- Rain gauge readings from site inspections
- Quality assurance/quality control records and results
- Non-storm water discharge inspections and visual observations and storm water discharge visual observation records
- Records of reasons why sampling did not occur
- Records of any corrective actions and follow-up activities that resulted from analytical results, visual observations, or inspections.

SECTION 8

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Appendix A
Construction General Permit

Linda S. Adams
Secretary for Environmental Protection

State Water Resources Control Board

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Arnold Schwarzenegger
Governor

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
GENERAL PERMIT FOR
STORM WATER DISCHARGES
ASSOCIATED WITH CONSTRUCTION AND LAND DISTURBANCE
ACTIVITIES

ORDER NO. 2009-0009-DWQ
NPDES NO**. CAS000002**

This Order was adopted by the State Water Resources Control Board on:	**September 2, 2009**
This Order shall become effective on:	**July 1, 2010**
This Order shall expire on:	**September 2, 2014**

IT IS HEREBY ORDERED, that this Order supersedes Order No. 99-08-DWQ except for enforcement purposes. The Discharger shall comply with the requirements in this Order to meet the provisions contained in Division 7 of the California Water Code (commencing with section 13000) and regulations adopted thereunder, and the provisions of the federal Clean Water Act and regulations and guidelines adopted thereunder.

I, Jeanine Townsend, Clerk to the Board, do hereby certify that this Order with all attachments is a full, true, and correct copy of an Order adopted by the State Water Resources Control Board, on September 2, 2009.

AYE: Vice Chair Frances Spivy-Weber
Board Member Arthur G. Baggett, Jr.
Board Member Tam M. Doduc

NAY: Chairman Charles R. Hoppin

ABSENT: None

ABSTAIN: None

Jeanine Townsend

Jeanine Townsend
Clerk to the Board

List of Documents included in this single file saved in pdf format on September 22, 2009:

- Fact Sheet
- Order
- Attachment A – Linear Underground/Overhead Requirements
- Attachment A.1 – LUP Project Type Determination
- Attachment A.2 – LUP Permit Registration Documents
- Attachment B – Permit Registration Documents
- Attachment C – Risk Level 1 Requirements
- Attachment D – Risk Level 2 Requirements
- Attachment E – Risk Level 3 Requirements
- Attachment F – Active Treatment System Requirements
- Appendix 1 – Risk Determination Worksheet and Sediment-related 303d List
- Appendix 2 – Post-Construction Water Balance
- Appendix 2.1 – Post-Construction Water Balance Calculator
- Appendix 3 - Bioassessment Monitoring Guidelines
- Appendix 4 – Adopted/Implemented Sediment and Non-sediment TMDLs
- Appendix 5 – Glossary
- Appendix 6 - Acronym List
- Appendix 7 – State and Regional Water Board Contacts

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Arnold Schwarzenegger
Governor

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I. BACKGROUND

A. History

In 1972, the Federal Water Pollution Control Act (also referred to as the Clean Water Act [CWA]) was amended to provide that the discharge of pollutants to waters of the United States from any point source is unlawful unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. The 1987 amendments to the CWA added Section 402(p), which establishes a framework for regulating municipal and industrial storm water discharges under the NPDES Program. On November 16, 1990, the U.S. Environmental Protection Agency (USEPA) published final regulations that established storm water permit application requirements for specified categories of industries. The regulations provide that discharges of storm water to waters of the United States from construction projects that encompass five or more acres of soil disturbance are effectively prohibited unless the discharge is in compliance with an NPDES Permit. Regulations (Phase II Rule) that became final on December 8, 1999 lowered the permitting threshold from five acres to one acre.

While federal regulations allow two permitting options for storm water discharges (Individual Permits and General Permits), the State Water Board has elected to adopt only one statewide General Permit at this time that will apply to most storm water discharges associated with construction activity.

On August 19, 1999, the State Water Board reissued the General Construction Storm Water Permit (Water Quality Order 99-08-DWQ). On December 8, 1999 the State Water Board amended Order 99-08-DWQ to apply to sites as small as one acre.

The General Permit accompanying this fact sheet regulates storm water runoff from construction sites. Regulating many storm water discharges under one permit will greatly reduce the administrative burden associated with permitting individual storm water discharges. To obtain coverage under this General Permit, dischargers shall electronically file the Permit Registration Documents (PRDs), which includes a Notice of Intent (NOI), Storm Water Pollution Prevention Plan (SWPPP), and other compliance related documents required by this General Permit and mail the appropriate permit fee to the State Water Board. It is expected that as the storm water program develops, the Regional Water Quality Control Boards (Regional Water Boards) may issue General Permits or Individual Permits containing more specific permit provisions. When this occurs, this General Permit will no longer regulate those dischargers.

B. Legal Challenges and Court Decisions

1. Early Court Decisions

Shortly after the passage of the CWA, the USEPA promulgated regulations exempting most storm water discharges from the NPDES permit requirements. (See 40 C.F.R. § 125.4 (1975); see also *Natural Resources Defense Council v. Costle* (D.C. Cir. 1977) 568 F.2d 1369, 1372 (*Costle*); *Defenders of Wildlife v. Browner* (9th Cir. 1999) 191 F.3d 1159, 1163 (*Defenders of Wildlife*).) When environmental groups challenged this exemption in federal court, the District of Columbia Court of Appeals invalidated the regulation, holding that the USEPA "does not have authority to exempt categories of point sources from the permit requirements of [CWA] § 402." (*Costle*, 568 F.2d at 1377.) The *Costle* court rejected the USEPA's argument that effluent-based storm sewer regulation was administratively infeasible because of the variable nature of storm water pollution and the number of affected storm sewers throughout the country. (*Id.* at 1377-82.) Although the court acknowledged the practical problems relating to storm sewer regulation, the court found the USEPA had the flexibility under the CWA to design regulations that would overcome these problems. (*Id.* at 1379-83.) In particular, the court pointed to general permits and permits based on requiring best management practices (BMPs).

During the next 15 years, the USEPA made numerous attempts to reconcile the statutory requirement of point source regulation with the practical problem of regulating possibly millions of diverse point source discharges of storm water. (See *Defenders of Wildlife*, 191 F.3d at 1163; see also Gallagher, Clean Water Act in Environmental Law Handbook (Sullivan, edit., 2003)
p. 300 (Environmental Law Handbook); Eisen, *Toward a Sustainable Urbanism: Lessons from Federal Regulation of Urban Storm Water Runoff* (1995) 48 Wash. U.J. Urb. & Contemp. L.1, 40-41 [Regulation of Urban Storm Water Runoff].)

In 1987, Congress amended the CWA to require NPDES permits for storm water discharges. (See CWA § 402(p), 33 U.S.C. § 1342(p); *Defenders of Wildlife,* 191 F.3d at 1163; *Natural Resources Defense Council v. USEPA* (9th Cir. 1992) 966 F.2d 1292, 1296.) In these amendments, enacted as part of the Water Quality Act of 1987, Congress distinguished between industrial and municipal storm water discharges. With respect to industrial storm water discharges, Congress provided that NPDES permits "shall meet all applicable provisions of this section and section 1311 [requiring the USEPA to establish effluent limitations under specific timetables]." (CWA § 402(p)(3)(A), 33 U.S.C. § 1342(p)(3)(A); see also *Defenders of Wildlife,* 191 F.3d at 1163-64.)

In 1990, USEPA adopted regulations specifying what activities were considered "industrial" and thus required discharges of storm water associated with those activities to obtain coverage under NPDES permits. (55 Fed. Reg. 47,990 (1990); 40 C.F.R. § 122.26(b)(14).) Construction activities, deemed a subset of the industrial activities category, must also be regulated by an NPDES permit. (40 C.F.R. § 122.26(b)(14)(x)). In 1999, USEPA issued regulations for "Phase II" of storm water regulation, which required most small construction sites (1-5 acres) to be regulated under the NPDES program. (64 Fed. Reg. 68,722; 40 C.F.R. § 122.26(b)(15)(i).)

2. Court Decisions on Public Participation

Two recent federal court opinions have vacated USEPA rules that denied meaningful public review of NPDES permit conditions. On January 14, 2003, the Ninth Circuit Court of Appeals held that certain aspects of USEPA's Phase II regulations governing MS4s were invalid primarily because the general permit did not contain express requirements for public participation. (*Environmental Defense Center v. USEPA* (9th Cir. 2003) 344 F.3d 832.) Specifically, the court determined that applications for general permit coverage (including the Notice of Intent (NOI) and Storm Water Management Program (SWMP)) must be made available to the public, the applications must be reviewed and determined to meet the applicable standard by the permitting authority before coverage commences, and there must be a process to accommodate public hearings. (*Id.* at 852-54.) Similarly, on February 28, 2005, the Second Circuit Court of Appeals held that the USEPA's confined animal feeding operation (CAFO) rule violated the CWA because it allowed dischargers to write their own nutrient management plans without public review. (*Waterkeeper Alliance v. USEPA* (2d Cir. 2005) 399 F.3d 486.) Although neither decision involved the issuance of construction storm water permits, the State Water Board's Office of Chief Counsel has recommended that the new General Permit address the courts' rulings where feasible[1].

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[1] In *Texas Independent Producers and Royalty Owners Assn. v. USEPA* (7th Cir. 2005) 410 F.3d 964, the Seventh Circuit Court of Appeals held that the USEPA's construction general permit was not required to provide the public with the opportunity for a public hearing on the Notice of Intent or Storm Water Pollution Prevention Plan. The Seventh Circuit briefly discussed why it agreed with the Ninth Circuit's dissent in *Environmental Defense Center*, but generally did not discuss the substantive holdings in *Environmental Defense Center* and *Waterkeeper Alliance*, because neither court addressed the initial question of whether the plaintiffs had standing to challenge the permits at issue. However, notwithstanding the Seventh Circuit's decision, it is not binding or controlling on the State Water Board because California is located within the Ninth Circuit.

The CWA and the USEPA's regulations provide states with the discretion to formulate permit terms, including specifying best management practices (BMPs), to achieve strict compliance with federal technology-based and water quality-based standards. (*Natural Resources Defense Council v. USEPA* (9th Cir. 1992) 966 F.2d 1292, 1308.) Accordingly, this General Permit has developed specific BMPs as well as numeric action levels (NALs) and numeric effluent limitations (NELs) in order to achieve these minimum federal standards. In addition, the General Permit requires a SWPPP and REAP (another dynamic, site-specific plan) to be developed but has removed all language requiring the discharger to implement these plans – instead, the discharger is required to comply with specific requirements. By requiring the dischargers to implement these specific BMPs, NALs, and NELs, this General Permit ensures that the dischargers do not "write their own permits." As a result this General Permit does not require each discharger's SWPPP and REAP to be reviewed and approved by the Regional Water Boards.

This General Permit also requires dischargers to electronically file all permit-related compliance documents. These documents include, but are not limited to, NOIs, SWPPPs, annual reports, Notice of Terminations (NOTs), and numeric action level (NAL) exceedance reports. Electronically submitted compliance information is immediately available to the public, as well as the Regional Water Quality Control Board (Regional Water Board) offices, via the Internet. In addition, this General Permit enables public review and hearings on permit applications when appropriate. Under this General Permit, the public clearly has a meaningful opportunity to participate in the permitting process.

C. Blue Ribbon Panel of Experts and Feasibility of Numeric Effluent Limitations

In 2005 and 2006, the State Water Board convened an expert panel (panel) to address the feasibility of numeric effluent limitations (NELs) in California's storm water permits. Specifically, the panel was asked to address:

"Is it technically feasible to establish numeric effluent limitations, or some other quantifiable limit, for inclusion in storm water permits? How would such limitations or criteria be established, and what information and data would be required?"

"The answers should address industrial general permits, construction general permits, and area-wide municipal permits. The answers should also address both technology-based limitations or criteria and water quality-based limitations or criteria. In evaluating establishment of any objective criteria, the panel should address all of the following:

The ability of the State Water Board to establish appropriate objective limitations or criteria;

How compliance determinations would be made;

The ability of dischargers and inspectors to monitor for compliance; and

The technical and financial ability of dischargers to comply with the limitations or criteria."

Through a series of public participation processes (State Water Board meetings, State Water Board workshops, and the solicitation of written comments), a number of water quality, public process and overall program effectiveness problems were identified. Some of these problems are addressed through this General Permit.

D. Summary of Panel Findings on Construction Activities

The panel's final report can be downloaded and viewed through links at www.waterboards.ca.gov or by clicking here[2].

The panel made the following observations:

"Limited field studies indicate that traditional erosion and sediment controls are highly variable in performance, resulting in highly variable turbidity levels in the site discharge."

"Site-to-site variability in runoff turbidity from undeveloped sites can also be quite large in many areas of California, particularly in more arid regions with less natural vegetative cover and steep slopes."

"Active treatment technologies involving the use of polymers with relatively large storage systems now exist that can provide much more consistent and very low discharge turbidity. However, these technologies have as yet only been applied to larger construction sites, generally five acres or greater. Furthermore, toxicity has been observed at some locations, although at the vast majority of sites, toxicity has not occurred. There is also the potential for an accidental large release of such chemicals with their use."

"To date most of the construction permits have focused on TSS and turbidity, but have not addressed other, potentially significant pollutants such as phosphorus and an assortment of chemicals used at construction sites."

"Currently, there is no required training or certification program for contractors, preparers of soil erosion and sediment control Storm Water Pollution Prevention Plans, or field inspectors."

"The quality of storm water discharges from construction sites that effectively employ BMPs likely varies due to site conditions such as climate, soil, and topography."

"The States of Oregon and Washington have recently adopted similar concepts to the Action Levels described earlier."

In addition, the panel made the following conclusions:

"It is the consensus of the Panel that active treatment technologies make Numeric Limits technically feasible for pollutants commonly associated with storm water discharges from construction sites (e.g. TSS and turbidity) for larger construction sites. Technical practicalities and cost-effectiveness may make these technologies less feasible for smaller sites, including small drainages within a larger site, as these technologies have seen limited use at small construction sites. If chemical addition is not permitted, then Numeric Limits are not likely feasible."

"The Board should consider Numeric Limits or Action Levels for other pollutants of relevance to construction sites, but in particular pH. It is of particular concern where fresh concrete or wash water from cement mixers/equipment is exposed to storm water."

"The Board should consider the phased implementation of Numeric Limits and Action Levels, commensurate with the capacity of the dischargers and support industry to respond."

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[2] http://www.waterboards.ca.gov/stormwtr/docs/numeric/swpanel_final_report.pdf

E. How the Panel's Findings are Used in this General Permit

The State Water Board carefully considered the findings of the panel and related public comments. The State Water Board also reviewed and considered the comments regarding statewide storm water policy and the reissuance of the Industrial General Permit. From the input received the State Water Board identified some permit and program performance gaps that are addressed in this General Permit. The Summary of Significant Changes (below) in this General Permit are a direct result of this process.

F. Summary of Significant Changes in This General Permit

The State Water Board has significant changes to Order 99-08-DWQ. This General Permit differs from Order 99-08-DWQ in the following significant ways:

Rainfall Erosivity Waiver: this General Permit includes the option allowing a small construction site (>1 and <5 acres) to self-certify if the rainfall erosivity value (R value) for their site's given location and time frame compute to be less than or equal to 5.

Technology-Based Numeric Action Levels: this General Permit includes NALs for pH and turbidity.

Technology-Based Numeric Effluent Limitations: this General Permit contains daily average NELs for pH during any construction phase where there is a high risk of pH discharge and daily average NELs turbidity for all discharges in Risk Level 3. The daily average NEL for turbidity is set at 500 NTU to represent the minimum technology that sites need to employ (to meet the traditional Best Available Technology Economically Achievable (BAT)/ Best Conventional Pollutant Control Technology (BCT) standard) and the traditional, numeric receiving water limitations for turbidity.

Risk-Based Permitting Approach: this General Permit establishes three levels of risk possible for a construction site. Risk is calculated in two parts: 1) Project Sediment Risk, and 2) Receiving Water Risk.

Minimum Requirements Specified: this General Permit imposes more minimum BMPs and requirements that were previously only required as elements of the SWPPP or were suggested by guidance.

Project Site Soil Characteristics Monitoring and Reporting: this General Permit provides the option for dischargers to monitor and report the soil characteristics at their project location. The primary purpose of this requirement is to provide better risk determination and eventually better program evaluation.

Effluent Monitoring and Reporting: this General Permit requires effluent monitoring and reporting for pH and turbidity in storm water discharges. The purpose of this monitoring is to determine compliance with the NELs and evaluate whether NALs included in this General Permit are exceeded.

Receiving Water Monitoring and Reporting: this General Permit requires some Risk Level 3 dischargers to monitor receiving waters and conduct bioassessments.

Post-Construction Storm Water Performance Standards: this General Permit specifies runoff reduction requirements for all sites not covered by a Phase I or Phase II MS4 NPDES permit, to avoid, minimize and/or mitigate post-construction storm water runoff impacts.

Rain Event Action Plan: this General Permit requires certain sites to develop and implement a Rain Event Action Plan (REAP) that must be designed to protect all exposed portions of the site within 48 hours prior to any likely precipitation event.

Annual Reporting: this General Permit requires all projects that are enrolled for more than one continuous three-month period to submit information and annually certify that their site is in compliance

with these requirements. The primary purpose of this requirement is to provide information needed for overall program evaluation and pubic information.

Certification/Training Requirements for Key Project Personnel: this General Permit requires that key personnel (e.g., SWPPP preparers, inspectors, etc.) have specific training or certifications to ensure their level of knowledge and skills are adequate to ensure their ability to design and evaluate project specifications that will comply with General Permit requirements.

Linear Underground/Overhead Projects: this General Permit includes requirements for all Linear Underground/Overhead Projects (LUPs).

II. RATIONALE

A. General Permit Approach

A general permit for construction activities is an appropriate permitting approach for the following reasons:

1. A general permit is an efficient method to establish the essential regulatory requirements for a broad range of construction activities under differing site conditions;

2. A general permit is the most efficient method to handle the large number of construction storm water permit applications;

3. The application process for coverage under a general permit is far less onerous than that for individual permit and hence more cost effective;

4. A general permit is consistent with USEPA's four-tier permitting strategy, the purpose of which is to use the flexibility provided by the CWA in designing a workable and efficient permitting system; and

5. A general permit is designed to provide coverage for a group of related facilities or operations of a specific industry type or group of industries. It is appropriate when the discharge characteristics are sufficiently similar, and a standard set of permit requirements can effectively provide environmental protection and comply with water quality standards for discharges. In most cases, the general permit will provide sufficient and appropriate management requirements to protect the quality of receiving waters from discharges of storm water from construction sites.

There may be instances where a general permit is not appropriate for a specific construction project. A Regional Water Board may require any discharger otherwise covered under the General Permit to apply for and obtain an Individual Permit or apply for coverage under a more specific General Permit. The Regional Water Board must determine that this General Permit does not provide adequate assurance that water quality will be protected, or that there is a site-specific reason why an individual permit should be required.

B. Construction Activities Covered

1. **Construction activity subject to this General Permit:**

Any construction or demolition activity, including, but not limited to, clearing, grading, grubbing, or excavation, or any other activity that results in a land disturbance of equal to or greater than one acre.

Construction activity that results in land surface disturbances of less than one acre if the construction activity is part of a larger common plan of development or sale of one or more acres of disturbed land surface.

Construction activity related to residential, commercial, or industrial development on lands currently used for agriculture including, but not limited to, the construction of buildings related to agriculture that are considered industrial pursuant to USEPA regulations, such as dairy barns or food processing facilities.

Construction activity associated with LUPs including, but not limited to, those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete

and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/borrow locations.

Discharges of sediment from construction activities associated with oil and gas exploration, production, processing, or treatment operations or transmission facilities.[3]

Storm water discharges from dredge spoil placement that occur outside of U.S. Army Corps of Engineers jurisdiction[4] (upland sites) and that disturb one or more acres of land surface from construction activity are covered by this General Permit. Construction projects that intend to disturb one or more acres of land within the jurisdictional boundaries of a CWA § 404 permit should contact the appropriate Regional Water Board to determine whether this permit applies to the project.

2. Linear Underground/Overhead Projects (LUPs) subject to this General Permit:

Underground/overhead facilities typically constructed as LUPs include, but are not limited to, any conveyance, pipe, or pipeline for the transportation of any gaseous, liquid (including water, wastewater for domestic municipal services), liquescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g., telephone, telegraph, radio or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to, those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/borrow locations.

Water Quality Order 2003-0007-DWQ regulated construction activities associated with small LUPs that resulted in land disturbances greater than one acre, but less than five acres. These projects were considered non-traditional construction projects. Attachment A of this Order now regulates all construction activities from LUPs resulting in land disturbances greater than one acre.

3. Common Plan of Development or Sale

USEPA regulations include the term “common plan of development or sale” to ensure that acreage within a common project does not artificially escape the permit requirements because construction activities are phased, split among smaller parcels, or completed by different owners/developers. In the absence of an exact definition of “common plan of development or sale,” the State Water Board is required to exercise its regulatory discretion in providing a common sense interpretation of the term as it applies to construction projects and permit coverage. An overbroad interpretation of the term would render meaningless the clear “one acre” federal permitting threshold and would potentially trigger permitting of

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[3] Pursuant to the Ninth Circuit Court of Appeals’ decision in *NRDC v. EPA* (9th Cir. 2008) 526 F.3d 591, and subsequent denial of the USEPA’s petition for reconsideration in November 2008, oil and gas construction activities discharging storm water contaminated only with sediment are no longer exempt from the NPDES program.

[4] A construction site that includes a dredge and/or fill discharge to any water of the United States (e.g., wetland, channel, pond, or marine water) requires a CWA Section 404 permit from the U.S. Army Corps of Engineers and a CWA Section 401 Water Quality Certification from the Regional Water Board or State Water Board.

almost any construction activity that occurs within an area that had previously received area-wide utility or road improvements.

Construction projects generally receive grading and/or building permits (Local Permits) from local authorities prior to initiating construction activity. These Local Permits spell out the scope of the project, the parcels involved, the type of construction approved, etc. Referring to the Local Permit helps define "common plan of development or sale." In cases such as tract home development, a Local Permit will include all phases of the construction project including rough grading, utility and road installation, and vertical construction. All construction activities approved in the Local Permit are part of the common plan and must remain under the General Permit until construction is completed. For custom home construction, Local Permits typically only approve vertical construction as the rough grading, utilities, and road improvements were already independently completed under the a previous Local Permit. In the case of a custom home site, the homeowner must submit plans and obtain a distinct and separate Local Permit from the local authority in order to proceed. It is not the intent of the State Water Board to require permitting for an individual homeowner building a custom home on a private lot of less than one acre if it is subject to a separate Local Permit. Similarly, the installation of a swimming pool, deck, or landscaping that disturbs less than one acre that was not part of any previous Local Permit are not required to be permitted.

The following are several examples of construction activity of less than one acre that would require permit coverage:

a. A landowner receives a building permit(s) to build tract homes on a 100-acre site split into 200 one-third acre parcels, (the remaining acreage consists of streets and parkways) which are sold to individual homeowners as they are completed. The landowner completes and sells all the parcels except for two. Although the remaining two parcels combined are less than one acre, the landowner must continue permit coverage for the two parcels.

b. One of the parcels discussed above is sold to another owner who intends to complete the construction as already approved in the Local Permit. The new landowner must file Permit Registration Documents (PRDs) to complete the construction even if the new landowner is required to obtain a separate Local Permit.

c. Landowner in (1) above purchases 50 additional one half-acre parcels adjacent to the original 200-acre project. The landowner seeks a Local Permit (or amendment to existing Local permit) to build on 20 parcels while leaving the remaining 30 parcels for future development. The landowner must amend PRDs to include the 20 parcels 14 days prior to commencement of construction activity on those parcels.

C. Construction Activities Not Covered

1. Traditional Construction Projects Not Covered

This General Permit does not apply to the following construction activity:

a. Routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility.

b. Disturbances to land surfaces solely related to agricultural operations such as disking, harrowing, terracing and leveling, and soil preparation.

c. Discharges of storm water from areas on tribal lands; construction on tribal lands is regulated by a federal permit.

d. Discharges of storm water within the Lake Tahoe Hydrologic Unit. The Lahontan Regional Water Board has adopted its own permit to regulate storm water discharges from construction activity in the Lake Tahoe Hydrologic Unit (Regional Water Board 6SLT). Owners of construction projects in this watershed must apply for the Lahontan Regional Water Board permit rather than the statewide Construction General Permit. Construction projects within the Lahontan region must also comply with the Lahontan Region Project Guideline for Erosion Control (R6T-2005-0007 Section), which can be found at **http://www.waterboards.ca.gov/lahontan/Adopted_Orders/2005/r6t_2005_0007.pdf**

e. Construction activity that disturbs less than one acre of land surface, unless part of a larger common plan of development or the sale of one or more acres of disturbed land surface.

f. Construction activity covered by an individual NPDES Permit for storm water discharges.

g. Landfill construction activity that is subject to the Industrial General Permit.

h. Construction activity that discharges to Combined Sewer Systems.

i. Conveyances that discharge storm water runoff combined with municipal sewage.

j. Discharges of storm water identified in CWA § 402(*l*)(2), 33 U.S.C. § 1342(*l*)(2).

2. **Linear Projects Not Covered**

a. LUP construction activity does not include linear routine maintenance projects. Routine maintenance projects are projects associated with operations and maintenance activities that are conducted on existing lines and facilities and within existing right-of-way, easements, franchise agreements, or other legally binding agreements of the discharger. Routine maintenance projects include, but are not limited to projects that are conducted to:

i. Maintain the original purpose of the facility or hydraulic capacity.

ii. Update existing lines[5] and facilities to comply with applicable codes, standards, and regulations regardless if such projects result in increased capacity.

iii. Repairing leaks.

Routine maintenance does not include construction of new[6] lines or facilities resulting from compliance with applicable codes, standards, and regulations.

Routine maintenance projects do not include those areas of maintenance projects that are outside of an existing right-of-way, franchise, easements, or agreements. When a project must secure new areas,

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[5]Update existing lines includes replacing existing lines with new materials or pipes.
[6]New lines are those that are not associated with existing facilities and are not part of a project to update or replace existing lines.

those areas may be subject to this General Permit based on the area of disturbed land outside the original right-of-way, easement, or agreement.

b. LUP construction activity does not include field activities associated with the planning and design of a project (e.g., activities associated with route selection).

c. Tie-ins conducted immediately adjacent to "energized" or "pressurized" facilities by the discharger are not considered construction activities where all other LUP construction activities associated with the tie-in are covered by an NOI and SWPPP of a third party or municipal agency.

3. **EPA's Small Construction Rainfall Erosivity Waiver**

EPA's Storm Water Phase II Final Rule provides the option for a Small Construction Rainfall Erosivity Waiver. This waiver applies to small construction sites between 1 and 5 acres, and allows permitting authorities to waive those sites that do not have adverse water quality impacts.

Dischargers eligible for this waiver are exempt from Construction General Permit Coverage. In order to obtain the waiver, the discharger must certify to the State Water Board that small construction activity will occur only when the rainfall erosivity factor is less than 5 ("R" in the Revised Universal Soil Loss Equation). The period of construction activity begins at initial earth disturbance and ends with final stabilization. Where vegetation will be used for final stabilization, the date of installation of a practice that provides interim non-vegetative stabilization can be used for the end of the construction period. The operator must agree (as a condition waiver eligibility) to periodically inspect and properly maintain the area until the criteria for final stabilization as defined in the General Permit have been met. If use of this interim stabilization eligibility condition was relied on to qualify for the waiver, signature on the waiver with a certification statement constitutes acceptance of and commitment to complete the final stabilization process. The discharger must submit a waiver certification to the State Board prior to commencing construction activities.

USEPA funded a cooperative agreement with Texas A&M University to develop an online rainfall erosivity calculator. Dischargers can access the calculator from EPA's website at: www.epa.gov/npdes/stormwater/cgp. Use of the calculator allows the discharger to determine potential eligibility for the rainfall erosivity waiver. It may also be useful in determining the time periods during which construction activity could be waived from permit coverage.

D. Obtaining and Terminating Permit Coverage

The Legally Responsible Person (LRP) must obtain coverage under this General Permit, except in two limited circumstances. First, where the construction of pipelines, utility lines, fiber-optic cables, or other linear underground/overhead projects will occur across several properties, the utility company, municipality, or other public or private company or agency that owns or operates the linear underground/overhead project is responsible for obtaining coverage under the General Permit. Second, where there is a lease of a mineral estate (oil, gas, geothermal, aggregate, precious metals, and/or industrial metals), the lessee is responsible for obtaining coverage under the General Permit. To obtain coverage, the LRP or other entity described above must file Permit Registration Documents (PRDs) prior to the commencement of construction activity. Failure to obtain coverage under this General Permit for storm water discharges to waters of the United States is a violation of the CWA and the California Water Code.

To obtain coverage under this General Permit, LRPs must electronically file the PRDs, which include a Notice of Intent (NOI), Storm Water Pollution Prevention Plan (SWPPP), and other documents required by this General Permit, and mail the appropriate permit fee to the State Water Board. It is expected that as the storm water program develops, the Regional Water Boards may issue General Permits or

Individual Permits that contain more specific permit provisions. When this occurs, this General Permit will no longer regulate those dischargers that obtain coverage under Individual Permits.

Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted.

The application requirements of the General Permit establish a mechanism to clearly identify the responsible parties, locations, and scope of operations of dischargers covered by the General Permit and to document the discharger's knowledge of the General Permit's requirements.

This General Permit provides a grandfathering exception to existing dischargers subject to Water Quality Order No. 99-08-DWQ. Construction projects covered under Water Quality Order No. 99-08-DWQ shall obtain permit coverage at Risk Level 1. LUP projects covered under Water Quality Order No. 2003-0007-DWQ shall obtain permit coverage at LUP Type 1. The Regional Water Boards have the authority to require Risk Determination to be performed on projects currently covered under Water Quality Order No. 99-08-DWQ and 2003-0007-DWQ where they deem necessary.

LRPs must file a Notice of Termination (NOT) with the Regional Water Board when construction is complete and final stabilization has been reached or ownership has been transferred. The discharger must certify that all State and local requirements have been met in accordance with this General Permit. In order for construction to be found complete, the discharger must install post-construction storm water management measures and establish a long-term maintenance plan. This requirement is intended to ensure that the post-construction conditions at the project site do not cause or contribute to direct or indirect water quality impacts (i.e., pollution and/or hydromodification) upstream and downstream. Specifically, the discharger must demonstrate compliance with the post-construction standards set forth in this General Permit (Section XIII). The discharger is responsible for all compliance issues including all annual fees until the NOT has been filed and approved by the local Regional Water Board.

E. Discharge Prohibitions

This General Permit authorizes the discharge of storm water to surface waters from construction activities that result in the disturbance of one or more acres of land, provided that the discharger satisfies all permit conditions set forth in the Order. This General Permit prohibits the discharge of pollutants other than storm water and non-storm water discharges authorized by this General Permit or another NPDES permit. This General Permit also prohibits all discharges which contain a hazardous substance in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges. In addition, this General Permit incorporates discharge prohibitions contained in water quality control plans, as implemented by the nine Regional Water Boards. Discharges to Areas of Special Biological Significance (ASBS) are prohibited unless covered by an exception that the State Water Board has approved.

Non-storm water discharges include a wide variety of sources, including improper dumping, spills, or leakage from storage tanks or transfer areas. Non-storm water discharges may contribute significant pollutant loads to receiving waters. Measures to control spills, leakage, and dumping, and to prevent illicit connections during construction must be addressed through structural as well as non-structural BMPs. The State Water Board recognizes, however, that certain non-storm water discharges may be necessary for the completion of construction projects. Authorized non-storm water discharges may include those from de-chlorinated potable water sources such as: fire hydrant flushing, irrigation of vegetative erosion control measures, pipe flushing and testing, water to control dust, uncontaminated ground water dewatering, and other discharges not subject to a separate general NPDES permit adopted by a region. Therefore this General Permit authorizes such discharges provided they meet the following conditions.

These authorized non-storm water discharges must:

1. be infeasible to eliminate;
2. comply with BMPs as described in the SWPPP;
3. filter or treat, using appropriate technology, all dewatering discharges from sedimentation basins;
4. meet the NELs and NALs for pH and turbidity; and
5. not cause or contribute to a violation of water quality standards.

Additionally, authorized non-storm water discharges must not be used to clean up failed or inadequate construction or post-construction BMPs designed to keep materials onsite. Authorized non-storm water dewatering discharges may require a permit because some Regional Water Boards have adopted General Permits for dewatering discharges.

This General Permit prohibits the discharge of storm water that causes or threatens to cause pollution, contamination, or nuisance.

F. Effluent Standards for All Types of Discharges

1. Technology-Based Effluent Limitations

Permits for storm water discharges associated with construction activity must meet all applicable provisions of Sections 301 and 402 of the CWA. These provisions require controls of pollutant discharges that utilize best available technology economically achievable (BAT) for toxic pollutants and non conventional pollutants and best conventional pollutant control technology (BCT) for conventional pollutants. Additionally, these provisions require controls of pollutant discharges to reduce pollutants and any more stringent controls necessary to meet water quality standards. The USEPA has already established such limitations, known as effluent limitation guidelines (ELGs), for some industrial categories. This is not the case with construction discharges. In instances where there are no ELGs the permit writer is to use best professional judgment (BPJ) to establish requirements that the discharger must meet using BAT/BCT technology. This General Permit contains both narrative effluent limitations and new numeric effluent limitations for pH and turbidity, set using the best professional judgment (BPJ) equivalent to BAT and BCT (respectively).

BAT/BCT technologies not only include passive systems such as conventional runoff and sediment control, but also treatment systems such as coagulation/flocculation using sand filtration, when appropriate. Such technologies allow for effective treatment of soil particles less 0.02 mm (medium silt) in diameter. The discharger must install structural controls, as necessary, such as erosion and sediment controls that meet BAT and BCT to achieve compliance with water quality standards. The narrative effluent limitations constitute compliance with the requirements of the CWA.

The numeric effluent limitations for pH and turbidity are based upon BPJ, which authorizes the State Water Board to issue a permit containing “such conditions as the Administrator determines are necessary to carry out the provisions of this Chapter” (CWA § 402(a)(1), 33 U.S.C. § 1342(a)(1).) Because the USEPA has not yet issued an effluent limit guideline for storm water, the State Water Board must use BPJ to consider the appropriate technology for the category or class of point sources, based upon all available information and any unique factors relating to the sources. In addition, the permitting authority must consider a number of factors including the cost of achieving effluent reductions in relation to the effluent reduction benefits, the age of the equipment and facilities, the processes employed and any required process changes, engineering aspects of the control technologies, non-water quality environmental impacts (including energy requirements), and other such other factors as the State Water Board deems appropriate (CWA 304(b)(1)(B)).

Because the permit is an NPDES permit, there is no legal requirement to address the factors set forth in Water Code sections 13241 and 13263, unless the permit is more stringent than what federal law requires. (See *City of Burbank v. State Water Resources Control Bd.* (2005) 35 Cal.4th 613, 618, 627.) None of the requirements in this permit are more stringent than the minimum federal requirements, which include technology-based requirements achieving BAT/BCT and strict compliance with water quality standards. The inclusion of numeric effluent limitations (NELs) in the permit do not cause the permit to be more stringent than current federal law. NELs and best management practices are simply two different methods of achieving the same federal requirement: strict compliance with state water quality standards. Federal law authorizes both narrative and numeric effluent limitations to meet state water quality standards. The use of NELs to achieve compliance with water quality standards is not a more stringent requirement than the use of BMPs. (State Water Board Order No. WQ 2006-0012 (*Boeing*).) Accordingly, the State Water Board does not need to take into account the factors in Water Code sections 13241 and 13263.

The State Water Board has concluded that the establishment of BAT/BCT will not create or aggravate other environmental problems through increases in air pollution, solid waste generation, or energy consumption. While there may be a slight increase in non-water quality impacts due to the implementation of additional monitoring or the construction of additional BMPs, these impacts will be negligible in comparison with the construction activities taking place on site and would be justified by the water quality benefits associated with compliance.

Considerations related to the processes employed and the changes necessitated by the adoption of the BAT/BCT effluent limits have been assessed throughout the stakeholder process (e.g., the Blue Ribbon Panel and the March 2007 preliminary draft) and are discussed in detail in Section I.C of this Fact Sheet. The following sections set forth the engineering aspects of the control technologies and the rationale for the determination of the numeric effluents for pH and turbidity.

In consideration of the costs for the establishment of BAT and BCT limits for pH and turbidity, existing requirements for the control of storm water pollution from construction sites have been established by USEPA and the previous Construction General Permit (State Water Board Order No. 99-08-DWQ) issued by the State Water Board. The General Permit establishes one, consistent set of performance standards for all levels and types of discharges (i.e., risk, linear utility, and ATS).The only difference is that for each level or type of discharge there may be more or less specific effluent limitations (e.g., the addition of numeric effluent limitations for turbidity applies to level/type 3 discharges). And the numeric effluent limitations themselves represent a minimum technology standard. In other words, the additional numeric effluent limitations, compared to the existing permit's narrative effluent limitations, do not increase compliance requirements; rather, they simply represent a point where one can quantitatively measure compliance with the lower end of the range of required technologies. Therefore, the compliance costs associated with the BAT/BCT numeric effluent limitations in this permit only differ by the costs required to measure compliance with the NELs when compared to the baseline compliance costs to comply with the limitations already established through EPA regulations and the existing Construction General Permit.

The State Water Board estimates these measurement costs to be approximately $1000 per construction site for the duration of the project. This represents the estimated cost of purchasing (or renting) monitoring equipment, in this case a turbidimeter (~$600) and a pH meter (~$400). In some cases the costs may be higher or lower. Costs could be lower if the discharger chooses to design and implement the project in a manner where effluent monitoring is likely to be avoided (e.g., no exposure during wet weather seasons, no discharge due to containment, etc.). Costs could be more if the project is subject to many effluent monitoring events or if the discharger exceeds NALs and/or NELs, resulting in additional monitoring requirements.

i. *pH NEL*

Given the potential contaminants, the minimum standard method for control of pH in runoff requires the use of preventive measures such as avoiding concrete pours during rainy weather, covering concrete and directing flow away from fresh concrete if a pour occurs during rain, covering scrap drywall and stucco

materials when stored outside and potentially exposed to rain, and other housekeeping measures. If necessary, pH-impaired storm water from construction sites can be treated in a filter or settling pond or basin, with additional natural or chemical treatment required to meet pH limits set forth in this permit. The basin or pond acts as a collection point and holds storm water for a sufficient period for the contaminants to be settled out, either naturally or artificially, and allows any additional treatment to take place. The State Water Board considers these techniques to be equivalent to BCT. In determining the pH concentration limit for discharges, the State Water Board used BPJ to set these limitations.

The chosen limits were established by calculating three standard deviations above and below the mean pH of runoff from highway construction sites[7] in California. Proper implementation of BMPs should result in discharges that are within the range of 6.0 to 9.0 pH Units.

ii. ***Turbidity NEL***

The Turbidity NEL of 500 NTU is a technology-based numeric effluent limitation and was developed using three different analyses aimed at finding the appropriate threshold to set the technology-based limit to ensure environmental protection, effluent quality and cost-effectiveness. The analyses fell into three, main types: (1) an ecoregion-specific dataset developed by Simon et. al. (2004) [8]; (2) Statewide Regional Water Quality Control Board enforcement data; and (3) published, peer-reviewed studies and reports on in-situ performance of best management practices in terms of erosion and sediment control on active construction sites.

A 1:3 relationship between turbidity (expressed as NTU) and suspended sediment concentration (expressed as mg/L) is assumed based on a review of suspended sediment and turbidity data from three gages used in the USGS National Water Quality Assessment Program:

USGS 11074000 SANTA ANA R BL PRADO DAM CA
USGS 11447650 SACRAMENTO R A FREEPORT CA
USGS 11303500 SAN JOAQUIN R NR VERNALIS CA

The turbidity NEL represents a feasible and cost effective performance standard that is demonstrated to be achievable. Although data has been collected to demonstrate that lower effluent levels may be achievable at some sites, staff cannot conclude at this time that a lower NEL is achievable within all the ecoregions of the state. The NEL represents staff determination that the NEL is the most practicable based on available data. The turbidity NEL represents a bridge between the narrative effluent limitations and receiving water limitations. The NEL limit may be considered an interim performance standard as additional data becomes available for evaluation during the next permit cycle. To support this NEL, State Water Board staff analyzed construction site discharge information (monitoring data, estimates) and receiving water monitoring information.

Since the turbidity NEL represents an appropriate threshold level expected at a site, compliance with this value does not necessarily represent compliance with either the narrative effluent limitations (as enforced through the BAT/BCT standard) or the receiving water limitations. In the San Diego region, some inland surface waters have a receiving water objective for turbidity equal to 20 NTU. Obviously a discharge up to, but not exceeding, the turbidity NEL of 500 NTU may still cause or contribute to the exceedance of the 20 NTU standard. Most of the waters of the State are protected by turbidity objectives based on background conditions**.**

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[7] Caltrans Construction Sites Runoff Characterization Study, 2002. Available at: http://www.dot.ca.gov/hq/env/stormwater/pdf/CTSW-RT-02-055.pdf.
[8] Simon, A., W.D. Dickerson, and A. Heins. 2004. Suspended-sediment transport rates at the 1.5-year recurrence interval for ecoregions of the United States: transport conditions at the bankfull and effective discharge. Geomorphology 58: pp. 243-262.

Table 1 - Regional Water Board Basin Plans, Water Quality Objectives for Turbidity

REGIONAL WATER BOARD	WQ Objective	Background/Natural Turbidity	Maximum Increase
1 Based	on background	All levels	20%
2 Based	on background	> 50 NTU	10%
3 Based	on background	0-50 JTU 50-100 JTU > 100 JTU	20% 10 NTU 10%
4 Based	on background	0-50 NTU > 50 NTU	20% 10%
5 Based	on background	0-5 NTU 5-50 NTU 50-100 NTU >100 NTU	1 NTU 20% 10 NTU 10%
6 Based	on background	All levels	10%
7 Based	on background	N/A N/A	
8 Based	on background	0-50 NTU 50-100 NTU >100 NTU	20% 10 NTU 10%
9 Inland	Surface Waters, 20 NTU All others, based on background	0-50 NTU 50-100 NTU >100 NTU	20% 10 NTU 10%

Table 2 shows the suspended sediment concentrations at the 1.5 year flow recurrence interval for the 12 ecoregions in California from Simon et. al (2004).

Table 2 - Results of Ecoregion Analysis

Ecoregion	Percent of California Land Area	Median Suspended Sediment Concentration (mg/L)
1 9.1		874
4 0.2		120
5 8.8		35.6
6 20.7		1530
7 7.7		122
8 3.0		47.4
9 9.4		284
13 5.2		143
14 21.7		5150
78 8.1		581
80 2.4		199
81 3.7		503
Area-weighted average		1633

If a 1:3 relationship between turbidity and suspended sediment is assumed, the median turbidity is 544 NTU.

The following table is composed of turbidity readings measured in NTUs from administrative civil liberty (ACL) actions for construction sites from 2003 - 2009. This data was derived from the complete listing of construction-related ACLs for the six year period. All ACLs were reviewed and those that included turbidimeter readings at the point of storm water discharge were selected for this dataset.

Table 3 – ACL Sampling Data taken by Regional Water Board Staff

WDID#	Region	Discharger	Turbidity (NTU)
5S34C331884	5S Bradshaw	Interceptor Section 6B	1800
5S05C325110	5S Bridalwood	Subdivision	1670
5S48C336297	5S Cheyenne	at Browns Valley	1629
5R32C314271	5R Grizzly	Ranch Construction	1400
6A090406008	6T	El Dorado County Department of Transportation, Angora Creek	97.4
5S03C346861	5S	TML Development, LLC	1600
6A31C325917	6T	Northstar Village	See Subdata Set

Subdata Set - Turbidity for point of storm water runoff discharge at Northstar Village

Date	Turbidity (NTU)	Location
10/5/2006	900	Middle Martis Creek
11/2/2006	190	Middle Martis Creek
01/04/2007	36	West Fork, West Martis Creek
02/08/2007	180	Middle Martis Creek
02/09/2007	130	Middle Martis Creek
02/09/2007	290	Middle Martis Creek
02/09/2007	100	West Fork, West Martis Creek
02/10/2007	28	Middle Martis Creek
02/10/2007	23	Middle Martis Creek
02/10/2007	32	Middle Martis Creek
02/10/2007	12	Middle Martis Creek
02/10/2007	60	West Fork, West Martis Creek
02/10/2007	34	West Fork, West Martis Creek

A 95% confidence interval for mean turbidity in an ACL order was constructed. The data set used was a small sample size, so the 500 NTU (the value derived as the NEL for this General Permit) needed to be verified as a possible population mean. In this case, the population refers to a hypothetical population of turbidity measurements of which our sample of 20 represents. A t-distribution was assumed due to the small sample size:

Mean: 512.23 NTU
Standard Deviation: 686.85
Margin of Error: 321.45
Confidence Interval: 190.78 NTU (Low)
833.68 NTU (High)

Based on a constructed 95% confidence interval, an ACL order turbidity measurement will be between 190.78 – 833.68 NTU. 500 NTU falls within this range. Using the same data set, a small-sample hypothesis test was also performed to test if the ACL turbidity data set contains enough information to cast doubt on choosing a 500 NTU as a mean. 500 NTU was again chosen due to its proposed use as an acceptable NEL value. The test was carried out using a 95% confidence interval. Results indicated that the ACL turbidity data set *does not* contain significant sample evidence to reject the claim of 500 NTU as an acceptable mean for the ACL turbidity population.

There are not many published, peer-reviewed studies and reports on in-situ performance of best management practices in terms of erosion and sediment control on active construction sites. The most often cited study is a report titled, "Improving the Cost Effectiveness of Highway Construction Site Erosion and Pollution Control" (Horner, Guedry, and Kortenhof 1990, http://www.wsdot.wa.gov/Research/Reports/200/200.1.htm). In a comment letter summarizing this report sent to the State Water Board, the primary author, Dr. Horner, states:

"The most effective erosion control product was wood fiber mulch applied at two different rates along with a bonding agent and grass seed in sufficient time before the tests to achieve germination. Plots treated in this way reduced influent turbidity by more than 97 percent and discharged effluent exhibiting mean and maximum turbidity values of 21 and 73 NTU, respectively. Some other mulch and blanket materials performed nearly as well. These tests demonstrated the control ability of widely available BMPs over a very broad range of erosion potential."

Other technologies studied in this report produced effluent quality at or near 100 NTU. It is the BPJ of the State Water Board staff that erosion control, while preferred, is not always an option on construction sites and that technology performance in a controlled study showing effluent quality directly leaving a BMP is always easier and cheaper to control than effluent being discharged from the project (edge of property, etc.). As a result, it is the BPJ of the State Water Board staff that it is not cost effective or feasible, at this time, for all risk level and type 3 sites in California to achieve effluent discharges with turbidity values that are less than 100 NTU.

To summarize, the analysis showed that: (1) results of the Simon et. al dataset reveals turbidity values in background receiving water in California's ecoregions range from 16 NTU to 1716 NTU (with a mean of 544 NTU); (2) based on a constructed 95% confidence interval, construction sites will be subject to administrative civil liability (ACL) when their turbidity measurement falls between 190.78 – 833.68 NTU; and (3) sites with highly controlled discharges employing and maintaining good erosion control practices can discharge effluent from the BMP with turbidity values less than 100 NTU. Therefore, the appropriate threshold to set the technology-based limit to ensure environmental protection, effluent quality, and cost-effectiveness ranges from 100 NTU to over 1700 NTU. To keep this parameter and the costs of compliance as low as possible, State Water Board staff has determined, using its BPJ, that it is most cost effective to set the numeric effluent limitation for turbidity at 500 NTU.

a. Compliance Storm Event

In response to public comments on the last draft and the recommendations of the expert panel, this General Permit contains "compliance storm event" exceptions from the technology-based NELs. The rationale is that technology-based requirements are developed assuming a certain design storm (defined as the storm producing a rainfall amount for a specified BMPs capacity). Compliance thresholds are needed for storm events above and beyond the design storms assumed to determine the technology-based NELs. For Risk Level 3 project sites applicable to NELs, this General Permit establishes a compliance storm event as the equivalent rainfall in a 5-year, 24-hour storm. This compliance storm was

chosen due to its relative infrequent occurrence and the fact that the runoff volume associated with it is not as large as a 10-year, 24-hour storm event. The discharger shall determine this value using Western Regional Climate Center Precipitation Frequency Maps[9] for 5-year 24-hour storm events in Northern and Southern California (note that these are expressed in tenths of inches – divide by 10 to get inches).

b. TMDLs and Waste Load Allocations

Dischargers located within the watershed of a CWA § 303(d) impaired water body, for which a TMDL for sediment has been adopted by the Regional Water Board or USEPA, must comply with the approved TMDL if it identifies "construction activity" or land disturbance as a source of sediment. If it does, the TMDL should include a specific waste load allocation for this activity/source. The discharger, in this case, may be required by a separate Regional Water Board order to implement additional BMPs, conduct additional monitoring activities, and/or comply with an applicable waste load allocation and implementation schedule. If a specific waste load allocation has been established that would apply to a specific discharge, the Regional Water Board may adopt an order requiring specific implementation actions necessary to meet that allocation. In the instance where an approved TMDL has specified a general waste load allocation to construction storm water discharges, but no specific requirements for construction sites have been identified in the TMDL, dischargers must consult with the state TMDL authority[10] to confirm that adherence to a SWPPP that meets the requirements of the General Permit will be consistent with the approved TMDL.

2. Determining Compliance with Effluent Standards

a. Technology-Based Numeric Action Levels (NALs)

This General Permit contains technology-based NALs for pH and turbidity, and requirements for effluent monitoring at all Risk level 2 & 3, and LUP Type 2 & 3 sites. Numeric action levels are essentially numeric benchmark values for certain parameters that, if exceeded in effluent sampling, trigger the discharger to take actions. Exceedance of an NAL does not itself constitute a violation of the General Permit. If the discharger fails to take the corrective action required by the General Permit, though, that may consititute a violation.

The primary purpose of NALs is to assist dischargers in evaluating the effectiveness of their on-site measures. Construction sites need to employ many different systems that must work together to achieve compliance with the permit's requirements. The NALs chosen should indicate whether the systems are working as intended.

Another purpose of NALs is to provide information regarding construction activities and water quality impacts. This data will provide the State and Regional Water Boards and the rest of the storm water community with more information about levels and types of pollutants present in runoff and how effective the dischargers BMPs are at reducing pollutants in effluent. The State Water Board also hopes to learn more about the linkage between effluent and receiving water quality. In addition, these requirements will provide information on the mechanics needed to establish compliance monitoring programs at construction sites in future permit deliberations.

i. *pH*

[9] http://www.wrcc.dri.edu/pcpnfreq/nca5y24.gif & http://www.wrcc.dri.edu/pcpnfreq/sca5y24.gif .
[10] http://www.waterboards.ca.gov/tmdl/tmdl.html.

The chosen limits were established by calculating one standard deviation above and below the mean pH of runoff from highway construction sites[11] in California. Proper implementation of BMPs should result in discharges that are within the range of 6.5 to 8.5 pH Units.

The Caltrans study included 33 highway construction sites throughout California over a period of four years, which included 120 storm events. All of these sites had BMPs in place that would be generally implemented at all types of construction sites in California.

ii. ***Turbidity***

BPJ was used to develop an NAL that can be used as a learning tool to help dischargers improve their site controls, and to provide meaningful information on the effectiveness of storm water controls. A statewide turbidity NAL has been set at 250 NTU.

G. Receiving Water Limitations

Construction-related activities that cause or contribute to an exceedance of water quality standards must be addressed. The dynamic nature of construction activity gives the discharger the ability to quickly identify and monitor the source of the exceedances. This is because when storm water mobilizes sediment, it provides visual cues as to where corrective actions should take place and how effective they are once implemented.

This General Permit requires that storm water discharges and authorized non-storm water discharges must not contain pollutants that cause or contribute to an exceedance of any applicable water quality objective or water quality standards. The monitoring requirements in this General Permit for sampling and analysis procedures will help determine whether BMPs installed and maintained are preventing pollutants in discharges from the construction site that may cause or contribute to an exceedance of water quality standards.

Water quality standards consist of designated beneficial uses of surface waters and the adoption of ambient criteria necessary to protect those uses. When adopted by the State Water Board or a Regional Water Board, the ambient criteria are termed “water quality objectives.” If storm water runoff from construction sites contains pollutants, there is a risk that those pollutants could enter surface waters and cause or contribute to an exceedance of water quality standards. For that reason, dischargers should be aware of the applicable water quality standards in their receiving waters. (The best method to ensure compliance with receiving water limitations is to implement BMPs that prevent pollutants from contact with storm water or from leaving the construction site in runoff.)

In California, water quality standards are published in the Basin Plans adopted by each Regional Water Board, the California Toxics Rule (CTR), the National Toxics Rule (NTR), and the Ocean Plan.

Dischargers can determine the applicable water quality standards by contacting Regional Water Board staff or by consulting one of the following sources. The actual Basin Plans that contain the water quality standards can be viewed at the website of the appropriate Regional Water Board. (http://www.waterboards.ca.gov/regions.html), the State Water Board site for statewide plans (http://www.waterboards.ca.gov/plnspols/index.html), or the USEPA regulations for the NTR and CTR (40 C.F.R. §§ 131.36-38). Basin Plans and statewide plans are also available by mail from the appropriate Regional Water Board or the State Water Board. The USEPA regulations are available at http://www.epa.gov/. Additional information concerning water quality standards can be accessed through http://www.waterboards.ca.gov/stormwtr/gen_const.html.

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[11] Caltrans Construction Sites Runoff Characterization Study, 2002. Available at: http://www.dot.ca.gov/hq/env/stormwater/pdf/CTSW-RT-02-055.pdf.

H. Training Qualifications and Requirements

The Blue Ribbon Panel (BRP) made the following observation about the lack of industry-specific training requirements:

"Currently, there is no required training or certification program for contractors, preparers of soil erosion and sediment control Storm Water Pollution Prevention Plans, or field inspectors."

Order 99-08-DWQ required that all dischargers train their employees on how to comply with the permit, but it did not specificy a curriculum or certification program. This has resulted in inconsistent implementation by all affected parties - the dischargers, the local governments where the construction activity occurs, and the regulators required to enforce 99-08-DWQ. This General Permit requires Qualified SWPPP Developers and practitioners to obtain appropriate training, and makes this curriculum mandatory two years after adoption, to allow time for course completion. The State and Regional Water Board are working with many stakeholders to develop the curriculum and mechanisms needed to develop and deliver the courses.

To ensure that the preparation, implementation, and oversight of the SWPPP is sufficient for effective pollution prevention, the Qualified SWPPP Developer and Qualified SWPPP Practitioners responsible for creating, revising, overseeing, and implementing the SWPPP must attend a State Water Board-sponsored or approved Qualified SWPPP Developer and Qualified SWPPP Practitioner training course.

I. Sampling, Monitoring, Reporting and Record Keeping

1. Traditional Construction Monitoring Requirements

This General Permit requires visual monitoring at all sites, and effluent water quality at all Risk Level 2 & 3 sites. It requires receiving water monitoring at some Risk Level 3 sites. All sites are required to submit annual reports, which contain various types of information, depending on the site characteristics and events. A summary of the monitoring and reporting requirements is found in Table 4.

Table 4 - Required Monitoring Elements for Risk Levels

	Visual	Non-visible Pollutant	Effluent	Receiving Water
Risk Level 1	three types required for all Risk Levels: non-storm water, pre-rain and post-rain	As needed for all Risk Levels (see below)	where applicable	not required
Risk Level 2			pH, turbidity	not required
Risk Level 3			(if NEL exceeded) pH, turbidity and SSC	(if NEL exceeded) pH, turbidity and SSC. Bioassessment for sites 30 acres or larger.

a. Visual

All dischargers are required to conduct quarterly, non-storm water visual inspections. For these inspections, the discharger must visually observe each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources. For storm-related inspections, dischargers must visually observe storm water discharges at all discharge locations within two business days after a qualifying event. For this requirement, a qualifying rain event is one producing precipitation of ½ inch or more of discharge. Dischargers must conduct a post-storm event inspection to

(1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify any additional BMPs necessary and revise the SWPPP accordingly. Dischargers must maintain on-site records of all visual observations, personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

b. Non-Visible Pollutant Monitoring

This General Permit requires that all dischargers develop a sampling and analysis strategy for monitoring pollutants that are not visually detectable in storm water. Monitoring for non-visible pollutants must be required at any construction site when the exposure of construction materials occurs and where a discharge can cause or contribute to an exceedance of a water quality objective.

Of significant concern for construction discharges are the pollutants found in materials used in large quantities at construction sites throughout California and exposed throughout the rainy season, such as cement, flyash, and other recycled materials or by-products of combustion. The water quality standards that apply to these materials will depend on their composition. Some of the more common storm water pollutants from construction activity are not CTR pollutants. Examples of non-visible pollutants include glyphosate (herbicides), diazinon and chlorpyrifos (pesticides), nutrients (fertilizers), and molybdenum (lubricants). The use of diazinon and chlorpyrifos is a common practice among landscaping professionals and may trigger sampling and analysis requirements if these materials come into contact with storm water. High pH values from cement and gypsum, high pH and SSC from wash waters, and chemical/fecal contamination from portable toilets, also are not CTR pollutants. Although some of these constituents do have numeric water quality objectives in individual Basin Plans, many do not and are subject only to narrative water quality standards (i.e. not causing toxicity). Dischargers are encouraged to discuss these issues with Regional Water Board staff and other storm water quality professionals.

The most effective way to avoid the sampling and analysis requirements, and to ensure permit compliance, is to avoid the exposure of construction materials to precipitation and storm water runoff. Materials that are not exposed do not have the potential to enter storm water runoff, and therefore receiving waters sampling is not required. Preventing contact between storm water and construction materials is one of the most important BMPs at any construction site.

Preventing or eliminating the exposure of pollutants at construction sites is not always possible. Some materials, such as soil amendments, are designed to be used in a manner that will result in exposure to storm water. In these cases, it is important to make sure that these materials are applied according to the manufacturer's instructions and at a time when they are unlikely to be washed away. Other construction materials can be exposed when storage, waste disposal or the application of the material is done in a manner not protective of water quality. For these situations, sampling is required unless there is capture and containment of all storm water that has been exposed. In cases where construction materials may be exposed to storm water, but the storm water is contained and is not allowed to run off the site, sampling will only be required when inspections show that the containment failed or is breached, resulting in potential exposure or discharge to receiving waters.

The discharger must develop a list of potential pollutants based on a review of potential sources, which will include construction materials soil amendments, soil treatments, and historic contamination at the site. The discharger must review existing environmental and real estate documentation to determine the potential for pollutants that could be present on the construction site as a result of past land use activities.

Good sources of information on previously existing pollution and past land uses include:

i. Environmental Assessments;

ii. Initial Studies;

iii. Phase 1 Assessments prepared for property transfers; and

iv. Environmental Impact Reports or Environmental Impact Statements prepared under the requirements of the National Environmental Policy Act or the California Environmental Quality Act.

In some instances, the results of soil chemical analyses may be available and can provide additional information on potential contamination.

The potential pollutant list must include all non-visible pollutants that are known or should be known to occur on the construction site including, but not limited to, materials that:

i. are being used in construction activities;

ii. are stored on the construction site;

iii. were spilled during construction operations and not cleaned up;

iv. were stored (or used) in a manner that created the potential for a release of the materials during past land use activities;

v. were spilled during previous land use activities and not cleaned up; or

vi. were applied to the soil as part of past land use activities.

C. Effluent Monitoring

Federal regulations[12] require effluent monitoring for discharges subject to NALs and NELs. Subsequently, all Risk Level 2 and 3 dischargers must perform sampling and analysis of effluent discharges to characterize discharges associated with construction activity from the entire area disturbed by the project. Dischargers must collect samples of stored or contained storm water that is discharged subsequent to a storm event producing precipitation of ½ inch or more at the time of discharge.

Table 5 - Storm Water Effluent Monitoring Requirements by Risk Level

	Frequency	Effluent Monitoring (Section E, below)
Risk Level 1	when applicable	non-visible pollutant parameters (if applicable)
Risk Level 2	Minimum of 3 samples per day during qualifying rain event characterizing discharges associated with construction activity from the entire project disturbed area.	pH, turbidity, and non-visible pollutant parameters (if applicable)
Risk Level 3	Minimum of 3 samples per day during qualifying rain event characterizing discharges associated with construction activity from the entire project disturbed area.	If NEL exceeded: pH, turbidity and suspended sediment concentration (SSC)., Plus non-visible pollutant parameters if applicable

Risk Level 1 dischargers must analyze samples for:

[12] 40 C.F.R. § 122.44.

i. any parameters indicating the presence of pollutants identified in the pollutant source assessment required in Attachment C contained in the General Permit.

Risk Level 2 dischargers must analyze samples for:

i. pH and turbidity;

ii. any parameters indicating the presence of pollutants identified in the pollutant source assessment required in Attachment D contained in the General Permit, and

iii. any additional parameters for which monitoring is required by the Regional Water Board.

Risk Level 3 dischargers must analyze samples for:

i. pH, turbidity and SSC;

ii. any parameters indicating the presence of pollutants identified in the pollutant source assessment required in Attachment E contained in the General Permit, and

iii. any additional parameters for which monitoring is required by the Regional Water Board.

2. **Linear Monitoring and Sampling Requirements**

Attachment A, establishes minimum monitoring and reporting requirements for all LUPs. It establishes different monitoring requirements depending on project complexity and risk to water quality. The monitoring requirements for Type 1 LUPs are less than Type 2 & 3 projects because Type 1 projects have a lower potential to impact water quality.

A discharger shall prepare a monitoring program prior to the start of construction and immediately implement the program at the start of construction for LUPs. The monitoring program must be implemented at the appropriate level to protect water quality at all times throughout the life of the project.

a. **Type 1 LUP Monitoring Requirements**

A discharger must conduct daily visual inspections of Type 1 LUPs during working hours while construction activities are occurring. Inspections are to be conducted by qualified personnel and can be conducted in conjunction with other daily activities. Inspections will be conducted to ensure the BMPs are adequate, maintained, and in place at the end of the construction day. The discharger will revise the SWPPP, as appropriate, based on the results of the daily inspections. Inspections can be discontinued in non-active construction areas where soil disturbing activities have been completed and final stabilization has been achieved (e.g., trench has been paved, substructures have been installed, and successful final vegetative cover or other stabilization criteria have been met).

A discharger shall implement the monitoring program for inspecting Type 1 LUPs. This program requires temporary and permanent stabilization BMPs after active construction is completed. Inspection activities will continue until adequate permanent stabilization has been established and will continue in areas where re-vegetation is chosen until minimum vegetative coverage has been established. Photographs shall be taken during site inspections and submitted to the State Water Board.

b. Type 2 & 3 LUP Monitoring Requirements

A discharger must conduct daily visual inspections of Type 2 & 3 LUPs during working hours while construction activities are occurring. Inspections are to be conducted by qualified personnel and can be in conjunction with other daily activities.

All dischargers of Type 2 & 3 LUPs are required to conduct inspections by qualified personnel of the construction site during normal working hours prior to all anticipated storm events and after actual storm events. During extended storm events, the discharger shall conduct inspections during normal working hours for each 24-hour period. Inspections can be discontinued in non-active construction areas where soil disturbing activities have been completed and final stabilization has been achieved (e.g., trench has been paved, substructures installed, and successful vegetative cover or other stabilization criteria have been met).

The goals of these inspections are (1) to identify areas contributing to a storm water discharge; (2) to evaluate whether measures to reduce pollutant loadings identified in the SWPPP are adequate and properly installed and functioning in accordance with the terms of the General Permit; and (3) to determine whether additional control practices or corrective maintenance activities are needed. Equipment, materials, and workers must be available for rapid response to failures and emergencies. All corrective maintenance to BMPs shall be performed as soon as possible, depending upon worker safety.

All dischargers shall develop and implement a monitoring program for inspecting Type 2 & 3 LUPs that require temporary and permanent stabilization BMPs after active construction is completed. Inspections will be conducted to ensure the BMPs are adequate and maintained. Inspection activities will continue until adequate permanent stabilization has been established and will continue in areas where revegetation is chosen until minimum vegetative coverage has been established.

A log of inspections conducted before, during, and after the storm events must be maintained in the SWPPP. The log will provide the date and time of the inspection and who conducted the inspection. Photographs must be taken during site inspections and submitted to the State Water Board.

c. Sampling Requirements for all LUP Project Types

LUPs are also subject to sampling and analysis requirements for visible pollutants (i.e., sedimentation/siltation, turbidity) and for non-visible pollutants.

Sampling for visible pollutants is required for Type 2 & 3 LUPs.

Non-visible pollutant monitoring is required for pollutants associated with construction sites and activities that (1) are not visually detectable in storm water discharges, and (2) are known or should be known to occur on the construction site, and (3) could cause or contribute to an exceedance of water quality objectives in the receiving waters. Sample collection for non-visible pollutants must only be required (1) during a storm event when pollutants associated with construction activities may be discharged with storm water runoff due to a spill, or in the event there was a breach, malfunction, failure, and/or leak of any BMP, and (2) when the discharger has failed to adequately clean the area of material and pollutants. Failure to implement appropriate BMPs will trigger the same sampling requirements as those required for a breach, malfunction and/or leak, or when the discharger has failed to implement appropriate BMPs prior to the next storm event.

Additional monitoring parameters may be required by the Regional Water Boards.

It is not anticipated that many LUPs will be required to collect samples for pollutants not visually detected in runoff due to the nature and character of the construction site and activities as previously described in this fact sheet. Most LUPs are constructed in urban areas with public access (e.g., existing roadways, road shoulders, parking areas, etc.). This raises a concern regarding the potential contribution of pollutants from vehicle use and/or from normal activities of the public (e.g., vehicle washing, landscape fertilization, pest spraying, etc.) in runoff from the project site. Since the dischargers are not the land

owners of the project area and are not able to control the presence of these pollutants in the storm water that runs through their projects, it is not the intent of this General Permit to require dischargers to sample for these pollutants. This General Permit does not require the discharger to sample for these types of pollutants except where the discharger has brought materials onsite that contain these pollutants and when a condition (e.g., breach, failure, etc.) described above occurs.

3. Receiving Water Monitoring

In order to ensure that receiving water limitations are met, discharges subject to numeric effluent limitations (i.e., Risk Level 3, LUP Type 3, and ATS with direct discharges into receiving waters) must also monitor the downstream receiving water(s) for turbidity, SSC, and pH (if applicable) when an NEL is exceeded.

a. Bioassessment Monitoring

This General Permit requires a bioassessment of receiving waters for dischargers of Risk Level 3 or LUP Type 3 construction projects equal to or larger than 30 acres with direct discharges into receiving waters. Benthic macroinvertebrate samples will be taken upstream and downstream of the site's discharge point in the receiving water. Bioassessments measure the quality of the stream by analyzing the aquatic life present. Higher levels of appropriate aquatic species tend to indicate a healthy stream; whereas low levels of organisms can indicate stream degradation. Active construction sites have the potential to discharge large amounts of sediment and pollutants into receiving waters. Requiring a bioassessment for large project sites, with the most potential to impact water quality, provides a snapshot of the health of the receiving water prior to initiation of construction activities. This snapshot can be used in comparison to the health of the receiving water after construction has commenced.

Each ecoregion (biologically and geographically related area) in the State has a specific yearly peak time where stream biota is in a stable and abundant state. This time of year is called an Index Period. The bioassessment requirements in this General Permit, requires benthic macroinvertebrate sampling within a sites index period. The State Water Board has developed a map designating index periods for the ecoregions in the State (see State Water Board Website).

This General Permit requires the bioassessment methods to be in accordance with the Surface Water Ambient Monitoring Program (SWAMP) in order to provide data consistency within the state as well as generate useable biological stream data.

Table 6 - Receiving Water Monitoring Requirements

	Receiving Water Monitoring Parameters
Risk Level 1 /LUP Type 1	not required
Risk Level 2 / LUP Type 2	not required
Risk Level 3 / LUP Type 3	If NEL exceeded: pH (if applicable), turbidity, and SSC. Bioassessment for sites 30 acres or larger.

4. Reporting Requirements

a. NEL Violation Report

All Risk Level 3 and LUP Type 3 dischargers must electronically submit all storm event sampling results to the State and Regional Water Boards, via SMARTS, no later than 5 days after the conclusion of the storm event. The purpose of the electronic filing of the NEL Violation Report is to 1) inform stakeholder agencies and organizations and the general public, and 2) notify the State and Regional Water Boards of

the exceedance so that they can determine whether any follow-up (e.g., inspection, enforcement, etc.) is necessary to bring the site into compliance.

In the event that an applicable NEL has been exceeded during a storm event equal to or larger than the Compliance Storm Event, Risk level 3/LUP Type 3 dischargers shall report the on-site rain gauge reading and nearby governmental rain gauge readings for verification. Specifically, the NEL Exceedance Report is required to contain:

- the analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit are to be reported as "less than the method detection limit or <MDL");
- the date, place, and time of sampling;
- any visual observation (inspections);
- any measurements, including precipitation; and
- a description of the current BMPs associated with the effluent sample that exceeded the NEL and any proposed corrective actions taken.

b. **NAL Exceedance Report**

All Risk Level 3 and LUP Type 3 dischargers must electronically submit all storm event sampling results to the State and Regional Water Boards, via the electronic data system, no later than 5 days after the conclusion of the storm event. In the event that any effluent sample exceeds an applicable NAL, all Risk Level 2 and LUP Type 2 dischargers must electronically submit all storm event sampling results to the State and Regional Water Boards no later than 10 days after the conclusion of the storm event. The Regional Water Boards have the authority to require the submittal of an NAL Exceedance Report.

Specifically, the NAL Exceedance Report is required to contain:

- the analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit are to be reported as "less than the method detection limit or <MDL");
- the date, place, and time of sampling;
- any visual observation (inspections);
- any measurements, including precipitation; and
- a description of the current BMPs associated with the effluent sample that exceeded the NAL and any proposed corrective actions taken.

c. **Annual Report**

All dischargers must prepare and electronically submit an annual report no later than September 1 of each year using the Storm water Multi-Application Reporting and Tracking System (SMARTS). The Annual Report must include a summary and evaluation of all sampling and analysis results, original laboratory reports, chain of custody forms, a summary of all corrective actions taken during the compliance year, and identification of any compliance activities or corrective actions that were not implemented.

5. Record Keeping

According to 40 C.F.R. Parts 122.21(p) and 122.41(j), the discharger is required to retain paper or electronic copies of all records required by this General Permit for a period of at least three years from the date generated or the date submitted to the State Water Board or Regional Water Boards. A discharger must retain records for a period beyond three years as directed by Regional Water Board.

J. Risk Determination

1. Traditional Projects

a. Overall Risk Determination

There are two major requirements related to site planning and risk determination in this General Permit. The project's overall risk is broken up into two elements – (1) project sediment risk (the relative amount of sediment that can be discharged, given the project and location details) and (2) receiving water risk (the risk sediment discharges pose to the receiving waters).

Project Sediment Risk:
Project Sediment Risk is determined by multiplying the R, K, and LS factors from the Revised Universal Soil Loss Equation (RUSLE) to obtain an estimate of project-related bare ground soil loss expressed in tons/acre. The RUSLE equation is as follows:

A = (R)(K)(LS)(C)(P)

Where: A = the rate of sheet and rill erosion
R = rainfall-runoff erosivity factor
K = soil erodibility factor
LS = length-slope factor
C = cover factor (erosion controls)
P = management operations and support practices (sediment controls)

The C and P factors are given values of 1.0 to simulate bare ground conditions.

There is a map option and a manual calculation option for determining soil loss. For the map option, the R factor for the project is calculated using the online calculator at http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm. The product of K and LS are shown on Figure 1. To determine soil loss in tons per acre, the discharger multiplies the R factor times the value for K times LS from the map.

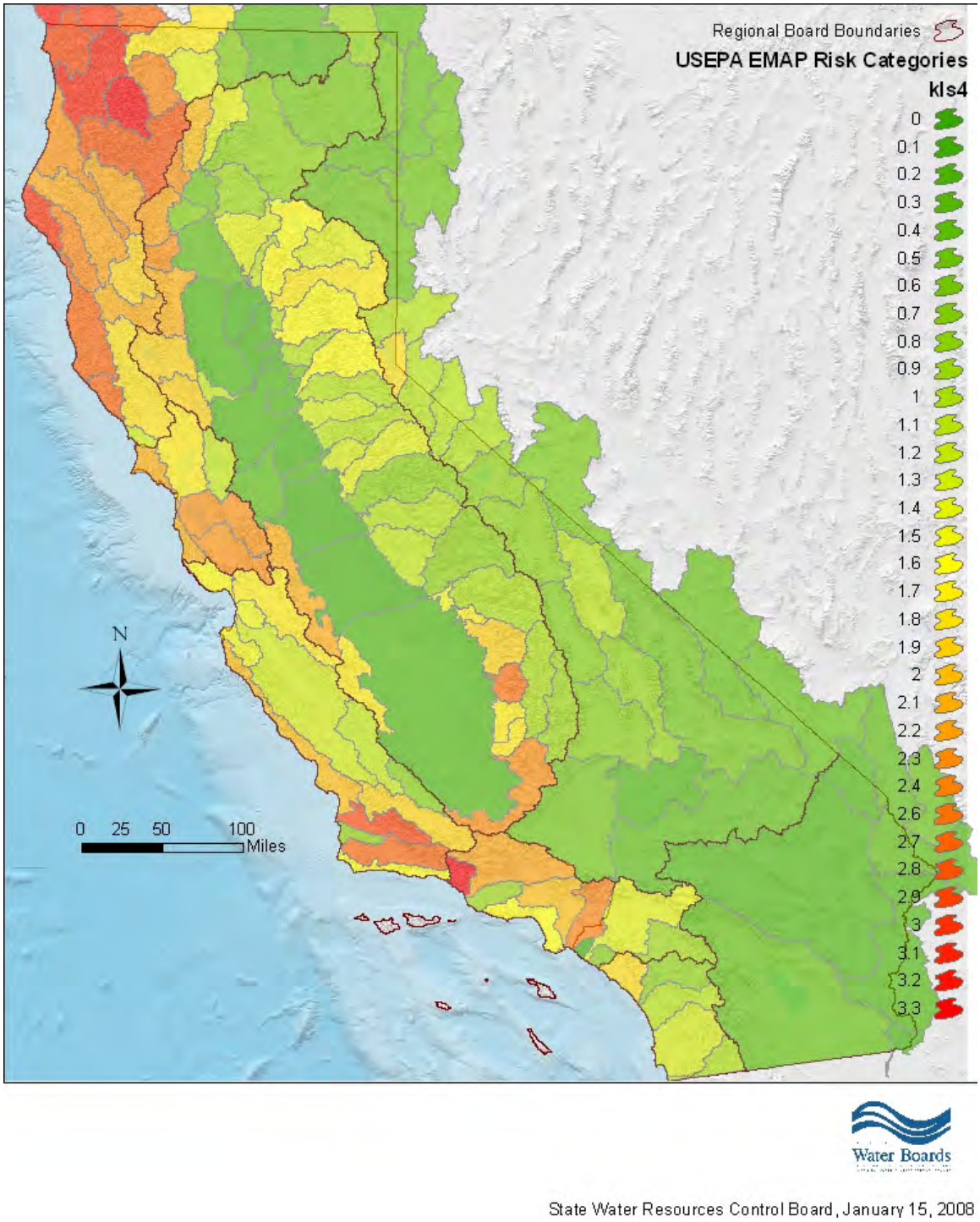

Figure 1 -Statewide Map of K * LS

For the manual calculation option, the R factor for the project is calculated using the online calculator at http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm. The K and LS factors are determined using Appendix 1.

Soil loss of less than 15 tons/acre is considered **low** sediment risk.
Soil loss between 15 and 75 tons/acre is **medium** sediment risk.
Soil loss over 75 tons/acre is considered **high** sediment risk.

The soil loss values and risk categories were obtained from mean and standard deviation RKLS values from the USEPA EMAP program. High risk is the mean RKLS value plus two standard deviations. Low risk is the mean RKLS value minus two standard deviations.

Receiving Water Risk:
Receiving water risk is based on whether a project drains to a sediment-sensitive waterbody. A sediment-sensitive waterbody is either

on the most recent 303d list for waterbodies impaired for sediment;
has a USEPA-approved Total Maximum Daily Load implementation plan for sediment; **or**
has the beneficial uses of COLD, SPAWN, and MIGRATORY.

A project that meets at least one of the three criteria has a high receiving water risk. A list of sediment-sensitive waterbodies will be posted on the State Water Board's website. It is anticipated that an interactive map of sediment sensitive water bodies in California will be available in the future.

The Risk Levels have been altered by eliminating the possibility of a Risk Level 4, and expanding the constraints for Risk Levels 1, 2, and 3. Therefore, projects with high receiving water risk and high sediment risk will be considered a Risk Level 3 risk to water quality.

In response to public comments, the Risk Level requirements have also been changed such that Risk Level 1 projects will be subject to minimum BMP and visual monitoring requirements, Risk Level 2 projects will be subject to NALs and some additional monitoring requirements, and Risk Level 3 projects will be subject to NELs, and more rigorous monitoring requirements such as receiving water monitoring and in some cases bioassessment.

Table 7 - Combined Risk Level Matrix

Combined Risk Level Matrix				
Receiving Water Risk		Sediment Risk		
		Low Medium		High
	Low	Level 1	Level 2	
	High	Level 2		Level 3

b. Effluent Standards

All dischargers are subject to the narrative effluent limitations specified in the General Permit. The narrative effluent limitations require storm water discharges associated with construction activity to meet all applicable provisions of Sections 301 and 402 of the CWA. These provisions require controls of pollutant discharges that utilize BAT and BCT to reduce pollutants and any more stringent controls necessary to meet water quality standards.

Risk Level 2, and 3 dischargers are subject to numeric effluent standards comparable to the project's risk to water quality. Risk Level 2 dischargers that pose a medium risk to water quality are subject to technology-based NALs for pH and turbidity. Risk Level 3 dischargers that pose a high risk to water quality are subject to technology-based NALs and technology-based NELs for pH and turbidity.

c. Good Housekeeping

Proper handling and managing of construction materials can help minimize threats to water quality. The discharger must consider good housekeeping measures for: construction materials, waste management, vehicle storage & maintenance, landscape materials, and potential pollutant sources. Examples include; conducting an inventory of products used, implementing proper storage & containment, and properly cleaning all leaks from equipment and vehicles.

d. Non-Storm Water Management

Non-storm water discharges directly connected to receiving waters or the storm drain system have the potential to negatively impact water quality. The discharger must implement measures to control all non-storm water discharges during construction, and from dewatering activities associated with construction. Examples include; properly washing vehicles in contained areas, cleaning streets, and minimizing irrigation runoff.

e. Erosion Control

The best way to minimize the risk of creating erosion and sedimentation problems during construction is to disturb as little of the land surface as possible by fitting the development to the terrain. When development is tailored to the natural contours of the land, little grading is necessary and, consequently, erosion potential is lower.[14] Other effective erosion control measures include: preserving existing vegetation where feasible, limiting disturbance, and stabilizing and re-vegetating disturbed areas as soon as possible after grading or construction activities. Particular attention must be paid to large, mass-graded sites where the potential for soil exposure to the erosive effects of rainfall and wind is great and where there is potential for significant sediment discharge from the site to surface waters. Until permanent vegetation is established, soil cover is the most cost-effective and expeditious method to protect soil particles from detachment and transport by rainfall. Temporary soil stabilization can be the single most important factor in reducing erosion at construction sites. The discharger is required to consider measures such as: covering disturbed areas with mulch, temporary seeding, soil stabilizers, binders, fiber rolls or blankets, temporary vegetation, and permanent seeding. These erosion control measures are only examples of what should be considered and should not preclude new or innovative approaches currently available or being developed. Erosion control BMPs should be the primary means of preventing storm water contamination, and sediment control techniques should be used to capture any soil that becomes eroded.[13]

Risk Level 3 dischargers pose a higher risk to water quality and are therefore additionally required to ensure that post-construction soil loss is equivalent to or less than the pre-construction levels.

f. Sediment Control

Sediment control BMPs should be the secondary means of preventing storm water contamination. When erosion control techniques are ineffective, sediment control techniques should be used to capture any soil that becomes eroded. The discharger is required to consider perimeter control measures such as: installing silt fences or placing straw wattles below slopes. These sediment control measures are only examples of what should be considered and should not preclude new or innovative approaches currently available or being developed.

Because Risk Level 2 and 3 dischargers pose a higher risk to water quality, additional requirements for the application of sediment controls are imposed on these projects. This General Permit also authorizes the Regional Water Boards to require Risk Level 3 dischargers to implement additional site-specific

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[13] U.S. Environmental Protection Agency. 2007. Developing Your Storm Water Pollution Prevention Plan: A Guide for Construction Sites.

sediment control requirements if the implementation of other erosion or sediment controls are not adequately protecting the receiving waters.

g. Run-on and Runoff Control

Inappropriate management of run-on and runoff can result in excessive physical impacts to receiving waters from sediment and increased flows. The discharger is required to manage all run-on and runoff from a project site. Examples include: installing berms and other temporary run-on and runoff diversions.

Risk Level 1 dischargers with lower risks to impact water quality are not subject to the run-on and runoff control requirements unless an evaluation deems them necessary or visual inspections show that such controls are required.

h. Inspection, Maintenance and Repair

All measures must be periodically inspected, maintained and repaired to ensure that receiving water quality is protected. Frequent inspections coupled with thorough documentation and timely repair is necessary to ensure that all measures are functioning as intended.

i. Rain Event Action Plan (REAP)

A Rain Event Action Plan (REAP) is a written document, specific for each rain event. A REAP should be designed that when implemented it protects all exposed portions of the site within 48 hours of any likely precipitation event forecast of 50% or greater probability.

This General Permit requires Risk Level 2 and 3 dischargers to develop and implement a REAP designed to protect all exposed portions of their sites within 48 hours prior to any likely precipitation event. The REAP requirement is designed to ensure that the discharger has adequate materials, staff, and time to implement erosion and sediment control measures that are intended to reduce the amount of sediment and other pollutants generated from the active site. A REAP must be developed when there is likely a forecast of 50% or greater probability of precipitation in the project area. (The National Oceanic and Atmospheric Administration (NOAA) defines a chance of precipitation as a probability of precipitation of 30% to 50% chance of producing precipitation in the project area.[14] NOAA defines the probability of precipitation (PoP) as the likelihood of occurrence (expressed as a percent) of a measurable amount (0.01 inch or more) of liquid precipitation (or the water equivalent of frozen precipitation) during a specified period of time at any given point in the forecast area.) Forecasts are normally issued for 12-hour time periods. Descriptive terms for uncertainty and aerial coverage are used as follows:

Table 8 -National Oceanic and Atmospheric Administration (NOAA) Definition of Probability of Precipitation (PoP)

PoP	Expressions of Uncertainty	Aerial Coverage
0%	none used	none used
10%	none used	isolated
20%	slight chance	isolated
30-50%	chance	scattered

[14] http://www.crh.noaa.gov/lot/severe/wxterms.php.

60-70%	likely	numerous
80-100%	none used	none used

The discharger must obtain the precipitation forecast information from the National Weather Service Forecast Office (http://www.srh.noaa.gov/).

2. Linear Projects

a. Linear Risk Determination

LUPs vary in complexity and water quality concerns based on the type of project. This General Permit has varying application requirements based on the project's risk to water quality. Factors that lead to the characterization of the project include location, sediment risk, and receiving water risk.

Based on the location and complexity of a project area or project section area, LUPs are separated into project types. As described below, LUPs have been categorized into three project types.

i. *Type 1 LUPs*

Type 1 LUPs are those construction projects where:

(1) 70 percent or more of the construction activity occurs on a paved surface and where areas disturbed during construction will be returned to preconstruction conditions or equivalent protection established at the end of the construction activities for the day, or

(2) greater than 30 percent of construction activities occur within the non-paved shoulders or land immediately adjacent to paved surfaces, or where construction occurs on unpaved improved roads, including their shoulders or land immediately adjacent to them where:

Areas disturbed during construction will be returned to pre-construction conditions or equivalent protection established at the end of the construction activities for the day to minimize the potential for erosion and sediment deposition, and

Areas where established vegetation was disturbed during construction will be stabilized and re-vegetated by the end of project. When required, adequate temporary stabilization Best Management Practices (BMPs) will be installed and maintained until vegetation is established to meet minimum cover requirements established in this General Permit for final stabilization.

Type 1 LUPs typically do not have a high potential to impact storm water quality because (1) these construction activities are not typically conducted during a rain event, (2) these projects are normally constructed over a short period of time[15], minimizing the duration that pollutants could potentially be exposed to rainfall; and (3) disturbed soils such as those from trench excavation are required to be hauled away, backfilled into the trench, and/or covered (e.g., metal plates, pavement, plastic covers over spoil piles) at the end of the construction day.

[15] Short period of time refers to a project duration of weeks to months, but typically less than one year in duration.

Type 1 LUPs are determined during the risk assessment found in Attachment A.1 to be 1) low sediment risk and low receiving water risk; 2) low sediment risk and medium receiving water risk; and 3) medium sediment risk and low receiving water risk.

This General Permit requires the discharger to ensure a SWPPP is developed for these construction activities that is specific to project type, location and characteristics.

ii. ***Type 2 LUPs:***

Type 2 projects are determined to have a combination of High, Medium, and Low project sediment risk along with High, Medium, and Low receiving water risk. Like Type 1 projects, Type 2 projects are typically constructed over a short period of time. However, these projects have a higher potential to impact water quality because they:

(1) typically occur outside the more urban/developed areas;

(2) have larger areas of soil disturbance that are not closed or restored at the end of the day;

(3) may have onsite stockpiles of soil, spoil and other materials;

(4) cross or occur in close proximity to a wide variety of sensitive resources that may include, but are not limited to, steep topography and/or water bodies; and

(5) have larger areas of disturbed soils that may be exposed for a longer time interval before final stabilization, cleanup and/or reclamation occurs.

This General Permit requires the discharger to develop and implement a SWPPP for these construction activities that are specific for project type, location and characteristics.

iii. ***Type 3 LUPs:***

Type 3 projects are determined to have a combination of High and Medium project sediment risk along with High and Medium receiving water risk. Similar to Type 2 projects, Type 3 projects have a higher potential to impact water quality because they:

(1) typically occur outside of the more urban/developed areas;

(2) have larger areas of soil disturbance that are not closed or restored at the end of the day;

(3) may have onsite stockpiles of soil, spoil and other materials;

(4) cross or occur in close proximity to a wide variety of sensitive resources that may include, but are not limited to, steep topography and/or water bodies; and

(5) have larger areas of disturbed soils that may be exposed for a longer time interval before final stabilization, cleanup and/or reclamation occurs.

This General Permit requires the discharger to develop and implement a SWPPP for these construction activities that are specific for project type, location, and characteristics.

b. **Linear Effluent Standards**

All LUPs are subject to the narrative effluent limitations specified in the General Permit.

Type 2 and 3 LUPs are subject to NELs comparable to the project type's risk to water quality. Type 2 projects that pose an intermediate risk to water quality are subject to technology-based NALs for pH and turbidity. Type 3 projects posing a high risk to water quality are subject to technology-based NALs and NELs for pH and turbidity.

c. Linear Good Housekeeping

Improper use and handling of construction materials could potentially cause a threat to water quality. In order to ensure proper site management of these construction materials, all LUP dischargers must comply with a minimum set of Good Housekeeping measures specified in Attachment A of this General Permit.

d. Linear Non-Storm Water Management

In order to ensure control of all non-storm water discharges during construction, all LUP dischargers must comply with the Non-Storm Water Management measures specified in Attachment A of this General Permit.

e. Linear Erosion Control

This General Permit requires all LUP dischargers to implement effective wind erosion control measures, and soil cover for inactive areas. Type 3 LUPs posing a higher risk to water quality are additionally required to ensure the post-construction soil loss is equivalent to or less than the pre-construction levels.

f. Linear Sediment Control

In order to ensure control and containment of all sediment discharges, all LUP dischargers must comply with the general Sediment Control measures specified in Attachment A or this General Permit. Additional requirements for sediment controls are imposed on Type 2 & 3 LUPs due to their higher risk to water quality.

g. Linear Run-on and Runoff Control

Discharges originating outside of a project's perimeter and flowing onto the property can adversely affect the quantity and quality of discharges originating from a project site. In order to ensure proper management of run-on and runoff, all LUPs must comply with the run-on and runoff control measures specified in Attachment A of this General Permit. Due to the lower risk of impacting water quality, Type 1 LUPs are not required to implement run-on and runoff controls unless deemed necessary by the discharger.

h. Linear Inspection, Maintenance and Repair

Proper inspection, maintenance, and repair activities are important to ensure the effectiveness of on-site measures to control water quality. In order to ensure that inspection, maintenance, and repair activities are adequately performed, the all LUP dischargers a re required to comply with the Inspection, Maintenance, and Repair requirements specified in Attachment A of this General Permit.

K. ATS[16] Requirements

There are instances on construction sites where traditional erosion and sediment controls do not effectively control accelerated erosion. Under such circumstances, or under circumstances where storm water discharges leaving the site may cause or contribute to an exceedance of a water quality standard, the use of an Active Treatment System (ATS) may be necessary. Additionally, it may be appropriate to use an ATS when site constraints inhibit the ability to construct a correctly sized sediment basin, when clay and/or highly erosive soils are present, or when the site has very steep or long slope lengths.[17]

Although treatment systems have been in use in some form since the mid-1990s, the ATS industry in California is relatively young, and detailed regulatory standards have not yet been developed. Many developers are using these systems to treat storm water discharges from their construction sites. The new ATS requirements set forth in this General Permit are based on those in place for small wastewater treatment systems, ATS regulations from the Central Valley Regional Water Quality Control Board (September 2005 memorandum "2005/2006 Rainy Season – Monitoring Requirements for Storm Water Treatment Systems that Utilize Chemical Additives to Enhance Sedimentation"), the Construction Storm Water Program at the State of Washington's Department of Ecology, as well as recent advances in technology and knowledge of coagulant performance and aquatic safety.

The effective design of an ATS requires a detailed survey and analysis of site conditions. With proper planning, ATS performance can provide exceptional water quality discharge and prevent significant impacts to surface water quality, even under extreme environmental conditions.

These systems can be very effective in reducing the sediment in storm water runoff, but the systems that use additives/polymers to enhance sedimentation also pose a potential risk to water quality (e.g., operational failure, equipment failure, additive/polymer release, etc.). The State Water Board is concerned about the potential acute and chronic impacts that the polymers and other chemical additives may have on fish and aquatic organisms if released in sufficient quantities or concentrations. In addition to anecdotal evidence of polymer releases causing aquatic toxicity in California, the literature supports this concern.[18] For example, cationic polymers have been shown to bind with the negatively charged gills of fish, resulting in mechanical suffocation.[19] Due to the potential toxicity impacts, which may be caused by the release of additives/polymers into receiving waters, this General Permit establishes residual polymer monitoring and toxicity testing requirements have been established in this General Permit for discharges from construction sites that utilize an ATS in order to protect receiving water quality and beneficial uses.

The primary treatment process in an ATS is coagulation/flocculation. ATS's operate on the principle that the added coagulant is bound to suspended sediment, forming floc, which is gravitationally settled in tanks or a basin, or removed by sand filters. A typical installation utilizes an injection pump upstream from the clarifier tank, basin, or sand filters, which is electronically metered to both flow rate and suspended solids level of the influent, assuring a constant dose. The coagulant mixes and reacts with the influent, forming a dense floc. The floc may be removed by gravitational setting in a clarifier tank or basin, or by filtration. Water from the clarifier tank, basin, or sand filters may be routed through cartridge(s) and/or bag filters for final polishing. Vendor-specific systems use various methods of dose control, sediment/floc removal, filtration, etc., that are detailed in project-specific documentation. The

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[16] An ATS is a treatment system that employs chemical coagulation, chemical flocculation, or electrocoagulation in order to reduce turbidity caused by fine suspended sediment.
[17] Pitt, R., S. Clark, and D. Lake. 2006. Construction Site Erosion and Sediment Controls: Planning, Design, and Performance. DEStech Publications. Lancaster, PA. 370pp.
[18] RomØen, K., B. Thu, and Ø. Evensen. 2002. Immersion delivery of plasmid DNA II. A study of the potentials of a chitosan based delivery system in rainbow trout (*Oncorhynchus mykiss*) fry. *Journal of Controlled Release* **85**: 215-225.
[19] Bullock, G., V. Blazer, S. Tsukuda, and S. Summerfelt. 2000. Toxicity of acidified chitosan for cultured rainbow trout (*Oncorhynchus mykiss*). *Aquaculture* **185**:273-280.

particular coagulant/flocculant to be used for a given project is determined based on the water chemistry of the site because the coagulants are specific in their reactions with various types of sediments. Appropriate selection of dosage must be carefully matched to the characteristics of each site.

ATS's are operated in two differing modes, either Batch or Flow-Through. Batch treatment can be defined as Pump-Treat-Hold-Test-Release. In Batch treatment, water is held in a basin or tank, and is not discharged until treatment is complete. Batch treatment involves holding or recirculating the treated water in a holding basin or tank(s) until treatment is complete or the basin or storage tank(s) is full. In Flow-Through treatment, water is pumped into the ATS directly from the runoff collection system or storm water holding pond, where it is treated and filtered as it flows through the system, and is then directly discharged. "Flow-Through Treatment" is also referred to as "Continuous Treatment."

1. Effluent Standards

This General Permit establishes NELs for discharges from construction sites that utilize an ATS. These systems lend themselves to NELs for turbidity and pH because of their known reliable treatment. Advanced systems have been in use in some form since the mid-1990s. An ATS is considered reliable, can consistently produce a discharge of less than 10 NTU, and has been used successfully at many sites in several states since 1995 to reduce turbidity to very low levels.[20]

This General Permit contains "compliance storm event" exceptions from the technology-based NELs for ATS discharges. The rationale is that technology-based requirements are developed assuming a certain design storm. In the case of ATS the industry-standard design storm is 10-year, 24-hour (as stated in Attachment F of this General Permit), so the compliance storm event has been established as the 10-year 24-hour event as well to provide consistency.

2. Training

Operator training is critical to the safe and efficient operation and maintenance of the ATS, and to ensure that all State Water Board monitoring and sampling requirements are met. The General Permit requires that all ATS operators have training specific to using ATS's liquid coagulants.

L. Post-Construction Requirements

Under past practices, new and redevelopment construction activities have resulted in modified natural watershed and stream processes. This is caused by altering the terrain, modifying the vegetation and soil characteristics, introducing impervious surfaces such as pavement and buildings, increasing drainage density through pipes and channels, and altering the condition of stream channels through straightening, deepening, and armoring. These changes result in a drainage system where sediment transport capacity is increased and sediment supply is decreased. A receiving channel's response is dependent on dominant channel materials and its stage of adjustment.

Construction activity can lead to impairment of beneficial uses in two main ways. First, during the actual construction process, storm water discharges can negatively affect the chemical, biological, and physical properties of downstream receiving waters. Due to the disturbance of the landscape, the most likely pollutant is sediment, however pH and other non-visible pollutants are also of great concern. Second, after most construction activities are completed at a construction site, the finished project may result in significant modification of the site's response to precipitation. New development and redevelopment

[20] Currier, B., G. Minton, R. Pitt, L. Roesner, K. Schiff, M. Stenstrom, E. Strassler, and E. Strecker. 2006. The Feasibility of Numeric Effluent Limits Applicable to Discharges of Storm Water Associated with Municipal, Industrial and Construction Activities.

projects have almost always resulted in permanent post-construction water quality impacts because more precipitation ends up as runoff and less precipitation is intercepted, evapotranspired, and infiltrated.

General Permit 99-08-DWQ required the SWPPP to include a description of all post-construction BMPs on a site and a maintenance schedule. An effective storm water management strategy must address the full suite of storm events (water quality, channel protection, overbank flood protection, extreme flood protection) (Figure 2).

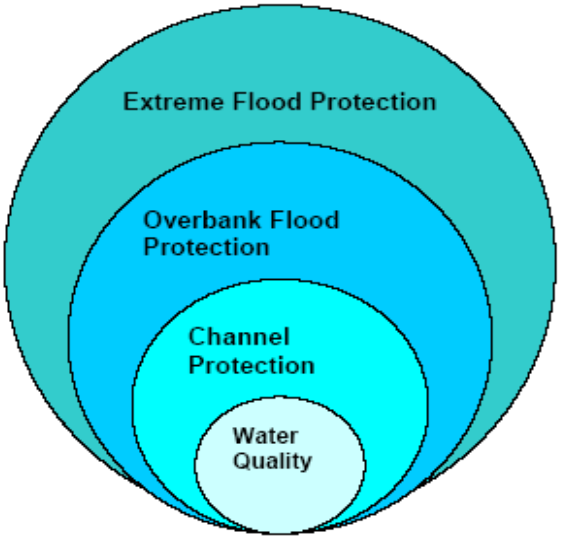

Figure 2 - Suite of Storm Events

The post-construction storm water performance standards in this General Permit specifically address water quality and channel protection events. Overbank flood protection and extreme flood protection events are traditionally dealt with in local drainage and flood protection ordinances. However, measures in this General Permit to address water quality and channel protection also reduce overbank and extreme flooding impacts. This General Permit aims to match post-construction runoff to pre-construction runoff for the 85th percentile storm event, which not only reduces the risk of impact to the receiving water's channel morphology but also provides some protection of water quality.

This General Permit clarifies that its runoff reduction requirements only apply to projects that lie outside of jurisdictions covered by a Standard Urban Storm water Management Plan (SUSMP) (or other more protective) post-construction requirements in either Phase I or Phase II permits.

Figures 3 and 4, below, show the General Permit enrollees (to Order 99-08-DWQ, as of March 10, 2008) overlaid upon a map with SUSMP (or more protective) areas in blue and purple. Areas without blue or purple indicate where the General Permit's runoff reduction requirements would actually apply.

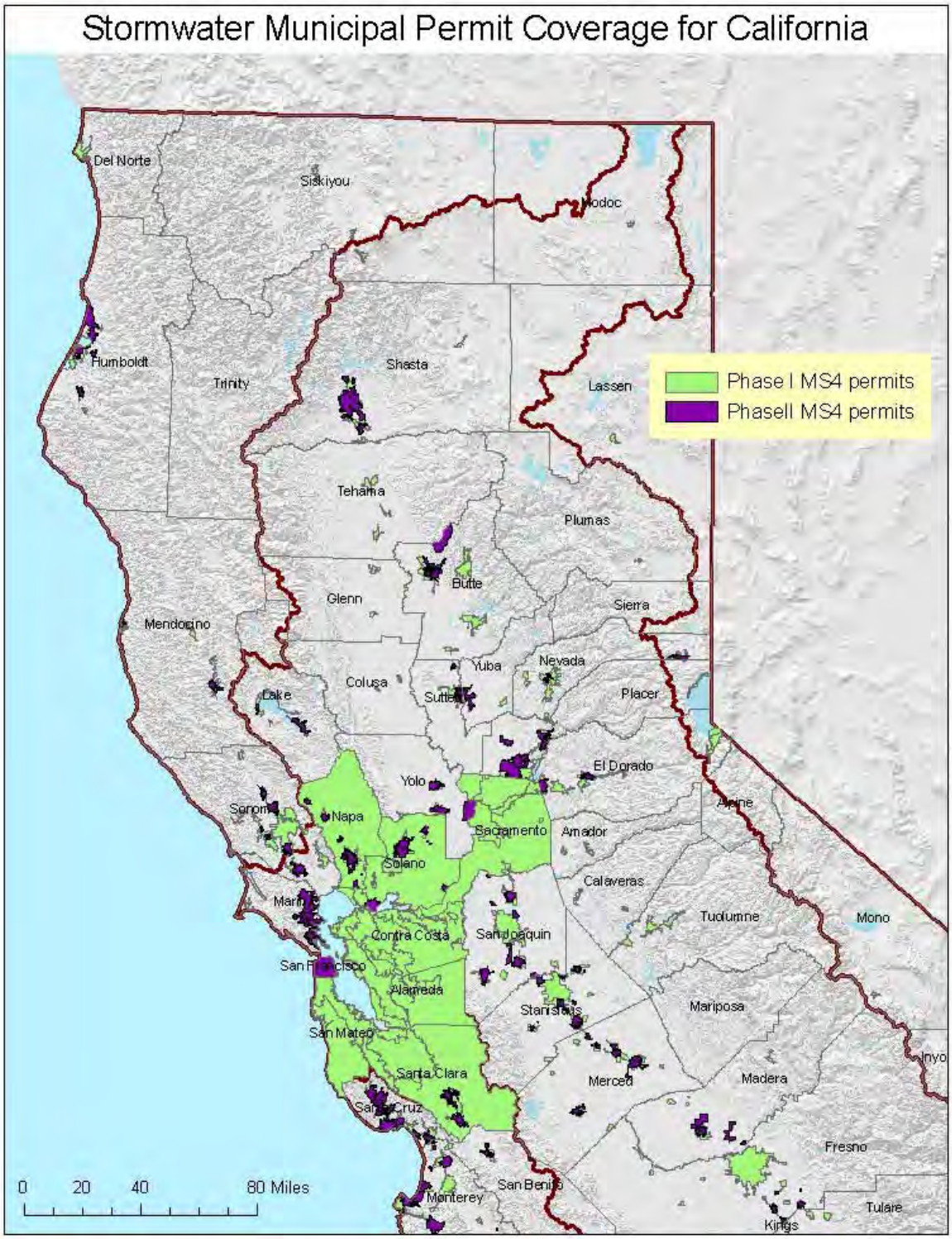

Figure 3 - Northern CA (2009) Counties / Cities With SUSMP-Plus Coverage

Figure 4 - Southern CA (2009) Counties / Cities With SUSMP-Plus Coverage

Water Quality:
This General Permit requires dischargers to replicate the pre-project runoff water balance (defined as the amount of rainfall that ends up as runoff) for the smallest storms up to the 85th percentile storm event, or the smallest storm event that generates runoff, whichever is larger. Contemporary storm water management generally routes these flows directly to the drainage system, increasing pollutant loads and potentially causing adverse effects on receiving waters. These smaller water quality events happen much more frequently than larger events and generate much higher pollutant loads on an annual basis. There are other adverse hydrological impacts that result from not designing according to the site's pre-construction water balance. In Maryland, Klein[21] noted that baseflow decreases as the extent of urbanization increases. Ferguson and Suckling[22] noted a similar relation in watersheds in Georgia. On Long Island, Spinello and Simmons[23] noted substantial decreases in base flow in intensely urbanized watersheds.

The permit emphasizes runoff reduction through on-site storm water reuse, interception, evapo-transpiration and infiltration through non-structural controls and conservation design measures (e.g., downspout disconnection, soil quality preservation/enhancement, interceptor trees). Employing these measures close to the source of runoff generation is the easiest and most cost-effective way to comply with the pre-construction water balance standard. Using low-tech runoff reduction techniques close to the source is consistent with a number of recommendations in the literature.[24] In many cases, BMPs implemented close to the source of runoff generation cost less than end-of the pipe measures.[25] Dischargers are given the option of using Appendix 2 to calculate the required runoff volume or a watershed process-based, continuous simulation model such as the EPA's Storm Water Management Model (SWMMM) or Hydrologic Simulation Program Fortran (HSPF). Such methods used by the discharger will be reviewed by the Regional Water Board upon NOT application.

Channel Protection:
In order to address channel protection, a basic understanding of fluvial geomorphic concepts is necessary. A dominant paradigm in fluvial geomorphology holds that streams adjust their channel dimensions (width and depth) in response to long-term changes in sediment supply and bankfull discharge (1.5 to 2 year recurrence interval). The bankfull stage corresponds to the discharge at which channel maintenance is the most effective, that is, the discharge at which the moving sediment, forming or removing bars, forming or changing bends and meanders, and generally doing work that results in the average morphologic characteristics of channels.[26] Lane (1955 as cited in Rosgen 1996[27]) showed the generalized relationship between sediment load, sediment size, stream discharge and stream slope in Figure 5. A change in any one of these variables sets up a series of mutual adjustments in the companion variables with a resulting direct change in the physical characteristics of the stream channel.

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[21] Klein 1979 as cited in Delaware Department of Natural Resources (DDNR). 2004. Green Technology: The Delaware Urban Runoff Management Approach. Dover, DE. 117 pp.
[22] Ferguson and Suckling 1990 as cited Delaware Department of Natural Resources (DDNR). 2004. Green Technology: The Delaware Urban Runoff Management Approach. Dover, DE. 117 pp.
[23] Center for Watershed Protection (CWP). 2000. The Practice of Watershed Protection: Techniques for protecting our nation's streams, lakes, rivers, and estuaries. Ellicott City, MD. 741 pp.
[24] Bay Area Storm Water Management Agencies Association (BASMAA). 1997. Start at the Source: Residential Site Planning and Design Guidance Manual for Storm Water Quality Protection. Palo Alto, CA;
McCuen, R.H. 2003 Smart Growth: hydrologic perspective. Journal of Professional Issues in Engineering Education and Practice. Vol (129), pp.151-154;
Moglen, G.E. and S. Kim. 2007. Impervious imperviousness-are threshold based policies a good idea? Journal of the American Planning Association, Vol 73 No. 2. pp 161-171.
[25] Delaware Department of natural Resources (DDNR). 2004. Green technology: The Delaware urban Runoff Management Approcah. Dover, DE. 117 pp.
[26] Dunne, T and L.B. Leopold. 1978. Water in Environmental Planning. San Francisco W.H. Freeman and Company
[27] Rosgen. D.L. 1996. Applied River Morphology. Pagosa Springs. Wildland Hydrology

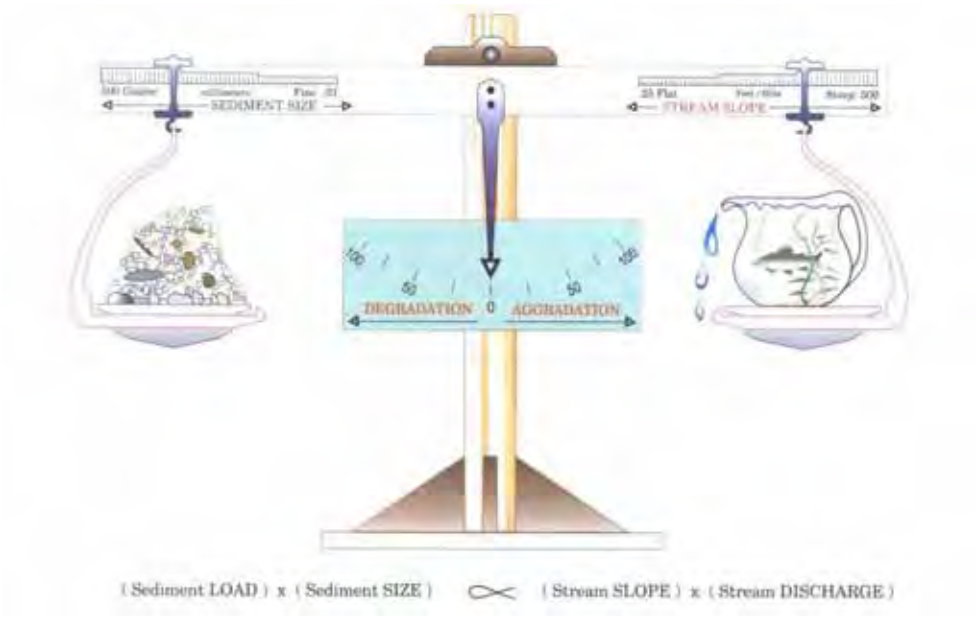

Figure 5 - Schematic of the Lane Relationship

After Lane (1955) as cited in Rosgen (1996)

Stream slope multiplied by stream discharge (the right side of the scale) is essentially an approximation of stream power, a unifying concept in fluvial geomorphology (Bledsoe 1999). Urbanization generally increases stream power and affects the resisting forces in a channel (sediment load and sediment size represented on the left side of the scale).

During construction, sediment loads can increase from 2 to 40,000 times over pre-construction levels.[28] Most of this sediment is delivered to stream channels during large, episodic rain events.[29] This increased sediment load leads to an initial aggradation phase where stream depths may decrease as sediment fills the channel, leading to a decrease in channel capacity and increase in flooding and overbank deposition. A degradation phase initiates after construction is completed.

Schumm et. al (1984) developed a channel evolution model that describes the series of adjustments from initial downcutting, to widening, to establishing new floodplains at lower elevations (Figure 6).

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[28] Goldman S.J., K. Jackson, and T.A. Bursztynsky. 1986. Erosion and Sediment Control Handbook. McGraw Hill. San Francisco.

[29] Wolman 1967 as cited in Paul, M.P. and J.L. Meyer. 2001. Streams in the Urban Landscape. *Annu. Rev.Ecol. Syst.* 32: 333-365.

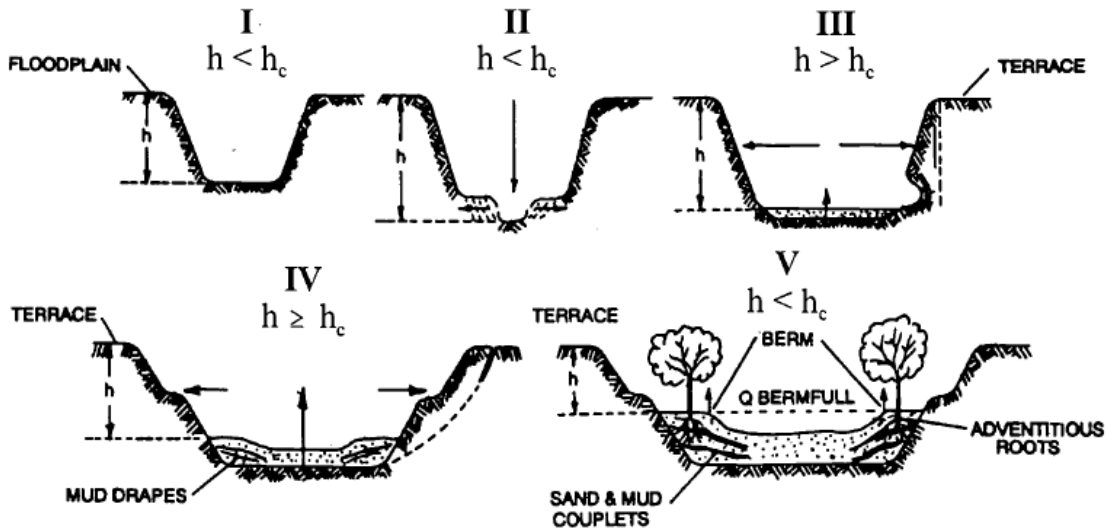

Figure 6 - Channel Changes Associated with Urbanization

After Incised Channel Evolution Sequence in Schumm et. al 1984

Channel incision (Stage II) and widening (Stages III and to a lesser degree, Stage IV) are due to a number of fundamental changes on the landscape. Connected impervious area and compaction of pervious surfaces increase the frequency and volume of bankfull discharges.[30] Increased drainage density (miles of stream length per square mile of watershed) also negatively impacts receiving stream channels.[31] Increased drainage density and hydraulic efficiency leads to an increase in the frequency and volume of bankfull discharges because the time of concentration is shortened. Flows from engineered pipes and channels are also often "sediment starved" and seek to replenish their sediment supply from the channel.

Encroachment of stream channels can also lead to an increase in stream slope, which leads to an increase in stream power. In addition, watershed sediment loads and sediment size (with size generally represented as the median bed and bank particle size, or d_{50}) decrease during urbanization.[32] This means that even if pre- and post-development stream power are the same, more erosion will occur in the post-development stage because the smaller particles are less resistant (provided they are non-cohesive).

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[30] Booth, D. B. and C. R. Jackson. 1997. Urbanization of Aquatic Systems: Degradation Thresholds, Storm Water Detection, and the Limits of Mitigation. Journal of the American Water Resources Association Vol. 33, No.5, pp. 1077-1089.

[31] May, C.W. 1998. Cumulative effects of urbanization on small streams in the Puget Sound Lowland ecoregion. Conference proceedings from Puget Sound Research '98 held March 12, 13 1998 in Seattle, WA;
Santa Clara Valley Urban Runoff Pollution Prevention Program. 2002. Hydromodification Management Plan Literature Review. 80 pp.

[32] Finkenbine, J.K., D.S. Atwater, and D.S. Mavinic. 2000. Stream health after urbanization. *J. Am. Water Resour. Assoc.* 36:1149-60;
Pizzuto, J.E. W.S. Hession, and M. McBride. 2000. Comparing gravel-bed rivers in paired urban and rural catchments of southeastern Pennsylvania. *Geology* 28:79-82.

As shown in Stages II and III, the channel deepens and widens to accommodate the increased stream power [33]and decrease in sediment load and sediment size. Channels may actually narrow as entrained sediment from incision is deposited laterally in the channel. After incised channels begin to migrate laterally (Stage III), bank erosion begins, which leads to general channel widening.[34] At this point, a majority of the sediment that leaves a drainage area comes from within the channel, as opposed to the background and construction related hillslope contribution. Stage IV is characterized by more aggradation and localized bank instability. Stage V represents a new quasi-equilibrium channel morphology in balance with the new flow and sediment supply regime. In other words, stream power is in balance with sediment load and sediment size.

The magnitude of the channel morphology changes discussed above varies along a stream network as well as with the age of development, slope, geology (sand-bedded channels may cycle through the evolution sequence in a matter of decades whereas clay-dominated channels may take much longer), watershed sediment load and size, type of urbanization, and land use history. It is also dependent on a channel's stage in the channel evolution sequence when urbanization occurs. Management strategies must take into account a channel's stage of adjustment and account for future changes in the evolution of channel form (Stein and Zaleski 2005). [35]

Traditional structural water quality BMPs (e.g. detention basins and other devices used to store volumes of runoff) unless they are highly engineered to provide adequate flow duration control, do not adequately protect receiving waters from accelerated channel bed and bank erosion, do not address post-development increases in runoff volume, and do not mitigate the decline in benthic macroinvertebrate communities in the receiving waters[36] suggest that structural BMPs are not as effective in protecting aquatic communities as a continuous riparian buffer of native vegetation. This is supported by the findings of Zucker and White[37], where instream biological metrics were correlated with the extent of forested buffers.

This General Permit requires dischargers to maintain pre-development drainage densities and times of concentration in order to protect channels and encourages dischargers to implement setbacks to reduce channel slope and velocity changes that can lead to aquatic habitat degradation.

There are a number of other approaches for modeling fluvial systems, including statistical and physical models and simpler stream power models.[38] The use of these models in California is described in Stein and Zaleski (2005).[39] Rather than prescribe a specific one-size-fits-all modeling method in this permit, the State Water Board intends to develop a stream power and channel evolution model-based framework to assess channels and develop a hierarchy of suitable analysis methods and management strategies. In time, this framework may become a State Water Board water quality control policy.

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[33] Hammer 1973 as cited in Delaware Department of Natural Resources (DDNR). 2004. Green Technology: The Delaware Urban Runoff Management Approach. Dover, DE. 117 pp;
Booth, D.B. 1990. Stream Channel Incision Following Drainage Basin Urbanization. *Water Resour. Bull.* 26:407-417.
[34] Trimble, S.W. 1997. Contribution of Stream Channel Erosion to Sediment Yield from an Urbanizing Watershed. *Science*: Vol. 278 (21), pp. 1442-1444.
[35] Stein, E.S. and S. Zaleski. 2005.Managing runoff to protect natural stream: the latest developments on investigation and management of hydromodification in California. Southern California Coastal Water Research Project Technical Report 475. 26 pp.
[36] Horner, R.R. 2006. Investigation of the Feasibility and Benefits of Low-Impact Site Design Practices (LID) for the San Diego Region. Available at: http://www.projectcleanwater.org/pdf/permit/case-study_lid.pdf.
[37] Delaware Department of Natural Resources (DDNR). 2004. Green Technology: The Delaware Urban Runoff Management Approach. Dover, DE. 117 pp.
[38] Finlayson, D.P. and D.R. Montgomery. 2003. Modeling large-scale fluvial erosion in geographic information systems. Geomorphology (53), pp. 147-164).
[39] Stein, E.S. and S. Zaleski. 2005.Managing runoff to protect natural stream: the latest developments on investigation and management of hydromodification in California. Southern California Coastal Water Research Project Technical Report 475. 26 pp.

Permit Linkage to Overbank and Extreme Flood Protection
Site design BMPs (e.g. rooftop and impervious disconnection, vegetated swales, setbacks and buffers) filter and settle out pollutants and provide for more infiltration than is possible for traditional centralized structural BMPs placed at the lowest point in a site. They provide source control for runoff and lead to a reduction in pollutant loads. When implemented, they also help reduce the magnitude and volume of larger, less frequent storm events (e.g., 10-yr, 24-hour storm and larger), thereby reducing the need for expensive flood control infrastructure. Nonstructural BMPs can also be a landscape amenity, instead of a large isolated structure requiring substantial area for ancillary access, buffering, screening and maintenance facilities.[25] The multiple benefits of using non-structural benefits will be critically important as the state's population increases and imposes strains upon our existing water resources.

Maintaining predevelopment drainage densities and times of concentration will help reduce post-development peak flows and volumes in areas not covered under a municipal permit. The most effective way to preserve drainage areas and maximize time of concentration is to implement landform grading, incorporate site design BMPs and implement distributed structural BMPs (e.g., bioretention cells, rain gardens, rain cisterns).

M. Storm Water Pollution Prevention Plans

USEPA's Construction General Permit requires that qualified personnel conduct inspections. USEPA defines qualified personnel as "a person knowledgeable in the principles and practice of erosion and sediment controls who possesses the skills to assess conditions at the construction site that could impact storm water quality and to assess the effectiveness of any sediment and erosion control measures selected to control the quality of storm water discharges from the construction activity."[40] USEPA also suggests that qualified personnel prepare SWPPPs and points to numerous states that require certified professionals to be on construction sites at all times. States that currently have certification programs are Washington, Georgia, Florida, Delaware, Maryland, and New Jersey. The Permit 99-08-DWQ did not require that qualified personnel prepare SWPPPs or conduct inspections. However, to ensure that water quality is being protected, this General Permit requires that all SWPPPs be written, amended, and certified by a Qualified SWPPP Developer. A Qualified SWPPP Developer must possess one of the eight certifications and or registrations specified in this General Permit and effective two years after the adoption date of this General Permit, must have attended a State Water Board-sponsored or approved Qualified SWPPP Developer training course. Table 9 provides an overview of the criteria used in determining qualified certification titles for a QSD and QSP.

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40 US Environmental Protection Agency. Stormwater Pollution Prevention Plans for Construction Activities. <http://cfpub.epa.gov/npdes/stormwater/swppp.cfm> and <http://www.epa.gov/npdes/pubs/sw_swppp_guide.pdf>.

Table 9 - Qualified SWPPP Developer/ Qualified SWPPP Practitioner Certification Criteria

Certification/ Title	Registered By	QSD/QSP	Certification Criteria
Professional Civil Engineer	California	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites
Professional Geologist or Engineering Geologist	California	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites
Landscape Architect	California	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites
Professional Hydrologist	American Institute of Hydrology	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites
Certified Professional in Erosion and Sediment Control™ (CPESC)	Enviro Cert International Inc.	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites 5. Continuing Education
Certified Inspector of Sediment and Erosion Control™ (CISEC)	Certified Inspector of Sediment and Erosion Control, Inc.	QSP	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites 5. Continuing Education
Certified Erosion, Sediment and Storm Water Inspector™ (CESSWI)	Enviro Cert International Inc.	QSP	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites 5. Continuing Education
Certified Professional in Storm Water Quality™ (CPSWQ)	Enviro Cert International Inc.	Both	1. Approval Process 2. Code of Ethics 3. Accountability 4. Pre-requisites 5. Continuing Education

The previous versions of the General Permit required development and implementation of a SWPPP as the primary compliance mechanism. The SWPPP has two major objectives: (1) to help identify the sources of sediment and other pollutants that affect the quality of storm water discharges; and (2) to describe and ensure the implementation of BMPs to reduce or eliminate sediment and other pollutants in storm water and non-storm water discharges. The SWPPP must include BMPs that address source control, BMPs that address pollutant control, and BMPs that address treatment control.

This General Permit shifts some of the measures that were covered by this general requirement to specific permit requirements, each individually enforceable as a permit term. This General Permit emphasizes the use of appropriately selected, correctly installed and maintained pollution reduction BMPs. This approach provides the flexibility necessary to establish BMPs that can effectively address source control of pollutants during changing construction activities. These specific requirements also improve both the clarity and the enforceability of the General Permit so that the dischargers understand, and the public can determine whether the discharges are in compliance with, permit requirements.

The SWPPP must be implemented at the appropriate level to protect water quality at all times throughout the life of the project. The SWPPP must remain on the site during construction activities, commencing with the initial mobilization and ending with the termination of coverage under the General Permit. For LUPs the discharger shall make the SWPPP available at the construction site during working hours while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio or telephone. Once construction activities are complete, until stabilization is achieved, the SWPPP shall be available from the SWPPP contact listed in the PRDs

A SWPPP must be appropriate for the type and complexity of a project and will be developed and implemented to address project specific conditions. Some projects may have similarities or complexities, yet each project is unique in its progressive state that requires specific description and selection of BMPs needed to address all possible generated pollutants

N. Regional Water Board Authorities

Because this General Permit will be issued to thousands of construction sites across the State, the Regional Water Boards retain discretionary authority over certain issues that may arise from the discharges in their respective regions. This General Permit does not grant the Regional Water Boards any authority they do not otherwise have; rather, it merely emphasizes that the Regional Water Boards can take specific actions related to this General Permit. For example, the Regional Water Boards will be enforcing this General Permit and may need to adjust some requirements for a discharger based on the discharger's compliance history.

Linda S. Adams
Secretary for Environmental Protection

State Water Resources Control Board

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Arnold Schwarzenegger
Governor

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
GENERAL PERMIT FOR
STORM WATER DISCHARGES
ASSOCIATED WITH CONSTRUCTION AND LAND DISTURBANCE
ACTIVITIES

ORDER NO. 2009-0009-DWQ
NPDES NO**. CAS000002**

This Order was adopted by the State Water Resources Control Board on:	**September 2, 2009**
This Order shall become effective on:	**July 1, 2010**
This Order shall expire on:	**September 2, 2014**

IT IS HEREBY ORDERED, that this Order supersedes Order No. 99-08-DWQ except for enforcement purposes. The Discharger shall comply with the requirements in this Order to meet the provisions contained in Division 7 of the California Water Code (commencing with section 13000) and regulations adopted thereunder, and the provisions of the federal Clean Water Act and regulations and guidelines adopted thereunder.

I, Jeanine Townsend, Clerk to the Board, do hereby certify that this Order with all attachments is a full, true, and correct copy of an Order adopted by the State Water Resources Control Board, on September 2, 2009.

AYE: Vice Chair Frances Spivy-Weber
Board Member Arthur G. Baggett, Jr.
Board Member Tam M. Doduc

NAY: Chairman Charles R. Hoppin

ABSENT: None

ABSTAIN: None

Jeanine Townsend

Jeanine Townsend
Clerk to the Board

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STATE WATER RESOURCES CONTROL BOARD
ORDER NO. 2009-0009-DWQ
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
GENERAL PERMIT NO. CAS000002

WASTE DISCHARGE REQUIREMENTS
FOR
DISCHARGES OF STORM WATER RUNOFF ASSOCIATED WITH CONSTRUCTION AND LAND DISTURBANCE ACTIVITIES

I. FINDINGS

A. General Findings

The State Water Resources Control Board (State Water Board) finds that:

1. The federal Clean Water Act (CWA) prohibits certain discharges of storm water containing pollutants except in compliance with a National Pollutant Discharge Elimination System (NPDES) permit (Title 33 United States Code (U.S.C.) §§ 1311 and 1342(p); also referred to as Clean Water Act (CWA) §§ 301 and 402(p)). The U.S. Environmental Protection Agency (U.S. EPA) promulgates federal regulations to implement the CWA's mandate to control pollutants in storm water runoff discharges. (Title 40 Code of Federal Regulations (C.F.R.) Parts 122, 123, and 124). The federal statutes and regulations require discharges to surface waters comprised of storm water associated with construction activity, including demolition, clearing, grading, and excavation, and other land disturbance activities (except operations that result in disturbance of less than one acre of total land area and which are not part of a larger common plan of development or sale), to obtain coverage under an NPDES permit. The NPDES permit must require implementation of Best Available Technology Economically Achievable (BAT) and Best Conventional Pollutant Control Technology (BCT) to reduce or eliminate pollutants in storm water runoff. The NPDES permit must also include additional requirements necessary to implement applicable water quality standards.

2. This General Permit authorizes discharges of storm water associated with construction activity so long as the dischargers comply with all requirements, provisions, limitations and prohibitions in the permit. In addition, this General Permit regulates the discharges of storm water associated with construction activities from all Linear Underground/Overhead Projects resulting in the disturbance of greater than or equal to one acre (Attachment A).

3. This General Permit regulates discharges of pollutants in storm water associated with construction activity (storm water discharges) to waters of the United States from construction sites that disturb one or more acres of land surface, or that are part of a common plan of development or sale that disturbs more than one acre of land surface.

4. This General Permit does not preempt or supersede the authority of local storm water management agencies to prohibit, restrict, or control storm water discharges to municipal separate storm sewer systems or other watercourses within their jurisdictions.

5. This action to adopt a general NPDES permit is exempt from the provisions of Chapter 3 of the California Environmental Quality Act (CEQA) (Public Resources Code Section 21100, et seq.), pursuant to Section 13389 of the California Water Code.

6. Pursuant to 40 C.F.R. § 131.12 and State Water Board Resolution No. 68-16,[1] which incorporates the requirements of § 131.12 where applicable, the State Water Board finds that discharges in compliance with this General Permit will not result in the lowering of water quality standards, and are therefore consistent with those provisions. Compliance with this General Permit will result in improvements in water quality.

7. This General Permit serves as an NPDES permit in compliance with CWA § 402 and will take effect on July 1, 2010 by the State Water Board provided the Regional Administrator of the U.S. EPA has no objection. If the U.S. EPA Regional Administrator objects to its issuance, the General Permit will not become effective until such objection is withdrawn.

8. Following adoption and upon the effective date of this General Permit, the Regional Water Quality Control Boards (Regional Water Boards) shall enforce the provisions herein.

9. Regional Water Boards establish water quality standards in Basin Plans. The State Water Board establishes water quality standards in various statewide plans, including the California Ocean Plan. U.S. EPA establishes water quality standards in the National Toxic Rule (NTR) and the California Toxic Rule (CTR).

[1] Resolution No. 68-16 generally requires that existing water quality be maintained unless degradation is justified based on specific findings.

10. This General Permit does not authorize discharges of fill or dredged material regulated by the U.S. Army Corps of Engineers under CWA § 404 and does not constitute a waiver of water quality certification under CWA § 401.

11. The primary storm water pollutant at construction sites is excess sediment. Excess sediment can cloud the water, which reduces the amount of sunlight reaching aquatic plants, clog fish gills, smother aquatic habitat and spawning areas, and impede navigation in our waterways. Sediment also transports other pollutants such as nutrients, metals, and oils and greases.

12. Construction activities can impact a construction site's runoff sediment supply and transport characteristics. These modifications, which can occur both during and after the construction phase, are a significant cause of degradation of the beneficial uses established for water bodies in California. Dischargers can avoid these effects through better construction site design and activity practices.

13. This General Permit recognizes four distinct phases of construction activities. The phases are Grading and Land Development Phase, Streets and Utilities Phase, Vertical Construction Phase, and Final Landscaping and Site Stabilization Phase. Each phase has activities that can result in different water quality effects from different water quality pollutants. This General Permit also recognizes inactive construction as a category of construction site type.

14. Compliance with any specific limits or requirements contained in this General Permit does not constitute compliance with any other applicable requirements.

15. Following public notice in accordance with State and Federal laws and regulations, the State Water Board heard and considered all comments and testimony in a public hearing on 06/03/2009. The State Water Board has prepared written responses to all significant comments.

16. Construction activities obtaining coverage under the General Permit may have multiple discharges subject to requirements that are specific to general, linear, and/or active treatment system discharge types.

17. The State Water Board may reopen the permit if the U.S. EPA adopts a final effluent limitation guideline for construction activities.

B. Activities Covered Under the General Permit

18. Any construction or demolition activity, including, but not limited to, clearing, grading, grubbing, or excavation, or any other activity that results in a land disturbance of equal to or greater than one acre.

19. Construction activity that results in land surface disturbances of less than one acre if the construction activity is part of a larger common plan of development or the sale of one or more acres of disturbed land surface.

20. Construction activity related to residential, commercial, or industrial development on lands currently used for agriculture including, but not limited to, the construction of buildings related to agriculture that are considered industrial pursuant to U.S. EPA regulations, such as dairy barns or food processing facilities.

21. Construction activity associated with Linear Underground/Overhead Utility Projects (LUPs) including, but not limited to, those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/borrow locations.

22. Discharges of sediment from construction activities associated with oil and gas exploration, production, processing, or treatment operations or transmission facilities.[2]

23. Storm water discharges from dredge spoil placement that occur outside of U.S. Army Corps of Engineers jurisdiction (upland sites) and that disturb one or more acres of land surface from construction activity are covered by this General Permit. Construction sites that intend to disturb one or more acres of land within the jurisdictional boundaries of a CWA § 404 permit should contact the appropriate Regional Water Board to determine whether this permit applies to the site.

[2] Pursuant to the Ninth Circuit Court of Appeals' decision in *NRDC v. EPA* (9th Cir. 2008) 526 F.3d 591, and subsequent denial of the U.S. EPA's petition for reconsideration in November 2008, oil and gas construction activities discharging storm water contaminated only with sediment are no longer exempt from the NPDES program.

C. Activities Not Covered Under the General Permit

24. Routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility.

25. Disturbances to land surfaces solely related to agricultural operations such as disking, harrowing, terracing and leveling, and soil preparation.

26. Discharges of storm water from areas on tribal lands; construction on tribal lands is regulated by a federal permit.

27. Construction activity and land disturbance involving discharges of storm water within the Lake Tahoe Hydrologic Unit. The Lahontan Regional Water Board has adopted its own permit to regulate storm water discharges from construction activity in the Lake Tahoe Hydrologic Unit (Regional Water Board 6SLT). Owners of construction sites in this watershed must apply for the Lahontan Regional Water Board permit rather than the statewide Construction General Permit.

28. Construction activity that disturbs less than one acre of land surface, and that is not part of a larger common plan of development or the sale of one or more acres of disturbed land surface.

29. Construction activity covered by an individual NPDES Permit for storm water discharges.

30. Discharges from small (1 to 5 acre) construction activities with an approved Rainfall Erosivity Waiver authorized by U.S. EPA Phase II regulations certifying to the State Board that small construction activity will occur only when the Rainfall Erosivity Factor is less than 5 (“R” in the Revised Universal Soil Loss Equation).

31. Landfill construction activity that is subject to the Industrial General Permit.

32. Construction activity that discharges to Combined Sewer Systems.

33. Conveyances that discharge storm water runoff combined with municipal sewage.

34. Discharges of storm water identified in CWA § 402(*l*)(2), 33 U.S.C. § 1342(*l*)(2).

35. Discharges occurring in basins that are not tributary or hydrologically connected to waters of the United States (for more information contact your Regional Water Board).

D. Obtaining and Modifying General Permit Coverage

36. This General Permit requires all dischargers to electronically file all Permit Registration Documents (PRDs), Notices of Termination (NOT), changes of information, annual reporting, and other compliance documents required by this General Permit through the State Water Board's Storm water Multi-Application and Report Tracking System (SMARTS) website.

37. Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted.

38. This General Permit grants an exception from the Risk Determination requirements for existing sites covered under Water Quality Orders No. 99-08-DWQ, and No. 2003-0007-DWQ. For certain sites, adding additional requirements may not be cost effective. Construction sites covered under Water Quality Order No. 99-08-DWQ shall obtain permit coverage at the Risk Level 1. LUPs covered under Water Quality Order No. 2003-0007-DWQ shall obtain permit coverage as a Type 1 LUP. The Regional Water Boards have the authority to require Risk Determination to be performed on sites currently covered under Water Quality Orders No. 99-08-DWQ and No. 2003-0007-DWQ where they deem it necessary. The State Water Board finds that there are two circumstances when it may be appropriate for the Regional Water Boards to require a discharger that had filed an NOI under State Water Board Order No. 99-08-DWQ to recalculate the site's risk level. These circumstances are: (1) when the discharger has a demonstrated history of noncompliance with State Water Board Order No. 99-08-DWQ or; (2) when the discharger's site poses a significant risk of causing or contributing to an exceedance of a water quality standard without the implementation of the additional Risk Level 2 or 3 requirements.

E. Prohibitions

39. All discharges are prohibited except for the storm water and non-storm water discharges specifically authorized by this General Permit or another NPDES permit. Non-storm water discharges include a wide variety of sources, including improper dumping, spills, or leakage from storage tanks or transfer areas. Non-storm water discharges may

contribute significant pollutant loads to receiving waters. Measures to control spills, leakage, and dumping, and to prevent illicit connections during construction must be addressed through structural as well as non-structural Best Management Practices (BMPs)[3]. The State Water Board recognizes, however, that certain non-storm water discharges may be necessary for the completion of construction.

40. This General Permit prohibits all discharges which contain a hazardous substance in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

41. This General Permit incorporates discharge prohibitions contained in water quality control plans, as implemented by the State Water Board and the nine Regional Water Boards.

42. Pursuant to the Ocean Plan, discharges to Areas of Special Biological Significance (ASBS) are prohibited unless covered by an exception that the State Water Board has approved.

43. This General Permit prohibits the discharge of any debris[4] from construction sites. Plastic and other trash materials can cause negative impacts to receiving water beneficial uses. The State Water Board encourages the use of more environmentally safe, biodegradable materials on construction sites to minimize the potential risk to water quality.

F. Training

44. In order to improve compliance with and to maintain consistent enforcement of this General Permit, all dischargers are required to appoint two positions - the Qualified SWPPP Developer (QSD) and the Qualified SWPPP Practitioner (QSP) - who must obtain appropriate training. Together with the key stakeholders, the State and Regional Water Boards are leading the development of this curriculum through a collaborative organization called The Construction General Permit (CGP) Training Team.

45. The Professional Engineers Act (Bus. & Prof. Code section 6700, et seq.) requires that all engineering work must be performed by a California licensed engineer.

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[3] BMPs are scheduling of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the United States. BMPs also include treatment requirements, operating procedures, and practice to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

[4] Litter, rubble, discarded refuse, and remains of destroyed inorganic anthropogenic waste.

G. Determining and Reducing Risk

46. The risk of accelerated erosion and sedimentation from wind and water depends on a number of factors, including proximity to receiving water bodies, climate, topography, and soil type.

47. This General Permit requires dischargers to assess the risk level of a site based on both sediment transport and receiving water risk. This General Permit contains requirements for Risk Levels 1, 2 and 3, and LUP Risk Type 1, 2, and 3 (Attachment A). Risk levels are established by determining two factors: first, calculating the site's sediment risk; and second, receiving water risk during periods of soil exposure (i.e. grading and site stabilization). Both factors are used to determine the site-specific Risk Level(s). LUPs can be determined to be Type 1 based on the flowchart in Attachment A.1.

48. Although this General Permit does not mandate specific setback distances, dischargers are encouraged to set back their construction activities from streams and wetlands whenever feasible to reduce the risk of impacting water quality (e.g., natural stream stability and habitat function). Because there is a reduced risk to receiving waters when setbacks are used, this General Permit gives credit to setbacks in the risk determination and post-construction storm water performance standards. The risk calculation and runoff reduction mechanisms in this General Permit are expected to facilitate compliance with any Regional Water Board and local agency setback requirements, and to encourage voluntary setbacks wherever practicable.

49. Rain events can occur at any time of the year in California. Therefore, a Rain Event Action Plan (REAP) is necessary for Risk Level 2 and 3 traditional construction projects (LUPs exempt) to ensure that active construction sites have adequate erosion and sediment controls implemented prior to the onset of a storm event, even if construction is planned only during the dry season.

50. Soil particles smaller than 0.02 millimeters (mm) (i.e., finer than medium silt) do not settle easily using conventional measures for sediment control (i.e., sediment basins). Given their long settling time, dislodging these soils results in a significant risk that fine particles will be released into surface waters and cause unacceptable downstream impacts. If operated correctly, an Active Treatment System (ATS[5]) can prevent or reduce the release of fine particles from construction sites.

[5] An ATS is a treatment system that employs chemical coagulation, chemical flocculation, or electro coagulation in order to reduce turbidity caused by fine suspended sediment.

Use of an ATS can effectively reduce a site's risk of impacting receiving waters.

51. Dischargers located in a watershed area where a Total Maximum Daily Load (TMDL) has been adopted or approved by the Regional Water Board or U.S. EPA may be required by a separate Regional Water Board action to implement additional BMPs, conduct additional monitoring activities, and/or comply with an applicable waste load allocation and implementation schedule. Such dischargers may also be required to obtain an individual Regional Water Board permit specific to the area.

H. Effluent Standards

52. The State Water Board convened a blue ribbon panel of storm water experts that submitted a report entitled, “The Feasibility of Numeric Effluent Limits Applicable to Discharges of Storm Water Associated with Municipal, Industrial and Construction Activities,” dated June 19, 2006. The panel concluded that numeric limits or action levels are technically feasible to control construction storm water discharges, provided that certain conditions are considered. The panel also concluded that numeric effluent limitations (NELs) are feasible for discharges from construction sites that utilize an ATS. The State Water Board has incorporated the expert panel’s suggestions into this General Permit, which includes both numeric action levels (NALs) and NELs for pH and turbidity, and special numeric limits for ATS discharges.

Numeric Effluent Limitations

53. Discharges of storm water from construction activities may become contaminated from alkaline construction materials resulting in high pH (greater than pH 7). Alkaline construction materials include, but are not limited to, hydrated lime, concrete, mortar, cement kiln dust (CKD), Portland cement treated base (CTB), fly ash, recycled concrete, and masonry work. This General Permit includes an NEL for pH (6.0-9.0) that applies only at sites that exhibit a "high risk of high pH discharge." A "high risk of high pH discharge" can occur during the complete utilities phase, the complete vertical build phase, and any portion of any phase where significant amounts of materials are placed directly on the land at the site in a manner that could result in significant alterations to the background pH of any discharges.

54. For Risk Level 3 discharges, this General Permit establishes technology-based, numeric effluent limitations (NELs) for turbidity of 500 NTU. Exceedances of the turbidity NEL constitutes a violation of this General Permit.

55. This General Permit establishes a 5 year, 24 hour (expressed in inches of rainfall) Compliance Storm Event exemption from the technology-based NELs for Risk Level 3 dischargers.

Determining Compliance with Numeric Limitations

56. This General Permit sets a pH NAL of 6.5 to 8.5, and a turbidity NAL of 250 NTU. The purpose of the NAL and its associated monitoring requirement is to provide operational information regarding the performance of the measures used at the site to minimize the discharge of pollutants and to protect beneficial uses and receiving waters from the adverse effects of construction-related storm water discharges. The NALs in this General Permit for pH and turbidity are not directly enforceable and do not constitute NELs.

57. This General Permit requires dischargers with NAL exceedances to immediately implement additional BMPs and revise their Storm Water Pollution Prevention Plans (SWPPPs) accordingly to either prevent pollutants and authorized non-storm water discharges from contaminating storm water, or to substantially reduce the pollutants to levels consistently below the NALs. NAL exceedances are reported in the State Water Boards SMARTS system, and the discharger is required to provide an NAL Exceedance Report when requested by a Regional Water Board.

58. If run-on is caused by a forest fire or any other natural disaster, then NELs do not apply.

59. Exceedances of the NELs are a violation of this Permit. This General Permit requires dischargers with NEL exceedances to implement additional monitoring, BMPs, and revise their SWPPPs accordingly. Dischargers are required to notify the State and Regional Water Boards of the violation through the State Water Boards SMARTs system, and provide an NEL Violation Report sharing additional information concerning the NEL exceedance.

I. Receiving Water Limitations

60. This General Permit requires all enrolled dischargers to determine the receiving waters potentially affected by their discharges and to comply with all applicable water quality standards, including any more stringent standards applicable to a water body.

J. Sampling, Monitoring, Reporting and Record Keeping

61. Visual monitoring of storm water and non-storm water discharges is required for all sites subject to this General Permit.

62. Records of all visual monitoring inspections are required to remain on-site during the construction period and for a minimum of three years.

63. For all Risk Level 3 and Risk Level 2 sites, this General Permit requires effluent monitoring for pH and turbidity. Sampling, analysis and monitoring requirements for effluent monitoring for pH and turbidity are contained in this General Permit.

64. Risk Level 3 sites in violation of the Numeric Effluent Limitations contained in this General Permit and with direct discharges to receiving water are required to conduct receiving water monitoring.

65. For Risk Level 3 sites larger than 30 acres and with direct discharges to receiving waters, this General Permit requires bioassessment sampling before and after site completion to determine if significant degradation to the receiving water's biota has occurred. Bioassessment sampling guidelines are contained in this General Permit.

66. A summary and evaluation of the sampling and analysis results will be submitted in the Annual Reports.

67. This General Permit contains sampling, analysis and monitoring requirements for non-visible pollutants at all sites subject to this General Permit.

68. Compliance with the General Permit relies upon dischargers to electronically self-report any discharge violations and to comply with any Regional Water Board enforcement actions.

69. This General Permit requires that all dischargers maintain a paper or electronic copy of all required records for three years from the date generated or date submitted, whichever is last. These records must be available at the construction site until construction is completed. For LUPs, these documents may be retained in a crew member's vehicle and made available upon request.

K. Active Treatment System (ATS) Requirements

70. Active treatment systems add chemicals to facilitate flocculation, coagulation and filtration of suspended sediment particles. The uncontrolled release of these chemicals to the environment can negatively affect the beneficial uses of receiving waters and/or degrade water quality (e.g., acute and chronic toxicity). Additionally, the batch storage and treatment of storm water through an ATS' can potentially

cause physical impacts on receiving waters if storage volume is inadequate or due to sudden releases of the ATS batches and improperly designed outfalls.

71. If designed, operated and maintained properly an ATS can achieve very high removal rates of suspended sediment (measured as turbidity), albeit at sometimes significantly higher costs than traditional erosion/sediment control practices. As a result, this General Permit establishes NELs consistent with the expected level of typical ATS performance.

72. This General Permit requires discharges of storm water associated with construction activity that undergo active treatment to comply with special operational and effluent limitations to ensure that these discharges do not adversely affect the beneficial uses of the receiving waters or cause degradation of their water quality.

73. For ATS discharges, this General Permit establishes technology-based NELs for turbidity.

74. This General Permit establishes a 10 year, 24 hour (expressed in inches of rainfall) Compliance Storm Event exemption from the technology-based numeric effluent limitations for ATS discharges. Exceedances of the ATS turbidity NEL constitutes a violation of this General Permit.

L. Post-Construction Requirements

75. This General Permit includes performance standards for post-construction that are consistent with State Water Board Resolution No. 2005-0006, "Resolution Adopting the Concept of Sustainability as a Core Value for State Water Board Programs and Directing Its Incorporation," and 2008-0030, “Requiring Sustainable Water Resources Management.“ The requirement for all construction sites to match pre-project hydrology will help ensure that the physical and biological integrity of aquatic ecosystems are sustained. This “runoff reduction” approach is analogous in principle to Low Impact Development (LID) and will serve to protect related watersheds and waterbodies from both hydrologic-based and pollution impacts associated with the post-construction landscape.

76. LUP projects are not subject to post-construction requirements due to the nature of their construction to return project sites to pre-construction conditions.

M. Storm Water Pollution Prevention Plan Requirements

77. This General Permit requires the development of a site-specific SWPPP. The SWPPP must include the information needed to demonstrate compliance with all requirements of this General Permit, and must be kept on the construction site and be available for review. The discharger shall ensure that a QSD develops the SWPPP.

78. To ensure proper site oversight, this General Permit requires a Qualified SWPPP Practitioner to oversee implementation of the BMPs required to comply with this General Permit.

N. Regional Water Board Authorities

79. Regional Water Boards are responsible for implementation and enforcement of this General Permit. A general approach to permitting is not always suitable for every construction site and environmental circumstances. Therefore, this General Permit recognizes that Regional Water Boards must have some flexibility and authority to alter, approve, exempt, or rescind permit authority granted under this General Permit in order to protect the beneficial uses of our receiving waters and prevent degradation of water quality.

IT IS HEREBY ORDERED that all dischargers subject to this General Permit shall comply with the following conditions and requirements (including all conditions and requirements as set forth in Attachments A, B, C, D, E and F)[6]:

II. CONDITIONS FOR PERMIT COVERAGE

A. Linear Underground/Overhead Projects (LUPs)

1. Linear Underground/Overhead Projects (LUPs) include, but are not limited to, any conveyance, pipe, or pipeline for the transportation of any gaseous, liquid (including water and wastewater for domestic municipal services), liquescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g. telephone, telegraph, radio or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to, (a) those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment, and associated ancillary facilities); and include, but are not limited to, (b) underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/ or pavement repair or replacement, and stockpile/borrow locations.

2. The utility company, municipality, or other public or private company or agency that owns or operates the linear underground/overhead project is responsible for obtaining coverage under the General Permit where the construction of pipelines, utility lines, fiber-optic cables, or other linear underground/overhead projects will occur across several properties unless the LUP construction activities are covered under another construction storm water permit.

3. Only LUPs shall comply with the conditions and requirements in Attachment A, A.1 & A.2 of this Order. The balance of this Order is not applicable to LUPs except as indicated in Attachment A.

B. Obtaining Permit Coverage Traditional Construction Sites

[6] These attachments are part of the General Permit itself and are not separate documents that are capable of being updated independently by the State Water Board.

1. The Legally Responsible Person (LRP) (see Special Provisions, Electronic Signature and Certification Requirements, Section IV.I.1) must obtain coverage under this General Permit.

2. To obtain coverage, the LRP must electronically file Permit Registration Documents (PRDs) prior to the commencement of construction activity. Failure to obtain coverage under this General Permit for storm water discharges to waters of the United States is a violation of the CWA and the California Water Code.

3. PRDs shall consist of:

   a. Notice of Intent (NOI)
   b. Risk Assessment (Section VIII)
   c. Site Map
   d. Storm Water Pollution Prevention Plan (Section XIV)
   e. Annual Fee
   f. Signed Certification Statement

   Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted.

   Attachment B contains additional PRD information. Dischargers must electronically file the PRDs, and mail the appropriate annual fee to the State Water Board.

4. This permit is effective on July 1, 2010.

   a. **Dischargers Obtaining Coverage On or After July 1, 2010:** All dischargers requiring coverage on or after July 1, 2010, shall electronically file their PRDs prior to the commencement of construction activities, and mail the appropriate annual fee no later than seven days prior to the commencement of construction activities. Permit coverage shall not commence until the PRDs and the annual fee are received by the State Water Board, and a WDID number is assigned and sent by SMARTS.

   b. **Dischargers Covered Under 99-08-DWQ and 2003-0007-DWQ:** Existing dischargers subject to State Water Board Order No. 99-08-DWQ (existing dischargers) will continue coverage under 99-08-DWQ until July 1, 2010. After July 1, 2010, all NOIs subject to State Water Board Order No. 99-08-DWQ will be terminated. Existing dischargers shall electronically file their PRDs no later than

July 1, 2010. If an existing discharger's site acreage subject to the annual fee has changed, it shall mail a revised annual fee no less than seven days after receiving the revised annual fee notification, **or else lose permit coverage**. All existing dischargers shall be exempt from the risk determination requirements in Section VIII of this General Permit until two years after permit adoption. All existing dischargers are therefore subject to Risk Level 1 requirements regardless of their site's sediment and receiving water risks. However, a Regional Board retains the authority to require an existing discharger to comply with the Section VIII risk determination requirements.

5. The discharger is only considered covered by this General Permit upon receipt of a Waste Discharger Identification (WDID) number assigned and sent by the State Water Board Storm water Multi-Application and Report Tracking System (SMARTS). In order to demonstrate compliance with this General Permit, the discharger must obtain a WDID number and must present documentation of a valid WDID upon demand.

6. During the period this permit is subject to review by the U.S. EPA, the prior permit (State Water Board Order No. 99-08-DWQ) remains in effect. Existing dischargers under the prior permit will continue to have coverage under State Water Board Order No. 99-08-DWQ until this General Permit takes effect on July 1, 2010. Dischargers who complete their projects and electronically file an NOT prior to July 1, 2010, are not required to obtain coverage under this General Permit.

7. Small Construction Rainfall Erosivity Waiver

   EPA's Small Construction Erosivity Waiver applies to sites between one and five acres demonstrating that there are no adverse water quality impacts.

   Dischargers eligible for a Rainfall Erosivity Waiver based on low erosivity potential shall complete the electronic Notice of Intent (NOI) and Sediment Risk form through the State Water Board's SMARTS system, certifying that the construction activity will take place during a period when the value of the rainfall erosivity factor is less than five. Where the LRP changes or another LRP is added during construction, the new LRP must also submit a waiver certification through the SMARTS system.

   If a small construction site continues beyond the projected completion date given on the waiver certification, the LRP shall recalculate the rainfall erosivity factor for the new project duration and submit this

information through the SMARTS system. If the new R factor is below five (5), the discharger shall update through SMARTS all applicable information on the waiver certification and retain a copy of the revised waiver onsite. The LRP shall submit the new waiver certification 30 days prior to the projected completion date listed on the original waiver form to assure exemption from permitting requirements is uninterrupted. If the new R factor is five (5) or above, the LRP shall be required to apply for coverage under this Order.

8. In the case of a public emergency that requires immediate construction activities, a discharger shall submit a brief description of the emergency construction activity within five days of the onset of construction, and then shall submit all PRDs within thirty days.

C. Revising Permit Coverage for Change of Acreage or New Ownership

1. The discharger may reduce or increase the total acreage covered under this General Permit when a portion of the site is complete and/or conditions for termination of coverage have been met (See Section II.D Conditions for Termination of Coverage); when ownership of a portion of the site is sold to a different entity; or when new acreage, subject to this General Permit, is added to the site.

2. Within 30 days of a reduction or increase in total disturbed acreage, the discharger shall electronically file revisions to the PRDs that include:

   a. A revised NOI indicating the new project size;

   b. A revised site map showing the acreage of the site completed, acreage currently under construction, acreage sold/transferred or added, and acreage currently stabilized in accordance with the Conditions for Termination of Coverage in Section II.D below.

   c. SWPPP revisions, as appropriate; and

   d. Certification that any new landowners have been notified of applicable requirements to obtain General Permit coverage. The certification shall include the name, address, telephone number, and e-mail address of the new landowner.

   e. If the project acreage has increased, dischargers shall mail payment of revised annual fees within 14 days of receiving the revised annual fee notification.

3. The discharger shall continue coverage under the General Permit for any parcel that has not achieved "Final Stabilization" as defined in Section II.D.

4. When an LRP owns property with active General Permit coverage, and the LRP sells the property, or a parcel thereof, to another person, that person shall become an LRP with respect to whatever parcel was sold. The existing LRP shall inform the new LRP of the General Permit's requirements. In order for the new LRP to continue the construction activity on its parcel of property, the new LRP, or the new LRP's approved signatory, must submit PRDs in accordance with this General Permit's requirements.

D. Conditions for Termination of Coverage

1. Within 90 days of when construction is complete or ownership has been transferred, the discharger shall electronically file a Notice of Termination (NOT), a final site map, and photos through the State Water Boards SMARTS system. Filing a NOT certifies that all General Permit requirements have been met. The Regional Water Board will consider a construction site complete only when all portions of the site have been transferred to a new owner, or all of the following conditions have been met:

   a. For purposes of "final stabilization," the site will not pose any additional sediment discharge risk than it did prior to the commencement of construction activity;

   b. There is no potential for construction-related storm water pollutants to be discharged into site runoff;

   c. Final stabilization has been reached;

   d. Construction materials and wastes have been disposed of properly;

   e. Compliance with the Post-Construction Standards in Section XIII of this General Permit has been demonstrated;

   f. Post-construction storm water management measures have been installed and a long-term maintenance plan[7] has been established; and

[7] For the purposes of this requirement a long-term maintenance plan will be designed for a minimum of five years, and will describe the procedures to ensure that the post-construction storm water management measures are adequately maintained.

g. All construction-related equipment, materials and any temporary BMPs no longer needed are removed from the site.

2. The discharger shall certify that final stabilization conditions are satisfied in their NOT. Failure to certify shall result in continuation of permit coverage and annual billing.

3. The NOT must demonstrate through photos, RUSLE or RUSLE2, or results of testing and analysis that the site meets all of the conditions above (Section II.D.1) and the final stabilization condition (Section II.D.1.a) is attained by one of the following methods:

   a. "70% final cover method," no computational proof required

      OR:

   b. "RUSLE or RUSLE2 method," computational proof required

      OR:

   c. "Custom method", the discharger shall demonstrate in some other manner than a or b, above, that the site complies with the "final stabilization" requirement in Section II.D.1.a.

III. DISCHARGE PROHIBITIONS

A. Dischargers shall not violate any discharge prohibitions contained in applicable Basin Plans or statewide water quality control plans. Waste discharges to Areas of Special Biological Significance (ASBS) are prohibited by the California Ocean Plan, unless granted an exception issued by the State Water Board.

B. All discharges are prohibited except for the storm water and non-storm water discharges specifically authorized by this General Permit or another NPDES permit.

C. Authorized non-storm water discharges may include those from de-chlorinated potable water sources such as: fire hydrant flushing, irrigation of vegetative erosion control measures, pipe flushing and testing, water to control dust, uncontaminated ground water from dewatering, and other discharges not subject to a separate general NPDES permit adopted by a Regional Water Board. The discharge of non-storm water is authorized under the following conditions:

1. The discharge does not cause or contribute to a violation of any water quality standard;

2. The discharge does not violate any other provision of this General Permit;

3. The discharge is not prohibited by the applicable Basin Plan;

4. The discharger has included and implemented specific BMPs required by this General Permit to prevent or reduce the contact of the non-storm water discharge with construction materials or equipment.

5. The discharge does not contain toxic constituents in toxic amounts or (other) significant quantities of pollutants;

6. The discharge is monitored and meets the applicable NALs and NELs; and

7. The discharger reports the sampling information in the Annual Report.

If any of the above conditions are not satisfied, the discharge is not authorized by this General Permit. The discharger shall notify the Regional Water Board of any anticipated non-storm water discharges not already authorized by this General Permit or another NPDES permit, to determine whether a separate NPDES permit is necessary.

D. Debris resulting from construction activities are prohibited from being discharged from construction sites.

E. When soil contamination is found or suspected and a responsible party is not identified, or the responsible party fails to promptly take the appropriate action, the discharger shall have those soils sampled and tested to ensure proper handling and public safety measures are implemented. The discharger shall notify the appropriate local, State, and federal agency(ies) when contaminated soil is found at a construction site, and will notify the appropriate Regional Water Board.

IV. SPECIAL PROVISIONS

A. Duty to Comply

1. The discharger shall comply with all of the conditions of this General Permit. Any permit noncompliance constitutes a violation of the Clean Water Act (CWA) and the Porter-Cologne Water Quality Control Act and is grounds for enforcement action and/or removal from General Permit coverage.

2. The discharger shall comply with effluent standards or prohibitions established under Section 307(a) of the CWA for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if this General Permit has not yet been modified to incorporate the requirement.

B. General Permit Actions

1. This General Permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the discharger for a General Permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not annul any General Permit condition.

2. If any toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under Section 307(a) of the CWA for a toxic pollutant which is present in the discharge and that standard or prohibition is more stringent than any limitation on the pollutant in this General Permit, this General Permit shall be modified or revoked and reissued to conform to the toxic effluent standard or prohibition and the dischargers so notified.

C. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a discharger in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this General Permit.

D. Duty to Mitigate

The discharger shall take all responsible steps to minimize or prevent any discharge in violation of this General Permit, which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance

The discharger shall at all times properly operate and maintain any facilities and systems of treatment and control (and related appurtenances) which are installed or used by the discharger to achieve compliance with the conditions of this General Permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. Proper operation and maintenance may require the operation of backup or auxiliary facilities or similar systems installed by a discharger when necessary to achieve compliance with the conditions of this General Permit.

F. Property Rights

This General Permit does not convey any property rights of any sort or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor does it authorize any infringement of Federal, State, or local laws or regulations.

G. Duty to Maintain Records and Provide Information

1. The discharger shall maintain a paper or electronic copy of all required records, including a copy of this General Permit, for three years from the date generated or date submitted, whichever is last. These records shall be available at the construction site until construction is completed.

2. The discharger shall furnish the Regional Water Board, State Water Board, or U.S. EPA, within a reasonable time, any requested information to determine compliance with this General Permit. The discharger shall also furnish, upon request, copies of records that are required to be kept by this General Permit.

H. Inspection and Entry

The discharger shall allow the Regional Water Board, State Water Board, U.S. EPA, and/or, in the case of construction sites which discharge through a municipal separate storm sewer, an authorized representative of the municipal operator of the separate storm sewer system receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the discharger's premises at reasonable times where a regulated construction activity is being conducted or where records must be kept under the conditions of this General Permit;

2. Access and copy at reasonable times any records that must be kept under the conditions of this General Permit;

3. Inspect at reasonable times the complete construction site, including any off-site staging areas or material storage areas, and the erosion/sediment controls; and

4. Sample or monitor at reasonable times for the purpose of ensuring General Permit compliance.

I. Electronic Signature and Certification Requirements

1. All Permit Registration Documents (PRDs) and Notice of Terminations (NOTs) shall be electronically signed, certified, and submitted via SMARTS to the State Water Board. Either the Legally Responsible Person (LRP) or a person legally authorized to sign and certify PRDs and NOTs on behalf of the LRP (the LRP's Approved Signatory) must submit all information electronically via SMARTS.

   a. The LRP's Approved Signatory must be one of the following:

      i. For a corporation: a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: (a) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or (b) the manager of the facility if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

      ii. For a partnership or sole proprietorship: a general partner or the proprietor, respectively;

      iii. For a municipality, State, Federal, or other public agency: either a principal executive officer or ranking elected official. The principal executive officer of a Federal agency includes the chief executive officer of the agency or the senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of U.S. EPA);

      iv. For the military: Any military officer who has been designated.

      v. For a public university: An authorized university official

b. Changes to Authorization. If an approved signatory's authorization is no longer accurate, a new authorization satisfying the requirements of paragraph (a) of this section must be submitted via SMARTS prior to or together with any reports, information or applications to be signed by an approved signatory.

2. All Annual Reports, or other information required by the General Permit (other than PRDs and NOTs) or requested by the Regional Water Board, State Water Board, U.S. EPA, or local storm water management agency shall be certified and submitted by the LRP or the LRP's approved signatory as described above.

J. Certification

Any person signing documents under Section IV.I above, shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

K. Anticipated Noncompliance

The discharger shall give advance notice to the Regional Water Board and local storm water management agency of any planned changes in the construction activity, which may result in noncompliance with General Permit requirements.

L. Bypass

Bypass[8] is prohibited. The Regional Water Board may take enforcement action against the discharger for bypass unless:

1. Bypass was unavoidable to prevent loss of life, personal injury or severe property damage;[9]

[8] The intentional diversion of waste streams from any portion of a treatment facility

[9] Severe property damage means substantial physical damage to property, damage to the treatment facilities that causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

2. There were no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated waste, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that could occur during normal periods of equipment downtime or preventative maintenance;

3. The discharger submitted a notice at least ten days in advance of the need for a bypass to the Regional Water Board; or

4. The discharger may allow a bypass to occur that does not cause effluent limitations to be exceeded, but only if it is for essential maintenance to assure efficient operation. In such a case, the above bypass conditions are not applicable. The discharger shall submit notice of an unanticipated bypass as required.

M. Upset

1. A discharger that wishes to establish the affirmative defense of an upset[10] in an action brought for noncompliance shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

   a. An upset occurred and that the discharger can identify the cause(s) of the upset

   b. The treatment facility was being properly operated by the time of the upset

   c. The discharger submitted notice of the upset as required; and

   d. The discharger complied with any remedial measures required

2. No determination made before an action of noncompliance occurs, such as during administrative review of claims that noncompliance was caused by an upset, is final administrative action subject to judicial review.

3. In any enforcement proceeding, the discharger seeking to establish the occurrence of an upset has the burden of proof

[10] An exceptional incident in which there is unintentional and temporary noncompliance the technology based numeric effluent limitations because of factors beyond the reasonable control of the discharger. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

N. Penalties for Falsification of Reports

Section 309(c)(4) of the CWA provides that any person who knowingly makes any false material statement, representation, or certification in any record or other document submitted or required to be maintained under this General Permit, including reports of compliance or noncompliance shall upon conviction, be punished by a fine of not more than $10,000 or by imprisonment for not more than two years or by both.

O. Oil and Hazardous Substance Liability

Nothing in this General Permit shall be construed to preclude the institution of any legal action or relieve the discharger from any responsibilities, liabilities, or penalties to which the discharger is or may be subject to under Section 311 of the CWA.

P. Severability

The provisions of this General Permit are severable; and, if any provision of this General Permit or the application of any provision of this General Permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this General Permit shall not be affected thereby.

Q. Reopener Clause

This General Permit may be modified, revoked and reissued, or terminated for cause due to promulgation of amended regulations, receipt of U.S. EPA guidance concerning regulated activities, judicial decision, or in accordance with 40 Code of Federal Regulations (CFR) 122.62, 122.63, 122.64, and 124.5.

R. Penalties for Violations of Permit Conditions

1. Section 309 of the CWA provides significant penalties for any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the CWA or any permit condition or limitation implementing any such section in a permit issued under Section 402. Any person who violates any permit condition of this General Permit is subject to a civil penalty not to exceed $37,500[11] per calendar day of such violation, as well as any other appropriate sanction provided by Section 309 of the CWA.

[11] May be further adjusted in accordance with the Federal Civil Penalties Inflation Adjustment Act.

2. The Porter-Cologne Water Quality Control Act also provides for civil and criminal penalties, which in some cases are greater than those under the CWA.

S. Transfers

This General Permit is not transferable.

T. Continuation of Expired Permit

This General Permit continues in force and effect until a new General Permit is issued or the SWRCB rescinds this General Permit. Only those dischargers authorized to discharge under the expiring General Permit are covered by the continued General Permit.

V. EFFLUENT STANDARDS

A. Narrative Effluent Limitations

1. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

2. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

B. Numeric Effluent Limitations (NELs)

Table 1- Numeric Effluent Limitations, Numeric Action Levels, Test Methods, Detection Limits, and Reporting Units

Parameter	Test Method	Discharge Type	Min. Detection Limit	Units	Numeric Action Level	Numeric Effluent Limitation
pH	Field test with calibrated portable instrument	Risk Level 2	0.2	pH units	lower NAL = 6.5 upper NAL = 8.5	N/A
		Risk Level 3			lower NAL = 6.5 upper NAL = 8.5	lower NEL = 6.0 upper NEL = 9.0
Turbidity	EPA 0180.1 and/or field test with calibrated portable instrument	Risk Level 2	1	NTU	250 NTU	N/A
		Risk Level 3			250 NTU	500 NTU

1. Numeric Effluent Limitations (NELs):

   a. **Storm Event, Daily Average pH Limits –** For Risk Level 3 dischargers, the pH of storm water and non-storm water discharges

shall be within the ranges specified in Table 1 during any site phase where there is a "high risk of pH discharge."[12]

b. **Storm Event Daily Average Turbidity Limit –** For Risk Level 3 dischargers, the turbidity of storm water and non-storm water discharges shall not exceed 500 NTU.

2. If daily average sampling results are outside the range of pH NELs (i.e., is below the lower NEL for pH or exceeds the upper NEL for pH) or exceeds the turbidity NEL (as listed in Table 1), the discharger is in violation of this General Permit and shall electronically file monitoring results in violation within 5 business days of obtaining the results.

3. **Compliance Storm Event**:

   Discharges of storm water from Risk Level 3 sites shall comply with applicable NELs (above) unless the storm event causing the discharges is determined after the fact to be equal to or larger than the Compliance Storm Event (expressed in inches of rainfall). The Compliance Storm Event for Risk Level 3 discharges is the 5 year, 24 hour storm (expressed in tenths of an inch of rainfall), as determined by using these maps:

   http://www.wrcc.dri.edu/pcpnfreq/nca5y24.gif
   http://www.wrcc.dri.edu/pcpnfreq/sca5y24.gif

   Compliance storm event verification shall be done by reporting on-site rain gauge readings as well as nearby governmental rain gauge readings.

4. Dischargers shall not be required to comply with NELs if the site receives run-on from a forest fire or any other natural disaster.

C. Numeric Action Levels (NALs)

1. For Risk Level 2 and 3 dischargers, the lower storm event average NAL for pH is 6.5 pH units and the upper storm event average NAL for pH is 8.5 pH units. The discharger shall take actions as described below if the discharge is outside of this range of pH values.

[12] A period of high risk of pH discharge is defined as a project's complete utilities phase, complete vertical build phase, and any portion of any phase where significant amounts of materials are placed directly on the land at the site in a manner that could result in significant alterations of the background pH of the discharges.

2. For Risk Level 2 and 3 dischargers, the NAL storm event daily average for turbidity is 250 NTU. The discharger shall take actions as described below if the discharge is outside of this range of turbidity values.

3. Whenever the results from a storm event daily average indicate that the discharge is below the lower NAL for pH, exceeds the upper NAL for pH, or exceeds the turbidity NAL (as listed in Table 1), the discharger shall conduct a construction site and run-on evaluation to determine whether pollutant source(s) associated with the site's construction activity may have caused or contributed to the NAL exceedance and shall immediately implement corrective actions if they are needed.

4. The site evaluation shall be documented in the SWPPP and specifically address whether the source(s) of the pollutants causing the exceedance of the NAL:

    a. Are related to the construction activities and whether additional BMPs are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) determine what corrective action(s) were taken or will be taken and with a description of the schedule for completion.

        AND/OR:

    b. Are related to the run-on associated with the construction site location and whether additional BMPs measures are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) what corrective action(s) were taken or will be taken with a description of the schedule for completion.

VI. RECEIVING WATER LIMITATIONS

A. The discharger shall ensure that storm water discharges and authorized non-storm water discharges to any surface or ground water will not adversely affect human health or the environment.

B. The discharger shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants in quantities that threaten to cause pollution or a public nuisance.

C. The discharger shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants that cause or contribute to an exceedance of any applicable water quality objectives or water quality standards (collectively, WQS) contained in a Statewide Water Quality Control Plan, the California Toxics Rule, the National Toxics Rule, or the applicable Regional Water Board's Water Quality Control Plan (Basin Plan).

D. Dischargers located within the watershed of a CWA § 303(d) impaired water body, for which a TMDL has been approved by the U.S. EPA, shall comply with the approved TMDL if it identifies "construction activity" or land disturbance as a source of the pollution.

VII. TRAINING QUALIFICATIONS AND CERTIFICATION REQUIREMENTS

A. General

The discharger shall ensure that all persons responsible for implementing requirements of this General Permit shall be appropriately trained in accordance with this Section. Training should be both formal and informal, occur on an ongoing basis, and should include training offered by recognized governmental agencies or professional organizations. Those responsible for preparing and amending SWPPPs shall comply with the requirements in this Section VII.

The discharger shall provide documentation of all training for persons responsible for implementing the requirements of this General Permit in the Annual Reports.

B. SWPPP Certification Requirements

1. **Qualified SWPPP Developer:** The discharger shall ensure that SWPPPs are written, amended and certified by a Qualified SWPPP Developer (QSD). A QSD shall have one of the following registrations or certifications, and appropriate experience, as required for:

   a. A California registered professional civil engineer;

   b. A California registered professional geologist or engineering geologist;

   c. A California registered landscape architect;

   d. A professional hydrologist registered through the American Institute of Hydrology;

   e. A Certified Professional in Erosion and Sediment Control (CPESC) ™ registered through Enviro Cert International, Inc.;

   f. A Certified Professional in Storm Water Quality (CPSWQ) ™ registered through Enviro Cert International, Inc.; or

   g. A professional in erosion and sediment control registered through the National Institute for Certification in Engineering Technologies (NICET);

Effective two years after the adoption date of this General Permit, a QSD shall have attended a State Water Board-sponsored or approved QSD training course.

2. The discharger shall list the name and telephone number of the currently designated Qualified SWPPP Developer(s) in the SWPPP.

3. **Qualified SWPPP Practitioner:** The discharger shall ensure that all BMPs required by this General Permit are implemented by a Qualified SWPPP Practitioner (QSP). A QSP is a person responsible for non-storm water and storm water visual observations, sampling and analysis. Effective two years from the date of adoption of this General Permit, a QSP shall be either a QSD or have one of the following certifications:

   a. A certified erosion, sediment and storm water inspector registered through Enviro Cert International, Inc.; or

   b. A certified inspector of sediment and erosion control registered through Certified Inspector of Sediment and Erosion Control, Inc.

   Effective two years after the adoption date of this General Permit, a QSP shall have attended a State Water Board-sponsored or approved QSP training course.

4. The LRP shall list in the SWPPP, the name of any Approved Signatory, and provide a copy of the written agreement or other mechanism that provides this authority from the LRP in the SWPPP.

5. The discharger shall include, in the SWPPP, a list of names of all contractors, subcontractors, and individuals who will be directed by the Qualified SWPPP Practitioner. This list shall include telephone numbers and work addresses. Specific areas of responsibility of each subcontractor and emergency contact numbers shall also be included.

6. The discharger shall ensure that the SWPPP and each amendment will be signed by the Qualified SWPPP Developer. The discharger shall include a listing of the date of initial preparation and the date of each amendment in the SWPPP.

VIII. RISK DETERMINATION

The discharger shall calculate the site's sediment risk and receiving water risk during periods of soil exposure (i.e. grading and site stabilization) and use the calculated risks to determine a Risk Level(s) using the methodology in

Appendix 1. For any site that spans two or more planning watersheds,[13] the discharger shall calculate a separate Risk Level for each planning watershed. The discharger shall notify the State Water Board of the site's Risk Level determination(s) and shall include this determination as a part of submitting the PRDs. If a discharger ends up with more than one Risk Level determination, the Regional Water Board may choose to break the project into separate levels of implementation.

IX. RISK LEVEL 1 REQUIREMENTS

Risk Level 1 Dischargers shall comply with the requirements included in Attachment C of this General Permit.

X. RISK LEVEL 2 REQUIREMENTS

Risk Level 2 Dischargers shall comply with the requirements included in Attachment D of this General Permit.

XI. RISK LEVEL 3 REQUIREMENTS

Risk Level 3 Dischargers shall comply with the requirements included in Attachment E of this General Permit.

XII. ACTIVE TREATMENT SYSTEMS (ATS)

Dischargers choosing to implement an ATS on their site shall comply with all of the requirements in Attachment F of this General Permit.

[13] Planning watershed: defined by the Calwater Watershed documents as a watershed that ranges in size from approximately 3,000 to 10,000 acres http://cain.ice.ucdavis.edu/calwater/calwfaq.html, http://gis.ca.gov/catalog/BrowseRecord.epl?id=22175 .

XIII. POST-CONSTRUCTION STANDARDS

A. All dischargers shall comply with the following runoff reduction requirements unless they are located within an area subject to post-construction standards of an active Phase I or II municipal separate storm sewer system (MS4) permit that has an approved Storm Water Management Plan.

1. This provision shall take effect three years from the adoption date of this permit, or later at the discretion of the Executive Officer of the Regional Board.

2. The discharger shall demonstrate compliance with the requirements of this section by submitting with their NOI a map and worksheets in accordance with the instructions in Appendix 2. The discharger shall use non-structural controls unless the discharger demonstrates that non-structural controls are infeasible or that structural controls will produce greater reduction in water quality impacts.

3. The discharger shall, through the use of non-structural and structural measures as described in Appendix 2, replicate the pre-project water balance (for this permit, defined as the volume of rainfall that ends up as runoff) for the smallest storms up to the 85th percentile storm event (or the smallest storm event that generates runoff, whichever is larger). Dischargers shall inform Regional Water Board staff at least 30 days prior to the use of any structural control measure used to comply with this requirement. Volume that cannot be addressed using non-structural practices shall be captured in structural practices and approved by the Regional Water Board. When seeking Regional Board approval for the use of structural practices, dischargers shall document the infeasibility of using non-structural practices on the project site, or document that there will be fewer water quality impacts through the use of structural practices.

4. For sites whose disturbed area exceeds two acres, the discharger shall preserve the pre-construction drainage density (miles of stream length per square mile of drainage area) for all drainage areas within the area serving a first order stream[14] or larger stream and ensure that post-project time of runoff concentration is equal or greater than pre-project time of concentration.

[14] A first order stream is defined as a stream with no tributaries.

B. All dischargers shall implement BMPs to reduce pollutants in storm water discharges that are reasonably foreseeable after all construction phases have been completed at the site (Post-construction BMPs).

XIV. SWPPP REQUIREMENTS

A. The discharger shall ensure that the Storm Water Pollution Prevention Plans (SWPPPs) for all traditional project sites are developed and amended or revised by a QSD. The SWPPP shall be designed to address the following objectives:

1. All pollutants and their sources, including sources of sediment associated with construction, construction site erosion and all other activities associated with construction activity are controlled;

2. Where not otherwise required to be under a Regional Water Board permit, all non-storm water discharges are identified and either eliminated, controlled, or treated;

3. Site BMPs are effective and result in the reduction or elimination of pollutants in storm water discharges and authorized non-storm water discharges from construction activity to the BAT/BCT standard;

4. Calculations and design details as well as BMP controls for site run-on are complete and correct, and

5. Stabilization BMPs installed to reduce or eliminate pollutants after construction are completed.

B. To demonstrate compliance with requirements of this General Permit, the QSD shall include information in the SWPPP that supports the conclusions, selections, use, and maintenance of BMPs.

C. The discharger shall make the SWPPP available at the construction site during working hours while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone.

XV. REGIONAL WATER BOARD AUTHORITIES

A. In the case where the Regional Water Board does not agree with the discharger's self-reported risk level (e.g., they determine themselves to be a Level 1 Risk when they are actually a Level 2 Risk site), Regional Water Boards may either direct the discharger to reevaluate the Risk Level(s) for their site or terminate coverage under this General Permit.

B. Regional Water Boards may terminate coverage under this General Permit for dischargers who fail to comply with its requirements or where they determine that an individual NPDES permit is appropriate.

C. Regional Water Boards may require dischargers to submit a Report of Waste Discharge / NPDES permit application for Regional Water Board consideration of individual requirements.

D. Regional Water Boards may require additional Monitoring and Reporting Program Requirements, including sampling and analysis of discharges to sediment-impaired water bodies.

E. Regional Water Boards may require dischargers to retain records for more than the three years required by this General Permit.

XVI. ANNUAL REPORTING REQUIREMENTS

A. All dischargers shall prepare and electronically submit an Annual Report no later than September 1 of each year.

B. The discharger shall certify each Annual Report in accordance with the Special Provisions.

C. The discharger shall retain an electronic or paper copy of each Annual Report for a minimum of three years after the date the annual report is filed.

D. The discharger shall include storm water monitoring information in the Annual Report consisting of:

1. a summary and evaluation of all sampling and analysis results, including copies of laboratory reports;

2. the analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as "less than the method detection limit");

3. a summary of all corrective actions taken during the compliance year;

4. identification of any compliance activities or corrective actions that were not implemented;

5. a summary of all violations of the General Permit;

6. the names of individual(s) who performed the facility inspections, sampling, visual observation (inspections), and/or measurements;

7. the date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation (rain gauge); and

8. the visual observation and sample collection exception records and reports specified in Attachments C, D, and E.

E. The discharger shall provide training information in the Annual Report consisting of:

1. documentation of all training for individuals responsible for all activities associated with compliance with this General Permit;

2. documentation of all training for individuals responsible for BMP installation, inspection, maintenance, and repair; and

3. documentation of all training for individuals responsible for overseeing, revising, and amending the SWPPP.

ATTACHMENT A
Linear Underground/ Overhead Requirements

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All Linear Underground/Overhead project dischargers who submit permit registration documents (PRDs) indicating their intention to be regulated under the provisions of this General Permit shall comply with the following:

A. DEFINITION OF LINEAR UNDERGROUND/OVERHEAD PROJECTS

1. Linear Underground/Overhead Projects (LUPs) include, but are not limited to, any conveyance, pipe, or pipeline for the transportation of any gaseous, liquid (including water and wastewater for domestic municipal services), liquiescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g., telephone, telegraph, radio, or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to, (a) those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment, and associated ancillary facilities); and include, but are not limited to, (b) underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/ or pavement repair or replacement, and stockpile/borrow locations.

2. LUP evaluation shall consist of two tasks:

a. Confirm that the project or project section(s) qualifies as an LUP. The State Water Board website contains a project determination guidance flowchart. http://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.shtml

b. Identify which Type(s) (1, 2 or 3 described in Section I below) are applicable to the project or project sections based on project sediment and receiving water risk. (See Attachment A.1)

3. A Legally Responsible Person (LRP) for a Linear Underground/Overhead project is required to obtain CGP coverage under one or more permit registration document (PRD) electronic submittals to the State Water Board's Storm Water Multi-Application and Report Tracking (SMARTs) system. Attachment A.1 contains a flow chart to be used when determining if a linear project qualifies for coverage and to determine LUP Types. Since a LUP may be constructed within both developed and undeveloped locations and portions of LUPs may be constructed by different contractors, LUPs may be broken into logical permit sections. Sections may be determined based on portions of a project conducted by one contractor. Other situations may also occur, such as the time period in which the sections of a project will be constructed (e.g. project phases), for which separate permit coverage is possible. For projects that are broken into separate sections, a description of how each section relates to the overall project and the definition of the boundaries between sections shall be clearly stated.

4. Where construction activities transverse or enter into different Regional Water Board jurisdictions, LRPs shall obtain permit coverage for each Regional Water Board area involved prior to the commencement of construction activities.

5. Small Construction Rainfall Erosivity Waiver

EPA's Small Construction Erosivity Waiver applies to sites between one and five acres demonstrating that there are no adverse water quality impacts.

Dischargers eligible for a Rainfall Erosivity Waiver based on low erosivity potential shall complete the electronic Notice of Intent (NOI) and Sediment Risk form through the State Water Board's SMARTS system, certifying that the construction activity will take place during a period when the value of the rainfall erosivity factor is less than five. Where the LRP changes or another LRP is added during construction, the new LRP must also submit a waiver certification through the SMARTS system.

If a small linear construction site continues beyond the projected completion date given on the waiver certification, the LRP shall recalculate the rainfall erosivity factor for the new project duration and submit this information through the SMARTS system. If the new R factor is below five (5), the discharger shall update through SMARTS all applicable information on the waiver certification and retain a copy of the revised waiver onsite. The LRP shall submit the new waiver certification 30 days prior to the projected completion date listed on the original waiver form to assure exemption from permitting requirements is uninterrupted. If the new R factor is five (5) or above, the LRP shall be required to apply for coverage under this Order.

B. LINEAR PROJECT PERMIT REGISTRATION DOCUMENTS (PRDs)

Any information provided to the Regional Water Board shall comply with the Homeland Security Act and any other federal law that concerns security in the United States; any information that does not comply should not be submitted. PRDs shall consist of the following:

1. Notice of Intent (NOI)

Prior to construction activities, the LRP of a proposed linear underground/overhead project shall utilize the processes and methods provided in Attachment A.2, Permit Registration Documents (PRDs) – General Instructions for Linear Underground/Overhead Projects to comply with the Construction General Permit.

2. Site Maps

LRPs submitting PRDs shall include at least 3 maps. The first map will be a zoomed[1] 1000-1500 ft vicinity map that shows the starting point of the project. The second will be a zoomed map of 1000-1500 ft showing the ending location of the project. The third will be a larger view vicinity map, 1000 ft to 2000 ft, displaying the entire project location depending on the project size, and indicating the LUP type (1, 2 or 3) areas within the total project footprint.

3. Drawings

LRPs submitting PRDs shall include a construction drawing(s) or other appropriate drawing(s) or map(s) that shows the locations of storm drain

[1] An image with a close-up/enhanced detailed view of site features that show minute details such as streets and neighboring structures.
Or: An image with a close-up/enhanced detailed view of the site's surrounding infrastructure.
Or: An image with a close up detailed view of the project and its surroundings.

inlets and waterbodies[2] that may receive discharges from the construction activities and that shows the locations of BMPs to be installed for all those BMPs that can be illustrated on the revisable drawing(s) or map(s). If storm drain inlets, waterbodies, and/or BMPs cannot be adequately shown on the drawing(s) or map(s) they should be described in detail within the SWPPP.

4. Storm Water Pollution Prevention Plan (SWPPP)

LUP dischargers shall comply with the SWPPP Preparation, Implementation, and Oversight requirements in Section K of this Attachment.

5. Contact information

LUP dischargers shall include contact information for all contractors (or subcontractors) responsible for each area of an LUP project. This should include the names, telephone numbers, and addresses of contact personnel. Specific areas of responsibility of each contact, and emergency contact numbers should also be included.

6. In the case of a public emergency that requires immediate construction activities, a discharger shall submit a brief description of the emergency construction activity within five days of the onset of construction, and then shall submit all PRDs within thirty days.

C. LINEAR PROJECT TERMINATION OF COVERAGE REQUIREMENTS

The LRP may terminate coverage of an LUP when construction activities are completed by submitting an electronic notice of termination (NOT) through the State Water Board's SMARTS system. Termination requirements are different depending on the complexity of the LUP. An LUP is considered complete when: (a) there is no potential for construction-related storm water pollution; (b) all elements of the SWPPP have been completed; (c) construction materials and waste have been disposed of properly; (d) the site is in compliance with all local storm water management requirements; and (e) the LRP submits a notice of termination (NOT) and has received approval for termination from the appropriate Regional Water Board office.

1. LUP Stabilization Requirements

The LUP discharger shall ensure that all disturbed areas of the construction site are stabilized prior to termination of coverage under this General Permit. Final stabilization for the purposes of submitting an NOT

[2] Includes basin(s) that the MS4 storm sewer systems may drain to for Hydromodification or Hydrological Conditional of Concerns under the MS4 permits.

is satisfied when all soil disturbing activities are completed and one of the following criteria is met:

a. In disturbed areas that were vegetated prior to construction activities of the LUP, the area disturbed must be re-established to a uniform vegetative cover equivalent to 70 percent coverage of the preconstruction vegetative conditions. Where preconstruction vegetation covers less than 100 percent of the surface, such as in arid areas, the 70 percent coverage criteria is adjusted as follows: if the preconstruction vegetation covers 50 percent of the ground surface, 70 percent of 50 percent (.70 X .50=.35) would require 35 percent total uniform surface coverage; or

b. Where no vegetation is present prior to construction, the site is returned to its original line and grade and/or compacted to achieve stabilization; or

c. Equiva lent stabilization measures have been employed. These measures include, but are not limited to, the use of such BMPs as blankets, reinforced channel liners, soil cement, fiber matrices, geotextiles, or other erosion resistant soil coverings or treatments.

2. LUP Termination of Coverage Requirements

The LRP shall file an NOT through the State Water Board's SMARTS system. By submitting an NOT, the LRP is certifying that construction activities for an LUP are complete and that the project is in full compliance with requirements of this General Permit and that it is now compliant with soil stabilization requirements where appropriate. Upon approval by the appropriate Regional Water Board office, permit coverage will be terminated.

3. Revising Coverage for Change of Acreage

When the LRP of a portion of an LUP construction project changes, or when a phase within a multi-phase project is completed, the LRP may reduce the total acreage covered by this General Permit. In reducing the acreage covered by this General Permit, the LRP shall electronically file revisions to the PRDs that include:

a. a revised NOI indicating the new project size;

b. a revised site map showing the acreage of the project completed, acreage currently under construction, acreage sold, transferred or added, and acreage currently stabilized.

c. SWPPP revisions, as appropriate; and

d. certification that any new LRPs have been notified of applicable requirements to obtain General Permit coverage. The certification shall include the name, address, telephone number, and e-mail address (if known) of the new LRP.

If the project acreage has increased, dischargers shall mail payment of revised annual fees within 14 days of receiving the revised annual fee notification.

D. DISCHARGE PROHIBITIONS

1. LUP dischargers shall not violate any discharge prohibitions contained in applicable Basin Plans or statewide water quality control plans. Waste discharges to Areas of Special Biological Significance (ASBS) are prohibited by the California Ocean Plan, unless granted an exception issued by the State Water Board.

2. LUP dischargers are prohibited from discharging non-storm water that is not otherwise authorized by this General Permit. Non-storm water discharges authorized by this General Permit[3] may include, fire hydrant flushing, irrigation of vegetative erosion control measures, pipe flushing and testing, water to control dust, street cleaning, dewatering,[4] uncontaminated groundwater from dewatering, and other discharges not subject to a separate general NPDES permit adopted by a Regional Water Board. Such discharges are allowed by this General Permit provided they are not relied upon to clean up failed or inadequate construction or post-construction BMPs designed to keep materials on site. These authorized non-storm water discharges:

[3] Dischargers must identify all authorized non-storm water discharges in the LUP's SWPPP and identify BMPs that will be implemented to either eliminate or reduce pollutants in non-storm water discharges. Regional Water Boards may direct the discharger to discontinue discharging such non-storm water discharges if determined that such discharges discharge significant pollutants or threaten water quality.
[4] Dewatering activities may be prohibited or need coverage under a separate permit issued by the Regional Water Boards. Dischargers shall check with the appropriate Regional Water Boards for any required permit or basin plan conditions prior to initial dewatering activities to land, storm drains, or waterbodies.

a. Shall not cause or contribute to a violation of any water quality standard;

b. Shall not violate any other provision of this General Permit;

c. Shall not violate any applicable Basin Plan;

d. Shall comply with BMPs as described in the SWPPP;

e. Shall not contain toxic constituents in toxic amounts or (other) significant quantities of pollutants;

f. Shall be monitored and meets the applicable NALs and NELs; and

g. Shall be reported by the discharger in the Annual Report.

If any of the above conditions are not satisfied, the discharge is not authorized by this General Permit. The discharger shall notify the Regional Water Board of any anticipated non-storm water discharges not authorized by this General Permit to determine the need for a separate NPDES permit.

Additionally, some LUP dischargers may be required to obtain a separate permit if the applicable Regional Water Board has adopted a General Permit for dewatering discharges. Wherever feasible, alternatives, that do not result in the discharge of non-storm water, shall be implemented in accordance with this Attachment's Section K.2 - SWPPP Implementation Schedule.

3. LUP dischargers shall ensure that trench spoils or any other soils disturbed during construction activities that are contaminated[5] are not discharged with storm water or non-storm water discharges into any storm drain or water body except pursuant to an NPDES permit.

When soil contamination is found or suspected and a responsible party is not identified, or the responsible party fails to promptly take the appropriate action, the LUP discharger shall have those soils sampled and tested to ensure that proper handling and public safety measures are

[5] Contaminated soil contains pollutants in concentrations that exceed the appropriate thresholds that various regulatory agencies set for those substances. Preliminary testing of potentially contaminated soils will be based on odor, soil discoloration, or prior history of the site's chemical use and storage and other similar factors. When soil contamination is found or suspected and a responsible party is not identified, or the responsible party fails to promptly take the appropriate action, the discharger shall have those soils sampled and tested to ensure proper handling and public safety measures are implemented. The legally responsible person will notify the appropriate local, State, or federal agency(ies) when contaminated soil is found at a construction site, and will notify the Regional Water Board by submitting an NOT at the completion of the project.

implemented. The LUP discharger shall notify the appropriate local, State, and federal agency(ies) when contaminated soil is found at a construction site, and will notify the appropriate Regional Water Board.

4. Discharging any pollutant-laden water that will cause or contribute to an exceedance of the applicable Regional Water Board's Basin Plan from a dewatering site or sediment basin into any receiving water or storm drain is prohibited.

5. Debris[6] resulting from construction activities are prohibited from being discharged from construction project sites.

E. SPECIAL PROVISIONS

1. Duty to Comply

a. The LUP discharger must comply with all of the conditions of this General Permit. Any permit noncompliance constitutes a violation of the Clean Water Act (CWA) and the Porter-Cologne Water Quality Control Act and is grounds for enforcement action and/or removal from General Permit coverage.

b. The LUP discharger shall comply with effluent standards or prohibitions established under Section 307(a) of the CWA for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if this General Permit has not yet been modified to incorporate the requirement.

2. General Permit Actions

a. This General Permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the discharger for a General Permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not annul any General Permit condition.

[6] Litter, rubble, discarded refuse, and remains of something destroyed.

b. If any toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under Section 307(a) of the CWA for a toxic pollutant which is present in the discharge and that standard or prohibition is more stringent than any limitation on the pollutant in this General Permit, this General Permit shall be modified or revoked and reissued to conform to the toxic effluent standard or prohibition and the dischargers so notified.

3. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for an LUP discharger in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this General Permit.

4. Duty to Mitigate

The LUP discharger shall take all responsible steps to minimize or prevent any discharge in violation of this General Permit, which has a reasonable likelihood of adversely affecting human health or the environment.

5. Proper Operation and Maintenance

The LUP discharger shall at all times properly operate and maintain any facilities and systems of treatment and control (and related appurtenances) which are installed or used by the discharger to achieve compliance with the conditions of this General Permit and with the requirements of the Storm Water Pollution Prevention Plan (SWPPP). Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. Proper operation and maintenance may require the operation of backup or auxiliary facilities or similar systems installed by a discharger when necessary to achieve compliance with the conditions of this General Permit.

6. Property Rights

This General Permit does not convey any property rights of any sort or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor does it authorize any infringement of Federal, State, or local laws or regulations.

7. Duty to Maintain Records and Provide Information

a. The LUP discharger shall maintain a paper or electronic copy of all required records, including a copy of this General Permit, for three years from the date generated or date submitted, whichever is last. These records shall be kept at the construction site or in a crew

member's vehicle until construction is completed, and shall be made available upon request.

b. The LUP discharger shall furnish the Regional Water Board, State Water Board, or USEPA, within a reasonable time, any requested information to determine compliance with this General Permit. The LUP discharger shall also furnish, upon request, copies of records that are required to be kept by this General Permit.

8. Inspection and Entry

The LUP discharger shall allow the Regional Water Board, State Water Board, USEPA, and/or, in the case of construction sites which discharge through a municipal separate storm sewer, an authorized representative of the municipal operator of the separate storm sewer system receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

a. Enter upon the discharger's premises at reasonable times where a regulated construction activity is being conducted or where records must be kept under the conditions of this General Permit;

b. Access and copy at reasonable times any records that must be kept under the conditions of this General Permit;

c. Inspect at reasonable times the complete construction site, including any off-site staging areas or material storage areas, and the erosion/sediment controls; and

d. Sample or monitor at reasonable times for the purpose of ensuring General Permit compliance.

9. Electronic Signature and Certification Requirements

a. All Permit Registration Documents (PRDs) and Notices of Termination (NOTs) shall be electronically signed, certified, and submitted via SMARTS to the State Water Board. Either the Legally Responsible Person (LRP) or a person legally authorized to sign and certify PRDs and NOTs on behalf of the LRP (the LRP's Approved Signatory) must submit all information electronically via SMARTS. For Linear Underground/Overhead projects, the Legally Responsible Person is the person in charge of the utility company, municipality, or other public or private company or agency that owns or operates the LUP. The LRP's Approved Signatory must be one of the following:

i For a corporation: a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

(1) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or

(2) the manager of the facility if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

ii For a partnership or sole proprietorship: a general partner or the proprietor, respectively; or

iii For a municipality, State, Federal, or other public agency: either a principal executive officer or ranking elected official. The principal executive officer of a Federal agency includes the chief executive officer of the agency or the senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of U.S. EPA).

b. Changes to Authorization. If an approved signatory's authorization is no longer accurate, a new authorization satisfying the requirements of paragraph (a) of this section must be submitted via SMARTS prior to or together with any reports, information or applications to be signed by an approved signatory.

c. All SWPPP revisions, annual reports, or other information required by the General Permit (other than PRDs and NOTs) or requested by the Regional Water Board, State Water Board, USEPA, or local storm water management agency shall be certified and submitted by the LRP or the LRP's approved signatory as described above.

10. Certification

Any person signing documents under Section E.9 above, shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

11. Anticipated Noncompliance

The LUP discharger shall give advance notice to the Regional Water Board and local storm water management agency of any planned changes in the construction activity, which may result in noncompliance with General Permit requirements.

12. Penalties for Falsification of Reports

Section 309(c)(4) of the CWA provides that any person who knowingly makes any false material statement, representation, or certification in any record or other document submitted or required to be maintained under this General Permit, including reports of compliance or noncompliance shall upon conviction, be punished by a fine of not more than $10,000 or by imprisonment for not more than two years or by both.

13. Oil and Hazardous Substance Liability

Nothing in this General Permit shall be construed to preclude the institution of any legal action or relieve the discharger from any responsibilities, liabilities, or penalties to which the LUP discharger is or may be subject to under Section 311 of the CWA.

14. Severability

The provisions of this General Permit are severable; and, if any provision of this General Permit or the application of any provision of this General Permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this General Permit shall not be affected thereby.

15. Reopener Clause

This General Permit may be modified, revoked and reissued, or terminated for cause due to promulgation of amended regulations, receipt of USEPA guidance concerning regulated activities, judicial decision, or in accordance with 40 Code of Federal Regulations (CFR) 122.62, 122.63, 122.64, and 124.5.

16. Penalties for Violations of Permit Conditions

a. Section 309 of the CWA provides significant penalties for any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the CWA or any permit condition or limitation implementing any such section in a permit issued under Section 402. Any person who violates any permit condition of this General Permit is

subject to a civil penalty not to exceed $37,500[7] per calendar day of such violation, as well as any other appropriate sanction provided by Section 309 of the CWA.

b. The Porter-Cologne Water Quality Control Act also provides for civil and criminal penalties, which in some cases are greater than those under the CWA.

17. Transfers

This General Permit is not transferable. A new LRP of an ongoing construction activity must submit PRDs in accordance with the requirements of this General Permit to be authorized to discharge under this General Permit. An LRP who is a property owner with active General Permit coverage who sells a fraction or all the land shall inform the new property owner(s) of the requirements of this General Permit.

18. Continuation of Expired Permit

This General Permit continues in force and effect until a new General Permit is issued or the SWRCB rescinds this General Permit. Only those dischargers authorized to discharge under the expiring General Permit are covered by the continued General Permit.

F. EFFLUENT STANDARDS

1. Narrative Effluent Limitations

a. LUP dischargers shall ensure that storm water discharges and authorized non-storm water discharges regulated by this General Permit do not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

b. LUP dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of structural or non-structural controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

[7] May be further adjusted in accordance with the Federal Civil Penalties Inflation Adjustment Act

2. Numeric Effluent Limitations (NELs)

Table 1. Numeric Effluent Limitations, Numeric Action Levels, Test Methods, Detection Limits, and Reporting Units

Parameter	Test Method	Discharge Type	Min. Detection Limit	Units	Numeric Action Level	Numeric Effluent Limitation
pH	Field test with calibrated portable instrument	LUP Type 2	0.2	pH units	lower NAL = 6.5 upper NAL = 8.5	N/A
		LUP Type 3			lower NAL = 6.5 upper NAL = 8.5	lower NEL = 6.0 upper NEL = 9.0
Turbidity	EPA 0180.1 and/or field test with calibrated portable instrument	LUP Type 2	1 NTU		250 NTU	N/A
		LUP Type 3			250 NTU	500 NTU

a. Numeric Effluent Limitations (NELs):

i **Storm Event, Daily Average pH Limits –** For LUP Type 3 dischargers, the daily average pH of storm water and non-storm water discharges shall be within the ranges specified in Table 1 during any project phase where there is a "high risk of pH discharge."[8]

ii **Storm Event Daily Average Turbidity Limit –** For LUP Type 3 dischargers, the daily average turbidity of storm water and non-storm water discharges shall not exceed 500 NTU.

[8] A period of high risk of pH discharge is defined as a project's complete utilities phase, complete vertical build phase, and any portion of any phase where significant amounts of materials are placed directly on the land at the site in a manner that could result in significant alterations of the background pH of the discharges.

b. If a daily average sample result is outside the range of pH NELs (i.e., is below the lower NEL for pH or exceeds the upper NEL for pH) or exceeds the turbidity NEL (as listed in Table 1), the discharger is in violation of this General Permit and shall electronically file the results in violation within 5 business days of obtaining the results.

c. Compliance Storm Event:

Discharges of storm water from LUP Type 3 sites shall comply with applicable NELs (above) unless the storm event causing the discharges is determined after the fact to be equal to or larger than the Compliance Storm Event (expressed in inches of rainfall). The Compliance Storm Event for LUP Type 3 discharges is the 5-year, 24-hour storm (expressed in tenths of an inch of rainfall), as determined by using these maps:

http://www.wrcc.dri.edu/pcpnfreq/nca5y24.gif
http://www.wrcc.dri.edu/pcpnfreq/sca5y24.gif

Compliance storm event verification shall be done by reporting on-site rain gauge readings as well as nearby governmental rain gauge readings.

d. Dischargers shall not be required to comply with NELs if the site receives run-on from a forest fire or any other natural disaster.

3. Numeric Action Levels (NALs)

a. For LUP Type 2 and 3 dischargers, the lower storm event daily average NAL for pH is 6.5 pH units and the upper storm event daily average NAL for pH is 8.5 pH units. The LUP discharger shall take actions as described below if the storm event daily average discharge is outside of this range of pH values.

b. For LUP Type 2 and 3 dischargers, the storm event daily average NAL for turbidity is 250 NTU. The discharger shall take actions as described below if the storm event daily average discharge is outside of this range of turbidity values.

c. Whenever daily average analytical effluent monitoring results indicate that the discharge is below the lower NAL for pH, exceeds the upper NAL for pH, or exceeds the turbidity NAL (as listed in Table 1), the LUP discharger shall conduct a construction site and run-on evaluation to determine whether pollutant source(s) associated with the site's construction activity may have caused or contributed to the NAL

exceedance and shall immediately implement corrective actions if they are needed.

d. The site evaluation will be documented in the SWPPP and specifically address whether the source(s) of the pollutants causing the exceedance of the NAL:

i Are related to the construction activities and whether additional BMPs or SWPPP implementation measures are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) determine what corrective action(s) were taken or will be taken and with a description of the schedule for completion.

AND/OR:

ii Are related to the run-on associated with the construction site location and whether additional BMPs or SWPPP implementation measures are required to (1) meet BAT/BCT requirements; (2) reduce or prevent pollutants in storm water discharges from causing exceedances of receiving water objectives; and (3) decide what corrective action(s) were taken or will be taken, including a description of the schedule for completion.

G. RECEIVING WATER LIMITATIONS

1. LUP dischargers shall ensure that storm water discharges and authorized non-storm water discharges to any surface or ground water will not adversely affect human health or the environment.

2. LUP dischargers shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants in quantities that threaten to cause pollution or a public nuisance.

3. LUP dischargers shall ensure that storm water discharges and authorized non-storm water discharges will not contain pollutants that cause or contribute to an exceedance of any applicable water quality objectives or water quality standards (collectively, WQS) contained in a Statewide Water Quality Control Plan, the California Toxics Rule, the National Toxics Rule, or the applicable Regional Water Board's Water Quality Control Plan (Basin Plan).

H. TRAINING QUALIFICATIONS

1. General

All persons responsible for implementing requirements of this General Permit shall be appropriately trained. Training should be both formal and informal, occur on an ongoing basis, and should include training offered by recognized governmental agencies or professional organizations. Persons responsible for preparing, amending and certifying SWPPPs shall comply with the requirements in this Section H.

2. SWPPP Certification Requirements

a. **Qualified SWPPP Developer:** The LUP discharger shall ensure that all SWPPPs be written, amended and certified by a Qualified SWPPP Developer (QSD). A QSD shall have one of the following registrations or certifications, and appropriate experience, as required for:

i A California registered professional civil engineer;

ii A California registered professional geologist or engineering geologist;

iii A California registered landscape architect;

iv A professional hydrologist registered through the American Institute of Hydrology;

v A certified professional in erosion and sediment control (CPESC) ™ registered through Enviro Cert International, Inc;

vi A certified professional in storm water quality (CPSWQ)™ registered through Enviro Cert International, Inc.; or

vii A certified professional in erosion and sediment control registered through the National Institute for Certification in Engineering Technologies (NICET).

Effective two years after the adoption date of this General Permit, a QSD shall have attended a State Water Board-sponsored or approved QSD training course.

b. The LUP discharger shall ensure that the SWPPP is written and amended, as needed, to address the specific circumstances for each construction site covered by this General Permit prior to commencement of construction activity for any stage.

c. The LUP discharger shall list the name and telephone number of the currently designated Qualified SWPPP Developer(s) in the SWPPP.

d. **Qualified SWPPP Practitioner:** The LUP discharger shall ensure that all elements of any SWPPP for each project will be implemented by a Qualified SWPPP Practitioner (QSP). A QSP is a person responsible for non-storm water and storm water visual observations, sampling and analysis, and for ensuring full compliance with the permit and implementation of all elements of the SWPPP. Effective two years from the date of adoption of this General Permit, a QSP shall be either a QSD or have one of the following certifications:

   i A certified erosion, sediment and storm water inspector registered through Certified Professional in Erosion and Sediment Control, Inc.; or

   ii A certified inspector of sediment and erosion control registered through Certified Inspector of Sediment and Erosion Control, Inc.

   Effective two years after the adoption date of this General Permit, a QSP shall have attended a State Water Board-sponsored or approved QSP training course.

e. The LUP discharger shall ensure that the SWPPP include a list of names of all contractors, subcontractors, and individuals who will be directed by the Qualified SWPPP Practitioner, and who is ultimately responsible for implementation of the SWPPP. This list shall include telephone numbers and work addresses. Specific areas of responsibility of each subcontractor and emergency contact numbers shall also be included.

f. The LUP discharger shall ensure that the SWPPP and each amendment be signed by the Qualified SWPPP Developer. The LUP discharger shall include a listing of the date of initial preparation and the dates of each amendment in the SWPPP.

I. TYPES OF LINEAR PROJECTS

This attachment establishes three types (Type 1, 2 & 3) of complexity for areas within an LUP or project section based on threat to water quality. Project area Types are determined through Attachment A.1.

The Type 1 requirements below establish the baseline requirements for all LUPs subject to this General Permit. Additional requirements for Type 2 and Type 3 LUPs are labeled.

1. Type 1 LUPs*:*

LUP dischargers with areas of a LUP designated as Type 1 shall comply with the requirements in this Attachment. Type 1 LUPs are:

a. Those construction areas where 70 percent or more of the construction activity occurs on a paved surface and where areas disturbed during construction will be returned to preconstruction conditions or equivalent protection established at the end of the construction activities for the day; or

b. Where greater than 30 percent of construction activities occur within the non-paved shoulders or land immediately adjacent to paved surfaces, or where construction occurs on unpaved improved roads, including their shoulders or land immediately adjacent to them where:

   i Areas disturbed during construction will be returned to preconstruction conditions or equivalent protection is established at the end of the construction activities for the day to minimize the potential for erosion and sediment deposition, and

   ii Areas where established vegetation was disturbed during construction will be stabilized and re-vegetated by the end of project. When required, adequate temporary stabilization BMPs will be installed and maintained until vegetation is established to meet minimum cover requirements established in this General Permit for final stabilization.

c. Where the risk determination is as follows:

   i Low sediment risk, low receiving water risk, or

   ii Low sediment risk, medium receiving water risk, or

   iii Medium sediment risk, low receiving water risk

2. Type 2 LUPs:

Type 2 LUPs are determined by the Combined Risk Matrix in Attachment A.1. Type 2 LUPs have the specified combination of risk:

d. High sediment risk, low receiving water risk, or

e. Medium sediment risk, medium receiving water risk, or

f. Low sediment risk, high receiving water risk

Receiving water risk is either considered "Low" for those areas of the project that are not in close proximity to a sensitive receiving watershed, "Medium" for those areas of the project within a sensitive receiving watershed yet outside of the flood plain of a sensitive receiving water body, and "High" where the soil disturbance is within close proximity to a sensitive receiving water body. Project sediment risk is calculated based on the Risk Factor Worksheet in Attachment C of this General Permit.

3. Type 3 LUPs:

Type 3 LUPs are determined by the Combined Risk Matrix in Attachment A.1. Type 3 LUPs have the specified combination of risk:

a. High sediment risk, high receiving water risk, or

b. High sediment risk, medium receiving water risk, or

c. Medium sediment risk, high receiving water risk

Receiving water risk is either considered "Medium" for those areas of the project within a sensitive receiving watershed yet outside of the flood plain of a sensitive receiving water body, or "High" where the soil disturbance is within close proximity to a sensitive receiving water body. Project sediment risk is calculated based on the Risk Factor Worksheet in Attachment C.

J. LUP TYPE-SPECIFIC REQUIREMENTS

1. Effluent Standards

a. Narrative – LUP dischargers shall comply with the narrative effluent standards below.

i Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

ii LUP dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

b. Numeric – LUP Type 1 dischargers are not subject to a numeric effluent standard

c. Numeric –LUP Type 2 dischargers are subject to a pH NAL of 6.5-8.5, and a turbidity NAL of 250 NTU.

d. Numeric – LUP Type 3 dischargers are subject to a pH NAL of 6.5-8.5, and a turbidity NAL of 250 NTU. In addition, LUP Type 3 dischargers are subject to a pH NEL of 6.0-9.0 and a turbidity NEL of 500 NTU.

2. Good Site Management "Housekeeping"

a. LUP dischargers shall implement good site management (i.e., "housekeeping") measures for <u>construction materials</u> that could potentially be a threat to water quality if discharged. At a minimum, the good housekeeping measures shall consist of the following:

i Identify the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

ii Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

iii Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).

iv Minimize exposure of construction materials to precipitation (not applicable to materials designed to be outdoors and exposed to the environment).

v Implement BMPs to control the off-site tracking of loose construction and landscape materials.

b. LUP dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:

i Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

ii Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.

iii Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.

iv Cover waste disposal containers at the end of every business day and during a rain event.

v Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.

vi Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.

vii Implement procedures that effectively address hazardous and non-hazardous spills.

viii Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require that:

(1) Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly; and

(2) Appropriate spill response personnel are assigned and trained.

ix Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

c. LUP dischargers shall implement good housekeeping for vehicle storage and maintenance, which, at a minimum, shall consist of the following:

   i Prevent oil, grease, or fuel from leaking into the ground, storm drains or surface waters.

   ii Implement appropriate BMPs whenever equipment or vehicles are fueled, maintained or stored.

   iii Clean leaks immediately and disposing of leaked materials properly.

d. LUP dischargers shall implement good housekeeping for landscape materials, which, at a minimum, shall consist of the following:

   i Contain stockpiled materials such as mulches and topsoil when they are not actively being used.

   ii Contain fertilizers and other landscape materials when they are not actively being used.

   iii Discontinue the application of any erodible landscape material at least 2 days before a forecasted rain event[9] or during periods of precipitation.

   iv Applying erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.

   v Stacking erodible landscape material on pallets and covering or storing such materials when not being used or applied.

e. LUP dischargers shall conduct an assessment and create a list of potential pollutant sources and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, LUP dischargers shall do the following:

[9] 50% or greater chance of producing precipitation.

i Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.

ii Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.

iii Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.

iv Ensure retention of sampling, visual observation, and inspection records.

v Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.

f. LUP dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations.

3. Non-Storm Water Management

a. LUP dischargers shall implement measures to control all non-storm water discharges during construction.

b. LUP dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.

c. LUP dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

4. Erosion Control

a. LUP dischargers shall implement effective wind erosion control.

b. LUP dischargers shall provide effective soil cover for inactive[10] areas and all finished slopes, and utility backfill.

[10] Areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days

c. LUP dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

5. Sediment Controls

a. LUP dischargers shall establish and maintain effective perimeter controls as needed, and implement effective BMPs for all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.

b. On sites where sediment basins are to be used, LUP dischargers shall, at minimum, design sediment basins according to the guidance provided in CASQA's Construction BMP Handbook.

c. **Additional LUP Type 2 & 3 Requirement:** LUP Type 2 & 3 dischargers shall apply linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths[11] in accordance with Table 2 below.

Table 2 – Critical Slope/Sheet Flow Length Combinations

Slope Percentage	Sheet flow length not to exceed
0-25% 20	feet
25-50% 15	feet
Over 50%	10 feet

d. **Additional LUP Type 2 & 3 Requirement:** LUP Type 2 & 3 dischargers shall ensure that construction activity traffic to and from the project is limited to entrances and exits that employ effective controls to prevent off-site tracking of sediment.

e. **Additional LUP Type 2 & 3 Requirement:** LUP Type 2 & 3 dischargers shall ensure that all storm drain inlets and perimeter controls, runoff control BMPs, and pollutant controls at entrances and exits (e.g. tire washoff locations) are maintained and protected from activities that reduce their effectiveness.

f. **Additional LUP Type 2 & 3 Requirement:** LUP Type 2 & 3 dischargers shall inspect all immediate access roads. At a minimum daily and prior to any rain event, the discharger shall remove any

[11] Sheet flow length is the length that shallow, low velocity flow travels across a site.

sediment or other construction activity-related materials that are deposited on the roads (by vacuuming or sweeping).

g. **Additional LUP Type 3 Requirement:** The Regional Water Board may require LUP Type 3 dischargers to implement additional site-specific sediment control requirements if the implementation of the other requirements in this section are not adequately protecting the receiving waters.

6. Run-on and Run-off Controls

a. LUP dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site-shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this Attachment.

b. Run-on and runoff controls are not required for Type 1 LUPs unless the evaluation of quantity and quality of run-on and runoff deems them necessary or visual inspections show that the site requires such controls.

7. Inspection, Maintenance and Repair

a. All inspection, maintenance repair and sampling activities at the discharger's LUP location shall be performed or supervised by a QSP representing the discharger. The QSP may delegate any or all of these activities to an employee trained to do the task(s) appropriately, but shall ensure adequate deployment.

b. LUP dischargers shall conduct visual inspections and observations daily during working hours (not recorded). At least once each 24-hour period during extended storm events, **LUP Type 2 & 3 dischargers** shall conduct visual inspections to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.

c. Upon identifying failures or other shortcomings, as directed by the QSP, LUP dischargers shall begin implementing repairs or design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.

d. For each pre- and post-rain event inspection required, LUP dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format that includes the information described below.

e. The LUP discharger shall ensure that the checklist remains on-site or with the SWPPP. At a minimum, an inspection checklist should include:

   i Inspection date and date the inspection report was written.

   ii Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.

   iii Site information, including stage of construction, activities completed, and approximate area of the site exposed.

   iv A description of any BMPs evaluated and any deficiencies noted.

   v If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.

   vi Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.

   vii Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.

   viii Photographs taken during the inspection, if any.

   ix Inspector's name, title, and signature.

K. STORM WATER POLLUTION PREVENTION PLAN (SWPPP) REQUIREMENTS

1. Objectives

SWPPPs for all LUPs shall be developed and amended or revised by a QSD. The SWPPP shall be designed to address the following objectives:

a. All pollutants and their sources, including sources of sediment, associated with construction activities associated with LUP activity are controlled;

b. All non-storm water discharges are identified and either eliminated, controlled, or treated;

c. BMPs are effective and result in the reduction or elimination of pollutants in storm water discharges and authorized non-storm water discharges from LUPs during construction; and

d. Stabilization BMPs installed to reduce or eliminate pollutants after construction is completed are effective and maintained.

2. SWPPP Implementation Schedule

a. LUPs for which PRDs have been submitted to the State Water Board shall develop a site/project location SWPPP prior to the start of land-disturbing activity in accordance with this Section and shall implement the SWPPP concurrently with commencement of soil-disturbing activities.

b. For an ongoing LUP involving a change in the LRP, the new LRP shall review the existing SWPPP and amend it, if necessary, or develop a new SWPPP within 15 calendar days to conform to the requirements set forth in this General Permit.

3. Availability

The SWPPP shall be available at the construction site during working hours while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone.

L. REGIONAL WATER BOARD AUTHORITIES

1. Regional Water Boards shall administer the provisions of this General Permit. Administration of this General Permit may include, but is not limited to, requesting the submittal of SWPPPs, reviewing SWPPPs, reviewing monitoring and sampling and analysis reports, conducting compliance inspections, gathering site information by any medium including sampling, photo and video documentation, and taking enforcement actions.

2. Regional Water Boards may terminate coverage under this General Permit for dischargers who fail to comply with its requirements or where they determine that an individual NPDES permit is appropriate.

3. Regional Water Boards may issue separate permits for discharges of storm water associated with construction activity to individual dischargers, categories of dischargers, or dischargers in a geographic area. Upon issuance of such permits by a Regional Water Board, dischargers subject to those permits shall no longer be regulated by this General Permit.

4. Regional Water Boards may direct the discharger to reevaluate the LUP Type(s) for the project (or elements/areas of the project) and impose the appropriate level of requirements.

5. Regional Water Boards may terminate coverage under this General Permit for dischargers who negligently or with willful intent incorrectly determine or report their LUP Type (e.g., they determine themselves to be a LUP Type 1 when they are actually a Type 2).

6. Regional Water Boards may review PRDs and reject or accept applications for permit coverage or may require dischargers to submit a Report of Waste Discharge / NPDES permit application for Regional Water Board consideration of individual requirements.

7. Regional Water Boards may impose additional requirements on dischargers to satisfy TMDL implementation requirements or to satisfy provisions in their Basin Plans.

8. Regional Water Boards may require additional Monitoring and Reporting Program Requirements, including sampling and analysis of discharges to sediment-impaired water bodies.

9. Regional Water Boards may require dischargers to retain records for more than the three years required by this General Permit.

10. Based on an LUP's threat to water quality and complexity, the Regional Water Board may determine on a case-by-case basis that an LUP, or a portion of an LUP, is not eligible for the linear project requirements contained in this Attachment, and require that the discharger comply with all standard requirements in this General Permit.

11. The Regional Water Board may require additional monitoring and reporting program requirements including sampling and analysis of discharges to CWA § 303(d)-listed water bodies. Additional requirements imposed by the Regional Water Board shall be consistent with the overall monitoring effort in the receiving waters.

M. MONITORING AND REPORTING REQUIREMENTS

Table 3. LUP Summary of Monitoring Requirements

LUP Type	Visual Inspections				Sample Collection		
	Daily Site BMP	Pre-storm Event / Baseline	Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water	Non-Visible (when applicable)
1	X						x
2	X	X	X	X	X		x
3	X	X	X	X	X	X	x

1. Objectives

LUP dischargers shall prepare a monitoring and reporting program (M&RP) prior to the start of construction and immediately implement the program at the start of construction for LUPs. The monitoring program must be implemented at the appropriate level to protect water quality at all times throughout the life of the project. The M&RP must be a part of the SWPPP, included as an appendix or separate SWPPP chapter.

2. M&RP Implementation Schedule

a. LUP dischargers shall implement the requirements of this Section at the time of commencement of construction activity. LUP dischargers are responsible for implementing these requirements until construction activity is complete and the site is stabilized.

b. LUP dischargers shall revise the M&RP when:

i Site conditions or construction activities change such that a change in monitoring is required to comply with the requirements and intent of this General Permit.

ii The Regional Water Board requires the discharger to revise its M&RP based on its review of the document. Revisions may include, but not be limited to, conducting additional site inspections, submitting reports, and certifications. Revisions shall be submitted via postal mail or electronic e-mail.

iii The Regional Water Board may require additional monitoring and reporting program requirements including sampling and analysis of discharges to CWA § 303(d)-listed water bodies. Additional requirements imposed by the Regional Water Board shall be consistent with the overall monitoring effort in the receiving waters.

3. LUP Type 1 Monitoring and Reporting Requirements

a. LUP Type 1 Inspection Requirements

i LUP Type 1 dischargers shall ensure that all inspections are conducted by trained personnel. The name(s) and contact number(s) of the assigned inspection personnel should be listed in the SWPPP.

ii LUP Type 1 dischargers shall ensure that all visual inspections are conducted daily during working hours and in conjunction with other daily activities in areas where active construction is occurring.

iii LUP Type 1 dischargers shall ensure that photographs of the site taken before, during, and after storm events are taken during inspections, and submitted through the State Water Board's SMARTS website once every three rain events.

iv LUP Type 1 dischargers shall conduct daily visual inspections to verify that:

(1) Appropriate BMPs for storm water and non-storm water are being implemented in areas where active construction is occurring (including staging areas);

(2) Project excavations are closed, with properly protected spoils, and that road surfaces are cleaned of excavated material and construction materials such as chemicals by either removing or storing the material in protective storage containers at the end of every construction day;

(3) Land areas disturbed during construction are returned to pre-construction conditions or an equivalent protection is used at the end of each workday to eliminate or minimize erosion and the possible discharge of sediment or other pollutants during a rain event.

v Inspections may be discontinued in non-active construction areas where soil-disturbing activities are completed and final soil stabilization is achieved (e.g., paving is completed, substructures

are installed, vegetation meets minimum cover requirements for final stabilization, or other stabilization requirements are met).

vi Inspection programs are required for LUP Type 1 projects where temporary and permanent stabilization BMPs are installed and are to be monitored after active construction is completed. Inspection activities shall continue until adequate permanent stabilization is established and, in areas where re-vegetation is chosen, until minimum vegetative coverage is established in accordance with Section C.1 of this Attachment.

b. LUP Type 1 Monitoring Requirements for Non-Visible Pollutants

LUP Type 1 dischargers shall implement sampling and analysis requirements to monitor non-visible pollutants associated with (1) construction sites; (2) activities producing pollutants that are not visually detectable in storm water discharges; and (3) activities which could cause or contribute to an exceedance of water quality objectives in the receiving waters.

i Sampling and analysis for non-visible pollutants is only required where the LUP Type 1 discharger believes pollutants associated with construction activities have the potential to be discharged with storm water runoff due to a spill or in the event there was a breach, malfunction, failure and/or leak of any BMP. Also, failure to implement BMPs may require sample collection.

(1) Visual observations made during the monitoring program described above will help the LUP Type 1 discharger determine when to collect samples.

(2) The LUP Type 1 discharger is not required to sample if one of the conditions described above (e.g., breach or spill) occurs and the site is cleaned of material and pollutants and/or BMPs are implemented prior to the next storm event.

ii LUP Type 1 dischargers shall collect samples down-gradient from all discharge locations where the visual observations were made triggering the monitoring, and which can be safely accessed. For sites where sampling and analysis is required, personnel trained in water quality sampling procedures shall collect storm water samples.

iii If sampling for non-visible pollutant parameters is required, LUP Type 1 dischargers shall ensure that samples be analyzed for parameters indicating the presence of pollutants identified in the pollutant source assessment required in Section J.2.a.i.

iv LUP Type 1 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.

v LUP Type 1 dischargers shall ensure that a sufficiently large sample of storm water that has not come into contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample[12]) will be collected for comparison with the discharge sample. Samples shall be collected during the first two hours of discharge from rain events that occur during daylight hours and which generate runoff.

vi LUP Type 1 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis. Analyses may include, but are not limited to, indicator parameters such as: pH, specific conductance, dissolved oxygen, conductivity, salinity, and Total Dissolved Solids (TDS).

vii For laboratory analyses, all sampling, sample preservation, and other analyses must be conducted according to test procedures pursuant to 40 C.F.R. Part 136. LUP Type 1 dischargers shall ensure that field samples are collected and analyzed according to manufacturer specifications of the sampling devices employed. Portable meters shall be calibrated according to manufacturer's specification.

viii LUP Type 1 dischargers shall ensure that all field and/or analytical data are kept in the SWPPP document.

c. <u>LUP Type 1 Visual Observation Exceptions</u>

i LUP Type 1 dischargers shall be prepared to collect samples and conduct visual observation (inspections) to meet the minimum visual observation requirements of this Attachment. The Type 1 LUP discharger is not required to physically collect samples or conduct visual observation (inspections) under the following conditions:

(1) During dangerous weather conditions such as flooding and electrical storms;

(2) Outside of scheduled site business hours.

(3) When access to the site is unsafe due to storm events.

[12] Sample collected at a location unaffected by contruction activities.

ii If the LUP Type 1 discharger does not collect the required samples or visual observation (inspections) due to these exceptions, an explanation why the sampling or visual observation (inspections) were not conducted shall be included in both the SWPPP and the Annual Report.

d. Particle Size Analysis for Risk Justification

LUP Type 1 dischargers utilizing justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

4. LUP Type 2 & 3 Monitoring and Reporting Requirements

a. LUP Type 2 & 3 Inspection Requirements

i LUP Type 2 & 3 dischargers shall ensure that all inspections are conducted by trained personnel. The name(s) and contact number(s) of the assigned inspection personnel should be listed in the SWPPP.

ii LUP Type 2 & 3 dischargers shall ensure that all visual inspections are conducted daily during working hours and in conjunction with other daily activities in areas where active construction is occurring.

iii LUP Type 2 & 3 dischargers shall ensure that photographs of the site taken before, during, and after storm events are taken during inspections, and submitted through the State Water Board's SMARTS website once every three rain events.

iv LUP Type 2 & 3 dischargers shall conduct daily visual inspections to verify that appropriate BMPs for storm water and non-storm water are being implemented and in place in areas where active construction is occurring (including staging areas).

v LUP Type 2 & 3 dischargers shall conduct inspections of the construction site prior to anticipated storm events, during extended storm events, and after actual storm events to identify areas contributing to a discharge of storm water associated with construction activity. Pre-storm inspections are to ensure that BMPs are properly installed and maintained; post-storm inspections are to assure that BMPs have functioned adequately. During

extended storm events, inspections shall be required during normal working hours for each 24-hour period.

vi Inspections may be discontinued in non-active construction areas where soil-disturbing activities are completed and final soil stabilization is achieved (e.g., paving is completed, substructures are installed, vegetation meets minimum cover requirements for final stabilization, or other stabilization requirements are met).

vii LUP Type 2 & 3 dischargers shall implement a monitoring program for inspecting projects that require temporary and permanent stabilization BMPs after active construction is complete. Inspections shall ensure that the BMPs are adequate and maintained. Inspection activities shall continue until adequate permanent stabilization is established and, in vegetated areas, until minimum vegetative coverage is established in accordance with Section C.1 of this Attachment.

viii If possible, LUP Type 2 & 3 dischargers shall install a rain gauge on-site at an accessible and secure location with readings made during all storm event inspections. When readings are unavailable, data from the closest rain gauge with publically available data may be used.

ix LUP Type 2 & 3 dischargers shall Include and maintain a log of the inspections conducted in the SWPPP. The log will provide the date and time of the inspection and who conducted the inspection.

b. <u>LUP Type 2 & 3 Storm Water Effluent Monitoring Requirements</u>

Table 4. LUP Type 2 & 3 Effluent Monitoring Requirements

LUP Type	Frequency	Effluent Monitoring
2	Minimum of 3 samples per day characterizing discharges associated with construction activity from the project active areas of construction.	Turbidity, pH, and non-visible pollutant parameters (if applicable)
3	Minimum of 3 samples per day characterizing discharges associated with construction activity from the project active areas of construction.	turbidity, pH, suspended sediment concentrations (SSC)[13] (only if turbidity NEL exceeded), plus non-visible pollutant parameters (if applicable)

i LUP Type 2 & 3 dischargers shall collect storm water grab samples from sampling locations characterizing discharges associated with

[13] Suspended Sediment Concentration monitoring is required for any Type 3 area that exceeds its turbidity NEL.

activity from the LUP active areas of construction. At a minimum, 3 samples shall be collected per day of discharge.

ii LUP Type 2 & 3 dischargers shall collect samples of stored or contained storm water that is discharged subsequent to a storm event producing precipitation of ½ inch or more at the time of discharge.

iii LUP Type 2 & 3 dischargers shall ensure that storm water grab sample(s) obtained be representative of the flow and characteristics of the discharge.

iv LUP Type 2 & 3 dischargers shall analyze their effluent samples for:

(1) pH and turbidity
(2) Any additional parameter for which monitoring is required by the Regional Water Board.

v LUP Type 3 dischargers that have violated the turbidity daily average NEL shall analyze subsequent effluent samples for turbidity and SSC.

c. <u>LUP Type 2 & 3 Storm Water Effluent Sampling Locations</u>

i LUP Type 2 & 3 dischargers shall perform sampling and analysis of storm water discharges to characterize discharges associated with construction activity from the entire disturbed project or area.

ii LUP Type 2 & 3 dischargers may monitor and report run-on from surrounding areas if there is reason to believe run-on may contribute to exceedance of NALs or NELs (applicable to Type 3).

iii LUP Type 2 & 3 dischargers shall select analytical test methods from the list provided in Table 5 below.

iv LUP Type 2 & 3 dischargers shall ensure that all storm water sample collection preservation and handling shall be conducted in accordance with the “Storm Water Sample Collection and Handling Instructions” below.

d. <u>LUP Type 3 Receiving Water Monitoring Requirements</u>

i In the event that an LUP Type 3 discharger violates an applicable NEL contained in this General Permit and has a direct discharge to receiving waters, the LUP discharger shall subsequently sample Receiving Waters (RWs) for turbidity, pH (if applicable) and SSC.

ii LUP Type 3 dischargers that meet the project criteria in Appendix 3 of this General Permit and have more than 30 acres of soil disturbance in the project area or project section area designated as Type 3, shall comply with the Bioassessment requirements prior to commencement of construction activity.

iii LUP Type 3 dischargers shall obtain RW samples in accordance with the requirements of the Receiving Water Sampling Locations section (Section M.4.d of this Attachment).

e. LUP Type 3 Receiving Water Sampling Locations

i **Upstream/up-gradient RW samples**: LUP Type 3 dischargers shall obtain any required upstream/up-gradient receiving water samples from a representative and accessible location as close as possible to and upstream from the effluent discharge point.

ii **Downstream/down-gradient RW samples**: LUP Type 3 dischargers shall obtain any required downstream/down-gradient receiving water samples from a representative and accessible location as close as possible to and downstream from the effluent discharge point.

iii If two or more discharge locations discharge to the same receiving water, LUP Type 3 dischargers may sample the receiving water at a single upstream and downstream location.

f. LUP Type 2 & 3 Monitoring Requirements for Non-Visible Pollutants

LUP Type 2 & 3 dischargers shall implement sampling and analysis requirements to monitor non-visible pollutants associated with (1) construction sites; (2) activities producing pollutants that are not visually detectable in storm water discharges; and (3) activities which could cause or contribute to an exceedance of water quality objectives in the receiving waters.

i Sampling and analysis for non-visible pollutants is only required where LUP Type 2 & 3 dischargers believe pollutants associated with construction activities have the potential to be discharged with storm water runoff due to a spill or in the event there was a breach, malfunction, failure and/or leak of any BMP. Also, failure to implement BMPs may require sample collection.

(1) Visual observations made during the monitoring program described above will help LUP Type 2 & 3 dischargers determine when to collect samples.

(2) LUP Type 2 & 3 dischargers are not required to sample if one of the conditions described above (e.g., breach or spill) occurs and the site is cleaned of material and pollutants and/or BMPs are implemented prior to the next storm event.

ii LUP Type 2 & 3 dischargers shall collect samples down-gradient from the discharge locations where the visual observations were made triggering the monitoring and which can be safely accessed. For sites where sampling and analysis is required, personnel trained in water quality sampling procedures shall collect storm water samples.

iii If sampling for non-visible pollutant parameters is required, LUP Type 2 & 3 dischargers shall ensure that samples be analyzed for parameters indicating the presence of pollutants identified in the pollutant source assessment required in Section J.2.a.i.

iv LUP Type 2 & 3 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.

v LUP Type 2 & 3 dischargers shall ensure that a sufficiently large sample of storm water that has not come into contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample[14]) will be collected for comparison with the discharge sample. Samples shall be collected during the first two hours of discharge from rain events that occur during daylight hours and which generate runoff.

vi LUP Type 2 & 3 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis. Analyses may include, but are not limited to, indicator parameters such as: pH, specific conductance, dissolved oxygen, conductivity, salinity, and Total Dissolved Solids (TDS).

vii For laboratory analyses, all sampling, sample preservation, and other analyses must be conducted according to test procedures pursuant to 40 C.F.R. Part 136. LUP Type 2 & 3 dischargers shall ensure that field samples are collected and analyzed according to manufacturer specifications of the sampling devices employed. Portable meters shall be calibrated according to manufacturer's specification.

viii LUP Type 2 & 3 dischargers shall ensure that all field and/or analytical data are kept in the SWPPP document.

[14] Sample collected at a location unaffected by construction activities

g. LUP Type 2 & 3 Visual Observation and Sample Collection Exceptions

i LUP Type 2 & 3 dischargers shall be prepared to collect samples and conduct visual observation (inspections) to meet the minimum visual observation requirements of this Attachment. Type 2 & 3 LUP dischargers are not required to physically collect samples or conduct visual observation (inspections) under the following conditions:

(1) During dangerous weather conditions such as flooding and electrical storms;

(2) Outside of scheduled site business hours.

(3) When access to the site is unsafe due to storm events.

ii If the LUP Type 2 or 3 discharger does not collect the required samples or visual observation (inspections) due to these exceptions, an explanation why the sampling or visual observation (inspections) were not conducted shall be included in both the SWPPP and the Annual Report.

h. LUP Type 2 & 3 Storm Water Sample Collection and Handling Instructions

LUP Type 2 & 3 dischargers shall refer to Table 5 below for test Methods, detection Limits, and reporting Units. During storm water sample collection and handling, the LUP Type 2 & 3 discharger shall:

i Identify the parameters required for testing and the number of storm water discharge points that will be sampled. Request the laboratory to provide the appropriate number of sample containers, types of containers, sample container labels, blank chain of custody forms, and sample preservation instructions.

ii Determine how to ship the samples to the laboratory. The testing laboratory should receive samples within 48 hours of the physical sampling (unless otherwise required by the laboratory). The options are to either deliver the samples to the laboratory, arrange to have the laboratory pick them up, or ship them overnight to the laboratory.

iii Use only the sample containers provided by the laboratory to collect and store samples. Use of any other type of containers could contaminate your samples.

iv Prevent sample contamination, by not touching, or putting anything into the sample containers before collecting storm water samples.

v Not overfilling sample containers. Overfilling can change the analytical results.

vi Tightly screw the cap of each sample container without stripping the threads of the cap.

vii Complete and attach a label to each sample container. The label shall identify the date and time of sample collection, the person taking the sample, and the sample collection location or discharge point. The label should also identify any sample containers that have been preserved.

viii Carefully pack sample containers into an ice chest or refrigerator to prevent breakage and maintain temperature during shipment. Remember to place frozen ice packs into the shipping container. Samples should be kept as close to 4° C (39° F) as possible until arriving at the laboratory. Do not freeze samples.

ix Complete a Chain of Custody form for each set of samples. The Chain of Custody form shall include the discharger's name, address, and phone number, identification of each sample container and sample collection point, person collecting the samples, the date and time each sample container was filled, and the analysis that is required for each sample container.

x Upon shipping/delivering the sample containers, obtain both the signatures of the persons relinquishing and receiving the sample containers.

xi Designate and train personnel to collect, maintain, and ship samples in accordance with the above sample protocols and good laboratory practices.

xii Refer to the Surface Water Ambient Monitoring Program's (SWAMP) Quality Assurance Management Plan (QAMP) for more information on sampling collection and analysis. See http://www.waterboards.ca.gov/water_issues/programs/swamp/[15] QAMP Link: http://www.waterboards.ca.gov/water_issues/programs/swamp/qamp.shtml

[15] Additional information regarding QAMP can be found at http://mpsl.mlml.calstate.edu/swqacompare.htm.

Table 5. Test Methods, Detection Limits, Reporting Units and Applicable NALs/NELs

Parameter	Test Method	Discharge Type	Min. Detection Limit	Reporting Units	Numeric Action Levels	Numeric Effluent Limitation (LUP Type 3)
pH	Field test with calibrated portable instrument	Type 2 & 3	0.2	pH units	Lower = 6.5 upper = 8.5	Lower = 6.0 upper = 9.0
Turbidity	EPA 0180.1 and/or field test with calibrated portable instrument	Type 2 & 3	1	NTU	250 NTU	500 NTU
SSC	ASTM Method D 3977-97[16]	Type 3 if NEL is exceeded	5 Mg/L		N/A	N/A
Bioassessment	(STE) Level I of (SAFIT),[17] fixed-count of 600 org/sample	Type 3 LUPs > 30 acres	N/A N/A		N/A	N/A

i. <u>LUP Type 2 & 3 Monitoring Methods</u>

i The LUP Type 2 or 3 discharger's project M&RP shall include a description of the following items:

(1) Visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures.

(2) Sampling locations, and sample collection and handling procedures. This shall include detailed procedures for sample collection, storage, preservation, and shipping to the testing lab to assure that consistent quality control and quality assurance is maintained. Dischargers shall attach to the monitoring program a copy of the Chain of Custody form used when handling and shipping samples.

[16] ASTM, 1999, Standard Test Method for Determining Sediment Concentration in Water Samples: American Society of Testing and Materials, D 3977-97, Vol. 11.02, pp. 389-394

[17] The current SAFIT STEs (28 November 2006) list requirements for both the Level I and Level II taxonomic effort, and are located at: http://www.swrcb.ca.gov/swamp/docs/safit/ste_list.pdf. When new editions are published by SAFIT, they will supersede all previous editions. All editions will be posted at the State Water Board's SWAMP website.

(3) Identification of the analytical methods and related method detection limits (if applicable) for each parameter required in Section M.4.f above.

ii LUP Type 2 & 3 dischargers shall ensure that all sampling and sample preservation be in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association). All monitoring instruments and equipment (including a discharger's own field instruments for measuring pH and turbidity) shall be calibrated and maintained in accordance with manufacturers' specifications to ensure accurate measurements. All laboratory analyses shall be conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified in this General Permit or by the Regional Water Board. With the exception of field analysis conducted by the discharger for turbidity and pH, all analyses shall be sent to and conducted at a laboratory certified for such analyses by the State Department of Health Services (SSC exception). The LUP discharger shall conduct its own field analysis of pH and may conduct its own field analysis of turbidity if the discharger has sufficient capability (qualified and trained employees, properly calibrated and maintained field instruments, etc.) to adequately perform the field analysis.

j. <u>LUP Type 2 & 3 Analytical Methods</u>

LUP Type 2 & 3 dischargers shall refer to Table 5 above for test Methods, detection Limits, and reporting Units.

i **pH**: LUP Type 2 & 3 dischargers shall perform pH analysis on-site with a calibrated pH meter or pH test kit. The LUP discharger shall record pH monitoring results on paper and retain these records in accordance with Section M.4.o, below.

ii **Turbidity**: LUP Type 2 & 3 dischargers shall perform turbidity analysis using a calibrated turbidity meter (turbidimeter), either on-site or at an accredited lab. Acceptable test methods include Standard Method 2130 or USEPA Method 180.1. The results shall be recorded in the site log book in Nephelometric Turbidity Units (NTU).

iii **Suspended sediment concentration (SSC)**: LUP Type 3 dischargers exceeding their NEL, shall perform SSC analysis using ASTM Method D3977-97.

iv **Bioassessment**: LUP Type 3 dischargers shall perform bioassessment sampling and analysis according to Appendix 3 of this General Permit.

k. Watershed Monitoring Option

If an LUP Type 2 or 3 discharger is part of a qualified regional watershed-based monitoring program the LUP Type 2 or 3 discharger may be eligible for relief from the monitoring requirements in this Attachment. The Regional Water Board may approve proposals to substitute an acceptable watershed-based monitoring program if it determines that the watershed-based monitoring program will provide information to determine each discharger's compliance with the requirements of this General Permit.

l. Particle Size Analysis for Risk Justification

LUP Type 2 & 3 dischargers justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

m. NAL Exceedance Report

i In the event that any effluent sample exceeds an applicable NAL, the Regional Water Boards may require LUP Type 2 & 3 dischargers to submit NAL Exceedance Reports.

ii LUP Type 2 & 3 dischargers shall certify each NAL Exceedance Report in accordance with the Special Provisions for Construction Activity.

iii LUP Type 2 & 3 dischargers shall retain an electronic or paper copy of each NAL Exceedance Report for a minimum of three years after the date the exceedance report is filed.

iv LUP Type 2 & 3 dischargers shall include in the NAL Exceedance Report:

(1) the analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as "less than the method detection limit"); and
(2) the date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation.

(3) Description of the current BMPs associated with the effluent sample that exceeded the NAL and the proposed corrective actions taken.

n. NEL Violation Report

i All LUP Type 3 dischargers shall electronically submit all storm event sampling results to the State Water Board no later than 5 days after the conclusion of the storm event.

ii In the event that a LUP Type 3 discharger has violated an applicable NEL, the discharger shall submit an NEL Violation Report to the State Water Board no later than 24 hours after the NEL exceedance has been identified.

iii The LUP Type 3 discharger shall certify each NEL Violation Report in accordance with the Special Provisions for Construction Activity.

iv The LUP Type 3 discharger shall retain an electronic or paper copy of each NEL Violation Report for a minimum of three years after the date the violation report is filed.

v The LUP Type 3 discharger shall include in the NEL Violation Report:

(1) the analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as "less than the method detection limit"); and
(2) the date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation.
(3) Description of the current on-site BMPs, and the proposed corrective actions taken to manage the NEL exceedance.

vi Compliance Storm Exemption:
In the event that an applicable NEL has been exceeded during a storm event equal to or larger than the Compliance Storm Event (see Section F.2.c of this Attachment), the LUP Type 3 discharger shall report the on-site rain gauge and nearby governmental rain gauge readings for verification.

o. Monitoring Records

LUP Type 2 & 3 dischargers shall ensure that records of all storm water monitoring information and copies of all reports (including Annual Reports) required by this General Permit be retained for a period of at least three years. LUP Type 2 & 3 dischargers may retain records off-

site and make them available upon request. These records shall include:

i The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation (rain gauge);

ii The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements;

iii The date and approximate time of analyses;

iv The individual(s) who performed the analyses;

v A summary of all analytical results from the last three years, the method detection limits and reporting units, the analytical techniques or methods used, and all chain of custody forms;

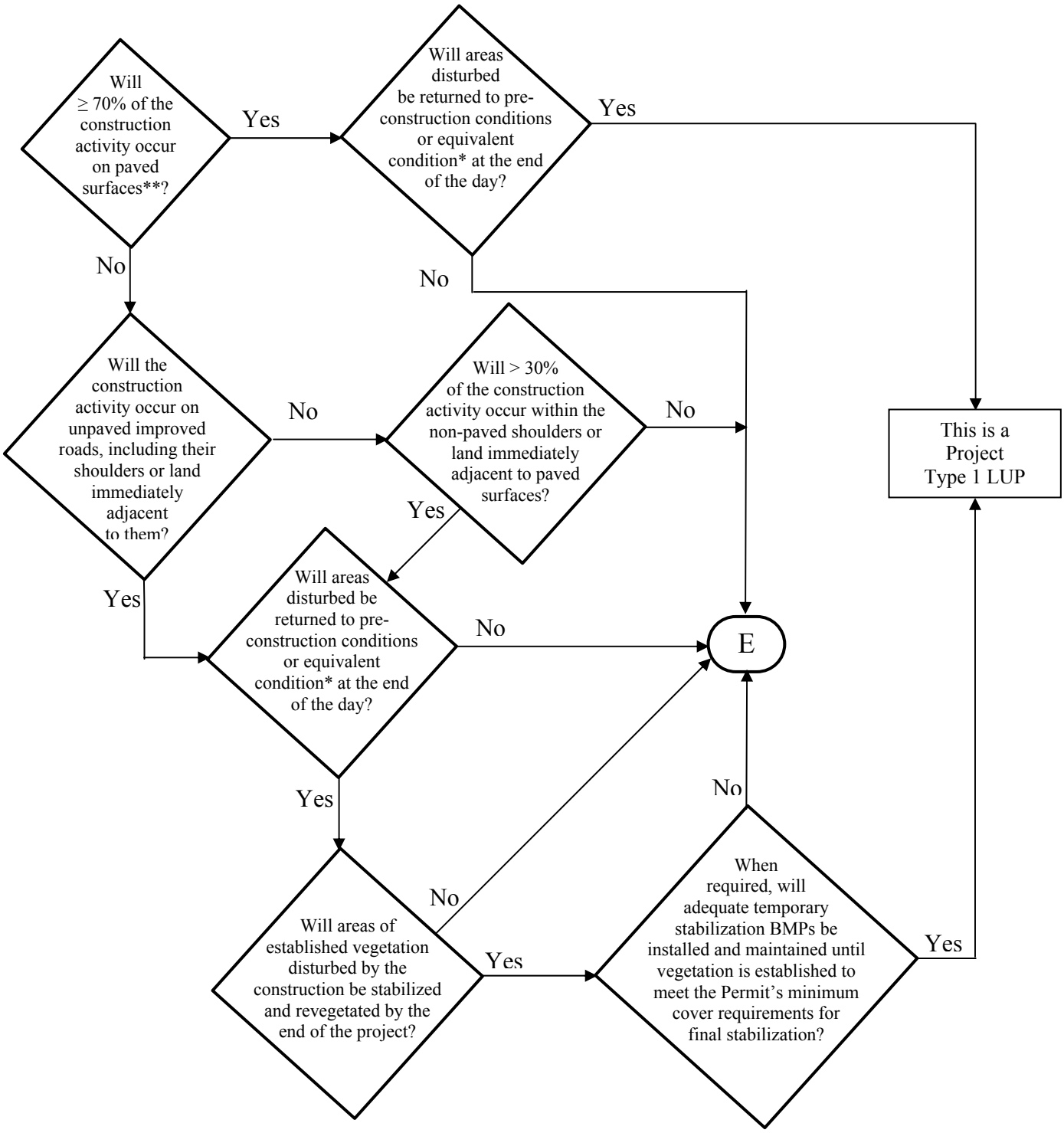
vi Quality assurance/quality control records and results;

vii Non-storm water discharge inspections and visual observation (inspections) and storm water discharge visual observation records (see Section M.4.a above);

viii Visual observation and sample collection exception records (see Section M.4.g above); and

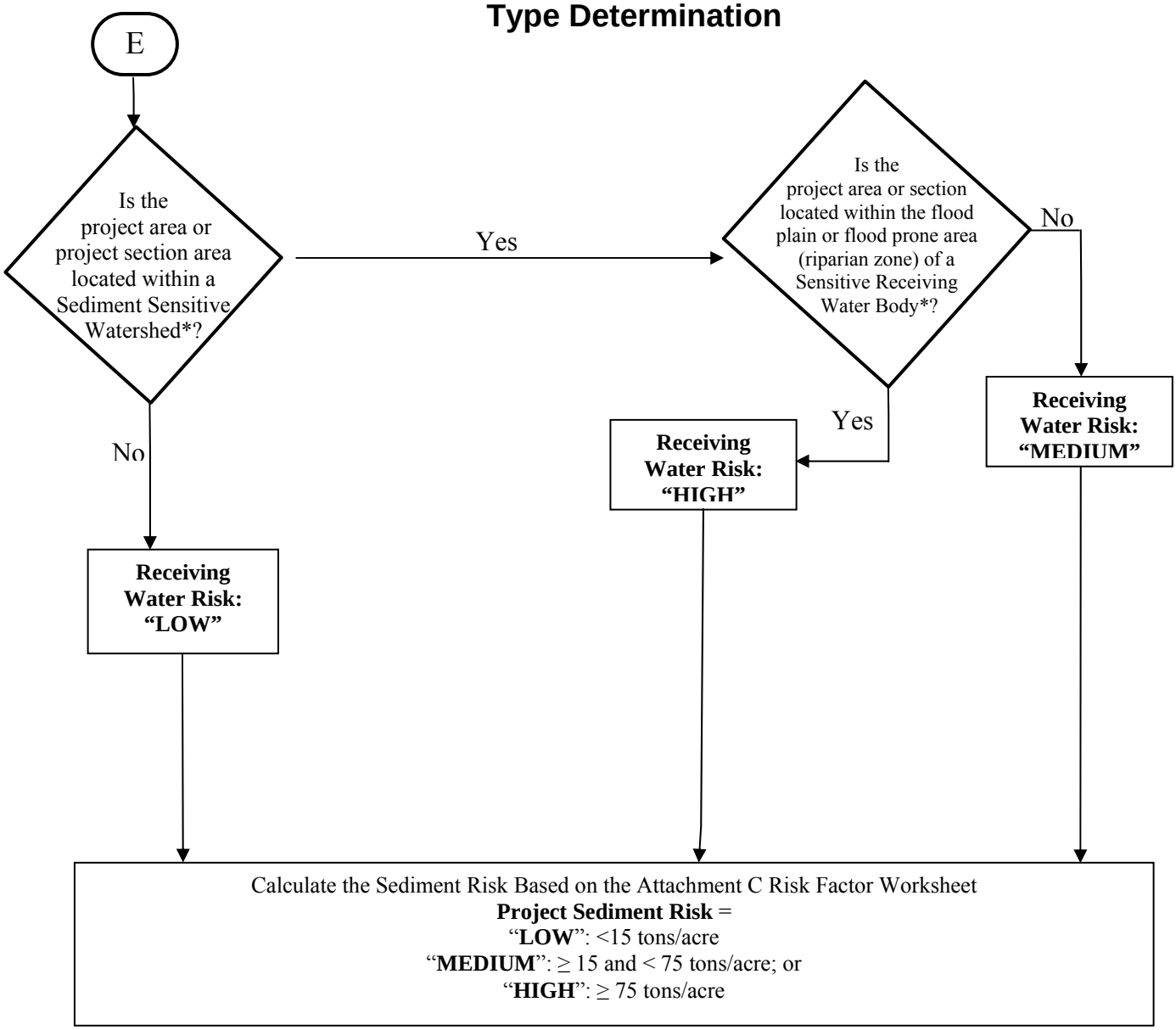
ix The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation (inspections), or inspections.

ATTACHMENT A.1
LUP Project Area or Project Section Area Type Determination



*See Definition of Terms
** Or: "Will < 30% of the soil disturbance occur on unpaved surfaces?

ATTACHMENT A.1
LUP Project Area or Project Section Area Type Determination



* See Definition of Terms

PROJECT SEDIMENT RISK

RECEIVING WATER RISK	**LOW**	**MEDIUM**	**HIGH**
LOW	Type 1	Type 1	Type 2
MEDIUM	Type 1	Type 2	Type 3
HIGH	Type 2	Type 3	Type 3

ATTACHMENT A.1
Definition of Terms

1. **Equivalent Condition** – Means disturbed soils such as those from trench excavation are required to be hauled away, backfilled into the trench, and/or covered (e.g., metal plates, pavement, plastic covers over spoil piles) at the end of the construction day.
2. **Linear Construction Activity** – Linear construction activity consists of underground/ overhead facilities that typically include, but are not limited to, any conveyance, pipe or pipeline for the transportation of any gaseous, liquid (including water, wastewater for domestic municipal services), liquescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g., telephone, telegraph, radio or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/ tower pad and cable/ wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/ borrow locations.
3. **Sediment Sensitive Receiving Water Body –** Defined as a water body segment that is listed on EPA's approved CWA 303(d) list for sedimentation/siltation, turbidity, or is designated with beneficial uses of SPAWN, MIGRATORY, and COLD.
4. **Sediment Sensitive Watershed –** Defined as a watershed draining into a receiving water body listed on EPA's approved CWA 303(d) list for sedimentation/siltation, turbidity, or a water body designated with beneficial uses of SPAWN, MIGRATORY, and COLD.

ATTACHMENT A.2
PERMIT REGISTRATION DOCUMENTS (PRDs)
GENERAL INSTRUCTIONS FOR LINEAR UNDERGROUND/OVERHEAD PROJECTS TO COMPLY WITH THE CONSTRUCTION GENERAL PERMIT

GENERAL INSTRUCTIONS

Who Must Submit

This permit is effective on July 1, 2010.

The Legally Responsible Person (LRP) for construction activities associated with linear underground/overhead project (LUP) must electronically apply for coverage under this General Permit on or after July 1, 2010. If it is determined that the LUP construction activities require an NPDES permit, the Legally Responsible Person[1] (LRP) shall submit PRDs for this General Permit in accordance with the following:

LUPs associated with Private or Municipal Development Projects

1. For LUPs associated with pre-development and pre-redevelopment construction activities:

   The LRP must obtain coverage[2] under this General Permit for its pre-development and pre-redevelopment construction activities where the total disturbed land area of these construction activities is greater than 1 acre.

2. For LUPs associated with new development and redevelopment construction projects:

   The LRP must obtain coverage under this General Permit for LUP construction activities associated with new development and redevelopment projects where the total disturbed land area of the LUP is greater than 1 acre. Coverage under this permit is not required where the same LUP construction activities are covered by another NPDES permit.

LUPs not associated with private or municipal new development or redevelopment projects:

The LRP must obtain coverage under this General Permit on or after July 1, 2010 for its LUP construction activities where the total disturbed land area is greater than 1 acre.

PRD Submittal Requirements

Prior to the start of construction activities a LRP must submit PRDs and fees to the State Water Board for each LUP.

New and Ongoing LUPs

Dischargers of new LUPs that commence construction activities after the adoption date of this General Permit shall file PRDs prior to the commencement of construction and implement the SWPPP upon the start of construction.

[1] person possessing the title of the land on which the construction activities will occur for the regulated site
[2] obtain coverage means filing PRDs for the project.

PERMIT REGISTRATION DOCUMENTS (PRDs)
GENERAL INSTRUCTIONS (CONTINUED)

Dischargers of ongoing LUPs that are currently covered under State Water Board Order No. 2003-0007 (Small LUP General Permit) shall electronically file Permit Registration Documents no later than July 1, 2010. After July 1, 2010, all NOIs subject to State Water Board Order No. 2003-0007-DWQ will be terminated. All existing dischargers shall be exempt from the risk determination requirements in Attachment A. All existing dischargers are therefore subject to LUP Type 1 requirements regardless of their project's sediment and receiving water risks. However, a Regional Board retains the authority to require an existing discharger to comply with the risk determination requirements in Attachment A.

Where to Apply

The Permit Registration Documents (PRDs) can be found at www.waterboards.ca.gov/water_issues/programs/stormwater/

Fees

The annual fee for storm water permits are established through the State of California Code of Regulations.

When Permit Coverage Commences

To obtain coverage under the General Permit, the LRP must include the complete PRDs and the annual fee. All PRDs deemed incomplete will be rejected with an explanation as to what is required to complete submittal. Upon receipt of complete PRDs and associated fee, each discharger will be sent a waste discharger's identification (WDID) number.

Projects and Activities Not Defined As Construction Activity

1. LUP construction activity does not include routine maintenance projects to maintain original line and grade, hydraulic capacity, or original purpose of the facility. Routine maintenance projects are projects associated with operations and maintenance activities that are conducted on existing lines and facilities and within existing right-of-way, easements, franchise agreements or other legally binding agreements of the discharger. Routine maintenance projects include, but are not limited to projects that are conducted to:

- Maintain the original purpose of the facility, or hydraulic capacity.
- Update existing lines[3] and facilities to comply with applicable codes, standards and regulations regardless if such projects result in increased capacity.
- Repairing leaks.

Routine maintenance does not include construction of new[4] lines or facilities resulting from compliance with applicable codes, standards and regulations.

[3] Update existing lines includes replacing existing lines with new materials or pipes.
[4] New lines are those that are not associated with existing facilities and are not part of a project to update or replace existing lines.

Routine maintenance projects do not include those areas of maintenance projects that are outside of an existing right-of-way, franchise, easements, or agreements. When a project must acquire new areas, those areas may be subject to this General Permit based on the area of disturbed land outside the original right-of-way, easement or agreement.

2. LUP construction activity does not include field activities associated with the planning and design of a project (e.g., activities associated with route selection).

3. Tie-ins conducted immediately adjacent to "energized" or "pressurized" facilities by the discharger are not considered small construction activities where all other LUP construction activities associated with the tie-in are covered by a NOI and SWPPP of a third party or municipal agency.

Calculating Land Disturbance Areas of LUPs

The total land area disturbed for LUPs is the sum of the:

- Surface areas of trenches, laterals and ancillary facilities, plus
- Area of the base of stockpiles on unpaved surfaces, plus
- Surface area of the borrow area, plus
- Areas of paved surfaces constructed for the project, plus
- Areas of new roads constructed or areas of major reconstruction to existing roads (e.g. improvements to two-track surfaces or road widening) for the sole purpose of accessing construction activities or as part of the final project, plus
- Equipment and material storage, staging, and preparation areas (laydown areas) not on paved surfaces, plus
- Soil areas outside the surface area of trenches, laterals and ancillary facilities that will be graded, and/or disturbed by the use of construction equipment, vehicles and machinery during construction activities.

Stockpiling Areas

Stockpiling areas, borrow areas and the removal of soils from a construction site may or may not be included when calculating the area of disturbed soil for a site depending on the following conditions:

- For stockpiling of soils onsite or immediately adjacent to a LUP site and the stockpile is not on a paved surface, the area of the base of the stockpile is to be included in the disturbed area calculation.

- The surface area of borrow areas that are onsite or immediately adjacent to a project site are to be included in the disturbed area calculation.

- For soil that is hauled offsite to a location owned or operated by the discharger that is not a paved surface, the area of the base of the stockpile is to be included in the disturbed area calculation except when the offsite location is already subject to a separate storm water permit.

PERMIT REGISTRATION DOCUMENTS (PRDs)
GENERAL INSTRUCTIONS (CONTINUED)

- For soil that is brought to the project from an off-site location owned or operated by the discharger the surface area of the borrow pit is to be included in the disturbed area calculation except when the offsite location is already subject to a separate storm water permit.

- Trench spoils on a paved surface that are either returned to the trench or excavation or hauled away from the project daily for disposal or reuse will not be included in the disturbed area calculation.

If you have any questions concerning submittal of PRDs, please call the State Water Board at (866) 563-3107.

ATTACHMENT B
PERMIT REGISTRATION DOCUMENTS (PRDs) TO COMPLY WITH THE TERMS OF THE GENERAL PERMIT TO DISCHARGE STORM WATER ASSOCIATED WITH CONSTRUCTION ACTIVITY

GENERAL INSTRUCTIONS

A. All Linear Construction Projects shall comply with the PRD requirements in Attachment A.2 of this Order.

B. Who Must Submit

Discharges of storm water associated with construction that results in the disturbance of one acre or more of land must apply for coverage under the General Construction Storm Water Permit (General Permit). Any construction activity that is a part of a larger common plan of development or sale must also be permitted, regardless of size. (For example, if 0.5 acre of a 20-acre subdivision is disturbed by the construction activities of discharger A and the remaining 19.5 acres is to be developed by discharger B, discharger A must obtain a General Storm Water Permit for the 0.5 acre project).

Other discharges from construction activities that are covered under this General Permit can be found in the General Permit Section II.B.

It is the LRP's responsibility to obtain coverage under this General Permit by electronically submitting complete PRDs (Permit Registration Documents).

In all cases, the proper procedures for submitting the PRDs must be completed before construction can commence.

C. Construction Activity Not Covered By This General Permit

Discharges from construction that are not covered under this General Permit can be found in the General Permit Sections II.A &B..

D. Annual Fees and Fee Calculation

Annual fees are calculated based upon the total area of land to be disturbed not the total size of the acreage owned. However, the calculation includes all acres to be disturbed during the duration of the project. For example, if 10 acres are scheduled to be disturbed the first year and 10 in each subsequent year for 5 years, the annual fees would be based upon 50 acres of disturbance. The State Water Board will evaluate adding acreage to an existing Permit Waste Discharge Identification (WDID) number on a case-by-case basis. In general, any acreage to be considered must be contiguous to the permitted land area and the existing

SWPPP must be appropriate for the construction activity and topography of the acreage under consideration. As acreage is built out and stabilized or sold, the Change of Information (COI) form enables the applicant to remove those acres from inclusion in the annual fee calculation. Checks should be made payable to: State Water Board.

The Annual fees are established through regulations adopted by the State Water Board. The total annual fee is the current base fee plus applicable surcharges for all construction sites submitting an NOI, based on the total acreage to be disturbed during the life of the project. Annual fees are subject to change by regulation.

Dischargers that apply for and satisfy the Small Construction Erosivity Wavier requirements shall pay a fee of $200.00 plus an applicable surcharge, see the General Permit Section II.B.7.

E. When to Apply

LRP's proposing to conduct construction activities subject to this General Permit must submit their PRDs prior to the commencement of construction activity.

F. Requirements for Completing Permit Registration Documents (PRDs)

All dischargers required to comply with this General Permit shall electronically submit the required PRDs for their type of construction as defined below.

G. Standard PRD Requirements (All Dischargers)

1. Notice of Intent
2. Risk Assessment (Standard or Site-Specific)
3. Site Map
4. SWPPP
5. Annual Fee
6. Certification

H. Additional PRD Requirements Related to Construction Type

1. Discharger in unincorporated areas of the State (not covered under an adopted Phase I or II SUSMP requirements) and that are not a linear project shall also submit a completed:
   a. Post-Construction Water Balance Calculator (Appendix 2).

2. Dischargers who are proposing to implement ATS shall submit:
   a. Complete ATS Plan in accordance with Attachment F at least 14 days prior to the planned operation of the ATS and a paper copy shall be available onsite during ATS operation.

b. Certification proof that design done by a professional in accordance with Attachment F.

3. Dischargers who are proposing an alternate Risk Justification:
   a. Particle Size Analysis.

I. Exceptions to Standard PRD Requirements

Construction sites with an R value less than 5 as determined in the Risk Assessment are not required to submit a SWPPP.

J. Description of PRDs

1. Notice of Intent (NOI)

2. Site Map(s) Includes:
   a. The project's surrounding area (vicinity)
   b. Site layout
   c. Construction site boundaries
   d. Drainage areas
   e. Discharge locations
   f. Sampling locations
   g. Areas of soil disturbance (temporary or permanent)
   h. Active areas of soil disturbance (cut or fill)
   i. Locations of all runoff BMPs
   j. Locations of all erosion control BMPs
   k. Locations of all sediment control BMPs
   l. ATS location (if applicable)
   m. Locations of sensitive habitats, watercourses, or other features which are not to be disturbed
   n. Locations of all post-construction BMPs
   o. Locations of storage areas for waste, vehicles, service, loading/unloading of materials, access (entrance/exits) points to construction site, fueling, and water storage, water transfer for dust control and compaction practices

3. **SWPPPs**
   A site-specific SWPPP shall be developed by each discharger and shall be submitted with the PRDs.

4. **Risk Assessment**
   All dischargers shall use the Risk Assessment procedure as describe in the General Permit Appendix 1.

   a. The Standard Risk Assessment includes utilization of the following:
      i. Receiving water Risk Assessment interactive map

ii. EPA Rainfall Erosivity Factor Calculator Website
iii. Sediment Risk interactive map
iv. Sediment sensitive water bodies list

b. The Site-Specific Risk Assessment includes the completion of the hand calculated R value Risk Calculator

5. **Post-Construction Water Balance Calculator**
All dischargers subject to this requirement shall complete the Water Balance Calculator (in Appendix 2) in accordance with the instructions.

6. **ATS Design Document and Certification**
All dischargers using ATS must submit electronically their system design (as well as any supporting documentation) and proof that the system was designed by a qualified ATS design professional (See Attachment F).

To obtain coverage under the General Permit PRDs must be included and completed. If any of the required items are missing, the PRD submittal is considered incomplete and will be rejected. Upon receipt of a complete PRD submittal, the State Water Board will process the application package in the order received and assign a (WDID) number.

Questions?

If you have any questions on completing the PRDs please email stormwater@waterboards.ca.gov or call (866) 563-3107.

ATTACHMENT C
RISK LEVEL 1 REQUIREMENTS

A. Effluent Standards

[These requirements are the same as those in the General Permit order.]

1. Narrative – Risk Level 1 dischargers shall comply with the narrative effluent standards listed below:

   a. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

   b. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

2. Numeric – Risk Level 1 dischargers are not subject to a numeric effluent standard.

B. Good Site Management "Housekeeping"

1. Risk Level 1 dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, Risk Level 1 dischargers shall implement the following good housekeeping measures:

   a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

   b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).

d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

e. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.

2. Risk Level 1 dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:

a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.

c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.

d. Cover waste disposal containers at the end of every business day and during a rain event.

e. Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.

f. Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.

g. Implement procedures that effectively address hazardous and non-hazardous spills.

h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require that:

i. Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly; and

ii. Appropriate spill response personnel are assigned and trained.

i. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

3. Risk Level 1 dischargers shall implement good housekeeping for vehicle storage and maintenance, which, at a minimum, shall consist of the following:

   a. Prevent oil, grease, or fuel to leak in to the ground, storm drains or surface waters.

   b. Place all equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate BMPs.

   c. Clean leaks immediately and disposing of leaked materials properly.

4. Risk Level 1 dischargers shall implement good housekeeping for landscape materials, which, at a minimum, shall consist of the following:

   a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.

   b. Contain fertilizers and other landscape materials when they are not actively being used.

   c. Discontinue the application of any erodible landscape material within 2 days before a forecasted rain event or during periods of precipitation.

   d. Apply erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.

   e. Stack erodible landscape material on pallets and covering or storing such materials when not being used or applied.

5. Risk Level 1 dischargers shall conduct an assessment and create a list of potential pollutant sources and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify

all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, Risk Level 1 dischargers shall do the following:

a. Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.

b. Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.

c. Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.

d. Ensure retention of sampling, visual observation, and inspection records.

e. Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.

6. Risk Level 1 dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.

C. Non-Storm Water Management

1. Risk Level 1 dischargers shall implement measures to control all non-storm water discharges during construction.

2. Risk Level 1 dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.

3. Risk Level 1 dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

D. Erosion Control

1. Risk Level 1 dischargers shall implement effective wind erosion control.

2. Risk Level 1 dischargers shall provide effective soil cover for inactive[1] areas and all finished slopes, open space, utility backfill, and completed lots.

3. Risk Level 1 dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

E. Sediment Controls

1. Risk Level 1 dischargers shall establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.

2. On sites where sediment basins are to be used, Risk Level 1 dischargers shall, at minimum, design sediment basins according to the method provided in CASQA's Construction BMP Guidance Handbook.

F. Run-on and Runoff Controls

Risk Level 1 dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this General Permit.

G. Inspection, Maintenance and Repair

1. Risk Level 1 dischargers shall ensure that all inspection, maintenance repair and sampling activities at the project location shall be performed or supervised by a Qualified SWPPP Practitioner (QSP) representing the discharger. The QSP may delegate any or all of these activities to an employee trained to do the task(s) appropriately, but shall ensure adequate deployment.

2. Risk Level 1 dischargers shall perform weekly inspections and observations, and at least once each 24-hour period during extended

[1] Inactive areas of construction are areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days.

storm events, to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.

3. Upon identifying failures or other shortcomings, as directed by the QSP, Risk Level 1 dischargers shall begin implementing repairs or design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.

4. For each inspection required, Risk Level 1 dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format.

5. Risk Level 1 dischargers shall ensure that checklists shall remain onsite with the SWPPP and at a minimum, shall include:

    a. Inspection date and date the inspection report was written.

    b. Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.

    c. Site information, including stage of construction, activities completed, and approximate area of the site exposed.

    d. A description of any BMPs evaluated and any deficiencies noted.

    e. If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.

    f. Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.

    g. Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.

    h. Photographs taken during the inspection, if any.

    i. Inspector's name, title, and signature.

H. Rain Event Action Plan

Not required for Risk Level 1 dischargers.

I. Risk Level 1 Monitoring and Reporting Requirements

Table 1- Summary of Monitoring Requirements

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
1	X	X		X	X		

1. **Construction Site Monitoring Program Requirements**

   a. Pursuant to Water Code Sections 13383 and 13267, all dischargers subject to this General Permit shall develop and implement a written site-specific Construction Site Monitoring Program (CSMP) in accordance with the requirements of this Section. The CSMP shall include all monitoring procedures and instructions, location maps, forms, and checklists as required in this section. The CSMP shall be developed prior to the commencement of construction activities, and revised as necessary to reflect project revisions. The CSMP shall be a part of the Storm Water Pollution Prevention Plan (SWPPP), included as an appendix or separate SWPPP chapter.

   b. Existing dischargers registered under the State Water Board Order No. 99-08-DWQ shall make and implement necessary revisions to their Monitoring Programs to reflect the changes in this General Permit in a timely manner, but no later than July 1, 2010. Existing dischargers shall continue to implement their existing Monitoring Programs in compliance with State Water Board Order No. 99-08-DWQ until the necessary revisions are completed according to the schedule above.

   c. When a change of ownership occurs for all or any portion of the construction site prior to completion or final stabilization, the new discharger shall comply with these requirements as of the date the ownership change occurs.

2. **Objectives**

   The CSMP shall be developed and implemented to address the following objectives:

   a. To demonstrate that the site is in compliance with the Discharge Prohibitions;

b. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives;

c. To determine whether immediate corrective actions, additional Best Management Practice (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges; and

d. To determine whether BMPs included in the SWPPP are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.

3. **Risk Level 1 - Visual Monitoring (Inspection) Requirements for Qualifying Rain Events**

a. Risk Level 1 dischargers shall visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event.

b. Risk Level 1 dischargers shall visually observe (inspect) the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge during operating hours.

c. Risk Level 1 dischargers shall conduct visual observations (inspections) during business hours only.

d. Risk Level 1 dischargers shall record the time, date and rain gauge reading of all qualifying rain events.

e. Within 2 business days (48 hours) prior to each qualifying rain event, Risk Level 1 dischargers shall visually observe (inspect):

i. All storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources. If needed, the discharger shall implement appropriate corrective actions.

ii. All BMPs to identify whether they have been properly implemented in accordance with the SWPPP. If needed, the discharger shall implement appropriate corrective actions.

iii. Any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

f. For the visual observations (inspections) described in e.i and e.iii above, Risk Level 1 dischargers shall observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants.

g. Within two business days (48 hours) after each qualifying rain event, Risk Level 1 dischargers shall conduct post rain event visual observations (inspections) to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly.

h. Risk Level 1 dischargers shall maintain on-site records of all visual observations (inspections), personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

4. **Risk Level 1 – Visual Observation Exemptions**

a. Risk Level 1 dischargers shall be prepared to conduct visual observation (inspections) until the minimum requirements of Section I.3 above are completed. Risk Level 1 dischargers are not required to conduct visual observation (inspections) under the following conditions:

i. During dangerous weather conditions such as flooding and electrical storms.

ii. Outside of scheduled site business hours.

b. If no required visual observations (inspections) are collected due to these exceptions, Risk Level 1 dischargers shall include an explanation in their SWPPP and in the Annual Report documenting why the visual observations (inspections) were not conducted.

5. **Risk Level 1 – Monitoring Methods**

Risk Level 1 dischargers shall include a description of the visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures in the CSMP.

6. **Risk Level 1 – Non-Storm Water Discharge Monitoring Requirements**

a. Visual Monitoring Requirements:

   i. Risk Level 1 dischargers shall visually observe (inspect) each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources.

   ii. Risk Level 1 dischargers shall conduct one visual observation (inspection) quarterly in each of the following periods: January-March, April-June, July-September, and October-December. Visual observation (inspections) are only required during daylight hours (sunrise to sunset).

   iii. Risk Level 1 dischargers shall ensure that visual observations (inspections) document the presence or evidence of any non-storm water discharge (authorized or unauthorized), pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.), and source. Risk Level 1 dischargers shall maintain on-site records indicating the personnel performing the visual observation (inspections), the dates and approximate time each drainage area and non-storm water discharge was observed, and the response taken to eliminate unauthorized non-storm water discharges and to reduce or prevent pollutants from contacting non-storm water discharges.

7. **Risk Level 1 – Non-Visible Pollutant Monitoring Requirements**

   a. Risk Level 1 dischargers shall collect one or more samples during any breach, malfunction, leakage, or spill observed during a visual inspection which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water.

   b. Risk Level 1 dischargers shall ensure that water samples are large enough to characterize the site conditions.

   c. Risk Level 1 dischargers shall collect samples at all discharge locations that can be safely accessed.

   d. Risk Level 1 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.

   e. Risk Level 1 dischargers shall analyze samples for all non-visible pollutant parameters (if applicable) - parameters indicating the

presence of pollutants identified in the pollutant source assessment required (Risk Level 1 dischargers shall modify their CSMPs to address these additional parameters in accordance with any updated SWPPP pollutant source assessment).

f. Risk Level 1 dischargers shall collect a sample of storm water that has not come in contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample) for comparison with the discharge sample.

g. Risk Level 1 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis.[2]

h. Risk Level 1 dischargers shall keep all field /or analytical data in the SWPPP document.

8. **Risk Level 1 – Particle Size Analysis for Project Risk Justification**

Risk Level 1 dischargers justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

9. **Risk Level 1 – Records**

Risk Level 1 dischargers shall retain records of all storm water monitoring information and copies of all reports (including Annual Reports) for a period of at least three years. Risk Level 1 dischargers shall retain all records on-site while construction is ongoing. These records include:

a. The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation.

b. The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements.

c. The date and approximate time of analyses.

d. The individual(s) who performed the analyses.

[2] For laboratory analysis, all sampling, sample preservation, and analyses must be conducted according to test procedures under 40 CFR Part 136. Field discharge samples shall be collected and analyzed according to the specifications of the manufacturer of the sampling devices employed.

e. A summary of all analytical results from the last three years, the method detection limits and reporting units, and the analytical techniques or methods used.

f. Rain gauge readings from site inspections.

g. Quality assurance/quality control records and results.

h. Non-storm water discharge inspections and visual observation (inspections) and storm water discharge visual observation records (see Sections I.3 and I.6 above).

i. Visual observation and sample collection exception records (see Section I.4 above).

j. The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation (inspections), or inspections.

ATTACHMENT D
RISK LEVEL 2 REQUIREMENTS

A. Effluent Standards

[These requirements are the same as those in the General Permit order.]

1. Narrative – Risk Level 2 dischargers shall comply with the narrative effluent standards listed below:

   a. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

   b. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

2. Numeric – Risk level 2 dischargers are subject to a pH NAL of 6.5-8.5, and a turbidity NAL of 250 NTU.

B. Good Site Management "Housekeeping"

1. Risk Level 2 dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, Risk Level 2 dischargers shall implement the following good housekeeping measures:

   a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

   b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).

d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

e. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.

2. Risk Level 2 dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:

a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.

c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.

d. Cover waste disposal containers at the end of every business day and during a rain event.

e. Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.

f. Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.

g. Implement procedures that effectively address hazardous and non-hazardous spills.

h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require:

i. Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly.

ii. Appropriate spill response personnel are assigned and trained.

i. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

3. Risk Level 2 dischargers shall implement good housekeeping for vehicle storage and maintenance, which, at a minimum, shall consist of the following:

   a. Prevent oil, grease, or fuel to leak in to the ground, storm drains or surface waters.

   b. Place all equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate BMPs.

   c. Clean leaks immediately and disposing of leaked materials properly.

4. Risk Level 2 dischargers shall implement good housekeeping for landscape materials, which, at a minimum, shall consist of the following:

   a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.

   b. Contain all fertilizers and other landscape materials when they are not actively being used.

   c. Discontinue the application of any erodible landscape material within 2 days before a forecasted rain event or during periods of precipitation.

   d. Apply erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.

   e. Stack erodible landscape material on pallets and covering or storing such materials when not being used or applied.

5. Risk Level 2 dischargers shall conduct an assessment and create a list of potential pollutant sources and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify

all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, Risk Level 2 dischargers shall do the following:

a. Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.

b. Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.

c. Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.

d. Ensure retention of sampling, visual observation, and inspection records.

e. Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.

6. Risk Level 2 dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.

7. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall document all housekeeping BMPs in the SWPPP and REAP(s) in accordance with the nature and phase of the construction project. Construction phases at traditional land development projects include Grading and Land Development Phase, Streets and Utilities, or Vertical Construction for traditional land development projects.

C. Non-Storm Water Management

1. Risk Level 2 dischargers shall implement measures to control all non-storm water discharges during construction.

2. Risk Level 2 dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.

3. Risk Level 2 dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

D. Erosion Control

1. Risk Level 2 dischargers shall implement effective wind erosion control.

2. Risk Level 2 dischargers shall provide effective soil cover for inactive[1] areas and all finished slopes, open space, utility backfill, and completed lots.

3. Risk Level 2 dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

E. Sediment Controls

1. Risk Level 2 dischargers shall establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.

2. On sites where sediment basins are to be used, Risk Level 2 dischargers shall, at minimum, design sediment basins according to the method provided in CASQA's Construction BMP Guidance Handbook.

3. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall implement appropriate erosion control BMPs (runoff control and soil stabilization) in conjunction with sediment control BMPs for areas under active[2] construction.

4. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall apply linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths[3] in accordance with Table 1.

Table 1 - Critical Slope/Sheet Flow Length Combinations

Slope Percentage	Sheet flow length not

[1] Inactive areas of construction are areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days.
[2] Active areas of construction are areas undergoing land surface disturbance. This includes construction activity during the preliminary stage, mass grading stage, streets and utilities stage and the vertical construction stage.
[3] Sheet flow length is the length that shallow, low velocity flow travels across a site.

	to exceed
0-25% 20	feet
25-50% 15	feet
Over 50%	10 feet

5. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall ensure that construction activity traffic to and from the project is limited to entrances and exits that employ effective controls to prevent offsite tracking of sediment.

6. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall ensure that all storm drain inlets and perimeter controls, runoff control BMPs, and pollutant controls at entrances and exits (e.g. tire washoff locations) are maintained and protected from activities that reduce their effectiveness.

7. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall inspect on a daily basis all immediate access roads daily. At a minimum daily (when necessary) and prior to any rain event, the discharger shall remove any sediment or other construction activity-related materials that are deposited on the roads (by vacuuming or sweeping).

F. Run-on and Run-off Controls

Risk Level 2 dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this General Permit.

G. Inspection, Maintenance and Repair

1. Risk Level 2 dischargers shall ensure that all inspection, maintenance repair and sampling activities at the project location shall be performed or supervised by a Qualified SWPPP Practitioner (QSP) representing the discharger. The QSP may delegate any or all of these activities to an employee appropriately trained to do the task(s).

2. Risk Level 2 dischargers shall perform weekly inspections and observations, and at least once each 24-hour period during extended storm events, to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.

3. Upon identifying failures or other shortcomings, as directed by the QSP, Risk Level 2 dischargers shall begin implementing repairs or

design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.

4. For each inspection required, Risk Level 2 dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format.

5. Risk Level 2 dischargers shall ensure that checklists shall remain onsite with the SWPPP and at a minimum, shall include:

   a. Inspection date and date the inspection report was written.

   b. Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.

   c. Site information, including stage of construction, activities completed, and approximate area of the site exposed.

   d. A description of any BMPs evaluated and any deficiencies noted.

   e. If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.

   f. Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.

   g. Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.

   h. Photographs taken during the inspection, if any.

   i. Inspector's name, title, and signature.

H. Rain Event Action Plan

1. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop a Rain Event Action Plan (REAP) 48 hours prior to any likely precipitation event. A likely precipitation event is any weather pattern that is forecast to have a 50% or greater probability of producing precipitation in the project area. The discharger shall

ensure a QSP 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).

2. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop the REAPs for all phases of construction (i.e., Grading and Land Development, Streets and Utilities, Vertical Construction, Final Landscaping and Site Stabilization).

3. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP ensure that the REAP include, at a minimum, the following site information:

   a. Site Address
   b. Calculated Risk Level (2 or 3)
   c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number
   d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number
   e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number

4. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP include in the REAP, at a minimum, the following project phase information:

   a. Activities associated with each construction phase
   b. Trades active on the construction site during each construction phase
   c. Trade contractor information
   d. Suggested actions for each project phase

5. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop additional REAPs for project sites where construction activities are indefinitely halted or postponed (Inactive Construction). At a minimum, Inactive Construction REAPs must include:

   a. Site Address
   b. Calculated Risk Level (2 or 3)
   c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number
   d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number
   e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number

f. Trades active on site during Inactive Construction
g. Trade contractor information
h. Suggested actions for inactive construction sites

6. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP begin implementation and make the REAP available onsite no later than 24 hours prior to the likely precipitation event.

7. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP maintain onsite a paper copy of each REAP onsite in compliance with the record retention requirements of the Special Provisions in this General Permit.

I. Risk Level 2 Monitoring and Reporting Requirements

Table 2- Summary of Monitoring Requirements

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
2	X	X	X	X	X	X	

1. Construction Site Monitoring Program Requirements

   a. Pursuant to Water Code Sections 13383 and 13267, all dischargers subject to this General Permit shall develop and implement a written site-specific Construction Site Monitoring Program (CSMP) in accordance with the requirements of this Section. The CSMP shall include all monitoring procedures and instructions, location maps, forms, and checklists as required in this section. The CSMP shall be developed prior to the commencement of construction activities, and revised as necessary to reflect project revisions. The CSMP shall be a part of the Storm Water Pollution Prevention Plan (SWPPP), included as an appendix or separate SWPPP chapter.

   b. Existing dischargers registered under the State Water Board Order No. 99-08-DWQ shall make and implement necessary revisions to their Monitoring Program to reflect the changes in this General Permit in a timely manner, but no later than July 1, 2010. Existing dischargers shall continue to implement their existing Monitoring Programs in compliance with State Water Board Order No. 99-08-DWQ until the necessary revisions are completed according to the schedule above.

   c. When a change of ownership occurs for all or any portion of the construction site prior to completion or final stabilization, the new discharger shall comply with these requirements as of the date the ownership change occurs.

2. **Objectives**

   The CSMP shall be developed and implemented to address the following objectives:

a. To demonstrate that the site is in compliance with the Discharge Prohibitions and applicable Numeric Action Levels (NALs)/Numeric Effluent Limitations (NELs) of this General Permit.

b. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives.

c. To determine whether immediate corrective actions, additional Best Management Practice (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges.

d. To determine whether BMPs included in the SWPPP/Rain Event Action Plan (REAP) are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.

3. **Risk Level 2 – Visual Monitoring (Inspection) Requirements for Qualifying Rain Events**

a. Risk Level 2 dischargers shall visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event.

b. Risk Level 2 dischargers shall visually observe (inspect) the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge during operating hours.

c. Risk Level 2 dischargers shall conduct visual observations (inspections) during business hours only.

d. Risk Level 2 dischargers shall record the time, date and rain gauge reading of all qualifying rain events.

e. Within 2 business days (48 hours) prior to each qualifying rain event, Risk Level 2 dischargers shall visually observe (inspect):

i. all storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources. If needed, the discharger shall implement appropriate corrective actions.

ii. all BMPs to identify whether they have been properly implemented in accordance with the SWPPP/REAP. If needed, the discharger shall implement appropriate corrective actions.

iii. any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

f. For the visual observations (inspections) described in c.i and c.iii above, Risk Level 2 dischargers shall observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants.

g. Within two business days (48 hours) after each qualifying rain event, Risk Level 2 dischargers shall conduct post rain event visual observations (inspections) to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly.

h. Risk Level 2 dischargers shall maintain on-site records of all visual observations (inspections), personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

4. **Risk Level 2 – Water Quality Sampling and Analysis**

a. Risk Level 2 dischargers shall collect storm water grab samples from sampling locations, as defined in Section I.5. The storm water grab sample(s) obtained shall be representative of the flow and characteristics of the discharge.

b. At minimum, Risk Level 2 dischargers shall collect 3 samples per day of the qualifying event.

c. Risk Level 2 dischargers shall ensure that the grab samples collected of stored or contained storm water are from discharges subsequent to a qualifying rain event (producing precipitation of ½ inch or more at the time of discharge).

<u>Storm Water Effluent Monitoring Requirements</u>

d. Risk Level 2 dischargers shall analyze their effluent samples for:

i. pH and turbidity.

ii. Any additional parameters for which monitoring is required by the Regional Water Board.

5. **Risk Level 2 – Storm Water Discharge Water Quality Sampling Locations**

Effluent Sampling Locations

a. Risk Level 2 dischargers shall perform sampling and analysis of storm water discharges to characterize discharges associated with construction activity from the entire project disturbed area.

b. Risk Level 2 dischargers shall collect effluent samples at all discharge points where storm water is discharged off-site.

c. Risk Level 2 dischargers shall ensure that storm water discharge collected and observed represent[4] the effluent in each drainage area based on visual observation of the water and upstream conditions.

d. Risk Level 2 dischargers shall monitor and report site run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs or NELs.

e. Risk Level 2 dischargers who deploy an ATS on their site, or a portion on their site, shall collect ATS effluent samples and measurements from the discharge pipe or another location representative of the nature of the discharge.

f. Risk Level 2 dischargers shall select analytical test methods from the list provided in Table 3 below.

g. All storm water sample collection preservation and handling shall be conducted in accordance with Section I.7 “Storm Water Sample Collection and Handling Instructions” below.

6. **Risk Level 2 – Visual Observation and Sample Collection Exemptions**

a. Risk Level 2 dischargers shall be prepared to collect samples and conduct visual observation (inspections) until the minimum requirements of Sections I.3 and I.4 above are completed. Risk

[4] For example, if there has been concrete work recently in an area, or drywall scrap is exposed to the rain, a pH sample shall be taken of drainage from the relevant work area. Similarly, if sediment laden water is flowing through some parts of a silt fence, samples shall be taken of the sediment-laden water even if most water flowing through the fence is clear.

Level 2 dischargers are not required to physically collect samples or conduct visual observation (inspections) under the following conditions:

i. During dangerous weather conditions such as flooding and electrical storms.

ii. Outside of scheduled site business hours.

b. If no required samples or visual observation (inspections) are collected due to these exceptions, Risk Level 2 dischargers shall include an explanation in their SWPPP and in the Annual Report documenting why the sampling or visual observation (inspections) were not conducted.

7. **Risk Level 2 – Storm Water Sample Collection and Handling Instructions**

a. Risk Level 2 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.

b. Risk Level 2 dischargers shall ensure that testing laboratories will receive samples within 48 hours of the physical sampling (unless otherwise required by the laboratory), and shall use only the sample containers provided by the laboratory to collect and store samples.

c. Risk Level 2 dischargers shall designate and train personnel to collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring Program's (SWAMP) 2008 Quality Assurance Program Plan (QAPrP).[5]

8. **Risk Level 2 – Monitoring Methods**

a. Risk Level 2 dischargers shall include a description of the following items in the CSMP:

i. Visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures.

ii. Sampling locations, and sample collection and handling procedures. This shall include detailed procedures for sample

[5] Additional information regarding SWAMP's QAPrP and QAMP can be found at http://www.waterboards.ca.gov/water_issues/programs/swamp/.
QAPrP:http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/qapp/swamp_qapp_master090108a.pdf.
QAMP: http://www.waterboards.ca.gov/water_issues/programs/swamp/qamp.shtml.

collection, storage, preservation, and shipping to the testing lab to assure that consistent quality control and quality assurance is maintained. Dischargers shall attach to the monitoring program an example Chain of Custody form used when handling and shipping samples.

iii. Identification of the analytical methods and related method detection limits (if applicable) for each parameter required in Section I.4 above.

b. Risk Level 2 dischargers shall ensure that all sampling and sample preservation are in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association). All monitoring instruments and equipment (including a discharger's own field instruments for measuring pH and turbidity) should be calibrated and maintained in accordance with manufacturers' specifications to ensure accurate measurements. Risk Level 2 dischargers shall ensure that all laboratory analyses are conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified in this General Permit or by the Regional Water Board. With the exception of field analysis conducted by the discharger for turbidity and pH, all analyses should be sent to and conducted at a laboratory certified for such analyses by the State Department of Health Services. Risk Level 2 dischargers shall conduct their own field analysis of pH and may conduct their own field analysis of turbidity if the discharger has sufficient capability (qualified and trained employees, properly calibrated and maintained field instruments, etc.) to adequately perform the field analysis.

9. **Risk Level 2 – Analytical Methods**

a. Risk Level 2 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.

b. **pH**: Risk Level 2 dischargers shall perform pH analysis on-site with a calibrated pH meter or a pH test kit. Risk Level 2 dischargers shall record pH monitoring results on paper and retain these records in accordance with Section I.14, below.

c. **Turbidity**: Risk Level 2 dischargers shall perform turbidity analysis using a calibrated turbidity meter (turbidimeter), either on-site or at an accredited lab. Acceptable test methods include Standard Method 2130 or USEPA Method 180.1. The results will be recorded in the site log book in Nephelometric Turbidity Units (NTU).

10. **Risk Level 2 - Non-Storm Water Discharge Monitoring Requirements**

    a. Visual Monitoring Requirements:

        i. Risk Level 2 dischargers shall visually observe (inspect) each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources.

        ii. Risk Level 2 dischargers shall conduct one visual observation (inspection) quarterly in each of the following periods: January-March, April-June, July-September, and October-December. Visual observation (inspections) are only required during daylight hours (sunrise to sunset).

        iii. Risk Level 2 dischargers shall ensure that visual observations (inspections) document the presence or evidence of any non-storm water discharge (authorized or unauthorized), pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.), and source. Risk Level 2 dischargers shall maintain on-site records indicating the personnel performing the visual observation (inspections), the dates and approximate time each drainage area and non-storm water discharge was observed, and the response taken to eliminate unauthorized non-storm water discharges and to reduce or prevent pollutants from contacting non-storm water discharges.

    b. Effluent Sampling Locations:

        i. Risk Level 2 dischargers shall sample effluent at all discharge points where non-storm water and/or authorized non-storm water is discharged off-site.

        ii. Risk Level 2 dischargers shall send all non-storm water sample analyses to a laboratory certified for such analyses by the State Department of Health Services.

        iii. Risk Level 2 dischargers shall monitor and report run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs.

11. **Risk Level 2 – Non-Visible Pollutant Monitoring Requirements**

a. Risk Level 2 dischargers shall collect one or more samples during any breach, malfunction, leakage, or spill observed during a visual inspection which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water.

b. Risk Level 2 dischargers shall ensure that water samples are large enough to characterize the site conditions.

c. Risk Level 2 dischargers shall collect samples at all discharge locations that can be safely accessed.

d. Risk Level 2 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.

e. Risk Level 2 dischargers shall analyze samples for all non-visible pollutant parameters (if applicable) - parameters indicating the presence of pollutants identified in the pollutant source assessment required (Risk Level 2 dischargers shall modify their CSMPs to address these additional parameters in accordance with any updated SWPPP pollutant source assessment).

f. Risk Level 2 dischargers shall collect a sample of storm water that has not come in contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample) for comparison with the discharge sample.

g. Risk Level 2 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis.[6]

h. Risk Level 2 dischargers shall keep all field /or analytical data in the SWPPP document.

12. **Risk Level 2 – Watershed Monitoring Option**

Risk Level 2 dischargers who are part of a qualified regional watershed-based monitoring program may be eligible for relief from the requirements in Sections I.5. The Regional Water Board may approve proposals to substitute an acceptable watershed-based monitoring program by determining if the watershed-based monitoring program

[6] For laboratory analysis, all sampling, sample preservation, and analyses must be conducted according to test procedures under 40 CFR Part 136. Field discharge samples shall be collected and analyzed according to the specifications of the manufacturer of the sampling devices employed.

will provide substantially similar monitoring information in evaluating discharger compliance with the requirements of this General Permit.

13. **Risk Level 2 – Particle Size Analysis for Project Risk Justification**

    Risk Level 2 dischargers justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

14. **Risk Level 2 – Records**

    Risk Level 2 dischargers shall retain records of all storm water monitoring information and copies of all reports (including Annual Reports) for a period of at least three years. Risk Level 2 dischargers shall retain all records on-site while construction is ongoing. These records include:

    a. The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation.

    b. The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements.

    c. The date and approximate time of analyses.

    d. The individual(s) who performed the analyses.

    e. A summary of all analytical results from the last three years, the method detection limits and reporting units, the analytical techniques or methods used, and the chain of custody forms.

    f. Rain gauge readings from site inspections;

    g. Quality assurance/quality control records and results.

    h. Non-storm water discharge inspections and visual observation (inspections) and storm water discharge visual observation records (see Sections I.3 and I.10 above).

    i. Visual observation and sample collection exception records (see Section I.6 above).

j. The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation (inspections), or inspections.

15. **Risk Level 2 – NAL Exceedance Report**

a. In the event that any effluent sample exceeds an applicable NAL, Risk Level 2 dischargers shall electronically submit all storm event sampling results to the State Water Board no later than 10 days after the conclusion of the storm event. The Regional Boards have the authority to require the submittal of an NAL Exceedance Report.

b. Risk Level 2 dischargers shall certify each NAL Exceedance Report in accordance with the Special Provisions for Construction Activity.

c. Risk Level 2 dischargers shall retain an electronic or paper copy of each NAL Exceedance Report for a minimum of three years after the date the annual report is filed.

d. Risk Level 2 dischargers shall include in the NAL Exceedance Report:

i. The analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as “less than the method detection limit”).

ii. The date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation.

iii. A description of the current BMPs associated with the effluent sample that exceeded the NAL and the proposed corrective actions taken.

Table 3 – Risk Level 2 Test Methods, Detection Limits, Reporting Units and Applicable NALs/NELs

Parameter	Test Method / Protocol	Discharge Type	Min. Detection Limit	Reporting Units	Numeric Action Level
pH	Field test with calibrated portable instrument	Risk Level 2 Discharges	0.2 pH	units	lower NAL = 6.5 upper NAL = 8.5
Turbidity EPA	0180.1 and/or field test with calibrated portable instrument	Risk Level 2 Discharges other than ATS	1 NTU		250 NTU
		For ATS discharges	1 NTU		N/A

ATTACHMENT E
RISK LEVEL 3 REQUIREMENTS

A. Effluent Standards

[These requirements are the same as those in the General Permit order.]

1. Narrative – Risk Level 3 dischargers shall comply with the narrative effluent standards listed below:

   a. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

   b. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

2. Numeric –Risk Level 3 dischargers are subject to a pH NAL of 6.5-8.5, and a turbidity NAL of 250 NTU. In addition, Risk Level 3 dischargers are subject to a pH NEL of 6.0-9.0 and a turbidity NEL of 500 NTU.

B. Good Site Management "Housekeeping"

1. Risk Level 3 dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, Risk Level 3 dischargers shall implement the following good housekeeping measures:

   a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

   b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).

d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

e. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.

2. Risk Level 3 dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:

a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.

c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.

d. Cover waste disposal containers at the end of every business day and during a rain event.

e. Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.

f. Contain and securely protecting stockpiled waste material from wind and rain at all times unless actively being used.

g. Implement procedures that effectively address hazardous and non-hazardous spills.

h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require that:

i. Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly; and

ii. Appropriate spill response personnel are assigned and trained.

i. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

3. Risk Level 3 dischargers shall implement good housekeeping for vehicle storage and maintenance, which, at a minimum, shall consist of the following:

   a. Prevent oil, grease, or fuel to leak in to the ground, storm drains or surface waters.

   b. Place all equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate BMPs.

   c. Clean leaks immediately and disposing of leaked materials properly.

4. Risk Level 3 dischargers shall implement good housekeeping for landscape materials, which, at a minimum, shall consist of the following:

   a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.

   b. Contain fertilizers and other landscape materials when they are not actively being used.

   c. Discontinuing the application of any erodible landscape material within 2 days before a forecasted rain event or during periods of precipitation.

   d. Applying erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.

   e. Stacking erodible landscape material on pallets and covering or storing such materials when not being used or applied.

5. Risk Level 3 dischargers shall conduct an assessment and create a list of potential pollutant sources and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify

all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, Risk Level 3 dischargers shall do the following:

a. Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.

b. Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.

c. Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.

d. Ensure retention of sampling, visual observation, and inspection records.

e. Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.

6. Risk Level 3 dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.

7. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall document all housekeeping BMPs in the SWPPP and REAP(s) in accordance with the nature and phase of the construction project. Construction phases at traditional land development projects include Grading and Land Development Phase, Streets and Utilities, or Vertical Construction for traditional land development projects.

C. Non-Storm Water Management

1. Risk Level 3 dischargers shall implement measures to control all non-storm water discharges during construction.

2. Risk Level 3 dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.

3. Risk Level 3 dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

D. Erosion Control

1. Risk Level 3 dischargers shall implement effective wind erosion control.

2. Risk Level 3 dischargers shall provide effective soil cover for inactive[1] areas and all finished slopes, open space, utility backfill, and completed lots.

3. Dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

E. Sediment Controls

1. Risk Level 3 dischargers shall establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.

2. On sites where sediment basins are to be used, Risk Level 3 dischargers shall, at minimum, design sediment basins according to the method provided in CASQA's Construction BMP Guidance Handbook.

3. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall implement appropriate erosion control BMPs (runoff control and soil stabilization) in conjunction with sediment control BMPs for areas under active[2] construction.

4. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall apply linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths[3] in accordance with Table 1.

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[1] Inactive areas of construction are areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days.
[2] Active areas of construction are areas undergoing land surface disturbance. This includes construction activity during the preliminary stage, mass grading stage, streets and utilities stage and the vertical construction stage
[3] Sheet flow length is the length that shallow, low velocity flow travels across a site.

Table 1 - Critical Slope/Sheet Flow Length Combinations

Slope Percentage	Sheet flow length not to exceed
0-25% 20	feet
25-50% 15	feet
Over 50%	10 feet

5. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall ensure that construction activity traffic to and from the project is limited to entrances and exits that employ effective controls to prevent offsite tracking of sediment.

6. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall ensure that all storm drain inlets and perimeter controls, runoff control BMPs, and pollutant controls at entrances and exits (e.g. tire washoff locations) are maintained and protected from activities that reduce their effectiveness.

7. **Additional Risk Level 3 Requirement:** Risk Level 3 dischargers shall inspect on a daily basis all immediate access roads daily. At a minimum daily (when necessary) and prior to any rain event, the discharger shall remove any sediment or other construction activity-related materials that are deposited on the roads (by vacuuming or sweeping).

8. **Additional Risk Level 3 Requirement:** The Regional Water Board may require Risk Level 3 dischargers to implement additional site-specific sediment control requirements if the implementation of the other requirements in this section are not adequately protecting the receiving waters.

F. Run-on and Run-off Controls

Risk Level 3 dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this General Permit.

G. Inspection, Maintenance and Repair

1. Risk Level 3 dischargers shall ensure that all inspection, maintenance repair and sampling activities at the project location shall be performed or supervised by a Qualified SWPPP Practitioner (QSP) representing the discharger. The QSP may delegate any or all of these activities to an employee appropriately trained to do the task(s).

2. Risk Level 3 dischargers shall perform weekly inspections and observations, and at least once each 24-hour period during extended storm events, to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.

3. Upon identifying failures or other shortcomings, as directed by the QSP, Risk Level 3 dischargers shall begin implementing repairs or design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.

4. For each inspection required, Risk Level 3 dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format.

5. Risk Level 3 dischargers shall ensure that checklists shall remain onsite with the SWPPP and at a minimum, shall include:

    a. Inspection date and date the inspection report was written.

    b. Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.

    c. Site information, including stage of construction, activities completed, and approximate area of the site exposed.

    d. A description of any BMPs evaluated and any deficiencies noted.

    e. If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.

    f. Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.

    g. Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.

    h. Photographs taken during the inspection, if any.

i. Inspector's name, title, and signature.

H. Rain Event Action Plan

1. **Additional Risk Level 3 Requirement:** The discharger shall ensure a QSP develop a Rain Event Action Plan (REAP) 48 hours prior to any likely precipitation event. A likely precipitation event is any weather pattern that is forecast to have a 50% or greater probability of producing precipitation in the project area. The QSP 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).

2. **Additional Risk Level 3 Requirement:** The discharger shall ensure a QSP develop the REAPs for all phases of construction (i.e., Grading and Land Development, Streets and Utilities, Vertical Construction, Final Landscaping and Site Stabilization).

3. **Additional Risk Level 3 Requirement:** The discharger shall ensure a QSP ensure that the REAP include, at a minimum, the following site information:

   a. Site Address.
   b. Calculated Risk Level (2 or 3).
   c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number.
   d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number.
   e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number.

4. **Additional Risk Level 3 Requirement:** The QSP shall include in the REAP, at a minimum, the following project phase information:

   a. Activities associated with each construction phase.
   b. Trades active on the construction site during each construction phase.
   c. Trade contractor information.
   d. Suggested actions for each project phase.

5. **Additional Risk Level 3 Requirement:** The QSP shall develop additional REAPs for project sites where construction activities are indefinitely halted or postponed (Inactive Construction). At a minimum, Inactive Construction REAPs must include:

a. Site Address.
b. Calculated Risk Level (2 or 3).
c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number.
d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number.
e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number.
f. Trades active on site during Inactive Construction.
g. Trade contractor information.
h. Suggested actions for inactive construction sites.

6. **Additional Risk Level 3 Requirement:** The discharger shall ensure a QSP begin implementation and make the REAP available onsite no later than 24 hours prior to the likely precipitation event.

7. **Additional Risk Level 3 Requirement:** The discharger shall ensure a QSP maintain onsite a paper copy of each REAP onsite in compliance with the record retention requirements of the Special Provisions in this General Permit.

I. Risk Level 3 Monitoring and Reporting Requirements

Table 2- Summary of Monitoring Requirements

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
3	X	X	X	X	X	X	X[4]

1. Construction Site Monitoring Program Requirements

   a. Pursuant to Water Code Sections 13383 and 13267, all dischargers subject to this General Permit shall develop and implement a written site-specific Construction Site Monitoring Program (CSMP) in accordance with the requirements of this Section. The CSMP shall include all monitoring procedures and instructions, location maps, forms, and checklists as required in this section. The CSMP shall be developed prior to the commencement of construction activities, and revised as necessary to reflect project revisions. The CSMP shall be a part of the Storm Water Pollution Prevention Plan (SWPPP), included as an appendix or separate SWPPP chapter.

   b. Existing dischargers registered under the State Water Board Order No. 99-08-DWQ shall make and implement necessary revisions to their Monitoring Program to reflect the changes in this General Permit in a timely manner, but no later than July 1, 2010. Existing dischargers shall continue to implement their existing Monitoring Program in compliance with State Water Board Order No. 99-08-DWQ until the necessary revisions are completed according to the schedule above.

   c. When a change of ownership occurs for all or any portion of the construction site prior to completion or final stabilization, the new discharger shall comply with these requirements as of the date the ownership change occurs.

2. **Objectives**

   The CSMP shall be developed and implemented to address the following objectives:

[4] When NEL exceeded

a. To demonstrate that the site is in compliance with the Discharge Prohibitions and applicable Numeric Action Levels (NALs)/Numeric Effluent Limitations (NELs) of this General Permit.

b. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives.

c. To determine whether immediate corrective actions, additional Best Management Practice (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges.

d. To determine whether BMPs included in the SWPPP/Rain Event Action Plan (REAP) are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.

3. **Risk Level 3 – Visual Monitoring (Inspection) Requirements for Qualifying Rain Events**

a. Risk Level 3 dischargers shall visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event.

b. Risk Level 3 dischargers shall visually observe (inspect) the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge during operating hours.

c. Risk Level 3 dischargers shall conduct visual observations (inspections) during business hours only.

d. Risk Level 3 dischargers shall record the time, date and rain gauge reading of all qualifying rain events.

e. Within 2 business days (48 hours) prior to each qualifying rain event, Risk Level 3 dischargers shall visually observe (inspect):

i. all storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources. If needed, the discharger shall implement appropriate corrective actions.

ii. all BMPs to identify whether they have been properly implemented in accordance with the SWPPP/REAP. If needed, the discharger shall implement appropriate corrective actions.

iii. any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

f. For the visual observations (inspections) described in c.i. and c.iii above, Risk Level 3 dischargers shall observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants.

g. Within two business days (48 hours) after each qualifying rain event, Risk Level 3 dischargers shall conduct post rain event visual observations (inspections) to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly.

h. Risk Level 3 dischargers shall maintain on-site records of all visual observations (inspections), personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

4. **Risk Level 3 – Water Quality Sampling and Analysis**

a. Risk Level 3 dischargers shall collect storm water grab samples from sampling locations, as defined in Section I.5. The storm water grab sample(s) obtained shall be representative of the flow and characteristics of the discharge.

b. At minimum, Risk Level 3 dischargers shall collect 3 samples per day of the qualifying event.

c. Risk Level 3 dischargers shall ensure that the grab samples collected of stored or contained storm water are from discharges subsequent to a qualifying rain event (producing precipitation of ½ inch or more at the time of discharge).

<u>Storm Water Effluent Monitoring Requirements</u>

d. Risk Level 3 dischargers shall analyze their effluent samples for:

i. pH and turbidity.

ii. Any additional parameters for which monitoring is required by the Regional Water Board.

e. Risk 3 dischargers shall electronically submit all storm event sampling results to the State Water Board no later than 5 days after the conclusion of the storm event.

f. Risk Level 3 discharger sites that have violated the turbidity daily average NEL shall analyze subsequent effluent samples for all the parameters specified in Section I.4.e, above, and Suspended Sediment Concentration (SSC).

Receiving Water Monitoring Requirements

g. In the event that a Risk Level 3 discharger violates an NEL contained in this General Permit and has a direct discharge into receiving waters, the Risk Level 3 discharger shall subsequently sample receiving waters (RWs) for all parameter(s) required in Section I.4.e above for the duration of coverage under this General Permit.

h. Risk Level 3 dischargers disturbing 30 acres or more of the landscape and with direct discharges into receiving waters shall conduct or participate in benthic macroinvertebrate bioassessment of RWs prior to commencement of construction activity (See Appendix 3).

i. Risk Level 3 dischargers shall obtain RW samples in accordance with the Receiving Water sampling location section (Section I.5), below.

5. **Risk Level 3 – Storm Water Discharge Water Quality Sampling Locations**

Effluent Sampling Locations

a. Risk Level 3 dischargers shall perform sampling and analysis of storm water discharges to characterize discharges associated with construction activity from the entire project disturbed area.

b. Risk Level 3 dischargers shall collect effluent samples at all discharge points where storm water is discharged off-site.

c. Risk Level 3 dischargers shall ensure that storm water discharge collected and observed represent[5] the effluent in each drainage area based on visual observation of the water and upstream conditions.

d. Risk Level 3 dischargers shall monitor and report site run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs or NELs.

e. Risk Level 3 dischargers who deploy an ATS on their site, or a portion on their site, shall collect ATS effluent samples and measurements from the discharge pipe or another location representative of the nature of the discharge.

f. Risk Level 3 dischargers shall select analytical test methods from the list provided in Table 3 below.

g. All storm water sample collection preservation and handling shall be conducted in accordance with Section I.7 "Storm Water Sample Collection and Handling Instructions" below.

Receiving Water Sampling Locations

h. **Upstream/up-gradient RW samples**: Risk Level 3 dischargers shall obtain any required upstream/up-gradient receiving water samples from a representative and accessible location as close as possible and upstream from the effluent discharge point.

i. **Downstream/down-gradient RW samples**: Risk Level 3 dischargers shall obtain any required downstream/down-gradient receiving water samples from a representative and accessible location as close as possible and downstream from the effluent discharge point.

j. If two or more discharge locations discharge to the same receiving water, Risk Level 3 dischargers may sample the receiving water at a single upstream and downstream location.

[5] For example, if there has been concrete work recently in an area, or drywall scrap is exposed to the rain, a pH sample shall be taken of drainage from the relevant work area. Similarly, if sediment-laden water is flowing through some parts of a silt fence, samples shall be taken of the sediment laden water even if most water flowing through the fence is clear.

6. **Risk Level 3 – Visual Observation and Sample Collection Exemptions**

   a. Risk Level 3 dischargers shall be prepared to collect samples and conduct visual observation (inspections) until the minimum requirements of Sections I.3 and I.4 above are completed. Risk Level 3 dischargers are not required to physically collect samples or conduct visual observation (inspections) under the following conditions:

      i. During dangerous weather conditions such as flooding and electrical storms.

      ii. Outside of scheduled site business hours.

   b. If no required samples or visual observation (inspections) are collected due to these exceptions, Risk Level 3 dischargers shall include an explanation in their SWPPP and in the Annual Report documenting why the sampling or visual observation (inspections) were not conducted.

7. **Risk Level 3 – Storm Water Sample Collection and Handling Instructions**

   a. Risk Level 3 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.

   b. Risk Level 3 dischargers shall ensure that testing laboratories will receive samples within 48 hours of the physical sampling (unless otherwise required by the laboratory), and shall use only the sample containers provided by the laboratory to collect and store samples.

   c. Risk Level 3 dischargers shall designate and train personnel to collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring Program's (SWAMP) 2008 Quality Assurance Program Plan (QAPrP).[6]

[6] Additional information regarding SWAMP's QAPrP and QAMP can be found at http://www.waterboards.ca.gov/water_issues/programs/swamp/.
QAPrP:http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/qapp/swamp_qapp_master090108a.pdf
QAMP: http://www.waterboards.ca.gov/water_issues/programs/swamp/qamp.shtml

8. **Risk Level 3 – Monitoring Methods**

   a. Risk Level 3 dischargers shall include a description of the following items in the CSMP:

      i. Visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures.

      ii. Sampling locations, and sample collection and handling procedures. This shall include detailed procedures for sample collection, storage, preservation, and shipping to the testing lab to assure that consistent quality control and quality assurance is maintained. Dischargers shall attach to the monitoring program an example Chain of Custody form used when handling and shipping samples.

      iii. Identification of the analytical methods and related method detection limits (if applicable) for each parameter required in Section I.4 above.

   b. Risk Level 3 dischargers shall ensure that all sampling and sample preservation are in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association). All monitoring instruments and equipment (including a discharger's own field instruments for measuring pH and turbidity) should be calibrated and maintained in accordance with manufacturers' specifications to ensure accurate measurements. Risk Level 3 dischargers shall ensure that all laboratory analyses are conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified in this General Permit or by the Regional Water Board. With the exception of field analysis conducted by the discharger for turbidity and pH, all analyses should be sent to and conducted at a laboratory certified for such analyses by the State Department of Health Services (SSC exception). Risk Level 3 dischargers shall conduct their own field analysis of pH and may conduct their own field analysis of turbidity if the discharger has sufficient capability (qualified and trained employees, properly calibrated and maintained field instruments, etc.) to adequately perform the field analysis.

9. **Risk Level 3 – Analytical Methods**

   a. Risk Level 3 dischargers shall refer to Table 3 below for test methods, detection limits, and reporting units.

b. **pH**: Risk Level 3 dischargers shall perform pH analysis on-site with a calibrated pH meter or a pH test kit. Risk Level 3 dischargers shall record pH monitoring results on paper and retain these records in accordance with Section I.14, below.

c. **Turbidity**: Risk Level 3 dischargers shall perform turbidity analysis using a calibrated turbidity meter (turbidimeter), either on-site or at an accredited lab. Acceptable test methods include Standard Method 2130 or USEPA Method 180.1. The results will be recorded in the site log book in Nephelometric Turbidity Units (NTU).

d. **Suspended sediment concentration (SSC)**: Risk Level 3 dischargers shall perform SSC analysis using ASTM Method D3977-97.

e. **Bioassessment**: Risk Level 3 dischargers shall perform bioassessment sampling and analysis according to Appendix 3 of this General Permit.

10. **Risk Level 3 - Non-Storm Water Discharge Monitoring Requirements**

a. Visual Monitoring Requirements:

i. Risk Level 3 dischargers shall visually observe (inspect) each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources.

ii. Risk Level 3 dischargers shall conduct one visual observation (inspection) quarterly in each of the following periods: January-March, April-June, July-September, and October-December. Visual observation (inspections) are only required during daylight hours (sunrise to sunset).

iii. Risk Level 3 dischargers shall ensure that visual observations (inspections) document the presence or evidence of any non-storm water discharge (authorized or unauthorized), pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.), and source. Risk Level 3 dischargers shall maintain on-site records indicating the personnel performing the visual observation (inspections), the dates and approximate time each drainage area and non-storm water discharge was observed, and the response taken to eliminate unauthorized non-storm water discharges and to

reduce or prevent pollutants from contacting non-storm water discharges.

b. Effluent Sampling Locations:

i. Risk Level 3 dischargers shall sample effluent at all discharge points where non-storm water and/or authorized non-storm water is discharged off-site.

ii. Risk Level 3 dischargers shall send all non-storm water sample analyses to a laboratory certified for such analyses by the State Department of Health Services.

iii. Risk Level 3 dischargers shall monitor and report run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs or NELs.

11. **Risk Level 3 – Non-Visible Pollutant Monitoring Requirements**

a. Risk Level 3 dischargers shall collect one or more samples during any breach, malfunction, leakage, or spill observed during a visual inspection which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water.

b. Risk Level 3 dischargers shall ensure that water samples are large enough to characterize the site conditions.

c. Risk Level 3 dischargers shall collect samples at all discharge locations that can be safely accessed.

d. Risk Level 3 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.

e. Risk Level 3 dischargers shall analyze samples for all non-visible pollutant parameters (if applicable) - parameters indicating the presence of pollutants identified in the pollutant source assessment required (Risk Level 3 dischargers shall modify their CSMPs to address these additional parameters in accordance with any updated SWPPP pollutant source assessment).

f. Risk Level 3 dischargers shall collect a sample of storm water that has not come in contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample) for comparison with the discharge sample.

g. Risk Level 3 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis.[7]

h. Risk Level 3 dischargers shall keep all field /or analytical data in the SWPPP document.

12. **Risk Level 3 – Watershed Monitoring Option**

Risk Level 3 dischargers who are part of a qualified regional watershed-based monitoring program may be eligible for relief from the requirements in Sections I.5. The Regional Water Board may approve proposals to substitute an acceptable watershed-based monitoring program by determining if the watershed-based monitoring program will provide substantially similar monitoring information in evaluating discharger compliance with the requirements of this General Permit.

13. **Risk Level 3 – Particle Size Analysis for Project Risk Justification**

Risk Level 3 dischargers justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

14. **Risk Level 3 – Records**

Risk Level 3 dischargers shall retain records of all storm water monitoring information and copies of all reports (including Annual Reports) for a period of at least three years. Risk Level 3 dischargers shall retain all records on-site while construction is ongoing. These records include:

a. The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation.

b. The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements.

c. The date and approximate time of analyses.

[7] For laboratory analysis, all sampling, sample preservation, and analyses must be conducted according to test procedures under 40 CFR Part 136. Field discharge samples shall be collected and analyzed according to the specifications of the manufacturer of the sampling devices employed.

d. The individual(s) who performed the analyses.

e. A summary of all analytical results from the last three years, the method detection limits and reporting units, the analytical techniques or methods used, and the chain of custody forms.

f. Rain gauge readings from site inspections.

g. Quality assurance/quality control records and results.

h. Non-storm water discharge inspections and visual observation (inspections) and storm water discharge visual observation records (see Sections I.3 and I.10 above).

i. Visual observation and sample collection exception records (see Section I.6 above).

j. The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation (inspections), or inspections.

15. **Risk Level 3 – NAL Exceedance Report**

a. In the event that any effluent sample exceeds an applicable NAL, Risk Level 3 dischargers shall electronically submit all storm event sampling results to the State Water Board no later than 10 days after the conclusion of the storm event. The Regional Boards have the authority to require the submittal of an NAL Exceedance Report.

b. Risk Level 3 dischargers shall certify each NAL Exceedance Report in accordance with the Special Provisions for Construction Activity In this General Permit.

c. Risk Level 3 dischargers shall retain an electronic or paper copy of each NAL Exceedance Report for a minimum of three years after the date the annual report is filed.

d. Risk Level 3 dischargers shall include in the NAL Exceedance Report:

i. The analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as “less than the method detection limit”).

ii. The date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation.

iii. A description of the current BMPs associated with the effluent sample that exceeded the NAL and the proposed corrective actions taken.

16. **Risk Level 3 – NEL Violation Report**

a. Risk Level 3 dischargers shall electronically submit all storm event sampling results to the State Water Board no later than 5 days after the conclusion of the storm event.

b. In the event that a discharger has violated an applicable NEL, Risk Level 3 dischargers shall submit an NEL Violation Report to the State Water Board within 24 hours after the NEL exceedance has been identified.

c. Risk Level 3 dischargers shall certify each NEL Violation Report in accordance with the Special Provisions for Construction Activity in this General Permit.

d. Risk Level 3 dischargers shall retain an electronic or paper copy of each NEL Violation Report for a minimum of three years after the date the annual report is filed.

e. Risk Level 3 dischargers shall include in the NEL Violation Report:

i. The analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as “less than the method detection limit”);

ii. The date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation; and

iii. A Description of the current onsite BMPs, and the proposed corrective actions taken to manage the NEL exceedance.

f. Compliance Storm Exemption - In the event that an applicable NEL has been exceeded during a storm event equal to or larger than the Compliance Storm Event, Risk level 3 discharger shall report the on-site rain gauge reading and nearby governmental rain gauge readings for verification.

17. **Risk Level 3 – Bioassessment**

a. Risk Level 3 dischargers with a total project-related ground disturbance exceeding 30 acres shall:

i. Conduct bioassessment monitoring, as described in Appendix 3.

ii. Include the collection and reporting of specified in stream biological data and physical habitat.

iii. Use the bioassessment sample collection and Quality Assurance & Quality Control (QA/QC) protocols developed by the State of California's Surface Water Ambient Monitoring Program (SWAMP).[8]

b. Risk Level 3 dischargers qualifying for bioassessment, where construction commences out of an index period for the site location shall:

i. Receive Regional Board approval for the sampling exception.

ii. Conduct bioassessment monitoring, as described in Appendix 3.

iii. Include the collection and reporting of specified instream biological data and physical habitat.

iv. Use the bioassessment sample collection and Quality Assurance & Quality Control (QA/QC) protocols developed by the State of California's Surface Water Ambient Monitoring Program (SWAMP).

OR

v. Make a check payable to: Cal State Chico Foundation (SWAMP Bank Account) or San Jose State Foundation (SWAMP Bank Account) and include the WDID# on the check for the amount calculated for the exempted project.

vi. Send a copy of the check to the Regional Water Board office for the site's region.

vii. Invest $**7,500.00 X The number of samples required** into the SWAMP program as compensation (upon regional board approval).

[8] http://www.waterboards.ca.gov/water_issues/programs/swamp/.

Table 3 – Risk Level 3 Test Methods, Detection Limits, Reporting Units and Applicable NALs/NELs

Parameter	Test Method / Protocol	Discharge Type	Min. Detection Limit	Reporting Units	Numeric Action Level	Numeric Effluent Limitation
pH	Field test with calibrated portable instrument	Risk Level 3 Discharges	0.2 pH	units	lower NAL = 6.5 upper NAL = 8.5	lower NEL = 6.0 upper NEL = 9.0
Turbidity EPA	0180.1 and/or field test with calibrated portable instrument	Risk Level 3 Discharges other than ATS	1	NTU	250 NTU	500 NTU
		For ATS discharges	1 NTU		N/A	10 NTU for Daily Weighted Average & 20 NTU for Any Single Sample
SSC ASTM	Method D 3977-97[9]	Risk Level 3 (if NEL exceeded)	5 mg/L		N/A	N/A
Bioassessment	(STE) Level I of (SAFIT),[10] fixed-count of 600 org/sample	Risk Level 3 projects> 30 acres	N/A N/A		N/A	N/A

[9] ASTM, 1999, Standard Test Method for Determining Sediment Concentration in Water Samples: American Society of Testing and Materials, D 3977-97, Vol. 11.02, pp. 389-394.

[10] The current SAFIT STEs (28 November 2006) list requirements for both the Level I and Level II taxonomic effort, and are located at: http://www.swrcb.ca.gov/swamp/docs/safit/ste_list.pdf. When new editions are published by SAFIT, they will supersede all previous editions. All editions will be posted at the State Water Board's SWAMP website.

ATTACHMENT F:
Active Treatment System (ATS) Requirements

Table 1 – Numeric Effluent Limitations, Numeric Action Levels, Test Methods, Detection Limits, and Reporting Units

Parameter	Test Method	Discharge Type	Min. Detection Limit	Units	Numeric Action Level	Numeric Effluent Limitation
Turbidity	EPA 0180.1 and/or field test with a calibrated portable instrument	For ATS discharges	1 NTU		N/A	10 NTU for Daily Flow-Weighted Average & 20 NTU for Any Single Sample

A. Dischargers choosing to implement an Active Treatment System (ATS) on their site shall comply with all of the requirements in this Attachment.

B. The discharger shall maintain a paper copy of each ATS specification onsite in compliance with the record retention requirements in the Special Provisions of this General Permit.

C. ATS Design, Operation and Submittals

1. The ATS shall be designed and approved by a Certified Professional in Erosion and Sediment Control (CPESC), a Certified Professional in Storm Water Quality (CPSWQ); a California registered civil engineer; or any other California registered engineer.

2. The discharger shall ensure that the ATS is designed in a manner to preclude the accidental discharge of settled floc[1] during floc pumping or related operations.

3. The discharger shall design outlets to dissipate energy from concentrated flows.

4. The discharger shall install and operate an ATS by assigning a lead person (or project manager) who has either a minimum of five years construction storm

[1] Floc is defined as a clump of solids formed by the chemical action in ATS systems.

water experience or who is a licensed contractors specifically holding a California Class A Contractors license.[2]

5. The discharger shall prepare an ATS Plan that combines the site-specific data and treatment system information required to safely and efficiently operate an ATS. The ATS Plan shall be electronically submitted to the State Water Board at least 14 days prior to the planned operation of the ATS and a paper copy shall be available onsite during ATS operation. At a minimum, the ATS Plan shall include:

   a. ATS Operation and Maintenance Manual for All Equipment.

   b. ATS Monitoring, Sampling & Reporting Plan, including Quality Assurance/Quality Control (QA/QC).

   c. ATS Health and Safety Plan.

   d. ATS Spill Prevention Plan.

6. The ATS shall be designed to capture and treat (within a 72-hour period) a volume equivalent to the runoff from a 10-year, 24-hour storm event using a watershed runoff coefficient of 1.0.

D. Treatment – Chemical Coagulation/Flocculation

1. Jar tests shall be conducted using water samples selected to represent typical site conditions and in accordance with ASTM D2035-08 (2003).

2. The discharger shall conduct, at minimum, six site-specific jar tests (per polymer with one test serving as a control) for each project to determine the proper polymer and dosage levels for their ATS.

3. Single field jar tests may also be conducted during a project if conditions warrant, for example if construction activities disturb changing types of soils, which consequently cause change in storm water and runoff characteristics.

E. Residual Chemical and Toxicity Requirements

1. The discharger shall utilize a residual chemical test method that has a method detection limit (MDL) of 10% or less than the maximum allowable threshold

[2] Business and Professions Code Division 3, Chapter 9, Article 4, Class A Contractor: A general engineering contractor is a contractor whose principal contracting business is in connection with fixed works requiring specialized engineering knowledge and skill. [http://www.cslb.ca.gov/General-Information/library/licensing-classifications.asp].

concentration[3] (MATC) for the specific coagulant in use and for the most sensitive species of the chemical used.

2. The discharger shall utilize a residual chemical test method that produces a result within one hour of sampling.

3. The discharger shall have a California State certified laboratory validate the selected residual chemical test. Specifically the lab will review the test protocol, test parameters, and the detection limit of the coagulant. The discharger shall electronically submit this documentation as part of the ATS Plan.

4. If the discharger cannot utilize a residual chemical test method that meets the requirements above, the discharger shall operate the ATS in Batch Treatment[4] mode.

5. A discharger planning to operate in Batch Treatment mode shall perform toxicity testing in accordance with the following:

   a. The discharger shall initiate acute toxicity testing on effluent samples representing effluent from each batch prior to discharge[5]. All bioassays shall be sent to a laboratory certified by the Department of Health Services (DHS) Environmental Laboratory Accreditation Program (ELAP). The required field of testing number for Whole Effluent Toxicity (WET) testing is E113.[6]

   b. Acute toxicity tests shall be conducted with the following species and protocols. The methods to be used in the acute toxicity testing shall be those outlined for a 96-hour acute test in "Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, USEPA-841-R-02-012" for Fathead minnow, *Pimephales promelas* (fathead minnow). Acute toxicity for *Oncorhynchus mykiss* (Rainbow Trout) may be used as a substitute for testing fathead minnows.

   c. All toxicity tests shall meet quality assurance criteria and test acceptability criteria in the most recent versions of the EPA test method for WET testing.

   d. The discharger shall electronically report all acute toxicity testing.

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[3] The Maximum Allowable Threshold Concentration (MATC) is the allowable concentration of residual, or dissolved, coagulant/flocculant in effluent. The MATC shall be coagulant/flocculant-specific, and based on toxicity testing conducted by an independent, third-party laboratory. A typical MATC would be:
The MATC is equal to the geometric mean of the NOEC (No Observed Effect Concentration) and LOEC (Lowest Observed Effect Concentration) Acute and Chronic toxicity results for most sensitive species determined for the specific coagulant. The most sensitive species test shall be used to determine the MATC.
[4] Batch Treatment mode is defined as holding or recirculating the treated water in a holding basin or tank(s) until treatment is complete or the basin or storage tank(s) is full.
[5] This requirement only requires that the test be initiated prior to discharge.
[6] http://www.dhs.ca.gov/ps/ls/elap/pdf/FOT_Desc.pdf.

F. Filtration

1. The ATS shall include a filtration step between the coagulant treatment train and the effluent discharge. This is commonly provided by sand, bag, or cartridge filters, which are sized to capture suspended material that might pass through the clarifier tanks.

2. Differential pressure measurements shall be taken to monitor filter loading and confirm that the final filter stage is functioning properly.

G. Residuals Management

1. Sediment shall be removed from the storage or treatment cells as necessary to ensure that the cells maintain their required water storage (i.e., volume) capability.

2. Handling and disposal of all solids generated during ATS operations shall be done in accordance with all local, state, and federal laws and regulations.

H. ATS Instrumentation

1. The ATS shall be equipped with instrumentation that automatically measures and records effluent water quality data and flow rate.

2. The minimum data recorded shall be consistent with the Monitoring and Reporting requirements below, and shall include:

   a. Influent Turbidity

   b. Effluent Turbidity

   c. Influent pH

   d. Effluent pH

   e. Residual Chemical

   f. Effluent Flow rate

   g. Effluent Flow volume

3. Systems shall be equipped with a data recording system, such as data loggers or webserver-based systems, which records each measurement on a frequency no longer than once every 15 minutes.

4. Cumulative flow volume shall be recorded daily. The data recording system shall have the capacity to record a minimum of seven days continuous data.

5. Instrumentation systems shall be interfaced with system control to provide auto shutoff or recirculation in the event that effluent measurements exceed turbidity or pH.

6. The system shall also assure that upon system upset, power failure, or other catastrophic event, the ATS will default to a recirculation mode or safe shut down.

7. Instrumentation (flow meters, probes, valves, streaming current detectors, controlling computers, etc.) shall be installed and maintained per manufacturer's recommendations, which shall be included in the QA/QC plan.

8. The QA/QC plan shall also specify calibration procedures and frequencies, instrument method detection limit or sensitivity verification, laboratory duplicate procedures, and other pertinent procedures.

9. The instrumentation system shall include a method for controlling coagulant dose, to prevent potential overdosing. Available technologies include flow/turbidity proportional metering, periodic jar testing and metering pump adjustment, and ionic charge measurement controlling the metering pump.

I. ATS Effluent Discharge

1. ATS effluent shall comply with all provisions and prohibitions in this General Permit, specifically the NELs.

2. NELs for discharges from an ATS:

   a. Turbidity of all ATS discharges shall be less than 10 NTU for daily flow-weighted average of all samples and 20 NTU for any single sample.

   b. Residual Chemical shall be < 10% of MATC[7] for the most sensitive species of the chemical used.

3. If an analytical effluent sampling result is outside the range of pH NELs (i.e., is below the lower NEL for pH or exceeds the upper NEL for pH) or exceeds the turbidity NEL (as listed in Table 1), the discharger is in violation of this General

[7] The Maximum Allowable Threshold Concentration (MATC) is the allowable concentration of residual, or dissolved, coagulant/flocculant in effluent. The MATC shall be coagulant/flocculant-specific, and based on toxicity testing conducted by an independent, third-party laboratory. The MATC is equal to the geometric mean of the NOEC (No Observed Effect Concentration) and LOEC (Lowest Observed Effect Concentration) Acute and Chronic toxicity results for most sensitive species determined for the specific coagulant. The most sensitive species test shall be used to determine the MATC.

Permit and shall electronically file the results in violation within 24-hours of obtaining the results.

4. If ATS effluent is authorized to discharge into a sanitary sewer system, the discharger shall comply with any pre-treatment requirements applicable for that system. The discharger shall include any specific criteria required by the municipality in the ATS Plan.

5. Compliance Storm Event:

   Discharges of storm water from ATS shall comply with applicable NELs (above) unless the storm event causing the discharges is determined after the fact to be equal to or larger than the Compliance Storm Event (expressed in inches of rainfall). The Compliance Storm Event for ATS discharges is the 10 year, 24 hour storm, as determined using these maps:

   http://www.wrcc.dri.edu/pcpnfreq/nca10y24.gif
   http://www.wrcc.dri.edu/pcpnfreq/sca10y24.gif

   This exemption is dependent on the submission of rain gauge data verifying the storm event is equal to or larger than the Compliance Storm.

J. Operation and Maintenance Plan

1. Each Project shall have a site-specific Operation and Maintenance (O&M) Manual covering the procedures required to install, operate and maintain the ATS.[8]

2. The O&M Manual shall only be used in conjunction with appropriate project-specific design specifications that describe the system configuration and operating parameters.

3. The O&M Manual shall have operating manuals for specific pumps, generators, control systems,and other equipment.

K. Sampling and Reporting Quality Assurance/ Quality Check (QA/QC) Plan

4. A project-specific QA/QC Plan shall be developed for each project. The QA/QC Plan shall include at a minimum:

   a. Calibration – Calibration methods and frequencies for all system and field instruments shall be specified.

   b. Method Detection Limits (MDLs) – The methods for determining MDLs shall be specified for each residual coagulant measurement method. Acceptable

[8] The manual is typically in a modular format covering generalized procedures for each component that is utilized in a particular system.

minimum MDLs for each method, specific to individual coagulants, shall be specified.

c. Laboratory Duplicates – Requirements for monthly laboratory duplicates for residual coagulant analysis shall be specified.

L. Personnel Training

1. Operators shall have training specific to using an ATS and liquid coagulants for storm water discharges in California.

2. The training shall be in the form of a formal class with a certificate and requirements for testing and certificate renewal.

3. Training shall include a minimum of eight hours classroom and 32 hours field training. The course shall cover the following topics:

   a. Coagulation Basics –Chemistry and physical processes

   b. ATS System Design and Operating Principles

   c. ATS Control Systems

   d. Coagulant Selection – Jar testing, dose determination, etc.

   e. Aquatic Safety/Toxicity of Coagulants, proper handling and safety

   f. Monitoring, Sampling, and Analysis

   g. Reporting and Recordkeeping

   h. Emergency Response

M. Active Treatment System (ATS) Monitoring Requirements

Any discharger who deploys an ATS on their site shall conduct the following:

1. Visual Monitoring

   a. A designated responsible person shall be on site daily at all times during treatment operations.

   b. Daily on-site visual monitoring of the system for proper performance shall be conducted and recorded in the project data log.

i. The log shall include the name and phone number of the person responsible for system operation and monitoring.

ii. The log shall include documentation of the responsible person's training.

2. Operational and Compliance Monitoring

a. Flow shall be continuously monitored and recorded at not greater than 15-minute intervals for total volume treated and discharged.

b. Influent and effluent pH must be continuously monitored and recorded at not greater than 15-minute intervals.

c. Influent and effluent turbidity (expressed in NTU) must be continuously monitored and recorded at not greater than 15-minute intervals.

d. The type and amount of chemical used for pH adjustment, if any, shall be monitored and recorded.

e. Dose rate of chemical used in the ATS system (expressed in mg/L) shall be monitored and reported 15-minutes after startup and every 8 hours of operation.

f. Laboratory duplicates – monthly laboratory duplicates for residual coagulant analysis must be performed and records shall be maintained onsite.

g. Effluent shall be monitored and recorded for residual chemical/additive levels.

h. If a residual chemical/additive test does not exist and the ATS is operating in a batch treatment mode of operation refer to the toxicity monitoring requirements below.

3. Toxicity Monitoring

A discharger operating in batch treatment mode shall perform toxicity testing in accordance with the following:

a. The discharger shall initiate acute toxicity testing on effluent samples representing effluent from each batch prior to discharge.[9] All bioassays shall be sent to a laboratory certified by the Department of Health Services (DHS) Environmental Laboratory Accreditation Program (ELAP). The required field of testing number for Whole Effluent Toxicity (WET) testing is E113.[10]

[9] This requirement only requires that the test be initiated prior to discharge.
[10] http://www.dhs.ca.gov/ps/ls/elap/pdf/FOT_Desc.pdf.

b. Acute toxicity tests shall be conducted with the following species and protocols. The methods to be used in the acute toxicity testing shall be those outlined for a 96-hour acute test in "Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, USEPA-841-R-02-012" for Fathead minnow, *Pimephales promelas or* Rainbow trout *Oncorhynchus mykiss* may be used as a substitute for fathead minnow.

c. All toxicity tests shall meet quality assurance criteria and test acceptability criteria in the most recent versions of the EPA test method for WET testing.[11]

4. Reporting and Recordkeeping

At a minimum, every 30 days a LRP representing the discharger shall access the State Water Boards Storm Water Mulit-Application and Report Tracking system (SMARTS) and electronically upload field data from the ATS. Records must be kept for three years after the project is completed .

5. Non-compliance Reporting

a. Any indications of toxicity or other violations of water quality objectives shall be reported to the appropriate regulatory agency as required by this General Permit.

b. Upon any measurements that exceed water quality standards, the system operator shall immediately notify his supervisor or other responsible parties, who shall notify the Regional Water Board.

c. If any monitoring data exceeds any applicable NEL in this General Permit, the discharger shall electronically submit a NEL Violation Report to the State Water Board within 24 hours after the NEL exceedance has been identified.

i. ATS dischargers shall certify each NEL Violation Report in accordance with the Special Provisions for Construction Activity in this General Permit.

ii. ATS dischargers shall retain an electronic or paper copy of each NEL Violation Report for a minimum of three years after the date the annual report is filed.

iii. ATS dischargers shall include in the NEL Violation Report:

(1) The analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as "less than the method detection limit");

[11] http://www.epa.gov/waterscience/methods/wet/.

(2) The date, place, time of sampling, visual observation (inspections), and/or measurements, including precipitation; and

(3) A description of the current onsite BMPs, and the proposed corrective actions taken to manage the NEL exceedance.

iv. Compliance Storm Exemption - In the event that an applicable NEL has been exceeded during a storm event equal to or larger than the Compliance Storm Event, ATS dischargers shall report the on-site rain gauge reading and nearby governmental rain gauge readings for verification.

Risk Determination Worksheet

Step 1 Determine Sediment Risk via one of the options listed:

1. GIS Map Method - EPA Rainfall Erosivity Calculator & GIS map
2. Individual Method - EPA Rainfall Erosivity Calculator & Individual Data

Step 2 Determine Receiving Water Risk via one of the options listed:

1. GIS map of Sediment Sensitive Watersheds provided (in development)
2. List of Sediment Sensitive Watersheds provided

Step 3 Determine Combined Risk Level

Sediment Risk Factor Worksheet	Entry

A) R Factor

Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S. Refer to the link below to determine the R factor for the project site.

http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm

R Factor Value	0

B) K Factor (weighted average, by area, for all site soils)

The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff. Use Site-specific data must be submitted.

Site-specific K factor guidance

K Factor Value	0

C) LS Factor (weighted average, by area, for all slopes)

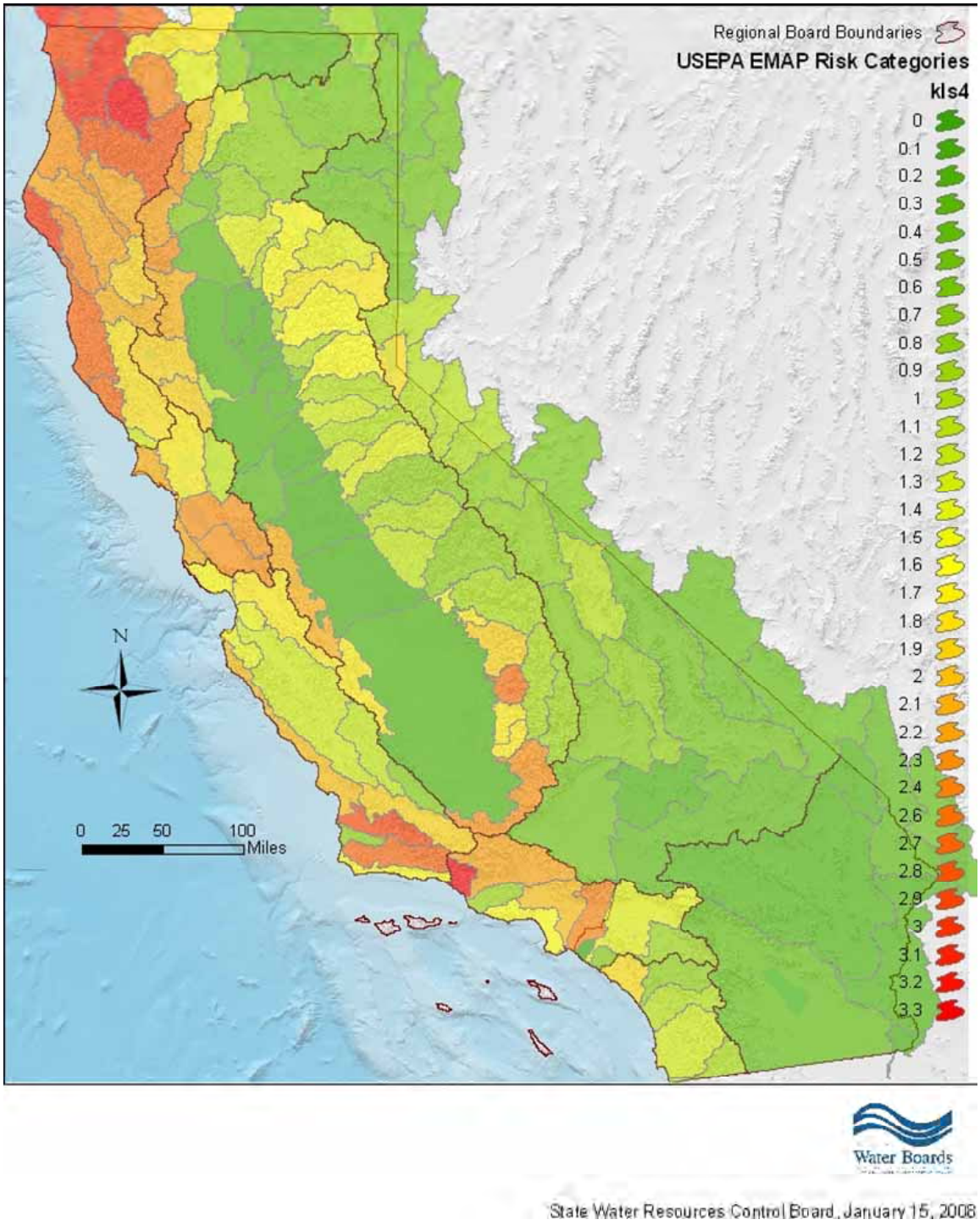
The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction.

LS Table

LS Factor Value	0

Watershed Erosion Estimate (=RxKxLS) in tons/acre	0
Site Sediment Risk Factor Low Sediment Risk: < 15 tons/acre Medium Sediment Risk: >=15 and <75 tons/acre High Sediment Risk: >= 75 tons/acre	**Low**

For the GIS Map Method, the R factor for the project is calculated using the online calculator at (see cell to right). The product of K and LS are shown on the figure below. To determine soil loss in tons per acre, multiply the R factor times the value for K times LS from the map.
http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm



Receiving Water (RW) Risk Factor Worksheet	Entry	Score
A. Watershed Characteristics	**yes/no**	
A.1. Does the disturbed area discharge (either directly or indirectly) to a **303(d)-listed waterbody impaired by sediment**? (For help with impaired waterbodies please check the attached worksheet or visit the link below) or has a **USEPA approved TMDL implementation plan for sediment**?: 2006 Approved Sediment-impared WBs Worksheet http://www.waterboards.ca.gov/water_issues/programs/tmdl/303d_lists2006_epa.shtml **OR**	**Yes**	**High**
A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY? http://www.ice.ucdavis.edu/geowbs/asp/wbquse.asp		

Combined Risk Level Matrix

Receiving Water Risk	Sediment Risk: Low	Sediment Risk: Medium	Sediment Risk: High
Low	Level 1	Level 2	
High	Level 2		Level 3

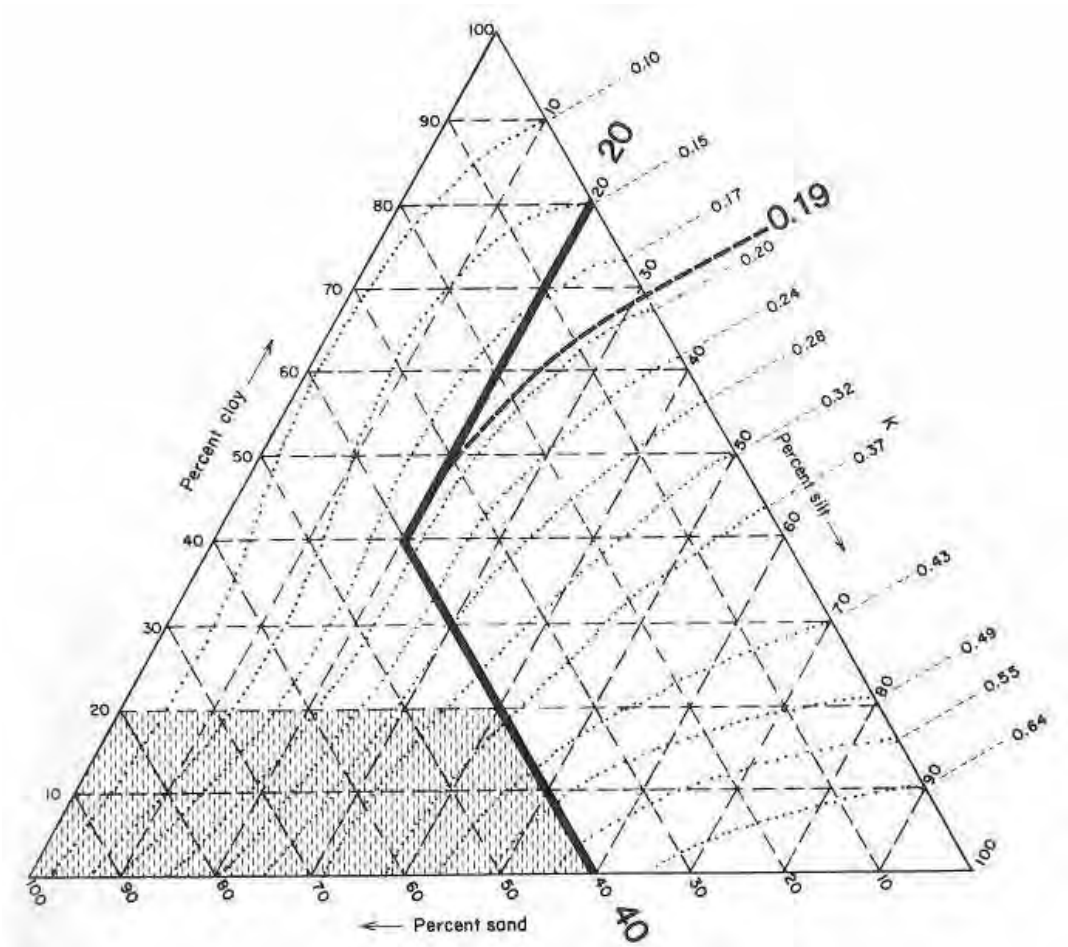
Project Sediment Risk: **Low**

Project RW Risk: **High**

Project Combined Risk: **Level 2**

Soil Erodibility Factor (K)

The K factor can be determined by using the nomograph method, which requires that a particle size analysis (ASTM D-422) be done to determine the percentages of sand, very fine sand, silt and clay. Use the figure below to determine appropriate K value.



Erickson triangular nomograph used to estimate soil erodibility (K) factor.
The figure above is the USDA nomograph used to determine the K factor for a soil, based on its texture (% silt plus very fine sand, % sand, % organic matter, soil structure, and permeability).
Nomograph from Erickson 1977 as referenced in Goldman et. al., 1986.

Sheet Flow Length (ft)	Average Watershed Slope (%) 0.2	0.5	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0	
<3	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.35	0.36	0.38	0.39	0.41	
6	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.37	0.41	0.45	0.49	0.56	
9	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.38	0.45	0.51	0.56	0.67	
12	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.39	0.47	0.55	0.62	0.76	
15	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.40	0.49	0.58	0.67	0.84	
25	0.05	0.07	0.10	0.16	0.21	0.26	0.31	0.36	0.45	0.57	0.71	0.85	0.98	1.24	
50	0.05	0.08	0.13	0.21	0.30	0.38	0.46	0.54	0.70	0.91	1.15	1.40	1.64	2.10	
75	0.05	0.08	0.14	0.25	0.36	0.47	0.58	0.69	0.91	1.20	1.54	1.87	2.21	2.86	
100	0.05	0.09	0.15	0.28	0.41	0.55	0.68	0.82	1.10	1.46	1.88	2.31	2.73	3.57	
150	0.05	0.09	0.17	0.33	0.50	0.68	0.86	1.05	1.43	1.92	2.51	3.09	3.68	4.85	
200	0.06	0.10	0.18	0.37	0.57	0.79	1.02	1.25	1.72	2.34	3.07	3.81	4.56	6.04	
250	0.06	0.10	0.19	0.40	0.64	0.89	1.16	1.43	1.99	2.72	3.60	4.48	5.37	7.16	
300	0.06	0.10	0.20	0.43	0.69	0.98	1.28	1.60	2.24	3.09	4.09	5.11	6.15	8.23	1
400	0.06	0.11	0.22	0.48	0.80	1.14	1.51	1.90	2.70	3.75	5.01	6.30	7.60	10.24	1
600	0.06	0.12	0.24	0.56	0.96	1.42	1.91	2.43	3.52	4.95	6.67	8.45	10.26	13.94	1
800	0.06	0.12	0.26	0.63	1.10	1.65	2.25	2.89	4.24	6.03	8.17	10.40	12.69	17.35	2
1000	0.06	0.13	0.27	0.69	1.23	1.86	2.55	3.30	4.91	7.02	9.57	12.23	14.96	20.57	2

LS Factors for Construction Sites. *Table from Renard et. al., 1997.*

WBID	REGION NUMBER	REGION NAME	WATER BODY TYPE ABBR	WATER BODY TYPE	WATER BODY NAME	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT ABBR	UNIT	POLLUTANT CODE	POLLUTANT	SOURCE CODE	POTENTIAL SOURCES	PROPOSED TMDL COMPLETION	COMMENTS
CAE115301	1	North Coast	E	Estuaries	Bodega HU, Estero Americano HA, estuary	11530012	199	A	Acres	1100	Sedimentation/Siltation	1510	Range Grazing-Riparian	2019	Water Quality Attainment strategy is attempting to increase voluntary measures for attainment of standards & objectives, as was done in the Estero de San Antonio/Stemple Creek T Water Quality Attainment Strategy, adopted by NCRWQCB in Dec, 97.
CAE115301	1	North Coast	E	Estuaries	Bodega HU, Estero Americano HA, estuary	11530012	199	A	Acres	1100	Sedimentation/Siltation	7000	Hydromodification	2019	Water Quality Attainment strategy is attempting to increase voluntary measures for attainment of standards & objectives, as was done in the Estero de San Antonio/Stemple Creek T Water Quality Attainment Strategy, adopted by NCRWQCB in Dec, 97.
CAE115301	1	North Coast	E	Estuaries	Bodega HU, Estero Americano HA, estuary	11530012	199	A	Acres	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	Water Quality Attainment strategy is attempting to increase voluntary measures for attainment of standards & objectives, as was done in the Estero de San Antonio/Stemple Creek T Water Quality Attainment Strategy, adopted by NCRWQCB in Dec, 97.
CAE115301	1	North Coast	E	Estuaries	Bodega HU, Estero Americano HA, estuary	11530012	199	A	Acres	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	Water Quality Attainment strategy is attempting to increase voluntary measures for attainment of standards & objectives, as was done in the Estero de San Antonio/Stemple Creek T Water Quality Attainment Strategy, adopted by NCRWQCB in Dec, 97.
CAE115301	1	North Coast	E	Estuaries	Bodega HU, Estero Americano HA, estuary	11530012	199	A	Acres	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Water Quality Attainment strategy is attempting to increase voluntary measures for attainment of standards & objectives, as was done in the Estero de San Antonio/Stemple Creek T Water Quality Attainment Strategy, adopted by NCRWQCB in Dec, 97.
CAE115301	1	North Coast	E	Estuaries	Bodega HU, Estero Americano HA, estuary	11530012	199	A	Acres	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	Water Quality Attainment strategy is attempting to increase voluntary measures for attainment of standards & objectives, as was done in the Estero de San Antonio/Stemple Creek T Water Quality Attainment Strategy, adopted by NCRWQCB in Dec, 97.
CAR111111	1	North Coast	R	Rivers/Streams	Eel River HU, Lower Eel River HA, Eel River Delta	11110000	426	M	Miles	1100	Sedimentation/Siltation	1500	Range Grazing-Riparian and/or Upland	2019	
CAR111111	1	North Coast	R	Rivers/Streams	Eel River HU, Lower Eel River HA, Eel River Delta	11110000	426	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	
CAR111111	1	North Coast	R	Rivers/Streams	Eel River HU, Lower Eel River HA, Eel River Delta	11110000	426	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR111411	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	1510	Range Grazing-Riparian	2004	
CAR111411	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	1520	Range Grazing-Upland	2004	
CAR111411	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2004	
CAR111411	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	2100	Harvesting, Restoration, Residue Management	2004	
CAR111411	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	2300	Logging Road Construction/Maintenance	2004	
CAR111411	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2004	
CAR111411	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	3200	Land Development	2004	
CAR111411	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	7000	Hydromodification	2004	
CAR111411	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	7550	Habitat Modification	2004	
CAR111411	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2004	
CAR111411	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2004	
CAR111411	1	North Coast	R	Rivers/Streams	Eel River HU, Middle Main HA	11140000	674	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2004	
CAR111621	1	North Coast	R	Rivers/Streams	Eel River HU, Upper Main HA (Includes Tomki Creek)	11160000	1141	M	Miles	1100	Sedimentation/Siltation	1935	Agriculture-grazing	2019	USEPA will develop a TMDL for Eel River, Upper Main Fork.
CAR111621	1	North Coast	R	Rivers/Streams	Eel River HU, Upper Main HA (Includes Tomki Creek)	11160000	1141	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	USEPA will develop a TMDL for Eel River, Upper Main Fork.
CAR111621	1	North Coast	R	Rivers/Streams	Eel River HU, Upper Main HA (Includes Tomki Creek)	11160000	1141	M	Miles	1100	Sedimentation/Siltation	2100	Harvesting, Restoration, Residue Management	2019	USEPA will develop a TMDL for Eel River, Upper Main Fork.
CAR111621	1	North Coast	R	Rivers/Streams	Eel River HU, Upper Main HA (Includes Tomki Creek)	11160000	1141	M	Miles	1100	Sedimentation/Siltation	2300	Logging Road Construction/Maintenance	2019	USEPA will develop a TMDL for Eel River, Upper Main Fork.
CAR111621	1	North Coast	R	Rivers/Streams	Eel River HU, Upper Main HA (Includes Tomki Creek)	11160000	1141	M	Miles	1100	Sedimentation/Siltation	2400	Silvicultural Point Sources	2019	USEPA will develop a TMDL for Eel River, Upper Main Fork.
CAR111621	1	North Coast	R	Rivers/Streams	Eel River HU, Upper Main HA (Includes Tomki Creek)	11160000	1141	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	USEPA will develop a TMDL for Eel River, Upper Main Fork.
CAR111621	1	North Coast	R	Rivers/Streams	Eel River HU, Upper Main HA (Includes Tomki Creek)	11160000	1141	M	Miles	1100	Sedimentation/Siltation	3100	Highway/Road/Bridge Construction	2019	USEPA will develop a TMDL for Eel River, Upper Main Fork.
CAR111621	1	North Coast	R	Rivers/Streams	Eel River HU, Upper Main HA (Includes Tomki Creek)	11160000	1141	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	USEPA will develop a TMDL for Eel River, Upper Main Fork.
CAR111621	1	North Coast	R	Rivers/Streams	Eel River HU, Upper Main HA (Includes Tomki Creek)	11160000	1141	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	USEPA will develop a TMDL for Eel River, Upper Main Fork.
CAR111621	1	North Coast	R	Rivers/Streams	Eel River HU, Upper Main HA (Includes Tomki Creek)	11160000	1141	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	USEPA will develop a TMDL for Eel River, Upper Main Fork.
CAR110001	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Elk River	11000000	88	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	The Eureka Plain HU, Elk River, includes the following Calwater Planning Watersheds (PWS): 110.00021, 110.00030, 110.00032, and 110.00042. Sedimentation, threat sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR110001	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Elk River	11000000	88	M	Miles	1100	Sedimentation/Siltation	2100	Harvesting, Restoration, Residue Management	2019	The Eureka Plain HU, Elk River, includes the following Calwater Planning Watersheds (PWS): 110.00021, 110.00030, 110.00032, and 110.00042. Sedimentation, threat sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR110001	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Elk River	11000000	88	M	Miles	1100	Sedimentation/Siltation	2300	Logging Road Construction/Maintenance	2019	The Eureka Plain HU, Elk River, includes the following Calwater Planning Watersheds (PWS): 110.00021, 110.00030, 110.00032, and 110.00042. Sedimentation, threat sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR110001	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Elk River	11000000	88	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	The Eureka Plain HU, Elk River, includes the following Calwater Planning Watersheds (PWS): 110.00021, 110.00030, 110.00032, and 110.00042. Sedimentation, threat sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR110001	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Elk River	11000000	88	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	The Eureka Plain HU, Elk River, includes the following Calwater Planning Watersheds (PWS): 110.00021, 110.00030, 110.00032, and 110.00042. Sedimentation, threat sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR110001	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Elk River	11000000	88	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	The Eureka Plain HU, Elk River, includes the following Calwater Planning Watersheds (PWS): 110.00021, 110.00030, 110.00032, and 110.00042. Sedimentation, threat sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR110001	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Elk River	11000000	88	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2019	The Eureka Plain HU, Elk River, includes the following Calwater Planning Watersheds (PWS): 110.00021, 110.00030, 110.00032, and 110.00042. Sedimentation, threat sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR110001	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Elk River	11000000	88	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	The Eureka Plain HU, Elk River, includes the following Calwater Planning Watersheds (PWS): 110.00021, 110.00030, 110.00032, and 110.00042. Sedimentation, threat sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR110001	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Freshwater Creek	11000000	84	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	The Eureka Plain HU, Freshwater Creek, includes the following Calwater Planning Watersheds (PWS): 110.00011, 110.00012, 110.00014, 110.00040, and 110.00050. Sedimentation, threat of sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR110001	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Freshwater Creek	11000000	84	M	Miles	1100	Sedimentation/Siltation	2100	Harvesting, Restoration, Residue Management	2019	The Eureka Plain HU, Freshwater Creek, includes the following Calwater Planning Watersheds (PWS): 110.00011, 110.00012, 110.00014, 110.00040, and 110.00050. Sedimentation, threat of sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR110001	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Freshwater Creek	11000000	84	M	Miles	1100	Sedimentation/Siltation	2300	Logging Road Construction/Maintenance	2019	The Eureka Plain HU, Freshwater Creek, includes the following Calwater Planning Watersheds (PWS): 110.00011, 110.00012, 110.00014, 110.00040, and 110.00050. Sedimentation, threat of sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.

WBID	REGION NUMBER	REGION NAME	WATER BODY TYPE ABBR	WATER BODY TYPE	WATER BODY NAME	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT ABBR	UNIT	POLLUTANT CODE	POLLUTANT	SOURCE CODE	POTENTIAL SOURCES	PROPOSED TMDL COMPLETION	COMMENTS
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Freshwater Creek	11000000	84	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	The Eureka Plain HU, Freshwater Creek, includes the following Calwater Planning Watersheds (PWS): 110.00011, 110.00012, 110.00014, 110.00040, and 110.00050. Sedimentation, threat of sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Freshwater Creek	11000000	84	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	The Eureka Plain HU, Freshwater Creek, includes the following Calwater Planning Watersheds (PWS): 110.00011, 110.00012, 110.00014, 110.00040, and 110.00050. Sedimentation, threat of sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Freshwater Creek	11000000	84	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	The Eureka Plain HU, Freshwater Creek, includes the following Calwater Planning Watersheds (PWS): 110.00011, 110.00012, 110.00014, 110.00040, and 110.00050. Sedimentation, threat of sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Freshwater Creek	11000000	84	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2019	The Eureka Plain HU, Freshwater Creek, includes the following Calwater Planning Watersheds (PWS): 110.00011, 110.00012, 110.00014, 110.00040, and 110.00050. Sedimentation, threat of sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR11000	1	North Coast	R	Rivers/Streams	Eureka Plain HU, Freshwater Creek	11000000	84	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	The Eureka Plain HU, Freshwater Creek, includes the following Calwater Planning Watersheds (PWS): 110.00011, 110.00012, 110.00014, 110.00040, and 110.00050. Sedimentation, threat of sedimentation, impaired irrigation water quality, impaired domestic supply water quality, impaired spawning habitat, increased rate and depth of flooding due to sediment, property damage. NCRWQCB and California Department of forestry staff are involved in ongoing efforts to attain adherance to Forest Practice Rules.
CAR10511	1	North Coast	R	Rivers/Streams	Klamath River HU, Lower HA, Klamath Glen HSA	10511000	609	M	Miles	1100	Sedimentation/Siltation	9000	Source Unknown	2019	If this listing is determined to be on tribal lands, USEPA should place this water body and pollutant on the section 303d list for the tribal lands. It is not the State Water Board's inten this listing affect other actions related to decommissioning and removal of dams on the Klamath River
CAR10910	1	North Coast	R	Rivers/Streams	Mad River HU, Mad River	10900000	654	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	USEPA will develop TMDL for the Mad River. Sediment TMDLS will be developed for the area tributary to and including: (1) the Mad River (North Fork), (2) the mad River (Upper), (3) the Mad River (Middle).
CAR10910	1	North Coast	R	Rivers/Streams	Mad River HU, Mad River	10900000	654	M	Miles	1100	Sedimentation/Siltation	5000	Resource Extraction	2019	USEPA will develop TMDL for the Mad River. Sediment TMDLS will be developed for the area tributary to and including: (1) the Mad River (North Fork), (2) the mad River (Upper), (3) the Mad River (Middle).
CAR10910	1	North Coast	R	Rivers/Streams	Mad River HU, Mad River	10900000	654	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	USEPA will develop TMDL for the Mad River. Sediment TMDLS will be developed for the area tributary to and including: (1) the Mad River (North Fork), (2) the mad River (Upper), (3) the Mad River (Middle).
CAR11412	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Austin Creek HSA	11412000	81	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment.
CAR11412	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Austin Creek HSA	11412000	81	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment.
CAR11412	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Austin Creek HSA	11412000	81	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment.
CAR11412	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Austin Creek HSA	11412000	81	M	Miles	1100	Sedimentation/Siltation	7300	Dam Construction	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment.
CAR11412	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Austin Creek HSA	11412000	81	M	Miles	1100	Sedimentation/Siltation	7400	Flow Regulation/Modification	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment.
CAR11412	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Austin Creek HSA	11412000	81	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment.
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	1200	Irrigated Crop Production	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	1300	Specialty Crop Production	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	1915	Agriculture-storm runoff	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	1935	Agriculture-grazing	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	3100	Highway/Road/Bridge Construction	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	3200	Land Development	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7000	Hydromodification	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7100	Channelization	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7300	Dam Construction	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7350	Upstream Impoundment	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7400	Flow Regulation/Modification	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7550	Habitat Modification	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7800	Drainage/Filling Of Wetlands	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11411	1	North Coast	R	Rivers/Streams	Russian River HU, Lower Russian River HA, Guerneville HSA	11411000	195	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11426	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Big Sulphur Creek HSA	11426000	85	M	Miles	1100	Sedimentation/Siltation	3210	Geothermal Development	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11426	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Big Sulphur Creek HSA	11426000	85	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11426	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Big Sulphur Creek HSA	11426000	85	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .

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CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	1100	Nonirrigated Crop Production	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	1200	Irrigated Crop Production	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	1300	Specialty Crop Production	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	1510	Range Grazing-Riparian	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	1520	Range Grazing-Upland	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	1915	Agriculture-storm runoff	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	1935	Agriculture-grazing	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	3210	Geothermal Development	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	4501	Surface Runoff	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	5000	Resource Extraction	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	7100	Channelization	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	7500	Bridge Construction	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	7800	Drainage/Filling Of Wetlands	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11425	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Geyserville HSA	11425000	242	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment TMDL.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	3200	Land Development	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	4000	Urban Runoff/Storm Sewers	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	1200	Irrigated Crop Production	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	1300	Specialty Crop Production	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	1500	Range Grazing-Riparian and/or Upland	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	1510	Range Grazing-Riparian	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	1600	Intensive Animal Feeding Operations	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	1915	Agriculture-storm runoff	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	1935	Agriculture-grazing	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	2100	Harvesting, Restoration, Residue Management	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	3100	Highway/Road/Bridge Construction	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	3200	Land Development	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	4300	Other Urban Runoff	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	4501	Surface Runoff	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .

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CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	7800	Drainage/Filling Of Wetlands	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	4300	Other Urban Runoff	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	4500	Highway/Road/Bridge Runoff	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	7000	Hydromodification	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	7100	Channelization	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	7800	Drainage/Filling Of Wetlands	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	8050	Erosion From Derelict Land	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	8300	Highway Maintenance and Runoff	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR11421	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Laguna de Santa Rosa	11421000	96	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	Entire Russian River watershed (including Laguna de Santa Rosa) is listed for sedimentation.
CAR30411	3	Central Coast	R	Rivers/Streams	San Vicente Creek	30411023	9.11953	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	
CAR31410	3	Central Coast	R	Rivers/Streams	Santa Ynez River (below city of Lompoc to Ocean)	31410040	3.8	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	
CAR31410	3	Central Coast	R	Rivers/Streams	Santa Ynez River (below city of Lompoc to Ocean)	31410040	3.8	M	Miles	1100	Sedimentation/Siltation	4000	Urban Runoff/Storm Sewers	2019	
CAR31410	3	Central Coast	R	Rivers/Streams	Santa Ynez River (below city of Lompoc to Ocean)	31410040	3.8	M	Miles	1100	Sedimentation/Siltation	5000	Resource Extraction	2019	
CAR31410	3	Central Coast	R	Rivers/Streams	Santa Ynez River (Cachuma Lake to below city o Lompoc)	31440050	43	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	
CAR31410	3	Central Coast	R	Rivers/Streams	Santa Ynez River (Cachuma Lake to below city o Lompoc)	31440050	43	M	Miles	1100	Sedimentation/Siltation	4000	Urban Runoff/Storm Sewers	2019	
CAR31410	3	Central Coast	R	Rivers/Streams	Santa Ynez River (Cachuma Lake to below city o Lompoc)	31440050	43	M	Miles	1100	Sedimentation/Siltation	5000	Resource Extraction	2019	
CAR31300	3	Central Coast	R	Rivers/Streams	Shuman Canyon Creek	31300041	8.5496	M	Miles	1100	Sedimentation/Siltation	9000	Source Unknown	2019	
CAR30413	3	Central Coast	R	Rivers/Streams	Valencia Creek	30413023	6.19	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2008	
CAR30413	3	Central Coast	R	Rivers/Streams	Valencia Creek	30413023	6.19	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2008	
CAR30412	3	Central Coast	R	Rivers/Streams	Zayante Creek	30412040	9.20875	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Zayante Creek	30412040	9.20875	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Zayante Creek	30412040	9.20875	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Zayante Creek	30412040	9.20875	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Zayante Creek	30412040	9.20875	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Zayante Creek	30412040	9.20875	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR11423	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Mark West Creek HSA	11423000	99	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	1100	Nonirrigated Crop Production	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	1200	Irrigated Crop Production	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	1300	Specialty Crop Production	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	1400	Pasture Grazing-Riparian and/or Upland	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	1510	Range Grazing-Riparian	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	1520	Range Grazing-Upland	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	1940	Dairies	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	3100	Highway/Road/Bridge Construction	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	3200	Land Development	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	4000	Urban Runoff/Storm Sewers	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	4100	Urban Runoff--Non-industrial Permitted	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	4300	Other Urban Runoff	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	4501	Surface Runoff	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.

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CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	7000	Hydromodification	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	7100	Channelization	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	7500	Bridge Construction	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	7550	Habitat Modification	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	7800	Drainage/Filling Of Wetlands	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11422	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Santa Rosa Creek	11422000	87	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	Entire Russian River watershed (including Santa Rosa Creek) is listed for sedimentation.
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	1915	Agriculture-storm runoff	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	2300	Logging Road Construction/Maintenance	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	3100	Highway/Road/Bridge Construction	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7000	Hydromodification	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7100	Channelization	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7300	Dam Construction	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7350	Upstream Impoundment	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7400	Flow Regulation/Modification	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7550	Habitat Modification	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7800	Drainage/Filling Of Wetlands	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11424	1	North Coast	R	Rivers/Streams	Russian River HU, Middle Russian River HA, Warm Springs HSA	11424000	255	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	Sediment impacts in Russian River tributaries prompted listing entire Russian River watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7000	Hydromodification	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7100	Channelization	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7300	Dam Construction	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7400	Flow Regulation/Modification	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7500	Bridge Construction	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7550	Habitat Modification	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7800	Drainage/Filling Of Wetlands	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .

WBID	REGION NUMBER	REGION NAME	WATER BODY TYPE ABBR	WATER BODY TYPE	WATER BODY NAME	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT ABBR	UNIT	POLLUTANT CODE	POLLUTANT	SOURCE CODE	POTENTIAL SOURCES	PROPOSED TMDL COMPLETION	COMMENTS
CAR11432	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Coyote Valley HSA	11432000	171	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11433	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Forsythe Creek HSA	11433000	122	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11433	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Forsythe Creek HSA	11433000	122	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	5000	Resource Extraction	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	7550	Habitat Modification	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	7800	Drainage/Filling Of Wetlands	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	8300	Highway Maintenance and Runoff	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAR11431	1	North Coast	R	Rivers/Streams	Russian River HU, Upper Russian River HA, Ukiah HSA	11431000	460	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2019	Russian River Watershed tributary sediment impairments led to listing of entire watershed for sediment .
CAB20114	2	San Francisco Bay	B	Bays and Harbors	Tomales Bay	20114033	8545.46	A	Acres	1100	Sedimentation/Siltation	1000	Agriculture	2008	TMDL will be developed as part of ongoing watershed management effort. Tributary streams, Lagunitas Creek and Walker Creek, must be managed first. Additional monitoring assessment needed.
CAB20114	2	San Francisco Bay	B	Bays and Harbors	Tomales Bay	20114033	8545.46	A	Acres	1100	Sedimentation/Siltation	7350	Upstream Impoundment	2008	TMDL will be developed as part of ongoing watershed management effort. Tributary streams, Lagunitas Creek and Walker Creek, must be managed first. Additional monitoring assessment needed.
CAR20240	2	San Francisco Bay	R	Rivers/Streams	Butano Creek	20240031	3.62774	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	Impairment to steelhead habita
CAR20113	2	San Francisco Bay	R	Rivers/Streams	Lagunitas Creek	20113020	16.75	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2009	Tributary to Tomales Bay. TMDLs will be developed as part of evolving watershed management effort. Additional monitoring and assessment nee
CAR20113	2	San Francisco Bay	R	Rivers/Streams	Lagunitas Creek	20113020	16.75	M	Miles	1100	Sedimentation/Siltation	4000	Urban Runoff/Storm Sewers	2009	Tributary to Tomales Bay. TMDLs will be developed as part of evolving watershed management effort. Additional monitoring and assessment nee
CAR20650	2	San Francisco Bay	R	Rivers/Streams	Napa River	20650010	65.33	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2006	TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment nee
CAR20650	2	San Francisco Bay	R	Rivers/Streams	Napa River	20650010	65.33	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2006	TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment nee
CAR20650	2	San Francisco Bay	R	Rivers/Streams	Napa River	20650010	65.33	M	Miles	1100	Sedimentation/Siltation	3200	Land Development	2006	TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment nee
CAR20650	2	San Francisco Bay	R	Rivers/Streams	Napa River	20650010	65.33	M	Miles	1100	Sedimentation/Siltation	4000	Urban Runoff/Storm Sewers	2006	TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment nee
CAR20240	2	San Francisco Bay	R	Rivers/Streams	Pescadero Creek	20240013	26.03	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	If California Department of Fish and Game and the National Marine Fisheries Service find that for this water body fish populations are not impacted, the State Water Board supp removing this water body and pollutant from the list.
CAR20630	2	San Francisco Bay	R	Rivers/Streams	Petaluma River	20630020	21.566	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	
CAR20630	2	San Francisco Bay	R	Rivers/Streams	Petaluma River	20630020	21.566	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	
CAR20630	2	San Francisco Bay	R	Rivers/Streams	Petaluma River	20630020	21.566	M	Miles	1100	Sedimentation/Siltation	4000	Urban Runoff/Storm Sewers	2019	
CAR20550	2	San Francisco Bay	R	Rivers/Streams	San Francisquito Creek	20550040	12.05	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2008	Impairment to steelhead habita
CAR20230	2	San Francisco Bay	R	Rivers/Streams	San Gregorio Creek	20230014	11.14	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	Impairment to steelhead habita
CAR20640	2	San Francisco Bay	R	Rivers/Streams	Sonoma Creek	20640050	30.23	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2008	TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment nee
CAR20640	2	San Francisco Bay	R	Rivers/Streams	Sonoma Creek	20640050	30.23	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2008	TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment nee
CAR20640	2	San Francisco Bay	R	Rivers/Streams	Sonoma Creek	20640050	30.23	M	Miles	1100	Sedimentation/Siltation	3200	Land Development	2008	TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment nee
CAR20640	2	San Francisco Bay	R	Rivers/Streams	Sonoma Creek	20640050	30.23	M	Miles	1100	Sedimentation/Siltation	4000	Urban Runoff/Storm Sewers	2008	TMDL will be developed as part of ongoing watershed management effort. Additional monitoring and assessment nee
CAR20112	2	San Francisco Bay	R	Rivers/Streams	Walker Creek	20112013	15.8352	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2009	Tributary to Tomales Bay. TMDLs will be developed as part of evolving watershed management effort. Additional monitoring and assessment nee
CAB30600	3	Central Coast	B	Bays and Harbors	Moss Landing Harbor	30600014	79.2726	A	Acres	1100	Sedimentation/Siltation	1000	Agriculture	2019	
CAB30600	3	Central Coast	B	Bays and Harbors	Moss Landing Harbor	30600014	79.2726	A	Acres	1100	Sedimentation/Siltation	1200	Irrigated Crop Production	2019	
CAB30600	3	Central Coast	B	Bays and Harbors	Moss Landing Harbor	30600014	79.2726	A	Acres	1100	Sedimentation/Siltation	1915	Agriculture-storm runoff	2019	
CAB30600	3	Central Coast	B	Bays and Harbors	Moss Landing Harbor	30600014	79.2726	A	Acres	1100	Sedimentation/Siltation	7000	Hydromodification	2019	
CAB30600	3	Central Coast	B	Bays and Harbors	Moss Landing Harbor	30600014	79.2726	A	Acres	1100	Sedimentation/Siltation	7200	Dredging	2019	
CAB30600	3	Central Coast	B	Bays and Harbors	Moss Landing Harbor	30600014	79.2726	A	Acres	1100	Sedimentation/Siltation	7810	Channel Erosion	2019	
CAB30600	3	Central Coast	B	Bays and Harbors	Moss Landing Harbor	30600014	79.2726	A	Acres	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAB30600	3	Central Coast	B	Bays and Harbors	Moss Landing Harbor	30600014	79.2726	A	Acres	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAE30600	3	Central Coast	E	Estuaries	Elkhorn Slough	30600014	2033.73	A	Acres	1100	Sedimentation/Siltation	1000	Agriculture	2015	
CAE30600	3	Central Coast	E	Estuaries	Elkhorn Slough	30600014	2033.73	A	Acres	1100	Sedimentation/Siltation	1200	Irrigated Crop Production	2015	
CAE30600	3	Central Coast	E	Estuaries	Elkhorn Slough	30600014	2033.73	A	Acres	1100	Sedimentation/Siltation	1915	Agriculture-storm runoff	2015	
CAE30600	3	Central Coast	E	Estuaries	Elkhorn Slough	30600014	2033.73	A	Acres	1100	Sedimentation/Siltation	7810	Channel Erosion	2015	
CAE30600	3	Central Coast	E	Estuaries	Elkhorn Slough	30600014	2033.73	A	Acres	1100	Sedimentation/Siltation	9100	Nonpoint Source	2015	
CAE30600	3	Central Coast	E	Estuaries	Moro Cojo Slough	30913011	62.4949	A	Acres	1100	Sedimentation/Siltation	1000	Agriculture	2019	
CAE30600	3	Central Coast	E	Estuaries	Moro Cojo Slough	30913011	62.4949	A	Acres	1100	Sedimentation/Siltation	1200	Irrigated Crop Production	2019	
CAE30600	3	Central Coast	E	Estuaries	Moro Cojo Slough	30913011	62.4949	A	Acres	1100	Sedimentation/Siltation	1915	Agriculture-storm runoff	2019	
CAE30600	3	Central Coast	E	Estuaries	Moro Cojo Slough	30913011	62.4949	A	Acres	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	
CAE30600	3	Central Coast	E	Estuaries	Moro Cojo Slough	30913011	62.4949	A	Acres	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAE30413	3	Central Coast	E	Estuaries	Soquel Lagoon	30413014	1.15873	A	Acres	1100	Sedimentation/Siltation	3000	Construction/Land Development	2011	
CAR30413	3	Central Coast	R	Rivers/Streams	Aptos Creek	30413023	8.40589	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2008	
CAR30413	3	Central Coast	R	Rivers/Streams	Aptos Creek	30413023	8.40589	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2008	
CAR30412	3	Central Coast	R	Rivers/Streams	Bean Creek	30412041	8.90707	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Bean Creek	30412041	8.90707	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Bean Creek	30412041	8.90707	M	Miles	1100	Sedimentation/Siltation	5000	Resource Extraction	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Bean Creek	30412041	8.90707	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Bean Creek	30412041	8.90707	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Bear Creek(Santa Cruz County	30412030	6.31531	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Bear Creek(Santa Cruz County	30412030	6.31531	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Bear Creek(Santa Cruz County	30412030	6.31531	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Bear Creek(Santa Cruz County	30412030	6.31531	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Bear Creek(Santa Cruz County	30412030	6.31531	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Boulder Creek	30412020	7.55958	M	Miles	1100	Sedimentation/Siltation	1300	Specialty Crop Production	2019	
CAR30412	3	Central Coast	R	Rivers/Streams	Boulder Creek	30412020	7.55958	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	

WBID	REGION NUMBER	REGION NAME	WATER BODY TYPE ABBR	WATER BODY TYPE	WATER BODY NAME	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT ABBR	UNIT	POLLUTANT CODE	POLLUTANT	SOURCE CODE	POTENTIAL SOURCES	PROPOSED TMDL COMPLETION	COMMENTS
CAR304123	3	Central Coast	R	Rivers/Streams	Boulder Creek	30412020	7.55958	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Boulder Creek	30412020	7.55958	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Boulder Creek	30412020	7.55958	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Boulder Creek	30412020	7.55958	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Branciforte Creek	30412051	5.78	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Branciforte Creek	30412051	5.78	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Branciforte Creek	30412051	5.78	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR313003	3	Central Coast	R	Rivers/Streams	Casmalia Canyon Creek	31300040	4.96262	M	Miles	1100	Sedimentation/Siltation	9000	Source Unknown	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Fall Creek	30412022	5.07242	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Fall Creek	30412022	5.07242	M	Miles	1100	Sedimentation/Siltation	7550	Habitat Modification	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Fall Creek	30412022	5.07242	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Fall Creek	30412022	5.07242	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Kings Creek	30412011	4.36837	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Kings Creek	30412011	4.36837	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Kings Creek	30412011	4.36837	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Kings Creek	30412011	4.36837	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Kings Creek	30412011	4.36837	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Love Creek	30412021	3.78816	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Love Creek	30412021	3.78816	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Love Creek	30412021	3.78816	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Love Creek	30412021	3.78816	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Love Creek	30412021	3.78816	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Love Creek	30412021	3.78816	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Mountain Charlie Gulch	30412040	3.92844	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Mountain Charlie Gulch	30412040	3.92844	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Mountain Charlie Gulch	30412040	3.92844	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Mountain Charlie Gulch	30412040	3.92844	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Newell Creek (Upper	30412031	3.50199	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Newell Creek (Upper	30412031	3.50199	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Newell Creek (Upper	30412031	3.50199	M	Miles	1100	Sedimentation/Siltation	3110	Road Construction	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Newell Creek (Upper	30412031	3.50199	M	Miles	1100	Sedimentation/Siltation	3215	Disturbed Sites (Land Develop.)	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Newell Creek (Upper	30412031	3.50199	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Newell Creek (Upper	30412031	3.50199	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAR304123	3	Central Coast	R	Rivers/Streams	Newell Creek (Upper	30412031	3.50199	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR404224	4	Los Angeles	R	Rivers/Streams	Las Virgenes Creek	40422010	11.62	M	Miles	1100	Sedimentation/Siltation	9000	Source Unknown	2019	
CAR404214	4	Los Angeles	R	Rivers/Streams	Malibu Creek	40421000	10.85	M	Miles	1100	Sedimentation/Siltation	9000	Source Unknown	2019	
CAR404244	4	Los Angeles	R	Rivers/Streams	Medea Creek Reach 1 (Lake to Confl. with Lindero)	40424000	2.57	M	Miles	1100	Sedimentation/Siltation	9000	Source Unknown	2019	
CAR403124	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 2 (estuary to Potrero Rd was Calleguas Creek Reaches 1 and 2 on 1998 303d list)	40312000	4.31213	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR403124	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 2 (estuary to Potrero Rd was Calleguas Creek Reaches 1 and 2 on 1998 303d list)	40312000	4.31213	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR403124	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 3 (Potrero Road upstream to confluence with Conejo Creek on 1998 303d list)	40312000	3.46697	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR403124	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 3 (Potrero Road upstream to confluence with Conejo Creek on 1998 303d list)	40312000	3.46697	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR403114	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 4 (was Revolon Slough Main Branch: Mugu Lagoon to Central Avenue on 1998 303d list)	40311000	7.18751	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR403114	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 4 (was Revolon Slough Main Branch: Mugu Lagoon to Central Avenue on 1998 303d list)	40311000	7.18751	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR403614	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 5 (was Beardsley Channe on 1998 303d list)	40311000	4.34088	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR403614	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 5 (was Beardsley Channe on 1998 303d list)	40311000	4.34088	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR403624	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 6 (was Arroyo Las Posas Reaches 1 and 2 on 1998 303d list)	40362000	15.2966	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR403624	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 6 (was Arroyo Las Posas Reaches 1 and 2 on 1998 303d list)	40362000	15.2966	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR403624	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 7 (was Arroyo Simi Reaches 1 and 2 on 1998 303d list)	40367000	13.9129	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR403624	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 7 (was Arroyo Simi Reaches 1 and 2 on 1998 303d list)	40367000	13.9129	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR403674	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 8 (was Tapo Canyon Reach 1)	40366000	7.18869	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR403644	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 11 (Arroyo Santa Rosa was part of Conejo Creek Reach 3 on 1998 303d list)	40365000	8.68888	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR403644	4	Los Angeles	R	Rivers/Streams	Calleguas Creek Reach 11 (Arroyo Santa Rosa was part of Conejo Creek Reach 3 on 1998 303d list)	40365000	8.68888	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2005	For 2006, sedimentation/siltation was moved by USEPA from the being addressed list back to the 303(d) list pending completion and USEPA approval of a TMDL.
CAR404234	4	Los Angeles	R	Rivers/Streams	Medea Creek Reach 2 (Abv Confl. with Linderc	40423000	5.41	M	Miles	1100	Sedimentation/Siltation	9000	Source Unknown	2019	
CAR404244	4	Los Angeles	R	Rivers/Streams	Triunfo Canyon Creek Reach 1	40424000	2.51	M	Miles	1100	Sedimentation/Siltation	9000	Source Unknown	2019	
CAR404244	4	Los Angeles	R	Rivers/Streams	Triunfo Canyon Creek Reach 2	40424000	3.32	M	Miles	1100	Sedimentation/Siltation	9000	Source Unknown	2019	
CAR526415	5	Central Valley	R	Rivers/Streams	Fall River (Pit)	52641031	8.61219	M	Miles	1100	Sedimentation/Siltation	2105	Historical Land Management Activities	2016	The sedimentation is accumulated sand size sediment in the upper Fall River. The historic land management activities include logging, grazing, channelization, roads, and railroads.
CAR517325	5	Central Valley	R	Rivers/Streams	Humbug Creek	51732030	2.20272	M	Miles	1100	Sedimentation/Siltation	5000	Resource Extraction	2012	All resource extraction sources are abandoned mine
CAR559115	5	Central Valley	R	Rivers/Streams	Panoche Creek (Silver Creek to Belmont Avenue)	55112000	17.6357	M	Miles	1100	Sedimentation/Siltation	1000	Agriculture	2007	
CAR559115	5	Central Valley	R	Rivers/Streams	Panoche Creek (Silver Creek to Belmont Avenue)	55112000	17.6357	M	Miles	1100	Sedimentation/Siltation	1935	Agriculture-grazing	2007	

WBID	REGION NUMBER	REGION NAME	WATER BODY TYPE ABBR	WATER BODY TYPE	WATER BODY NAME	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT ABBR	UNIT	POLLUTANT CODE	POLLUTANT	SOURCE CODE	POTENTIAL SOURCES	PROPOSED TMDL COMPLETION	COMMENTS
CAR55911 5		Central Valley	R	Rivers/Streams	Panoche Creek (Silver Creek to Belmont Avenue)	55112000	17.6357	M	Miles	1100	Sedimentation/Siltation	3100	Highway/Road/Bridge Construction	2007	
CAL63030(6		Lahontan	L	Lakes/Reservoirs	Bridgeport Reservoi	63030050	2614.34	A	Acres	1100	Sedimentation/Siltation	1350	Grazing-Related Sources	2006	
CAL63030(6		Lahontan	L	Lakes/Reservoirs	Bridgeport Reservoi	63030050	2614.34	A	Acres	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2006	
CAL63030(6		Lahontan	L	Lakes/Reservoirs	Bridgeport Reservoi	63030050	2614.34	A	Acres	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2006	
CAL63030(6		Lahontan	L	Lakes/Reservoirs	Bridgeport Reservoi	63030050	2614.34	A	Acres	1100	Sedimentation/Siltation	8540	Sediment Resuspension	2006	
CAL63430(6		Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	1350	Grazing-Related Sources	2007	
CAL63430(6		Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	2000	Silviculture	2007	
CAL63430(6		Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	3100	Highway/Road/Bridge Construction	2007	
CAL63430(6		Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	3200	Land Development	2007	
CAL63430(6		Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	4000	Urban Runoff/Storm Sewers	2007	
CAL63430(6		Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	4300	Other Urban Runoff	2007	
CAL63430(6		Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	4500	Highway/Road/Bridge Runoff	2007	
CAL63430(6		Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	4600	Urban Runoff--Erosion and Sedimentation	2007	
CAL63430(6		Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	7000	Hydromodification	2007	
CAL63430(6		Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	7100	Channelization	2007	
CAL63430(6		Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	7600	Removal of Riparian Vegetation	2007	
CAL63430(6		Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2007	
CAL63430(6		Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	7810	Channel Erosion	2007	
CAL63430(6		Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2007	
CAL63430(6		Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	8100	Atmospheric Deposition	2007	
CAL63430(6		Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	8540	Sediment Resuspension	2007	
CAL63430(6		Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	8600	Natural Sources	2007	
CAL63430(6		Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	8700	Recreational and Tourism Activities (non-boating)	2007	
CAL63430(6		Lahontan	L	Lakes/Reservoirs	Tahoe, Lake	63430010	85364.1	A	Acres	1100	Sedimentation/Siltation	9100	Nonpoint Source	2007	
CAR63420 6		Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	1500	Range Grazing-Riparian and/or Upland	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420 6		Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420 6		Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420 6		Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	4501	Surface Runoff	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420 6		Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	5000	Resource Extraction	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420 6		Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	7000	Hydromodification	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420 6		Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420 6		Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420 6		Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	8100	Atmospheric Deposition	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420 6		Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420 6		Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	8700	Recreational and Tourism Activities (non-boating)	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63420 6		Lahontan	R	Rivers/Streams	Blackwood Creek	63420021	5.87001	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2008	Creek affected by past gravel quarry operations and other watershed disturbance including grazing and timber harv
CAR63520 6		Lahontan	R	Rivers/Streams	Bronco Creek	63520053	1.34403	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2006	Watershed disturbance in naturally highly erosive watershe
CAR63520 6		Lahontan	R	Rivers/Streams	Bronco Creek	63520053	1.34403	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2006	Watershed disturbance in naturally highly erosive watershe
CAR63520 6		Lahontan	R	Rivers/Streams	Bronco Creek	63520053	1.34403	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2006	Watershed disturbance in naturally highly erosive watershe
CAR63040 6		Lahontan	R	Rivers/Streams	Clearwater Creek	63040051	12.4874	M	Miles	1100	Sedimentation/Siltation	1500	Range Grazing-Riparian and/or Upland	2006	Listed on basis of limited information; additional monitoring may support delisti
CAR63040 6		Lahontan	R	Rivers/Streams	Clearwater Creek	63040051	12.4874	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2006	Listed on basis of limited information; additional monitoring may support delisti
CAR63040 6		Lahontan	R	Rivers/Streams	Clearwater Creek	63040051	12.4874	M	Miles	1100	Sedimentation/Siltation	8300	Highway Maintenance and Runoff	2006	Listed on basis of limited information; additional monitoring may support delisti
CAR63010 6		Lahontan	R	Rivers/Streams	East Walker River, below Bridgeport Reservo	63030050	8.00973	M	Miles	1100	Sedimentation/Siltation	1350	Grazing-Related Sources	2019	
CAR63010 6		Lahontan	R	Rivers/Streams	East Walker River, below Bridgeport Reservo	63030050	8.00973	M	Miles	1100	Sedimentation/Siltation	4500	Highway/Road/Bridge Runoff	2019	
CAR63010 6		Lahontan	R	Rivers/Streams	East Walker River, below Bridgeport Reservo	63030050	8.00973	M	Miles	1100	Sedimentation/Siltation	4600	Urban Runoff--Erosion and Sedimentation	2019	
CAR63010 6		Lahontan	R	Rivers/Streams	East Walker River, below Bridgeport Reservo	63030050	8.00973	M	Miles	1100	Sedimentation/Siltation	7350	Upstream Impoundment	2019	
CAR63010 6		Lahontan	R	Rivers/Streams	East Walker River, below Bridgeport Reservo	63030050	8.00973	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2019	
CAR63520 6		Lahontan	R	Rivers/Streams	Gray Creek (Nevada County	63520052	2.8033	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2006	Sediment from disturbance of naturally highly erosive watershe
CAR63520 6		Lahontan	R	Rivers/Streams	Gray Creek (Nevada County	63520052	2.8033	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2006	Sediment from disturbance of naturally highly erosive watershe
CAR63520 6		Lahontan	R	Rivers/Streams	Gray Creek (Nevada County	63520052	2.8033	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2006	Sediment from disturbance of naturally highly erosive watershe
CAR63410 6		Lahontan	R	Rivers/Streams	Heavenly Valley Creek (USFS boundary to Trout Creek)	63410031	1.44732	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2019	
CAR63410 6		Lahontan	R	Rivers/Streams	Heavenly Valley Creek (USFS boundary to Trout Creek)	63410031	1.44732	M	Miles	1100	Sedimentation/Siltation	3200	Land Development	2019	
CAR63410 6		Lahontan	R	Rivers/Streams	Heavenly Valley Creek (USFS boundary to Trout Creek)	63410031	1.44732	M	Miles	1100	Sedimentation/Siltation	7000	Hydromodification	2019	
CAR63410 6		Lahontan	R	Rivers/Streams	Heavenly Valley Creek (USFS boundary to Trout Creek)	63410031	1.44732	M	Miles	1100	Sedimentation/Siltation	7550	Habitat Modification	2019	
CAR63410 6		Lahontan	R	Rivers/Streams	Heavenly Valley Creek (USFS boundary to Trout Creek)	63410031	1.44732	M	Miles	1100	Sedimentation/Siltation	8700	Recreational and Tourism Activities (non-boating)	2019	
CAR63410 6		Lahontan	R	Rivers/Streams	Heavenly Valley Creek (USFS boundary to Trout Creek)	63410031	1.44732	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAR63030 6		Lahontan	R	Rivers/Streams	Hot Springs Canyon Creek	63030042	2.8612	M	Miles	1100	Sedimentation/Siltation	1500	Range Grazing-Riparian and/or Upland	2008	Listed on basis of limited data; further monitoring may support delistir
CAR63520 6		Lahontan	R	Rivers/Streams	Squaw Creek	63520011	5.8	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2006	
CAR63520 6		Lahontan	R	Rivers/Streams	Squaw Creek	63520011	5.8	M	Miles	1100	Sedimentation/Siltation	4300	Other Urban Runoff	2006	
CAR63520 6		Lahontan	R	Rivers/Streams	Squaw Creek	63520011	5.8	M	Miles	1100	Sedimentation/Siltation	7000	Hydromodification	2006	
CAR63520 6		Lahontan	R	Rivers/Streams	Squaw Creek	63520011	5.8	M	Miles	1100	Sedimentation/Siltation	7800	Drainage/Filling Of Wetlands	2006	
CAR63520 6		Lahontan	R	Rivers/Streams	Squaw Creek	63520011	5.8	M	Miles	1100	Sedimentation/Siltation	8300	Highway Maintenance and Runoff	2006	
CAR63520 6		Lahontan	R	Rivers/Streams	Squaw Creek	63520011	5.8	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2006	
CAR63520 6		Lahontan	R	Rivers/Streams	Squaw Creek	63520011	5.8	M	Miles	1100	Sedimentation/Siltation	8700	Recreational and Tourism Activities (non-boating)	2006	
CAR63520 6		Lahontan	R	Rivers/Streams	Squaw Creek	63520011	5.8	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2006	
CAR63510 6		Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	1500	Range Grazing-Riparian and/or Upland	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63510 6		Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63510 6		Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	3000	Construction/Land Development	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63510 6		Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	3100	Highway/Road/Bridge Construction	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63510 6		Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	7700	Streambank Modification/Destabilization	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63510 6		Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63510 6		Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	7820	Erosion/Siltation	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63510 6		Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	8600	Natural Sources	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63510 6		Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	8700	Recreational and Tourism Activities (non-boating)	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63510 6		Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	8710	Snow skiing activities	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63510 6		Lahontan	R	Rivers/Streams	Truckee River	63510010	39.1307	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2006	Watershed disturbance including ski resorts, silvicultural activities, urban development, reservoir construction and management; highly erosive subwatersh
CAR63420 6		Lahontan	R	Rivers/Streams	Ward Creek	63420020	5.675	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2008	
CAR63420 6		Lahontan	R	Rivers/Streams	Ward Creek	63420020	5.675	M	Miles	1100	Sedimentation/Siltation	3200	Land Development	2008	
CAR63420 6		Lahontan	R	Rivers/Streams	Ward Creek	63420020	5.675	M	Miles	1100	Sedimentation/Siltation	4000	Urban Runoff/Storm Sewers	2008	

WBID	REGION NUMBER	REGION NAME	WATER BODY TYPE ABBR	WATER BODY TYPE	WATER BODY NAME	CALWATER WATERSHED	ESTIMATED SIZE AFFECTED	UNIT ABBR	UNIT	POLLUTANT CODE	POLLUTANT	SOURCE CODE	POTENTIAL SOURCES	PROPOSED TMDL COMPLETION	COMMENTS
CAR634206		Lahontan	R	Rivers/Streams	Ward Creek	63420020	5.675	M	Miles	1100	Sedimentation/Siltation	4500	Highway/Road/Bridge Runoff	2008	
CAR634206		Lahontan	R	Rivers/Streams	Ward Creek	63420020	5.675	M	Miles	1100	Sedimentation/Siltation	7810	Channel Erosion	2008	
CAR634206		Lahontan	R	Rivers/Streams	Ward Creek	63420020	5.675	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2008	
CAR632106		Lahontan	R	Rivers/Streams	Wolf Creek (Alpine County)	63210031	11.8207	M	Miles	1100	Sedimentation/Siltation	1500	Range Grazing-Riparian and/or Upland	2019	
CAR632106		Lahontan	R	Rivers/Streams	Wolf Creek (Alpine County)	63210031	11.8207	M	Miles	1100	Sedimentation/Siltation	2000	Silviculture	2019	
CAR632106		Lahontan	R	Rivers/Streams	Wolf Creek (Alpine County)	63210031	11.8207	M	Miles	1100	Sedimentation/Siltation	9100	Nonpoint Source	2019	
CAL801718		Santa Ana	L	Lakes/Reservoirs	Big Bear Lake	80171000	2865.01	A	Acres	1100	Sedimentation/Siltation	3000	Construction/Land Development	2006	
CAL801718		Santa Ana	L	Lakes/Reservoirs	Big Bear Lake	80171000	2865.01	A	Acres	1100	Sedimentation/Siltation	8710	Snow skiing activities	2006	
CAL801718		Santa Ana	L	Lakes/Reservoirs	Big Bear Lake	80171000	2865.01	A	Acres	1100	Sedimentation/Siltation	9105	Unknown Nonpoint Source	2006	
CAR801718		Santa Ana	R	Rivers/Streams	Rathbone (Rathbun) Creek	80171000	4.68	M	Miles	1100	Sedimentation/Siltation	8710	Snow skiing activities	2006	
CAR801718		Santa Ana	R	Rivers/Streams	Rathbone (Rathbun) Creek	80171000	4.68	M	Miles	1100	Sedimentation/Siltation	9105	Unknown Nonpoint Source	2006	
CAE904319		San Diego	E	Estuaries	Agua Hedionda Lagoon	90431000	6.83187	A	Acres	1100	Sedimentation/Siltation	9201	Nonpoint/Point Source	2019	
CAE904219		San Diego	E	Estuaries	Buena Vista Lagoon	90421000	202.298	A	Acres	1100	Sedimentation/Siltation	9201	Nonpoint/Point Source	2019	
CAE906109		San Diego	E	Estuaries	Los Penasquitos Lagoon	90610000	468.918	A	Acres	1100	Sedimentation/Siltation	9201	Nonpoint/Point Source	2019	
CAE904619		San Diego	E	Estuaries	San Elijo Lagoon	90461000	565.804	A	Acres	1100	Sedimentation/Siltation	9201	Nonpoint/Point Source	2019	Estimated size of impairment is 150 acres

Post-Construction Water Balance Calculator

User may make changes from any cell that is orange or brown in color (similar to the cells to the immediate right). Cells in green are calculated for you.

(Step 1a) If you know the 85th percentile storm event for your location enter it in the box below

(Step 1b) If you can not answer 1a then select the county where the project is located (click on the cell to the right for drop-down): This will determine the average 85th percentile 24 hr. storm event for your site, which will appear under precipitation to left.

SACRAMENTO

(Step 1c) If you would like a more percise value select the location closest to your site. If you do not recgonize any of these locations, leave this drop-down menu at location. The average value for the County will be used.

SACRAMENTO FAA ARPT

Project Information		***Runoff Calculations***		
Project Name:	***Optional***	(Step 2) Indicate the Soil Type (dropdown menu to right):	***Group C Soils***	**Low infiltration. Sandy clay loam. Infiltration rate 0.05 to 0.15 inch/hr when wet.**
Waste Discharge Identification (WDID):	***Optional***	(Step 3) Indicate the existing **dominant** non-built land Use Type (dropdown menu to right):	***Wood & Grass: <50% ground cover***	
Date:	***Optional***	(Step 4) Indicate the proposed **dominant** non-built land Use Type (dropdown menu to right):	***Lawn, Grass, or Pasture covering more than 75% of the open space***	
Sub Drainage Area Name (from map):	***Optional***		**Complete Either**	

Runoff Curve Numbers			**Sq Ft**	**Acres**	**Acres**
Existing Pervious Runoff Curve Number	**82**	*(Step 5) Total Project Site Area:*		**5.00**	**5.00**
Proposed Development Pervious Runoff Curve Number	**74**	*(Step 6) Sub-watershed Area:*		**5.00**	**5.00**
		Percent of total project :	**100%**		

Design Storm					
Based on the County you indicated above, we have included the 85 percentile average 24 hr event - P85 (in)^ for your area.	**0.62**	**in**			
The Amount of rainfall needed for runoff to occur (Existing runoff curve number -P from existing RCN (in)^)	**0.44**	**In**	***(Step 7) Sub-watershed Conditions***	**Complete Either**	**Calculated Acres**
P used for calculations (in) (the greater of the above two criteria)	**0.62**	**In**	Sub-watershed Area (acres)	**Sq Ft** / **Acres**	**5.00**
^Available at www.cabmphandbooks.com			Existing Rooftop Impervious Coverage	**0**	**0.00**
			Existing Non-Rooftop Impervious Coverage	**0**	**0.00**
			Proposed Rooftop Impervious Coverage	**0**	**0.00**
			Proposed Non-Rooftop Impervious Coverage	**0**	**0.00**

Credits	**Acres**	**Square Feet**
Porous Pavement	**0.00**	**0**
Tree Planting	**0.00**	**0**
Downspout Disconnection	**0.00**	**0**
Impervious Area Disconnection	**0.00**	**0**
Green Roof	**0.00**	**0**
Stream Buffer	**0.00**	**0**
Vegetated Swales	**0.00**	**0**
Subtotal	**0.00**	**0**
Subtotal Runoff Volume Reduction Credit	**0 Cu. Ft.**	

Pre-Project Runoff Volume (cu ft)	**247**	**Cu.Ft.**
Project-Related Runoff Volume Increase w/o credits (cu ft)	**0**	**Cu.Ft.**
Project-Related Volume Increase with Credits (cu ft)	**0**	**Cu.Ft.**

You have achieved your minimum requirements

(Step 9) Impervious Volume Reduction Credits	**Volume (cubic feet)**
Rain Barrels/Cisterns	**0 Cu. Ft.**
Soil Quality	**0 Cu. Ft.**
Subtotal Runoff Volume Reduction	**0 Cu. Ft.**
Total Runoff Volume Reduction Credit	**0 Cu. Ft.**

Porous Pavement Credit Worksheet

Please fill out a porous pavement credit worksheet for each project sub-watershed.

For the PROPOSED Development:

Proposed Porous Pavement	Runoff Reduction*	Fill in either Acres or SqFt In SqFt.	In Acres	Equivalent Acres
Area of **Brick without Grout** on less than 12 inches of base with at least 20% void space over soil	0.45			0.00
Area of **Brick without Grout** on more than 12 inches of base with at least 20% void space over soil	0.90			0.00
Area of **Cobbles** less than 12 inches deep and over soil	0.30			0.00
Area of **Cobbles** less than 12 inches deep and over soil	0.60			0.00
Area of **Reinforced Grass Pavement** on less than 12 inches of base with at least 20% void space over soil	0.45			0.00
Area of **Reinforced Grass Pavement** on at least 12 inches of base with at least 20% void space over soil	0.90			0.00
Area of **Porous Gravel Pavement** on less than 12 inches of base with at least 20% void space over soil	0.38			0.00
Area of **Porous Gravel Pavement** on at least 12 inches of base with at least 20% void space over soil	0.75			0.00
Area of **Poured Porous Concrete or Asphalt Pavement** with less than 4 inches of gravel base (washed stone)	0.40			0.00
Area of **Poured Porous Concrete or Asphalt Pavement** with 4 to 8 inches of gravel base (washed stone)	0.60			0.00
Area of **Poured Porous Concrete or Asphalt Pavement** with 8 to 12 inches of gravel base (washed stone)	0.80			0.00
Area of **Poured Porous Concrete or Asphalt Pavement** with 12 or more inches of gravel base (washed stone)	1.00			0.00

*=1-Rv**

Return to Calculator

**Using Site Design Techniques to meet Development Standards for Stormwater Quality (BASMAA 2003)

**NCDENR Stormwater BMP Manual (2007)

Tree Planting Credit Worksheet

Please fill out a tree canopy credit worksheet for each project sub-watershed.

Tree Canopy Credit Criteria	Number of Trees Planted	Credit (acres)
Number of proposed evergreen trees to be planted (credit = number of trees x 0.005)*	0	0.00
Number of proposed deciduous trees to be planted (credit = number of trees x 0.0025)*		0.00
	Square feet Under Canopy	
Square feet under an existing tree canopy, that will remain on the property, with an average diameter at 4.5 ft above grade (i.e., diameter at breast height or DBH) is LESS than 12 in diameter.		0.00
Square feet under an existing tree canopy that will remain on the property, with an average diameter at 4.5 ft above grade (i.e., diameter at breast height or DBH) is 12 in diameter or GREATER.		0.00
Please describe below how the project will ensure that these trees will be maintained.		

0

Return to Calculator

* credit amount based on credits from Stormwater Quality Design Manual for the Sacramento and South Placer Regions

Downspout Disconnection Credit Worksheet

Please fill out a downspout disconnection credit worksheet for each project subwatershed. If you answer yes to all questions, all rooftop area draining to each downspout will be subtracted from your proposed rooftop impervious coverage.

Downspout Disconnection Credit Criteria					
Do downspouts and any extensions extend at least six feet from a basement and two feet from a crawl space or concrete slab?				○ Yes	◉ No
Is the area of rooftop connecting to each disconnected downspout 600 square feet or less?				○ Yes	◉ No
Is the roof runoff from the design storm event fully contained in a raised bed or planter box or does it drain as sheet flow to a landscaped area large enough to contain the roof runoff from the design storm event?				○ Yes	◉ No
The Stream Buffer and/or Vegetated Swale credits **will not** be taken in this sub-watershed area?				○ Yes	◉ No
Percentage of existing	0.00	Acres	of rooftop surface has disconnected downspouts		
Percentage of the proposed	0.00	Acres	of rooftop surface has disconnected downspouts	50	
				Return to Calculator	

Impervious Area Disconnection Credit Worksheet

Please fill out an impervious area disconnection credit worksheet for each project sub-watershed. If you answer yes to all questions, all non-rooftop impervious surface area will be subtracted from your proposed non-rooftop impervious coverage.

Non-Rooftop Disconnection Credit Criteria	Response
Is the maximum contributing impervious flow path length less than 75 feet or, if equal or greater than 75 feet, is a storage device (e.g. French drain, bioretention area, gravel trench) implemented to achieve the required disconnection length?	◉ Yes ○ No
Is the impervious area to any one discharge location less than 5,000 square feet?	◉ Yes ○ No
The Stream Buffer credit **will not** be taken in this sub-watershed area?	◉ Yes ○ No

Percentage of existing	0.00	Acres non-rooftop surface area disconnected	
Percentage of the proposed	0.00	Acres non-rooftop surface area disconnected	70

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Green Roof Credit Worksheet

Please fill out a greenroof credit worksheet for each project sub-watershed. If you answer yes to all questions, 70% of the greenroof area will be subtracted from your proposed rooftop impervious coverage.

Green Roof Credit Criteria	Response
Is the roof slope less than 15% or does it have a grid to hold the substrate in place until it forms a thick vegetation mat?	◉ Yes ○ No
Has a professional engineer assessed the necessary load reserves and designed a roof structure to meet state and local codes?	◉ Yes ○ No
Is the irrigation needed for plant establishment and/or to sustain the green roof during extended dry periods, is the source from stored, recycled, reclaimed, or reused water?	◉ Yes ○ No
Percentage of existing 0.00 Acres rooftop surface area in greenroof	
Percentage of the proposed 0.00 Acres rooftop surface area in greenroof	

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Stream Buffer Credit Worksheet

Please fill out a stream buffer credit worksheet for each project sub-watershed. If you answer yes to all questions, you may subtract all impervious surface draining to each stream buffer that has not been addressed using the Downspout and/or Impervious Area Disconnection credits.

Stream Buffer Credit Criteria				Response
Does runoff enter the floodprone width* or within 500 feet (whichever is larger) of a stream channel as sheet flow**?				○ Yes ◉ No
Is the contributing overland slope 5% or less, or if greater than 5%, is a level spreader used?				○ Yes ◉ No
Is the buffer area protected from vehicle or other traffic barriers to reduce compaction?				○ Yes ◉ No
Will the stream buffer be maintained in an ungraded and uncompacted condition and will the vegetation be maintained in a natural condition?				○ Yes ◉ No
Percentage of existing	0.00	Acres	impervious surface area draining into a stream buffer:	
Percentage of the proposed	0.00	Acres	impervious surface area that will drain into a stream buffer:	
Please describe below how the project will ensure that the buffer areas will remain in ungraded and uncompacted condition and that the vegetation will be maintained in a natural condition.				

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* floodprone width is the width at twice the bankfull depth.
** the maximum contributing length shall be 75 feet for impervious area

Vegetated Swale Credit Worksheet

Please fill out a vegetated swale worksheet for each project subwatershed. If you answer yes to all questions, you may subtract all impervious surface draining to each stream buffer that has not been addressed using the Downspout Disconnection credit.

Vegetated Swale Credit Criteria

Have all vegetated swales been designed in accordance with Treatment Control BMP 30 (TC-30 - Vegetated Swale) from the California Stormwater BMP Handbook, New Development and Redevelopment (available at www.cabmphandbooks.com)?	○ Yes ◉ No
Is the maximum flow velocity for runoff from the design storm event less than or equal to 1.0 foot per second?	○ Yes ◉ No

Percentage of existing	0.00	Acres of impervious area draining to a vegetated swale	
Percentage of the proposed	0.00	Acres of impervious area draining to a vegetated swale	

Return to Calculator

Rain Barrel/Cistern Credit Worksheet

Please fill out a rain barrel/cistern worksheet for each project sub-watershed.

Rain Barrel/Cistern Credit Criteria	Response
Total number of rain barrel(s)/cisterns	
Average capacity of rain barrel(s)/cistern(s) (in gallons)	
Total capacity rain barrel(s)/cistern(s) (in cu ft) [1]	0

[1] accounts for 10% loss

Return to Calculator

Please fill out a soil quality worksheet for each project sub-watershed.

	Response
Will the landscaped area be lined with an impervious membrane?	
Will the soils used for landscaping meet the ideal bulk densities listed in Table 1 below? [1]	○ Yes ◉ No
If you answered yes to the question above, and you know the area-weighted bulk density within the top 12 inches for soils used for landscaping (in g/cm^3)* , fill in the cell to the right and skip to cell G11. If not select from the drop-down menu in G10.	1.3
If you answered yes to the question above, but you do not know the exact bulk density, which of the soil types in the drop down menu to the right best describes the top 12 inches for soils used for landscaping (in g/cm^3).	Sandy loams, loams
What is the average depth of your landscaped soil media meeting the above criteria (inches)?	12
What is the total area of the landscaped areas meeting the above criteria (in acres)?	2.97

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Table 1

Sands, loamy sands	<1.6
Sandy loams, loams	<1.4
Sandy clay loams, loams, clay loams	<1.4
Silts, silt loams	<1.3
Silt loams, silty clay loams	<1.1
Sandy clays, silty clays, some clay loams (35-45% clay)	<1.1
Clays (>45% clay)	<1.1

Porosity (%) 50.94%

Mineral grains in many soils are mainly quartz and feldspar, so 2.65 a good average for particle density. To determine percent porosity, use the formula: Porosity (%) = (1-Bulk Density/2.65) X 100

[1] USDA NRCS. "Soil Quality Urban Technical Note No.2-Urban Soil Compaction". March 2000. http://soils.usda.gov/sqi/management/files/sq_utn_2.pdf

* To determine how to calculate density see: http://www.globe.gov/tctg/bulkden.pdf?sectionID=94

APPENDIX 2:
Post-Construction Water Balance Performance Standard Spreadsheet

The discharger shall submit with their Notice of Intent (NOI) the following information to demonstrate compliance with the New and Re-Development Water Balance Performance Standard.

Map Instructions

The discharger must submit a small-scale topographic map of the site to show the existing contour elevations, pre- and post-construction drainage divides, and the total length of stream in each watershed area. Recommended scales include 1 in. = 20 ft., 1 in. = 30 ft., 1 in. = 40 ft., or 1 in = 50 ft. The suggested contour interval is usually 1 to 5 feet, depending upon the slope of the terrain. The contour interval may be increased on steep slopes. Other contour intervals and scales may be appropriate given the magnitude of land disturbance.

Spreadsheet Instructions

The intent of the spreadsheet is to help dischargers calculate the project-related increase in runoff volume and select impervious area and runoff reduction credits to reduce the project-related increase in runoff volume to pre-project levels.

The discharger has the option of using the spreadsheet (**Appendix 2.1)** or a more sophisticated, watershed process-based model (e.g. Storm Water Management Model, Hydrological Simulation Program Fortran) to determine the project-related increase in runoff volume.

In* Appendix 4.1**, ***you must complete the worksheet for each land use/soil type combination for each project sub-watershed.

Steps 1 through 9 pertain specifically to the Runoff Volume Calculator:

Step 1: Enter the county where the project is located in cell H3.

Step 2: Enter the soil type in cell H6.

Step 3: Enter the existing pervious (dominant) land use type in cell H7.

Step 4: Enter the proposed pervious (dominant) land use type in cell H8.

Step 5: Enter the total project site area in cell H11 or J11.

Step 6: Enter the sub-watershed area in cell H12 or J12.

Step 7: Enter the existing rooftop area in cell H17 or J17, the existing non-rooftop impervious area in cell H18 or J18, the proposed rooftop area in cell H19 or J19, and the proposed non-rooftop impervious area in cell H20 or J20

Step 8: Work through each of the impervious area reduction credits and claim credits where applicable. Volume that cannot be addressed using non-structural practices must be captured in structural practices and approved by the Regional Water Board.

Step 9: Work through each of the impervious volume reduction credits and claim credits where applicable. Volume that cannot be addressed using non-structural practices must be captured in structural practices and approved by the Regional Water Board.

Non-structural Practices Available for Crediting

- ***Porous Pavement***
- ***Tree Planting***
- ***Downspout Disconnection***
- ***Impervious Area Disconnection***
- ***Green Roof***
- ***Stream Buffer***
- ***Vegetated Swales***
- ***Rain Barrels and Cisterns***
- ***Landscaping Soil Quality***

APPENDIX 3
Bioassessment Monitoring Guidelines

Bioassessment monitoring is required for projects that meet all of the following criteria:

1. The project is rated Risk Level 3 or LUP Type 3
2. The project directly discharges runoff to a freshwater wadeable stream (or streams) that is either: (a) listed by the State Water Board or USEPA as impaired due to sediment, and/or (b) tributary to any downstream water body that is listed for sediment; and/or have the beneficial use SPAWN & COLD & MIGRATORY
3. Total project-related ground disturbance exceeds 30 acres.

For all such projects, the discharger shall conduct bioassessment monitoring, as described in this section, to assess the effect of the project on the biological integrity of receiving waters.
Bioassessment shall include:

1. The collection and reporting of specified instream biological data
2. The collection and reporting of specified instream physical habitat data

<u>Bioassessment Exception</u>
If a site qualifies for bioassessment, but construction commences out of an index period for the site location, the discharger shall:

1. Receive Regional Water Board approval for the sampling exception
2. Make a check payable to: Cal State Chico Foundation (SWAMP Bank Account) or San Jose State Foundation (SWAMP Bank Account) and include the WDID# on the check for the amount calculated for the exempted project.
3. Send a copy of the check to the Regional Water Board office for the site's region
4. Invest **7,500.00 X The number of samples required** into the SWAMP program as compensation (upon Regional Water Board approval).
5. Conduct bioassessment monitoring, as described in Appendix 4
6. Include the collection and reporting of specified instream biological data and physical habitat
7. Use the bioassessment sample collection and Quality Assurance & Quality Control (QA/QC) protocols developed by the State of California's Surface Water Ambient Monitoring Program (SWAMP)

<u>Site Locations and Frequency</u>
Macroinvertebrate samples shall be collected both before ground disturbance is initiated and after the project is completed. The "after" sample(s) shall be collected after at least one winter season resulting in surface runoff has transpired after project-related ground disturbance has ceased. "Before" and "after" samples shall be collected both upstream and downstream of the project's

discharge. Upstream samples should be taken immediately before the sites outfall and downstream samples should be taken immediately after the outfall (when safe to collect the samples). Samples should be collected for each freshwater wadeable stream that is listed as impaired due to sediment, or tributary to a water body that is listed for sediment. Habitat assessment data shall be collected concurrently with all required macroinvertebrate samples.

Index Period (Timing of Sample Collection)
Macroinvertebrate sampling shall be conducted during the time of year (i.e., the "index period") most appropriate for bioassessment sampling, depending on ecoregion. This map is posted on the State Water Board's Website: http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml

Field Methods for Macroinvertebrate Collections
In collecting macroinvertebrate samples, the discharger shall use the "Reachwide Benthos (Multi-habitat) Procedure" specified in *Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California* (Ode 2007).[1]

Physical - Habitat Assessment Methods
The discharger shall conduct, concurrently with all required macroinvertebrate collections, the "Full" suite of physical habitat characterization measurements as specified in *Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California* (Ode 2007), and as summarized in the Surface Water Ambient Monitoring Program's *Stream Habitat Characterization Form — Full Version*.

Laboratory Methods
Macroinvertebrates shall be identified and classified according to the Standard Taxonomic Effort (STE) Level I of the Southwestern Association of Freshwater Invertebrate Taxonomists (SAFIT),[2] and using a fixed-count of 600 organisms per sample.

Quality Assurance
The discharger or its consultant(s) shall have and follow a quality assurance (QA) plan that covers the required bioassessment monitoring. The QA plan shall include, or be supplemented to include, a specific requirement for external QA checks (i.e., verification of taxonomic identifications and correction of data where errors are identified). External QA checks shall be performed on one of the

[1] This document is available on the Internet at: http://www.swrcb.ca.gov/swamp/docs/phab_sopr6.pdf.
[2] The current SAFIT STEs (28 November 2006) list requirements for both the Level I and Level II taxonomic effort, and are located at: http://www.swrcb.ca.gov/swamp/docs/safit/ste_list.pdf. When new editions are published by SAFIT, they will supersede all previous editions. All editions will be posted at the State Water Board's SWAMP website.

discharger's macroinvertebrate samples collected per calendar year, or ten percent of the samples per year (whichever is greater). QA samples shall be randomly selected. The external QA checks shall be paid for by the discharger, and performed by the California Department of Fish and Game's Aquatic Bioassessment Laboratory. An alternate laboratory with equivalent or better expertise and performance may be used if approved in writing by State Water Board staff.

Sample Preservation and Archiving

The original sample material shall be stored in 70 percent ethanol and retained by the discharger until: 1) all QA analyses specified herein and in the relevant QA plan are completed; and 2) any data corrections and/or re-analyses recommended by the external QA laboratory have been implemented. The remaining subsampled material shall be stored in 70 percent ethanol and retained until completeness checks have been performed according to the relevant QA plan. The identified organisms shall be stored in 70 percent ethanol, in separate glass vials for each final ID taxon. (For example, a sample with 45 identified taxa would be archived in a minimum of 45 vials, each containing all individuals of the identified taxon.) Each of the vials containing identified organisms shall be labeled with taxonomic information (i.e., taxon name, organism count) and collection information (i.e., site name/site code, waterbody name, date collected, method of collection). The identified organisms shall be archived (i.e., retained) by the discharger for a period of not less than three years from the date that all QA steps are completed, and shall be checked at least once per year and "topped off" with ethanol to prevent desiccation. The identified organisms shall be relinquished to the State Water Board upon request by any State Water Board staff.

Data Submittal

The macroinvertebrate results (i.e., taxonomic identifications consistent with the specified SAFIT STEs, and number of organisms within each taxa) shall be submitted to the State Water Board in electronic format. The State Water Board's Surface Water Ambient Monitoring Program (SWAMP) is currently developing standardized formats for reporting bioassessment data. All bioassessment data collected after those formats become available shall be submitted using the SWAMP formats. Until those formats are available, the biological data shall be submitted in MS-Excel (or equivalent) format.[3]

The physical/habitat data shall be reported using the standard format titled *SWAMP Stream Habitat Characterization Form — Full Version*.[4]

[3] Any version of Excel, 2000 or later, may be used.
[4] Available at: http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/reports/fieldforms_fullversion052908.pdf

Invasive Species Prevention

In conducting the required bioassessment monitoring, the discharger and its consultants shall take precautions to prevent the introduction or spread of aquatic invasive species. At minimum, the discharger and its consultants shall follow the recommendations of the California Department of Fish and Game to minimize the introduction or spread of the New Zealand mudsnail.[5]

[5] Instructions for controlling the spread of NZ mudsnails, including decontamination methods, can be found at: http://www.dfg.ca.gov/invasives/mudsnail/
More information on AIS More information on AIS
http://www.waterboards.ca.gov/water_issues/programs/swamp/ais/

Appendix 4 Sediment TMDLs

Implemented Sediment TMDLs in California. Construction was listed as a source in all fo these TMDLs in relation to road construction. Although construction was mentioned as a source, it was not given a specific allocation amount. The closest allocation amount would be for the road activity management WLA. **Implementation Phase** – Adoption process by the Regional Board, the State Water Resources Control Board, the Office of Administrative Law, and the US Environmental Protection Agency completed and TMDL being implemented.

A. Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres**	**WLA** tons mi^2 yr
1 R1.epa.albionfinaltmdl	R	Albion River	Sedimentation	Road Construction	2001	43 acres	See A (table 6)

B Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres**	**WLA** tons mi^2 yr
1 R1.epa.EelR-middle.mainSed.temp	R	Middle Main Eel River and Tributaries (from Dos Rios to the South Fork)	Sedimentation Road	Construction	2005-2006 521	mi^2	100

C Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres**	**WLA** tons mi^2 yr
1 R1.epa.EelRsouth.sed.temp	R	South Fork Eel River	Sedimentation	Road Construction	12 1999	See chart	473

D Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres**	**WLA** tons mi^2 yr
1 R1.epa.bigfinaltmdl	R Big	River	Sedimentation	Road Construction	12 2001	181 mi^2 watershed drainage	TMDL = loading capacity = nonpoint sources + background =

							393 t mi2 yr

E Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres	WLA tons mi^2 yr
1 R1.epa.EelR-lower.Sed.temp-121807-signed	R	Lower Eel River	Sedimentation	Road Construction	12 2007	300 square-mile watershed	898

F Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres	WLA tons mi^2 yr
1 R1.epa.EelR-middle.Sed.temp-	R	Middle Fork Eel River	Sedimentation	Road Construction	12 2003	753 mi^2 (approx. 482,000 acres)	82

G Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres Mi^2	WLA tons mi^2 yr
1 R1.epa.EelRnorth-Sed.temp.final-121807-signed	R	North Fork Eel River	Sedimentation	Road Construction	12 30 2002	289 (180,020 acres)	20

H Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres Mi^2	WLA tons mi^2 yr
1 R1.epa.EelR-upper.mainSed.temp-	R	Upper Main Eel River and Tributaries (including Tomki Creek, Outlet Creek and Lake Pillsbury)	Sedimentation	Road Construction	12 29 2004	688 (approx. 440,384 acres)	14

I Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres	WLA tons mi^2 yr
1 R1.epa.gualalafinaltmdl	R	Gualala River	Sedimentation	Road Construction	Not sure	300 (191,145 acres)	7

J Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA tons mi^2 yr
1 R1.epa.Mad-sed.turbidity	R	Mad River	Sedimentation	Road Construction	12 21 2007	480	174

K Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA tons mi^2 yr
1 R1.epa.mattole.sediment	R	Mattole River	Sedimentation	Road Construction	12 30 2003	296	27 or 520+27 = 547

L Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA tons mi^2 yr
1 R1.epa.navarro.sed.temp	R	Navarro River	Sedimentation	Road Construction	Not sure	315 (201,600 acres).	50

M Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA tons mi^2 yr
1 R1.epa.noyo.sediment	R	Noyo River	Sedimentation	Road Construction	12 16 1999	113 (72,323 acres)	68 (three areas measured) Table 16 in the TMDL

N Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA tons mi^2 yr
1 R1.epa.RedwoodCk.sed	Cr	Redwood Creek	Sedimentation	Road Construction	12 30 1998	278	1900 Total allocation

O Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA – Roads tons mi^2 yr
1 R1.epa.tenmile.sed	R	Ten Mile River	Sedimentation	Road Construction	2000	120	9

P Region	Type	Name	Pollutant Stressor	Potential Sources	TMDL Completion Date	Watershed Acres mi^2	WLA management tons mi^2 yr
1 R1.epa.trinity.sed	R	Trinity River	Sedimentation	Road Construction	12 20 2001	2000 of 3000 covered in this TMDL	See rows below
1	Cr	Horse Linto Creek	Sedimentation	Road Construction	12 20 2001	64	528
1	Cr	Mill creek and Tish Tang	Sedimentation	Road Construction	12 20 2001	39	210
1	Cr	Willow Creek	Sedimentation	Road Construction	12 20 2001	43	94
1	Cr	Campbell Creek and Supply Creek	Sedimentation	Road Construction	12 20 2001	11	1961
1	Cr	Lower Mainstem and Coon Creek	Sedimentation	Road Construction	12 20 2001	32	63
1 R		Reference Subwatershed [1]	Sedimentation	Road Construction	12 20 2001	434	24
1	Cr	Canyon Creek	Sedimentation	Road	12 20 2001	64	326

				Construction			
1 R		Upper Tributaries[2]	Sedimentation	Road Construction	12 20 2001	72	67
1 R		Middle Tributaries[3]	Sedimentation	Road Construction	12 20 2001	54	53
1 R		Lower Tributaries[4]	Sedimentation	Road Construction	12 20 2001	96	55
1	Cr	Weaver and Rush Creeks	Sedimentation	Road Construction	12 20 2001	72	169
1 Cr		Deadwood Creek Hoadley Gulch Poker Bar	Sedimentation	Road Construction	12 20 2001	47	68
1	L	Lewiston Lake	Sedimentation	Road Construction	12 20 2001	25	49
1 Cr		Grassvalley Creek	Sedimentation	Road Construction	12 20 2001	37	44
1	Cr	Indian Creek	Sedimentation	Road Construction	12 20 2001	34	81
1	Cr	Reading and Browns Creek	Sedimentation	Road Construction	12 20 2001	104	66
1 Cr		Reference Subwatersheds[5]	Sedimentation	Road Construction	12 20 2001	235	281
1	L, Cr	Westside tributaries[6]	Sedimentation	Road Construction	12 20 2001	93	105
1 R,	Cr, G	Upper trinity[7]	Sedimentation	Road Construction	12 20 2001	161	690
1 R,	Cr, G	East Fork Tributaries[8]	Sedimentation	Road Construction	12 20 2001	115	65
1	R, L	Eastside Tributaries[9]	Sedimentation	Road Construction	12 20 2001	89	60

1 New River, Big French, Manzanita, North Fork, East Fork, North Fork
2 Dutch, Soldier, Oregon gulch, Conner Creek
3 Big Bar, Prairie Creek, Little French Creek
4 Swede, Italian, Canadian, Cedar Flat, Mill, McDonald, Hennessy, Quimby, Hawkins, Sharber
5 Stuarts Fork, Swift Creek, Coffee Creek
6 Stuart Arm, Stoney Creek, Mule Creek, East Fork, Stuart Fork, West Side Trinity Lake, Hatchet Creek, Buckeye Creek,
7 Upper Trinity River, Tangle Blue, Sunflower, Graves, Bear Upper Trinity Mainstream, Ramshorn Creek, Ripple Creek, Minnehaha Creek, Snowslide Gulch, Scorpion Creek
8 East Fork Trinity, Cedar Creek, Squirrel Gulch

9 East Side Tributaries, Trinity Lake

Q Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres** mi^2	**WLA** tons mi^2 yr
1 R1.epa.trinity.so.sed	R, Cr	South Fork Trinity River and Hayfork Creek	Sedimentation	Road Construction	12 1998	Not given, 19 miles long	33 (road total)

R Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres** mi^2	**WLA** tons mi^2 yr
1 R1.epa.vanduzen.sed	R, Cr	Van Duzen River and Yager Creek	Sedimentation	Various	12 16 1999	429	1353 total allocation
1		Upper Basin	Sedimentation	Road Construction			7
1		Middle Basin	Sedimentation	Road Construction			22
1		Lower Basin	Sedimentation	Road Construction			20

S Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres** mi^2	**WLA** tons mi^2 yr
6 R6.blackwood.sed Cr		Blackwood Creek (Placer County)	Bedded Sediment	Various	9 2007	11	17272 total

T Region	**Type**	**Name**	**Pollutant Stressor**	**Potential Sources**	**TMDL Completion Date**	**Watershed Acres** mi^2	**WLA** tons mi^2 yr
6 R6.SquawCk.sed R		Squaw Creek (Placer County)	Sedimentation /controllable sources	Various – basin plan amendment	4 13 2006	8.2	10,900

Adopted TMDLs for Construction Sediment Sources

Region	Type	Name	Pollutant Stressor	Potential Sources	**TMDL Completion Date**	**Watershed Area** mi^2	Waste load Allocation tons mi^2 yr
8 R		Newport Bay San Diego Creek Watershed	Sedimentation	Construction Land Development	1999 2.24	(1432 acres)	125,000 tons per Year (no more than 13,000 tons per year from construction sites)

Appendix 4 Non Sediment TMDLs

Region 1 Lost River-DIN and CBOD

Region 1 Source: Cal Trans Construction TMDL Completion Date: 12 30 2008 TMDL Type: River, Lake Watershed Area= 2996 mi^2	**Pollutant Stressors/WLA**	
	Dissolved inorganic nitrogen (DIN) (metric tons/yr)	**Carbonaceous biochemical oxygen demand (CBOD) (metric tons/yr)**
Lost River from the Oregon border to Tule Lake	.1 .2	
Tule Lake Refuge	.1	.2
Lower Klamath Refuge	.1	.2

Region 2 San Francisco Bay-Mercury

Region 2 Source:Non-Urban Stormwater Runoff TMDL Type: Bay	**Name**	**Pollutant Stressor/WLA**	**TMDL Completion Date**
	San Francisco Bay	Mercury 25 kg/year	08 09 2006

Region 4 Machado Lake Nutrients - Resolution No. 2008-006
(Effective Date - March 11, 2009)

General Construction Stormwater Permit WLAs	Years After Effective Date	Total Phosphorus (mg/L)	Total Nitrogen (TKN + NO3-N + NO2-N) (mg/L)
Interim WLAs[1]	At Effective Date	1.25	3.50
Interim WLAs[2] 5	years	1.25	2.45
Final WLAs[2]	9.5 years	0.10	1.00

[1] The compliance points for effective date interim WLAs are measured in the lake.
[2] No compliance points are specified for general construction stormwater permits for the year 5 interim WLAs and final WLAs

Region 4 Ballona Creek-Metals and Selenium – Resolution No. 2007-015
(Effective Date October 29, 2008)

Wet Weather WLAs

Region 4 Source: NPDES General Construction TMDL Completion Date: 10 29 2008 TMDL Type: Creek								
	Copper (Cu)		**Lead (Pb)**		**Selenium (Se)**		**Zinc (Zn)**	
	g/day	g/day/acre	g/day	g/day/acre	g/day	g/day/acre	g/day	g/day/acre
Ballona Creek	4.94E-07 x Daily storm volume (L)	2.20E-10 x Daily storm volume (L)	1.62E-06 x Daily storm volume (L)	7.20E-10 x Daily storm volume (L)	1.37E-07 x Daily storm volume (L)	6.10E-11 x Daily storm volume (L)	3.27E-06 x Daily storm volume (L)	1.45E-09 x Daily storm volume (L)

Wet-weather WLA Implementation

- Within seven years of the effective date of the TMDL, the construction industry will submit the results of BMP effectiveness studies to determine BMPs that will achieve compliance with the final waste load allocations assigned to construction storm water permittees.
- Regional Board staff will bring the recommended BMPs before the Regional Board for consideration within eight years of the effective date of the TMDL.
- General construction storm water permittees will be considered in compliance with final waste load allocations if they implement these Regional Board approved BMPs. All permittees must implement the approved BMPs within nine years of the effective date of the TMDL. If no effectiveness studies are conducted and no BMPs are approved by the Regional Board within eight years of the effective date of the TMDL, each general construction storm water permit holder will be subject to site-specific BMPs and monitoring requirements to demonstrate compliance with final waste load allocations.

Dry-weather WLAs

A waste load allocation of zero is assigned to all general construction storm water permits during dry weather.

Dry-weather WLA Implementation

Non-storm water flows authorized by the General Permit for Storm Water Discharges Associated with Construction Activity (Water Quality Order No. 99-08 DWQ), or any successor order, are exempt from the dry-weather waste load allocation equal to zero as long as they comply with the provisions of sections C.3 and A.9 of the Order No. 99-08 DWQ, which state that these authorized non-storm discharges shall be:

(1) infeasible to eliminate
(2) comply with BMPs as described in the Storm Water Pollution Prevention Plan prepared by the permittee, and
(3) not cause or contribute to a violation of water quality standards, or comparable provisions in any successor order.

Unauthorized non-storm water flows are already prohibited by Order No. 99-08 DWQ.

Region 4 Los Angeles River and Tributaries-Metals– Resolution No. 2007-014
(Effective Date October 29, 2008)

Wet Weather WLAs

	Cadmium (Cd)		**Copper (Cu)**		**Lead (Pb)**		**Zinc (Zn)**	
	kg/day g/day/acre		kg/day g/day/acre		kg/day g/day/acre		kg/day g/day/acre	
5.9x10	$^{-11}$ x Daily storm volume (L)	7.6×10^{-12} x Daily storm volume (L)	3.2×10^{-10} x Daily storm volume (L)	4.2×10^{-11} x Daily storm volume (L)	1.2×10^{-9} x Daily storm volume (L)	1.5×10^{-10} x Daily storm volume (L)	3.01×10^{-9} x Daily storm volume (L)	3.9×10^{-10} x Daily storm volume (L)

Wet-weather WLA Implementation

- Within seven years of the effective date of the TMDL, the construction industry will submit the results of BMP effectiveness studies to determine BMPs that will achieve compliance with the final waste load allocations assigned to construction storm water permittees.
- Regional Board staff will bring the recommended BMPs before the Regional Board for consideration within eight years of the effective date of the TMDL.
- General construction storm water permittees will be considered in compliance with final waste load allocations if they implement these Regional Board approved BMPs. All permittees must implement the approved BMPs within nine years of the effective date of the TMDL. If no effectiveness studies are conducted and no BMPs are approved by the Regional Board within eight years of the effective date of the TMDL, each general construction storm water permit holder will be subject to site-specific BMPs and monitoring requirements to demonstrate compliance with final waste load allocations.

Dry-weather WLAs

A waste load allocation of zero is assigned to all general construction storm water permits during dry weather.

Dry-weather WLA Implementation

Non-storm water flows authorized by the General Permit for Storm Water Discharges Associated with Construction Activity (Water Quality Order No. 99-08 DWQ), or any successor order, are exempt from the dry-weather waste load allocation equal to zero as

long as they comply with the provisions of sections C.3 and A.9 of the Order No. 99-08 DWQ, which state that these authorized non-storm discharges shall be:

(1) infeasible to eliminate
(2) comply with BMPs as described in the Storm Water Pollution Prevention Plan prepared by the permittee, and
(3) not cause or contribute to a violation of water quality standards, or comparable provisions in any successor order.

Unauthorized non-storm water flows are already prohibited by Order No. 99-08 DWQ.

Region 4 Calleguas Creek Metals TMDL – Resolution No. 2006-012 (Effective Date - March 26, 2007)

Interim Limits and Final WLAs for Total Recoverable Copper, Nickel, and Selenium

Interim limits and waste load allocations are applied to receiving water.

A. Interim Limits

Constituents	Calleguas and Conejo Creek			Revolon Slough		
	Dry CMC (ug/L)	Dry CCC (ug/L)	Wet CMC (ug/L)	Dry CMC (ug/L)	Dry CCC (ug/L)	Wet CMC (ug/L)
Copper*	23	19	204	23	19	204
Nickel	15	13	(a)	15	13	(a)
Selenium	(b)	(b)	(b)	14	13	(a)

(a) The current loads do not exceed the TMDL under wet conditions; interim limits are not required.
(b) Selenium allocations have not been developed for this reach as it is not on the 303(d) list.
(c) Attainment of interim limits will be evaluated in consideration of background loading data, if available.

B. Final WLAs for Total Recoverable Copper, Nickel, and Selenium

Dry-Weather WLAs in Water Column

Flow Range	Calleguas and Conejo Creek			Revolon Slough		
	Low Flow	Average Flow	Elevated Flow	Low Flow	Average Flow	Elevated Flow
Copper1 (lbs/day)	0.04*WER - 0.02	0.12*WER - 0.02	0.18*WER - 0.03	0.03*WER - 0.01	0.06*WER - 0.03	0.13*WER - 0.02
Nickel (lbs/day)	0.100	0.120	0.440	0.050	0.069	0.116
Selenium (lbs/day)	(a)	(a)	(a)	0.004	0.003	0.004

[1] If site-specific WERs are approved by the Regional Board, TMDL waste load allocations shall be implemented in accordance with the approved WERs using the equations set forth above. Regardless of the final WERs, total copper loading shall not exceed current loading.

(a) Selenium allocations have not been developed for this reach as it is not on the 303(d) list.

Wet-Weather WLAs in Water Column

Constituent	Calleguas Creek	Revolon Slough
Copper[1] (lbs/day)	(0.00054*Q^2*0.032*Q - 0.17)*WER - 0.06	(0.0002*Q2+0.0005*Q)*WER
Nickel[2] (lbs/day)	0.014*Q^2+0.82*Q	0.027*Q^2+0.47*Q
Selenium[2] (lbs/day)	(a)	0.027*Q^2+0.47*Q

[1] If site-specific WERs are approved by the Regional Board, TMDL waste load allocations shall be implemented in accordance with the approved WERs using the equations set forth above. Regardless of the final WERs, total copper loading shall not exceed current loading.

[2] Current loads do not exceed loading capacity during wet weather. Sum of all loads cannot exceed loads presented in the table

(a) Selenium allocations have not been developed for this reach as it is not on the 303(d) list.

Q: Daily storm volume.

Interim Limits and Final WLAs for Mercury in Suspended Sediment

Flow Range	Calleguas Creek		Revolon Slough	
	Interim (lbs/yr)	Final (lbs/yr)	Interim (lbs/yr)	Final (lbs/yr)
0-15,000 MGY	3.3	0.4	1.7	0.1
15,000-25,000 MGY	10.5	1.6	4	0.7
Above 25,000 MGY	64.6	9.3	10.2	1.8

MGY: million gallons per year.

In accordance with current practice, a group concentration-based WLA has been developed for all permitted stormwater discharges, including municipal separate storm sewer systems (MS4s), Caltrans, general industrial and construction stormwater permits, and Naval Air Weapons Station Point Mugu. Dischargers will have a required 25%, 50% and 100% reduction in the difference between the current loadings and the load allocations at 5, 10 and 15 years after the effective date, respectively. Achievement of required reductions will be evaluated based on progress towards BMP implementation as outlined in the urban water quality management plans (UWQMPs). If the interim reductions are not met, the dischargers will submit a report to the Executive Officer detailing why the reductions were not met and the steps that will be taken to meet the required reductions.

Region 4 Calleguas Creek-OC Pesticides, PCBs, and Siltation (Resolution 2005-010)
Effective Date - March 24, 2006

Interim Requirements

Region 4 Calleguas Creek Source: Minor NPDES point sources/WDRs TMDL Completion Date: 3 24 2006 TMDL Type:Creek	**Pollutant Stressor**	**WLA Daily Max (µg/L)**	**WLA Monthly Ave (µg/L)**
	Chlordane 1.2		0.59
	4,4-DDD 1.7		0.84
	4,4-DDE 1.2		0.59
	4,4-DDT 1.2		0.59
	Dieldrin 0.28		0.14
	PCB's 0.34		0.17
	Toxaphene 0.33		0.16

Region 4 Calleguas Creek-Calleguas Creek Toxicicity (Resolution 2005-009)
Effective Date - March 24, 2006

Minor sources include NPDES permittees other than POTWs and MS4s, discharging to the Calleguas Creek Watershed. A wasteload of 1.0 TUc is allocated to the minor point sources discharging to the Calleguas Creek Watershed. Additionally, the following wasteloads for chlorpyrifos and diazinon are established. Final WLAs apply as of March 24, 2006.

Chlorpyrifos WLAs, ug/L
Final WLA
(4 day)
0.014
Diazinon WLAs, ug/L
Final WLA
Acute and Chronic
0.10

Region 4 Calleguas Creek-Salts (Resolution 2007-016)
Effective Date – December 2, 2008

Final Dry Weather Pollutant WLA (mg/L)					
Region 4 Calleaguas Creek Source Permitted Stormwater Dischargers TMDL Completion Date: 12 2 2008 TMDL Type:Creek	**Critical Condition Flow Rate (mgd)**	**Chloride (lb/day)**	**TDS (lb/day)**	**Sulfate (lb/day)**	**Boron (lb/day)**
Simi	1.39	1738 9849 2897 12			
Las Posas	0.13	157 887 261 N/A			
Conejo	1.26	1576 8931 2627 N/A			
Camarillo	0.06	72	406 119 N/A		
Pleasant Valley (Calleguas)	0.12	150 850 250 N/A			
Pleasant Valley (Revolon)	0.25	314	1778	523	2
Dry Weather Interim Pollutant WLA (mg/L)					
	Chloride (mg/L)	**TDS (mg/L)**	**Sulfate (mg/L)**	**Boron (mg/L)**	

Simi 230.0		1720.0	1289.0	1.3
Las Posas	230	1720	1289	1.3
Conejo 230		1720	1289	1.3
Camarillo 230		1720	1289	1.3
Pleasant Valley (Calleguas)	230	1720	1289	1.3
Pleasant Valley (Revolon)	230	1720	1289	1.3

- Dry- weather waste load allocations apply in the receiving water at the base of each subwatershed. Dry weather allocations apply when instream flow rates are below the 86th percentile flow and there has been no measurable precipitation in the previous 24 hours.
- Because wet weather flows transport a large mass of salts at low concentrations, these dischargers meet water quality objectives during wet weather. No wet weather allocations are assigned.

Ballona Creek Toxic Pollutants (Resolution No. 2005-008)
Effective Date - January 11, 2006

Each storm water permittee enrolled under the general construction or industrial storm water permits will receive an individual waste load allocation on a per acre basis, based on the acreage of their facility.

Metals per Acre WLAs for Individual General Construction or Industrial Storm Water Permittees (g/yr/ac)

Cadmium	Copper	Lead	Silver	Zinc
0.1	3 4 0.1			13

Organics per Acre WLAs for Individual General Construction or Industrial Storm Water Permittees (mg/yr/ac)

Chlordane	DDTs	Total PCBs	Total PAHs
0.04	0.14	2	350

Waste load allocations will be incorporated into the State Board general permit upon renewal or into a watershed specific general construction storm water permit developed by the Regional Board.

Within seven years of the effective date of the TMDL, the construction industry will submit the results of BMP effectiveness studies to determine BMPs that will achieve compliance with the waste load allocations assigned to construction storm water permittees. Regional Board staff will bring the recommended BMPs before the Regional Board for consideration within eight years of the

effective date of the TMDL. General construction storm water permittees will be considered in compliance with waste load allocations if they implement these Regional Board approved BMPs.

All general construction permittees must implement the approved BMPs within nine years of the effective date of the TMDL. If no effectiveness studies are conducted and no BMPs are approved by the Regional Board within eight years of the effective date of the TMDL, each general construction storm water permit holder will be subject to site-specific BMPs and monitoring requirements to demonstrate compliance with waste load allocations.

Region 4 Marina Del Rey Harbor Toxic Pollutants TMDL (Resolution No. 2005-012)
Effective Date March 22, 2006

Each storm water permittee enrolled under the general construction or industrial storm water permits will receive an individual waste load allocation on a per acre basis, based on the acreage of their facility.

Metals per Acre WLAs for Individual General Construction or Industrial Storm Water Permittees (g/yr/ac)

Copper	Lead	Zinc
2.3	3.1	10

Organics per acre WLAs for Individual General Construction or Industrial Storm Water Permittees (mg/yr/ac)

Chlordane	Total PCBs
0.03	1.5

Waste load allocations will be incorporated into the State Board general permit upon renewal or into a watershed specific general construction storm water permit developed by the Regional Board.

Within seven years of the effective date of the TMDL, the construction industry will submit the results of BMP effectiveness studies to determine BMPs that will achieve compliance with the waste load allocations assigned to construction storm water permittees. Regional Board staff will bring the recommended BMPs before the Regional Board for consideration within eight years of the effective date of the TMDL. General construction storm water permittees will be considered in compliance with waste load allocations if they implement these Regional Board approved BMPs.

All general construction permittees must implement the approved BMPs within nine years of the effective date of the TMDL. If no effectiveness studies are conducted and no BMPs are approved by the Regional Board within eight years of the effective date of

the TMDL, each general construction storm water permit holder will be subject to site-specific BMPs and monitoring requirements to demonstrate compliance with waste load allocations.

Region 4 San Gabriel River and Tributaries-Metals and Selenium (EPA-established TMDL – Effective date: 3/26/07)

Wet-weather allocations

Waterbody	Copper	Lead	Zinc
San Gabriel River Reach 2*		0.8 kg/d	
Coyote Creek**	0.513 kg/d	2.07 kg/d	3.0 kg/d

*Mass-based allocations are based on a flow of 260 cfs (daily storm volume = 6.4×10^8 liters)

**Mass-based allocations are based on a flow of 156 cfs (daily storm volume = 3.8×10^8 liters)

Dry-weather allocations

The dry-weather copper waste load allocation for general construction storm water permittees that discharge to San Gabriel Reach 1, Coyote Creek, and the Estuary is zero.

The dry-weather selenium allocation for general construction storm water permittees that discharge to San Jose Creek Reach 1 and Reach 2 is 5 µg/L (total recoverable metals).

Region 4 Upper Santa Clara River Chloride TMDL Adopted by Resolution No 2006-016 Effective Date June 12, 2008

“Other NPDES dischargers” have a chloride WLA equal to 100 mg/L.

This TMDL was revised by Resolution No 2008-012, which, when it becomes effective, includes the following conditional WLAs for “Other minor NPDES discharges”:

Reach	Concentration-based Conditional WLA for Chloride (mg/L)*
6	150 (12-month Average), 230 (Daily Maximum)
5	150 (12-month Average), 230 (Daily Maximum)
4B	117 (3-month Average), 230 (Daily Maximum)

*The conditional WLAs for chloride for all point sources shall apply only when chloride load reductions and/or chloride export projects are in operation by the Santa Clarita Valley Sanitation District according to the implementation plan for the TMDL. If these conditions are not met, WLAs shall be based on existing water quality objectives for chloride of 100 mg/L.

Region 4 The Harbor Beaches of Ventura County-Bacteria (Adopted by Resolution No. 2007-017)
Effective Date – December 18, 2008

Current and future enrollees in the Statewide Construction Activity Storm Water General Permit in the Channel Islands Harbor subwatershed are assigned WLAs of zero (0) days of allowable exceedances of the single sample limits and the rolling 30-day geometric mean limits.

Single Sample Limits are:
a. Total coliform density shall not exceed 10,000/100 ml.
b. Fecal coliform density shall not exceed 400/100 ml.
c. Enterococcus density shall not exceed 104/100 ml.
d. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

Rolling 30-day Geometric Mean Limits are:
a. Total coliform density shall not exceed 1,000/100 ml.
b. Fecal coliform density shall not exceed 200/100 ml.
c. Enterococcus density shall not exceed 35/100 ml.

Los Angeles Harbor Bacteria TMDL (Adopted by Resolution No. 2004-001)
Effective Date – March 10, 2005

Current and future enrollees in the Statewide Construction Activity Storm Water General Permit in the watershed are assigned WLAs of zero (0) days of allowable exceedances of the single sample limits and the rolling 30-day geometric mean.

Single Sample Limits are:
a. Total coliform density shall not exceed 10,000/100 ml.
b. Fecal coliform density shall not exceed 400/100 ml.
c. Enterococcus density shall not exceed 104/100 ml.
d. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

Rolling 30-day Geometric Mean Limits are:
a. Total coliform density shall not exceed 1,000/100 ml.
b. Fecal coliform density shall not exceed 200/100 ml.
c. Enterococcus density shall not exceed 35/100 ml.

Ballona Creek Bacteria TMDL (Adopted by Resolution No. 2006-011)
Effective Date – April 27, 2007

Current and future enrollees in the Statewide Construction Activity Storm Water General Permit in the watershed are assigned WLAs of zero (0) days of allowable exceedances of the single sample limits and the rolling 30-day geometric mean.

Single Sample Limits are:
a. Total coliform density shall not exceed 10,000/100 ml.
b. Fecal coliform density shall not exceed 400/100 ml.
c. Enterococcus density shall not exceed 104/100 ml.
d. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

Rolling 30-day Geometric Mean Limits are:
a. Total coliform density shall not exceed 1,000/100 ml.
b. Fecal coliform density shall not exceed 200/100 ml.
c. Enterococcus density shall not exceed 35/100 ml.

Region 4 Resolution No. 03-009 Los Angeles River and Tributaries-Nutrients

Minor Point Sources

Waste loads are allocated to minor point sources enrolled under NPDES or WDR permits including but not limited to Tapia WRP, Whittier Narrows WRP, Los Angeles Zoo WRP, industrial and construction stormwater, and municipal storm water and urban runoff from municipal separate storm sewer systems (MS4s)

Region 4 Minor Point Sources for NPDES/WDR Permits TMDL Effective Date: 3 23 2004 TMDL Type: River	Pollutant Stressor/WLA				
	Total Ammonia (NH_3)		**Nitrate-nitrogen (NO_3-N)**	**Nitrite-nitrogen (NO_2-N)**	**NO_3-N + NO_3-N**
	1 Hr Ave mg/l	30 Day Ave mg/l	30 Day Ave mg/l		30 Day Ave mg/l
LA River Above Los Angeles-Glendale WRP (LAG)	4.7 1.6 8.0			1.0	8.0
LA River Below LAG	8.7	2.4	8.0	1.0	8.0
Los Angeles Tributaries 10.1		2.3	8.0	1.0	8.0

Malibu Creek Attachment A to Resolution No. 2004-019R-Bacteria

Effective date: 1 24 2006. The WLAs for permittees under the NPDES General Stormwater Construction Permit are zero (0) days of allowable exceedances for the single sample limits and the rolling 30-day geometric mean.

Single Sample Limits are:
a. Total coliform density shall not exceed 10,000/100 ml.
b. Fecal coliform density shall not exceed 400/100 ml.
c. Enterococcus density shall not exceed 104/100 ml.
d. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

Rolling 30-day Geometric Mean Limits are:
a. Total coliform density shall not exceed 1,000/100 ml.
b. Fecal coliform density shall not exceed 200/100 ml.
c. Enterococcus density shall not exceed 35/100 ml.

Region 4 Marina del Rey Harbor, Mothers' Beach and Back Basins
Attachment A to Resolution No. 2003-012-Bacteria

Effective date: 3 18 2004. Discharges from general construction storm water permits are not expected to be a significant source of bacteria. Therefore, the WLAs for these discharges are zero (0) days of allowable exceedances for the single sample limits and the rolling 30-day geometric mean. Any future enrollees under a general NPDES permit, general industrial storm water permit or general construction storm water permit within the MdR Watershed will also be subject to a WLA of zero days of allowable exceedances.

Single Sample Limits are:
a. Total coliform density shall not exceed 10,000/100 ml.
b. Fecal coliform density shall not exceed 400/100 ml.
c. Enterococcus density shall not exceed 104/100 ml.
d. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

Rolling 30-day Geometric Mean Limits are:
a. Total coliform density shall not exceed 1,000/100 ml.
b. Fecal coliform density shall not exceed 200/100 ml.
c. Enterococcus density shall not exceed 35/100 ml.

Santa Clara River Nutrients TMDL (Adopted by Resolution No. 2003-011
Effective Date - March 23, 2004

Concentration-based wasteloads are allocated to municipal, industrial and construction stormwater sources regulated under NPDES permits. For stormwater permittees discharging into Reach 7, the thirty-day WLA for ammonia as nitrogen is 1.75 mg/L and the one-hour WLA for ammonia as nitrogen is 5.2 mg/L; the thirty-day average WLA for nitrate plus nitrite as nitrogen is 6.8 mg/L. For stormwater permittees discharging into Reach 3, the thirty-day WLA for ammonia as nitrogen is 2.0 mg/L and the one-hour WLA for ammonia as nitrogen is 4.2 mg/L; the thirty-day average WLA for nitrate plus nitrite nitrogen is 8.1 mg/L.

Region 8 RESOLUTION NO. R8-2007- 0024

Total Maximum Daily Loads (TMDLs) for San Diego Creek,
Upper and Lower Newport Bay, Orange County, California

Region 8 NPDES Construction Permit TMDL Completion Date: 1 24 1995 TMDL Type: River. Cr, Bay	Organochlorine Compounds							
	Total DDT		**Chlordane**		**Total PCBs**		**Toxaphene**	
	g/day	g/yr	g/day	g/yr	g/day	g/yr	g/day	g/yr
San Diego Creek	.27	99.8	**.18***	**64.3***	**.09***	**31.5***	.004	1.5
Upper Newport Bay	.11	40.3	.06	23.4	.06	23.2	**X**	**X**
Lower Newport Bay	.04	14.9	.02	8.6	.17	60.7	**X**	**X**

*Red= Informational WLA only, not for enforcement purposes

Organochlorine Compounds TMDLs Implementation Tasks and Schedule

Regional Board staff shall develop a SWPPP Improvement Program that identifies the Regional Board's expectations with respect to the content of SWPPPs, including documentation regarding the selection and implementation of BMPs, and a sampling and analysis plan. The Improvement Program shall include specific guidance regarding the development and implementation of monitoring plans, including the constituents to be monitored, sampling frequency and analytical protocols. The SWPPP Improvement Program shall be completed by (*the date of OAL approval of this BPA*). ***No later than two months*** from completion of the Improvement Program, Board staff shall assure that the requirements of the Program are communicated to interested parties, including dischargers with existing authorizations under the General Construction Permit. Existing, authorized dischargers shall revise their project SWPPPs as needed to address the Program requirements as soon as possible but ***no later than (three months of completion of the SWPPP Improvement Program)***. Applicable SWPPPs that do not adequately address the Program requirements shall be considered inadequate and enforcement by the Regional Board shall proceed accordingly. The Caltrans and Orange County MS4 permits shall be revised as needed to assure that the permittees communicate the Regional Board's SWPPP expectations, based on the SWPPP Improvement Program, with the Standard Conditions of Approval.

APPENDIX 5:
Glossary

Active Areas of Construction
All areas subject to land surface disturbance activities related to the project including, but not limited to, project staging areas, immediate access areas and storage areas. All previously active areas are still considered active areas until final stabilization is complete. [The construction activity Phases used in this General Permit are the Preliminary Phase, Grading and Land Development Phase, Streets and Utilities Phase, and the Vertical Construction Phase.]

Active Treatment System (ATS)
A treatment system that employs chemical coagulation, chemical flocculation, or electrocoagulation to aid in the reduction of turbidity caused by fine suspended sediment.

Acute Toxicity Test
A chemical stimulus severe enough to rapidly induce a negative effect; in aquatic toxicity tests, an effect observed within 96 hours or less is considered acute.

Air Deposition
Airborne particulates from construction activities. .

Approved Signatory
A person who has legal authority to sign, certify, and electronically submit Permit Registration Documents and Notices of Termination on behalf of the Legally Responsible Person.

Beneficial Uses
As defined in the California Water Code, beneficial uses of the waters of the state that may be protected against quality degradation include, but are not limited to, domestic, municipal, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.

Best Available Technology Economically Achievable (BAT)
As defined by USEPA, BAT is a technology-based standard established by the Clean Water Act (CWA) as the most appropriate means available on a national basis for controlling the direct discharge of toxic and nonconventional pollutants to navigable waters. The BAT effluent limitations guidelines, in general, represent the best existing performance of treatment technologies that are economically achievable within an industrial point source category or subcategory.

Best Conventional Pollutant Control Technology (BCT)

As defined by USEPA, BCT is a technology-based standard for the discharge from existing industrial point sources of conventional pollutants including biochemical oxygen demand (BOD), total suspended sediment (TSS), fecal coliform, pH, oil and grease.

Best Professional Judgment (BPJ)
The method used by permit writers to develop technology-based NPDES permit conditions on a case-by-case basis using all reasonably available and relevant data.

Best Management Practices (BMPs)
BMPs are scheduling of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants. BMPs also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Chain of Custody (COC)
Form used to track sample handling as samples progress from sample collection to the analytical laboratory. The COC is then used to track the resulting analytical data from the laboratory to the client. COC forms can be obtained from an analytical laboratory upon request.

Coagulation
The clumping of particles in a discharge to settle out impurities, often induced by chemicals such as lime, alum, and iron salts.

Common Plan of Development
Generally a contiguous area where multiple, distinct construction activities may be taking place at different times under one plan. A plan is generally defined as any piece of documentation or physical demarcation that indicates that construction activities may occur on a common plot. Such documentation could consist of a tract map, parcel map, demolition plans, grading plans or contract documents. Any of these documents could delineate the boundaries of a common plan area. However, broad planning documents, such as land use master plans, conceptual master plans, or broad-based CEQA or NEPA documents that identify potential projects for an agency or facility are not considered common plans of development.

Daily Average Discharge
The discharge of a pollutant measured during any 24-hour period that reasonably represents a calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged during the day. For pollutants with limitations expressed in other units of measurement (e.g., concentration) the daily discharge is calculated as the average measurement of the pollutant

throughout the day (40 CFR 122.2). In the case of pH, the pH must first be converted from a log scale.

Debris
Litter, rubble, discarded refuse, and remains of destroyed inorganic anthropogenic waste.

Direct Discharge
A discharge that is routed directly to waters of the United States by means of a pipe, channel, or ditch (including a municipal storm sewer system), or through surface runoff.

Discharger
The Legally Responsible Person (see definition) or entity subject to this General Permit.

Dose Rate (for ATS)
In exposure assessment, dose (e.g. of a chemical) per time unit (e.g. mg/day), sometimes also called dosage.

Drainage Area
The area of land that drains water, sediment, pollutants, and dissolved materials to a common outlet.

Effluent
Any discharge of water by a discharger either to the receiving water or beyond the property boundary controlled by the discharger.

Effluent Limitation
Any numeric or narrative restriction imposed on quantities, discharge rates, and concentrations of pollutants which are discharged from point sources into waters of the United States, the waters of the contiguous zone, or the ocean.

Erosion
The process, by which soil particles are detached and transported by the actions of wind, water, or gravity.

Erosion Control BMPs
Vegetation, such as grasses and wildflowers, and other materials, such as straw, fiber, stabilizing emulsion, protective blankets, etc., placed to stabilize areas of disturbed soils, reduce loss of soil due to the action of water or wind, and prevent water pollution.

Field Measurements
Testing procedures performed in the field with portable field-testing kits or meters.

Final Stabilization
All soil disturbing activities at each individual parcel within the site have been completed in a manner consistent with the requirements in this General Permit.

First Order Stream
Stream with no tributaries.

Flocculants
Substances that interact with suspended particles and bind them together to form flocs.

Good Housekeeping BMPs
BMPs designed to reduce or eliminate the addition of pollutants to construction site runoff through analysis of pollutant sources, implementation of proper handling/disposal practices, employee education, and other actions.

Grading Phase (part of the Grading and Land Development Phase)
Includes reconfiguring the topography and slope including; alluvium removals; canyon cleanouts; rock undercuts; keyway excavations; land form grading; and stockpiling of select material for capping operations.

Hydromodification
Hydromodification is the alteration of the hydrologic characteristics of coastal and non-coastal waters, which in turn could cause degradation of water resources. Hydromodification can cause excessive erosion and/or sedimentation rates, causing excessive turbidity, channel aggradation and/or degradation.

Identified Organisms
Organisms within a sub-sample that is specifically identified and counted.

Inactive Areas of Construction
Areas of construction activity that are not active and those that have been active and are not scheduled to be re-disturbed for at least 14 days.

Index Period
The period of time during which bioassessment samples must be collected to produce results suitable for assessing the biological integrity of streams and rivers. Instream communities naturally vary over the course of a year,and sampling during the index period ensures that samples are collected during a time frame when communities are stable so that year-to-year consistency is obtained. The index period approach provides a cost-effective alternative to year-round sampling. Furthermore, sampling within the appropriate index period will yield results that are comparable to the assessment thresholds or criteria for a given region, which are established for the same index period. Because index

periods differ for different parts of the state, it is essential to know the index period for your area.

K Factor
The soil erodibility factor used in the Revised Universal Soil Loss Equation (RUSLE). It represents the combination of detachability of the soil, runoff potential of the soil, and the transportability of the sediment eroded from the soil.

Legally Responsible Person
The person who possesses the title of the land or the leasehold interest of a mineral estate upon which the construction activities will occur for the regulated site. For linear underground/overhead projects, it is in the person in charge of the utility company, municipality, or other public or private company or agency that owns or operates the LUP.

Likely Precipitation Event
Any weather pattern that is forecasted to have a 50% or greater chance of producing precipitation in the project area. The discharger shall obtain likely 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).

Maximum Allowable Threshold Concentration (MATC)
The allowable concentration of residual, or dissolved, coagulant/flocculant in effluent. The MATC shall be coagulant/flocculant-specific, and based on toxicity testing conducted by an independent, third-party laboratory. A typical MATC would be:

The MATC is equal to the geometric mean of the NOEC (No Observed Effect Concentration) and LOEC (Lowest Observed Effect Concentration) Acute and Chronic toxicity results for most sensitive species determined for the specific coagulant. The most sensitive species test shall be used to determine the MATC.

Natural Channel Evolution
The physical trend in channel adjustments following a disturbance that causes the river to have more energy and degrade or aggrade more sediment. Channels have been observed to pass through 5 to 9 evolution types. Once they pass though the suite of evolution stages, they will rest in a new state of equilibrium.

Non-Storm Water Discharges
Discharges are discharges that do not originate from precipitation events. They can include, but are not limited to, discharges of process water, air conditioner condensate, non-contact cooling water, vehicle wash water, sanitary wastes, concrete washout water, paint wash water, irrigation water, or pipe testing water.

Non-Visible Pollutants

Pollutants associated with a specific site or activity that can have a negative impact on water quality, but cannot be seen though observation (ex: chlorine). Such pollutants being discharged are not authorized.

Numeric Action Level (NAL)
Level is used as a warning to evaluate if best management practices are effective and take necessary corrective actions. Not an effluent limit.

Original Sample Material
The material (i.e., macroinvertebrates, organic material, gravel, etc.) remaining after the subsample has been removed for identification.

pH
Unit universally used to express the intensity of the acid or alkaline condition of a water sample. The pH of natural waters tends to range between 6 and 9, with neutral being 7. Extremes of pH can have deleterious effects on aquatic systems.

Post-Construction BMPs
Structural and non-structural controls which detain, retain, or filter the release of pollutants to receiving waters after final stabilization is attained.

Preliminary Phase (Pre-Construction Phase - Part of the Grading and Land Development Phase)
Construction stage including rough grading and/or disking, clearing and grubbing operations, or any soil disturbance prior to mass grading.

Project

Qualified SWPPP Developer
Individual who is authorized to develop and revise SWPPPs.

Qualified SWPPP Practitioner
Individual assigned responsibility for non-storm water and storm water visual observations, sampling and analysis, and responsibility to ensure full compliance with the permit and implementation of all elements of the SWPPP, including the preparation of the annual compliance evaluation and the elimination of all unauthorized discharges.

Qualifying Rain Event
Any event that produces 0.5 inches or more precipitation with a 48 hour or greater period between rain events.

R Factor
Erosivity factor used in the Revised Universal Soil Loss Equation (RUSLE). The R factor represents the erosivity of the climate at a particular location. An

average annual value of R is determined from historical weather records using erosivity values determined for individual storms. The erosivity of an individual storm is computed as the product of the storm's total energy, which is closely related to storm amount, and the storm's maximum 30-minute intensity.

Rain Event Action Plan (REAP)
Written document, specific for each rain event, that when implemented is designed to protect all exposed portions of the site within 48 hours of any likely precipitation event.

Remaining Sub sampled Material
The material (e.g., organic material, gravel, etc.) that remains after the organisms to be identified have been removed from the subsample for identification. (Generally, no macroinvertebrates are present in the remaining subsampled material, but the sample needs to be checked and verified using a complete Quality Assurance (QA) plan)

Routine Maintenance
Activities intended to maintain the original line and grade, hydraulic capacity, or original purpose of a facility.

Runoff Control BMPs
Measures used to divert runon from offsite and runoff within the site.

Run-on
Discharges that originate offsite and flow onto the property of a separate project site.

Revised Universal Soil Loss Equation (RUSLE)
Empirical model that calculates average annual soil loss as a function of rainfall and runoff erosivity, soil erodibility, topography, erosion controls, and sediment controls.

Sampling and Analysis Plan
Document that describes how the samples will be collected, under what conditions, where and when the samples will be collected, what the sample will be tested for, what test methods and detection limits will be used, and what methods/procedures will be maintained to ensure the integrity of the sample during collection, storage, shipping and testing (i.e., quality assurance/quality control protocols).

Sediment
Solid particulate matter, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth's surface either above or below sea level.

Sedimentation
Process of deposition of suspended matter carried by water, wastewater, or other liquids, by gravity. It is usually accomplished by reducing the velocity of the liquid below the point at which it can transport the suspended material.

Sediment Control BMPs
Practices that trap soil particles after they have been eroded by rain, flowing water, or wind. They include those practices that intercept and slow or detain the flow of storm water to allow sediment to settle and be trapped (e.g., silt fence, sediment basin, fiber rolls, etc.).

Settleable Solids (SS)
Solid material that can be settled within a water column during a specified time frame. It is typically tested by placing a water sample into an Imhoff settling cone and then allowing the solids to settle by gravity for a given length of time. Results are reported either as a volume (mL/L) or a mass (mg/L) concentration.

Sheet Flow
Flow of water that occurs overland in areas where there are no defined channels where the water spreads out over a large area at a uniform depth.

Site

Soil Amendment
Any material that is added to the soil to change its chemical properties, engineering properties, or erosion resistance that could become mobilized by storm water.

Streets and Utilities Phase
Construction stage including excavation and street paving, lot grading, curbs, gutters and sidewalks, public utilities, public water facilities including fire hydrants, public sanitary sewer systems, storm sewer system and/or other drainage improvements.

Structural Controls
Any structural facility designed and constructed to mitigate the adverse impacts of storm water and urban runoff pollution

Suspended Sediment Concentration (SSC)
The measure of the concentration of suspended solid material in a water sample by measuring the dry weight of all of the solid material from a known volume of a collected water sample. Results are reported in mg/L.

Total Suspended Solids (TSS)
The measure of the suspended solids in a water sample includes inorganic substances, such as soil particles and organic substances, such as algae,

aquatic plant/animal waste, particles related to industrial/sewage waste, etc. The TSS test measures the concentration of suspended solids in water by measuring the dry weight of a solid material contained in a known volume of a sub-sample of a collected water sample. Results are reported in mg/L.

Toxicity
The adverse response(s) of organisms to chemicals or physical agents ranging from mortality to physiological responses such as impaired reproduction or growth anomalies.

Turbidity
The cloudiness of water quantified by the degree to which light traveling through a water column is scattered by the suspended organic and inorganic particles it contains. The turbidity test is reported in Nephelometric Turbidity Units (NTU) or Jackson Turbidity Units (JTU).

Vertical Construction Phase
The Build out of structures from foundations to roofing, including rough landscaping.

Waters of the United States
Generally refers to surface waters, as defined by the federal Environmental Protection Agency in 40 C.F.R. § 122.2.[1]

Water Quality Objectives (WQO)
Water quality objectives are defined in the California Water Code as limits or levels of water quality constituents or characteristics, which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area.

[1] The application of the definition of "waters of the United States" may be difficult to determine; there are currently several judicial decisions that create some confusion. If a landowner is unsure whether the discharge must be covered by this General Permit, the landowner may wish to seek legal advice.

APPENDIX 6:
Acronym List

ASBS	Areas of Special Biological Significance
ASTM	American Society of Testing and Materials; Standard Test Method for Particle-Size Analysis of Soils
ATS	Active Treatment System
BASMAA	Bay Area Storm water Management Agencies Association
BAT	Best Available Technology Economically Achievable
BCT	Best Conventional Pollutant Control Technology
BMP	Best Management Practices
BOD	Biochemical Oxygen Demand
BPJ	Best Professional Judgment
CAFO	Confined Animal Feeding Operation
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CGP	NPDES General Permit for Storm Water Discharges Associated with Construction Activities
CIWQS	California Integrated Water Quality System
CKD	Cement Kiln Dust
COC	Chain of Custody
CPESC	Certified Professional in Erosion and Sediment Control
CPSWQ	Certified Professional in Storm Water Quality
CSMP	Construction Site Monitoring Program
CTB	Cement Treated Base
CTR	California Toxics Rule
CWA	Clean Water Act
CWC	California Water Code
CWP	Center for Watershed Protection
DADMAC	Diallyldimethyl-ammonium chloride
DDNR	Delaware Department of Natural Resources
DFG	Department of Fish and Game
DHS	Department of Health Services
DWQ	Division of Water Quality
EC	Electrical Conductivity
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency
ESA	Environmentally Sensitive Area
ESC	Erosion and Sediment Control
HSPF	Hydrologic Simulation Program Fortran
JTU	Jackson Turbidity Units
LID	Low Impact Development
LOEC	Lowest Observed Effect Concentration
LRP	Legally Responsible Person
LUP	Linear Underground/Overhead Projects

MATC	Maximum Allowable Threshold Concentration
MDL	Method Detection Limits
MRR	Monitoring and Reporting Requirements
MS4	Municipal Separate Storm Sewer System
MUSLE	Modified Universal Soil Loss Equation
NAL	Numeric Action Level
NEL	Numeric Effluent Limitation
NICET	National Institute for Certification in Engineering Technologies
NOAA	National Oceanic and Atmospheric Administration
NOEC	No Observed Effect Concentration
NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NTR	National Toxics Rule
NTU	Nephelometric Turbidity Units
O&M	Operation and Maintenance
PAC	Polyaluminum chloride
PAM	Polyacrylamide
PASS	Polyaluminum chloride Silica/sulfate
POC	Pollutants of Concern
PoP	Probability of Precipitation
POTW	Publicly Owned Treatment Works
PRDs	Permit Registration Documents
PWS	Planning Watershed
QAMP	Quality Assurance Management Plan
QA/QC	Quality Assurance/Quality Control
REAP	Rain Event Action Plan
Regional Board	Regional Water Quality Control Board
ROWD	Report of Waste Discharge
RUSLE	Revised Universal Soil Loss Equation
RW	Receiving Water
SMARTS	Storm water Multi Application Reporting and Tracking System
SS	Settleable Solids
SSC	Suspended Sediment Concentration
SUSMP	Standard Urban Storm Water Mitigation Plan
SW	Storm Water
SWARM	Storm Water Annual Report Module
SWAMP	Surface Water Ambient Monitoring Program
SWMM	Storm Water Management Model
SWMP	Storm Water Management Program
SWPPP	Storm Water Pollution Prevention Plan
TC	Treatment Control
TDS	Total Dissolved Solids

TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
USACOE	U.S. Army Corps of Engineers
USC	United States Code
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WDID	Waste Discharge Identification Number
WDR	Waste Discharge Requirements
WLA	Waste Load Allocation
WET	Whole Effluent Toxicity
WRCC	Western Regional Climate Center
WQBEL	Water Quality Based Effluent Limitation
WQO	Water Quality Objective
WQS	Water Quality Standard

APPENDIX 7:
State and Regional Water Resources Control Board Contacts

NORTH COAST REGION (1)
5550 Skylane Blvd, Ste. A
Santa Rose, CA 95403
(707) 576-2220 FAX: (707)523-0135

SAN FRANCISCO BAY REGION (2)
1515 Clay Street, Ste. 1400
Oakland, CA 94612
(510) 622-2300 FAX: (510) 622-2640

CENTRAL COAST REGION (3)
895 Aerovista Place, Ste 101
San Luis Obispo, CA 93401
(805) 549-3147 FAX: (805) 543-0397

LOS ANGELES REGION (4)
320 W. 4th Street, Ste. 200
Los Angeles, CA 90013
(213) 576-6600 FAX: (213) 576-6640

CENTRAL VALLEY REGION (5S)
11020 Sun Center Dr., #200
Rancho Cordova, CA 95670-6114
(916) 464-3291 FAX: (916) 464-4645

FRESNO BRANCH OFFICE (5F)
1685 E St.
Fresno, CA 93706
(559) 445-5116 FAX: (559) 445-5910

REDDING BRANCH OFFICE (5R)
415 Knollcrest Drive, Ste. 100
Redding, CA 96002
(530) 224-4845 FAX: (530) 224-4857

LAHONTAN REGION (6 SLT)
2501 Lake Tahoe Blvd.
South Lake Tahoe, CA 96150
(530) 542-5400 FAX: (530) 544-2271

VICTORVILLE OFFICE (6V)
14440 Civic Drive, Ste. 200
Victorville, CA 92392-2383
(760) 241-6583 FAX: (760) 241-7308

COLORADO RIVER BASIN REGION (7)
73-720 Fred Waring Dr., Ste. 100
Palm Desert, CA 92260
(760) 346-7491 FAX: (760) 341-6820

SANTA ANA REGION (8)
3737 Main Street, Ste. 500
Riverside, CA 92501-3339
Phone (951) 782-4130 FAX: (951) 781-6288

SAN DIEGO REGION (9)
9174 Sky Park Court, Ste. 100
San Diego, CA 92123-4340
(858) 467-2952 FAX: (858) 571-6972

STATE WATER BOARD
PO Box 1977
Sacramento, CA 95812-1977
stormwater@waterboards.ca.gov

Appendix B
Submitted Permit Registration Documents:
NOI, Risk Assessment (Construction Site Sediment and Receiving Water Risk Determination); Site Map (including vicinity map); Signed Certification Statement.

Submitted Permit Registration Documents included in this Appendix are listed below:

- NOI
- Risk Assessment (Construction Site Sediment and Receiving Water Risk Determination)
- Site Map (including vicinity map)
- Signed Certification Statement.

Appendix C
SWPPP Amendment Log

Amendment Log

Project Name: _____

Any amendments shall be documented in a letter format and kept with the site copy of the SWPPP. Include figures as needed. See Section 1-4 for further details. Amendments must be signed by the QSD.

Amendment Number	Date	Description
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

SWPPP Amendment No._____

Project Name: _____

To Be Completed by QSD

'I certify under a penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.'

QSD's Signature	Date
QSD's Name and Title	QSD's Telephone Number

Appendix D
Submitted Changes to PRDS
(due to change in ownership or acreage)

Submitted Permit Registration Documents

Include the following Permit Registration Documents that were submitted to the SMARTS System:

- NOI
- Risk Assessment (Construction Site Sediment and Receiving Water Risk Determination)
- Site Map (including vicinity map)
- Signed Certification Statement

Appendix E
Preliminary Stormwater Management Design

BLACK & VEATCH

Calculation Record

Client Name: Radback Energy Page 1 of 26

Project Name: Tenaska Project No.: 163994

Calculation Title: IMP Sizing for Laydown Area

Calculation No./File No.: 52.5406.1001

Calculation Is: (check all that apply) ☐ Preliminary ☒ Final ☐ Nuclear Safety-Related

Objective To determine the minimum required size of bioswale to satisfy Stormwater C.3 requirements for treatment and flow control for the construction laydown area for the proposed Tenaska Project.

Unverified Assumptions Requiring Subsequent Verification

No.	Assumption	Verified By	Date

See Page 2 of this calculation for additional assumptions.

This Section Used for Computer Generated Calculations

Program Name/Number: Version:

Evidence of or reference to computer program verification, if applicable:

Bases or reference thereto supporting application of the computer program to the physical problem:

Review and Approval

Rev	Prepared By	Date	Verified By	Date	Approved By	Date
0	J Zhong Jimmy Zhong	March 25, 2009	PL Nelson PL Nelson	31 MAR 09	PL Nelson	31 MAR 09

Purpose

To determine the minimum required size of bioswale to satisfy Stormwater C.3 requirements for treatment and flow control for the construction laydown area for the proposed Tenaska Project.

References

1. Black & Veatch Drawing:
   - 163994-SS-3002, Rev. A, "Grading & Drainage - Site Plan - Sheet 2"
   - 163994-SS-3202, Rev. A, "Surfacing/Fencing/Roadway - Site Plan - Sheet 2"
2. Contra Costa Clean Water Program; Stormwater C.3 Guidebook; Stormwater Quality Requirements for Development Applications; Fourth Edition; September 10, 2008.
3. Contra Costa County Public Works Department; Mean Seasonal Isohyets Compiled from Precipitation Records 1879-1973; Drawing No. B-166; December 1977.
4. US Department of Agriculture, Natural Resources Conservation Service; Web Soil Survey; http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.
5. US Department of Agriculture; Urban Hydrology for Small Watersheds, 2nd Edition; Technical Release 55 (TR-55); June 1986.
6. Email Communications between Black & Veatch and Contra Costa Clean Water Program; March 2009.

Definition of Units and Constants

English units will be used.

Example of Common Unit Designations:

Rainfall amount in inches (in)

Drainage area in acres (ac)

Attachments

1. Black & Veatch Drawings SS-3002 and SS-3202
2. Reference 2 – Select Pages
3. Reference 3 – Drawing No. B-166
4. Reference 4 – Select Pages
5. Reference 5 – Select Pages
6. Email Communications

Summary

Based on the Stormwater C.3 requirements, the required bioswale surface area is 9,638 ft^2; the required bioswale volume is 7,986 ft^3 for the construction laydown area.

The design bioswale has a length of 1154 feet. The bioswale cross section will be trapezoidal with a bottom width of 2 feet and a side slope of 3 (h) to 1 (v). The proposed depth of the bioswale is 2 feet. The design free board is 6 inches which gives an effective depth of 1.5 feet.

The design bioswale in the construction laydown area has sufficient surface area (12,694 ft^2) and volume (11,252 ft^3) to satisfy the Stormwater C.3 requirements.

Construction Laydown Area

Most of the construction laydown area is covered by bare soil with little vegetation. The northeast portion of this area is covered by existing asphalt pavement. See B&V Drawing SS-3002.

The existing asphalt area will not be graded and will remain "as is". From the topography, this asphalt area slopes downward towards the north. Consequently rainfall on the asphalt pavement will flow offsite and will not enter the bioswale. Therefore, stormwater from the existing asphalt pavement area will not be included in the sizing calculations for the bioswale.

Only the bare soil area will be graded during construction. See B&V Drawing SS-3002. A gravel loop road will be built over the bare soil area. A bioswale will be constructed at the center of the bare soil area to collect and infiltrate stormwater. The bare soil area is graded in such a pattern that stormwater will flow towards the center of this area and be collected in the bioswale. The gravel road will be installed in a trench so that its surface will be even with its adjacent ground surface. In this way, stormwater will be able to flow over the gravel road and be collected in the bioswale. At the east end of the bioswale, a pump station will be installed so that if the storm water in the bioswale exceeds its volume capacity, the excess water will be pumped out to a location offsite.

Two drainage management areas (DMA) were identified based on the type of their ground covers: (1) Bare Soil; and (2) Gravel Road. See B&V Drawing SS-3202. The measured areas are:

DMA-1	Bare Soil	547,461 ft^2
DMA-2	Gravel Road	72,205 ft^2

The above measurements were made by using AutoCAD.

NRCS Soil Group

Based on the soil survey information from the US Department of Agriculture Natural Resources Conservation Service (NRCS), the project site in Contra Costa County, California is covered by "Delhi Sand". See Attachment 4. From the description of "Delhi Sand" by NRCS, this soil layer is "somewhat excessively drained"; the capacity of the most limiting layer to transmit water is "high to very high (5.95 to 19.98 in/hr)". See Attachment 5. Per Ref. 5, this type of soil can be classified as Hydrologic Soil Group A soil.

Runoff Coefficients

Dense-graded aggregate (Caltran Class 2 aggregate) will be utilized to build the gravel road. After being compacted, the dense-graded aggregate is estimated to have a runoff coefficient of 0.5 to 0.7. See communications with Contra Costa County Clean Water Program (Attachment 6). Use 0.6 in this calculation.

From Table 4-2 of the Stormwater C.3 Guidebook, the "Landscape, Group A Soil" will have a runoff coefficient of 0.1 for treatment and flow control. Based on engineering experience and judgment, the "Bare soil, Group A Soil" will have a runoff coefficient of approximately 0.2.

Consequently,

$$\sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} = (547{,}461 \text{x} 0.2 + 72{,}205 \text{x} 0.6) = 152{,}815 \text{ ft}^2.$$

IMP Sizing Factors

Since the project site is covered by hydrologic group A soil, the subsurface reservoir volume (V_2) is not needed per Stormwater C.3 Guidebook. From this guidebook, for "treatment and flow control", the IMP sizing factor for the area (A) of bioswale is 0.07. The IMP sizing factor for the surface reservoir volume (V_1) of bioswale is 0.058. (Ref. 2, Table 4-6).

Rain Adjustment Factor

Per the Isohyetal Map by Contra Costa County Public Works, Figure B-166 (Ref. 3), the mean annual precipitation (MAP) at the project site is 12.5 inches. Consequently, for group A soils,

$$\text{Rain Adjustment Factor} = \frac{0.0009 \times (MAP - 20.2) + 0.07}{0.07} \qquad \text{(Ref. 2, Equation 4-3)}$$

$$= \frac{0.0009 \times (12.5 - 20.2) + 0.07}{0.07}$$

$$= 0.901.$$

Minimum Area and Minimum Volume of IMP

Per Ref. 2, Equation 4-7, the required minimum area (A) of the bioswale is:

$$\text{Min. IMP Area A} = \sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} \times \begin{pmatrix} IMP \\ Sizing \\ Factor \end{pmatrix} \times \begin{pmatrix} Rain \\ Adjustment \\ Factor \end{pmatrix}$$

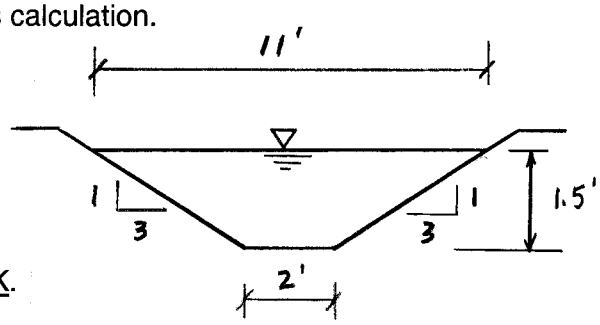
$$= 152{,}815 \text{ x } 0.07 \text{ x } 0.901 = 9{,}638 \text{ ft}^2.$$

The required minimum surface reservoir volume (V_1) of the bioswale is:

$$\text{Min. IMP Volume } (V_1) = \sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} \times \begin{pmatrix} IMP \\ Sizing \\ Factor \end{pmatrix} \times \begin{pmatrix} Rain \\ Adjustment \\ Factor \end{pmatrix}$$

$$= 152{,}815 \text{ x } 0.058 \text{ x } 0.901 = 7{,}986 \text{ ft}^3.$$

The proposed bioswale in the construction laydown area will be 1154 feet long. The bioswale cross section will be trapezoidal. Bottom width = 2 feet. Side slope = 3 (h) to 1 (v). The proposed depth of the bioswale is 2 feet, but the top 6 inches is reserved as free board. Consequently, use 1.5 feet as the bioswale depth in this calculation.



The surface area of the proposed bioswale is:

$11 \text{ x } 1154 = 12{,}694 \text{ ft}^2 > 9{,}638 \text{ ft}^2$, OK.

The volume of the proposed bioswale is:

$\frac{2+11}{2} \text{ x } 1.5 \text{ x } 1154 = 11{,}252 \text{ ft}^3 > 7{,}986 \text{ ft}^3$, OK.

In summary, the proposed size of the bioswale in the construction laydown area is sufficient to meet the Stormwater C.3 requirements.

A spreadsheet was prepared for the above calculations to follow the format by Contra Costa County Clean Water Program. See next page.

BLACK & VEATCH					
OWNER	Radback Energy		COMP'D BY	J. Zhong	
PLANT	Tenaska	Unit No.	DATE	17-Mar-2009	
PROJECT NO.	163994	File No. 52.5406.1001	CKD BY	Plovelan	
TITLE	IMP Sizing for Laydown Area		DATE	31 MAR 09	
			PAGE	7	OF 26

Soil Type	IMP Name
A	Bioswale (1154' long)

DMA Name	DMA Area (ft^2)	Post-Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA-1	547,461	Bare Soil, Group A Soil	0.20	109,492
DMA-2	72,205	Gravel Road	0.60	43,323
			Total:	152,815

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume	
0.070	0.901	9,638	12,694	**IMP Area (ft^2)**
0.058	0.901	7,986	11,252	**V_1 (ft^3)**
NA	0.901	NA	NA	**V_2 (ft^3)**
			Orifice Size:	NA

Radback Tenaska project

project # 163994 File # 52.5406.1001

IMP sizing for Laydown Area

prepared by: Jzhong

Date: 3/24/09

# of pages: 3

Attachment 1

Black & Veatch Dwgs SS-3002

and SS-3202

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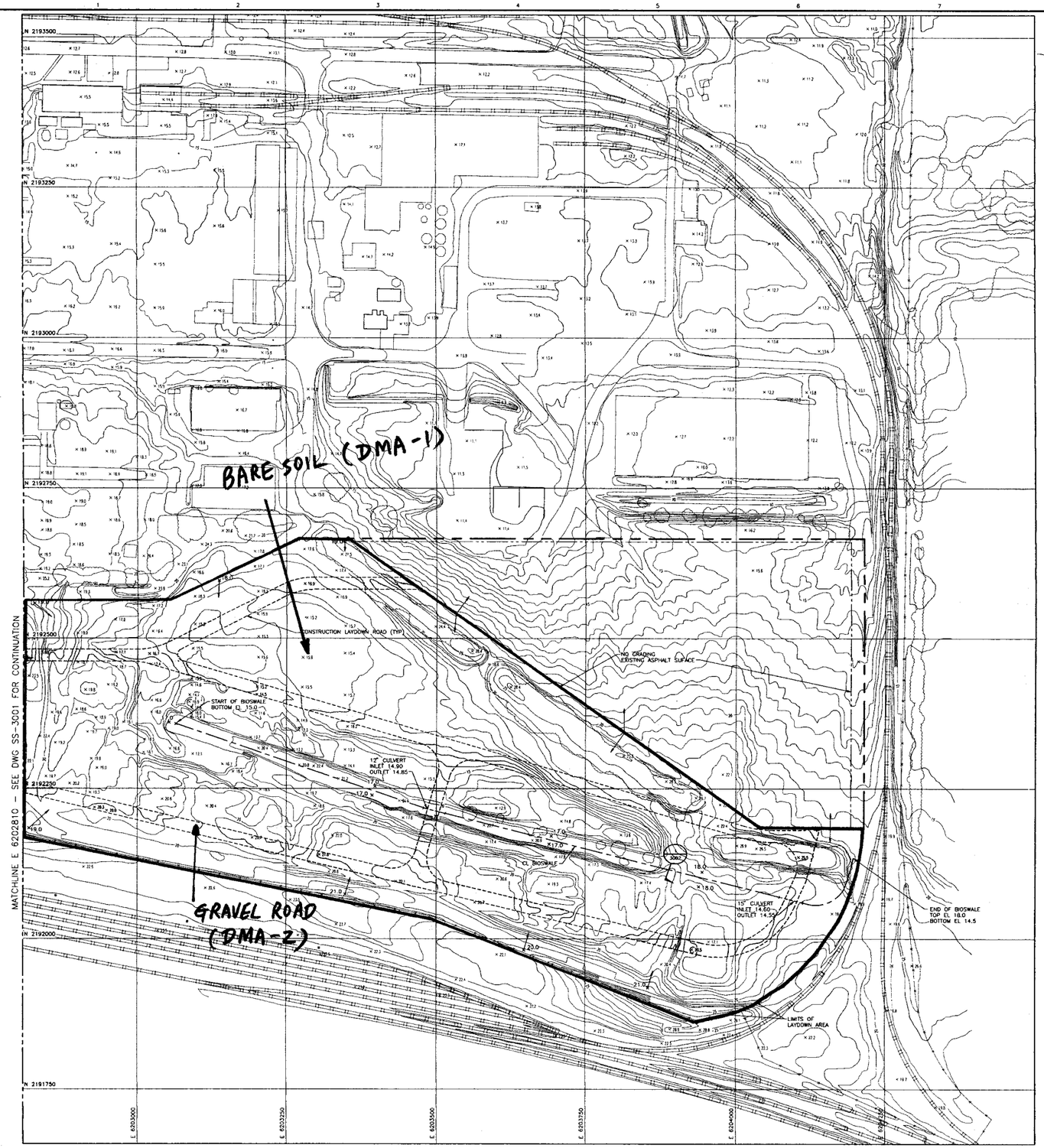

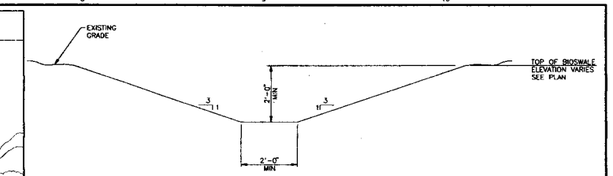

SECTION 1
TYPICAL BIOSWALE
NO SCALE

NOTES

1. SEE DRAWING SS-3001 FOR GENERAL NOTES AND LEGEND.
2. ALL TREES WITHIN LAYDOWN AREA SHALL BE REMOVED.

NOT TO BE USED FOR CONSTRUCTION

THE DISTRIBUTION AND USE OF THE NATIVE FILE FORMAT OF THIS DRAWING OUTSIDE OF BLACK & VEATCH IS UNCONTROLLED AND SHALL BE USED FOR REFERENCE PURPOSES ONLY.

NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
A	20/MAR/09	ISSUED FOR CLIENT REVIEW	NAW	PLN		PLN	DVM

60' 30' 0 60' 120'
1" = 60'

I HEREBY CERTIFY THAT THIS DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CALIFORNIA
SIGNED _____
DATE _____ REG NO. _____

BLACK & VEATCH CORPORATION
ENGINEER PLN DRAWN NAW
CHECKED DATE

CONTRA COSTA GENERATING STATION LLC
CONTRA COSTA COMBINED CYCLE FACILITY

GRADING AND DRAINAGE – SITE PLAN – SHEET 2

PROJECT 163994 DRAWING NUMBER –SS–3002 REV A
CODE
AREA

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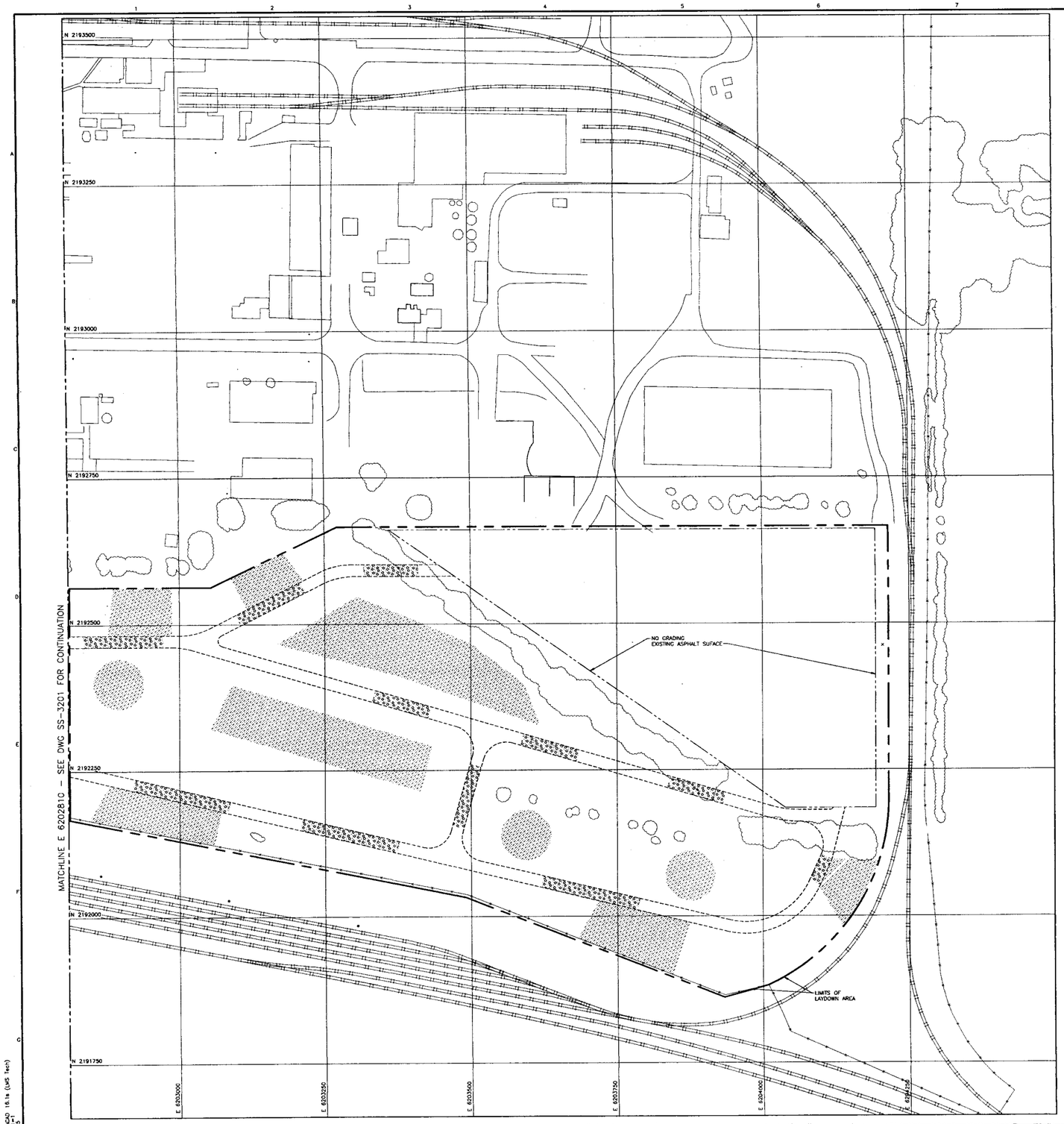
03/20/09 11:18:21

DWG40999 26-MAR-2009 15:27:50



NOTES

1. SEE DRAWING SS-3001 FOR GENERAL NOTES AND LEGEND.

NOT TO BE USED
FOR CONSTRUCTION

NO	DATE	REVISIONS AND RECORD OF ISSUE	DRAWN	DES	CHK	PDL	APP
A	OPEN	ISSUED FOR	NAM	PLN		PLN	DVW

60' 30' 0 60' 120'
1"=60'

I HEREBY CERTIFY THAT THIS DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CALIFORNIA
SIGNED
DATE REG NO.

BLACK & VEATCH CORPORATION
ENGINEER PLN DRAWN NAM
CHECKED DATE

CONTRA COSTA GENERATING STATION LLC
CONTRA COSTA COMBINED CYCLE FACILITY

SURFACING/FENCING/ROADWAY – SITE PLAN – SHEET 2

PROJECT DRAWING NUMBER REV
163994–SS–3202 A
CODE
AREA

ACAD 16.1s (LMS Tech)
SPU37182 1:1
A1PA0079 01-56-00
D0W079 E1-56-00

Radback Tenaska project
project # 163994 File # 52.5406.1001
IMP sizing for Laydown Area

prepared by: JZhong
Date: 3/24/09
# of pages: 5

Attachment 2

Reference 2

select pages

(Runoff factor) x (tributary area) ≤ 2 x (self-retaining area) *Equation 4-1*

For treatment-only sites, and

(Runoff factor) x (tributary area) ≤ 1 x (self-retaining area) *Equation 4-2*

for sites subject to flow-control requirements. Use the runoff factors in Table 4-2.

Prolonged ponding is a potential problem at higher impervious/pervious ratios. In your design, ensure that the pervious area soils can handle the additional run-on and are sufficiently well-drained.

Runoff from self-treating and self-retaining areas does not require any further treatment or flow control.

TABLE 4-2. Runoff factors to be used when sizing IMPs.

Surface	Treatment and Flow Control	Treatment only
Roofs	1.0	1.0
Concrete or Asphalt	1.0	1.0
Pervious Concrete	0.1	0.1
Porous Asphalt	0.1	0.1
Grouted Unit Pavers	1.0	1.0
Solid Unit Pavers	0.5	0.2
Crushed Aggregate	0.1	0.1
Turfblock	0.1	0.1
Landscape, Group A Soil	0.1	0.1
Landscape, Group B Soil	0.3	0.1
Landscape, Group C Soil	0.5	0.1
Landscape, Group D Soil	0.7	0.1

Areas draining to IMPs are used to calculate the required size of the IMP. On most densely developed sites—such as commercial and mixed-use developments and small-lot residential subdivisions—most DMAs will drain to IMPs.

The CCCWP has developed sizing factors (ratios of IMP area to impervious DMA area). For each IMP design, factors are provided for:

TABLE 4-6. Sizing Factors

Treatment and Flow Control	NRCS Soil Group			
IMP	**A**	**B**	**C**	**D**
Bioretention Facility				
A	0.07	0.11	0.06	0.05
V_1	0.058	0.092	0.050	0.042
V_2	N/A	N/A	0.066	0.055
Flow-through Planter				
A	N/A	N/A	0.06	0.05
V_1	N/A	N/A	0.050	0.042
V_2	N/A	N/A	0.066	0.055
Dry Well				
A	0.05	0.06	N/A	N/A
V	0.130	0.204	N/A	N/A
Cistern + bioretention facility				
A (bioretention facility)	*0.04*	*0.04*	*0.04*	*0.04*
V (cistern)	0.193	0.228	0.088	0.060

* Cistern sized for flow control when used in conjunction with a treatment IMP. IMP underdrain required in B, C and D soils.

Treatment Only

Bioretention Facility				
A	*0.04*	*0.04*	*0.04*	*0.04*
Flow-through Planter				
A	*0.04*	*0.04*	*0.04*	*0.04*
Dry Well (treatment only)				
A	0.02	0.04	N/A	N/A
V	0.068	0.136	N/A	N/A

Units Notes:
A = ft^2 of IMP footprint per ft^2 of tributary impervious area (unitless)
V, V_1, V_2 = ft^3 per ft^2 of equivalent tributary impervious area (ft.)

STEP 5: OBTAIN SIZING AND RAIN ADJUSTMENT FACTORS FOR EACH IMP

For each of the IMPs, obtain the appropriate **area** sizing factor from Table 4-6.

Sizing factors for treatment-only IMPs (in *italics*) do not require any adjustment for differing rainfall patterns.

Both area (A) and volume (V_1, V_2) sizing factors for treatment-plus-flow-control IMPs, however, must be adjusted to account for the effects of differing rainfall patterns on pre-project and post-project runoff.

Use the equations below to compute the rainfall adjustment:

Equation 4-3

$$\text{For Group A soils, } Rain\ Adjustment = \frac{0.0009 \times \left(MAP_{project\ site} - 20.2\right) + 0.07}{0.07}$$

Equation 4-4

$$\text{For Group B soils, } Rain\ Adjustment = \frac{-0.0005 \times \left(MAP_{project\ site} - 20.2\right) + 0.11}{0.11}$$

Equation 4-5

$$\text{For Group C soils, } Rain\ Adjustment = \frac{-0.0022 \times \left(MAP_{project\ site} - 20.2\right) + 0.06}{0.06}$$

Equation 4-6

$$\text{For Group D soils, } Rain\ Adjustment = \frac{-0.0022 \times \left(MAP_{project\ site} - 20.2\right) + 0.05}{0.05}$$

where *MAP* is the mean annual precipitation at the site as shown on the isohyetal map, Contra Costa County Public Works Figure B-166, available on the CCCWP C.3 web pages.

► STEP 6: CALCULATE MINIMUM AREA AND VOLUME OF EACH IMP

The minimum area and storage volumes of each IMP are found by summing up the contributions of each tributary DMA and multiplying by the adjusted sizing factor for the IMP.

Equation 4-7

$$Min.\ IMP\ Area\ or\ Volume = \sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} \times \begin{pmatrix} IMP \\ Sizing \\ Factor \end{pmatrix} \times \begin{pmatrix} Rain \\ Adjustment \\ Factor \end{pmatrix}$$

Bioretention facilities and flow-through planters have two storage volumes. V_1 is the floodable volume above the soil layer. V_2 is the storage volume below the soil layer, calculated by multiplying the volume of gravel by an assumed porosity of 0.4. See Figure 4-6. Note these volumes can be configured in a variety of practical combinations of depth and area to best fit into your landscape design.

Cisterns and dry wells have a single storage volume (V).

V is calculated using Equation 4-8:

Equation 4-8

$$Min.V = \sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} \times \begin{pmatrix} IMP\,Volume \\ Sizing \\ Factor \end{pmatrix} \times \begin{pmatrix} Rain \\ Adjustment \\ Factor \end{pmatrix}$$

Use the format of Table 4-7 to present the calculations of the required minimum area and volumes of the receiving IMP:

TABLE 4-7. Format for presenting calculations of minimum IMP Areas and Volumes

DMA Name	*DMA Area (square feet)*	*Post-project surface type*	*DMA Runoff factor*	*DMA Area × runoff factor*	*Soil Type:*	*IMP Name*			
					IMP Sizing factor	*Rain Adjust-ment Factor*	*Minimum Area or Volume*	*Proposed Area or Volume*	
			Total						***IMP Area***
									V or V1
									V2
								Orifice Size:	

► STEP 7: DETERMINE IF IMP AREA AND VOLUME ARE ADEQUATE

Sizing and configuring IMPs may be an iterative process. After computing the minimum IMP area using Steps 1–6, review the site plan to determine if the reserved IMP area is sufficient. If so, the planned IMPs will meet the Provision C.3 sizing requirements. If not, revise the plan accordingly. Revisions may include:

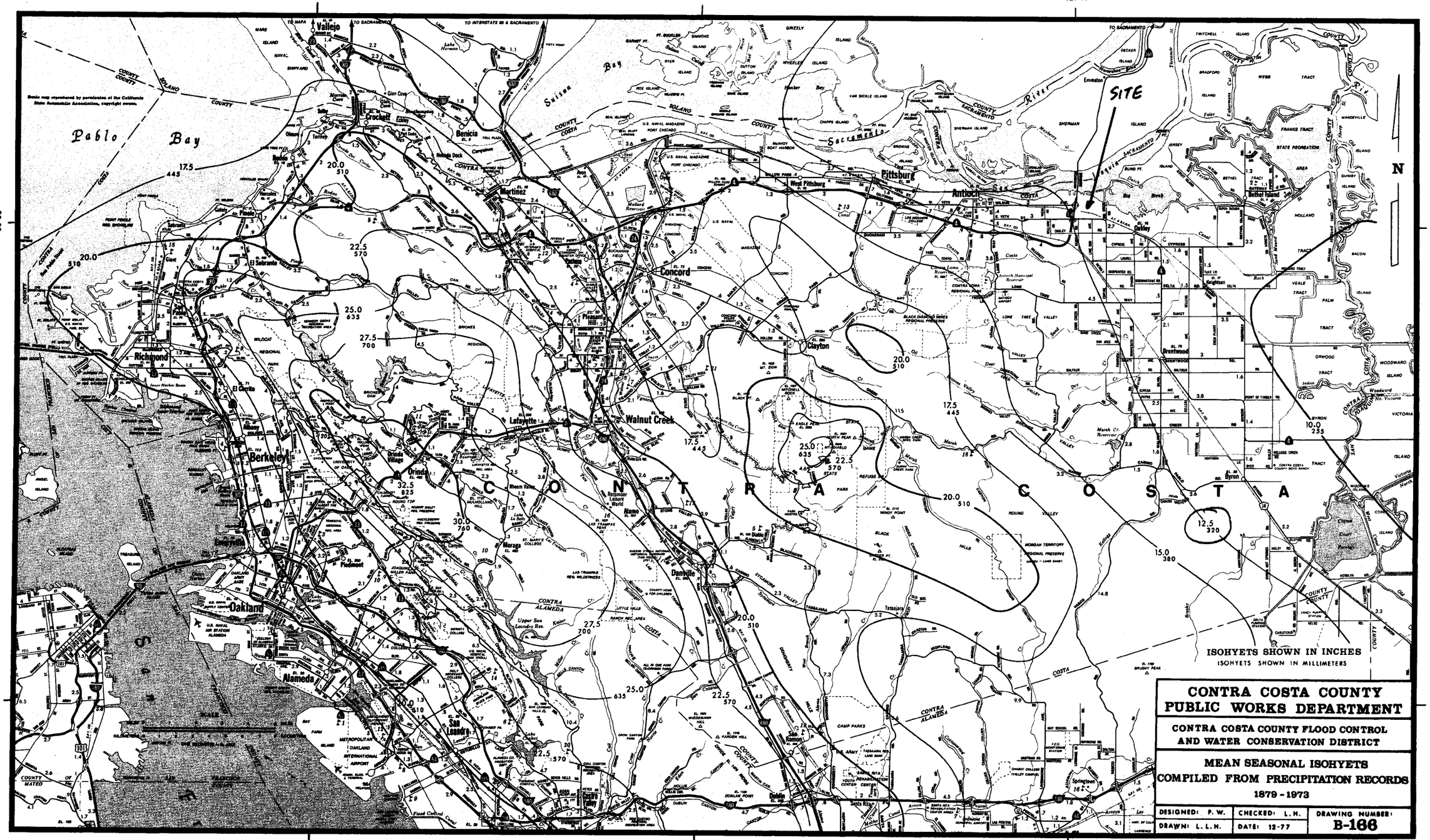
Radback Tenaska project
project # 163994 File # 52.5406.1001
IMP Sizing for Laydown Area

prepared by: JZhong
Date: 3/24/09
# of pages: 2

Attachment 3

Reference 3

Drawing No. B-166


122°15′
122°00′
121°45′
38°00′
37°45′
Pablo Bay
Suisun Bay
Sacramento River
SITE
N
C O N T R A C O S T A
ISOHYETS SHOWN IN INCHES
ISOHYETS SHOWN IN MILLIMETERS
Vallejo
Benicia
Martinez
Pittsburg
Antioch
Concord
Pleasant Hill
Walnut Creek
Richmond
Berkeley
Oakland
Alameda
San Leandro
Hayward
Fremont
Lafayette
Orinda
Moraga
Danville
San Ramon
Dublin
Livermore
Pleasanton
Clayton
Brentwood
Oakley
Byron
Bethel Island
Knightsen
Emmaton
Crockett
Rodeo
Pinole
El Sobrante
El Cerrito
Albany
Piedmont
Sunol
Springtown
CONTRA COSTA COUNTY PUBLIC WORKS DEPARTMENT
CONTRA COSTA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
MEAN SEASONAL ISOHYETS
COMPILED FROM PRECIPITATION RECORDS
1879 - 1973
DESIGNED: P. W.
CHECKED: L. H.
DRAWING NUMBER:
B-166
DRAWN: L. L. H.
DATE: 12-77

Radback Tenaska project

project # 163994 File # 52.5406.1001

IMP sizing for Laydown Area

prepared by: JZhang

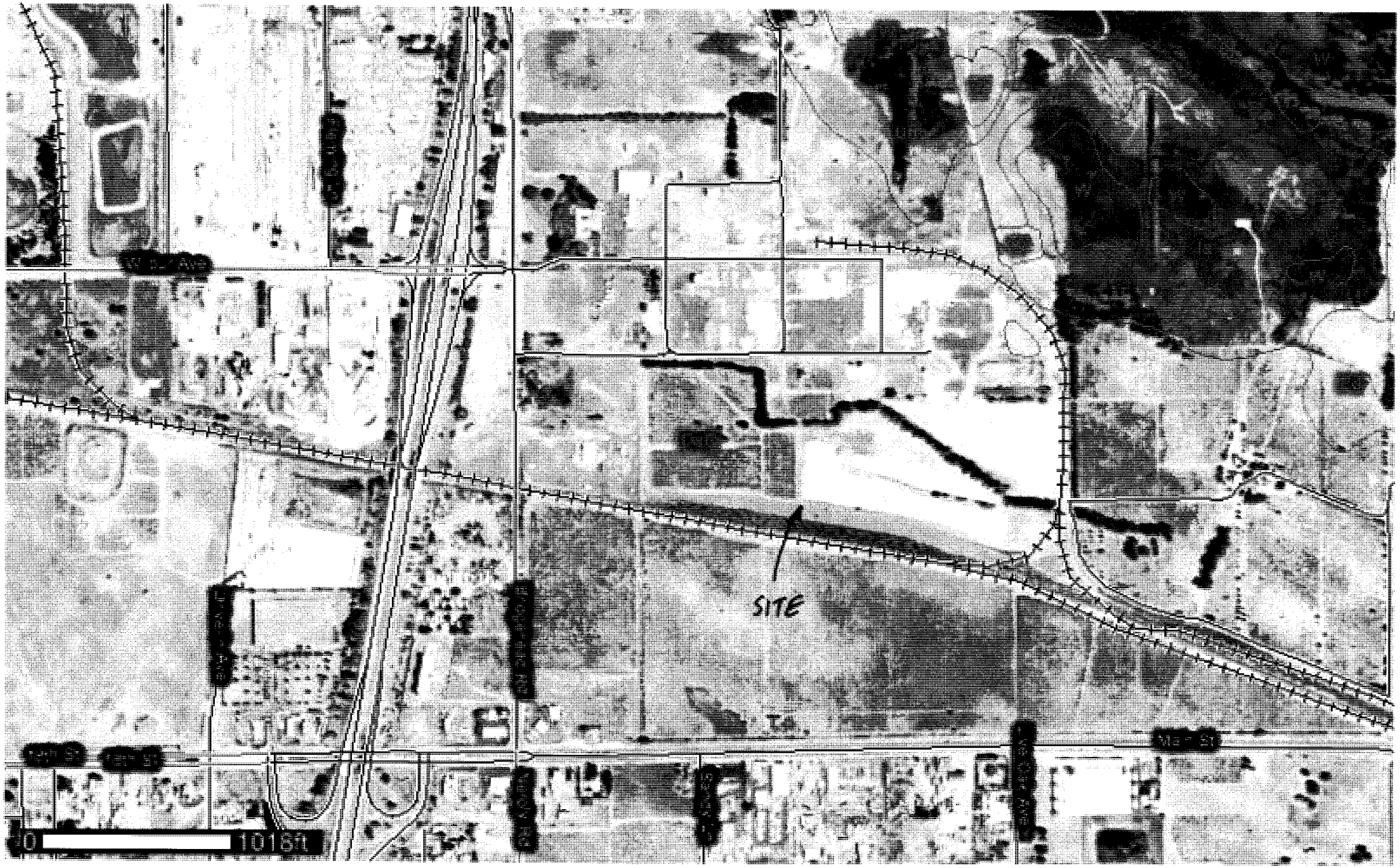
Date: 3/24/09

# of pages: 4

Attachment 4

Reference 4

select pages


SITE
0
100 ft

Contra Costa County, California

DaC—DELHI SAND, 2 TO 9 PERCENT SLOPES

Map Unit Setting

Elevation: 10 to 150 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 59 degrees F
Frost-free period: 260 to 300 days

Map Unit Composition

Delhi and similar soils: 85 percent
Minor components: 15 percent

Description of Delhi

Setting

Landform: Flood plains, terraces, alluvial fans
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits derived from igneous and sedimentary rock

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability (nonirrigated): 6e

Typical profile

0 to 5 inches: Sand
5 to 60 inches: Sand

Minor Components

Unnamed

Percent of map unit: 12 percent

Laugenour
Percent of map unit: 3 percent

Data Source Information

Soil Survey Area: Contra Costa County, California
Survey Area Data: Version 8, Jul 22, 2008

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prepared by: JZhong

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Attachment 5

Reference 5

select page

Appendix A Hydrologic Soil Groups

Soils are classified into hydrologic soil groups (HSG's) to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting. The HSG's, which are A, B, C, and D, are one element used in determining runoff curve numbers (see chapter 2). For the convenience of TR-55 users, exhibit A-1 lists the HSG classification of United States soils.

The infiltration rate is the rate at which water enters the soil at the soil surface. It is controlled by surface conditions. HSG also indicates the transmission rate—the rate at which the water moves within the soil. This rate is controlled by the soil profile. Approximate numerical ranges for transmission rates shown in the HSG definitions were first published by Musgrave (USDA 1955). The four groups are defined by SCS soil scientists as follows:

Group A soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sand or gravel and have a high rate of water transmission (greater than 0.30 in/hr).

Group B soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (0.15-0.30 in/hr).

Group C soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission (0.05-0.15 in/hr).

Group D soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission (0-0.05 in/hr).

In exhibit A-1, some of the listed soils have an added modifier; for example, "Abrazo, gravelly." This refers to a gravelly phase of the Abrazo series that is found in SCS soil map legends.

Disturbed soil profiles

As a result of urbanization, the soil profile may be considerably altered and the listed group classification may no longer apply. In these circumstances, use the following to determine HSG according to the texture of the new surface soil, provided that significant compaction has not occurred (Brakensiek and Rawls 1983).

HSG	*Soil textures*
A	Sand, loamy sand, or sandy loam
B	Silt loam or loam
C	Sandy clay loam
D	Clay loam, silty clay loam, sandy clay, silty clay, or clay

Drainage and group D soils

Some soils in the list are in group D because of a high water table that creates a drainage problem. Once the soils are effectively drained, they are placed in a different group. For example, Ackerman soil is classified as A/D. This indicates that the drained Ackerman soil is in group A and the undrained soil is in group D.

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IMP sizing for Laydown Area

prepared by: Jzhong

Date: 3/24/09

# of pages: 3

Attachment 6

Email communications with contra costa county clean water program

Zhong, Jimmy

From: Dan Cloak [dan@dancloak.com]
Sent: Monday, March 02, 2009 3:54 PM
To: 'Tom Dalziel'; Zhong, Jimmy
Subject: RE: Stormwater C.3 Question

Hi,

It is correct that dense-graded aggregates are not very pervious. Why not use an open-graded aggregate, such as ½ in. crushed rock? Be sure to use a rigid frame around the gravel area.

"Porous Pavements" by Bruce Ferguson is a good reference for porous pavement design.

If dense-graded aggregate is used, I would suggest a runoff coefficient of 0.5 to 0.7, depending on slope.

Dan

From: Tom Dalziel [mailto:tdalz@pw.cccounty.us]
Sent: Monday, March 02, 2009 11:04 AM
To: Zhong, Jimmy; Dan@dancloak.com
Subject: RE: Stormwater C.3 Question

Hi Dan,

Can you review and respond, as appropriate, to Jimmy on my behalf?

Thanks.

Tom Dalziel
Assistant Program Manager
Contra Costa Clean Water Program
tdalz@pw.cccounty.us
Ph. (925) 313-2392, Fax (925) 313-2301

From: Zhong, Jimmy [mailto:ZhongJ@bv.com]
Sent: Wednesday, February 25, 2009 1:11 PM
To: Tom Dalziel
Subject: Stormwater C.3 Question

Tom,

I talked to you and Dan this morning regarding runoff factor for Class 2 aggregates (Caltran Standard Specification Section 26). After our phone call, I had a discussion with my supervisor. He indicated that this type of material is **dense-graded** aggregate which is typically used as pavement base material. After being compacted, this type of material is not that pervious based on his experience. Dense-graded aggregates have much lower porosity than open-graded aggregates after compaction. As such, my supervisor thinks the runoff factor of 0.1 can apply to open-graded aggregate but may not be able to apply to dense-graded aggregate. Would you please forward this email to Dan and ask him again if a runoff factor of 0.1 can still be applied to Class 2 aggregates (compacted)? If not, what kind of runoff factor should be used?

I apologize if I did not communicate clearly this morning on the type of material we are using and for any confusions it caused.

Thanks again for your help.

Jimmy Zhong, P.E.
Geotechnical/Civil Engineer
Energy Division
Black & Veatch Corporation
3550 Green Court, Ann Arbor, MI 48105
P: (734) 622-8533 F: (734) 622-8700

BLACK & VEATCH

Calculation Record

Client Name: Radback Energy Page 1 of 43

Project Name: Tenaska Project No.: 163994

Calculation Title: IMP Sizing for Plant Area

Calculation No./File No.: 52.5406.1002

Calculation Is: (check all that apply) ☐ Preliminary ☒ Final ☐ Nuclear Safety-Related

Objective To determine the minimum required size of bioswales to satisfy Stormwater C.3 requirements for treatment and flow control for the plant area for the proposed Tenaska Project.

Unverified Assumptions Requiring Subsequent Verification

No.	Assumption	Verified By	Date

See Page 2 of this calculation for additional assumptions.

This Section Used for Computer Generated Calculations

Program Name/Number: Version:

Evidence of or reference to computer program verification, if applicable:

Bases or reference thereto supporting application of the computer program to the physical problem:

Review and Approval

Rev	Prepared By	Date	Verified By	Date	Approved By	Date
0	J Zhong Jimmy Zhong	March 31, 2009	PLNelson	15 APR 09	PLNelson	15 APR 09

Purpose

To determine the minimum required size of bioswales to satisfy Stormwater C.3 requirements for treatment and flow control for the plant area for proposed Tenaska Project.

References

1. Black & Veatch Drawing:
   - 163994-SS-3001, Rev. A, "Grading & Drainage - Site Plan - Sheet 1"
   - 163994-SS-3201, Rev. A, "Surfacing/Fencing/Roadway - Site Plan - Sheet 1"
   - 163994-SS-3050, Rev. A, "Site Sections and Details"
   - 163994-SS-1002, Rev. 1, "General Arrangement – Site"
2. Contra Costa Clean Water Program; Stormwater C.3 Guidebook; Stormwater Quality Requirements for Development Applications; Fourth Edition; September 10, 2008.
3. Contra Costa County Public Works Department; Mean Seasonal Isohyets Compiled from Precipitation Records 1879-1973; Drawing No. B-166; December 1977.
4. US Department of Agriculture, Natural Resources Conservation Service; Web Soil Survey; http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.
5. US Department of Agriculture; Urban Hydrology for Small Watersheds, 2nd Edition; Technical Release 55 (TR-55); June 1986.
6. Email Communications between Black & Veatch and Contra Costa Clean Water Program; March 2009.

Definition of Units and Constants

English units will be used.

Example of Common Unit Designations:

Rainfall amount in inches (in)
Drainage area in acres (ac)

Attachments

1. Black & Veatch Drawings SS1002, SS-3001, SS-3201 and SS-3050
2. Reference 2 – Select Pages
3. Reference 3 – Drawing No. B-166
4. Reference 4 – Select Pages
5. Reference 5 – Select Pages
6. Email Communications

Summary:

Five bioswales will be constructed within the plant area to collect and infiltrate stormwater.
Based on the Stormwater C.3 requirements, the required bioswale surface area and volume for each bioswale are listed in the following table.
The design bioswale length, shape, design surface area and volume are presented in the following table. The design bioswales in the plant area have sufficient surface areas and volume to satisfy the Stormwater C.3 requirements.

IMP ID	Shape	Length (feet)	Side Slope	Bottom Width (feet)	Design Surface Area (ft^2)	Design Volume (ft^3)	Required Surface Area (ft^2)	Required Volume (ft^3)
Bioswale #1	Trapezoidal	390	3 (h) to 1 (v)	2	7,800	12,870	5,406	4,479
Bioswale #2	Trapezoidal	933	3 (h) to 1 (v)	2	18,660	30,789	7,635	6,326
Bioswale #3	Trapezoidal	187	3 (h) to 1 (v)	2	2,618	2,992	740	613
Bioswale #4	Trapezoidal	391	3 (h) to 1 (v)	2	7,820	12,903	7,598	6,296
Bioswale #5	Trapezoidal	465	3 (h) to 1 (v)	2 ft for first 265 ft long section; 8 ft for remaining 200 ft long section	10,305	19,244	10,274	8,512

IMP Sizing for Plant Area

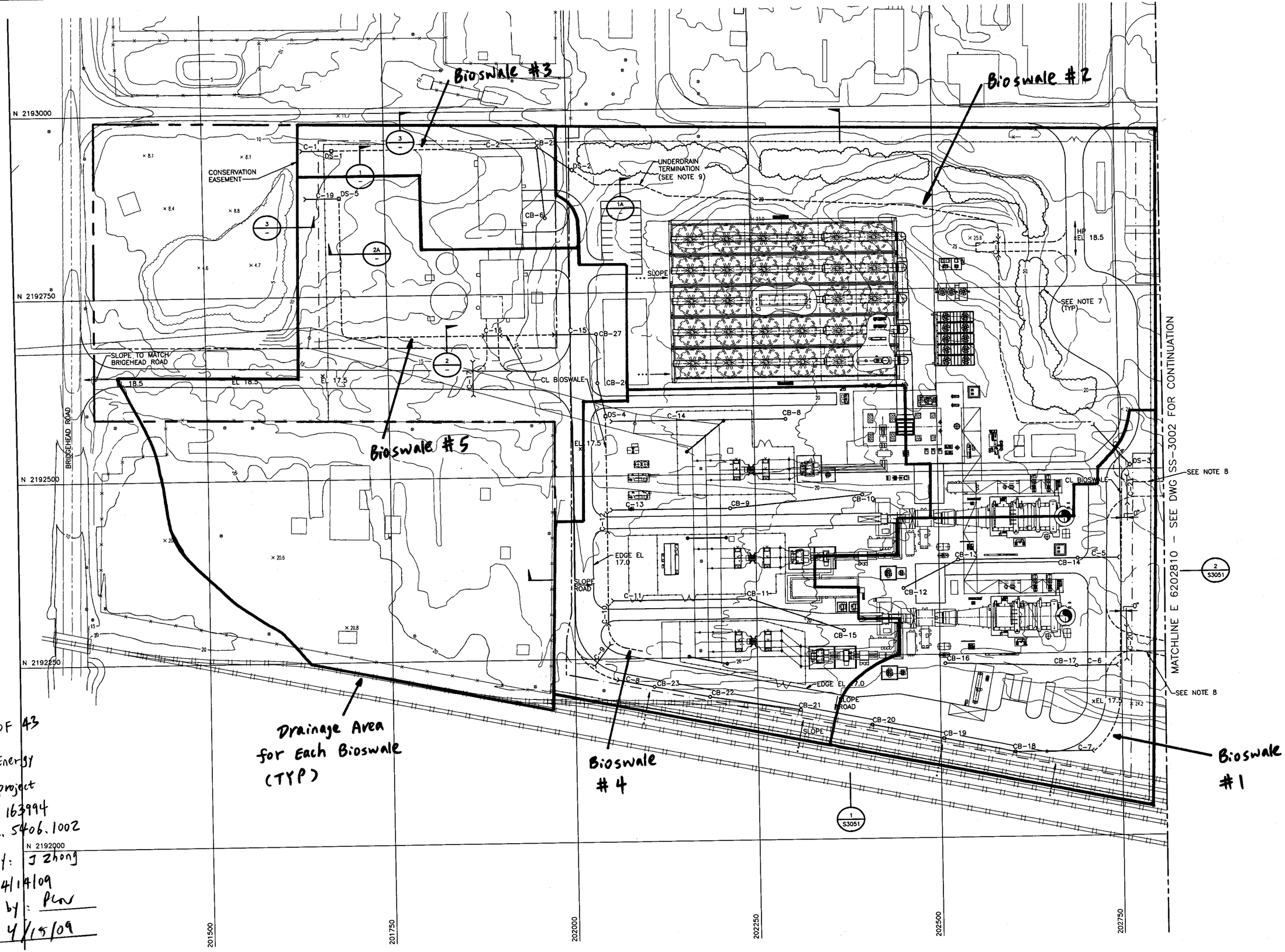
The generation area primarily consists of two combustion turbines, two heat recovery steam generators (HRSG), one air cooled condenser (ACC), three switchyards, one water treatment building, one warehouse building, two water storage tanks, one administration building, and other miscellaneous equipment/facilities. See B&V Drawing SS-1002 for plant general arrangement (Attachment 1). Plant loop road and major equipment access roads will be constructed within the plant. The areas adjacent to the buildings and equipment will have gravel surfacing. Other areas will be covered with vegetated grass. See B&V Drawing SS-3001 for proposed site surfacing of the plant (Attachment 1). The existing trees on this project site will be preserved.

Five bioswales will be constructed within the plant site to collect and infiltrate stormwater. See Page 5 for the locations of bioswales and delineated drainage area for each bioswale. Drop structures will be installed at the end of each bioswale such that sufficient depth (volume) of stormwater has to be collected in the bioswale before downstream discharge can occur.

An existing natural gas distribution facility is located west of the project and is outside the project limits. This area is generally covered by gravel surfacing. From the topography, most of the natural gas facility drains towards the wetland. After constructing the plant access road from Bridgehead Road, this area will continue to drain towards the wetland via a culvert being installed underneath the access road. The natural gas facility will be included in the IMP sizing for bioswale #5 since the stormwater from this area will flow to and accumulate in this bioswale.

NRCS Soil Group

Based on the soil survey information from the US Department of Agriculture Natural Resources Conservation Service (NRCS), the project site in Contra Costa County, California is covered by "Delhi Sand". See Attachment 4. From the description of "Delhi Sand" by NRCS, this soil layer is "somewhat excessively drained"; the capacity of the most limiting layer to transmit water is "high to very high (5.95 to 19.98 in/hr)". Per Ref. 5, this type of soil can be classified as Hydrologic Soil Group A soil.



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Radback Energy
Tenaska project
project # 163994
File # 52.5406.1002
prepared by: J Zhong
Date: 4/14/09
checked by: PLW
Date: 4/15/09

IMP Sizing for Bioswale #1

Refer to Page 5, the total drainage area for bioswale #1 is measured to be: 153,520 ft^2 (3.52 ac). The bioswale #1 is measured to be 390 feet long.

Five drainage management areas (DMA) were identified based on the type of ground covers: (1) Equipment/Roofs; (2) Asphalt Pavement; (3) Gravel Surfacing; (4) Grass/Landscape; and (5) Transformer Containment.

The measured areas are shown in the following table. The measurements were made by using AutoCAD.

DMA Name	Post-Project Surface Type	DMA Area (ft^2)
DMA-1	Equipment/Roofs	20,871
DMA-2	Asphalt Pavement	27,640
DMA-3	Gravel Surfacing	54,230
DMA-4	Grass/Landscape	46,694
DMA-5	Transformer Containment	4,085

Runoff Coefficients

Dense-graded aggregate (Caltran Class 2 aggregate) will be utilized as the materials for aggregate surfacing. After being compacted, the dense-graded aggregate is estimated to have a runoff coefficient of 0.5 to 0.7. See communications with Contra Costa County Clean Water Program (Attachment 6). Use 0.6 in this calculation.

From Table 4-2 of the Stormwater C.3 Guidebook, the "Grass/Landscape" will have a runoff coefficient of 0.1 for Group A Soil for treatment and flow control. The "Equipment/Roofs" and "Asphalt Pavement" will have a runoff coefficient of 1.0. The "Transformer Containment" will have no runoff since all the runoff will go to oil-water separator which discharges to the sanitary sewer and will not be discharged on site.

Consequently,

$$\sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} = (20{,}871\text{x}1.0+27{,}640\text{x}1.0+54{,}230\text{x}0.6+46{,}694\text{x}0.1+4{,}085\text{x}0)$$

$$= 85{,}718\ ft^2.$$

IMP Sizing Factors

Since the project site is covered by hydrologic group A soil, the subsurface reservoir volume (V_2) is not needed per Stormwater C.3 Guidebook. From this guidebook, for "treatment and flow control", the IMP sizing factor for the area (A) of bioswale is 0.07. The IMP sizing factor for the surface reservoir volume (V_1) of bioswale is 0.058. (Ref. 2, Table 4-6).

Rain Adjustment Factor

Per the Isohyetal Map by Contra Costa County Public Works, Figure B-166 (Ref. 3), the mean annual precipitation (MAP) at the project site is 12.5 inches. Consequently, for group A soils,

$$\text{Rain Adjustment Factor} = \frac{0.0009 \times (MAP - 20.2) + 0.07}{0.07} \qquad \text{(Ref. 2, Equation 4-3)}$$

$$= \frac{0.0009 \times (12.5 - 20.2) + 0.07}{0.07}$$

$$= 0.901.$$

Minimum Area and Minimum Volume of IMP

Per Ref. 2, Equation 4-7, the required minimum area (A) of the bioswale is:

$$\text{Min. IMP Area A} = \sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} \times \begin{pmatrix} IMP \\ Sizing \\ Factor \end{pmatrix} \times \begin{pmatrix} Rain \\ Adjustment \\ Factor \end{pmatrix}$$

$$= 85{,}718 \times 0.07 \times 0.901 = 5{,}406 \text{ ft}^2.$$

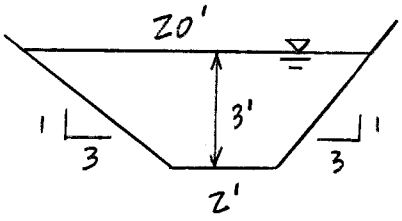
The required minimum surface reservoir volume (V_1) of the bioswale is:

$$\text{Min. IMP Volume } (V_1) = \sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} \times \begin{pmatrix} IMP \\ Sizing \\ Factor \end{pmatrix} \times \begin{pmatrix} Rain \\ Adjustment \\ Factor \end{pmatrix}$$

$$= 85{,}718 \times 0.058 \times 0.901 = 4{,}479 \text{ ft}^3.$$

The proposed bioswale #1 is 390 feet long. The bioswale cross section will be trapezoidal. Bottom width = 2 feet. Side slope = 3 (h) to 1 (v). The bottom of the bioswale is at EL 12.5. Drop structure DS-3 will be installed at the end of bioswale #1. See B&V Drawing SS-3001

(Attachment 1). The top of grate elevation of DS-3 will be at EL 15.5 (see Drawing SS-3050). The effective depth of the bioswale is: 15.5 – 12.5 = 3 feet.



The surface area of bioswale #1 is:

$$20 \times 390 = 7{,}800 \text{ ft}^2 > 5{,}406 \text{ ft}^2, \quad \underline{\text{OK}}.$$

The volume of bioswale #1 is:

$$\frac{2+20}{2} \times 3 \times 390 = 12{,}870 \text{ ft}^3 > 4{,}479 \text{ ft}^3, \quad \underline{\text{OK}}.$$

Conclusion: The proposed size of bioswale #1 is sufficient to meet the Stormwater C.3 requirements.

A spreadsheet was prepared for the above calculations to follow the format by Contra Costa County Clean Water Program. See next page.

BLACK & VEATCH					
OWNER	Radback Energy		COMP'D BY	J. Zhong	
PLANT	Tenaska	Unit No.	DATE	20-Mar-2009	
PROJECT NO.	163994	File No. 52.5406.1002	CKD BY	PLN	
TITLE	IMP Sizing		DATE	4/15/09	
			PAGE	9	OF 43

DMA Name	DMA Area (ft^2)	Post-Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor
DMA-1	20,871	Equipment/Roofs	1.00	20,871
DMA-2	27,640	Asphalt Pavement	1.00	27,640
DMA-3	54,230	Gravel Surfacing	0.60	32,538
DMA-4	46,694	Landscape, Group A Soil	0.10	4,669
DMA-5	4,085	Transformer Containment	0.00	0
			Total:	85,718

Soil Type	IMP Name			
A	Bioswale #1			
IMP Sizing Factor	**Rain Adjustment Factor**	**Minimum Area or Volume**	**Proposed Area or Volume**	
0.070	0.901	5,406	7,800	**IMP Area (ft^2)**
0.058	0.901	4,479	12,870	**V_1 (ft^3)**
NA	0.901	NA	NA	**V_2 (ft^3)**
			Orifice Size:	NA

IMP Sizing for Bioswale #2

Refer to Page 5, the total drainage area for bioswale #2 is measured to be: 337,648 ft^2 (7.75 ac). The bioswale #2 is measured to be 933 feet long.

Six drainage management areas (DMA) were identified based on the type of ground covers: (1) Equipment/Roofs; (2) Asphalt Pavement; (3) Gravel Surfacing; (4) Grass/Landscape; (5) Transformer Containment; and (6) Open Graded Aggregates (ACC Area).

The measured areas are shown in the following table. The measurements were made by using AutoCAD.

DMA Name	Post-Project Surface Type	DMA Area (ft^2)
DMA-1	Equipment/Roofs	34,029
DMA-2	Asphalt Pavement	37,473
DMA-3	Gravel Surfacing	45,970
DMA-4	Grass/Landscape	151,570
DMA-5	Transformer Containment	406
DMA-6	Open Graded Aggregates	68,200

Runoff Coefficients

From Table 4-2 of the Stormwater C.3 Guidebook, the "Grass/Landscape" will have a runoff coefficient of 0.1 for Group A Soil for treatment and flow control. The "Equipment/Roofs" and "Asphalt Pavement" will have a runoff coefficient of 1.0. The "Open Graded Aggregates" will have a runoff coefficient of 0.1. The "Transformer Containment" will have no runoff since all the runoff will go to oil-water separator which discharges to the sanitary sewer and will not be discharged on site.

Use 0.6 for dense-graded aggregate surfacing (see Page 6).

Consequently,

$$\sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} = (34{,}029\text{x}1.0+37{,}473\text{x}1.0+45{,}970\text{x}0.6+151{,}570\text{x}0.1+406\text{x}0+$$

$$68{,}200\text{x}0.1) = 121{,}061\ ft^2.$$

IMP sizing factor = 0.07 for the area (A) of bioswale; IMP sizing factor = 0.058 for the surface reservoir volume (V_1). See Page 7.

Rain adjustment factor = 0.901. See Page 7.

Minimum Area and Minimum Volume of IMP

Per Ref. 2, Equation 4-7, the required minimum area (A) of the bioswale is:

$$\text{Min. IMP Area A} = \sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} \times \begin{pmatrix} IMP \\ Sizing \\ Factor \end{pmatrix} \times \begin{pmatrix} Rain \\ Adjustment \\ Factor \end{pmatrix}$$

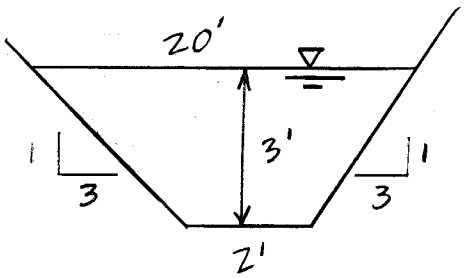
$$= 121{,}061 \times 0.07 \times 0.901 = 7{,}635 \text{ ft}^2.$$

The required minimum surface reservoir volume (V_1) of the bioswale is:

$$\text{Min. IMP Volume } (V_1) = \sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} \times \begin{pmatrix} IMP \\ Sizing \\ Factor \end{pmatrix} \times \begin{pmatrix} Rain \\ Adjustment \\ Factor \end{pmatrix}$$

$$= 121{,}061 \times 0.058 \times 0.901 = 6{,}326 \text{ ft}^3.$$

The proposed bioswale #2 is 933 feet long. The bioswale cross section will be trapezoidal. Bottom width = 2 feet. Side slope = 3 (h) to 1 (v). The bottom of the bioswale is at EL 12.5. Drop structure DS-2 will be installed at the end of bioswale #2. See B&V Drawing SS-3001. The top of grate elevation of DS-2 will be at EL 15.5 (see Drawing SS-3050). The effective depth of the bioswale is: 15.5 – 12.5 = 3 feet.



The surface area of bioswale #2 is:

$20 \times 933 = 18{,}660 \text{ ft}^2 > 7{,}635 \text{ ft}^2$, OK.

The volume of bioswale #2 is:

$\frac{2+20}{2} \times 3 \times 933 = 30{,}789 \text{ ft}^3 > 6{,}326 \text{ ft}^3$, OK.

Conclusion: The proposed size of bioswale #2 is sufficient to meet the Stormwater C.3 requirements.

A spreadsheet was prepared for the above calculations to follow the format by Contra Costa County Clean Water Program. See next page.

BLACK & VEATCH					
OWNER	Radback Energy		COMP'D BY	J. Zhong	
PLANT	Tenaska	Unit No.	DATE	20-Mar-2009	
PROJECT NO.	163994	File No. 52.5406.1002	CKD BY	PLW	
TITLE	IMP Sizing		DATE	4/15/09	
			PAGE	12	OF 43

Soil Type	IMP Name
A	Bioswale #2

DMA Name	DMA Area (ft^2)	Post-Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume	
DMA-1	34,029	Equipment / Roofs	1.00	34,029					
DMA-2	37,473	Asphalt Pavement	1.00	37,473					
DMA-3	45,970	Gravel Surfacing	0.60	27,582					
DMA-4	151,570	Landscape, Group A Soil	0.10	15,157					
DMA-5	406	Transformer Containment	0.00	0					
DMA-6	68,200	Open Graded Aggregates	0.10	6,820					
			Total:	121,061	0.070	0.901	7,635	18,660	IMP Area (ft^2)
					0.058	0.901	6,326	30,789	V_1 (ft^3)
					NA	0.901	NA	NA	V_2 (ft^3)
								Orifice Size:	NA

IMP Sizing for Bioswale #3

Refer to Page 5, the total drainage area for bioswale #3 is measured to be: 40,711 ft^2 (0.93 ac). The bioswale #3 is measured to be 187 feet long.

Three drainage management areas (DMA) were identified based on the type of ground covers: (1) Equipment/Roofs; (2) Asphalt Pavement; and (3) Grass/Landscape.

The measured areas are shown in the following table. The measurements were made by using AutoCAD.

DMA Name	Post-Project Surface Type	DMA Area (ft^2)
DMA-1	Equipment/Roofs	6,423
DMA-2	Asphalt Pavement	2,086
DMA-3	Grass/Landscape	32,202

Runoff Coefficients

From Table 4-2 of the Stormwater C.3 Guidebook, the "Grass/Landscape" will have a runoff coefficient of 0.1 for Group A Soil for treatment and flow control. The "Equipment/Roofs" and "Asphalt Pavement" will have a runoff coefficient of 1.0.

Consequently,

$$\sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} = (6{,}423\text{x}1.0+2{,}086\text{x}1.0+32{,}202\text{x}0.1)$$

$$= 11{,}729\ ft^2.$$

IMP sizing factor = 0.07 for the area (A) of bioswale; IMP sizing factor = 0.058 for the surface reservoir volume (V_1). See Page 7.

Rain adjustment factor = 0.901. See Page 7.

Minimum Area and Minimum Volume of IMP

Per Ref. 2, Equation 4-7, the required minimum area (A) of the bioswale is:

$$\text{Min. IMP Area A} = \sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} \times \begin{pmatrix} IMP \\ Sizing \\ Factor \end{pmatrix} \times \begin{pmatrix} Rain \\ Adjustment \\ Factor \end{pmatrix}$$

$$= 11{,}729 \times 0.07 \times 0.901 = 740 \text{ ft}^2.$$

The required minimum surface reservoir volume (V_1) of the bioswale is:

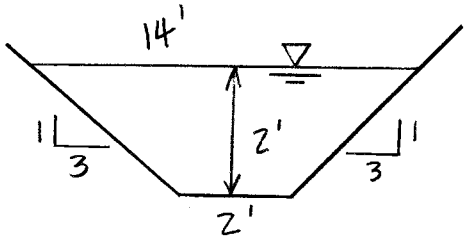
$$\text{Min. IMP Volume } (V_1) = \sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} \times \begin{pmatrix} IMP \\ Sizing \\ Factor \end{pmatrix} \times \begin{pmatrix} Rain \\ Adjustment \\ Factor \end{pmatrix}$$

$$= 11{,}729 \times 0.058 \times 0.901 = 613 \text{ ft}^3.$$

The proposed bioswale #3 is 187 feet long. The bioswale cross section will be trapezoidal. Bottom width = 2 feet. Side slope = 3 (h) to 1 (v). The bottom of the bioswale is at EL 11.0. Drop structure DS-1 will be installed at the end of bioswale #3. See B&V Drawing SS-3001. The top of grate elevation of DS-1 will be at EL 13.0 (see Drawing SS-3050). The effective depth of the bioswale is: 13.0 – 11.0 = 2 feet.

The surface area of bioswale #3 is:

$14 \times 187 = 2{,}618 \text{ ft}^2 > 740 \text{ ft}^2$, <u>OK</u>.



The volume of bioswale #3 is:

$$\frac{2+14}{2} \times 2 \times 187 = 2992 \text{ ft}^3 > 613 \text{ ft}^3, \text{ OK}.$$

A 6" perforated underdrain will be installed in bioswale #3 and a portion of bioswale #2 to discharge stormwater runoff from less intensive storm events to the wetland to allow the wetland to continue to have water. See Dwg SS-3001 (Attachment 1).

<u>Conclusion</u>: The proposed size of bioswale #3 is sufficient to meet the Stormwater C.3 requirements.

A spreadsheet was prepared for the above calculations to follow the format by Contra Costa County Clean Water Program. See next page.

BLACK & VEATCH					
OWNER	Radback Energy		COMP'D BY	J. Zhong	
PLANT	Tenaska	Unit No.	DATE	20-Mar-2009	
PROJECT NO.	163994	File No. 52.5406.1002	CKD BY	PLN	
TITLE	IMP Sizing		DATE	4/15/09	
			PAGE	15	OF 43

Soil Type	IMP Name
A	Bioswale #3

DMA Name	DMA Area (ft^2)	Post-Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume	
DMA-1	6,423	Equipment / Roofs	1.00	6,423					
DMA-2	2,086	Asphalt Pavement	1.00	2,086					
DMA-3	32,202	Landscape, Group A Soil	0.10	3,220					
			Total:	11,729	0.070	0.901	740	2,618	IMP Area (ft^2)
					0.058	0.901	613	2,992	V_1 (ft^3)
					NA	0.901	NA	NA	V_2 (ft^3)
								Orifice Size:	NA

IMP Sizing for Bioswale #4

Refer to Page 5, the total drainage area for bioswale #4 is measured to be: 190,955 ft^2 (4.38 ac). The bioswale #4 is measured to be 391 feet long.

Five drainage management areas (DMA) were identified based on the type of ground covers: (1) Equipment/Roofs; (2) Asphalt Pavement; (3) Gravel Surfacing; (4) Grass/Landscape; and (5) Transformer Containment.

The measured areas are shown in the following table. The measurements were made by using AutoCAD.

DMA Name	Post-Project Surface Type	DMA Area (ft^2)
DMA-1	Equipment/Roofs	19,314
DMA-2	Asphalt Pavement	33,262
DMA-3	Gravel Surfacing	109,208
DMA-4	Grass/Landscape	23,692
DMA-5	Transformer Containment	5,479

Runoff Coefficients

From Table 4-2 of the Stormwater C.3 Guidebook, the "Grass/Landscape" will have a runoff coefficient of 0.1 for Group A Soil for treatment and flow control. The "Equipment/Roofs" and "Asphalt Pavement" will have a runoff coefficient of 1.0. The "Transformer Containment" will have no runoff since all the runoff will go to oil-water separator which discharges to the sanitary sewer and will not be discharged on site.

Use 0.6 for dense-graded aggregate surfacing (see Page 6).

Consequently,

$$\sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} = (19{,}314\text{x}1.0+33{,}262\text{x}1.0+109{,}208\text{x}0.6+23{,}692\text{x}0.1+5{,}479\text{x}0)$$

$$= 120{,}470\ ft^2.$$

IMP sizing factor = 0.07 for the area (A) of bioswale; IMP sizing factor = 0.058 for the surface reservoir volume (V_1). See Page 7.

Rain adjustment factor = 0.901. See Page 7.

Minimum Area and Minimum Volume of IMP

Per Ref. 2, Equation 4-7, the required minimum area (A) of the bioswale is:

$$\text{Min. IMP Area A} = \sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} \times \begin{pmatrix} IMP \\ Sizing \\ Factor \end{pmatrix} \times \begin{pmatrix} Rain \\ Adjustment \\ Factor \end{pmatrix}$$

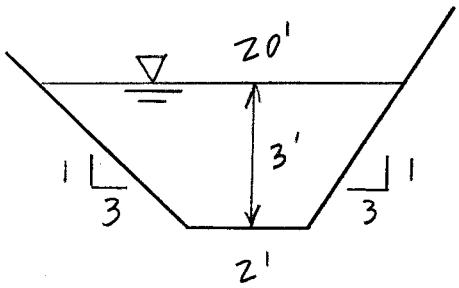
$$= 120{,}470 \text{ x } 0.07 \text{ x } 0.901 = 7{,}598 \text{ ft}^2.$$

The required minimum surface reservoir volume (V_1) of the bioswale is:

$$\text{Min. IMP Volume } (V_1) = \sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} \times \begin{pmatrix} IMP \\ Sizing \\ Factor \end{pmatrix} \times \begin{pmatrix} Rain \\ Adjustment \\ Factor \end{pmatrix}$$

$$= 120{,}470 \text{ x } 0.058 \text{ x } 0.901 = 6{,}296 \text{ ft}^3.$$

The proposed bioswale #4 is 391 feet long. The bioswale cross section will be trapezoidal. Bottom width = 2 feet. Side slope = 3 (h) to 1 (v). The bottom of the bioswale is at EL 12.5. Drop structure DS-4 will be installed at the end of bioswale #4. See B&V Drawing SS-3001. The top of grate elevation of DS-4 will be at EL 15.5 (see Drawing SS-3050). The effective depth of the bioswale is: 15.5 – 12.5 = 3 feet.



The surface area of bioswale #4 is:

20 x 391 = 7,820 ft^2 > 7,598 ft^2, OK.

The volume of bioswale #4 is:

$$\frac{2+20}{2} \text{ x } 3 \text{ x } 391 = 12{,}903 \text{ ft}^3 > 6{,}296 \text{ ft}^3, \text{ OK.}$$

Conclusion: The proposed size of bioswale #4 is sufficient to meet the Stormwater C.3 requirements.

A spreadsheet was prepared for the above calculations to follow the format by Contra Costa County Clean Water Program. See next page.

BLACK & VEATCH					
OWNER	Radback Energy		COMP'D BY	J. Zhong	
PLANT	Tenaska	Unit No.	DATE	20-Mar-2009	
PROJECT NO.	163994	File No. 52.5406.1002	CKD BY	PLN	
TITLE	IMP Sizing		DATE	4/15/09	
			PAGE	18	OF 43

Soil Type	IMP Name
A	Bioswale #4

DMA Name	DMA Area (ft^2)	Post-Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume	
DMA-1	19,314	Equipment / Roofs	1.00	19,314					
DMA-2	33,262	Asphalt Pavement	1.00	33,262					
DMA-3	109,208	Gravel Surfacing	0.60	65,525					
DMA-4	23,692	Landscape, Group A Soil	0.10	2,369					
DMA-5	5,479	Transformer Containment	0.00	0					
			Total:	120,470	0.070	0.901	7,598	7,820	IMP Area (ft^2)
					0.058	0.901	6,296	12,903	V_1 (ft^3)
					NA	0.901	NA	NA	V_2 (ft^3)
								Orifice Size:	NA

IMP Sizing for Bioswale #5

Refer to Page 5, the total drainage area for bioswale #5 is measured to be: 318,309 ft^2 (7.31 ac) (natural gas facility included). The bioswale #5 is measured to be 465 feet long total.

Four drainage management areas (DMA) were identified based on the type of ground covers: (1) Equipment/Roofs; (2) Asphalt Pavement; (3) Gravel Surfacing; and (4) Grass/Landscape.

The measured areas are shown in the following table. The measurements were made by using AutoCAD.

DMA Name	Post-Project Surface Type	DMA Area (ft^2)
DMA-1	Equipment/Roofs	15,984
DMA-2	Asphalt Pavement	25,905
DMA-3	Gravel Surfacing	186,725
DMA-4	Grass/Landscape	89,695

Runoff Coefficients

From Table 4-2 of the Stormwater C.3 Guidebook, the "Grass/Landscape" will have a runoff coefficient of 0.1 for Group A Soil for treatment and flow control. The "Equipment/Roofs" and "Asphalt Pavement" will have a runoff coefficient of 1.0.

Use 0.6 for dense-graded aggregate surfacing (see Page 6).

Consequently,

$$\sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} = (15{,}984\text{x}1.0+25{,}905\text{x}1.0+186{,}725\text{x}0.6+89{,}695\text{x}0.1)$$

$$= 162{,}894\ ft^2.$$

IMP sizing factor = 0.07 for the area (A) of bioswale; IMP sizing factor = 0.058 for the surface reservoir volume (V_1). See Page 7.

Rain adjustment factor = 0.901. See Page 7.

Minimum Area and Minimum Volume of IMP

Per Ref. 2, Equation 4-7, the required minimum area (A) of the bioswale is:

$$\text{Min. IMP Area A} = \sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} \times \begin{pmatrix} IMP \\ Sizing \\ Factor \end{pmatrix} \times \begin{pmatrix} Rain \\ Adjustment \\ Factor \end{pmatrix}$$

$$= 162{,}894 \text{ x } 0.07 \text{ x } 0.901 = 10{,}274 \text{ ft}^2.$$

The required minimum surface reservoir volume (V_1) of the bioswale is:

$$\text{Min. IMP Volume } (V_1) = \sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} \times \begin{pmatrix} IMP \\ Sizing \\ Factor \end{pmatrix} \times \begin{pmatrix} Rain \\ Adjustment \\ Factor \end{pmatrix}$$

$$= 162{,}894 \text{ x } 0.058 \text{ x } 0.901 = 8{,}512 \text{ ft}^3.$$

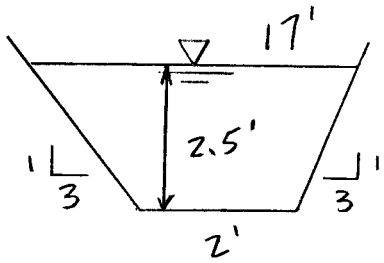
The proposed bioswale #5 is 465 feet long total. The bioswale cross section will be trapezoidal. Bottom width = 2 feet for the first 265 feet long section (Section 2 on SS-3001) and 8 feet for the remaining 200 feet long section (Section 2A on SS-3001). Side slope = 3 (h) to 1 (v). The bottom of the bioswale is at EL 12.0 for Section 2 and EL 11.0 for Section 2A. Drop structure DS-5 will be installed at the end of bioswale #5. See B&V Drawing SS-3001. The top of grate elevation of DS-5 will be at EL 15.0 (see Drawing SS-3050). The effective depth of the bioswale is: 14.5 – 11.0 = 3.5 feet for Section 2A and 14.5 – 12.0 = 2.5 feet for Section 2. See Dwg SS-3001 in Attachment 1.

The surface area of bioswale #5 is:

$17 \text{ x } 265 + 29 \text{ x } 200 = 10{,}305 \text{ ft}^2 > 10{,}274 \text{ ft}^2$, <u>OK</u>.

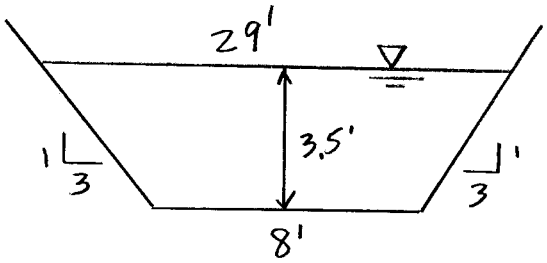
The volume of bioswale #5 is:

$$\frac{2+17}{2} \text{ x } 2.5 \text{ x } 265 + \frac{8+29}{2} \text{ x } 3.5 \text{ x } 200 = 19{,}244 \text{ ft}^3 > 8{,}512 \text{ ft}^3, \text{ OK}.$$



Section 2

DWG SS-3001



Section 2A

DWG SS-3001

Conclusion: The proposed size of bioswale #5 is sufficient to meet the Stormwater C.3 requirements.

A spreadsheet was prepared for the above calculations to follow the format by Contra Costa County Clean Water Program. See next page.

BLACK & VEATCH					
OWNER	Radback Energy		COMP'D BY	J. Zhong	
PLANT	Tenaska	Unit No.	DATE	20-Mar-2009	
PROJECT NO.	163994	File No. 52.5406.1002	CKD BY	PLN	
TITLE	IMP Sizing		DATE	4/15/09	
			PAGE	22	OF 43

Soil Type	IMP Name
A	Bioswale #5

DMA Name	DMA Area (ft^2)	Post-Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume	
DMA-1	15,984	Equipment / Roofs	1.00	15,984					
DMA-2	25,905	Asphalt Pavement	1.00	25,905					
DMA-3	186,725	Gravel Surfacing	0.60	112,035					
DMA-4	89,695	Landscape, Group A Soil	0.10	8,970					
			Total:	162,894	0.070	0.901	10,274	10,305	IMP Area (ft^2)
					0.058	0.901	8,512	19,244	V_1 (ft^3)
					NA	0.901	NA	NA	V_2 (ft^3)
								Orifice Size:	NA

Radback Tenaska project

project # 163994 File # 52.5406.1002

Imp sizing for plant Area

prepared by: Jzhong

Date: 3/30/09

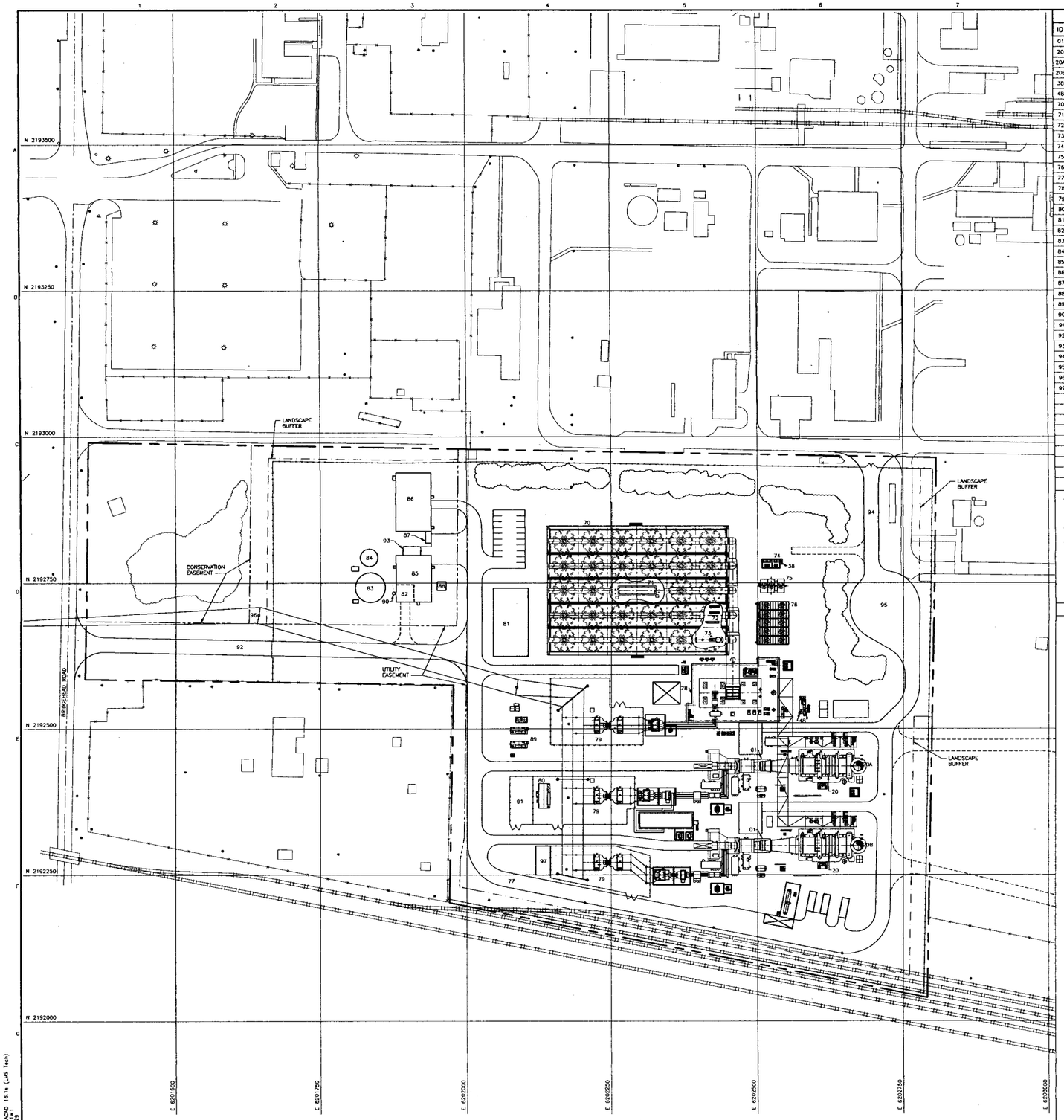
# of pages: 5

Attachment 1

Black & Veatch Dwgs

SS-1002, SS-3001, SS-3201, SS-3050

DWG40999 31-MAR-2009 09:29:37



FACILITIES LEGEND

ID	FACILITY	STRUCTURE HEIGHT	TIEDOWN LOCATION NORTH	TIEDOWN LOCATION EAST	REMARKS
01	COMBUSTION TURBINE	70'	–	–	–
20	HEAT RECOVERY STEAM GENERATOR (HRSG)	103'	–	–	–
20A	HRSG EXHAUST STACK A	155'	2192436.00	6202665.00	CL EXHAUST STACK
20B	HRSG EXHAUST STACK B	155'	2192300.00	6202665.00	CL EXHAUST STACK
38	SAFETY SHOWER EYEWASH STATION	–	–	–	–
48	AUXILIARY BOILER	50'	2192527.61	6202572.26	CL EXHAUST STACK
70	AIR COOLED CONDENSER (ACC)	124'	–	–	–
71	ACC ELECTRICAL ENCLOSURE	14'	–	–	–
72	CONDENSER AIR EXTRACTION SKIDS	6'	–	–	–
73	ACC CONDENSATE COLLECTION TANK	28'	–	–	–
74	WET SURFACE AIR COOLER CHEMICAL FEED SKIDS	8'	–	–	–
75	WET SURFACE AIR COOLER	23'	2192744.67	6202523.00	CL COOLER
76	CLOSED CYCLE COOLING WATER HEAT EXCHANGER	19'	–	–	–
77	LOOP ROAD	–	–	–	–
78	STEAM TURBINE FOUNDATION	–	–	–	–
79	SWITCHYARD	18' & 45'	–	–	–
80	SWITCHYARD CONTROL ENCLOSURE	12'	–	–	–
81	CONTROL & ADMIN BUILDING	14'	–	–	–
82	FIRE WATER PUMP ROOM	20'	–	–	–
83	FIRE/SERVICE WATER STORAGE TANK	32'	–	–	–
84	DEMIN WATER STORAGE TANK	24'	–	–	–
85	WATER TREATMENT BUILDING	20'	–	–	–
86	WAREHOUSE/MAINTENANCE BUILDING	16'	–	–	–
87	LUBRICANT STORAGE SHED	10'	–	–	–
88	WASTE WATER LIFT STATION (IF REQUIRED)	–	–	–	–
89	GAS COMPRESSORS & GAS CONDITIONING	13'	–	–	–
90	DIESEL FIRE PUMP EXHAUST	16'	2192732.52	6201874.72	CL EXHAUST STACK
91	GAS METERING STATION	–	–	–	–
92	ACCESS ROAD	–	–	–	–
93	LEASED MIX BED EXCHANGER CONCRETE SLAB	–	–	–	–
94	EMERGENCY ACCESS ROAD	–	–	–	–
95	CUL DA SAC (TURNAROUND)	–	–	–	–
96	230KV POWER POLE	106'	–	–	–
97	OUTAGE MAINTENANCE TRAILERS AREA	–	–	–	–

NOTES

1. COORDINATES ARE BASED ON CALIFORNIA COORDINATE SYSTEM CCS83, ZONE 3. ELEVATION ARE BASED ON, NGVD 29 DATUM. BENCHMARK IS NATIONAL GEODETIC SURVEY BENCH MARK "W 563", LOCATED ADJACENT TO THE FLAGPOLE AT THE DUPONT PLANT ENTRANCE, ELEVATION = 11.168 FEET. TO OBTAIN DUPONT PLANT DATUM ELEVATION, ADD 0.70 FEET TO THE ELEVATIONS SHOWN. TOPOGRAPHIC DATA IS BASED ON AERIAL PHOTOGRAPH DATED JUNE 11, 2001. AERIAL SURVEY INFORMATION WAS OBTAINED BY RONALD GREENWELL & ASSOCIATES, INC.
2. SEE PLANT ARRANGEMENT DRAWING SM-2001, FOR LEGEND OF MAIN POWER BLOCK.
3. PROPERTY AND EASEMENT BOUNDARY INFORMATION IS BASED UPON DRAWING EXHIBIT D, BY RONALD GREENWELL & ASSOCIATES, INC. REVISION DATED 05/FEB/09.

GENERAL LEGEND

- NEW FENCE
- EXISTING FENCE
- PROPERTY BOUNDRY (SEE NOTE 3)
- EASEMENT BOUNDARY (SEE NOTE 3)
- LANDSCAPE BUFFER

NOT TO BE USED FOR CONSTRUCTION

THE DISTRIBUTION AND USE OF THE NATIVE FILE FORMAT OF THIS DRAWING OUTSIDE OF BLACK & VEATCH IS UNCONTROLLED AND SHALL BE USED FOR REFERENCE PURPOSES ONLY.

NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
1	30/MAR/09	ISSUED PER ECN-N-S-0001	NAW	PLN		PLN	DVW
0	13/MAR/09	ISSUED FOR PERMITTING	NAW	PLN		PLN	DVW

SCALE: 1" =60'

I HEREBY CERTIFY THAT THIS DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CALIFORNIA

SIGNED _____ REG NO. _____

DATE _____

BLACK & VEATCH CORPORATION

ENGINEER PLN DRAWN NAW

CHECKED DATE

CONTRA COSTA GENERATING STATION LLC

CONTRA COSTA COMBINED CYCLE FACILITY

GENERAL ARRANGEMENT SITE

PROJECT DRAWING NUMBER: 163994-SS-1002

REV: 1

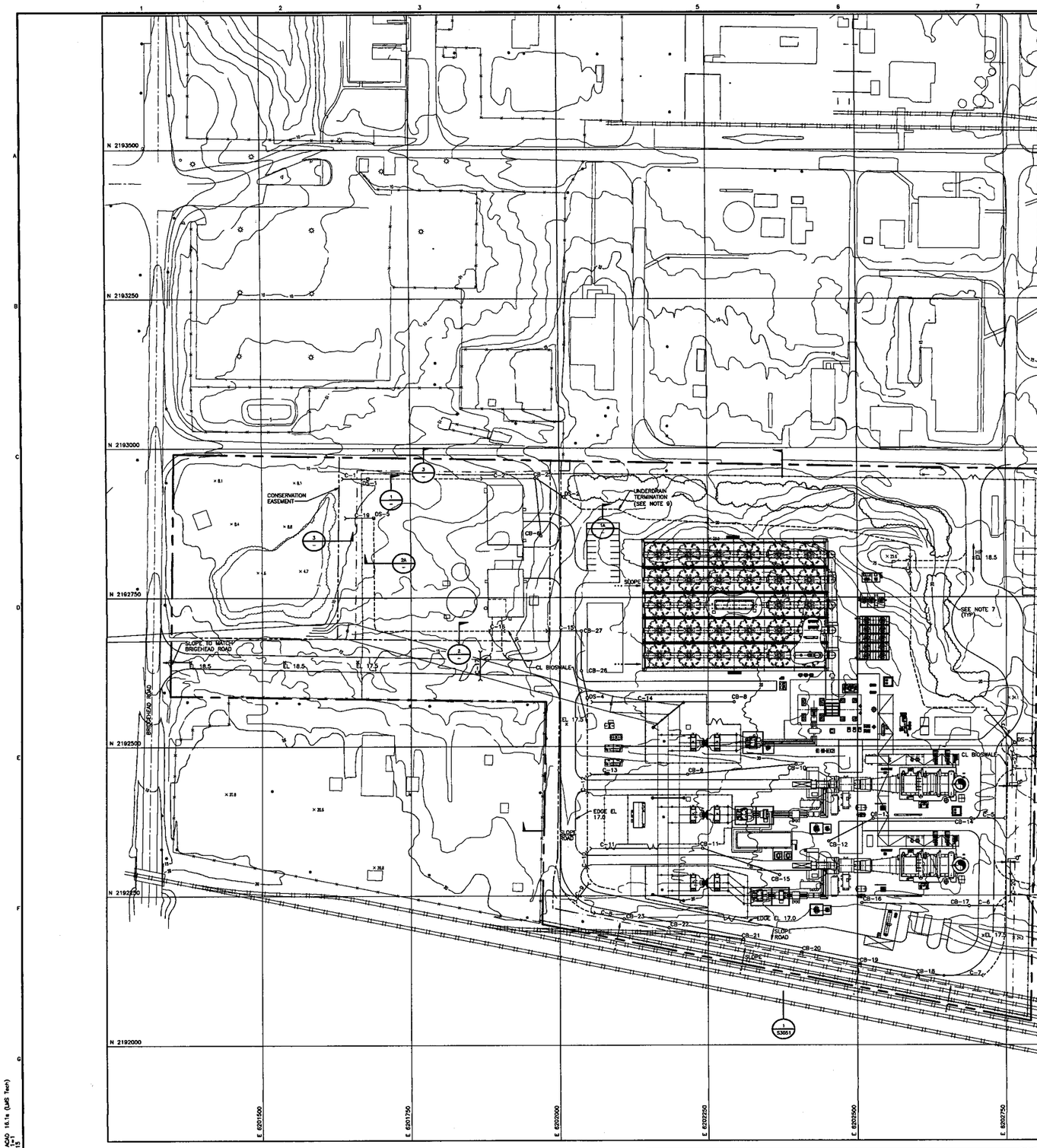
CODE

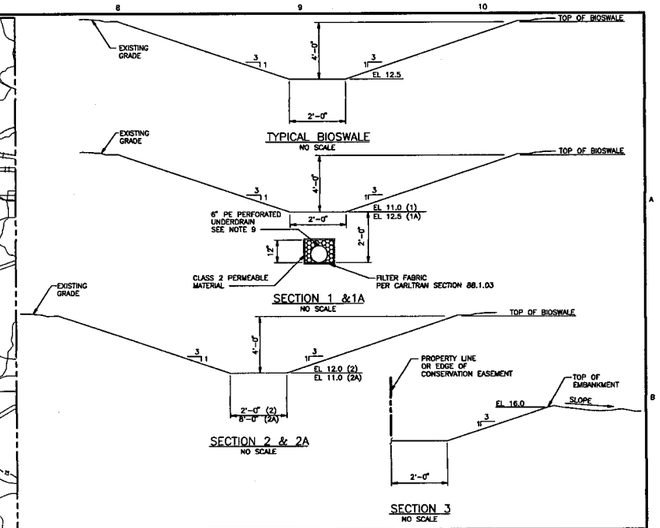
AREA

ACAD 16.1s (LMS Tech)

WEB:6411 PLN/DVW E1 03/30/09 15:09:29

DWG40999 14-APR-2009 15:06:53





ABBREVIATIONS APPLICABLE TO ALL SS-3000 SERIES DRAWINGS

APPROX	=	APPROXIMATE	LTR	=	LATER
ASPH	=	ASPHALT	MAX	=	MAXIMUM
AVG	=	AVERAGE	MH	=	MANHOLE
BND	=	BEND	MIN	=	MINIMUM
BLDG	=	BUILDING	MJ	=	MECHANICAL JOINT
B/MH	=	BOTTOM OF MANHOLE ELEVATION	MSL	=	MEAN SEA LEVEL
BOC	=	BOTTOM OF CONDUIT ELEVATION	NO.	=	NUMBER
BOD	=	BOTTOM OF DUCTBANK ELEVATION	NTS	=	NOT TO SCALE
BOP	=	BOTTOM OF PIPE ELEVATION	OD	=	OUTSIDE DIAMETER
BU	=	BELL-UP	OWS	=	OIL WATER SEPARATOR
C	=	CULVERT	OWMH	=	OILYWASTE MANHOLE
CB	=	CATCH BASIN	PC	=	POINT OF CURVATURE
CD	=	CABLE DUCT	PE	=	PLAIN END
CHDPE	=	CORRUGATED HIGH DENSITY POLYETHYLENE PIPE	PI	=	POINT OF INTERSECTION
			PLCS	=	PLACES
CL	=	CENTERLINE	PM	=	PLANT MANHOLE
CLR	=	CLEAR	POT	=	POINT OF TANGENT
CMH	=	CHEMICAL MANHOLE	PT	=	PIPE TERMINATION
CND	=	CONDUIT	PVC	=	POLYVINYL CHLORIDE PIPE
CONC	=	CONCRETE	QTY	=	QUANITY
CO	=	CLEAN OUT	R	=	RADIUS
CS	=	CARBON STEEL	RCP	=	REINFORCED CONCRETE PIPE
CW	=	CIRCULATING WATER	RD	=	ROOF DRAIN
DB	=	DUCTBANK	REV	=	REVISION
DBC	=	DIRECT BURIED CABLE	RGS	=	RIGID GALVANIZED STEEL
DET	=	DETAIL	RR	=	RAILROAD
DIA	=	DIAMETER	SECT	=	SECTION
DIP	=	DUCTILE IRON PIPE	SIM	=	SIMILAR
DWG	=	DRAWING	SLS	=	SANITARY LIFT STATION
DWP	=	DOUBLE WALL PIPE	SMH	=	SANITARY MANHOLE
EC	=	ELECTRICAL CONDUIT	STMH	=	STORM MANHOLE
ECC	=	ECCENTRIC	STRL	=	STRUCTURAL
EF	=	EACH FACE	T/C	=	TOP OF CONCRETE ELEVATION
EHH	=	ELECTRICAL HANDHOLE	T/G	=	TOP OF GRADE ELEVATION
EL	=	ELEVATION	THH	=	TELEPHONE SERVICE HANDHOLE
EMH	=	ELECTRICAL MANHOLE	T/MH	=	TOP OF MANHOLE ELEVATION
EW	=	EACH WAY	T/P	=	TOP OF PAVEMENT ELEVATION
FC	=	FIELD CHECK	TP	=	MECH PIPE TERMINAL POINT
FDN	=	FOUNDATION	TYP	=	TYPICAL
FF	=	FLAT FACE	UGL	=	UNDERGROUND LIGHTING CONDUIT
FRP	=	FIBERGLASS REINFORCED PIPE	UNO	=	UNLESS NOTED OTHERWISE
GR	=	GRADE	VERT	=	VERTICAL
HDM	=	HOT DRAIN MANHOLE	WGT	=	WEIGHT
HDPE	=	HIGH DENSITY POLYETHYLENE PIPE	WTR	=	WATER
HP	=	HIGH POINT	W/	=	WITH
HYD	=	HYDRANT	W/O	=	WITHOUT
ID	=	INSIDE DIAMETER	WP	=	WORK POINT
INV	=	INVERT	XFMR	=	TRANSFORMER
JBX	=	JUNCTION BOX			
L	=	LENGTH			
LP	=	LOW POINT			

LEGEND APPLICABLE TO ALL S3000 DRAWINGS

	NEW CULVERT		NEW SLIDE GATE
	CL BIOSWALE		NEW SWING GATE
S3000	SECTION OR DETAIL NUMBER / DRAWING DESIGNATION NUMBER		EXISTING POWER POLE
× 326.5	FINISHED SPOT ELEVATIONS	CB-101	NEW CATCH BASIN
			NEW DROP STRUCTURE
BM-1	SURVEY MONUMENT/CONTROL POINT		PROPERTY LINE
	EXISTING FENCE		BOUNDARY LINE
	NEW SECURITY FENCE	126	EXISTING CONTOURS
	TEMPORARY CONSTRUCTION FENCE		GRADE TO DRAIN (DIRECTION OF ARROW)
TR-1	EROSION CONTROL METHOD		

NOTES APPLICABLE TO ALL SS-3000 SERIES DRAWINGS

1. COORDINATES ARE BASED ON CALIFORNIA COORDINATE SYSTEM CCS83, ZONE 3. ELEVATION ARE BASED ON, NGVD 29 DATUM. BENCHMARK IS NATIONAL GEODETIC SURVEY BENCH MARK "W 563", LOCATED ADJACENT TO THE FLAGPOLE AT THE DUPONT PLANT ENTRANCE. ELEVATION = 11.185 FEET. TO OBTAIN DUPONT PLANT DATUM ELEVATION, ADD 0.70 FEET TO THE ELEVATIONS SHOWN. TOPOGRAPHIC DATA IS BASED ON AERIAL PHOTOGRAPH DATED JUNE 11, 2001. AERIAL SURVEY INFORMATION WAS OBTAINED BY RONALD GREENWELL & ASSOCIATES, INC.
2. NEW GRADE ELEVATIONS SHOWN ON THE SITE GRADING AND DRAINAGE PLANS INDICATE FINISH GRADE UNLESS NOTED OTHERWISE.
3. ALL CUT AND FILL SLOPES SHALL BE 3 HORIZONTAL TO 1 VERTICAL OR FLATTER, UNLESS NOTED OTHERWISE.
4. SEE DWG SS-3050 FOR GRADING AND DRAINAGE DETAILS INCLUDING CULVERT, CATCH BASIN AND DROP STRUCTURE CHARTS.
5. TOP OF CONCRETE ELEVATIONS AND FINISH FLOOR ELEVATIONS FOR ALL EQUIPMENT AND BUILDINGS IS EL 18.0. FINISH GRADE ADJACENT TO ALL FOUNDATIONS IS EL 17.5.
6. CL OF ALL PAVED ROADS IS EL 17.5 UNO.
7. TREES TO REMAIN. GRADE TO REMAIN UNCHANGED WITHIN 20' OF TREE BASE.
8. TEMPORARY ROAD FROM LAYDOWN AREA. ROAD AND CULVERT UNDER ROAD TO BE REMOVED AT END OF CONSTRUCTION.
9. UNDERDRAIN CONTINUOUS UNDER BIOSWALE FROM UNDERDRAIN TERMINATION TO CONSERVATION EASEMENT. UTILIZE UNPERFORATED PIPE BETWEEN DS-2 TO C-2 OUTLET AND DS-1 TO C-1 OUTLET.

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04/01/09

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NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
0	18/APR/09	ISSUED FOR PERMITTING	NAW	PLN		PLN	DVW

SCALE: 1" =60'

I HEREBY CERTIFY THAT THIS DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CALIFORNIA.
SIGNED
DATE REG NO.

BLACK & VEATCH CORPORATION
ENGINEER PLN DRWN NAW
CHECKED DATE

CONTRA COSTA GENERATING STATION LLC
CONTRA COSTA COMBINED CYCLE FACILITY

GRADING AND DRAINAGE – SITE PLAN – SHEET 1

PROJECT 163994 DRAWING NUMBER SS-3001 REV 0
CODE
AREA

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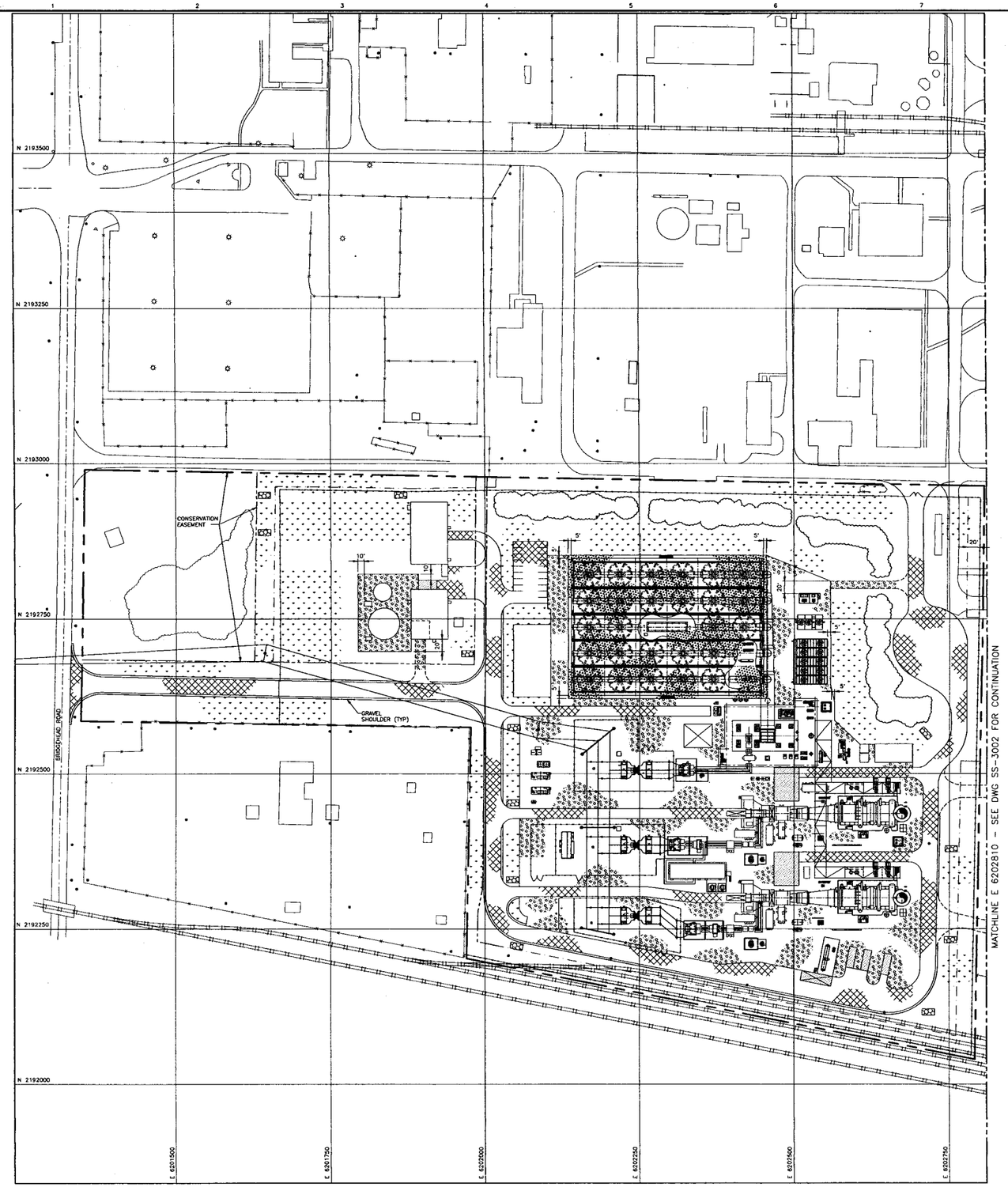
04/14/09 07:15

DWG40999 31-MAR-2009 09:31:01



SITE SURFACING LEGEND

- ASPHALT SURFACING
- AGGREGATE SURFACING
- CONCRETE
- GRASS
- OPEN GRADED STONE SURFACING
- RIPRAP
- EXISTING FACILITY
- NEW FACILITY
- NATURAL SOIL

NOTES

1. SEE DRAWING SS-3001 FOR GENERAL NOTES AND LEGEND.

NOT TO BE USED
FOR CONSTRUCTION

NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
A	27/MAR/09	ISSUED FOR CLIENT REVIEW	NAW	PLN		PLN	WA

60' 30' 0 60' 120'
SCALE: 1"=60'

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SIGNED
DATE REG NO.

BLACK & VEATCH CORPORATION
ENGINEER PLN DRAWN NAW
CHECKED DATE

CONTRA COSTA GENERATING STATION LLC
CONTRA COSTA COMBINED CYCLE FACILITY

SURFACING/FENCING/ROADWAY – SITE PLAN – SHEET 1

PROJECT DRAWING NUMBER REV
163994–SS–3201 A
CODE
AREA

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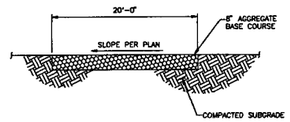
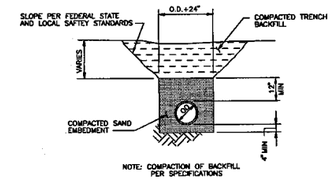
07/27/08 8:46:53

DWG40999 14-APR-2009 15:07:20



TYPICAL CONSTRUCTION LAYDOWN ROAD
NO SCALE



TYPICAL PIPE EMBEDMENT
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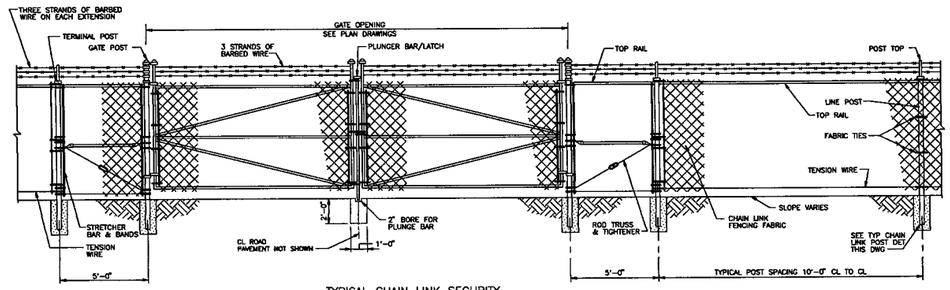

TYPICAL CHAIN LINK SECURITY FENCE AND GATE DETAIL
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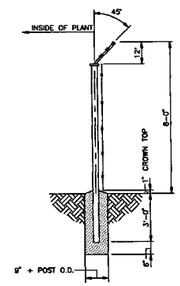

TYPICAL SECURITY FENCE POST DETAIL
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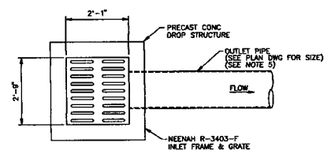
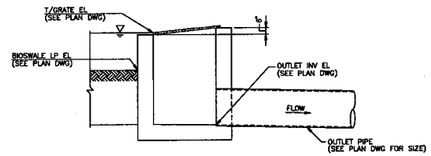
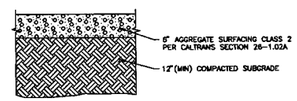


PLAN



SECTION

TYPICAL BIOSWALE DROP STRUCTURE DETAIL
NO SCALE



TYPICAL AGGREGATE SURFACING SECTION
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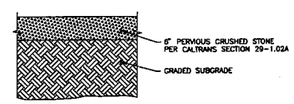

TYPICAL PERVIOUS CRUSHED STONE SURFACING SECTION
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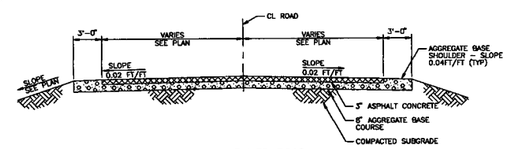
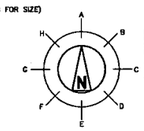


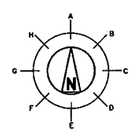
TYPICAL PAVED ROAD
NO SCALE
SEE DWG SS-3201

CULVERT TABLE						
CULVERT NO.	INLET INV ELEVATION	OUTLET INV ELEVATION	LENGTH	PIPE DIAMETER	PIPE MATERIAL	REMARKS
C-1	8.2	8.0	–	18"	–	
C-2	11.8	11.5	–	18"	–	
C-3	13.0	13.0	–	18"	–	
C-4	13.2	13.0	–	18"	–	
C-5	13.1	13.0	–	12"	–	
C-6	13.1	13.0	–	12"	–	
C-7	13.3	13.0	–	12"	–	
C-8	13.2	13.0	–	12"	–	
C-9	13.0	13.0	–	12"	–	
C-10	13.0	13.0	–	15"	–	
C-11	13.4	13.0	–	12"	–	
C-12	13.0	13.0	–	18"	–	
C-13	13.4	13.0	–	12"	–	
C-14	13.5	13.0	–	12"	–	
C-15	12.8	12.5	–	18"	–	
C-16	12.5	12.5	–	18"	–	
C-17	14.7	14.4	–	12"	–	
C-19	8.7	8.5	–	18"	–	
C-20	–	–	–	18"	–	
C-21	–	–	–	18"	–	



CATCH BASIN TABLE																					
STRUCTURE NO.	CENTERLINE COORDINATES		TOP OF GRATE ELEVATION	INLET & OUTLET PIPE INFORMATION																	REMARKS
				A		B		C		D		E		F		G		H			
	NORTH	EAST		INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA		
CB-6	–	–	16.0	–	–	13.2	12"	–	–	–	–	13.2	12"	–	–	–	–	–	–		
CB-7	NOT USED																				
CB-8	–	–	17.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	13.5	12"		
CB-9	–	–	17.0	–	–	–	–	13.4	12"	–	–	–	–	–	–	13.4	12"	–	–		
CB-10	–	–	17.0	–	–	–	–	13.4	12"	–	–	–	–	–	–	–	–	–	–		
CB-11	–	–	17.0	–	–	–	–	–	–	13.4	12"	–	–	–	–	13.4	12"	–	–		
CB-12	–	–	17.0	–	–	13.6	12"	–	–	–	–	–	–	–	–	–	–	–	–		
CB-13	–	–	17.0	–	–	–	–	13.4	12"	–	–	–	–	13.4	12"	–	–	–	–		
CB-14	–	–	17.0	–	–	–	–	13.1	12"	–	–	–	–	–	–	13.1	12"	–	–		
CB-15	–	–	17.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	13.6	12"		
CB-16	–	–	17.0	–	–	–	–	13.4	12"	–	–	–	–	–	–	–	–	–	–		
CB-17	–	–	17.0	–	–	–	–	13.1	12"	–	–	–	–	–	–	13.1	12"	–	–		
CB-18	–	–	16.5	–	–	13.2	12"	–	–	–	–	–	–	–	–	13.2	12"	–	–		
CB-19	–	–	16.5	–	–	–	–	13.4	12"	–	–	–	–	–	–	13.4	12"	–	–		
CB-20	–	–	16.5	–	–	–	–	13.6	12"	–	–	–	–	–	–	–	–	–	–		
CB-21	–	–	16.5	–	–	–	–	–	–	–	–	–	–	–	–	13.6	12"	–	–		
CB-22	–	–	16.5	–	–	–	–	13.4	12"	–	–	–	–	–	–	13.4	12"	–	–		
CB-23	–	–	16.5	–	–	–	–	13.2	12"	–	–	–	–	–	–	13.2	12"	–	–		
CB-24	NOT USED																				
CB-25	–	–	15.0	–	–	–	–	–	–	11.8	18"	12.3	12"	–	–	11.8	18"	–	–		
CB-26	–	–	16.0	13.2	18"	–	–	–	–	–	–	13.2	18"	–	–	–	–	–	–		
CB-27	–	–	16.5	–	–	–	–	–	–	–	–	12.8	18"	–	–	12.8	18"	–	–		

ALL DIMENSIONS ARE IN FEET, EXCEPT DIAMETER, WHICH IS IN INCHES
FOR PIPELINE MATERIAL SEE PIPELINE LIST



DROP STRUCTURE (DS) TABLE																					
STRUCTURE NO.	CENTERLINE COORDINATES		TOP OF GRATE ELEVATION	INLET & OUTLET PIPE INFORMATION																	REMARKS
				A		B		C		D		E		F		G		H			
	NORTH	EAST		INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA		
DS-1	–	–	13.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	12.1	18"		
DS-2	–	–	15.5	–	–	–	–	–	–	–	–	–	–	–	–	11.8	18"	–	–		
DS-3	–	–	15.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	13.2	18"		
DS-4	–	–	15.5	13.5	18"	–	–	–	–	–	–	–	–	–	–	–	–	–	–		
DS-5	–	–	14.5	8.7	18"	–	–	–	–	–	–	–	–	–	–	–	–	–	–		

ALL DIMENSIONS ARE IN FEET, EXCEPT DIAMETER, WHICH IS IN INCHES
FOR PIPELINE MATERIAL SEE PIPELINE LIST

NOTES

1. FILTER FABRIC SHALL BE UV-STABILIZED NONWOVEN GEOTEXTILE HAVING A MINIMUM WEIGHT OF 135 g/M^2 PER CALTRANS SS 88-1.03.
2. SEE DWG SS-3001 FOR GENERAL NOTES AND LEGEND.

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0	16/APR/09	ISSUED FOR PERMITTING	NAW	PLN		PLN	DVW

60' 30' 0 60' 120'
SCALE: 1"=60'

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SIGNED
DATE REG NO.

BLACK & VEATCH CORPORATION
ENGINEER PLN DRAWN NAW
CHECKED DATE

CONTRA COSTA GENERATING STATION LLC
CONTRA COSTA COMBINED CYCLE FACILITY

SITE
SECTIONS AND DETAILS

PROJECT DRAWING NUMBER 163994-SS-3050
REV 0
CODE
AREA

ACAD 16.1a (LMS Tech)
1=1
E1
09/17/1/50
A1/R0/D7
04/14/09 07:18:52

Radback Tenaska project

project # 163994 File # 52.5406.1002

IMP sizing for plant Area

prepared by: J zhong

Date: 3/30/09

# of pages: 5

Attachment 2

Reference 2

Select pages

(Runoff factor) x (tributary area) $\leq$ 2 x (self-retaining area) *Equation 4-1*

For treatment-only sites, and

(Runoff factor) x (tributary area) $\leq$ 1 x (self-retaining area) *Equation 4-2*

for sites subject to flow-control requirements. Use the runoff factors in Table 4-2.

Prolonged ponding is a potential problem at higher impervious/pervious ratios. In your design, ensure that the pervious area soils can handle the additional run-on and are sufficiently well-drained.

Runoff from self-treating and self-retaining areas does not require any further treatment or flow control.

TABLE 4-2. Runoff factors to be used when sizing IMPs.

Surface	Treatment and Flow Control	Treatment only
Roofs	1.0	1.0
Concrete or Asphalt	1.0	1.0
Pervious Concrete	0.1	0.1
Porous Asphalt	0.1	0.1
Grouted Unit Pavers	1.0	1.0
Solid Unit Pavers	0.5	0.2
Crushed Aggregate	0.1	0.1
Turfblock	0.1	0.1
Landscape, Group A Soil	0.1	0.1
Landscape, Group B Soil	0.3	0.1
Landscape, Group C Soil	0.5	0.1
Landscape, Group D Soil	0.7	0.1

Areas draining to IMPs are used to calculate the required size of the IMP. On most densely developed sites—such as commercial and mixed-use developments and small-lot residential subdivisions—most DMAs will drain to IMPs.

The CCCWP has developed sizing factors (ratios of IMP area to impervious DMA area). For each IMP design, factors are provided for:

TABLE 4-6. Sizing Factors

Treatment and Flow Control	NRCS Soil Group			
IMP	**A**	**B**	**C**	**D**
Bioretention Facility				
A	0.07	0.11	0.06	0.05
V_1	0.058	0.092	0.050	0.042
V_2	N/A	N/A	0.066	0.055
Flow-through Planter				
A	N/A	N/A	0.06	0.05
V_1	N/A	N/A	0.050	0.042
V_2	N/A	N/A	0.066	0.055
Dry Well				
A	0.05	0.06	N/A	N/A
V	0.130	0.204	N/A	N/A
Cistern + bioretention facility				
A (bioretention facility)	*0.04*	*0.04*	*0.04*	*0.04*
V (cistern)	0.193	0.228	0.088	0.060

* Cistern sized for flow control when used in conjunction with a treatment IMP. IMP underdrain required in B, C and D soils.

Treatment Only

Bioretention Facility				
A	*0.04*	*0.04*	*0.04*	*0.04*
Flow-through Planter				
A	*0.04*	*0.04*	*0.04*	*0.04*
Dry Well (treatment only)				
A	0.02	0.04	N/A	N/A
V	0.068	0.136	N/A	N/A

Units Notes:
A = ft^2 of IMP footprint per ft^2 of tributary impervious area (unitless)
V, V_1, V_2 = ft^3 per ft^2 of equivalent tributary impervious area (ft.)

STEP 5: OBTAIN SIZING AND RAIN ADJUSTMENT FACTORS FOR EACH IMP

For each of the IMPs, obtain the appropriate **area** sizing factor from Table 4-6.

Sizing factors for treatment-only IMPs (in *italics*) do not require any adjustment for differing rainfall patterns.

Both area (A) and volume (V_1, V_2) sizing factors for treatment-plus-flow-control IMPs, however, must be adjusted to account for the effects of differing rainfall patterns on pre-project and post-project runoff.

Use the equations below to compute the rainfall adjustment:

Equation 4-3

$$\text{For Group A soils, } Rain\ Adjustment = \frac{0.0009 \times \left(MAP_{project\ site} - 20.2\right) + 0.07}{0.07}$$

Equation 4-4

$$\text{For Group B soils, } Rain\ Adjustment = \frac{-0.0005 \times \left(MAP_{project\ site} - 20.2\right) + 0.11}{0.11}$$

Equation 4-5

$$\text{For Group C soils, } Rain\ Adjustment = \frac{-0.0022 \times \left(MAP_{project\ site} - 20.2\right) + 0.06}{0.06}$$

Equation 4-6

$$\text{For Group D soils, } Rain\ Adjustment = \frac{-0.0022 \times \left(MAP_{project\ site} - 20.2\right) + 0.05}{0.05}$$

where *MAP* is the mean annual precipitation at the site as shown on the isohyetal map, Contra Costa County Public Works Figure B-166, available on the CCCWP C.3 web pages.

► STEP 6: CALCULATE MINIMUM AREA AND VOLUME OF EACH IMP

The minimum area and storage volumes of each IMP are found by summing up the contributions of each tributary DMA and multiplying by the adjusted sizing factor for the IMP.

Equation 4-7

$$Min.\ IMP\ Area\ or\ Volume = \sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} \times \begin{pmatrix} IMP \\ Sizing \\ Factor \end{pmatrix} \times \begin{pmatrix} Rain \\ Adjustment \\ Factor \end{pmatrix}$$

Bioretention facilities and flow-through planters have two storage volumes. V_1 is the floodable volume above the soil layer. V_2 is the storage volume below the soil layer, calculated by multiplying the volume of gravel by an assumed porosity of 0.4. See Figure 4-6. Note these volumes can be configured in a variety of practical combinations of depth and area to best fit into your landscape design.

Cisterns and dry wells have a single storage volume (V).

V is calculated using Equation 4-8:

Equation 4-8

$$Min.V = \sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} \times \begin{pmatrix} IMP\,Volume \\ Sizing \\ Factor \end{pmatrix} \times \begin{pmatrix} Rain \\ Adjustment \\ Factor \end{pmatrix}$$

Use the format of Table 4-7 to present the calculations of the required minimum area and volumes of the receiving IMP:

TABLE 4-7. Format for presenting calculations of minimum IMP Areas and Volumes

DMA Name	*DMA Area (square feet)*	*Post-project surface type*	*DMA Runoff factor*	*DMA Area × runoff factor*	*Soil Type:*	*IMP Name*			
					IMP Sizing factor	*Rain Adjust-ment Factor*	*Minimum Area or Volume*	*Proposed Area or Volume*	
			Total						***IMP Area***
									V or V1
									V2
								Orifice Size:	

► STEP 7: DETERMINE IF IMP AREA AND VOLUME ARE ADEQUATE

Sizing and configuring IMPs may be an iterative process. After computing the minimum IMP area using Steps 1–6, review the site plan to determine if the reserved IMP area is sufficient. If so, the planned IMPs will meet the Provision C.3 sizing requirements. If not, revise the plan accordingly. Revisions may include:

Radback Tenaska project

project # 163994 File # 52.5406.1002

IMP sizing for ~~Lagoon~~ Plant Area

prepared by: JZhong

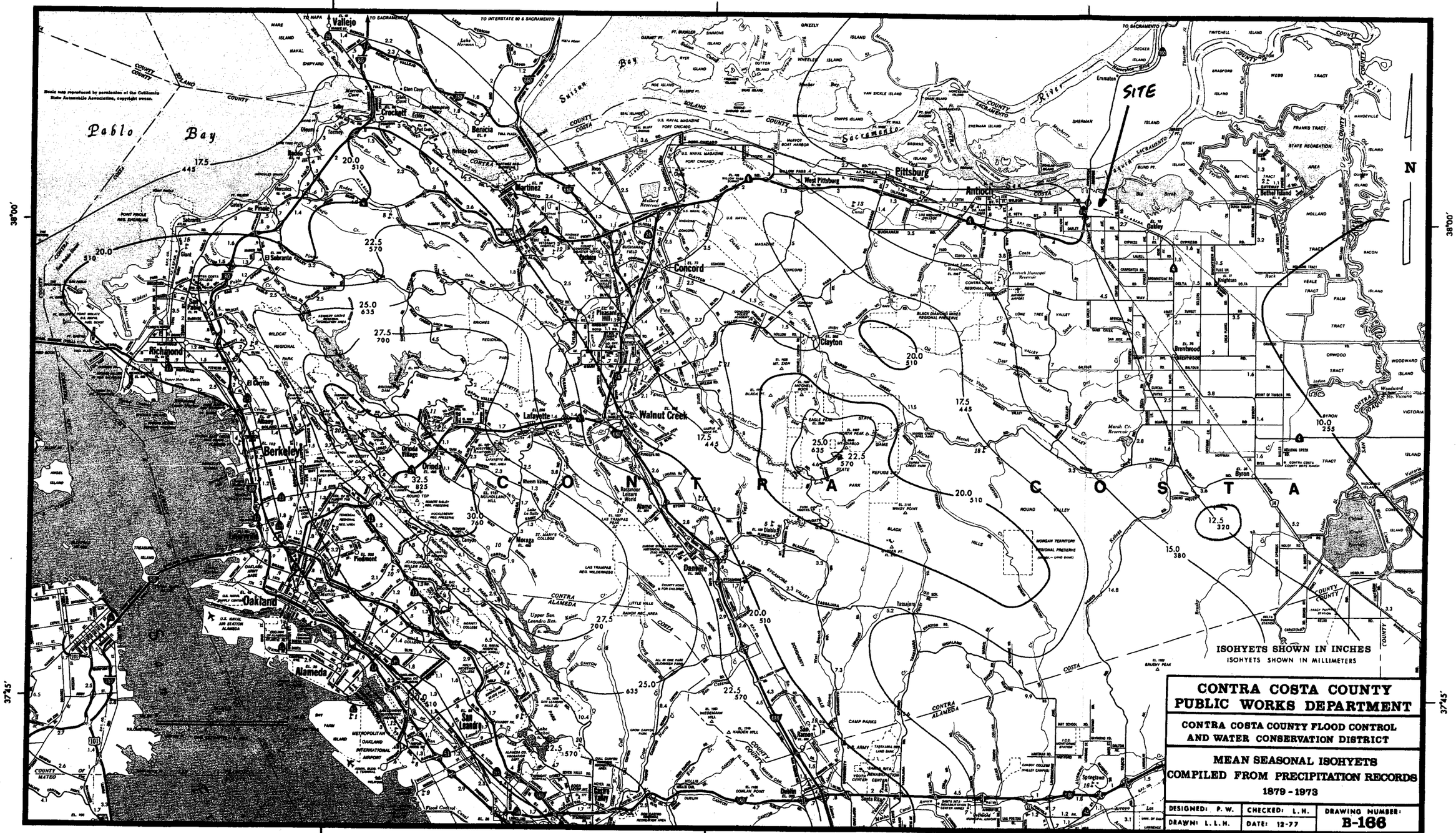
Date: 3/24/09

# of pages: 2

Attachment 3

Reference 3

Drawing No. B-166


122°15′
122°00′
121°45′
38°00′
37°45′
N
SITE
Pablo Bay
Suisun Bay
Sacramento River
San Joaquin River
Vallejo
Crockett
Benicia
Martinez
Pittsburg
Antioch
West Pittsburg
Concord
Pleasant Hill
Walnut Creek
Clayton
Richmond
El Cerrito
Berkeley
Lafayette
Orinda
Moraga
Alamo
Danville
San Ramon
Dublin
Pleasanton
Livermore
Oakland
Alameda
San Leandro
Hayward
Fremont
Brentwood
Oakley
Knightsen
Bethel Island
Byron
Springtown
CONTRA COSTA
ISOHYETS SHOWN IN INCHES
ISOHYETS SHOWN IN MILLIMETERS
CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT
CONTRA COSTA COUNTY FLOOD CONTROL
AND WATER CONSERVATION DISTRICT
MEAN SEASONAL ISOHYETS
COMPILED FROM PRECIPITATION RECORDS
1879 - 1973
DESIGNED: P. W.
CHECKED: L. H.
DRAWING NUMBER:
B-166
DRAWN: L. L. H.
DATE: 12-77

Rabbit Tenaska project

project # 163994 File # 52.5406.1002

IMP sizing for ~~[illegible]~~ Plant Area

prepared by: JZhang

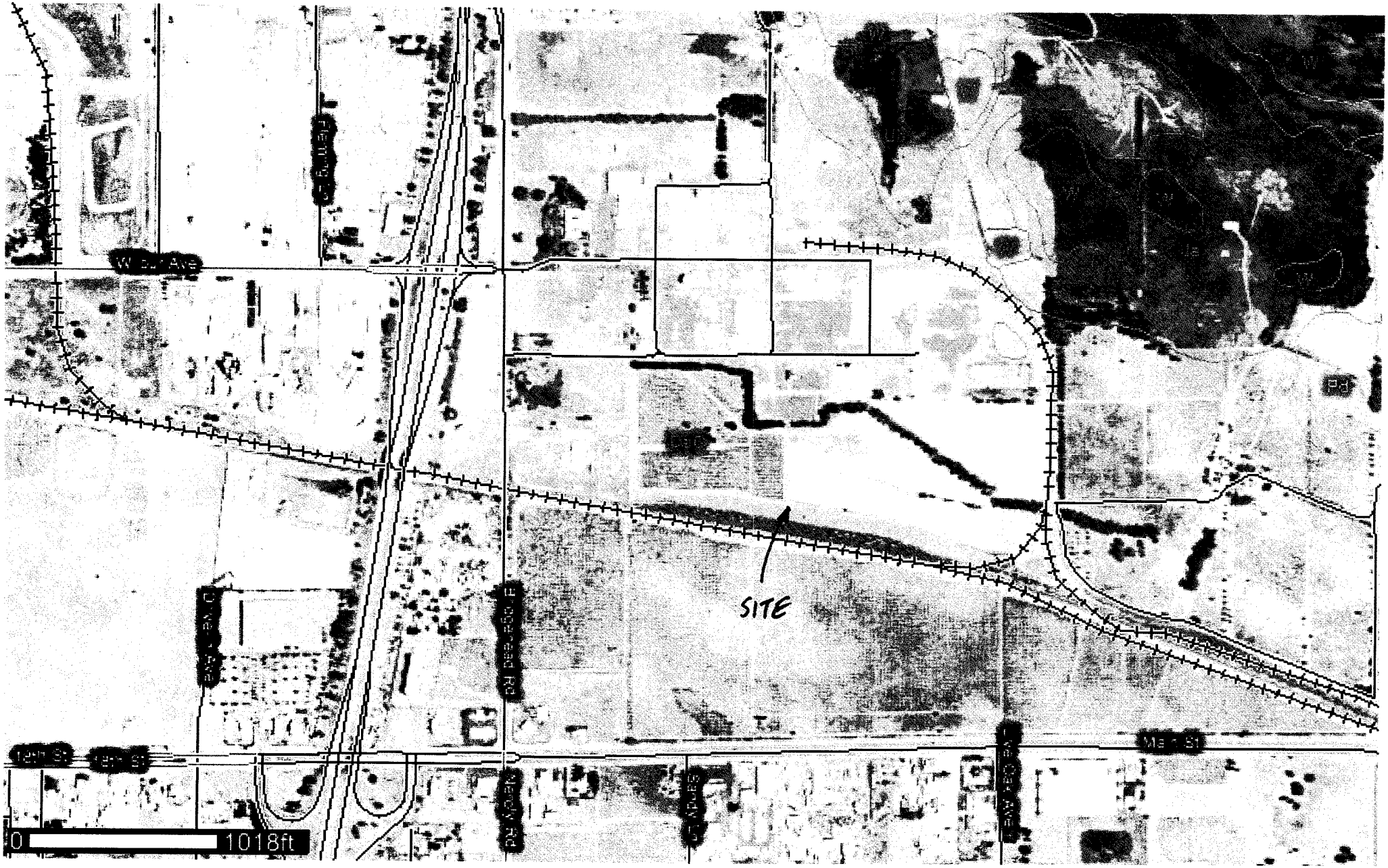
Date: 3/24/09

# of pages: 4

Attachment 4

Reference 4

select pages


W 8th Ave
Ave C
Ave D
Ave E
Ave F
Ave G
Ave H
Ave I
Ave J
12th St
13th St
Main St
SITE
0
1018ft

Contra Costa County, California

DaC—DELHI SAND, 2 TO 9 PERCENT SLOPES

Map Unit Setting

Elevation: 10 to 150 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 59 degrees F
Frost-free period: 260 to 300 days

Map Unit Composition

Delhi and similar soils: 85 percent
Minor components: 15 percent

Description of Delhi

Setting

Landform: Flood plains, terraces, alluvial fans
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits derived from igneous and sedimentary rock

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability (nonirrigated): 6e

Typical profile

0 to 5 inches: Sand
5 to 60 inches: Sand

Minor Components

Unnamed

Percent of map unit: 12 percent

Laugenour

Percent of map unit: 3 percent

Data Source Information

Soil Survey Area: Contra Costa County, California
Survey Area Data: Version 8, Jul 22, 2008

Radback Tenaska project

project # 163994 File # 52.5406.1002

IMP sizing for ~~system~~ plant Area

prepared by: JZhang

Date: 3/24/09

# of pages: 2

Attachment 5

Reference 5

select page

Appendix A Hydrologic Soil Groups

Soils are classified into hydrologic soil groups (HSG's) to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting. The HSG's, which are A, B, C, and D, are one element used in determining runoff curve numbers (see chapter 2). For the convenience of TR-55 users, exhibit A-1 lists the HSG classification of United States soils.

The infiltration rate is the rate at which water enters the soil at the soil surface. It is controlled by surface conditions. HSG also indicates the transmission rate—the rate at which the water moves within the soil. This rate is controlled by the soil profile. Approximate numerical ranges for transmission rates shown in the HSG definitions were first published by Musgrave (USDA 1955). The four groups are defined by SCS soil scientists as follows:

Group A soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sand or gravel and have a high rate of water transmission (greater than 0.30 in/hr).

Group B soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (0.15-0.30 in/hr).

Group C soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission (0.05-0.15 in/hr).

Group D soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission (0-0.05 in/hr).

In exhibit A-1, some of the listed soils have an added modifier; for example, "Abrazo, gravelly." This refers to a gravelly phase of the Abrazo series that is found in SCS soil map legends.

Disturbed soil profiles

As a result of urbanization, the soil profile may be considerably altered and the listed group classification ma no longer apply. In these circumstances, use the follov ing to determine HSG according to the texture of the new surface soil, provided that significant compactior has not occurred (Brakensiek and Rawls 1983).

HSG	*Soil textures*
A	Sand, loamy sand, or sandy loam
B	Silt loam or loam
C	Sandy clay loam
D	Clay loam, silty clay loam, sandy clay, silty clay, or clay

Drainage and group D soils

Some soils in the list are in group D because of a higl water table that creates a drainage problem. Once th soils are effectively drained, they are placed in a diff ent group. For example, Ackerman soil is classified a A/D. This indicates that the drained Ackerman soil is group A and the undrained soil is in group D.

Radback Tenaska project

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IMP sizing for ~~plant~~ Area

prepared by: Jzhang

Date: 3/24/09

# of pages: 3

Attachment 6

Email communications with contra costa county clean water program

Zhong, Jimmy

From: Dan Cloak [dan@dancloak.com]
Sent: Monday, March 02, 2009 3:54 PM
To: 'Tom Dalziel'; Zhong, Jimmy
Subject: RE: Stormwater C.3 Question

Hi,

It is correct that dense-graded aggregates are not very pervious. Why not use an open-graded aggregate, such as ½ in. crushed rock? Be sure to use a rigid frame around the gravel area.

"Porous Pavements" by Bruce Ferguson is a good reference for porous pavement design.

If dense-graded aggregate is used, I would suggest a runoff coefficient of 0.5 to 0.7, depending on slope.

Dan

From: Tom Dalziel [mailto:tdalz@pw.cccounty.us]
Sent: Monday, March 02, 2009 11:04 AM
To: Zhong, Jimmy; Dan@dancloak.com
Subject: RE: Stormwater C.3 Question

Hi Dan,

Can you review and respond, as appropriate, to Jimmy on my behalf?

Thanks.

Tom Dalziel
Assistant Program Manager
Contra Costa Clean Water Program
tdalz@pw.cccounty.us
Ph. (925) 313-2392, Fax (925) 313-2301

From: Zhong, Jimmy [mailto:ZhongJ@bv.com]
Sent: Wednesday, February 25, 2009 1:11 PM
To: Tom Dalziel
Subject: Stormwater C.3 Question

Tom,

I talked to you and Dan this morning regarding runoff factor for Class 2 aggregates (Caltran Standard Specification Section 26). After our phone call, I had a discussion with my supervisor. He indicated that this type of material is **dense-graded** aggregate which is typically used as pavement base material. After being compacted, this type of material is not that pervious based on his experience. Dense-graded aggregates have much lower porosity than open-graded aggregates after compaction. As such, my supervisor thinks the runoff factor of 0.1 can apply to open-graded aggregate but may not be able to apply to dense-graded aggregate. Would you please forward this email to Dan and ask him again if a runoff factor of 0.1 can still be applied to Class 2 aggregates (compacted)? If not, what kind of runoff factor should be used?

I apologize if I did not communicate clearly this morning on the type of material we are using and for any confusions it caused.

Thanks again for your help.

Jimmy Zhong, P.E.
Geotechnical/Civil Engineer
Energy Division
Black & Veatch Corporation
3550 Green Court, Ann Arbor, MI 48105
P: (734) 622-8533 F: (734) 622-8700

BLACK & VEATCH

Calculation Record

Client Name: Radback Energy Page 1 of 53

Project Name: Tenaska Project No.: 163994

Calculation Title: Stormwater Analysis for Wetland

Calculation No./File No.: 52, 5406, 1003

Calculation Is: (check all that apply) ☐ Preliminary ☒ Final ☐ Nuclear Safety-Related

Objective To determine if the existing wetland at the Tenaska project site can retain the runoff of a 100-yr 24-hr storm without overflowing to other properties. The analysis is performed for pre-construction ground conditions at the site.

Unverified Assumptions Requiring Subsequent Verification

No.	Assumption	Verified By	Date

See Page 2 of this calculation for additional assumptions.

This Section Used for Computer Generated Calculations

Program Name/Number: HEC-HMS Version: 3.3

Evidence of or reference to computer program verification, if applicable:

Bases or reference thereto supporting application of the computer program to the physical problem:

Review and Approval

Rev	Prepared By	Date	Verified By	Date	Approved By	Date
0	J Zhong Jimmy Zhong	March 5, 2009	[illegible]	6 MAR 09	[illegible]	6 MAR 09

Purpose

To determine if the existing wetland at the Tenaska project site can retain the runoff of a 100-year 24-hour storm without overflowing to other properties. The analysis is performed for pre-construction ground conditions at the project site. The existing wetland has no outlet structure.

References

1. Black & Veatch Drawings:
   - 163994-SS-3001, Rev. A, "Grading & Drainage - Site"
   - 163994-SS-3002, Rev. A, "Grading & Drainage - Site"
2. US Department of Agriculture; Urban Hydrology for Small Watersheds, 2nd Edition; Technical Release 55 (TR-55); June 1986.
3. US Army Corps of Engineers; Hydrologic Modeling System HEC-HMS, User's Manual, Version 3.3; September 2008.
4. US Army Corps of Engineers; Hydrologic Modeling System HEC-HMS, Technical Reference Manual; March 2000.
5. US Department of Commerce; Technical Paper No. 40; Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years; May 1961.
6. US Department of Agriculture, Natural Resources Conservation Service; Web Soil Survey; http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.
7. Mays, L. W.; Stormwater Collection Systems Design Handbook, McGraw-Hill; 2001.

Definition of Units and Constants

English units will be used.

Example of Common Unit Designations:

Rainfall amount in inches (in)

Drainage area in acres (ac)

Attachments

1. HEC-HMS Input
2. HEC-HMS Output
3. Reference 2 – Select Pages
4. Reference 6 – Select Pages

Summary

Based on the HEC-HMS analysis, the maximum water elevation in the wetland is determined to be EL 9.1 feet. The lowest elevation where the stormwater in the wetland can overflow to other properties is EL 11.5 feet. Based on the HEC-HMS analysis with current ground cover conditions, the stormwater runoff to the wetland will not overflow to other properties for a 100-year 24-hour storm.

Hydrology Modeling – HEC-HMS

There is one drainage area that will drain to the wetland. See Page 5 for the boundary delineation of this area. This drainage area generally has four types of ground cover: (1) Vineyard, 19.85 acres; (2) Gravel Pavement, 3.96 acres; (3) Railroad Yard, 0.94 acres; and (4) Wetland, 0.40 acres. The total area of this drainage area is 25.15 acres (0.0393 mile^2). The measurements of the above areas were made by using AutoCAD.

The stormwater runoff to the wetland for a 100-year 24-hour storm event was modeled by using a computer program, HEC-HMS version 3.3, developed by the US Army Corps of Engineers (Ref. 3).

Section 1.0 Determine the Time of Concentration

Time of concentration (T_c) can be calculated as:

$$T_c = T_{sheet} + T_{shallow} + T_{channel} \qquad \text{(Ref. 4, Eq. 6-11)}$$

Where:

T_{sheet} = travel time in sheet flow;
$T_{shallow}$ = travel time in shallow concentrated flow;
$T_{channel}$ = travel time in open channels.

There is no open channel flow on this site. Thus $T_{channel} = 0$.

The flow path from the hydraulically most distant point of this drainage area to the wetland is identified as shown on Page 5.

The total flow length is measured to 1490 feet.

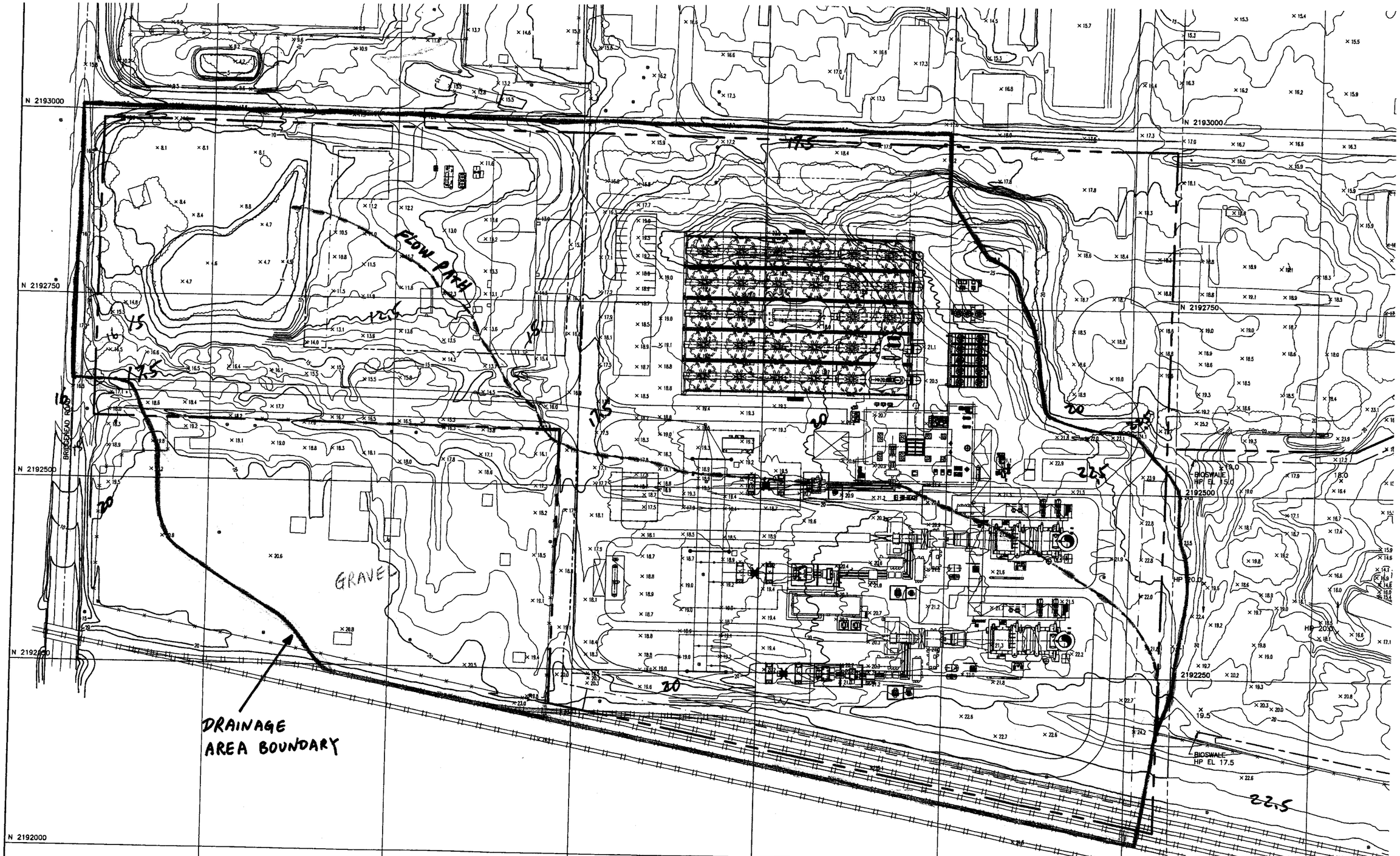
(1) Sheet Flow

Sheet flow travel time can be calculated as:

$$T_{sheet} = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5} s^{0.4}} \qquad \text{(Ref. 2, Eq. 3-3)}$$

Where:

n = roughness coefficient;
L = flow length (ft);
P_2 = 2-year, 24-hour rainfall (in);
s = land slope (ft/ft).



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stormwater Analysis
page 5 of 53

prepared by: J zhong
Date: 3/4/09
checked by: PW
Date: 3/6/09

NOTE: THIS PAGE IS A PORTION OF B&V Drawing 163994-SS-3001 Rev A.

AQAD 16.1s (LMS Tech)
1=1
E1
09:17:10

Roughness coefficient n = 0.17 for "cultivated soils, residue cover > 20%". (Ref. 2, Table 3-1)

Per Ref. 2, "After a maximum of 300 feet, sheet flow usually becomes shallow concentrated flow". Use sheet flow length L = 300 feet.

2-year, 24-hour rainfall P_2 = 2 inch for this site per Ref. 5 (see Page 8).

The land slope for the first 300 feet = (24.2-21.5)/300 = 0.009 ft/ft. (Refer to Page 5)

Thus, $T_{sheet} = \dfrac{0.007 \times (0.17 \times 300)^{0.8}}{2^{0.5} \times 0.009^{0.4}}$ = 0.76 hour.

(2) Shallow Concentrated Flow
The flow length for shallow concentrated flow L = 1490-300 = 1190 feet.
The average watercourse slope = (21.5-5) / 1190 = 0.014 ft/ft. (Refer to Page 5)

Based on a slope of 0.014 ft/ft, from Ref. 2, Figure 3-1, the average velocity (V) for "unpaved" surface is found to be:

V = 1.9 ft/sec.

Thus the travel time for shallow concentrated flow is calculated to be:

$$T_{shallow} = \frac{L}{3600 \times V} = \frac{1190}{3600 \times 1.9} = 0.17 \text{ hour.}$$

In summary, the time of concentration is calculated to be:

$T_c = T_{sheet} + T_{shallow} + T_{channel}$
$= 0.76 + 0.17 + 0$
$= 0.93$ hour.

Per Ref. 4, "For ungaged watersheds, the SCS suggests that the UH (unit hydrograph) lag time may be related to the time of concentration, T_c, as: $T_{lag} = 0.6\ T_c$". See Page 7.

The SCS UH lag time (T_{lag}) is an input parameter into the HEC-HMS computer program. Thus

T_{lag} = 0.6 x 0.93 = 0.56 hour = 33.6 minutes.

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UH can be found from the dimensionless form, which is included in HEC-HMS, by multiplication.

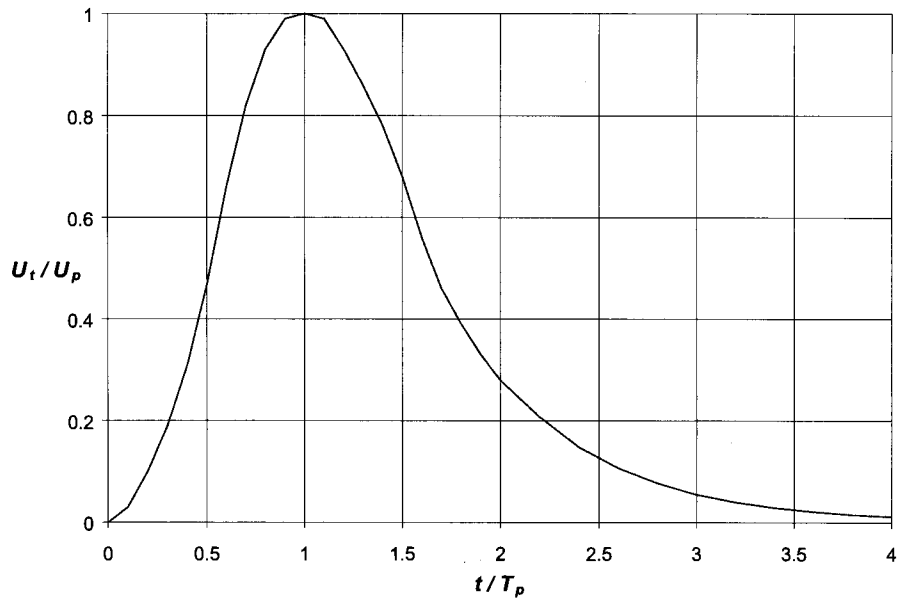


Figure 6-2. SCS unit hydrograph

Estimating the SCS UH Model Parameters

The SCS UH lag can be estimated via calibration, using procedures described in Chapter 9, for gaged headwater subwatersheds.

For ungaged watersheds, the SCS suggests that the UH lag time may be related to time of concentration, t_c, as:

$$t_{lag} = 0.6\, t_c \qquad (6\text{-}10)$$

Time of concentration is a quasi-physically based parameter that can be estimated as

$$t_c = t_{sheet} + t_{shallow} + t_{channel} \qquad (6\text{-}11)$$

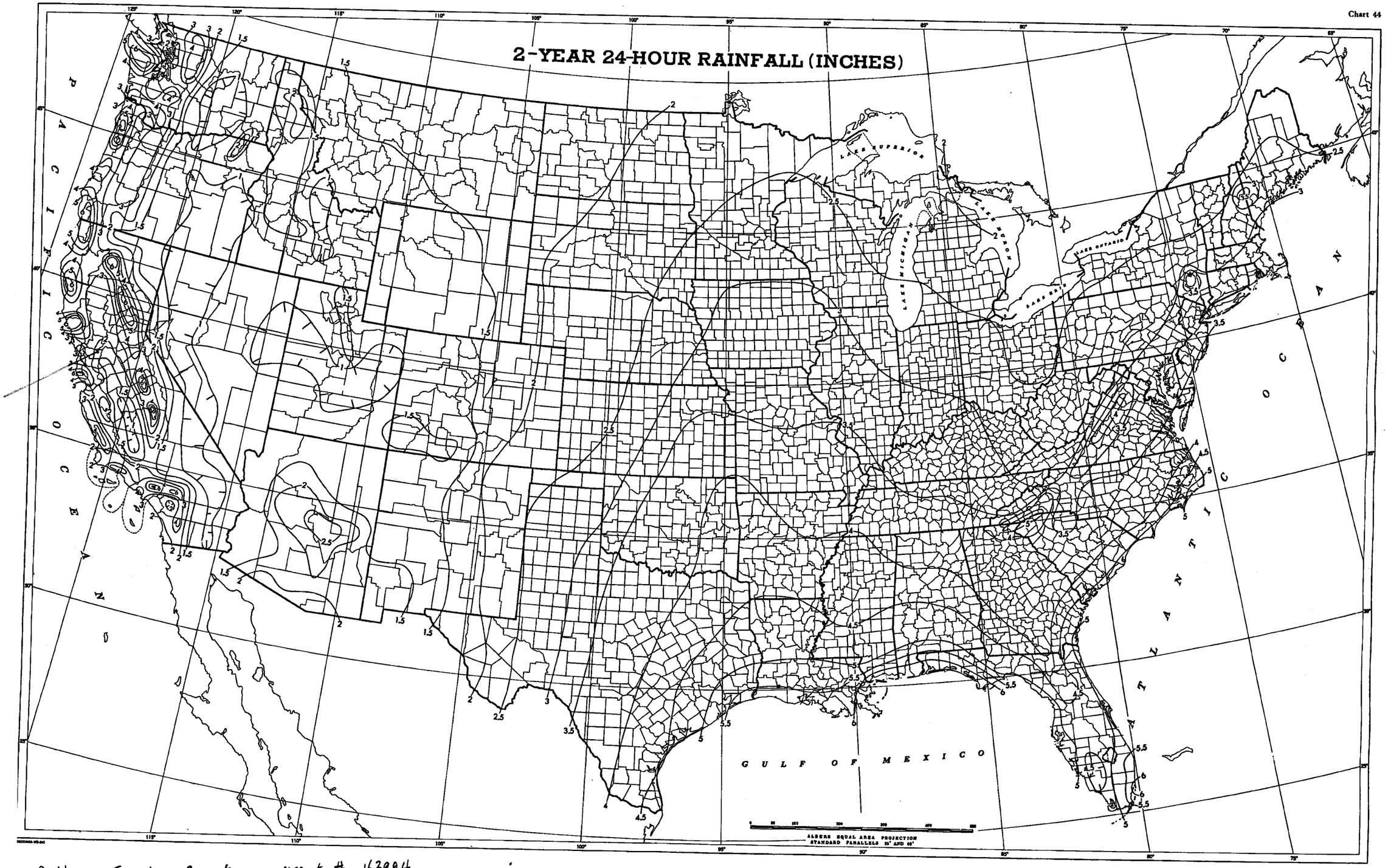
where t_{sheet} = sum of travel time in sheet flow segments over the watershed land surface; $t_{shallow}$ = sum of travel time in shallow flow segments, down streets, in gutters, or in shallow rills and rivulets; and $t_{channel}$ = sum of travel time in channel segments.

NOTE: THIS PAGE IS FROM REF. 4.

Identify open channels where cross section information is available. Obtain cross sections from field surveys, maps, or aerial photographs. For these channels, estimate velocity by Manning's equation:

$$V = \frac{CR^{2/3}S^{1/2}}{n} \qquad (6\text{-}12)$$

where V = average velocity; R = the hydraulic radius (defined as the ratio of channel cross-section area to wetted perimeter); S = slope of the energy grade



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52.5486.1003

NOTE: THIS PAGE IS
FROM REF. 5.

Section 2.0 Rainfall Distribution

From Ref. 2, Figure B-2, the rainfall distribution for the site in Contra Costa County, California should be Type I distribution.

From Ref. 5, the 100-year 24-hour rainfall amount for the site is 4 inches. (See Page 10)

Section 3.0 Determine the Composite SCS Curve Number

"SCS Curve Number" method was used in the HEC-HMS computer program to calculate the loss rate for the drainage area.

The drainage area generally has four types of ground cover: (1) Vineyard, 19.85 acres; (2) Gravel Pavement, 3.96 acres; (3) Railroad Yard, 0.94 acres; and (4) Wetland, 0.40 acres. The total area of this drainage area is 25.15 acres (0.0393 mile^2). The measurements of the above areas were made by using AutoCAD.

Based on the soil survey information from the US Department of Agriculture Natural Resources Conservation Service (NRCS), the site in Contra Costa County, California is covered by "Delhi Sand". See Attachment 4. From the description of "Delhi Sand" by NRCS, this soil layer is "somewhat excessively drained"; the capacity of the most limiting layer to transmit water is "high to very high (5.95 to 19.98 in/hr)". See Attachment 4. Per Ref. 2, this type of soil can be classified as Hydrologic Soil Group A soil.

Per Ref. 2, Table 2-2b, the curve number (CN) for "Row Crops, straight row (SR) with crop residue cover (CR)" for Group A soil is between 64 (good condition) and 71 (poor condition). Use the average curve number 68 for the vineyard area.

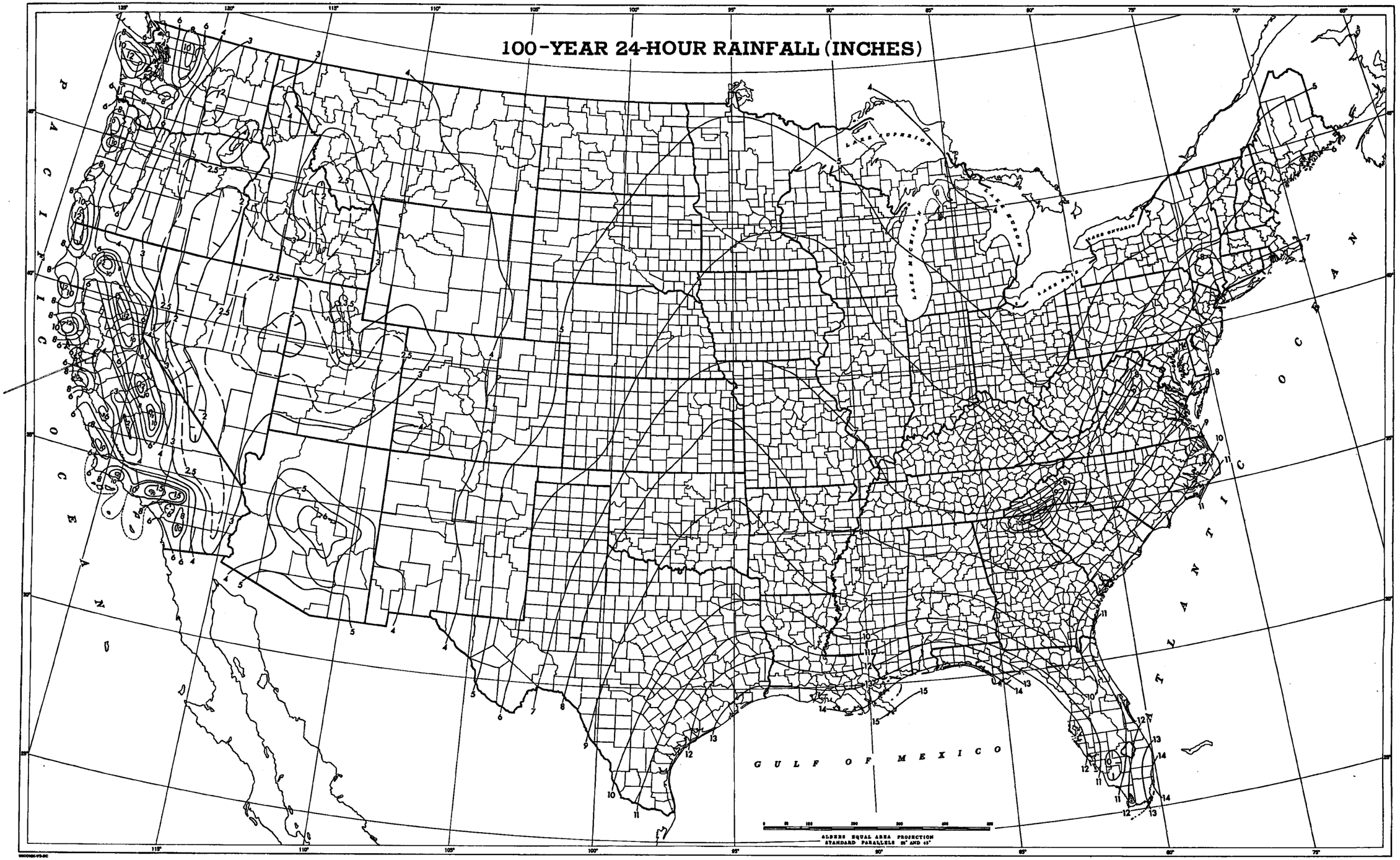
Per Ref. 2, Table 2-2a, the curve number for gravel area for Group A soil is 76. The ground cover in railroad yard is similar to the gravel area. Use the same curve number (76) for the railroad yard.

Treat the wetland as an impervious area since it may have standing water in it. Per Ref. 2, Table 2-2a, a curve number of 98 can be used for this area.

Thus the composite curve number (CN) for the drainage area is calculated as:

$$CN = (19.85 \times 68 + 3.96 \times 76 + 0.94 \times 76 + 0.40 \times 98) / 25.15 = 70.$$

The "SCS Curve Number" method also requires the input of initial abstraction (initial loss) in the computer program. The initial abstraction accounts for all losses before runoff begins. It



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NOTE: THIS PAGE IS FROM REF. 5.

includes water retained in surface depressions, water intercepted by vegetation, evaporation, and infiltration (Ref. 2).

The initial abstraction (I_a) can be estimated to be:

$I_a = 0.2\ S$ (Ref. 2, Eq. 2-2)

Where: $S = \frac{1000}{CN} - 10$ (Ref. 2, Eq. 2-4)

Based on a composite CN of 70, the initial abstraction is calculated to be:

$$I_a = 0.2 \times (1000/70 - 10) = 0.857 \text{ inch.}$$

The "SCS Curve Number" method also requires the input of "% impervious" in the computer program. The impervious area consists of the roofs of a few small buildings in the southwest portion of the drainage area. By using AutoCAD, the total roof area is measured to be 0.17 acre. Thus,

% impervious = 0.17 / 25.15 = 0.68%, say 1%.

Section 4.0 Wetland Area versus Elevation

The bottom of the wetland is at an approximate elevation of 5 feet. See B&V Drawing SS-3001 (Page 5). The relationship of Area versus Elevation for the wetland area was presented in the table below. The wetland area was measured by using AutoCAD. It should be noted that a small portion of the wetland at the east side within the project property will be filled at a later time. This area will be graded at a 4 (H) to 1 (V) slope towards the wetland. The area in the table below at Elevation 10 (1.44 acres) has already had the future fill area been deducted to accurately model the wetland storage capacity.

Elevation (ft)	Wetland Area (acre)
5.0	0.40
7.5	0.62
10.0	1.44

Section 5.0 HEC-HMS Output

The parameters determined in Sections 1.0 through 4.0 were input into the HEC-HMS computer program. The outflow from the wetland is specified in the HEC-HMS program to be 0 at all times (no outflow). The initial water elevation in the wetland is specified to be at

EL 5 assuming that standing water in the wetland is not higher than EL 5 before the 100-year 24-hour storm begins.

The maximum water elevation in the wetland was calculated by running the HEC-HMS program.

The output results are included in Attachment 2 and are summarized below.

Peak Inflow:	9.0 ft^3/sec.
Peak Storage:	2.8 acre-feet
Peak Elevation:	9.1 feet.

Conclusion:

Based on the HEC-HMS analysis, the existing wetland will be able to contain all the runoff from its drainage area at current ground cover conditions for a 100-year 24-hour storm.

From B&V Drawing SS-3001, the lowest elevation where the stormwater in the wetland can overflow to other properties is EL 11.5 feet. Based on the HEC-HMS analysis, the stormwater runoff to the wetland will not overflow to other properties for a 100-year 24-hour storm.

Radback Tenaska project stormwater Analysis JZ 3/4/09

project # 163994

# of pages : 12

52.5406.1003

Attachment 1

HEC-HMS Input

HEC-HMS 3.3 [C:\hmsproj\Radback\Radback.hms]

File Edit View Components Parameters Compute Results Tools Help

- Radback
  - Basin Models
    - Basin 1
      - Drainage Area
      - Wetland
  - Meteorologic Models
    - Met 1
  - Control Specifications
    - Control 1
  - Time-Series Data
    - Discharge Gages
  - Paired Data
    - Elevation-Area Functions

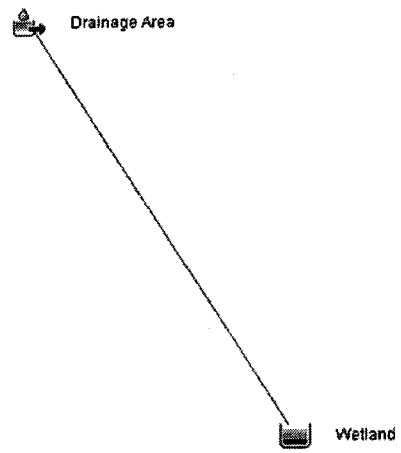
Components | Compute | Results

Subbasin | Loss | Transform | Options

Basin Name: Basin 1
Element Name: Drainage Area

Description:	Tenaska Site
Downstream:	Wetland
Area (MI2)	0.0393
Loss Method:	SCS Curve Number
Transform Method:	SCS Unit Hydrograph
Baseflow Method:	--None--

Basin Model [Basin 1] Current Run [Run 1]




```
NOTE 10181: Opened control specifications "Control 1" at time 05Mar2009, 14:14:46.
NOTE 10179: Opened basin model "Basin 1" at time 05Mar2009, 14:14:46.
NOTE 10180: Opened meteorologic model "Met 1" at time 05Mar2009, 14:14:47.
NOTE 10184: Began computing simulation run "Run 1" at time 05Mar2009, 14:14:48.
NOTE 20364: Found no parameter problems in meteorologic model "Met 1".
NOTE 40049: Found no parameter problems in basin model "Basin 1".
NOTE 41743: Initial abstraction ratio for subbasin "Drainage Area" is 0.2.
NOTE 10185: Finished computing simulation run "Run 1" at time 05Mar2009, 14:14:48.
```

start | HEC-HMS 3.3 [C:\hm...] | 3:18 PM

HEC-HMS 3.3 [C:\hmsproj\Radback\Radback.hms]

File Edit View Components Parameters Compute Results Tools Help

- Radback
  - Basin Models
    - Basin 1
      - Drainage Area
        - SCS Curve Number
        - SCS Unit Hydrograph
        - No Baseflow
      - Wetland
  - Meteorologic Models
  - Control Specifications
  - Time-Series Data
  - Paired Data

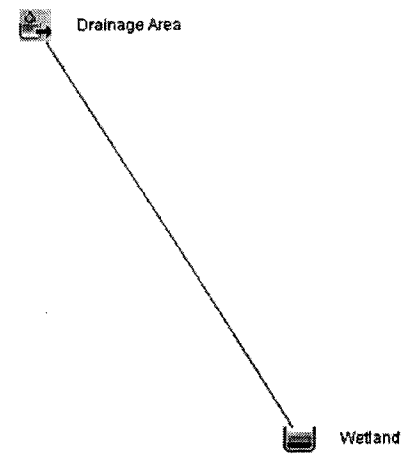
Components | Compute | Results

Subbasin | Loss | Transform | Options

Basin Name: Basin 1
Element Name: Drainage Area

Initial Abstraction (IN)	0.857
Curve Number:	70
Impervious (%)	1

Basin Model [Basin 1], Current Run [Run 1]



NOTE 10179: Opened basin model "Basin 1" at time 11Mar2009, 13:42:37.
NOTE 10181: Opened control specifications "Control 1" at time 11Mar2009, 13:42:56.
NOTE 10180: Opened meteorologic model "Met 1" at time 11Mar2009, 13:42:56.
NOTE 10184: Began computing simulation run "Run 1" at time 11Mar2009, 13:42:58.
NOTE 20364: Found no parameter problems in meteorologic model "Met 1".
NOTE 40049: Found no parameter problems in basin model "Basin 1".
NOTE 41743: Initial abstraction ratio for subbasin "Drainage Area" is 0.2.
NOTE 10185: Finished computing simulation run "Run 1" at time 11Mar2009, 13:42:58.

start | Inbox - Microsoft Out... | HEC-HMS 3.3 [C:\hm... | 1:45 PM

HEC-HMS 3.3 [C:\hmsproj\Radback\Radback.hms]

File Edit View Components Parameters Compute Results Tools Help

- Radback
  - Basin Models
    - Basin 1
      - Drainage Area
      - Wetland
  - Meteorologic Models
    - Met 1
  - Control Specifications
    - Control 1
  - Time-Series Data
    - Discharge Gages
  - Paired Data
    - Elevation-Area Functions

Components | Compute | Results

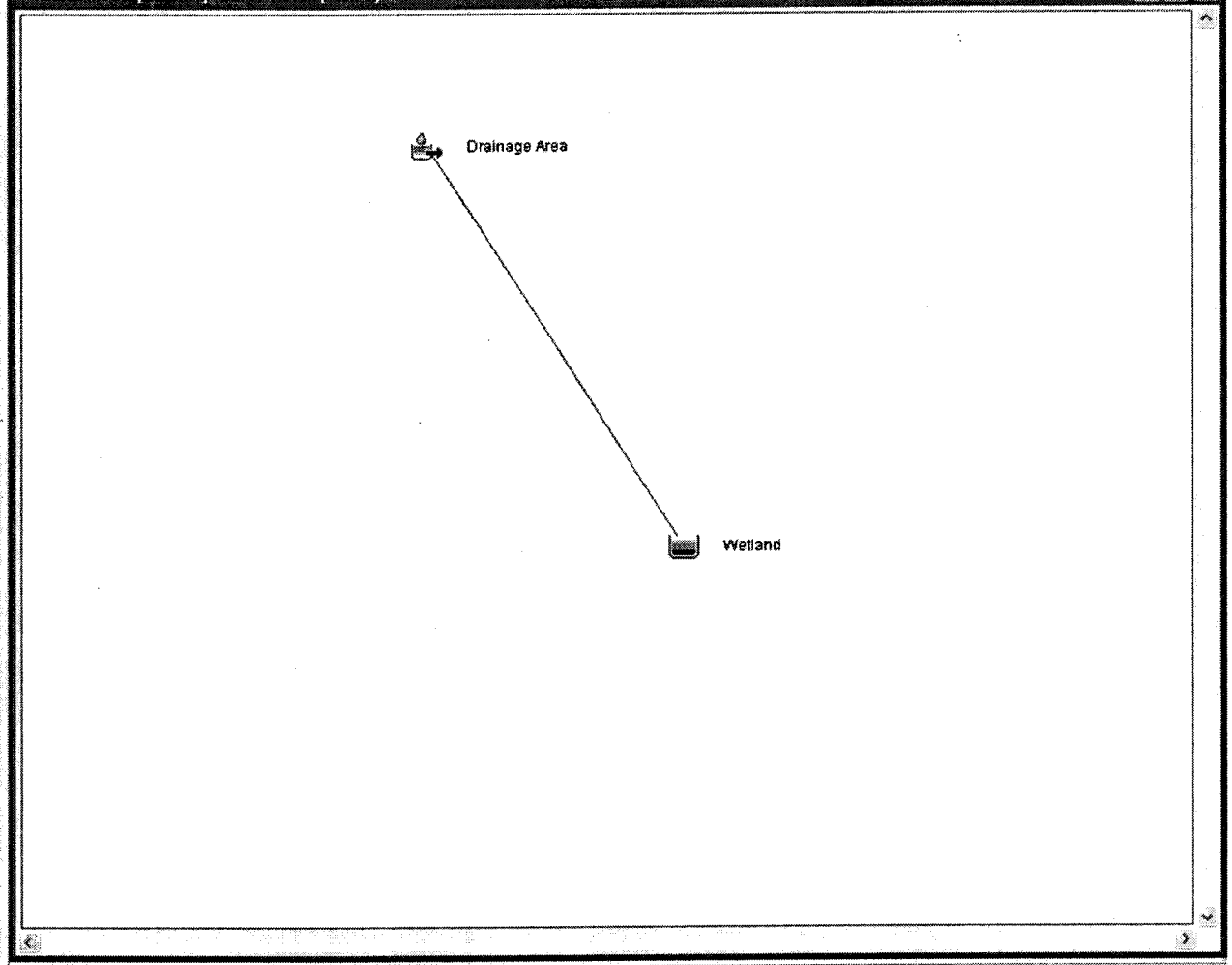
Subbasin | Loss | Transform | Options

Basin Name: Basin 1
Element Name: Drainage Area

Graph Type: Standard

Lag Time (MIN) 33.600000

Basin Model [Basin 1] Current Run [Run 1]




```
NOTE 10181: Opened control specifications "Control 1" at time 05Mar2009, 14:14:46.
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NOTE 10185: Finished computing simulation run "Run 1" at time 05Mar2009, 14:14:48.
```

start

HEC-HMS 3.3 [C:\hmsproj\Radback\Radback.hms]

File Edit View Components Parameters Compute Results Tools Help

- Radback
  - Basin Models
    - Basin 1
      - Drainage Area
      - Wetland
  - Meteorologic Models
    - Met 1
  - Control Specifications
    - Control 1
  - Time-Series Data
    - Discharge Gages
  - Paired Data
    - Elevation-Area Functions

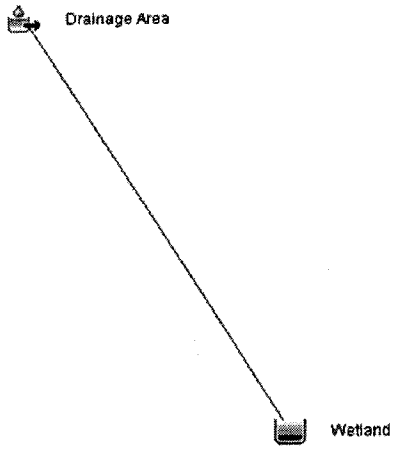
Components | Compute | Results

Subbasin | Loss | Transform | Options

Basin Name: Basin 1
Element Name: Drainage Area

Observed Flow: --None--
Observed Stage: --None--
Observed SWE: --None--
Elev-Discharge: --None--
Ref Flow (CFS)
Ref Label:

Basin Model [Basin 1] Current Run [Run 1]




```
NOTE 10181: Opened control specifications "Control 1" at time 05Mar2009, 14:14:46.
NOTE 10179: Opened basin model "Basin 1" at time 05Mar2009, 14:14:46.
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NOTE 41743: Initial abstraction ratio for subbasin "Drainage Area" is 0.2.
NOTE 10185: Finished computing simulation run "Run 1" at time 05Mar2009, 14:14:48.
```

start | untitled - Paint

HEC-HMS 3.3 [C:\hmsproj\Radback\Radback.hms]

File Edit View Components Parameters Compute Results Tools Help

- Radback
  - Basin Models
    - Basin 1
      - Drainage Area
        - SCS Curve Number
        - SCS Unit Hydrograph
        - No Baseflow
      - Wetland
  - Meteorologic Models
    - Met 1
  - Control Specifications
    - Control 1
  - Time-Series Data
    - Discharge Gages
  - Paired Data
    - Elevation-Area Functions

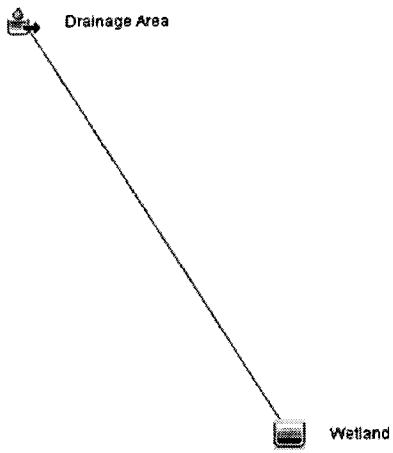
Components | Compute | Results

Reservoir | Options

Basin Name: Basin 1
Element Name: Wetland

Description:	Wetland Storage
Downstream:	-None-
Method:	Specified Release
Storage Method:	Elevation-Area
Elev-Area Function:	Reservoir-1(Basin 1)
Initial Condition:	Elevation
Initial Elevation (FT)	5.0
Discharge Gage:	Gage 1
Max Release (CFS)	
Max Capacity (AC-FT)	

Basin Model [Basin 1] Current Run [Run 1]

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NOTE 10185: Finished computing simulation run "Run 1" at time 05Mar2009, 14:14:48.
```

start

HEC-HMS 3.3 [C:\hmsproj\Radback\Radback.hms]

File Edit View Components Parameters Compute Results Tools Help

- Radback
  - Basin Models
    - Basin 1
      - Drainage Area
        - SCS Curve Number
        - SCS Unit Hydrograph
        - No Baseflow
      - Wetland
  - Meteorologic Models
    - Met 1
  - Control Specifications
    - Control 1
  - Time-Series Data
    - Discharge Gages
  - Paired Data
    - Elevation-Area Functions

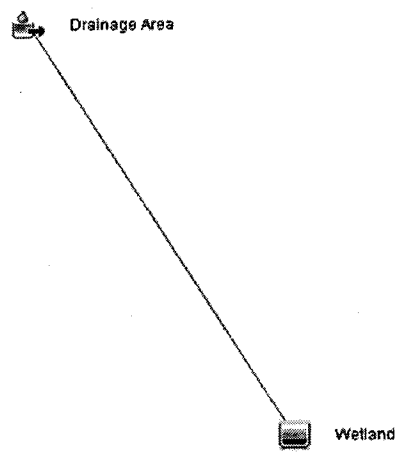
Components | Compute | Results

Reservoir | Options

Basin Name: Basin 1
Element Name: Wetland

Observed Flow: --None--
Observed Stage: --None--
Observed Pool Elevation: --None--
Elev-Discharge: --None--
Ref Flow (CFS)
Ref Label:

Basin Model [Basin 1] Current Run [Run 1]

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NOTE 10185: Finished computing simulation run "Run 1" at time 05Mar2009, 14:14:48.
```

start

HEC-HMS 3.3 [C:\hmsproj\Radback\Radback.hms]

File Edit View Components Parameters Compute Results Tools Help

- Radback
  - Basin Models
    - Basin 1
      - Drainage Area
        - SCS Curve Number
        - SCS Unit Hydrograph
        - No Baseflow
      - Wetland
  - Meteorologic Models
    - Met 1
      - SCS Storm
  - Control Specifications
    - Control 1
  - Time-Series Data
    - Discharge Gages
  - Paired Data
    - Elevation-Area Functions

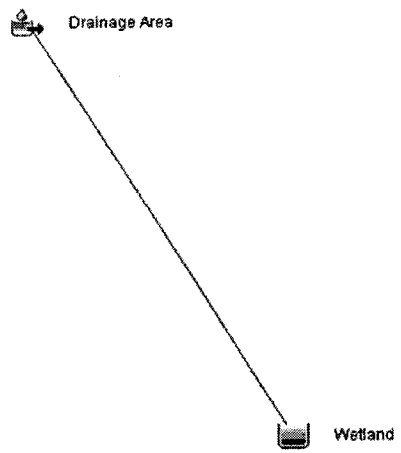
Components | Compute | Results

Meteorology Model | Basins

Name: Met 1

Description:	Antioch, CA (100-yr 24-hr storm)
Precipitation:	SCS Storm
Evapotranspiration:	--None--
Snowmelt:	--None--
Unit System:	U.S. Customary

Basin Model [Basin 1] Current Run [Run 1]




```
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NOTE 41743: Initial abstraction ratio for subbasin "Drainage Area" is 0.2.
NOTE 10185: Finished computing simulation run "Run 1" at time 05Mar2009, 14:14:48.
```

start | HEC-HMS 3.3 [C:\hm... | untitled - Paint | 2:26 PM

HEC-HMS 3.3 [C:\hmsproj\Radback\Radback.hms]

File Edit View Components Parameters Compute Results Tools Help

- Radback
  - Basin Models
    - Basin 1
      - Drainage Area
        - SCS Curve Number
        - SCS Unit Hydrograph
        - No Baseflow
      - Wetland
  - Meteorologic Models
    - Met 1
      - SCS Storm
  - Control Specifications
    - Control 1
  - Time-Series Data
    - Discharge Gages
  - Paired Data
    - Elevation-Area Functions

Components | Compute | Results

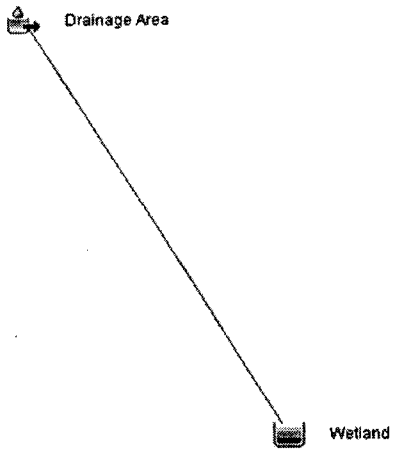
Precipitation

Name: Met 1

Method: Type 1

Depth (IN) 4.0

Basin Model [Basin 1] Current Run [Run 1]

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NOTE 10185: Finished computing simulation run "Run 1" at time 05Mar2009, 14:14:48.
```

start | untitled - Paint | 2:27 PM

HEC-HMS 3.3 [C:\hmsproj\Radback\Radback.hms]

File Edit View Components Parameters Compute Results Tools Help

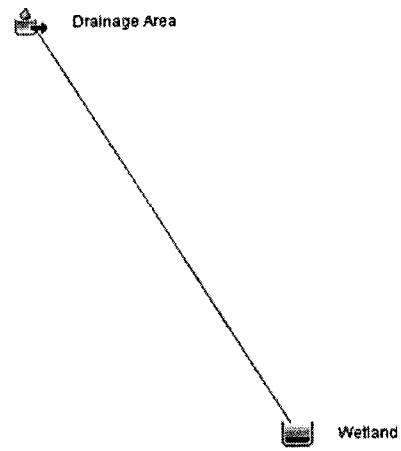
- Radback
  - Basin Models
    - Basin 1
      - Drainage Area
        - SCS Curve Number
        - SCS Unit Hydrograph
        - No Baseflow
      - Wetland
  - Meteorologic Models
    - Met 1
      - SCS Storm
  - Control Specifications
    - Control 1
  - Time-Series Data
    - Discharge Gages
      - Gage 1
  - Paired Data
    - Elevation-Area Functions
      - Basin Storage 1 (Basin 1)

Components | Compute | Results

Paired Data | Table | Graph

Elevation (FT)	Area (AC)
5.0	0.40
7.5	0.62
10.0	1.44

Basin Model [Basin 1], Current Run [Run 1]




```
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NOTE 10180: Opened meteorologic model "Met 1" at time 05Mar2009, 14:14:47.
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NOTE 20364: Found no parameter problems in meteorologic model "Met 1".
NOTE 40049: Found no parameter problems in basin model "Basin 1".
NOTE 41743: Initial abstraction ratio for subbasin "Drainage Area" is 0.2.
NOTE 10185: Finished computing simulation run "Run 1" at time 05Mar2009, 14:14:48.
```

start | HEC-HMS 3.3 [C:\hm... | untitled - Paint | 2:29 PM

HEC-HMS 3.3 [C:\hmsproj\Radback\Radback.hms]

File Edit View Components Parameters Compute Results Tools Help

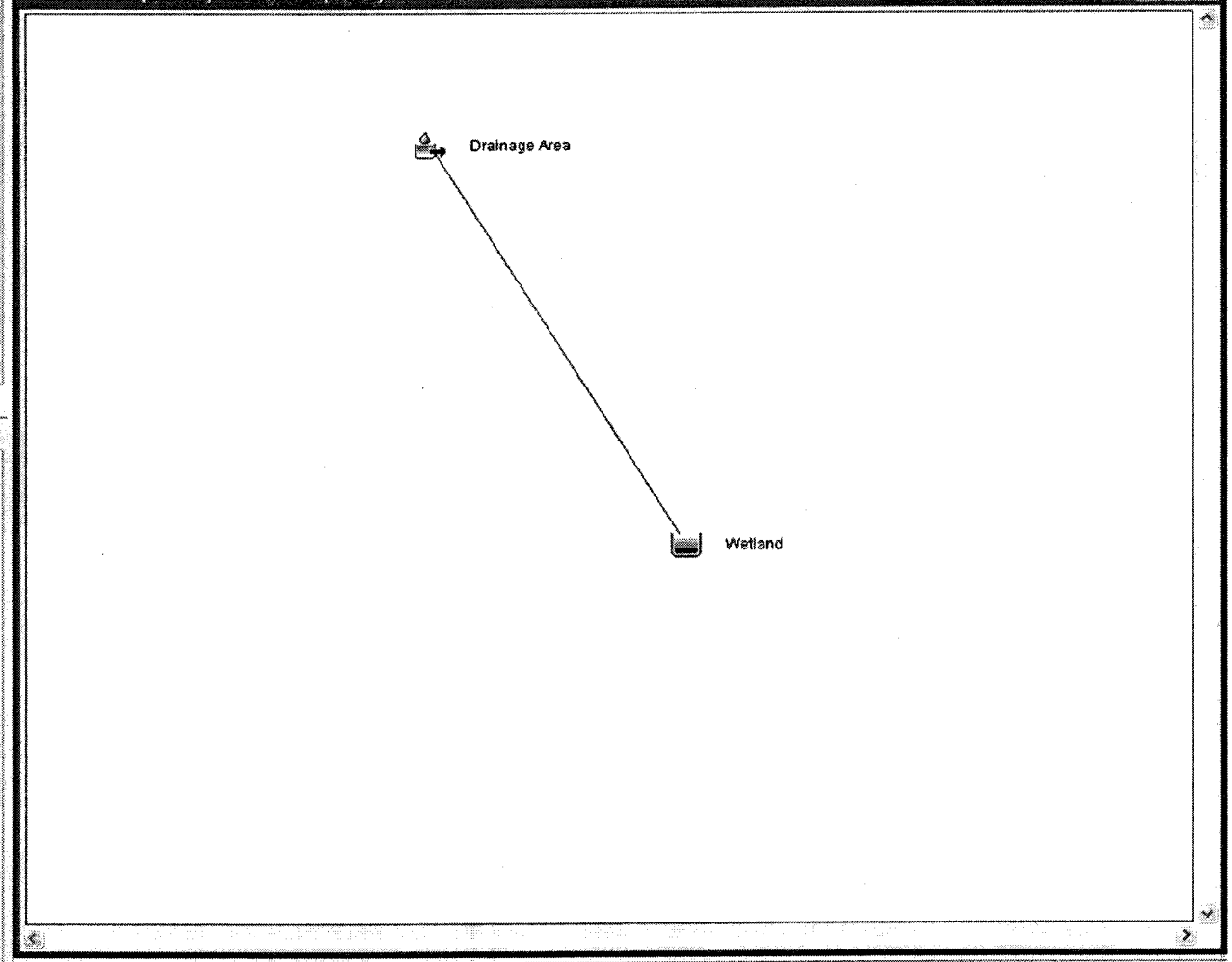
- Radback
  - Basin Models
    - Basin 1
      - Drainage Area
        - SCS Curve Number
        - SCS Unit Hydrograph
        - No Baseflow
      - Wetland
  - Meteorologic Models
    - Met 1
      - SCS Storm
  - Control Specifications
    - Control 1
  - Time-Series Data
    - Discharge Gages
      - Gage 1
        - 10Jan2020, 06:00 - 12Jan2020, 06:00
  - Paired Data
    - Elevation-Area Functions
      - Reservoir-1(Basin 1)

Components | Compute | Results

Time-Series Gage | Time Window | Table | Graph

Time (ddMMMYYYY, HH:mm)	Discharge (CFS)
10Jan2020, 06:00	0.0
10Jan2020, 07:00	0.0
10Jan2020, 08:00	0.0
10Jan2020, 09:00	0.0
10Jan2020, 10:00	0.0
10Jan2020, 11:00	0.0
10Jan2020, 12:00	0.0
10Jan2020, 13:00	0.0
10Jan2020, 14:00	0.0
10Jan2020, 15:00	0.0
10Jan2020, 16:00	0.0
10Jan2020, 17:00	0.0
10Jan2020, 18:00	0.0
10Jan2020, 19:00	0.0
10Jan2020, 20:00	0.0
10Jan2020, 21:00	0.0
10Jan2020, 22:00	0.0
10Jan2020, 23:00	0.0
11Jan2020, 00:00	0.0
11Jan2020, 01:00	0.0
11Jan2020, 02:00	0.0
11Jan2020, 03:00	0.0
11Jan2020, 04:00	0.0
11Jan2020, 05:00	0.0
11Jan2020, 06:00	0.0

Basin Model [Basin 1] Current Run [Run 1]




```
NOTE 10181: Opened control specifications "Control 1" at time 05Mar2009, 14:14:46.
NOTE 10179: Opened basin model "Basin 1" at time 05Mar2009, 14:14:46.
NOTE 10180: Opened meteorologic model "Met 1" at time 05Mar2009, 14:14:47.
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NOTE 20364: Found no parameter problems in meteorologic model "Met 1".
NOTE 40049: Found no parameter problems in basin model "Basin 1".
NOTE 41743: Initial abstraction ratio for subbasin "Drainage Area" is 0.2.
NOTE 10185: Finished computing simulation run "Run 1" at time 05Mar2009, 14:14:48.
```

start | HEC-HMS 3.3 [C:\hm... | untitled - Paint

HEC-HMS 3.3 [C:\hmsproj\Radback\Radback.hms]

File Edit View Components Parameters Compute Results Tools Help

- Radback
  - Basin Models
    - Basin 1
      - Drainage Area
        - SCS Curve Number
        - SCS Unit Hydrograph
        - No Baseflow
      - Wetland
  - Meteorologic Models
    - Met 1
      - SCS Storm
  - Control Specifications
    - Control 1
  - Time-Series Data
    - Discharge Gages
  - Paired Data
    - Elevation-Area Functions

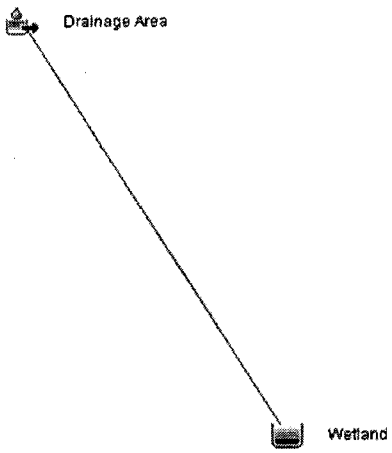
Components | Compute | Results

Control Specifications

Name: Control 1

Description:	Duration
Start Date (ddMMMYYYY)	10Jan2020
Start Time (HH:mm)	06:00
End Date (ddMMMYYYY)	12Jan2020
End Time (HH:mm)	06:00
Time Interval:	6 Minutes

Basin Model [Basin 1] Current Run [Run 1]




```
NOTE 10181: Opened control specifications "Control 1" at time 05Mar2009, 14:14:46.
NOTE 10179: Opened basin model "Basin 1" at time 05Mar2009, 14:14:46.
NOTE 10160: Opened meteorologic model "Met 1" at time 05Mar2009, 14:14:47.
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NOTE 40049: Found no parameter problems in basin model "Basin 1".
NOTE 41743: Initial abstraction ratio for subbasin "Drainage Area" is 0.2.
NOTE 10185: Finished computing simulation run "Run 1" at time 05Mar2009, 14:14:48.
```

start | HEC-HMS 3.3 [C:\hmsp... | untitled - Paint | 2:28 PM

Radback Tenaska Project stormwater Analysis JZ 3/4/09

project # 163994

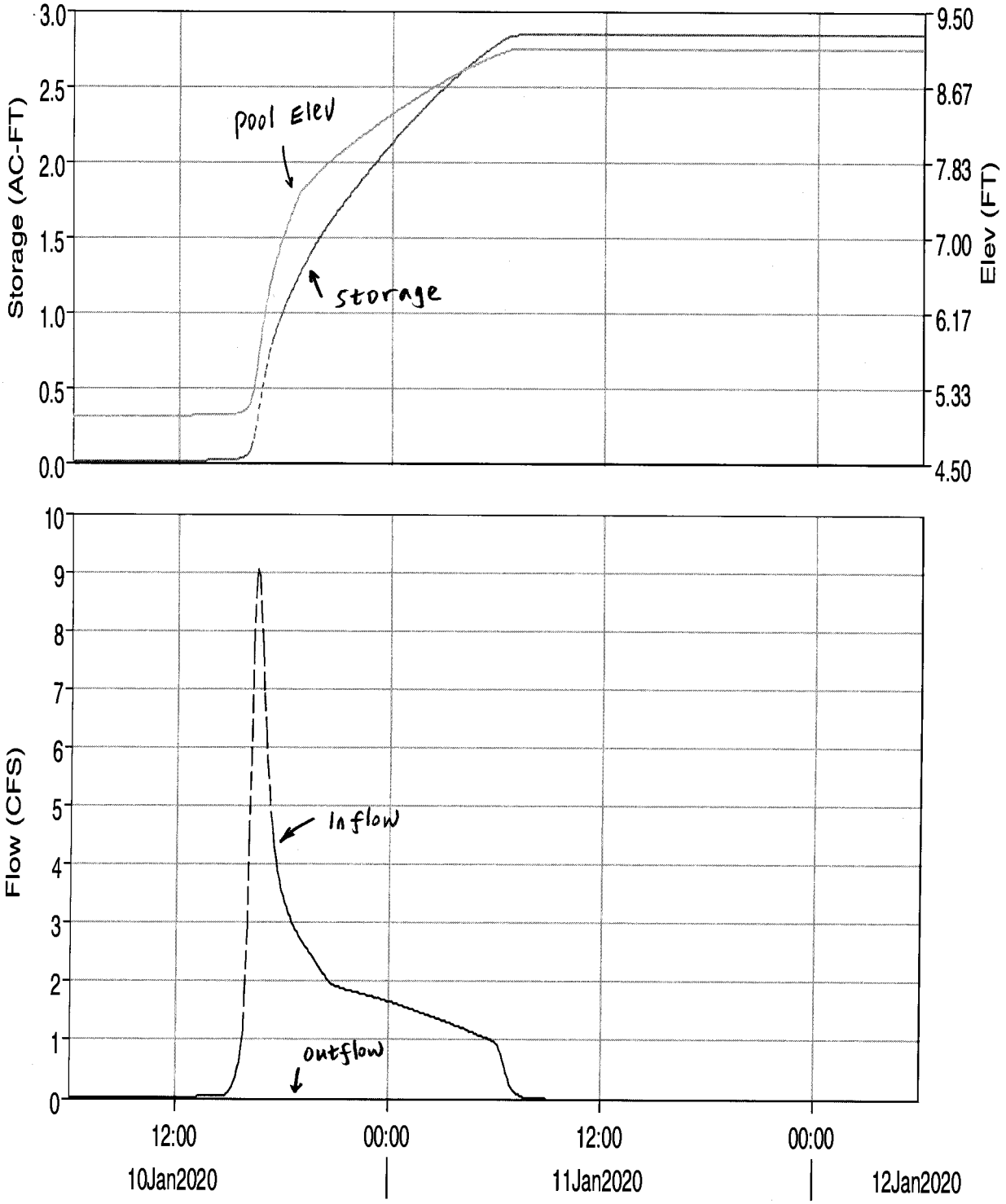
# of pages: 15

52, 5406, 1003

Attachment 2

HEC-HMS Output

Reservoir "Wetland" Results for Run "Run 1"



Run:Run 1 Element:WETLAND Result:Storage

Run:Run 1 Element:WETLAND Result:Pool Elevation

Run:Run 1 Element:WETLAND Result:Outflow

Run:Run 1 Element:WETLAND Result:Combined Inflow

Project: Radback
Simulation Run: Run 1 Reservo

Start of Run: 10Jan2020, 06:00 Basin
End of Run: 12Jan2020, 06:00 M
Compute Time: 11Mar2009, 13:42:58

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
10Jan2020	06:00	0.0	0.0	5.0	0.0
10Jan2020	06:06	0.0	0.0	5.0	0.0
10Jan2020	06:12	0.0	0.0	5.0	0.0
10Jan2020	06:18	0.0	0.0	5.0	0.0
10Jan2020	06:24	0.0	0.0	5.0	0.0
10Jan2020	06:30	0.0	0.0	5.0	0.0
10Jan2020	06:36	0.0	0.0	5.0	0.0
10Jan2020	06:42	0.0	0.0	5.0	0.0
10Jan2020	06:48	0.0	0.0	5.0	0.0
10Jan2020	06:54	0.0	0.0	5.0	0.0
10Jan2020	07:00	0.0	0.0	5.0	0.0
10Jan2020	07:06	0.0	0.0	5.0	0.0
10Jan2020	07:12	0.0	0.0	5.0	0.0
10Jan2020	07:18	0.0	0.0	5.0	0.0
10Jan2020	07:24	0.0	0.0	5.0	0.0
10Jan2020	07:30	0.0	0.0	5.0	0.0
10Jan2020	07:36	0.0	0.0	5.0	0.0
10Jan2020	07:42	0.0	0.0	5.0	0.0
10Jan2020	07:48	0.0	0.0	5.0	0.0
10Jan2020	07:54	0.0	0.0	5.0	0.0
10Jan2020	08:00	0.0	0.0	5.0	0.0
10Jan2020	08:06	0.0	0.0	5.0	0.0
10Jan2020	08:12	0.0	0.0	5.0	0.0
10Jan2020	08:18	0.0	0.0	5.0	0.0
10Jan2020	08:24	0.0	0.0	5.0	0.0

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
10Jan2020	08:30	0.0	0.0	5.0	0.0
10Jan2020	08:36	0.0	0.0	5.0	0.0
10Jan2020	08:42	0.0	0.0	5.0	0.0
10Jan2020	08:48	0.0	0.0	5.0	0.0
10Jan2020	08:54	0.0	0.0	5.0	0.0
10Jan2020	09:00	0.0	0.0	5.0	0.0
10Jan2020	09:06	0.0	0.0	5.0	0.0
10Jan2020	09:12	0.0	0.0	5.0	0.0
10Jan2020	09:18	0.0	0.0	5.0	0.0
10Jan2020	09:24	0.0	0.0	5.0	0.0
10Jan2020	09:30	0.0	0.0	5.0	0.0
10Jan2020	09:36	0.0	0.0	5.0	0.0
10Jan2020	09:42	0.0	0.0	5.0	0.0
10Jan2020	09:48	0.0	0.0	5.0	0.0
10Jan2020	09:54	0.0	0.0	5.0	0.0
10Jan2020	10:00	0.0	0.0	5.0	0.0
10Jan2020	10:06	0.0	0.0	5.0	0.0
10Jan2020	10:12	0.0	0.0	5.0	0.0
10Jan2020	10:18	0.0	0.0	5.0	0.0
10Jan2020	10:24	0.0	0.0	5.0	0.0
10Jan2020	10:30	0.0	0.0	5.0	0.0
10Jan2020	10:36	0.0	0.0	5.0	0.0
10Jan2020	10:42	0.0	0.0	5.0	0.0
10Jan2020	10:48	0.0	0.0	5.0	0.0
10Jan2020	10:54	0.0	0.0	5.0	0.0
10Jan2020	11:00	0.0	0.0	5.0	0.0
10Jan2020	11:06	0.0	0.0	5.0	0.0
10Jan2020	11:12	0.0	0.0	5.0	0.0
10Jan2020	11:18	0.0	0.0	5.0	0.0
10Jan2020	11:24	0.0	0.0	5.0	0.0
10Jan2020	11:30	0.0	0.0	5.0	0.0

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
10Jan2020	11:36	0.0	0.0	5.0	0.0
10Jan2020	11:42	0.0	0.0	5.0	0.0
10Jan2020	11:48	0.0	0.0	5.0	0.0
10Jan2020	11:54	0.0	0.0	5.0	0.0
10Jan2020	12:00	0.0	0.0	5.0	0.0
10Jan2020	12:06	0.0	0.0	5.0	0.0
10Jan2020	12:12	0.0	0.0	5.0	0.0
10Jan2020	12:18	0.0	0.0	5.0	0.0
10Jan2020	12:24	0.0	0.0	5.0	0.0
10Jan2020	12:30	0.0	0.0	5.0	0.0
10Jan2020	12:36	0.0	0.0	5.0	0.0
10Jan2020	12:42	0.0	0.0	5.0	0.0
10Jan2020	12:48	0.0	0.0	5.0	0.0
10Jan2020	12:54	0.0	0.0	5.0	0.0
10Jan2020	13:00	0.0	0.0	5.0	0.0
10Jan2020	13:06	0.0	0.0	5.0	0.0
10Jan2020	13:12	0.0	0.0	5.0	0.0
10Jan2020	13:18	0.0	0.0	5.0	0.0
10Jan2020	13:24	0.0	0.0	5.0	0.0
10Jan2020	13:30	0.0	0.0	5.0	0.0
10Jan2020	13:36	0.0	0.0	5.0	0.0
10Jan2020	13:42	0.0	0.0	5.0	0.0
10Jan2020	13:48	0.0	0.0	5.0	0.0
10Jan2020	13:54	0.0	0.0	5.0	0.0
10Jan2020	14:00	0.0	0.0	5.0	0.0
10Jan2020	14:06	0.0	0.0	5.0	0.0
10Jan2020	14:12	0.0	0.0	5.0	0.0
10Jan2020	14:18	0.0	0.0	5.0	0.0
10Jan2020	14:24	0.0	0.0	5.0	0.0
10Jan2020	14:30	0.0	0.0	5.0	0.0
10Jan2020	14:36	0.0	0.0	5.0	0.0

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
10Jan2020	14:42	0.1	0.0	5.0	0.0
10Jan2020	14:48	0.1	0.0	5.0	0.0
10Jan2020	14:54	0.1	0.0	5.0	0.0
10Jan2020	15:00	0.1	0.0	5.0	0.0
10Jan2020	15:06	0.2	0.0	5.0	0.0
10Jan2020	15:12	0.2	0.0	5.0	0.0
10Jan2020	15:18	0.3	0.0	5.0	0.0
10Jan2020	15:24	0.4	0.0	5.1	0.0
10Jan2020	15:30	0.5	0.0	5.1	0.0
10Jan2020	15:36	0.6	0.0	5.1	0.0
10Jan2020	15:42	0.8	0.0	5.1	0.0
10Jan2020	15:48	1.1	0.0	5.1	0.0
10Jan2020	15:54	1.8	0.1	5.1	0.0
10Jan2020	16:00	2.9	0.1	5.2	0.0
10Jan2020	16:06	4.4	0.1	5.2	0.0
10Jan2020	16:12	6.2	0.2	5.3	0.0
10Jan2020	16:18	7.7	0.2	5.4	0.0
10Jan2020	16:24	8.7	0.3	5.6	0.0
10Jan2020	16:30	9.0	0.4	5.7	0.0
10Jan2020	16:36	8.9	0.4	5.8	0.0
10Jan2020	16:42	8.4	0.5	6.0	0.0
10Jan2020	16:48	7.7	0.6	6.1	0.0
10Jan2020	16:54	6.9	0.6	6.2	0.0
10Jan2020	17:00	6.3	0.7	6.3	0.0
10Jan2020	17:06	5.8	0.7	6.4	0.0
10Jan2020	17:12	5.3	0.8	6.5	0.0
10Jan2020	17:18	4.9	0.8	6.6	0.0
10Jan2020	17:24	4.6	0.9	6.7	0.0
10Jan2020	17:30	4.3	0.9	6.8	0.0
10Jan2020	17:36	4.1	0.9	6.8	0.0
10Jan2020	17:42	3.9	1.0	6.9	0.0

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
10Jan2020	17:48	3.7	1.0	7.0	0.0
10Jan2020	17:54	3.6	1.0	7.0	0.0
10Jan2020	18:00	3.5	1.1	7.1	0.0
10Jan2020	18:06	3.3	1.1	7.1	0.0
10Jan2020	18:12	3.3	1.1	7.2	0.0
10Jan2020	18:18	3.2	1.1	7.2	0.0
10Jan2020	18:24	3.1	1.2	7.3	0.0
10Jan2020	18:30	3.0	1.2	7.3	0.0
10Jan2020	18:36	3.0	1.2	7.4	0.0
10Jan2020	18:42	2.9	1.2	7.4	0.0
10Jan2020	18:48	2.8	1.3	7.5	0.0
10Jan2020	18:54	2.8	1.3	7.5	0.0
10Jan2020	19:00	2.7	1.3	7.5	0.0
10Jan2020	19:06	2.7	1.3	7.6	0.0
10Jan2020	19:12	2.6	1.3	7.6	0.0
10Jan2020	19:18	2.6	1.4	7.6	0.0
10Jan2020	19:24	2.5	1.4	7.6	0.0
10Jan2020	19:30	2.5	1.4	7.6	0.0
10Jan2020	19:36	2.5	1.4	7.7	0.0
10Jan2020	19:42	2.4	1.5	7.7	0.0
10Jan2020	19:48	2.4	1.5	7.7	0.0
10Jan2020	19:54	2.3	1.5	7.7	0.0
10Jan2020	20:00	2.3	1.5	7.7	0.0
10Jan2020	20:06	2.2	1.5	7.8	0.0
10Jan2020	20:12	2.2	1.5	7.8	0.0
10Jan2020	20:18	2.1	1.6	7.8	0.0
10Jan2020	20:24	2.1	1.6	7.8	0.0
10Jan2020	20:30	2.1	1.6	7.8	0.0
10Jan2020	20:36	2.0	1.6	7.8	0.0
10Jan2020	20:42	2.0	1.6	7.9	0.0
10Jan2020	20:48	2.0	1.6	7.9	0.0

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
10Jan2020	20:54	1.9	1.7	7.9	0.0
10Jan2020	21:00	1.9	1.7	7.9	0.0
10Jan2020	21:06	1.9	1.7	7.9	0.0
10Jan2020	21:12	1.9	1.7	7.9	0.0
10Jan2020	21:18	1.9	1.7	8.0	0.0
10Jan2020	21:24	1.9	1.7	8.0	0.0
10Jan2020	21:30	1.9	1.8	8.0	0.0
10Jan2020	21:36	1.9	1.8	8.0	0.0
10Jan2020	21:42	1.9	1.8	8.0	0.0
10Jan2020	21:48	1.8	1.8	8.0	0.0
10Jan2020	21:54	1.8	1.8	8.1	0.0
10Jan2020	22:00	1.8	1.8	8.1	0.0
10Jan2020	22:06	1.8	1.8	8.1	0.0
10Jan2020	22:12	1.8	1.9	8.1	0.0
10Jan2020	22:18	1.8	1.9	8.1	0.0
10Jan2020	22:24	1.8	1.9	8.1	0.0
10Jan2020	22:30	1.8	1.9	8.1	0.0
10Jan2020	22:36	1.8	1.9	8.2	0.0
10Jan2020	22:42	1.8	1.9	8.2	0.0
10Jan2020	22:48	1.8	2.0	8.2	0.0
10Jan2020	22:54	1.8	2.0	8.2	0.0
10Jan2020	23:00	1.7	2.0	8.2	0.0
10Jan2020	23:06	1.7	2.0	8.2	0.0
10Jan2020	23:12	1.7	2.0	8.2	0.0
10Jan2020	23:18	1.7	2.0	8.3	0.0
10Jan2020	23:24	1.7	2.0	8.3	0.0
10Jan2020	23:30	1.7	2.1	8.3	0.0
10Jan2020	23:36	1.7	2.1	8.3	0.0
10Jan2020	23:42	1.7	2.1	8.3	0.0
10Jan2020	23:48	1.7	2.1	8.3	0.0
10Jan2020	23:54	1.7	2.1	8.3	0.0

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
11Jan2020	00:00	1.7	2.1	8.4	0.0
11Jan2020	00:06	1.6	2.1	8.4	0.0
11Jan2020	00:12	1.6	2.2	8.4	0.0
11Jan2020	00:18	1.6	2.2	8.4	0.0
11Jan2020	00:24	1.6	2.2	8.4	0.0
11Jan2020	00:30	1.6	2.2	8.4	0.0
11Jan2020	00:36	1.6	2.2	8.4	0.0
11Jan2020	00:42	1.6	2.2	8.5	0.0
11Jan2020	00:48	1.6	2.2	8.5	0.0
11Jan2020	00:54	1.6	2.2	8.5	0.0
11Jan2020	01:00	1.6	2.3	8.5	0.0
11Jan2020	01:06	1.6	2.3	8.5	0.0
11Jan2020	01:12	1.5	2.3	8.5	0.0
11Jan2020	01:18	1.5	2.3	8.5	0.0
11Jan2020	01:24	1.5	2.3	8.5	0.0
11Jan2020	01:30	1.5	2.3	8.6	0.0
11Jan2020	01:36	1.5	2.3	8.6	0.0
11Jan2020	01:42	1.5	2.3	8.6	0.0
11Jan2020	01:48	1.5	2.4	8.6	0.0
11Jan2020	01:54	1.5	2.4	8.6	0.0
11Jan2020	02:00	1.5	2.4	8.6	0.0
11Jan2020	02:06	1.4	2.4	8.6	0.0
11Jan2020	02:12	1.4	2.4	8.6	0.0
11Jan2020	02:18	1.4	2.4	8.6	0.0
11Jan2020	02:24	1.4	2.4	8.7	0.0
11Jan2020	02:30	1.4	2.4	8.7	0.0
11Jan2020	02:36	1.4	2.5	8.7	0.0
11Jan2020	02:42	1.4	2.5	8.7	0.0
11Jan2020	02:48	1.4	2.5	8.7	0.0
11Jan2020	02:54	1.4	2.5	8.7	0.0
11Jan2020	03:00	1.3	2.5	8.7	0.0

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
11Jan2020	03:06	1.3	2.5	8.7	0.0
11Jan2020	03:12	1.3	2.5	8.8	0.0
11Jan2020	03:18	1.3	2.5	8.8	0.0
11Jan2020	03:24	1.3	2.5	8.8	0.0
11Jan2020	03:30	1.3	2.6	8.8	0.0
11Jan2020	03:36	1.3	2.6	8.8	0.0
11Jan2020	03:42	1.3	2.6	8.8	0.0
11Jan2020	03:48	1.2	2.6	8.8	0.0
11Jan2020	03:54	1.2	2.6	8.8	0.0
11Jan2020	04:00	1.2	2.6	8.8	0.0
11Jan2020	04:06	1.2	2.6	8.8	0.0
11Jan2020	04:12	1.2	2.6	8.9	0.0
11Jan2020	04:18	1.2	2.6	8.9	0.0
11Jan2020	04:24	1.2	2.6	8.9	0.0
11Jan2020	04:30	1.2	2.7	8.9	0.0
11Jan2020	04:36	1.2	2.7	8.9	0.0
11Jan2020	04:42	1.1	2.7	8.9	0.0
11Jan2020	04:48	1.1	2.7	8.9	0.0
11Jan2020	04:54	1.1	2.7	8.9	0.0
11Jan2020	05:00	1.1	2.7	8.9	0.0
11Jan2020	05:06	1.1	2.7	8.9	0.0
11Jan2020	05:12	1.1	2.7	8.9	0.0
11Jan2020	05:18	1.1	2.7	9.0	0.0
11Jan2020	05:24	1.1	2.7	9.0	0.0
11Jan2020	05:30	1.0	2.7	9.0	0.0
11Jan2020	05:36	1.0	2.8	9.0	0.0
11Jan2020	05:42	1.0	2.8	9.0	0.0
11Jan2020	05:48	1.0	2.8	9.0	0.0
11Jan2020	05:54	1.0	2.8	9.0	0.0
11Jan2020	06:00	1.0	2.8	9.0	0.0
11Jan2020	06:06	1.0	2.8	9.0	0.0

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
11Jan2020	06:12	0.9	2.8	9.0	0.0
11Jan2020	06:18	0.9	2.8	9.0	0.0
11Jan2020	06:24	0.8	2.8	9.0	0.0
11Jan2020	06:30	0.7	2.8	9.1	0.0
11Jan2020	06:36	0.5	2.8	9.1	0.0
11Jan2020	06:42	0.4	2.8	9.1	0.0
11Jan2020	06:48	0.3	2.8	9.1	0.0
11Jan2020	06:54	0.2	2.8	9.1	0.0
11Jan2020	07:00	0.2	2.8	9.1	0.0
11Jan2020	07:06	0.1	2.8	9.1	0.0
11Jan2020	07:12	0.1	2.8	9.1	0.0
11Jan2020	07:18	0.1	2.8	9.1	0.0
11Jan2020	07:24	0.1	2.8	9.1	0.0
11Jan2020	07:30	0.0	2.8	9.1	0.0
11Jan2020	07:36	0.0	2.8	9.1	0.0
11Jan2020	07:42	0.0	2.8	9.1	0.0
11Jan2020	07:48	0.0	2.8	9.1	0.0
11Jan2020	07:54	0.0	2.8	9.1	0.0
11Jan2020	08:00	0.0	2.8	9.1	0.0
11Jan2020	08:06	0.0	2.8	9.1	0.0
11Jan2020	08:12	0.0	2.8	9.1	0.0
11Jan2020	08:18	0.0	2.8	9.1	0.0
11Jan2020	08:24	0.0	2.8	9.1	0.0
11Jan2020	08:30	0.0	2.8	9.1	0.0
11Jan2020	08:36	0.0	2.8	9.1	0.0
11Jan2020	08:42	0.0	2.8	9.1	0.0
11Jan2020	08:48	0.0	2.8	9.1	0.0
11Jan2020	08:54	0.0	2.8	9.1	0.0
11Jan2020	09:00	0.0	2.8	9.1	0.0
11Jan2020	09:06	0.0	2.8	9.1	0.0
11Jan2020	09:12	0.0	2.8	9.1	0.0

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
11Jan2020	09:18	0.0	2.8	9.1	0.0
11Jan2020	09:24	0.0	2.8	9.1	0.0
11Jan2020	09:30	0.0	2.8	9.1	0.0
11Jan2020	09:36	0.0	2.8	9.1	0.0
11Jan2020	09:42	0.0	2.8	9.1	0.0
11Jan2020	09:48	0.0	2.8	9.1	0.0
11Jan2020	09:54	0.0	2.8	9.1	0.0
11Jan2020	10:00	0.0	2.8	9.1	0.0
11Jan2020	10:06	0.0	2.8	9.1	0.0
11Jan2020	10:12	0.0	2.8	9.1	0.0
11Jan2020	10:18	0.0	2.8	9.1	0.0
11Jan2020	10:24	0.0	2.8	9.1	0.0
11Jan2020	10:30	0.0	2.8	9.1	0.0
11Jan2020	10:36	0.0	2.8	9.1	0.0
11Jan2020	10:42	0.0	2.8	9.1	0.0
11Jan2020	10:48	0.0	2.8	9.1	0.0
11Jan2020	10:54	0.0	2.8	9.1	0.0
11Jan2020	11:00	0.0	2.8	9.1	0.0
11Jan2020	11:06	0.0	2.8	9.1	0.0
11Jan2020	11:12	0.0	2.8	9.1	0.0
11Jan2020	11:18	0.0	2.8	9.1	0.0
11Jan2020	11:24	0.0	2.8	9.1	0.0
11Jan2020	11:30	0.0	2.8	9.1	0.0
11Jan2020	11:36	0.0	2.8	9.1	0.0
11Jan2020	11:42	0.0	2.8	9.1	0.0
11Jan2020	11:48	0.0	2.8	9.1	0.0
11Jan2020	11:54	0.0	2.8	9.1	0.0
11Jan2020	12:00	0.0	2.8	9.1	0.0
11Jan2020	12:06	0.0	2.8	9.1	0.0
11Jan2020	12:12	0.0	2.8	9.1	0.0
11Jan2020	12:18	0.0	2.8	9.1	0.0

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
11Jan2020	12:24	0.0	2.8	9.1	0.0
11Jan2020	12:30	0.0	2.8	9.1	0.0
11Jan2020	12:36	0.0	2.8	9.1	0.0
11Jan2020	12:42	0.0	2.8	9.1	0.0
11Jan2020	12:48	0.0	2.8	9.1	0.0
11Jan2020	12:54	0.0	2.8	9.1	0.0
11Jan2020	13:00	0.0	2.8	9.1	0.0
11Jan2020	13:06	0.0	2.8	9.1	0.0
11Jan2020	13:12	0.0	2.8	9.1	0.0
11Jan2020	13:18	0.0	2.8	9.1	0.0
11Jan2020	13:24	0.0	2.8	9.1	0.0
11Jan2020	13:30	0.0	2.8	9.1	0.0
11Jan2020	13:36	0.0	2.8	9.1	0.0
11Jan2020	13:42	0.0	2.8	9.1	0.0
11Jan2020	13:48	0.0	2.8	9.1	0.0
11Jan2020	13:54	0.0	2.8	9.1	0.0
11Jan2020	14:00	0.0	2.8	9.1	0.0
11Jan2020	14:06	0.0	2.8	9.1	0.0
11Jan2020	14:12	0.0	2.8	9.1	0.0
11Jan2020	14:18	0.0	2.8	9.1	0.0
11Jan2020	14:24	0.0	2.8	9.1	0.0
11Jan2020	14:30	0.0	2.8	9.1	0.0
11Jan2020	14:36	0.0	2.8	9.1	0.0
11Jan2020	14:42	0.0	2.8	9.1	0.0
11Jan2020	14:48	0.0	2.8	9.1	0.0
11Jan2020	14:54	0.0	2.8	9.1	0.0
11Jan2020	15:00	0.0	2.8	9.1	0.0
11Jan2020	15:06	0.0	2.8	9.1	0.0
11Jan2020	15:12	0.0	2.8	9.1	0.0
11Jan2020	15:18	0.0	2.8	9.1	0.0
11Jan2020	15:24	0.0	2.8	9.1	0.0

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
11Jan2020	15:30	0.0	2.8	9.1	0.0
11Jan2020	15:36	0.0	2.8	9.1	0.0
11Jan2020	15:42	0.0	2.8	9.1	0.0
11Jan2020	15:48	0.0	2.8	9.1	0.0
11Jan2020	15:54	0.0	2.8	9.1	0.0
11Jan2020	16:00	0.0	2.8	9.1	0.0
11Jan2020	16:06	0.0	2.8	9.1	0.0
11Jan2020	16:12	0.0	2.8	9.1	0.0
11Jan2020	16:18	0.0	2.8	9.1	0.0
11Jan2020	16:24	0.0	2.8	9.1	0.0
11Jan2020	16:30	0.0	2.8	9.1	0.0
11Jan2020	16:36	0.0	2.8	9.1	0.0
11Jan2020	16:42	0.0	2.8	9.1	0.0
11Jan2020	16:48	0.0	2.8	9.1	0.0
11Jan2020	16:54	0.0	2.8	9.1	0.0
11Jan2020	17:00	0.0	2.8	9.1	0.0
11Jan2020	17:06	0.0	2.8	9.1	0.0
11Jan2020	17:12	0.0	2.8	9.1	0.0
11Jan2020	17:18	0.0	2.8	9.1	0.0
11Jan2020	17:24	0.0	2.8	9.1	0.0
11Jan2020	17:30	0.0	2.8	9.1	0.0
11Jan2020	17:36	0.0	2.8	9.1	0.0
11Jan2020	17:42	0.0	2.8	9.1	0.0
11Jan2020	17:48	0.0	2.8	9.1	0.0
11Jan2020	17:54	0.0	2.8	9.1	0.0
11Jan2020	18:00	0.0	2.8	9.1	0.0
11Jan2020	18:06	0.0	2.8	9.1	0.0
11Jan2020	18:12	0.0	2.8	9.1	0.0
11Jan2020	18:18	0.0	2.8	9.1	0.0
11Jan2020	18:24	0.0	2.8	9.1	0.0
11Jan2020	18:30	0.0	2.8	9.1	0.0

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
11Jan2020	18:36	0.0	2.8	9.1	0.0
11Jan2020	18:42	0.0	2.8	9.1	0.0
11Jan2020	18:48	0.0	2.8	9.1	0.0
11Jan2020	18:54	0.0	2.8	9.1	0.0
11Jan2020	19:00	0.0	2.8	9.1	0.0
11Jan2020	19:06	0.0	2.8	9.1	0.0
11Jan2020	19:12	0.0	2.8	9.1	0.0
11Jan2020	19:18	0.0	2.8	9.1	0.0
11Jan2020	19:24	0.0	2.8	9.1	0.0
11Jan2020	19:30	0.0	2.8	9.1	0.0
11Jan2020	19:36	0.0	2.8	9.1	0.0
11Jan2020	19:42	0.0	2.8	9.1	0.0
11Jan2020	19:48	0.0	2.8	9.1	0.0
11Jan2020	19:54	0.0	2.8	9.1	0.0
11Jan2020	20:00	0.0	2.8	9.1	0.0
11Jan2020	20:06	0.0	2.8	9.1	0.0
11Jan2020	20:12	0.0	2.8	9.1	0.0
11Jan2020	20:18	0.0	2.8	9.1	0.0
11Jan2020	20:24	0.0	2.8	9.1	0.0
11Jan2020	20:30	0.0	2.8	9.1	0.0
11Jan2020	20:36	0.0	2.8	9.1	0.0
11Jan2020	20:42	0.0	2.8	9.1	0.0
11Jan2020	20:48	0.0	2.8	9.1	0.0
11Jan2020	20:54	0.0	2.8	9.1	0.0
11Jan2020	21:00	0.0	2.8	9.1	0.0
11Jan2020	21:06	0.0	2.8	9.1	0.0
11Jan2020	21:12	0.0	2.8	9.1	0.0
11Jan2020	21:18	0.0	2.8	9.1	0.0
11Jan2020	21:24	0.0	2.8	9.1	0.0
11Jan2020	21:30	0.0	2.8	9.1	0.0
11Jan2020	21:36	0.0	2.8	9.1	0.0

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Attachment 3

Reference 2

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Chapter 2 Estimating Runoff

SCS runoff curve number method

The SCS Runoff Curve Number (CN) method is described in detail in NEH-4 (SCS 1985). The SCS runoff equation is

$$Q = \frac{(P - I_a)^2}{(P - I_a) + S} \qquad \text{[eq. 2-1]}$$

where

Q = runoff (in)
P = rainfall (in)
S = potential maximum retention after runoff begins (in) and
I_a = initial abstraction (in)

Initial abstraction (I_a) is all losses before runoff begins. It includes water retained in surface depressions, water intercepted by vegetation, evaporation, and infiltration. I_a is highly variable but generally is correlated with soil and cover parameters. Through studies of many small agricultural watersheds, I_a was found to be approximated by the following empirical equation:

$$I_a = 0.2S \qquad \text{[eq. 2-2]}$$

By removing I_a as an independent parameter, this approximation allows use of a combination of S and P to produce a unique runoff amount. Substituting equation 2-2 into equation 2-1 gives:

$$Q = \frac{(P - 0.2S)^2}{(P + 0.8S)} \qquad \text{[eq. 2-3]}$$

S is related to the soil and cover conditions of the watershed through the CN. CN has a range of 0 to 100, and S is related to CN by:

$$S = \frac{1000}{CN} - 10 \qquad \text{[eq. 2-4]}$$

Figure 2-1 and table 2-1 solve equations 2-3 and 2-4 for a range of CN's and rainfall.

Factors considered in determining runoff curve numbers

The major factors that determine CN are the hydrologic soil group (HSG), cover type, treatment, hydrologic condition, and antecedent runoff condition (ARC). Another factor considered is whether impervious areas outlet directly to the drainage system (connected) or whether the flow spreads over pervious areas before entering the drainage system (unconnected). Figure 2-2 is provided to aid in selecting the appropriate figure or table for determining curve numbers.

CN's in table 2-2 (*a* to *d*) represent average antecedent runoff condition for urban, cultivated agricultural, other agricultural, and arid and semiarid rangeland uses. Table 2-2 assumes impervious areas are directly connected. The following sections explain how to determine CN's and how to modify them for urban conditions.

Hydrologic soil groups

Infiltration rates of soils vary widely and are affected by subsurface permeability as well as surface intake rates. Soils are classified into four HSG's (A, B, C, and D) according to their minimum infiltration rate, which is obtained for bare soil after prolonged wetting. Appendix A defines the four groups and provides a list of most of the soils in the United States and their group classification. The soils in the area of interest may be identified from a soil survey report, which can be obtained from local SCS offices or soil and water conservation district offices.

Most urban areas are only partially covered by impervious surfaces: the soil remains an important factor in runoff estimates. Urbanization has a greater effect on runoff in watersheds with soils having high infiltration rates (sands and gravels) than in watersheds predominantly of silts and clays, which generally have low infiltration rates.

Any disturbance of a soil profile can significantly change its infiltration characteristics. With urbanization, native soil profiles may be mixed or removed or fill material from other areas may be introduced. Therefore, a method based on soil texture is given in appendix A for determining the HSG classification for disturbed soils.

Table 2-2a Runoff curve numbers for urban areas [1]

Cover description: Cover type and hydrologic condition	Average percent impervious area [2]	Curve numbers for hydrologic soil group: A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

1 Average runoff condition, and $I_a = 0.2S$.

2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

4 Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

5 Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-2b Runoff curve numbers for cultivated agricultural lands [1]

Cover description			Curve numbers for hydrologic soil group			
Cover type	Treatment [2]	Hydrologic condition [3]	A	B	C	D
Fallow	Bare soil	—	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
	C&T+ CR	Poor	65	73	79	81
		Good	61	70	77	80
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
	C&T+ CR	Poor	60	71	78	81
		Good	58	69	77	80
Close-seeded or broadcast legumes or rotation meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

[1] Average runoff condition, and I_a=0.2S

[2] Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.

[3] Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff.

Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

Sheet flow

Sheet flow is flow over plane surfaces. It usually occurs in the headwater of streams. With sheet flow, the friction value (Manning's n) is an effective roughness coefficient that includes the effect of raindrop impact; drag over the plane surface; obstacles such as litter, crop ridges, and rocks; and erosion and transportation of sediment. These n values are for very shallow flow depths of about 0.1 foot or so. Table 3-1 gives Manning's n values for sheet flow for various surface conditions.

Table 3-1 Roughness coefficients (Manning's n) for sheet flow

Surface description	n [1]
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤20%	0.06
Residue cover >20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses [2]	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods:[3]	
Light underbrush	0.40
Dense underbrush	0.80

1 The n values are a composite of information compiled by Engman (1986).
2 Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass, and native grass mixtures.
3 When selecting n , consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.

For sheet flow of less than 300 feet, use Manning's kinematic solution (Overtop and Meadows 1976) to compute T_t:

$$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5} s^{0.4}} \qquad \text{[eq. 3-3]}$$

where:

T_t = travel time (hr),
n = Manning's roughness coefficient (table 3-1)
L = flow length (ft)
P_2 = 2-year, 24-hour rainfall (in)
s = slope of hydraulic grade line (land slope, ft/ft)

This simplified form of the Manning's kinematic solution is based on the following: (1) shallow steady uniform flow, (2) constant intensity of rainfall excess (that part of a rain available for runoff), (3) rainfall duration of 24 hours, and (4) minor effect of infiltration on travel time. Rainfall depth can be obtained from appendix B.

Shallow concentrated flow

After a maximum of 300 feet, sheet flow usually becomes shallow concentrated flow. The average velocity for this flow can be determined from figure 3-1, in which average velocity is a function of watercourse slope and type of channel. For slopes less than 0.005 ft/ft, use equations given in appendix F for figure 3-1. Tillage can affect the direction of shallow concentrated flow. Flow may not always be directly down the watershed slope if tillage runs across the slope.

After determining average velocity in figure 3-1, use equation 3-1 to estimate travel time for the shallow concentrated flow segment.

Open channels

Open channels are assumed to begin where surveyed cross section information has been obtained, where channels are visible on aerial photographs, or where blue lines (indicating streams) appear on United States Geological Survey (USGS) quadrangle sheets. Manning's equation or water surface profile information can be used to estimate average flow velocity. Average flow velocity is usually determined for bankfull elevation.

Chapter 3 Time of Concentration and Travel Time

Travel time (T_t) is the time it takes water to travel from one location to another in a watershed. T_t is a component of time of concentration (T_c), which is the time for runoff to travel from the hydraulically most distant point of the watershed to a point of interest within the watershed. T_c is computed by summing all the travel times for consecutive components of the drainage conveyance system.

T_c influences the shape and peak of the runoff hydrograph. Urbanization usually decreases T_c, thereby increasing the peak discharge. But T_c can be increased as a result of (a) ponding behind small or inadequate drainage systems, including storm drain inlets and road culverts, or (b) reduction of land slope through grading.

Factors affecting time of concentration and travel time

Surface roughness

One of the most significant effects of urban development on flow velocity is less retardance to flow. That is, undeveloped areas with very slow and shallow overland flow through vegetation become modified by urban development: the flow is then delivered to streets, gutters, and storm sewers that transport runoff downstream more rapidly. Travel time through the watershed is generally decreased.

Channel shape and flow patterns

In small non-urban watersheds, much of the travel time results from overland flow in upstream areas. Typically, urbanization reduces overland flow lengths by conveying storm runoff into a channel as soon as possible. Since channel designs have efficient hydraulic characteristics, runoff flow velocity increases and travel time decreases.

Slope

Slopes may be increased or decreased by urbanization, depending on the extent of site grading or the extent to which storm sewers and street ditches are used in the design of the water management system. Slope will tend to increase when channels are straightened and decrease when overland flow is directed through storm sewers, street gutters, and diversions.

Computation of travel time and time of concentration

Water moves through a watershed as sheet flow, shallow concentrated flow, open channel flow, or some combination of these. The type that occurs is a function of the conveyance system and is best determined by field inspection.

Travel time (T_t) is the ratio of flow length to flow velocity:

$$T_t = \frac{L}{3600V} \qquad \text{[eq. 3-1]}$$

where:

T_t = travel time (hr)
L = flow length (ft)
V = average velocity (ft/s)
3600 = conversion factor from seconds to hours.

Time of concentration (T_c) is the sum of T_t values for the various consecutive flow segments:

$$T_c = T_{t_1} + T_{t_2} + \ldots T_{t_m} \qquad \text{[eq. 3-2]}$$

where:

T_c = time of concentration (hr)
m = number of flow segments

Figure 3-1 Average velocities for estimating travel time for shallow concentrated flow

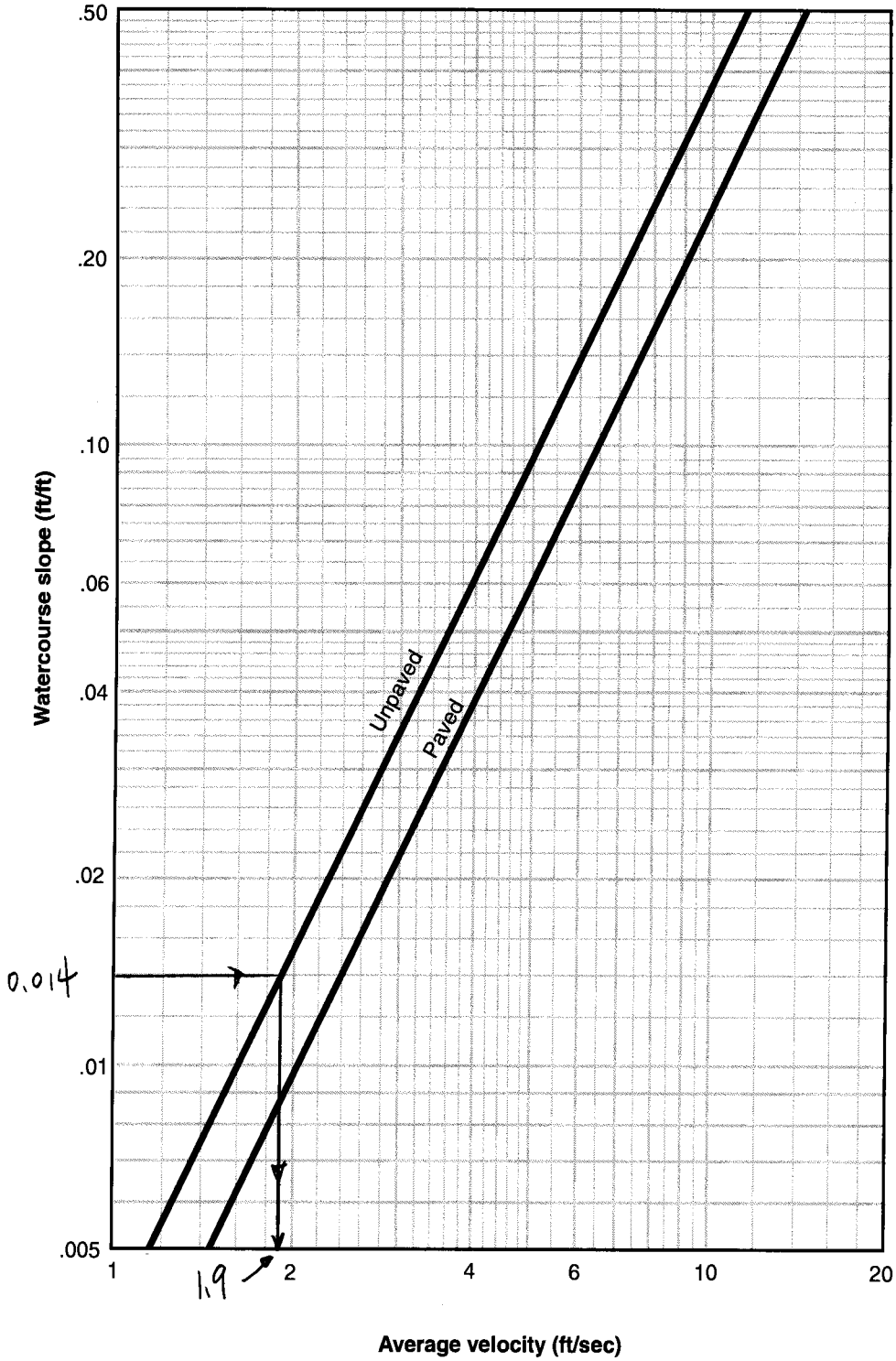
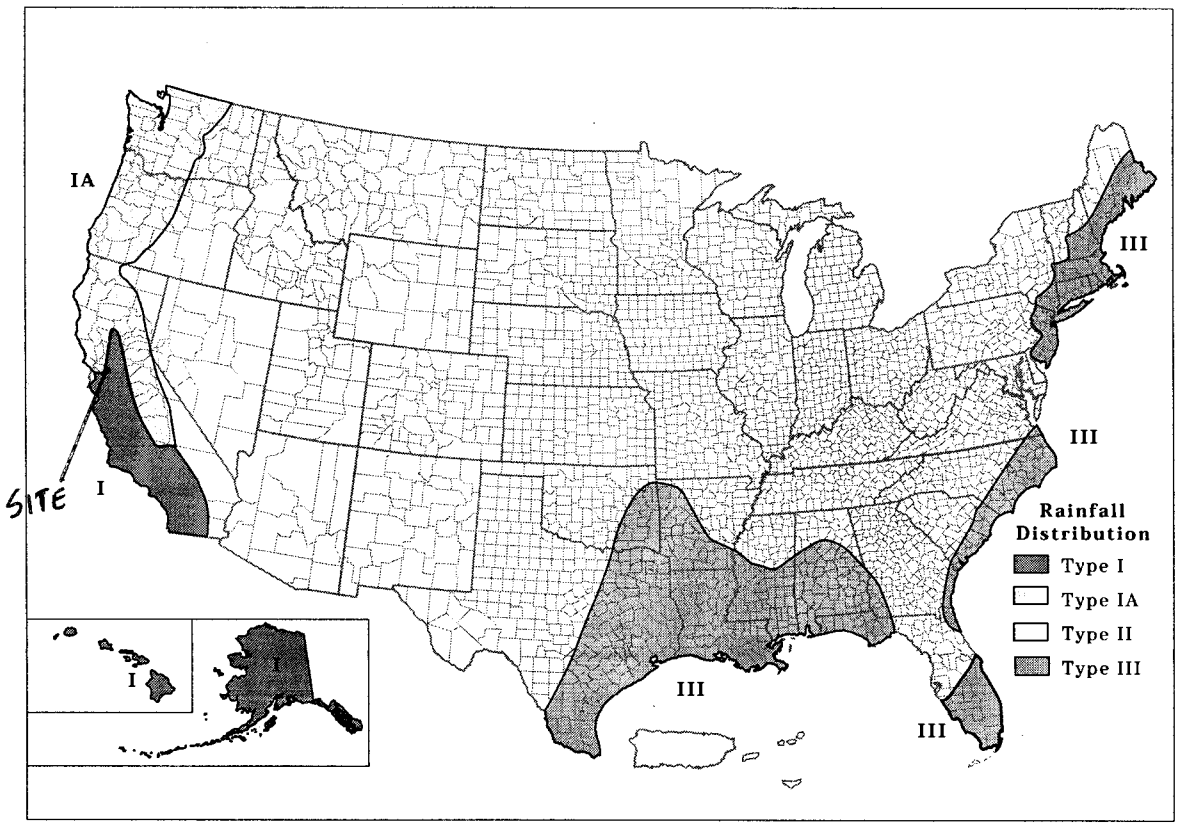


Figure B-2 Approximate geographic boundaries for NRCS (SCS) rainfall distributions



Rainfall data sources

This section lists the most current 24-hour rainfall data published by the National Weather Service (NWS) for various parts of the country. Because NWS Technical Paper 40 (TP-40) is out of print, the 24-hour rainfall maps for areas east of the 105th meridian are included here as figures B-3 through B-8. For the area generally west of the 105th meridian, TP-40 has been superseded by NOAA Atlas 2, the Precipitation-Frequency Atlas of the Western United States, published by the National Ocean and Atmospheric Administration.

East of 105th meridian

Hershfield, D.M. 1961. Rainfall frequency atlas of the United States for durations from 30 minutes to 24 hours and return periods from 1 to 100 years. U.S. Dept. Commerce, Weather Bur. Tech. Pap. No. 40. Washington, DC. 155 p.

West of 105th meridian

Miller, J.F., R.H. Frederick, and R.J. Tracey. 1973. Precipitation-frequency atlas of the Western United States. Vol. I Montana; Vol. II, Wyoming; Vol III, Colorado; Vol. IV, New Mexico; Vol V, Idaho; Vol. VI, Utah; Vol. VII, Nevada; Vol. VIII, Arizona; Vol. IX, Washington; Vol. X, Oregon; Vol. XI, California. U.S. Dept. of Commerce, National Weather Service, NOAA Atlas 2. Silver Spring, MD.

Alaska

Miller, John F. 1963. Probable maximum precipitation and rainfall-frequency data for Alaska for areas to 400 square miles, durations to 24 hours and return periods from 1 to 100 years. U.S. Dept. of Commerce, Weather Bur. Tech. Pap. No. 47. Washington, DC. 69 p.

Hawaii

Weather Bureau. 1962. Rainfall-frequency atlas of the Hawaiian Islands for areas to 200 square miles, durations to 24 hours and return periods from 1 to 100 years. U.S. Dept. Commerce, Weather Bur. Tech. Pap. No. 43. Washington, DC. 60 p.

Puerto Rico and Virgin Islands

Weather Bureau. 1961. Generalized estimates of probable maximum precipitation and rainfall-frequency data for Puerto Rico and Virgin Islands for areas to 400 square miles, durations to 24 hours, and return periods from 1 to 100 years. U.S. Dept. Commerce, Weather Bur. Tech. Pap. No. 42. Washington, DC. 94 P.

Appendix A Hydrologic Soil Groups

Soils are classified into hydrologic soil groups (HSG's) to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting. The HSG's, which are A, B, C, and D, are one element used in determining runoff curve numbers (see chapter 2). For the convenience of TR-55 users, exhibit A-1 lists the HSG classification of United States soils.

The infiltration rate is the rate at which water enters the soil at the soil surface. It is controlled by surface conditions. HSG also indicates the transmission rate—the rate at which the water moves within the soil. This rate is controlled by the soil profile. Approximate numerical ranges for transmission rates shown in the HSG defmitions were first published by Musgrave (USDA 1955). The four groups are defined by SCS soil scientists as follows:

Group A soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sand or gravel and have a high rate of water transmission (greater than 0.30 in/hr).

Group B soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (0.15-0.30 in/hr).

Group C soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission (0.05-0.15 in/hr).

Group D soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission (0-0.05 in/hr).

In exhibit A-1, some of the listed soils have an added modifier; for example, "Abrazo, gravelly." This refers to a gravelly phase of the Abrazo series that is found in SCS soil map legends.

Disturbed soil profiles

As a result of urbanization, the soil profile may be considerably altered and the listed group classification may no longer apply. In these circumstances, use the following to determine HSG according to the texture of the new surface soil, provided that significant compaction has not occurred (Brakensiek and Rawls 1983).

HSG	*Soil textures*
A	Sand, loamy sand, or sandy loam
B	Silt loam or loam
C	Sandy clay loam
D	Clay loam, silty clay loam, sandy clay, silty clay, or clay

Drainage and group D soils

Some soils in the list are in group D because of a high water table that creates a drainage problem. Once these soils are effectively drained, they are placed in a different group. For example, Ackerman soil is classified as A/D. This indicates that the drained Ackerman soil is in group A and the undrained soil is in group D.

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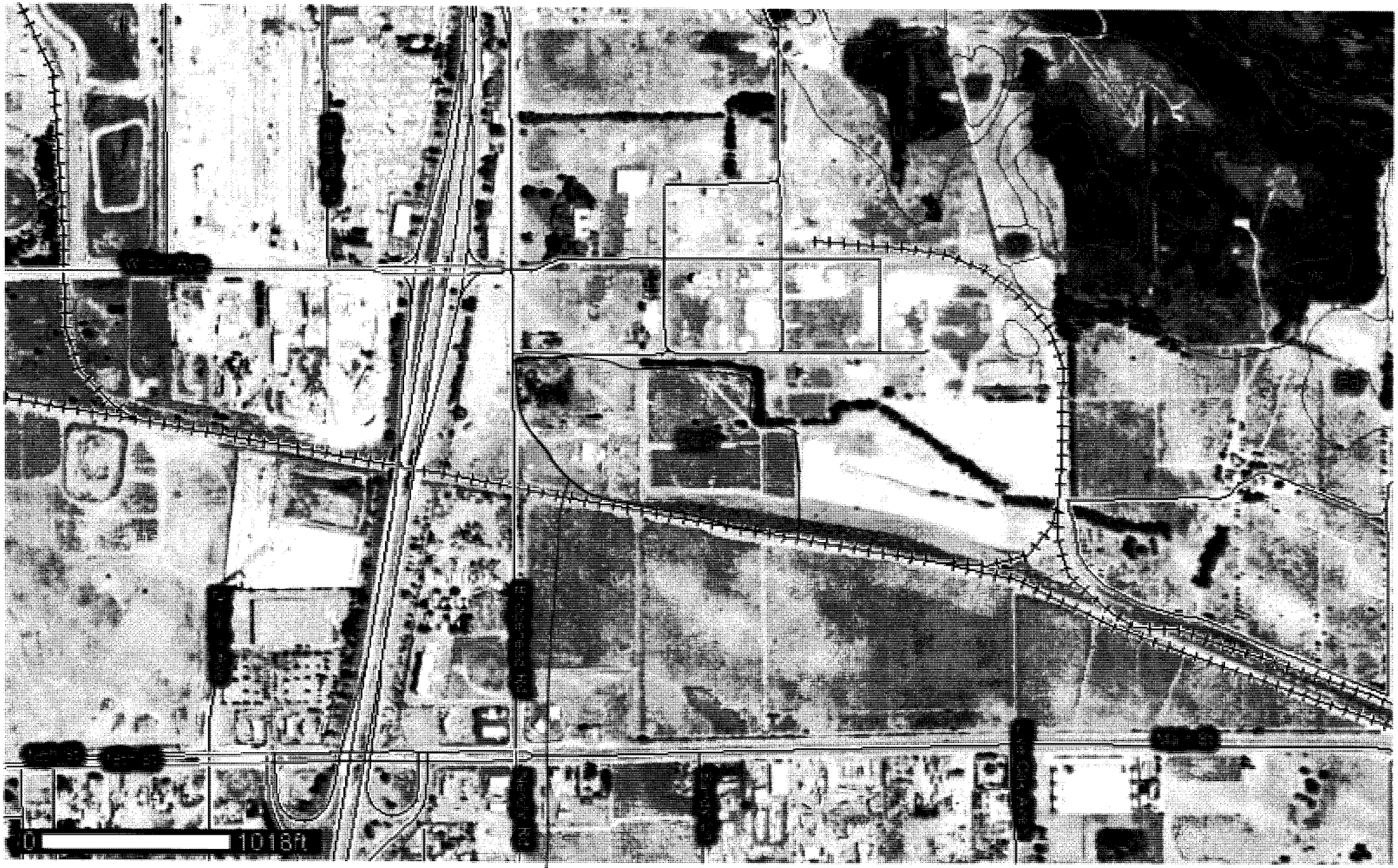
Attachment 4

Reference 6

Select pages

(printed out from the Online Web soil survey)



Project site

Map Unit Description

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series.* All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of a given series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases.* Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas.* Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Additional information about the map units described in this report is available in other soil reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the soil reports define some of the properties included in the map unit descriptions.

Contra Costa County, California

DaC—DELHI SAND, 2 TO 9 PERCENT SLOPES

Map Unit Setting

Elevation: 10 to 150 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 59 degrees F
Frost-free period: 260 to 300 days

Map Unit Composition

Delhi and similar soils: 85 percent
Minor components: 15 percent

Description of Delhi

Setting

Landform: Flood plains, terraces, alluvial fans
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits derived from igneous and sedimentary rock

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability (nonirrigated): 6e

Typical profile

0 to 5 inches: Sand
5 to 60 inches: Sand

Minor Components

Unnamed

Percent of map unit: 12 percent

Laugenour

Percent of map unit: 3 percent

Data Source Information

Soil Survey Area: Contra Costa County, California
Survey Area Data: Version 8, Jul 22, 2008

BLACK & VEATCH

Calculation Record

Client Name: Radback Energy Page 1 of 67

Project Name: Tenaska Contra Costa Generating Station Project No.: 163994

Calculation Title: Soil Erosion Control

Calculation No./File No.: 52.5406.1004

Calculation Is: (check all that apply) ☐ Preliminary ☒ Final ☐ Nuclear Safety-Related

Objective To design the site's Best Management Practices (BMP) for soil erosion and sediment control.

Unverified Assumptions Requiring Subsequent Verification

No.	Assumption	Verified By	Date

See Page _____ of this calculation for additional assumptions.

This Section Used for Computer Generated Calculations

Program Name/Number: _____ Version: _____

Evidence of or reference to computer program verification, if applicable:

Bases or reference thereto supporting application of the computer program to the physical problem:

Review and Approval

Rev	Prepared By	Date	Verified By	Date	Approved By	Date
0	P. L. Nelson	3 Apr 2009	Jimmy Zhong	4/3/09	P L Nelson	4/3/09

Purpose

To design the site's Best Management Practices (BMP) for soil erosion and sediment control.

References

1. US Dept of Agriculture, Natural Resources Conservation Services (NRCS), Web Soil Survey.
2. Black & Veatch Drawing:
   - 163994-SS-3101, Rev. A, "Soil Erosion Control Site, Plan Sheet 1"
   - 163994-SS-3102, Rev. A, "Soil Erosion Control Site, Plan Sheet 2"
   - 163994-SS-3150, Rev. A, "Soil Erosion Control Site, Sections and Details"
3. California Stormwater Quality Association, California Stormwater Best Management Practice (BMP) Construction Handbook, January 2003.

Definition of Units and Constants

English units will be used.

Example of Common Unit Designations:

Rainfall amount in inches (in)

Drainage area in acres (ac)

Assumptions

Contained in the body of the calculation.

Attachments

1. NRCS Soil Survey
2. Black & Veatch Drawings SS-3101, SS-3102 and SS-3150
3. Reference 2 – Select Pages

Summary

As noted on the drawings and in this calculation, the project site meets the requirements of the California Stormwater Quality Association (CSQA), California Stormwater Best Management Practice (BMP) Construction Handbook.

Site Location

The site is located on the border of Antioch and Oakley California at a former industrial facility. The site previously had no buildings, process equipment or other facilities when the industrial facility was in operation. The main site is currently a vineyard with a row of eucalyptus trees along the north east corner. The site appears to be tilled once or twice a year. Soil is Delhi sand (dune sand) and has a high to very high water transmission rate (Ref 1 and attachment 1). The laydown area was disturbed by industrial facility activities in the form of asphalt paving in the northeast portion. The paved area will be used as-is for temporary storage of materials and equipment. The remainder of the laydown area is currently sparse vegetation to bare soil very similar in nature to the main plant area. ✓

Main Plant Site Design (Dwg SS-3101)

The site drainage design is required to meet Contra Costa Clean Water Program's Stormwater C.3 Guidebook, Stormwater Quality Requirements for Development Applications, Fourth Edition. The vast majority of stormwater runoff will be directed to bioswales for both runoff rate control and water quality improvement. The main plant site will utilize hydraulic mulch, hydroseeding, geotextiles & mats, velocity dissipation devices, silt fence, fiber rolls, storm drain inlet protection and stabilized construction roadway. General details and facts about each BMP are noted in attachment 3. Project specific details are shown in attachment 2 along with plan drawing SS-3101. ✓

Laydown Area Design (Dwg SS-3101)

The laydown area drainage design will meet the same requirements as the main plant site. The stormwater drainage from the asphalt paved area will not be modified. Silt fence wil be placed along the edge to capture any soil from construction traffic deposited on the asphalt. The soil area will be graded to drain to a bioswale down the middle of the laydown area. The bioswale will be pumped as needed to prevent over topping of the bioswale due to a lack of a gravity outlet. BMPs will include hydraulic mulch, hydroseeding, geotextiles & mats, soil binder, silt fence, fiber rolls and stabilized construction roadway. See plan drawing SS-3102 (attachment 2) for further details.

General Construction Sequence

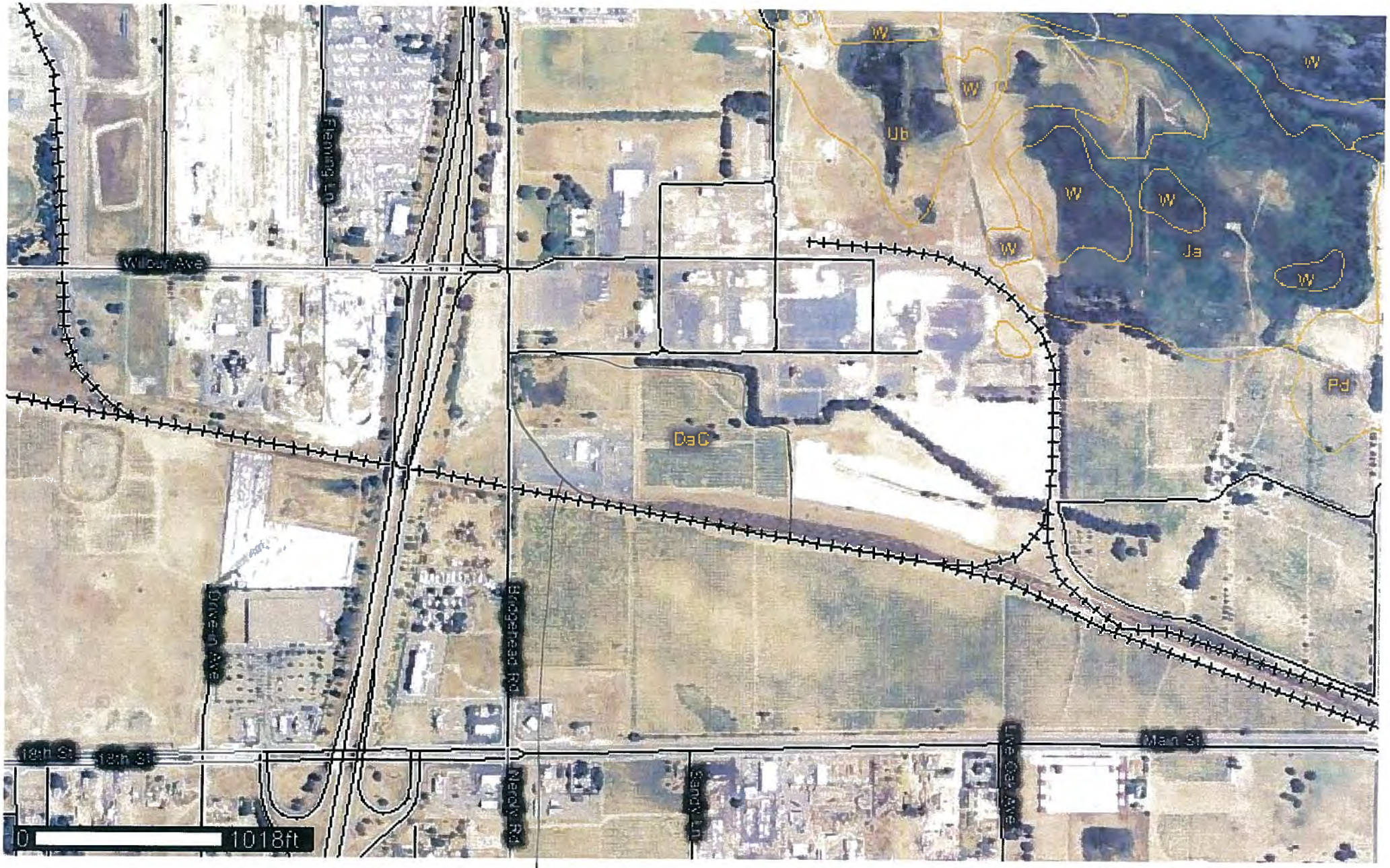
1. Install silt fence and stabilized construction entrances/exits as indicated on the drawings. Construction contractor may temporarily install an additional construction entrance/exit based on the details of the site grading equipment/methods utilized.

2. Install bioswales starting at the lowest elevations and working toward higher elevations. No more soil shall be disturbed than is required to building the facilities lowest in elevation first. Stabilize bioswales and slopes adjacent to conservation easement area as soon as practical in the grading process. Install fiber rolls along top of bioswales at the same time as installing hydroseeding and geotextiles/mats. Fiber rolls may be removed once vegetation obtains 70% coverage within the bioswales. ✓
3. Install storm sewer and catch basin in conjunction with other underground utilities. Place inlet protection on each catch basin and velocity dissipation devices on sewer outlets as each item is installed.
4. Install aggregate roads and maintain construction entrances/exits as required.
5. Install aggregate area surfacing and remaining vegetation/landscaping as project construction permits.

Attachment 1

NRCS Web Soil Survey

4 pages



Project site

Map Unit Description

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of a given series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Additional information about the map units described in this report is available in other soil reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the soil reports define some of the properties included in the map unit descriptions.

Contra Costa County, California

DaC—DELHI SAND, 2 TO 9 PERCENT SLOPES

Map Unit Setting

Elevation: 10 to 150 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 59 degrees F
Frost-free period: 260 to 300 days

Map Unit Composition

Delhi and similar soils: 85 percent
Minor components: 15 percent

Description of Delhi

Setting

Landform: Flood plains, terraces, alluvial fans
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits derived from igneous and sedimentary rock

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability (nonirrigated): 6e

Typical profile

0 to 5 inches: Sand
5 to 60 inches: Sand

Minor Components

Unnamed

Percent of map unit: 12 percent

Laugenour

Percent of map unit: 3 percent

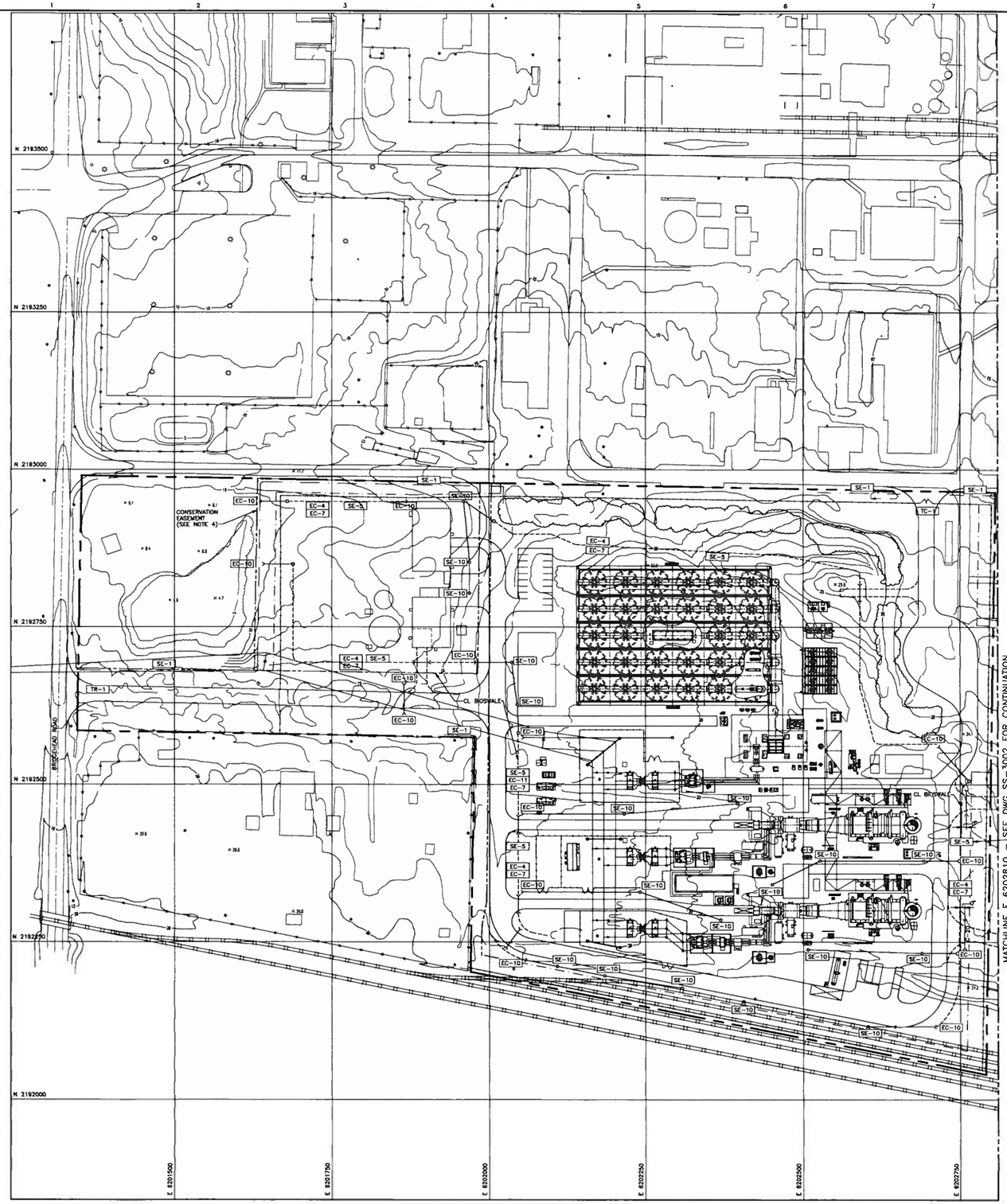
Data Source Information

Soil Survey Area: Contra Costa County, California
Survey Area Data: Version 8, Jul 22, 2008

Attachment 2

B+V Design Dwgs

3 pages



OPEN
04/01/09

NOTES APPLICABLE TO ALL SS-3000 SERIES DRAWINGS

1. SEE DRAWING SS-3001 FOR GENERAL NOTES AND LEGEND.
2. SEE DWG SS-3001 FOR GRADING & DRAINAGE PLAN
3. SEE DWG SS-3150 FOR SOIL EROSION CONTROL SECTIONS AND DETAILS.
4. NO CONSTRUCTION ACTIVITY SHALL OCCUR WITHIN CONSERVATION EASEMENT.
5. SE-5 MAY BE REMOVED AFTER BIOSWALE GRASS OBTAINS 70% COVERAGE.
6. SEE DWG SS-3201 FOR SITE SURFACING PLAN. ALL GRASS OR LANDSCAPE AREAS SHALL BE SEEDED AND FERTILIZED EC-4 AND COVERED WITH HYDRAULIC MULCH EC-3

NOT TO BE USED FOR CONSTRUCTION

THE DISTRIBUTION AND USE OF THE NATIVE FILE FORMAT OF THIS DRAWING OUTSIDE OF BLACK & VEATCH IS UNCONTROLLED AND SHALL BE USED FOR REFERENCE PURPOSES ONLY.

NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
A	OPEN		MAB	PLN	PLN	DVN	

SCALE: 1" = 60' (60' 30' 0 60' 120')

I HEREBY CERTIFY THAT THIS DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CALIFORNIA.
SIGNED _____
DATE _____ REG NO. _____

BLACK & VEATCH CORPORATION

ENGINEER PLN DRAWN NAW
CHECKED DATE

CONTRA COSTA GENERATING STATION LLC
CONTRA COSTA COMBINED CYCLE FACILITY

SOIL EROSION CONTROL – SITE PLAN – SHEET 1

PROJECT DRAWING NUMBER: 163994–SS–3101
REV: A
CODE
AREA

SPU37182
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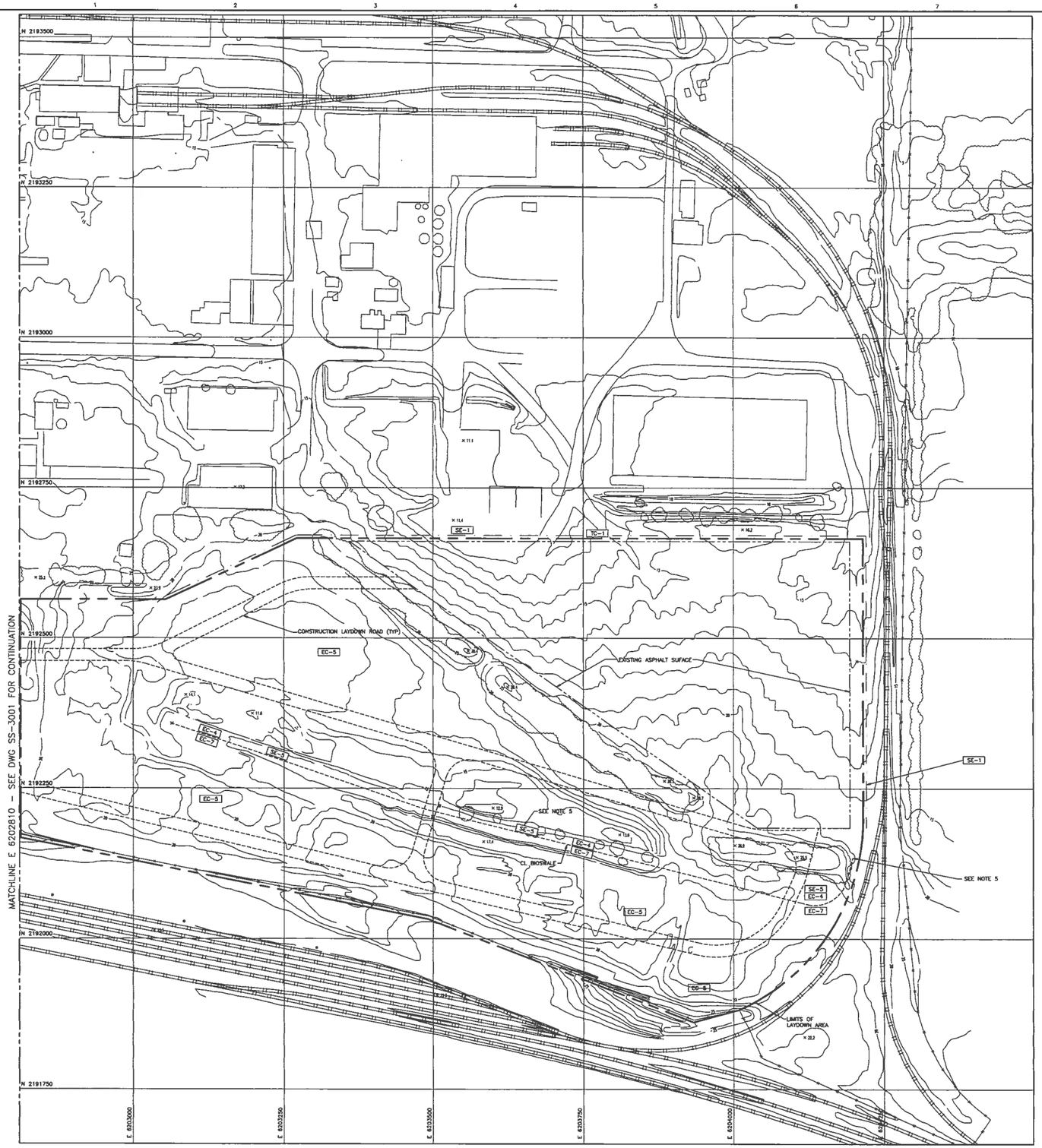

OPEN

04/02/09

NOTES

1. SEE DRAWING SS-3001 FOR GENERAL NOTES AND LEGEND.
2. SEE DWG SS-3002 FOR GRADING & DRAINAGE PLAN
3. SEE DWG SS-3150 FOR SOIL EROSION CONTROL SECTIONS AND DETAILS.
4. SEE DWG SS-3202 FOR SITE SURFACING PLAN.
5. A TEMPORARY 2000 GPM PUMP SHALL BE INSTALLED AND STARTED WHEN WATER LEVEL REACHES EL 16.5. PUMP SHALL DISCHARGE TO NATURAL DRAINAGE EAST OF RAILROAD TRACKS.
6. SE-5 MAY BE REMOVED AFTER BIOSWALE GRASS OBTAINS 70% COVERAGE.
7. SOIL BINDER EC-5 SHOULD BE APPLIED PRIOR TO STORAGE OF MATERIAL OR EQUIPMENT.

NOT TO BE USED FOR CONSTRUCTION

THE DISTRIBUTION AND USE OF THE NATIVE FILE FORMAT OF THIS DRAWING OUTSIDE OF BLACK & VEATCH IS UNCONTROLLED AND SHALL BE USED FOR REFERENCE PURPOSES ONLY.

NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	PLN	APP
A	OPEN		NAW				PLN	VW

60' 30' 0 60' 120'
1" = 60'

I HEREBY CERTIFY THAT THIS DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CALIFORNIA.

SIGNED _____
DATE _____ REG NO. _____

BLACK & VEATCH CORPORATION

ENGINEER PLN DRAWN NAW
CHECKED DATE

CONTRA COSTA GENERATING STATION LLC
CONTRA COSTA COMBINED CYCLE FACILITY

SOIL EROSION CONTROL – SITE PLAN – SHEET 2

PROJECT DRAWING NUMBER: 163994–SS–3102
REV: A
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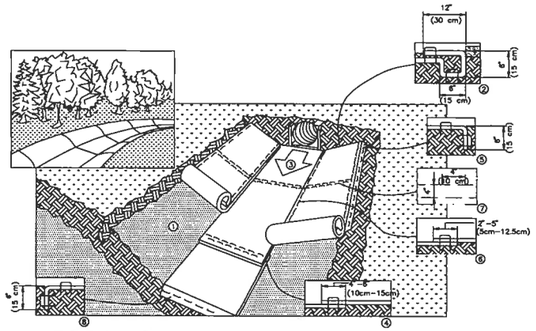
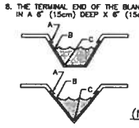


1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED. NOTE: WHEN USING CELL-O-SEED DO NOT SEED PREPARED AREA. CELL-O-SEED MUST BE INSTALLED WITH PAPER SIDE DOWN.
2. BEGIN AT THE TOP OF THE CHANNEL BY ANCHORING THE BLANKET IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH WITH APPROXIMATELY 12" (30cm) OF BLANKET EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" (30cm) PORTION OF BLANKET BACK OVER SEED AND COMPACTED SOIL. SECURE BLANKET OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30cm) APART ACROSS THE WIDTH OF THE BLANKET.
3. ROLL CENTER BLANKET IN DIRECTION OF WATER FLOW IN BOTTOM OF CHANNEL. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE. WHEN USING OPTIONAL DOT SYSTEM™ STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
4. PLACE CONSECUTIVE BLANKETS END OVER END (SHINGLE STYLE) WITH A 4"-6" (10cm-15cm) OVERLAP. USE A DOUBLE ROW OF STAPLES STAGGERED 4" (10cm) APART AND 4" (10cm) ON CENTER TO SECURE BLANKETS.
5. FULL LENGTH EDGE OF BLANKETS AT TOP OF SIDE SLOPES MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
6. ADJACENT BLANKETS MUST BE OVERLAPPED APPROXIMATELY 2"-5" (5cm-12.5cm) (DEPENDING ON BLANKET TYPE) AND STAPLED. TO ENSURE PROPER SEAM ALIGNMENT, PLACE THE EDGE OF THE OVERLAPPING BLANKET (BLANKET BEING INSTALLED ON TOP) EVEN WITH THE COLORED SEAM STITCH ON THE BLANKET BEING OVERLAPPED.
7. IN HIGH FLOW CHANNEL APPLICATIONS, A STAPLE CHECK SLOT IS RECOMMENDED AT 30 TO 40 FOOT (8m-12m) INTERVALS. USE A DOUBLE ROW OF STAPLES STAGGERED 4" (10cm) APART AND 4" (10cm) ON CENTER OVER ENTIRE WIDTH OF THE CHANNEL.
8. THE TERMINAL END OF THE BLANKETS MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.



CRITICAL POINTS

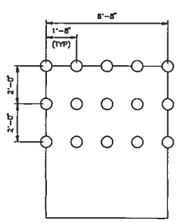
A. OVERLAPS AND SEAMS
B. PROJECTED WATER LINE
C. CHANNEL BOTTOM/SIDE SLOPE VERTICES

NOTE:
- HORIZONTAL STAPLE SPACING SHOULD BE ALTERED IF NECESSARY TO ALLOW STAPLES TO SECURE THE CRITICAL POINTS ALONG THE CHANNEL SURFACE.

** IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 8" (15 cm) MAY BE NECESSARY TO PROPERLY ANCHOR THE BLANKETS.

EC-7 EROSION BLANKET INSTALLATION (NORTH AMERICAN GREEN SC150BN OR S150 BN)

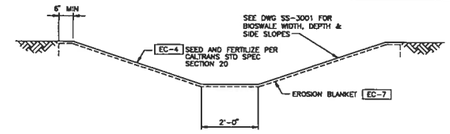
NO SCALE
SEE THIS DWG



NOTE:
USE 3.4 STAPLES PER SQ YD WITH 8", 11 GA WIRE "U" STAPLES.
FOR LOOSE SOILS USE STAPLES 8" AND LONGER.
FOR HARD OR ROCKY SOILS USE 9 GA STAPLES OR HEAVIER.
SECURE BLANKETS TO SOIL BY PLACING A STAPLE/STAKE THROUGH EACH WHITE COLORED CIRCLE.

STAPLE PATTERN "D" FOR EROSION BLANKET

NO SCALE
SEE THIS DWG



TYPICAL BIOSWALE EROSION PROTECTION

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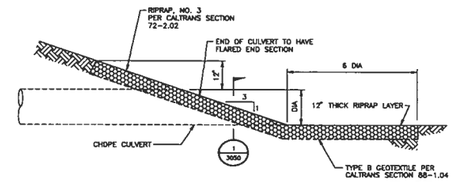
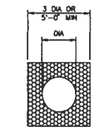


EC-10 TYPICAL STORM DRAIN PIPING INLET/OUTLET PROTECTION

NO SCALE



SECTION 1

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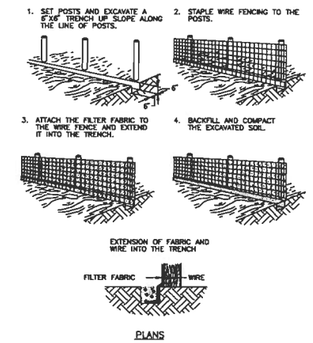

SE-1 SILT FENCE DETAIL

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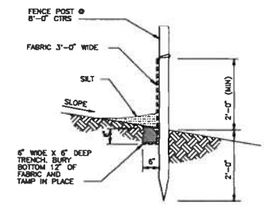
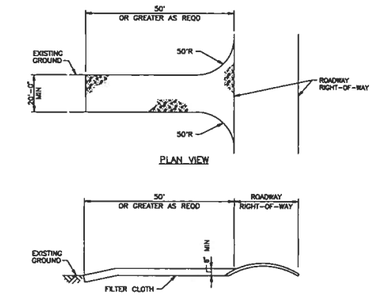
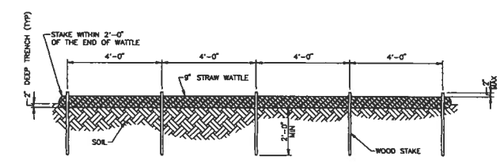


ELEVATION



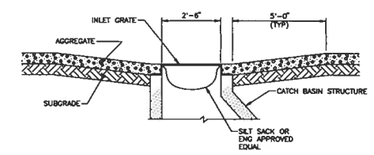
TC-1 TYPICAL STABILIZED CONSTRUCTION ENTRANCE

NO SCALE
SEE NOTE 2



SE-5 STRAW WATTLE DETAIL

NOT TO SCALE



SE-10 TYPICAL CATCH BASIN SEDIMENT FILTER

NOT TO SCALE

NOTES

1. SEE DRAWING SS-3001 FOR GENERAL NOTES AND LEGEND.
2. PROVIDE APPROPRIATE TRANSITION BETWEEN STABILIZED CONSTRUCTION ENTRANCE AND ROADWAY R.O.W.
3. DESIGN CRITERIA FOR STABILIZED CONSTRUCTION ENTRANCE.
   A. STONE SIZE - USE ASTM C-33, SIZE NO 2 OR 3, USE CRUSHED STONE.
   B. THICKNESS - NOT LESS THAN 8 INCHES.
   C. WIDTH - NOT LESS THAN FULL WIDTH OF POINTS OF INGRESS OR EGRESS.
   D. LENGTH - 50 FEET MINIMUM WHERE THE SOILS ARE SANDS OR GRAVEL OR 100 FEET MINIMUM WHERE SOILS ARE CLAYS OR SILTS, EXCEPT WHERE THE TRAVELED LENGTH IS LESS THAN 50 OR 100 FEET RESPECTIVELY. THESE LENGTHS MAY BE INCREASED WHERE FIELD CONDITIONS DICTATE.
   E. FILTER CLOTH - WILL BE PLACED OVER ENTIRE AREA PRIOR TO PLACING OF STONE.
   F. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ON TO PUBLIC RIGHT-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE OR ADDITIONAL LENGTH AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.

NOT TO BE USED FOR CONSTRUCTION

NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
A	OPEN	ISSUED FOR	HAN	PLM	PLM	DVR	

60' 30' 0 60' 120'
SCALE: 1"=60'

I HEREBY CERTIFY THAT THIS DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CALIFORNIA
SIGNED
DATE REG NO.

BLACK & VEATCH CORPORATION
ENGINEER PLM DRAWN HAW
CHECKED DATE

CONTRA COSTA GENERATING STATION LLC
CONTRA COSTA COMBINED CYCLE FACILITY

SOIL EROSION CONTROL - SITE SECTIONS AND DETAILS

PROJECT DRAWING NUMBER 163994-SS-3150 REV A
CODE
AREA

SPU37182 ACAD 16.1s (LMS Tech)
A1A40107 E1
04/09/08 (11:03:28)

BLACK & VEATCH

Calculation Record

Client Name: Radback Energy Page 1 of 30

Project Name: Tenaska Project No.: 163994

Calculation Title: Storm Sewer Pipe Design

Calculation No./File No.: 52.5406.1005

Calculation Is: (check all that apply) ☐ Preliminary ☒ Final ☐ Nuclear Safety-Related

Objective To verify the storm sewer pipes have sufficient capacity to convey the stormwater runoff for the design storm event for proposed Tenaska Contra Costa Generation Project.

Unverified Assumptions Requiring Subsequent Verification

No.	Assumption	Verified By	Date

See Page 2 of this calculation for additional assumptions.

This Section Used for Computer Generated Calculations

Program Name/Number: Version:

Evidence of or reference to computer program verification, if applicable:

Bases or reference thereto supporting application of the computer program to the physical problem:

Review and Approval

Rev	Prepared By	Date	Verified By	Date	Approved By	Date
0	J Zhong Jimmy Zhong	April 15, 2009	P Nelson	4/15/09	P Nelson	4/15/09

Purpose

The design of storm sewer pipes for this project generally consist of two sizes - 12" diameter and 18" diameter. All the sewer pipes will be installed at a minimum of 0.4% slope. The purpose of this calculation is to verify the storm sewer pipes have sufficient capacity to convey the stormwater for a 10-year storm event. The two 18" diameter pipes which discharge directly to the wetland at the most downstream of bioswales will be sized based on a 50-year storm event due to bioswale sizing being based on a 30-year design event.

References

1. Black & Veatch Drawing:
   - 163994-SS-3001, Rev. 0, "Grading & Drainage - Site Plan - Sheet 1"
   - 163994-SS-3201, Rev. A, "Surfacing/Fencing/Roadway - Site Plan - Sheet 1"
   - 163994-SS-3050, Rev. 0, "Site Sections and Details"
   - 163994-SS-1002, Rev. 1, "General Arrangement – Site"
2. Roberson, Cassidy and Chaudhry; Hydraulic Engineering; John Wiley & Sons, Inc.; Second Edition; 1997.
3. US Department of Commerce; Rainfall Intensity-Duration-Frequency Curves; Technical Paper No. 25; December 1955.
4. US Department of Agriculture; Urban Hydrology for Small Watersheds, 2nd Edition; Technical Release 55 (TR-55); June 1986.
5. Contra Costa Clean Water Program; Stormwater C.3 Guidebook; Stormwater Quality Requirements for Development Applications; Fourth Edition; September 10, 2008.
6. Mays, L. W.; Stormwater Collection Systems Design Handbook; McGraw-Hill; 2001.
7. Black & Veatch Calculation; Stormwater Analysis for Wetland; File No. 52.5406.1003; Same Project; March 2009.
8. Black & Veatch Calculation; IMP Sizing for Plant Area; File No. 52.5406.1002; Same Project; March 2009.

Definition of Units and Constants

English units will be used.

Example of Common Unit Designations:

Rainfall intensity in inches per hour (inch/hr)

Drainage area in acres (ac)

B&V General Design Criteria

The following design items are based on standard practices used at B&V and engineering experience:

1. Use the Rational Method to determine the peak rate of run-off.

$$Q = CIA \quad \text{(cfs)} \qquad \text{(Ref. 2, Eq. 2-1)}$$

C = runoff coefficient
I = rainfall intensity (inch/hr)
A = drainage area (acres)

2. Per Ref. 4, Page 3-4, 0.1 hour (6 minutes) is the minimum time of concentration (T_c) used in TR-55 for a drainage basin. Per Ref. 6, Table 4.2, standard time of concentrations can be used for small, impervious areas. The recommended time of concentration is 5 minutes for "roof and property drainage", 5 minutes for "road inlet pits", and 10 minutes for "small areas less than 1 acre". Based on the above information, the minimum travel time to a yard catch basin within each drainage basin is set to be 6 minutes (0.1 hour).

3. Assume the project site is graded with slopes of approximately 0.5% for effective drainage of stormwater.

4. Slope storm sewer piping with a diameter of 12-inch and greater at a minimum of 0.4% which is typical for storm sewer design.

5. Design the storm sewer piping such that the full flow velocity through the piping will be greater than 2 ft/s and less than 8 ft/s.

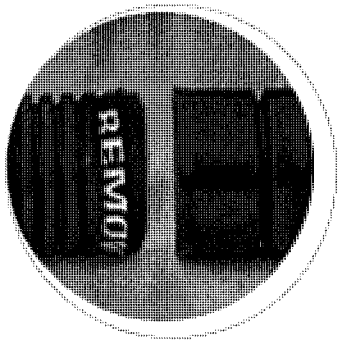
6. Use corrugated high-density polyethylene (CHDPE) pipes for typical storm sewer piping. Use Manning's "n" of 0.011 based on the product specification of HANCOR SURE-LOK® F477 (see Page 4).

Radback Tenaska project 163994
File # 52.5406.1005 page 4 of 30

Hancor®
Technology · Innovation · Solutions™

HANCOR SURE-LOK® WT PIPE SPECIFICATIONS

Diameter: 4" - 10" (100 - 250mm)
Length: 20' (6.1m)
Specifications: AASHTO M252, Type S
Joints: Bell-and-spigot
Gasket: Rubber, meeting ASTM F477



SCOPE

This specification describes 4" - 10" (100 - 250 mm) Hancor Sure-Lok WT pipe for use in non-pressure drainage applications.

PIPE REQUIREMENTS

Sure-Lok WT pipe shall have a smooth interior and annular exterior corrugations.

- 4" - 10" (100 - 250 mm) shall meet AASHTO M252, Type S.
- Manning's "n" value for use in design shall be 0.010 to 0.012. USE n = 0.011

JOINT PERFORMANCE

Pipe shall be joined with the Sure-Lok joint meeting the requirements of AASHTO M252. The joint shall be watertight according to the laboratory requirements of ASTM D3212. Joints shall remain watertight when subjected to a 1.5 degree axial misalignment.

Gaskets shall be made of polyisoprene meeting the requirements of ASTM F477 with the addition that the gaskets shall not have any visible cracking when tested according to ASTM D1149 after 72 hour exposure in 50 PPHM ozone at 104° F (40° C).

Gaskets shall be installed by the pipe manufacturer and covered with a removable wrap to ensure the gasket is free from debris. A joint lubricant supplied by the manufacturer shall be used on the gasket and bell during assembly.

FITTINGS

4" - 10" (100 - 250 mm) fittings shall conform to AASHTO M252.

MATERIAL PROPERTIES

Virgin material for pipe and fitting production shall be high density polyethylene meeting ASTM D3350 minimum cell classification 324420C for 4" - 10" (100 - 250 mm) diameters.

INSTALLATION

Installation shall be in accordance with ASTM D2321 and Hancor's published installation guidelines; with the exception that minimum cover in trafficked areas shall be one-foot (0.3 m). Contact your local Hancor representative or visit our website at www.hancor.com for a copy of the latest installation guidelines.

PIPE DIMENSIONS

Nominal Pipe I.D., in. (mm)	4 (100)	6 (150)	8 (200)	10* (250)
Approx. Pipe O.D., in. (mm)	4.7 (119)	6.9 (175)	9.4 (239)	11.8 (300)
Approx. Pitch in. (mm)	0.6 (16)	0.7 (18)	1.0 (26)	13.1 (333)
Approx. Weight lb./ft. (kg/m)	0.33 (0.49)	1.0 (1.5)	1.5 (2.2)	3.3 (4.9)

*Check with sales representative for availability.

OFFICIAL PARTNER
DUCKS UNLIMITED

Hancor is an Official Partner of Ducks Unlimited, the world's leading wetland conservation organization.

All sales of Hancor product are subject to a limited warranty and purchasers are solely responsible for installation and use of Hancor products and determining whether a product is suited for any specific needs. Please consult a full copy of Hancor's Terms and Conditions for Sale for further details.

Direct Contact

Customer Service
888-FOR PIPE (367-7473)
Fax 888-FAX PIPE (329-7473) 24 hours a day

Application Engineering
For technical questions, call
800-2HANCOR (242-6267), ext. 809

Electronic Media

Web Site
For further details on product specifications, visit the Design Aids section of our On-Line Pipeline:
www.hancor.com

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#1121/0404

Project Specific Design Criteria

The following design items are specific to the project site:

1. Subdivide the individual drainage basins based on the following runoff categories:
   - Equipment/Roofs
   - Asphalt/Concrete Pavement
   - Gravel Surfacing (dense-graded aggregates)
   - Landscape/Grass
   - Transformer Containment
   - Open Graded Aggregates (ACC Area)

2. Use the following runoff coefficients (C) for the Rational Method (Ref. 5 and Ref. 8):
   - Equipment/Roofs = 1.00
   - Asphalt/Concrete Pavement = 1.00
   - Gravel Surfacing = 0.60
   - Landscape/Grass, Type A Soil = 0.10 (See Ref. 8 for Soil Classification)
   - Transformer Containment = 0.00
   - Open Graded Aggregates = 0.10

3. Use the rainfall intensity curves for Sacramento, California (Ref. 3) to determine the intensity for the project site as this project site is close to and has similar climate conditions as Sacramento, California.

Attachments

1. Black & Veatch Drawings SS-1002, SS-3001, SS-3201 and SS-3050
2. Reference 3 – Select Pages
3. Reference 4 – Select Pages
4. Reference 5 – Select Pages
5. Reference 6 – Select Pages

Summary

The 12" diameter storm sewer pipes were verified to have sufficient capacity to carry the peak runoff for a 10-year storm event. The 18" diameter storm sewer pipes at the end of the bioswales which discharge directly to the wetland (these pipes have the maximum flow rates among 18" diameter pipes) were verified to have sufficient capacity to carry the peak runoff for a 50-year storm event.

General

The design storm sewer pipes for this project generally consist of two sizes - 12" diameter and 18" diameter. All the sewer pipes will be installed at approximately 0.5% slope. The 12" diameter sewer pipes will drain to bioswales constructed near the perimeter of the plant. Two bioswale routes will be constructed to convey stormwater runoff to the wetland, one route along the north boundary of the plant site and the other one along the south boundary. See Drawing SS-3001 (Attachment 1). The bioswales will collect and infiltrate stormwater on site. Drop structures will be installed at the end of each bioswale such that sufficient depth (volume) of stormwater has to be collected in the bioswales before downstream discharge can happen.

18" diameter storm sewer pipes will be installed at the most downstream of bioswales along with drop structures to discharge any overflow to the wetland. The wetland is located on the west side of the conservation easement. 18" diameter pipes acting as culverts will be used to connect adjacent bioswales. See Drawing SS-3001 (Attachment 1).

Pipe Sizing - 12" Diameter

By examining individual drainage basins and their ground cover conditions, the storm sewer pipes C-5, C-6 and C-11 are considered to have the maximum flow rates among 12" diameter sewer pipes. The drainage areas for these three sewer pipes are delineated as shown on Page 10. These three areas will be utilized to verify that the 12" diameter storm sewer pipes have sufficient capacity to carry the peak flow.

Slope of Pipes C-5 and C-6: From SS-3050 (Attachment 1), the inlet invert EL is at 13.1; the outlet invert EL is at 12.9. The pipe is measured to be 52 feet long. Thus the slope = (13.1-12.9)/52 = 0.4%.

Slope of Pipe C-11: From SS-3050 (Attachment 1), the inlet invert EL is at 13.4; the outlet invert EL is at 12.6. The pipe is measured to be 185 feet long. Thus the slope = (13.4-12.6)/185 = 0.4%.

Use 0.4% as the slope of the pipes in the calculations.

(1) Travel Time

The minimum time of concentration (T_c) used in TR-55 is 0.1 hour.
The drainage areas for storm sewer pipes C-5, C-6 and C-11 predominantly consist of equipment, asphalt pavement and aggregate surfacing. These areas are relatively small in size. It is expected that the time of concentration for these areas are very low. Use the minimum time of concentration T_c = 0.1 hr (6 minutes) for all these drainage areas.

(2) Rainfall Intensity

Based on the "Rainfall Intensity – Duration – Frequency" curve for Sacramento, California, the rainfall intensity for a 10-year storm event for 6-minute duration is:

I = 2.9 inch/hr. (see Ref. 3)

(3) Maximum Allowable Flow Rate

The maximum allowable flow rate for a 12" diameter pipe with a 0.4% slope was determined using the FlowMaster 2005 computer program. From the computer output shown on Page 11, the results are as follows:

Maximum allowable flow rate = 2.66 cfs. (full pipe flow)
Flow velocity = 3.39 ft/s, between 2 ft/s and 8 ft/s, OK.

The peak runoff rate by Rational Method is: Q = C x I x A, where: I in inch/hr, A in acres, and Q in cfs.

For I = 2.9 inch/hr and maximum Q = 2.66 cfs, the maximum (C x A) is calculated to be:

$(C \times A)_{\max imum}$ = 2.66 / 2.9 = 0.92 acres.

The $C \times A$ values were calculated for each drainage basin for the storm sewer pipes C-5, C-6 and C-11. See below. All the areas were measured by using AutoCAD.

Drainage Basin for C-5

	Area, A (ft^2)	Runoff Coefficient, C	C X A (ft^2)
Equipment/Roofs	14,071	1.0	14,071
Asphalt Pavement	6,678	1.0	6,678
Gravel Surfacing	22,232	0.6	13,339
Transformer Containment	1,142	0.0	0
Total	--	--	34,088

$\sum(C \times A)$ = 34,088 ft^2 = 0.783 acres < $(C \times A)_{\max imum}$ = 0.92 acres, OK.

Drainage Basin for C-6

	Area, A (ft^2)	Runoff Coefficient, C	C X A (ft^2)
Equipment/Roofs	6,800	1.0	6,800
Asphalt Pavement	2,290	1.0	2,290
Gravel Surfacing	18,317	0.6	10,990
Transformer Containment	2,943	0.0	0
Total	--	--	20,080

$\sum(C \times A)$ = 20,080 ft^2 = 0.461 acres < $(C \times A)_{\max imum}$ = 0.92 acres, OK.

Drainage Basin for C-11

	Area, A (ft^2)	Runoff Coefficient, C	C X A (ft^2)
Equipment/Roofs	5,862	1.0	5,862
Asphalt Pavement	4,138	1.0	4,138
Gravel Surfacing	19,291	0.6	11,575
Transformer Containment	1,874	0.0	0
Total	--	--	21,575

$$\sum(C \times A) = 21{,}575\ ft^2 = 0.495\ acres < (C \times A)_{max\ imum} = 0.92\ acres,\ OK.$$

Conclusion: The 12" diameter storm sewer pipes have sufficient capacity to carry the flows.

Radback Energy
Tenaska project
project # 163994
File # 52.5406.1005
storm sewer pipe Design

prepared by: J zhong
Date: April 15, 2009
checked by: Pravelen
Date: 4/15/09

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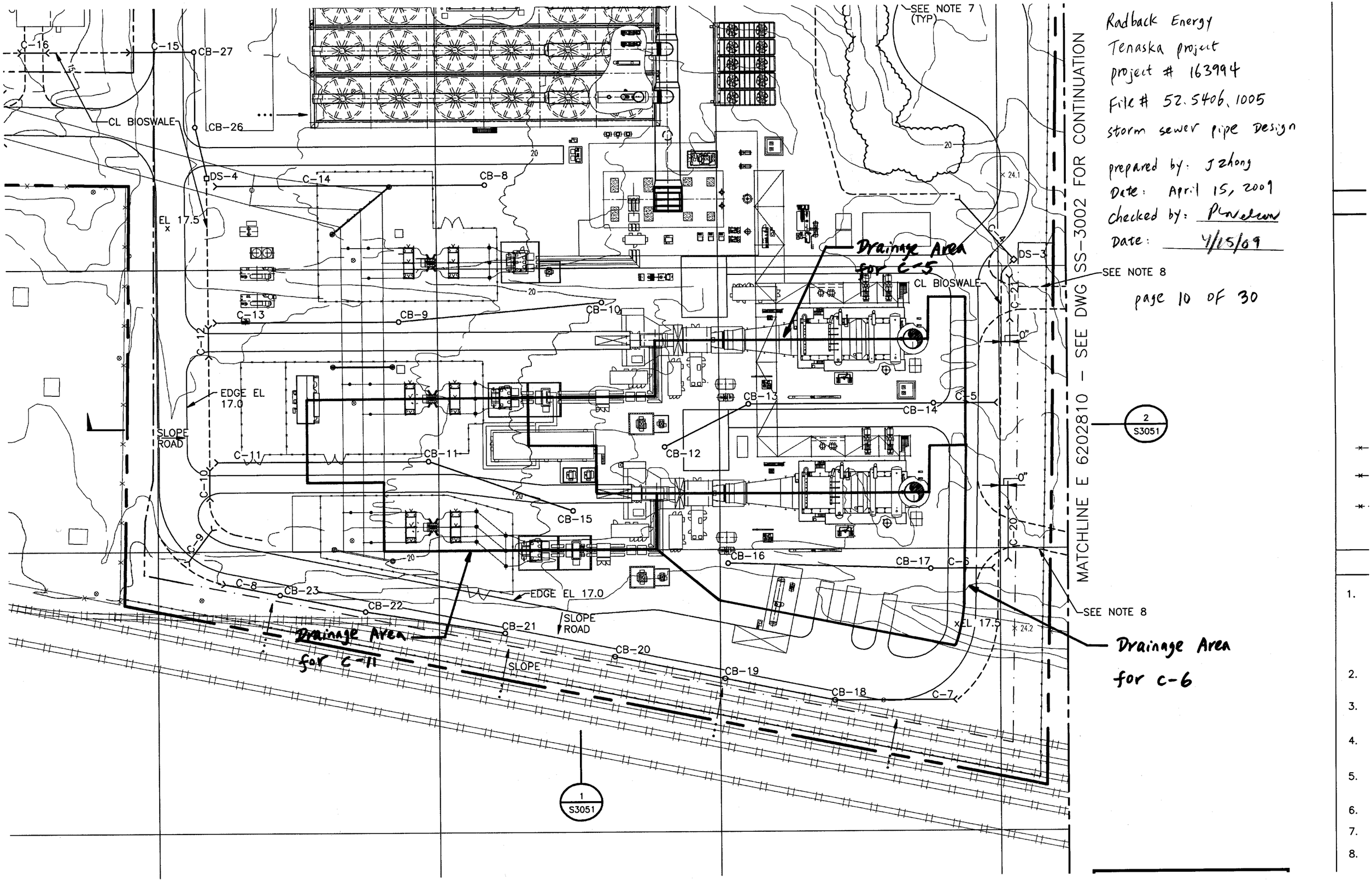


Radback Tenaska project
project # 163994
File # 52.5406.1005

Worksheet for Circular Pipe - 1

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.00400	ft/ft
Normal Depth	1.00	ft
Diameter	1.00	ft
Discharge	2.66	ft^3/s

Results

Discharge	2.66	ft^3/s
Normal Depth	1.00	ft
Flow Area	0.79	ft^2
Wetted Perimeter	3.14	ft
Top Width	0.00	ft
Critical Depth	0.70	ft
Percent Full	100.0	%
Critical Slope	0.00572	ft/ft
Velocity	3.39	ft/s
Velocity Head	0.18	ft
Specific Energy	1.18	ft
Froude Number	0.00	
Maximum Discharge	2.86	ft^3/s
Discharge Full	2.66	ft^3/s
Slope Full	0.00400	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%

Pipe Sizing - 18" Diameter

18" diameter storm sewer pipes (C-1 and C-19) will be installed at the most downstream of bioswales along with drop structures to discharge any overflow to the wetland. There are two bioswale routes to convey stormwater runoff to the wetland. The first route is along the north boundary of the plant site while the second route is along the south boundary. The drainage areas for the first route and second route are delineated as shown on Page 15.

Slope of Pipe C-1: From SS-3050 (Attachment 1), the inlet invert EL is at 8.2; the outlet invert EL is at 8.0. The pipe is measured to be 38 feet long. Thus the slope = (8.2-8.0)/38 = 0.5%.

Slope of Pipe C-19: From SS-3050 (Attachment 1), the inlet invert EL is at 8.7; the outlet invert EL is at 8.4. The pipe is measured to be 45 feet long. Thus the slope = (8.7-8.4)/45 = 0.7%.

Use 0.5% as the slope of the pipes in the calculations to be conservative.

(1) Travel Time

Per calculation "Stormwater Analysis for Wetland" for the same project (Ref. 7), the time of concentration for this project site is 0.93 hour (56 minutes) for pre-development condition. For post-development condition, IMPs (bioswales) will be installed to retain and infiltrate stormwater on site. The Stormwater C.3 Guidebook (Ref. 5) indicates that post-project runoff does not exceed pre-project runoff rates or durations if the IMPs are sized based on the C.3 Guidebook. Based on this, it is estimated that the post-development time of concentration will not exceed the pre-development time of concentration. Therefore, use the time of concentration T_c = 56 minutes for both bioswale routes.

(2) Rainfall Intensity

Based on the "Rainfall Intensity – Duration – Frequency" curve for Sacramento, California, the rainfall intensity for a 50-year storm event for 56-minute duration is:

I = 1.2 inch/hr. (see Ref. 3)

(3) Maximum Allowable Flow Rate

The maximum allowable flow rate for an 18" diameter pipe with a 0.5% slope was determined using the FlowMaster 2005 computer program. From the computer output on Page 16, the results are as follows:

Maximum allowable flow rate = 8.78 cfs. (full pipe flow)
Flow velocity = 4.97 ft/s, between 2 ft/s and 8 ft/s, OK.

The peak runoff rate by Rational Method is: Q = C x I x A, where: I in inch/hr, A in acres, and Q in cfs.

For I = 1.2 inch/hr and maximum Q = 8.78 cfs, the maximum (C x A) is calculated to be:
$(C \times A)_{\max imum}$ = 8.78 / 1.2 = 7.32 acres.

The $C \times A$ values were calculated for each drainage area of the two bioswale routes. See below. All the areas were measured by using AutoCAD.

Drainage Area for North Bioswale Route

	Area, A (ft^2)	Runoff Coefficient, C	C X A (ft^2)
Equipment/Roofs	61,323	1.0	61,323
Asphalt Pavement	67,199	1.0	67,199
Gravel Surfacing	100,200	0.6	60,120
Open Graded Aggregates (ACC Area)	68,200	0.1	6,820
Landscape, Group A Soil	230,466	0.1	23,047
Transformer Containment	4,491	0.0	0
Total	--	--	218,509

$\sum(C \times A)$ = 218,509 ft^2 = 5.02 acres < $(C \times A)_{\max imum}$ = 7.32 acres, OK.

Drainage Area for South Bioswale Route

	Area, A (ft^2)	Runoff Coefficient, C	C X A (ft^2)
Equipment/Roofs	35,298	1.0	35,298
Asphalt Pavement	59,167	1.0	59,167
Gravel Surfacing	295,933	0.6	177,560

	Area, A (ft^2)	Runoff Coefficient, C	C X A (ft^2)
Landscape, Group A Soil	113,387	0.1	11,339
Transformer Containment	5,479	0.0	0
Total	--	--	283,364

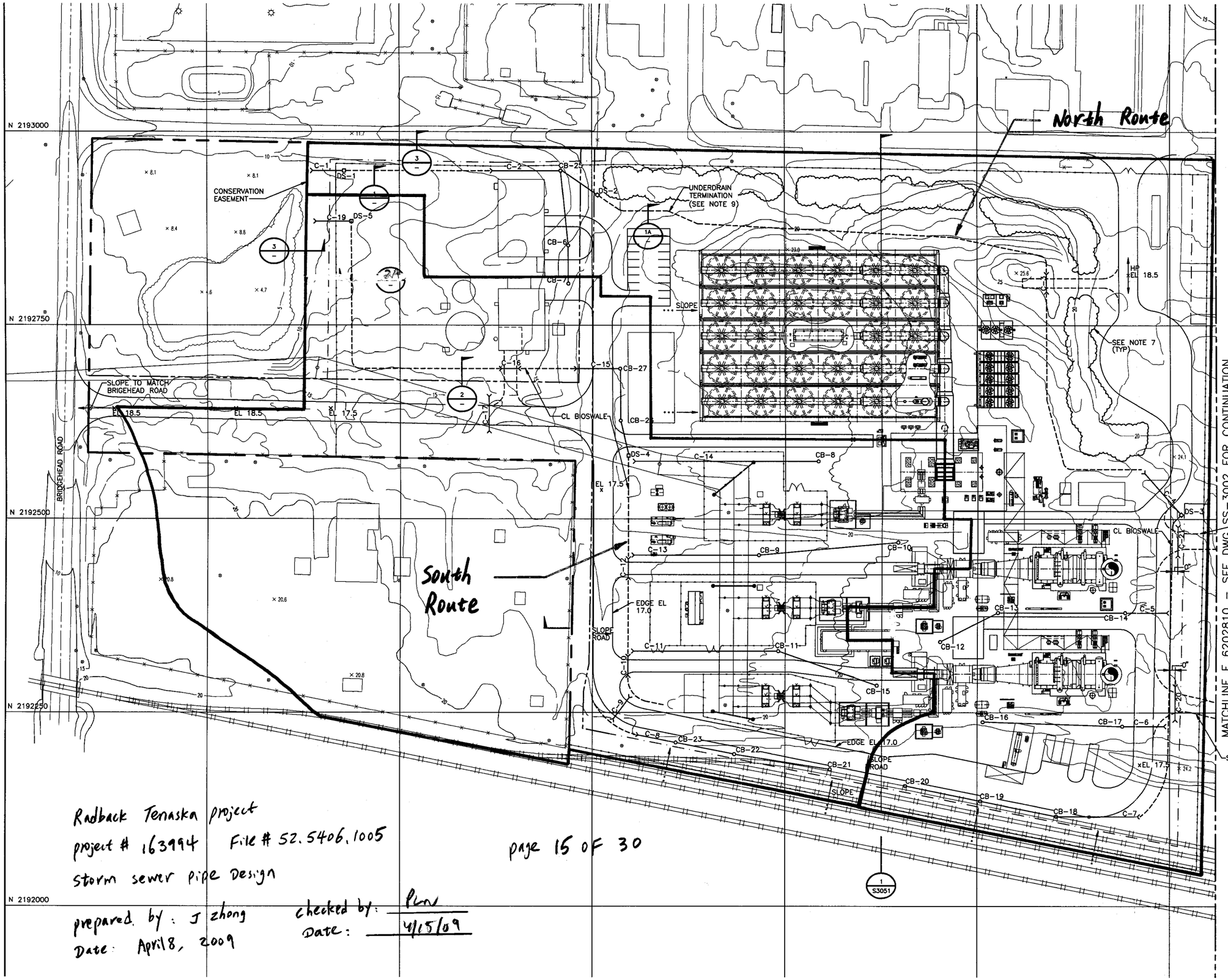
$$\sum(C \times A) = 283{,}364 \text{ ft}^2 = 6.51 \text{ acres} < (C \times A)_{\max imum} = 7.32 \text{ acres, OK.}$$

The combined peak flow rate of pipes C-1 and C-19 is:

$$\sum(C \times A) \text{ x I} = (5.02 + 6.51) \text{ x } 1.2 = 13.8 \text{ cfs.}$$

The peak flow rate from Ref. 7 was estimated at 9.0 cfs. Rational Method used in this calculation is known to over-estimate flow rate, especially for ~~large~~ larger areas (normal limit is 20 acres).

Conclusion: The 18" diameter storm sewer pipes have sufficient capacity to carry the flows.



Radback Tenaska project

project # 163994 File # 52.5406.1005

storm sewer pipe Design

prepared by: J zhong

Date: April 8, 2009

checked by: Pkw

Date: 4/15/09

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OPEN

ABBREVIATION

APPROX	–	APPR
ASPH	–	ASPH
AVG	–	AVER
BND	–	BEND
BLDG	–	BUILD
B/MH	–	BOTT
BOC	–	BOTT
BOD	–	BOTT
BOP	–	BOTT
BU	–	BELL-
C	–	CULV
CB	–	CATC
CD	–	CABL
CHDPE	–	CORR DENS
CL	–	CENT
CLR	–	CLEA
CMH	–	CHEM
CND	–	COND
CONC	–	CONC
CO	–	CLEA
CS	–	CARB
CW	–	CIRC
DB	–	DUCT
DBC	–	DIREC
DET	–	DETAI
DIA	–	DIAME
DIP	–	DUCT
DWG	–	DRAW
DWP	–	DOUB
EC	–	ELECT
ECC	–	ECCE
EF	–	EACH
EHH	–	ELECT
EL	–	ELEVA
EMH	–	ELECT
EW	–	EACH
FC	–	FIELD
FDN	–	FOUN
FF	–	FLAT
FRP	–	FIBER
GR	–	GRAD
HDM	–	HOT
HDPE	–	HIGH
HP	–	HIGH
HYD	–	HYDR
ID	–	INSID
INV	–	INVER
JBX	–	JUNC
L	–	LENG
LP	–	LOW

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NOTES A

1. COORDINATES ARE BASE NGVD 29 DATUM. BENC THE FLAGPOLE AT THE DATUM ELEVATION, ADD PHOTOGRAPH DATED JU ASSOCIATES, INC.
2. NEW GRADE ELEVATIONS INDICATE FINISH GRADE
3. ALL CUT AND FILL SLO NOTED OTHERWISE.
4. SEE DWG SS-3050 FO STRUCTURE CHARTS.
5. TOP OF CONCRETE ELE EL 18.0. FINISH GRADE
6. CL OF ALL PAVED ROA
7. TREES TO REMAIN. GRA
8. TEMPORARY ROAD FRO CONSTRUCTION.
9. UNDERDRAIN CONTINUO EASEMENT. UTILIZE UNP

Radback Tenaska project
project # 163994
File # 52.5406.1005

Worksheet for Circular Pipe - 1

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.00500	ft/ft
Normal Depth	1.50	ft
Diameter	1.50	ft
Discharge	8.78	ft³/s

Results

Discharge	8.78	ft³/s
Normal Depth	1.50	ft
Flow Area	1.77	ft²
Wetted Perimeter	4.71	ft
Top Width	0.00	ft
Critical Depth	1.15	ft
Percent Full	100.0	%
Critical Slope	0.00575	ft/ft
Velocity	4.97	ft/s
Velocity Head	0.38	ft
Specific Energy	1.88	ft
Froude Number	0.00	
Maximum Discharge	9.44	ft³/s
Discharge Full	8.78	ft³/s
Slope Full	0.00500	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%

Radback Energy
Tenaska Contra Costa Generation
Project # 163994 File # 52.5406.1005

Prepared by: J Zhong
Date: April 8, 2009
# of Pages: 5

Attachment 1

Black & Veatch Dwgs SS-1002, SS-3001, SS-3201 and SS-3050

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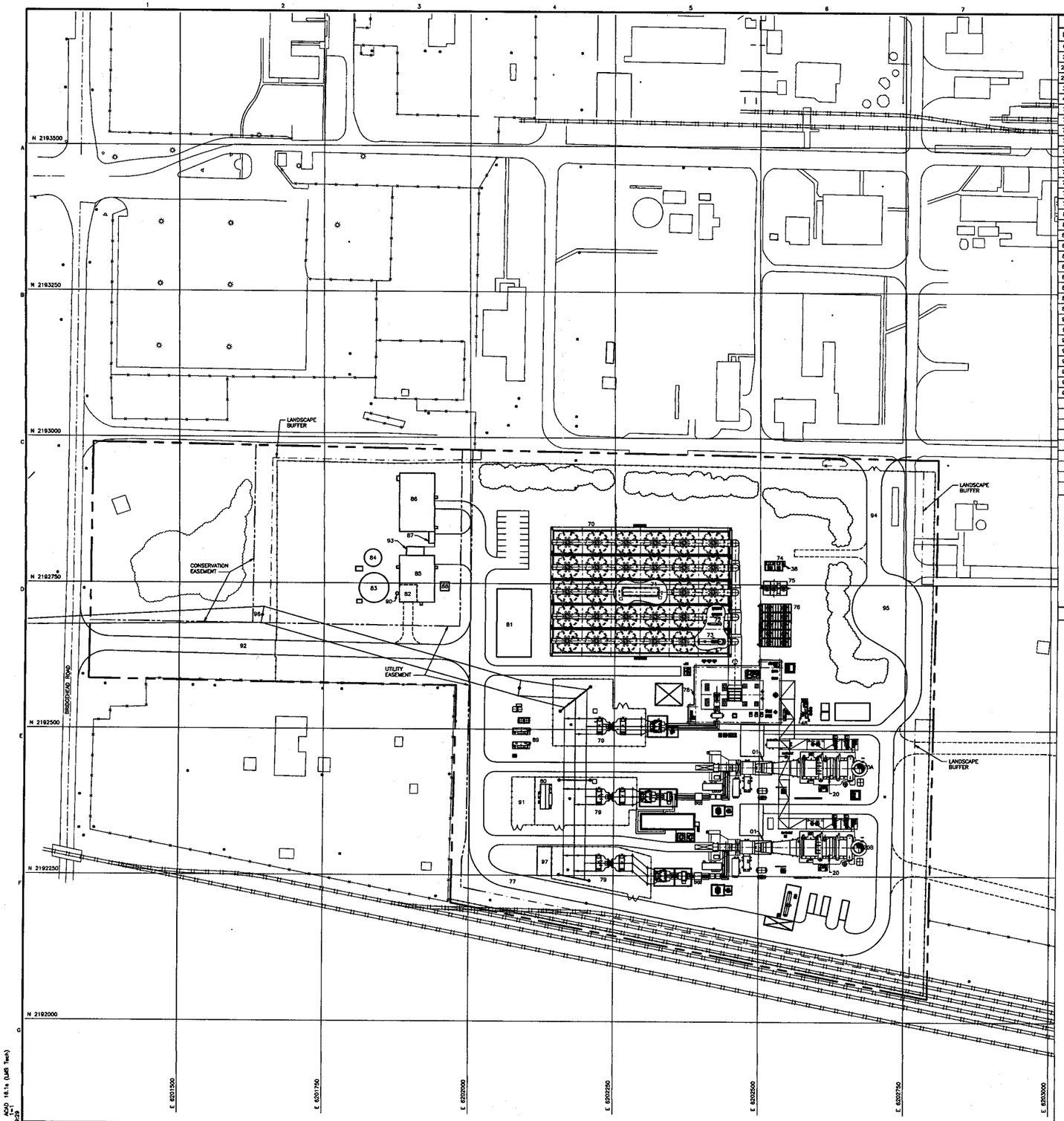

FACILITIES LEGEND

ID	FACILITY	STRUCTURE HEIGHT	TIEDOWN LOCATION NORTH	TIEDOWN LOCATION EAST	REMARKS
01	COMBUSTION TURBINE	70'	–	–	–
20	HEAT RECOVERY STEAM GENERATOR (HRSG)	103'	–	–	–
20A	HRSG EXHAUST STACK A	155'	2192436.00	6202665.00	CL EXHAUST STACK
20B	HRSG EXHAUST STACK B	155'	2192300.00	6202665.00	CL EXHAUST STACK
38	SAFETY SHOWER EYEWASH STATION	–	–	–	–
48	AUXILIARY BOILER	50'	2192527.61	6202572.26	CL EXHAUST STACK
70	AIR COOLED CONDENSER (ACC)	124'	–	–	–
71	ACC ELECTRICAL ENCLOSURE	14'	–	–	–
72	CONDENSER AIR EXTRACTION SKIDS	6'	–	–	–
73	ACC CONDENSATE COLLECTION TANK	28'	–	–	–
74	WET SURFACE AIR COOLER CHEMICAL FEED SKIDS	8'	–	–	–
75	WET SURFACE AIR COOLER	23'	2192744.67	6202523.00	CL COOLER
76	CLOSED CYCLE COOLING WATER HEAT EXCHANGER	19'	–	–	–
77	LOOP ROAD	–	–	–	–
78	STEAM TURBINE FOUNDATION	–	–	–	–
79	SWITCHYARD	18' & 45'	–	–	–
80	SWITCHYARD CONTROL ENCLOSURE	12'	–	–	–
81	CONTROL & ADMIN BUILDING	14'	–	–	–
82	FIRE WATER PUMP ROOM	20'	–	–	–
83	FIRE/SERVICE WATER STORAGE TANK	32'	–	–	–
84	DEMIN WATER STORAGE TANK	24'	–	–	–
85	WATER TREATMENT BUILDING	20'	–	–	–
86	WAREHOUSE/MAINTENANCE BUILDING	16'	–	–	–
87	LUBRICANT STORAGE SHED	10'	–	–	–
88	WASTE WATER LIFT STATION (IF REQUIRED)	–	–	–	–
89	GAS COMPRESSORS & GAS CONDITIONING	13'	–	–	–
90	DIESEL FIRE PUMP EXHAUST	16'	2192732.52	6201874.72	CL EXHAUST STACK
91	GAS METERING STATION	–	–	–	–
92	ACCESS ROAD	–	–	–	–
93	LEASED MIX BED EXCHANGER CONCRETE SLAB	–	–	–	–
94	EMERGENCY ACCESS ROAD	–	–	–	–
95	CUL DA SAC (TURNAROUND)	–	–	–	–
96	230KV POWER POLE	106'	–	–	–
97	OUTAGE MAINTENANCE TRAILERS AREA	–	–	–	–

NOTES

1. COORDINATES ARE BASED ON CALIFORNIA COORDINATE SYSTEM CCS83, ZONE 3. ELEVATION ARE BASED ON, NGVD 29 DATUM. BENCHMARK IS NATIONAL GEODETIC SURVEY BENCH MARK "W 563", LOCATED ADJACENT TO THE FLAGPOLE AT THE DUPONT PLANT ENTRANCE, ELEVATION = 11.168 FEET. TO OBTAIN DUPONT PLANT DATUM ELEVATION, ADD 0.70 FEET TO THE ELEVATIONS SHOWN. TOPOGRAPHIC DATA IS BASED ON AERIAL PHOTOGRAPH DATED JUNE 11, 2001. AERIAL SURVEY INFORMATION WAS OBTAINED BY RONALD GREENWELL & ASSOCIATES, INC.
2. SEE PLANT ARRANGEMENT DRAWING SM-2001, FOR LEGEND OF MAIN POWER BLOCK.
3. PROPERTY AND EASEMENT BOUNDARY INFORMATION IS BASED UPON DRAWING EXHIBIT D, BY RONALD GREENWELL & ASSOCIATES, INC. REVISION DATED 05/FEB/09.

GENERAL LEGEND

- NEW FENCE
- EXISTING FENCE
- PROPERTY BOUNDARY (SEE NOTE 3)
- EASEMENT BOUNDARY (SEE NOTE 3)
- LANDSCAPE BUFFER

NOT TO BE USED FOR CONSTRUCTION

THE DISTRIBUTION AND USE OF THE NATIVE FILE FORMAT OF THIS DRAWING OUTSIDE OF BLACK & VEATCH IS UNCONTROLLED AND SHALL BE USED FOR REFERENCE PURPOSES ONLY.

NO	DATE	REVISIONS AND RECORD OF ISSUE	DRWN	DES	CHK	PDE	APP
1	30/MAR/09	ISSUED PER ECN-N-S-0001	NAW	PLN		PLN	DWN
0	13/MAR/09	ISSUED FOR PERMITTING	NAW	PLN		PLN	DWN

SCALE: 1" = 60'

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SIGNED _____ REG NO. _____

DATE _____

BLACK & VEATCH CORPORATION

ENGINEER PLN DRAWN NAW

CHECKED DATE

CONTRA COSTA GENERATING STATION LLC

CONTRA COSTA COMBINED CYCLE FACILITY

GENERAL ARRANGEMENT SITE

PROJECT DRAWING NUMBER 163994-SS-1002

REV 1

CODE

AREA

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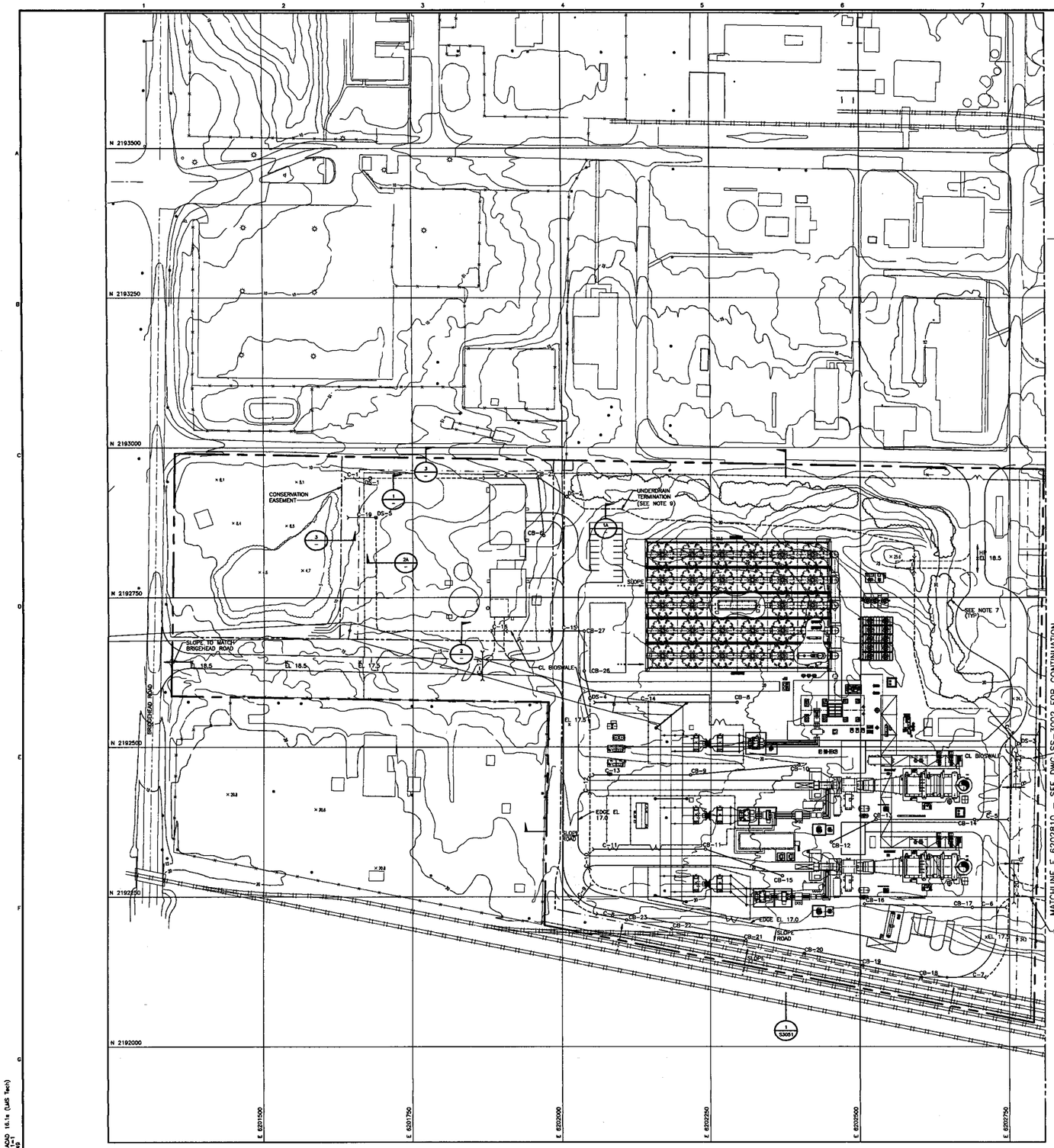

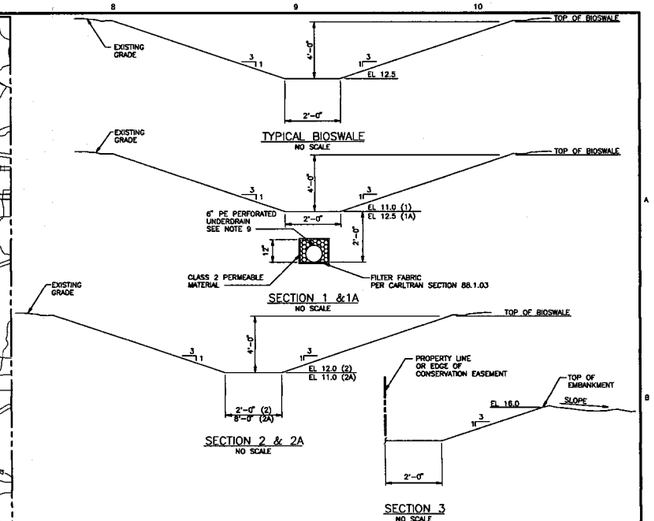

ABBREVIATIONS APPLICABLE TO ALL SS-3000 SERIES DRAWINGS

APPROX	=	APPROXIMATE	LTR	=	LATER
ASPH	=	ASPHALT	MAX	=	MAXIMUM
AVG	=	AVERAGE	MH	=	MANHOLE
BND	=	BEND	MIN	=	MINIMUM
BLDG	=	BUILDING	MJ	=	MECHANICAL JOINT
BLMH	=	BOTTOM OF MANHOLE ELEVATION	MSL	=	MEAN SEA LEVEL
BOC	=	BOTTOM OF CONDUIT ELEVATION	NO.	=	NUMBER
BOD	=	BOTTOM OF DUCTBANK ELEVATION	NTS	=	NOT TO SCALE
BOP	=	BOTTOM OF PIPE ELEVATION	OD	=	OUTSIDE DIAMETER
BU	=	BELL-UP	OWS	=	OIL WATER SEPARATOR
C	=	CULVERT	OWMH	=	OILYWASTE MANHOLE
CB	=	CATCH BASIN	PC	=	POINT OF CURVATURE
CD	=	CABLE DUCT	PE	=	PLAIN END
CHDPE	=	CORRUGATED HIGH DENSITY POLYETHYLENE PIPE	PI	=	POINT OF INTERSECTION
CL	=	CENTERLINE	PLCS	=	PLACES
CLR	=	CLEAR	PM	=	PLANT MANHOLE
CMH	=	CHEMICAL MANHOLE	POT	=	POINT OF TANGENT
CND	=	CONDUIT	PT	=	PIPE TERMINATION
CONC	=	CONCRETE	PVC	=	POLYVINYL CHLORIDE PIPE
CO	=	CLEAN OUT	QTY	=	QUANTITY
CS	=	CARBON STEEL	R	=	RADIUS
CW	=	CIRCULATING WATER	RCP	=	REINFORCED CONCRETE PIPE
DB	=	DUCTBANK	RD	=	ROOF DRAIN
DBC	=	DIRECT BURIED CABLE	RDV	=	REVISION
DET	=	DETAIL	RGS	=	RIGID GALVANIZED STEEL
DIA	=	DIAMETER	RR	=	RAILROAD
DIP	=	DUCTILE IRON PIPE	SECT	=	SECTION
DWG	=	DRAWING	SIM	=	SIMILAR
DWP	=	DOUBLE WALL PIPE	SLS	=	SANITARY LIFT STATION
EC	=	ELECTRICAL CONDUIT	SMH	=	SANITARY MANHOLE
ECC	=	ECCENTRIC	STMH	=	STORM MANHOLE
EF	=	EACH FACE	STRL	=	STRUCTURAL
EHH	=	ELECTRICAL HANDHOLE	T/C	=	TOP OF CONCRETE ELEVATION
EL	=	ELEVATION	T/G	=	TOP OF GRADE ELEVATION
EMH	=	ELECTRICAL MANHOLE	T/M	=	TELEPHONE SERVICE HANDHOLE
EW	=	EACH WAY	T/M	=	TOP OF MANHOLE ELEVATION
FC	=	FIELD CHECK	T/P	=	TOP OF PAVEMENT ELEVATION
FDN	=	FOUNDATION	TP	=	MECH PIPE TERMINAL POINT
FF	=	FLAT FACE	TYP	=	TYPICAL
FRP	=	FIBERGLASS REINFORCED PIPE	UGL	=	UNDERGROUND LIGHTING CONDUIT
GR	=	GRADE	UNO	=	UNLESS NOTED OTHERWISE
HDM	=	HOT DRAIN MANHOLE	VERT	=	VERTICAL
HDPE	=	HIGH DENSITY POLYETHYLENE PIPE	WGT	=	WEIGHT
HP	=	HIGH POINT	WTR	=	WATER
HYD	=	HYDRANT	W/	=	WITH
ID	=	INSIDE DIAMETER	W/O	=	WITHOUT
INV	=	INVERT	WP	=	WORK POINT
JBX	=	JUNCTION BOX	XFMR	=	TRANSFORMER
L	=	LENGTH			
LP	=	LOW POINT			

LEGEND APPLICABLE TO ALL S3000 DRAWINGS

- NEW CULVERT
- CL BIOSWALE
- SECTION OR DETAIL NUMBER / DRAWING DESIGNATION NUMBER (1 / S3000)
- FINISHED SPOT ELEVATIONS (× 326.5)
- SURVEY MONUMENT/CONTROL POINT (BM-1)
- EXISTING FENCE
- NEW SECURITY FENCE
- TEMPORARY CONSTRUCTION FENCE
- EROSION CONTROL METHOD (TR-1)
- NEW SLIDE GATE
- NEW SWING GATE
- EXISTING POWER POLE
- NEW CATCH BASIN (CB-101)
- NEW DROP STRUCTURE
- PROPERTY LINE
- BOUNDARY LINE
- EXISTING CONTOURS (126)
- GRADE TO DRAIN (DIRECTION OF ARROW)

NOTES APPLICABLE TO ALL SS-3000 SERIES DRAWINGS

1. COORDINATES ARE BASED ON CALIFORNIA COORDINATE SYSTEM CCS83, ZONE 3. ELEVATION ARE BASED ON, NGVD 29 DATUM. BENCHMARK IS NATIONAL GEODETIC SURVEY BENCH MARK "W 563", LOCATED ADJACENT TO THE FLAGPOLE AT THE DUPONT PLANT ENTRANCE. ELEVATION = 11.168 FEET. TO OBTAIN DUPONT PLANT DATUM ELEVATION, ADD 0.70 FEET TO THE ELEVATIONS SHOWN. TOPOGRAPHIC DATA IS BASED ON AERIAL PHOTOGRAPH DATED JUNE 11, 2001. AERIAL SURVEY INFORMATION WAS OBTAINED BY RONALD GREENWELL & ASSOCIATES, INC.
2. NEW GRADE ELEVATIONS SHOWN ON THE SITE GRADING AND DRAINAGE PLANS INDICATE FINISH GRADE UNLESS NOTED OTHERWISE.
3. ALL CUT AND FILL SLOPES SHALL BE 3 HORIZONTAL TO 1 VERTICAL OR FLATTER, UNLESS NOTED OTHERWISE.
4. SEE DWG SS-3050 FOR GRADING AND DRAINAGE DETAILS INCLUDING CULVERT, CATCH BASIN AND DROP STRUCTURE CHARTS.
5. TOP OF CONCRETE ELEVATIONS AND FINISH FLOOR ELEVATIONS FOR ALL EQUIPMENT AND BUILDINGS IS EL 16.0. FINISH GRADE ADJACENT TO ALL FOUNDATIONS IS EL 17.5.
6. CL OF ALL PAVED ROADS IS EL 17.5 UNO.
7. TREES TO REMAIN. GRADE TO REMAIN UNCHANGED WITHIN 20' OF TREE BASE.
8. TEMPORARY ROAD FROM LAYDOWN AREA. ROAD AND CULVERT UNDER ROAD TO BE REMOVED AT END OF CONSTRUCTION.
9. UNDERDRAIN CONTINUOUS UNDER BIOSWALE FROM UNDERDRAIN TERMINATION TO CONSERVATION EASEMENT. UTILIZE UNPERFORATED PIPE BETWEEN DS-2 TO C-2 OUTLET AND DS-1 TO C-1 OUTLET.

NOT TO BE USED FOR CONSTRUCTION

THE DISTRIBUTION AND USE OF THE NATIVE FILE FORMAT OF THIS DRAWING OUTSIDE OF BLACK & VEATCH IS UNCONTROLLED AND SHALL BE USED FOR REFERENCE PURPOSES ONLY.

NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	PLN	DWN	APP
0	16/APR/09	ISSUED FOR PERMITTING					NAW	PLN	

SCALE: 1"=60' (60' 30' 0 60' 120')

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SIGNED _____ DATE _____ REG NO. _____

BLACK & VEATCH CORPORATION

ENGINEER PLN DRAWN NAW CHECKED DATE

CONTRA COSTA GENERATING STATION LLC
CONTRA COSTA COMBINED CYCLE FACILITY

GRADING AND DRAINAGE – SITE PLAN – SHEET 1

PROJECT DRAWING NUMBER: 163994-SS-3001 REV: 0

CODE AREA

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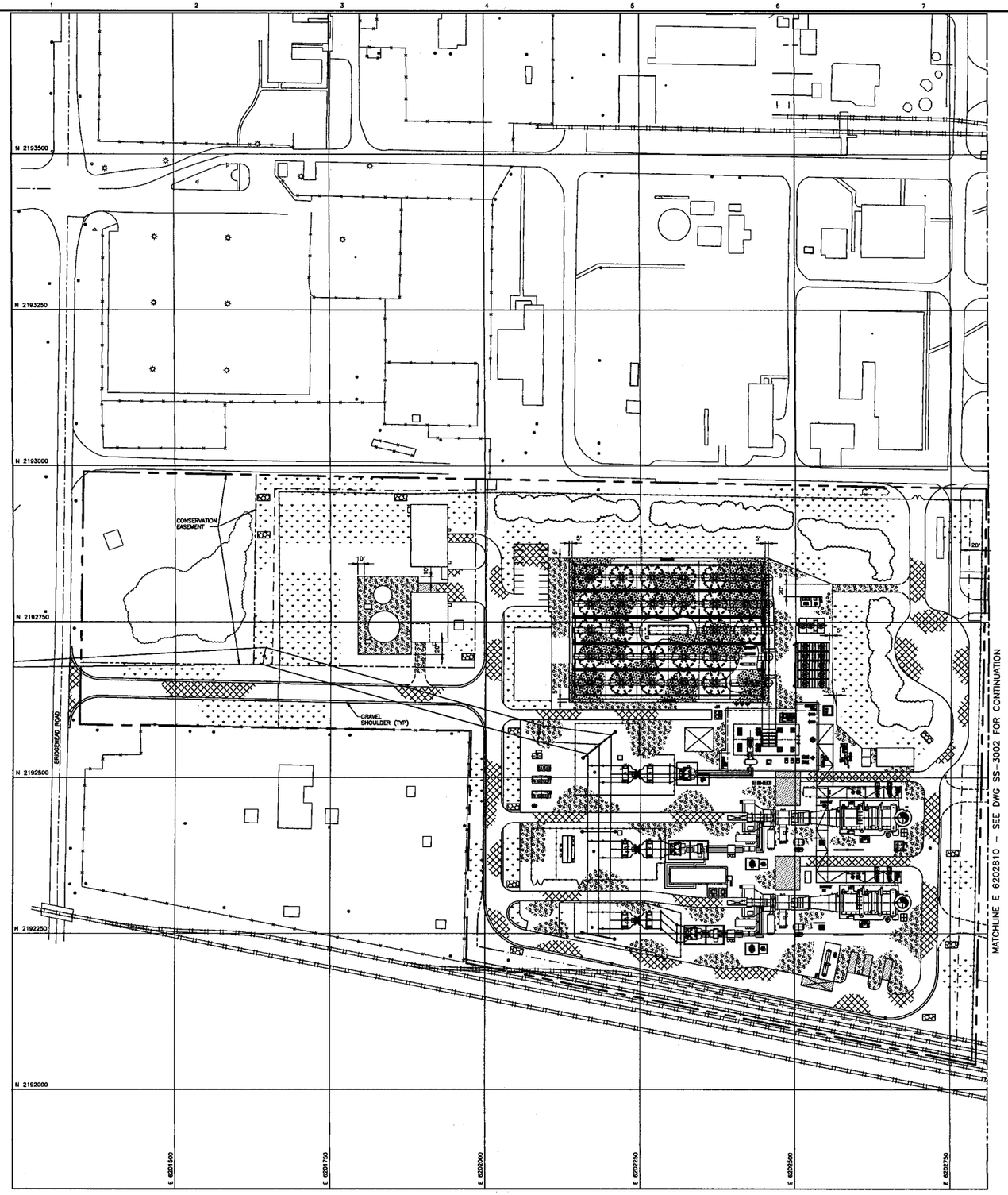

SITE SURFACING LEGEND

- ASPHALT SURFACING
- AGGREGATE SURFACING
- CONCRETE
- GRASS
- OPEN GRADED STONE SURFACING
- RIPRAP
- EXISTING FACILITY
- NEW FACILITY
- NATURAL SOIL

NOTES

1. SEE DRAWING SS-3001 FOR GENERAL NOTES AND LEGEND.

NOT TO BE USED
FOR CONSTRUCTION

NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	PLN	APP
A	27/MAR/09	ISSUED FOR CLIENT REVIEW	NAW				PLN	DVM

60' 30' 0 60' 120'
SCALE: 1" =60'

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SIGNED
DATE REG. NO.

BLACK & VEATCH CORPORATION
ENGINEER PLN DRAWN NAW
CHECKED DATE

CONTRA COSTA GENERATING STATION LLC
CONTRA COSTA COMBINED CYCLE FACILITY

SURFACING/FENCING/ROADWAY – SITE PLAN – SHEET 1

PROJECT DRAWING NUMBER 163994–SS–3201
REV A
CODE
AREA

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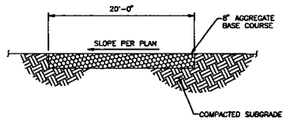

TYPICAL CONSTRUCTION LAYDOWN ROAD
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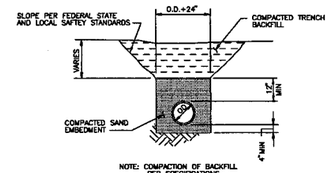

TYPICAL PIPE EMBEDMENT
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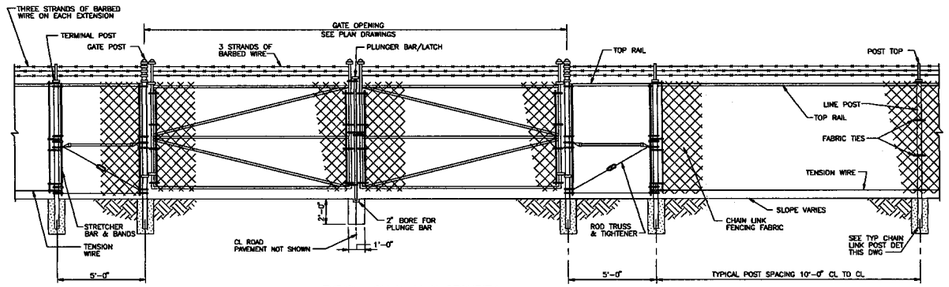

TYPICAL CHAIN LINK SECURITY FENCE AND GATE DETAIL
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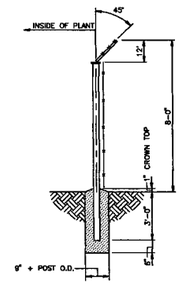

TYPICAL SECURITY FENCE POST DETAIL
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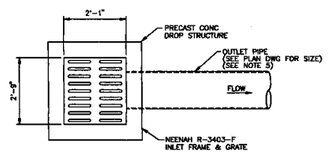
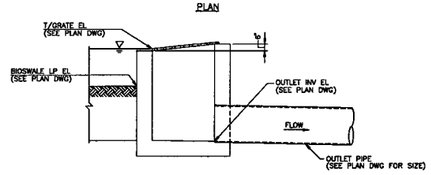


PLAN



SECTION

TYPICAL BIOSWALE DROP STRUCTURE DETAIL
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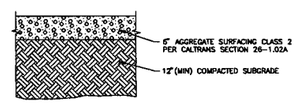

TYPICAL AGGREGATE SURFACING SECTION
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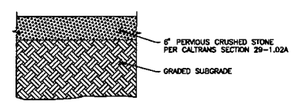

TYPICAL PERVIOUS CRUSHED STONE SURFACING SECTION
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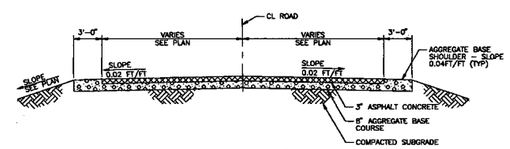
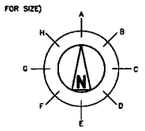


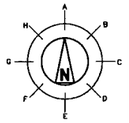
TYPICAL PAVED ROAD
NO SCALE
SEE DWG SS-3201

CULVERT TABLE						
CULVERT NO.	INLET INV. ELEVATION	OUTLET INV. ELEVATION	LENGTH	PIPE DIAMETER	PIPE MATERIAL	REMARKS
C-1	8.2	8.0	–	18"	–	
C-2	11.8	11.5	–	18"	–	
C-3	13.0	13.0	–	18"	–	
C-4	13.2	13.0	–	18"	–	
C-5	13.1	12.9	–	12"	–	
C-6	13.1	12.9	–	12"	–	
C-7	13.3	13.0	–	12"	–	
C-8	13.2	13.0	–	12"	–	
C-9	13.0	13.0	–	12"	–	
C-10	13.0	13.0	–	15"	–	
C-11	13.4	12.6	–	12"	–	
C-12	13.0	13.0	–	18"	–	
C-13	13.4	12.6	–	12"	–	
C-14	13.5	12.5	–	12"	–	
C-15	12.8	12.5	–	18"	–	
C-16	12.5	12.5	–	18"	–	
C-17	14.7	14.4	–	12"	–	
C-19	8.7	8.4	–	18"	–	
C-20	–	–	–	18"	–	
C-21	–	–	–	18"	–	



CATCH BASIN TABLE																						
STRUCTURE NO.	CENTERLINE COORDINATES		TOP OF GRATE ELEVATION	INLET & OUTLET PIPE INFORMATION																		REMARKS
				A		B		C		D		E		F		G		H				
	NORTH	EAST		INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA			
CB-6	–	–	16.0	–	–	13.2	12"	–	–	–	–	13.2	12"	–	–	–	–	–	–			
CB-7	NOT USED																					
CB-8	–	–	17.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	13.5	12"			
CB-9	–	–	17.0	–	–	–	–	13.4	12"	–	–	–	–	–	–	13.4	12"	–	–			
CB-10	–	–	17.0	–	–	–	–	13.4	12"	–	–	–	–	–	–	–	–	–	–			
CB-11	–	–	17.0	–	–	–	–	–	–	13.4	12"	–	–	–	–	13.4	12"	–	–			
CB-12	–	–	17.0	–	–	13.6	12"	–	–	–	–	–	–	–	–	–	–	–	–			
CB-13	–	–	17.0	–	–	–	–	13.4	12"	–	–	–	–	13.4	12"	–	–	–	–			
CB-14	–	–	17.0	–	–	–	–	13.1	12"	–	–	–	–	–	–	13.1	12"	–	–			
CB-15	–	–	17.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	13.6	12"			
CB-16	–	–	17.0	–	–	–	–	13.4	12"	–	–	–	–	–	–	–	–	–	–			
CB-17	–	–	17.0	–	–	–	–	13.1	12"	–	–	–	–	–	–	13.1	12"	–	–			
CB-18	–	–	16.5	–	–	13.2	12"	–	–	–	–	–	–	–	–	13.2	12"	–	–			
CB-19	–	–	16.5	–	–	–	–	13.4	12"	–	–	–	–	–	–	13.4	12"	–	–			
CB-20	–	–	16.5	–	–	–	–	13.6	12"	–	–	–	–	–	–	–	–	–	–			
CB-21	–	–	16.5	–	–	–	–	–	–	–	–	–	–	–	–	13.6	12"	–	–			
CB-22	–	–	16.5	–	–	–	–	13.4	12"	–	–	–	–	–	–	13.4	12"	–	–			
CB-23	–	–	16.5	–	–	–	–	13.2	12"	–	–	–	–	–	–	13.2	12"	–	–			
CB-24	NOT USED																					
CB-25	–	–	15.0	–	–	–	–	–	–	11.8	18"	12.3	12"	–	–	11.8	18"	–	–			
CB-26	–	–	16.0	13.2	18"	–	–	–	–	–	–	13.2	18"	–	–	–	–	–	–			
CB-27	–	–	16.5	–	–	–	–	–	–	–	–	12.8	18"	–	–	12.8	18"	–	–			

ALL DIMENSIONS ARE IN FEET, EXCEPT DIAMETER, WHICH IS IN INCHES
FOR PIPELINE MATERIAL SEE PIPELINE LIST



DROP STRUCTURE (DS) TABLE																						
STRUCTURE NO.	CENTERLINE COORDINATES		TOP OF GRATE ELEVATION	INLET & OUTLET PIPE INFORMATION																		REMARKS
				A		B		C		D		E		F		G		H				
	NORTH	EAST		INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA			
DS-1	–	–	13.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	12.1	18"			
DS-2	–	–	15.5	–	–	–	–	–	–	–	–	–	–	–	–	11.8	18"	–	–			
DS-3	–	–	15.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	13.2	18"			
DS-4	–	–	15.5	13.5	18"	–	–	–	–	–	–	–	–	–	–	–	–	–	–			
DS-5	–	–	14.5	8.7	18"	–	–	–	–	–	–	–	–	–	–	–	–	–	–			

ALL DIMENSIONS ARE IN FEET, EXCEPT DIAMETER, WHICH IS IN INCHES
FOR PIPELINE MATERIAL SEE PIPELINE LIST

NOTES

1. FILTER FABRIC SHALL BE UV-STABILIZED NONWOVEN GEOTEXTILE HAVING A MINIMUM WEIGHT OF 135 g/M^2 PER CALTRANS SS 88-1.03.
2. SEE DWG SS-3001 FOR GENERAL NOTES AND LEGEND.

NOT TO BE USED FOR CONSTRUCTION

THE DISTRIBUTION AND USE OF THE NATIVE FILE FORMAT OF THIS DRAWING OUTSIDE OF BLACK & VEATCH IS UNCONTROLLED AND SHALL BE USED FOR REFERENCE PURPOSES ONLY.

NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
0	16/APR/09	ISSUED FOR PERMITTING	NAW	PLN		PLN	DVW

60' 30' 0 60' 120'
SCALE: 1"=60'

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SIGNED
DATE REG NO.

BLACK & VEATCH CORPORATION
ENGINEER PLN DRAWN NAW
CHECKED DATE

CONTRA COSTA GENERATING STATION LLC
CONTRA COSTA COMBINED CYCLE FACILITY

SITE
SECTIONS AND DETAILS

PROJECT DRAWING NUMBER 163994-SS-3050 REV 0
CODE
AREA

SPU37162 ACAD 18.1s (LMS Tech)
A1APU07B ES:17-35 1=1
DATA/Dwg/163994/SS/163994-SS-3050.dwg

Radback Energy
Tenaska Contra Costa Generation
Project # 163994 File # 52.5406.1005

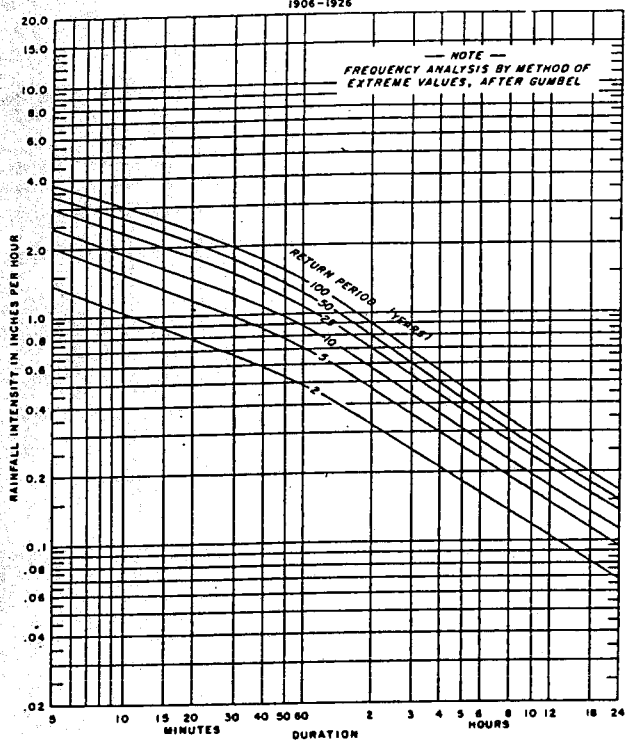
Prepared by: J Zhong
Date: April 8, 2009
# of Pages: 2

Attachment 2

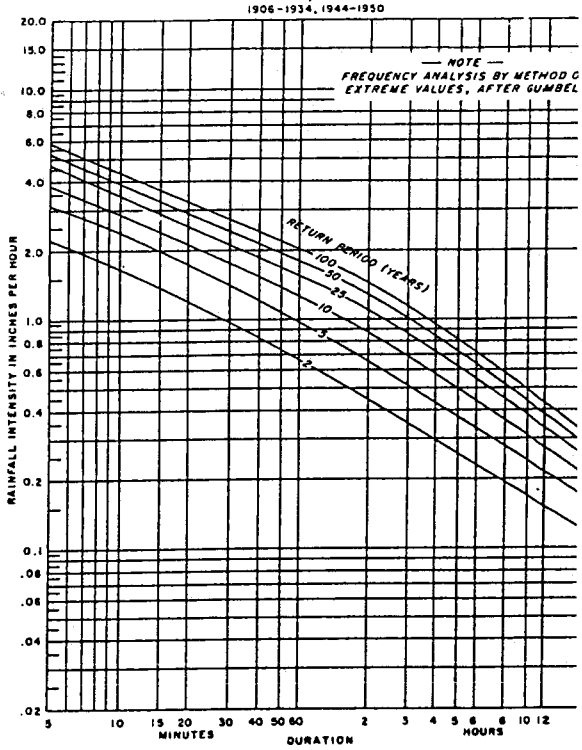
Reference 3 – Select Pages

RAINFALL INTENSITY– DURATION–FREQUENCY CURVES

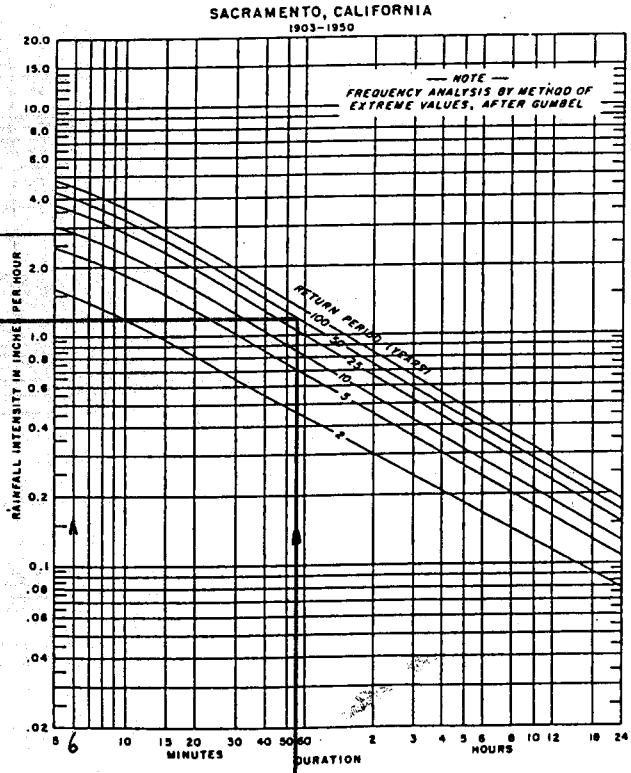
PT. REYES, CALIFORNIA
1906–1926



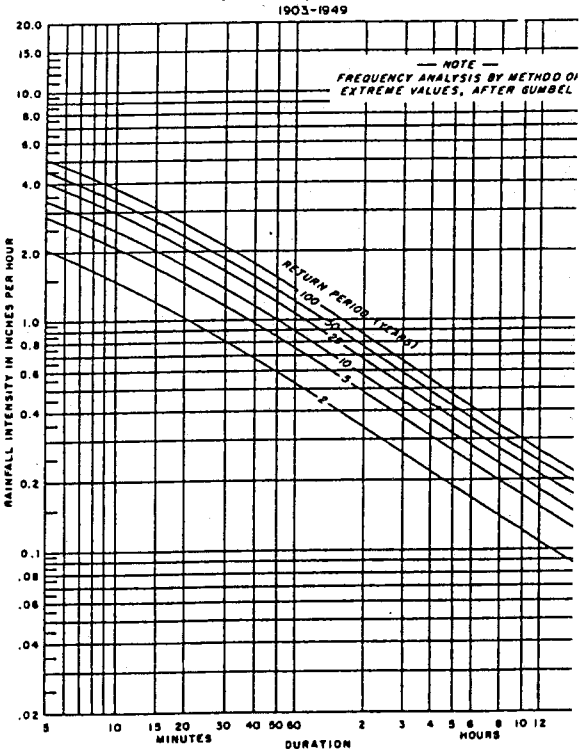
RED BLUFF, CALIFORNIA
1906–1934, 1944–1950



SACRAMENTO, CALIFORNIA
1903–1950



SAN DIEGO, CALIFORNIA
1903–1949



Radback Energy
Tenaska Contra Costa Generation
Project # 163994 File # 52.5406.1005

Prepared by: J Zhong
Date: April 8, 2009
# of Pages: 2

Attachment 3

Reference 4 – Select Pages

Manning's equation is:

$$V = \frac{1.49 r^{\frac{2}{3}} s^{\frac{1}{2}}}{n} \qquad \text{[eq. 3-4]}$$

where:

V = average velocity (ft/s)
r = hydraulic radius (ft) and is equal to a/p_w
a = cross sectional flow area (ft^2)
p_w = wetted perimeter (ft)
s = slope of the hydraulic grade line (channel slope, ft/ft)
n = Manning's roughness coefficient for open channel flow.

Manning's n values for open channel flow can be obtained from standard textbooks such as Chow (1959) or Linsley et al. (1982). After average velocity is computed using equation 3-4, T_t for the channel segment can be estimated using equation 3-1.

Reservoirs or lakes

Sometimes it is necessary to estimate the velocity of flow through a reservoir or lake at the outlet of a watershed. This travel time is normally very small and can be assumed as zero.

Limitations

- Manning's kinematic solution should not be used for sheet flow longer than 300 feet. Equation 3-3 was developed for use with the four standard rainfall intensity-duration relationships.

- In watersheds with storm sewers, carefully identify the appropriate hydraulic flow path to estimate T_c. Storm sewers generally handle only a small portion of a large event. The rest of the peak flow travels by streets, lawns, and so on, to the outlet. Consult a standard hydraulics textbook to determine average velocity in pipes for either pressure or nonpressure flow.

- The minimum T_c used in TR-55 is 0.1 hour.

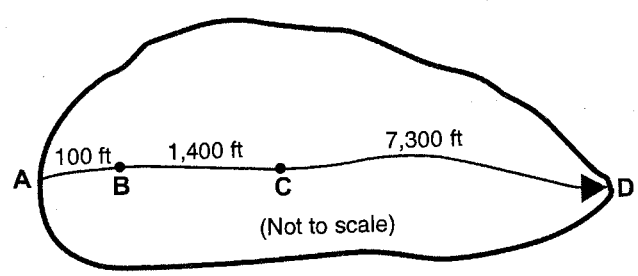
- A culvert or bridge can act as a reservoir outlet if there is significant storage behind it. The procedures in TR-55 can be used to determine the peak flow upstream of the culvert. Detailed storage routing procedures should be used to determine the outflow through the culvert.

Example 3-1

The sketch below shows a watershed in Dyer County, northwestern Tennessee. The problem is to compute T_c at the outlet of the watershed (point D). The 2-year 24-hour rainfall depth is 3.6 inches. All three types of flow occur from the hydraulically most distant point (A) to the point of interest (D). To compute T_c, first determine T_t for each segment from the following information:

Segment AB: Sheet flow; dense grass; slope (s) = 0.01 ft/ft; and length (L) = 100 ft. Segment BC: Shallow concentrated flow; unpaved; s = 0.01 ft/ft; and L = 1,400 ft. Segment CD: Channel flow; Manning's n = .05; flow area (a) = 27 ft^2; wetted perimeter (p_w) = 28.2 ft; s = 0.005 ft/ft; and L = 7,300 ft.

See figure 3-2 for the computations made on worksheet 3.



Attachment 4

Reference 5 – Select Pages

(Runoff factor) x (tributary area) ≤ 2 x (self-retaining area) *Equation 4-1*

For treatment-only sites, and

(Runoff factor) x (tributary area) ≤ 1 x (self-retaining area) *Equation 4-2*

for sites subject to flow-control requirements. Use the runoff factors in Table 4-2.

Prolonged ponding is a potential problem at higher impervious/pervious ratios. In your design, ensure that the pervious area soils can handle the additional run-on and are sufficiently well-drained.

Runoff from self-treating and self-retaining areas does not require any further treatment or flow control.

TABLE 4-2. Runoff factors to be used when sizing IMPs.

Surface	Treatment and Flow Control	Treatment only
Roofs	1.0	1.0
Concrete or Asphalt	1.0	1.0
Pervious Concrete	0.1	0.1
Porous Asphalt	0.1	0.1
Grouted Unit Pavers	1.0	1.0
Solid Unit Pavers	0.5	0.2
Crushed Aggregate	0.1	0.1
Turfblock	0.1	0.1
Landscape, Group A Soil	0.1	0.1
Landscape, Group B Soil	0.3	0.1
Landscape, Group C Soil	0.5	0.1
Landscape, Group D Soil	0.7	0.1

Areas draining to IMPs are used to calculate the required size of the IMP. On most densely developed sites—such as commercial and mixed-use developments and small-lot residential subdivisions—most DMAs will drain to IMPs.

The CCCWP has developed sizing factors (ratios of IMP area to impervious DMA area). For each IMP design, factors are provided for:

1. the intensity-duration-frequency method, with a hydrograph corresponding to a 50-year storm,
2. the 85th percentile rainfall intensity times two, and
3. 0.2 inches per hour.

An analysis conducted for the CCCWP determined all three methods yielded similar results. The 0.2 inches per hour rainfall intensity is used for sizing flow-based treatment facilities in Contra Costa County. This intensity corresponds to a storm depth of approximately 0.6 inches.

The CCCWP used the 0.2 inches per hour criterion to develop a **consistent countywide sizing factor** for bioretention facilities when used for stormwater treatment only (i.e., not for flow control). The factor is based on maintaining a minimum percolation rate of 5 inches per hour through an engineered soil mix. The sizing factor is the ratio of the design intensity of rainfall on tributary impervious surfaces (0.2 inches/hour) to the design percolation rate in the facility (5 inches/hour), or **0.04** (dimensionless).

► FLOW-CONTROL (HYDROGRAPH MODIFICATION MANAGEMENT)

The NPDES permit specifies for applicable projects:

> ...estimated post-project runoff peaks and durations do not exceed estimated pre-project peaks and durations if increased stormwater runoff peaks or durations could cause erosion or other significant effects on beneficial uses.

Applicants may select among **four options** for compliance. See Table 1-2. The first three options demonstrate runoff will not exceed pre-project durations by showing there will be no net increase in impervious area, by using Integrated Management Practice designs and sizing factors developed by the Program, or by constructing a site-specific hydrologic model. The fourth option is to demonstrate that, even though runoff will increase, it will not cause erosion or other significant effects on beneficial uses. This may be done by showing downstream channels are not susceptible to erosion (Option 4a) or that a restoration project will mitigate any impacts from increased flows (Options 4b and 4c).

Details on compliance requirements are in Appendix C. Technical background is in the Hydrograph Modification Management Plan, which is available on the Program's website.

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Prepared by: J Zhong
Date: April 8, 2009
# of Pages: 2

Attachment 5

Reference 6 – Select Pages

TABLE 4.2 Time of Concentration for Small, Impervious Areas

Location	Standard t_c (minutes)
Roof and property drainage	5
Road inlet pits	5
Small areas <1 acre	10

Rather than attempting more detailed analysis, for areas up to one acre, values in Table 4.2 (taken from Urban Storm Water Management Manual for Malaysia, 2000) can be used.

To obtain an estimate of the time of concentration for the basin, the component values should be added. However, the addition must be done only for those components of flow in series along the principal path of flow from the hydraulically most remote point to the design point. Do not add travel time in intermediate tributaries. In the case of residential areas, consider only the interconnected impervious area.

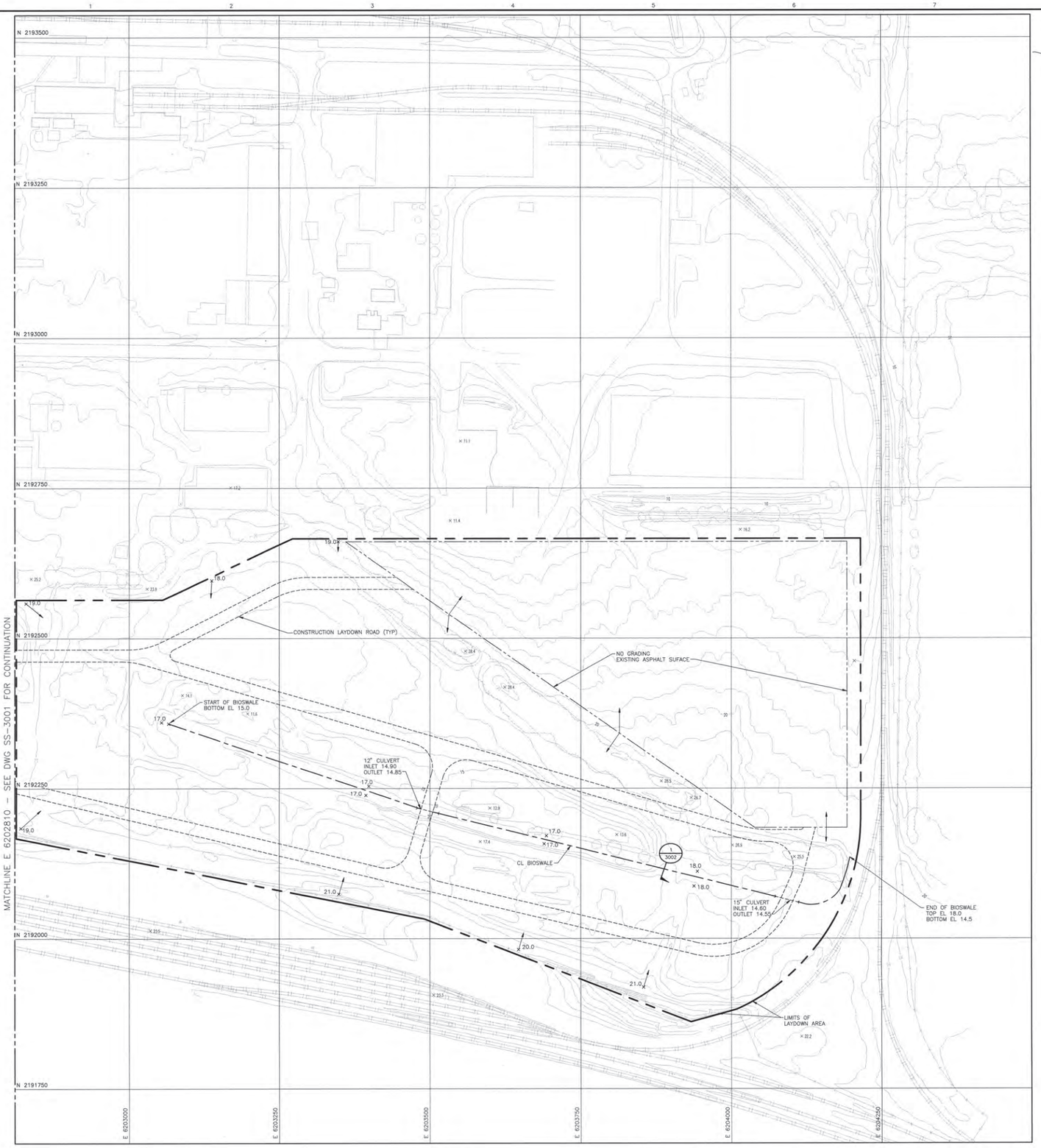
In the selection of a time of concentration for any individual component, the engineer should probably use two or three of the methods with which he or she is familiar and for which the necessary independent variables and parameters exist or can be economically determined. The procedure that gives a reasonable value and is conservative (shorter times will result in higher peak flow rates) with respect to the design objective should be the value that is selected.

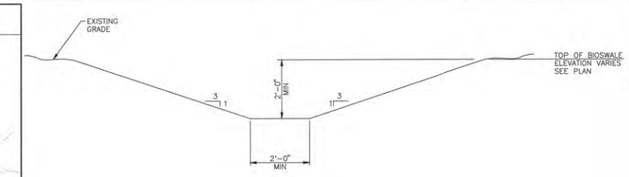
Remember, the equations are based on average velocities, not point velocities. Therefore, in many, if not most cases, you can walk faster than water flows. For overland flow and for concentrated flow in swales or natural channels, velocities will normally be less than 5 ft/sec or 6 ft/sec, and in larger, lined channels and closed conduits, they will usually be less than 10 ft/sec to 12 ft/sec.

Typically, rainfall intensities are determined from *Intensity-Duration-Frequency curves* (*IDF curves*) or *Depth-Duration-Frequency curves* (*DDF curves*). These are plots of rainfall intensity (or depth) versus duration of event rainfall. Usually, there are several curves on a single graph, one for each of several different rainfall frequencies (e.g. the 10-year event, the 25-year event, the 50-year event and the 100-year event). Figure 4.1 is a set of IDF curves for Rolla, MO.

Often, one or both of these graphs (or a tabular form thereof) are supplied by the local governmental authority under whose auspices the work is being done. First, the time of concentration is determined. Then, in the case of the IDF curve, the graph is entered with time of concentration and the rainfall intensity or depth is read at the intersection of the time coordinate and the corresponding design frequency. In the case of DDF data, the design depth is divided by the time of concentration so as to obtain the desired rainfall intensity, I.

In the absence of preexisting IDF or DDF curves, the engineer must develop the information that is required. In the best of all worlds, an engineer should develop IDF or DDF curves from local or nearby rainfall data. However, for all practical purposes, the necessary rainfall data are seldom available, and if they are available, the cost of developing the rainfall frequency relations is seldom justifiable in terms of any design project where the Rational method is applicable (e.g. drainage design for a subdivision, an industrial park, a shopping center, etc.). In this case, IDF or DDF curves can be developed from rainfall data contained in published rainfall frequency atlases (e.g. Hershfield, 1961; Miller et al., 1973; Frederick et al., 1977; Huff and Angel, 1992). For a given frequency, rainfall depths are interpolated from isohyets in the atlas at the published durations. Each rainfall depth is divided by the corresponding duration to obtain an average rainfall intensity for that particular duration. The computed intensities for the given frequency are then plotted on either logarithmic or on semilogarithmic coordinates (time on the logarithmic scale in both cases). Use of loga-





SECTION 1
TYPICAL BIOSWALE
NO SCALE

NOTES

1. SEE DRAWING SS-3001 FOR GENERAL NOTES AND LEGEND.
2. ALL TREES WITHIN LAYDOWN AREA SHALL BE REMOVED.

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60' 30' 0 60' 120'
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SIGNED
DATE REG NO.

BLACK & VEATCH CORPORATION
ENGINEER PLN DRAWN NAW
CHECKED DATE

CONTRA COSTA GENERATING STATION LLC
CONTRA COSTA COMBINED CYCLE FACILITY

GRADING AND DRAINAGE – SITE PLAN – SHEET 2

PROJECT DRAWING NUMBER 163994–SS–3002 REV 0
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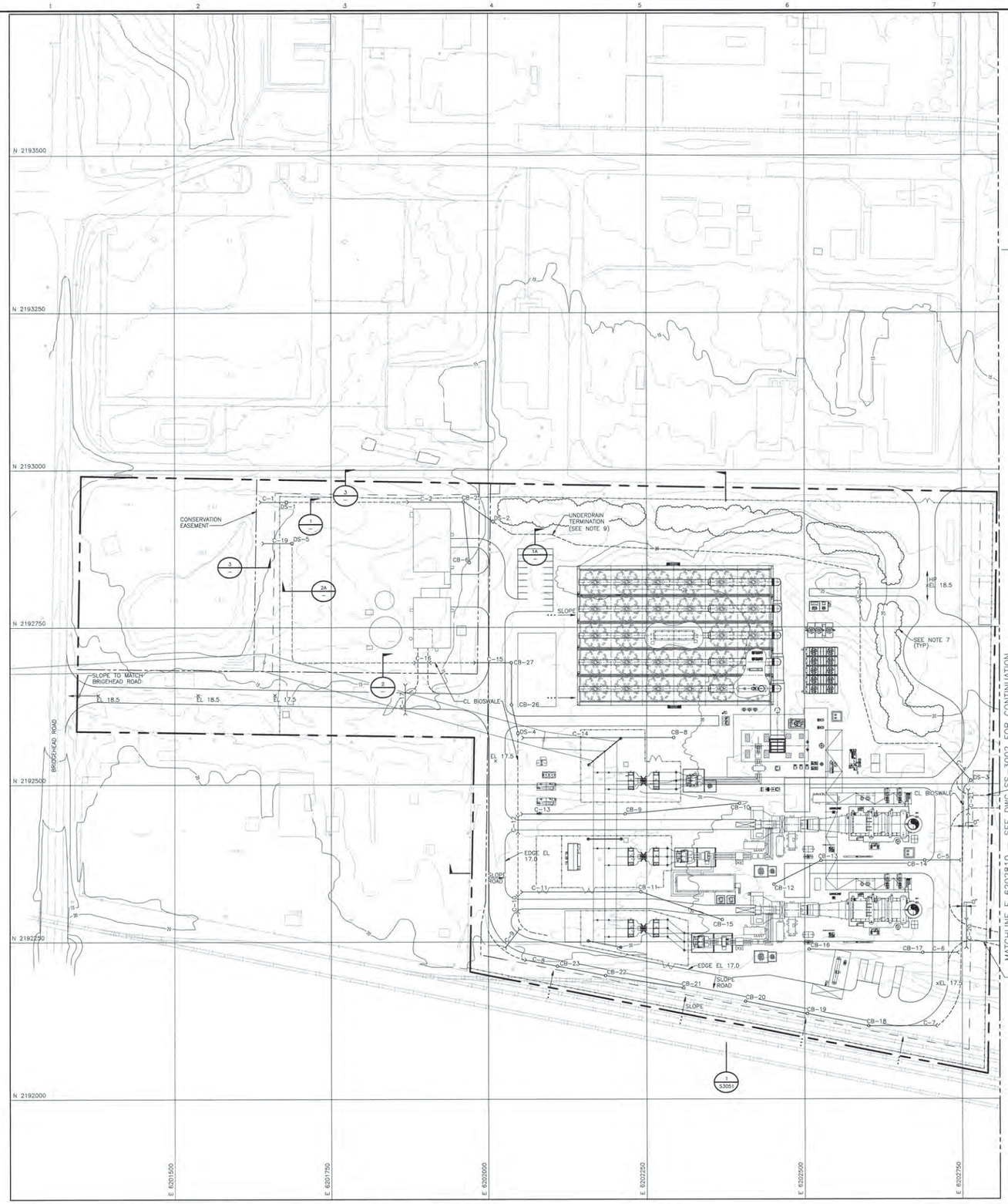

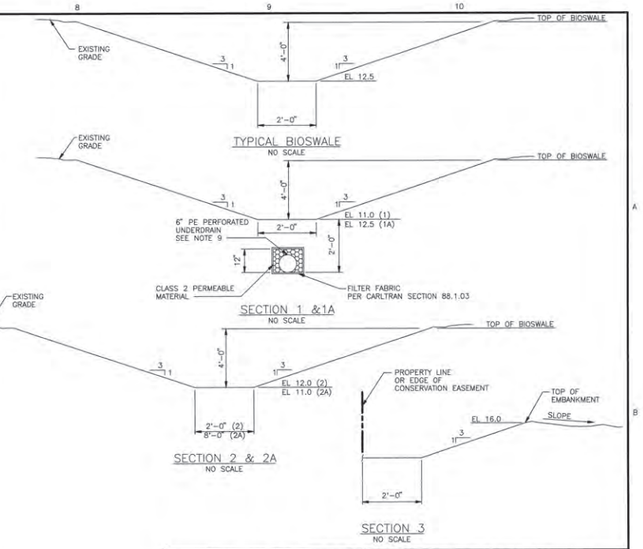

ABBREVIATIONS APPLICABLE TO ALL SS-3000 SERIES DRAWINGS

APPROX	–	APPROXIMATE	LTR	–	LATER
ASPH	–	ASPHALT	MAX	–	MAXIMUM
AVG	–	AVERAGE	MH	–	MANHOLE
BND	–	BEND	MIN	–	MINIMUM
BLDG	–	BUILDING	MJ	–	MECHANICAL JOINT
B/MH	–	BOTTOM OF MANHOLE ELEVATION	MSL	–	MEAN SEA LEVEL
BOC	–	BOTTOM OF CONDUIT ELEVATION	NO.	–	NUMBER
BOD	–	BOTTOM OF DUCTBANK ELEVATION	NTS	–	NOT TO SCALE
BOP	–	BOTTOM OF PIPE ELEVATION	OD	–	OUTSIDE DIAMETER
BU	–	BELL-UP	OWS	–	OIL WATER SEPARATOR
C	–	CULVERT	OWMH	–	OILYWASTE MANHOLE
CB	–	CATCH BASIN	PC	–	POINT OF CURVATURE
CD	–	CABLE DUCT	PE	–	PLAIN END
CHDPE	–	CORRUGATED HIGH DENSITY POLYETHYLENE PIPE	PI	–	POINT OF INTERSECTION
			PLCS	–	PLACES
CL	–	CENTERLINE	PM	–	PLANT MANHOLE
CLR	–	CLEAR	POT	–	POINT OF TANGENT
CMH	–	CHEMICAL MANHOLE	PT	–	PIPE TERMINATION
CND	–	CONDUIT	PVC	–	POLYVINYL CHLORIDE PIPE
CONC	–	CONCRETE	QTY	–	QUANITY
CO	–	CLEAN OUT	R	–	RADIUS
CS	–	CARBON STEEL	RCP	–	REINFORCED CONCRETE PIPE
CW	–	CIRCULATING WATER	RD	–	ROOF DRAIN
DB	–	DUCTBANK	REV	–	REVISION
DBC	–	DIRECT BURIED CABLE	RGS	–	RIGID GALVANIZED STEEL
DET	–	DETAIL	RR	–	RAILROAD
DIA	–	DIAMETER	SECT	–	SECTION
DIP	–	DUCTILE IRON PIPE	SIM	–	SIMILAR
DWG	–	DRAWING	SLS	–	SANITARY LIFT STATION
DWP	–	DOUBLE WALL PIPE	SMH	–	SANITARY MANHOLE
EC	–	ELECTRICAL CONDUIT	STMH	–	STORM MANHOLE
ECC	–	ECCENTRIC	STRL	–	STRUCTURAL
EF	–	EACH FACE	T/C	–	TOP OF CONCRETE ELEVATION
EHH	–	ELECTRICAL HANDHOLE	T/G	–	TOP OF GRADE ELEVATION
EL	–	ELEVATION	THH	–	TELEPHONE SERVICE HANDHOLE
EMH	–	ELECTRICAL MANHOLE	T/MH	–	TOP OF MANHOLE ELEVATION
EW	–	EACH WAY	T/P	–	TOP OF PAVEMENT ELEVATION
FC	–	FIELD CHECK	TP	–	MECH PIPE TERMINAL POINT
FDN	–	FOUNDATION	TYP	–	TYPICAL
FF	–	FLAT FACE	UGL	–	UNDERGROUND LIGHTING CONDUIT
FRP	–	FIBERGLASS REINFORCED PIPE	UNO	–	UNLESS NOTED OTHERWISE
GR	–	GRADE	VERT	–	VERTICAL
HDM	–	HOT DRAIN MANHOLE	WGT	–	WEIGHT
HDPE	–	HIGH DENSITY POLYETHYLENE PIPE	WTR	–	WATER
HP	–	HIGH POINT	W/	–	WITH
HYD	–	HYDRANT	W/O	–	WITHOUT
ID	–	INSIDE DIAMETER	WP	–	WORK POINT
INV	–	INVERT	X/MR	–	TRANSFORMER
JBX	–	JUNCTION BOX			
L	–	LENGTH			
LP	–	LOW POINT			

LEGEND APPLICABLE TO ALL S3000 DRAWINGS

	NEW CULVERT		NEW SLIDE GATE
	CL BIOSWALE		NEW SWING GATE
1 / S3000	SECTION OR DETAIL NUMBER / DRAWING DESIGNATION NUMBER		EXISTING POWER POLE
× 326.5	FINISHED SPOT ELEVATIONS	CB-101	NEW CATCH BASIN
			NEW DROP STRUCTURE
BM-1	SURVEY MONUMENT/CONTROL POINT		PROPERTY LINE
	EXISTING FENCE		BOUNDARY LINE
	NEW SECURITY FENCE	126	EXISTING CONTOURS
	TEMPORARY CONSTRUCTION FENCE		GRADE TO DRAIN (DIRECTION OF ARROW)
TR-1	EROSION CONTROL METHOD		

NOTES APPLICABLE TO ALL SS-3000 SERIES DRAWINGS

1. COORDINATES ARE BASED ON CALIFORNIA COORDINATE SYSTEM CCS83, ZONE 3. ELEVATION ARE BASED ON, NGVD 29 DATUM. BENCHMARK IS NATIONAL GEODETIC SURVEY BENCH MARK "W 563", LOCATED ADJACENT TO THE FLAGPOLE AT THE DUPONT PLANT ENTRANCE, ELEVATION = 11.168 FEET. TO OBTAIN DUPONT PLANT DATUM ELEVATION, ADD 0.70 FEET TO THE ELEVATIONS SHOWN. TOPOGRAPHIC DATA IS BASED ON AERIAL PHOTOGRAPH DATED JUNE 11, 2001. AERIAL SURVEY INFORMATION WAS OBTAINED BY RONALD GREENWELL & ASSOCIATES, INC.
2. NEW GRADE ELEVATIONS SHOWN ON THE SITE GRADING AND DRAINAGE PLANS INDICATE FINISH GRADE UNLESS NOTED OTHERWISE.
3. ALL CUT AND FILL SLOPES SHALL BE 3 HORIZONTAL TO 1 VERTICAL OR FLATTER, UNLESS NOTED OTHERWISE.
4. SEE DWG SS-3050 FOR GRADING AND DRAINAGE DETAILS INCLUDING CULVERT, CATCH BASIN AND DROP STRUCTURE CHARTS.
5. TOP OF CONCRETE ELEVATIONS AND FINISH FLOOR ELEVATIONS FOR ALL EQUIPMENT AND BUILDINGS IS EL 18.0. FINISH GRADE ADJACENT TO ALL FOUNDATIONS IS EL 17.5.
6. CL OF ALL PAVED ROADS IS EL 17.5 UNO.
7. TREES TO REMAIN. GRADE TO REMAIN UNCHANGED WITHIN 20' OF TREE BASE.
8. TEMPORARY ROAD FROM LAYDOWN AREA. ROAD AND CULVERT UNDER ROAD TO BE REMOVED AT END OF CONSTRUCTION.
9. UNDERDRAIN CONTINUOUS UNDER BIOSWALE FROM UNDERDRAIN TERMINATION TO CONSERVATION EASEMENT. UTILIZE UNPERFORATED PIPE BETWEN DS-2 TO C-2 OUTLET AND DS-1 TO C-1 OUTLET.

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GRADING AND DRAINAGE – SITE PLAN – SHEET 1

PROJECT DRAWING NUMBER: 163994-SS-3001 REV: 0
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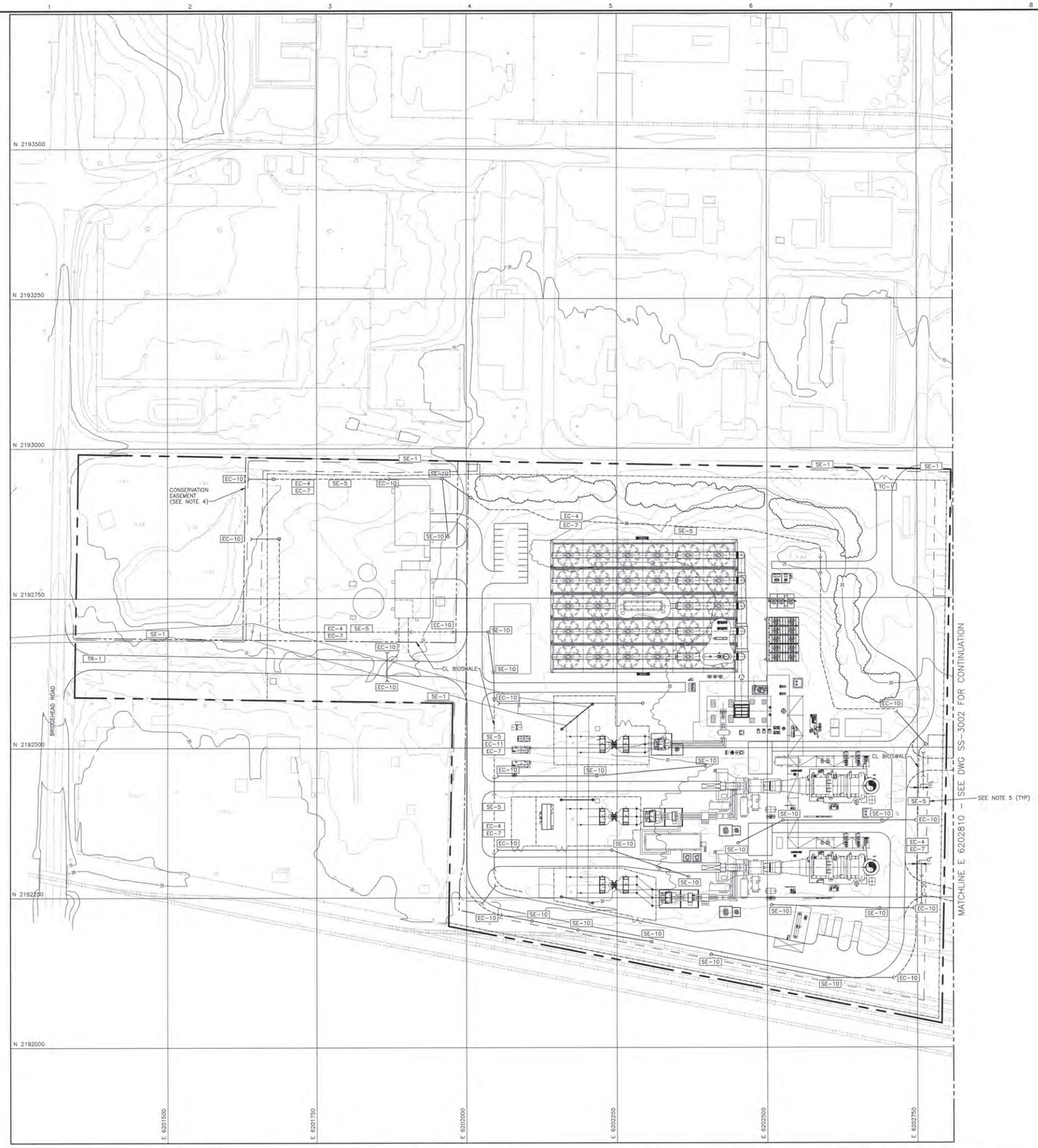

NOTES APPLICABLE TO ALL SS-3000 SERIES DRAWINGS

1. SEE DRAWING SS-3001 FOR GENERAL NOTES AND LEGEND.
2. SEE DWG SS-3001 FOR GRADING & DRAINAGE PLAN
3. SEE DWG SS-3150 FOR SOIL EROSION CONTROL SECTIONS AND DETAILS.
4. NO CONSTRUCTION ACTIVITY SHALL OCCUR WITHIN CONSERVATION EASEMENT.
5. SE-5 MAY BE REMOVED AFTER BIOSWALE GRASS OBTAINS 70% COVERAGE.
6. SEE DWG SS-3201 FOR SITE SURFACING PLAN. ALL GRASS OR LANDSCAPE AREAS SHALL BE SEEDED AND FERTILIZED EC-4 AND COVERED WITH HYDRAULIC MULCH EC-3

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SOIL EROSION CONTROL – SITE PLAN – SHEET 1

PROJECT DRAWING NUMBER: 163994–SS–3101

REV: 0

CODE

AREA

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A1-D-29 E1 256.00

Appendix F
Risk Level 1 Requirements

ATTACHMENT C
RISK LEVEL 1 REQUIREMENTS

A. Effluent Standards

1. Narrative – Risk Level 1 dischargers shall comply with the narrative effluent standards listed below:

a. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

b. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

2. Numeric – Risk Level 1 dischargers are not subject to a numeric effluent standard.

B. Good Site Management "Housekeeping"

1. Risk Level 1 dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, Risk Level 1 dischargers shall implement the following good housekeeping measures:

a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).

d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

e. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.

2. Risk Level 1 dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:

a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.

c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.

d. Cover waste disposal containers at the end of every business day and during a rain event.

e. Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.

f. Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.

g. Implement procedures that effectively address hazardous and nonhazardous spills.

h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require that:

i. Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly; and

ii. Appropriate spill response personnel are assigned and trained.

i. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

3. Risk Level 1 dischargers shall implement good housekeeping for vehicle storage and maintenance, which, at a minimum, shall consist of the following:

a. Prevent oil, grease, or fuel to leak in to the ground, storm drains or surface waters.

b. Place all equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate BMPs.

c. Clean leaks immediately and disposing of leaked materials properly.

4. Risk Level 1 dischargers shall implement good housekeeping for landscape materials, which, at a minimum, shall consist of the following:

a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.

b. Contain fertilizers and other landscape materials when they are not actively being used.

c. Discontinue the application of any erodible landscape material within 2 days before a forecasted rain event or during periods of precipitation.

d. Apply erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.

e. Stack erodible landscape material on pallets and covering or storing such materials when not being used or applied.

5. Risk Level 1 dischargers shall conduct an assessment and create a list of potential pollutant sources and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, Risk Level 1 dischargers shall do the following:

a. Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.

b. Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.

c. Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.

d. Ensure retention of sampling, visual observation, and inspection records.

e. Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.

6. Risk Level 1 dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.

C. Non-Storm Water Management

1. Risk Level 1 dischargers shall implement measures to control all nonstorm water discharges during construction.
2. Risk Level 1 dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.
3. Risk Level 1 dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

D. Erosion Control

1. Risk Level 1 dischargers shall implement effective wind erosion control.
2. Risk Level 1 dischargers shall provide effective soil cover for inactive[1] areas and all finished slopes, open space, utility backfill, and completed lots.
3. Risk Level 1 dischargers shall limit the use of plastic materials when

more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

E. Sediment Controls

1. Risk Level 1 dischargers shall establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.
2. On sites where sediment basins are to be used, Risk Level 1 dischargers shall, at minimum, design sediment basins according to the method provided in CASQA's Construction BMP Guidance Handbook.

F. Run-on and Runoff Controls

Risk Level 1 dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this General Permit.

G. Inspection, Maintenance and Repair

1. Risk Level 1 dischargers shall ensure that all inspection, maintenance repair and sampling activities at the project location shall be performed or supervised by a Qualified SWPPP Practitioner (QSP) representing the discharger. The QSP may delegate any or all of these activities to an employee trained to do the task(s) appropriately, but shall ensure adequate deployment.
2. Risk Level 1 dischargers shall perform weekly inspections and observations, and at least once each 24-hour period during extended

[1] Inactive areas of construction are areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days.

storm events, to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.
3. Upon identifying failures or other shortcomings, as directed by the QSP, Risk Level 1 dischargers shall begin implementing repairs or design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.
4. For each inspection required, Risk Level 1 dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format.
5. Risk Level 1 dischargers shall ensure that checklists shall remain onsite with the SWPPP and at a minimum, shall include:

a. Inspection date and date the inspection report was written.

b. Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.

c. Site information, including stage of construction, activities completed, and approximate area of the site exposed.

d. A description of any BMPs evaluated and any deficiencies noted.

e. If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.

f. Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.

g. Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.

h. Photographs taken during the inspection, if any.

i. Inspector’s name, title, and signature.

H. Rain Event Action Plan

Not required for Risk Level 1 dischargers.

Appendix G
Construction Schedule

Construction Schedule

Construction of the generating facility, from site preparation and grading to commercial operation is expected to take place from the first quarter of 2011 to the fourth quarter of 2013 (33 months total). Major milestones are listed in Table 2.4. A copy of this schedule is in Appendix G.

TABLE 2.4
Project Schedule Major Milestones

Activity	Date
Begin/Demolition	First quarter 2011
Startup and Test	Second quarter 2013
Commercial Operation	Fourth quarter 2013

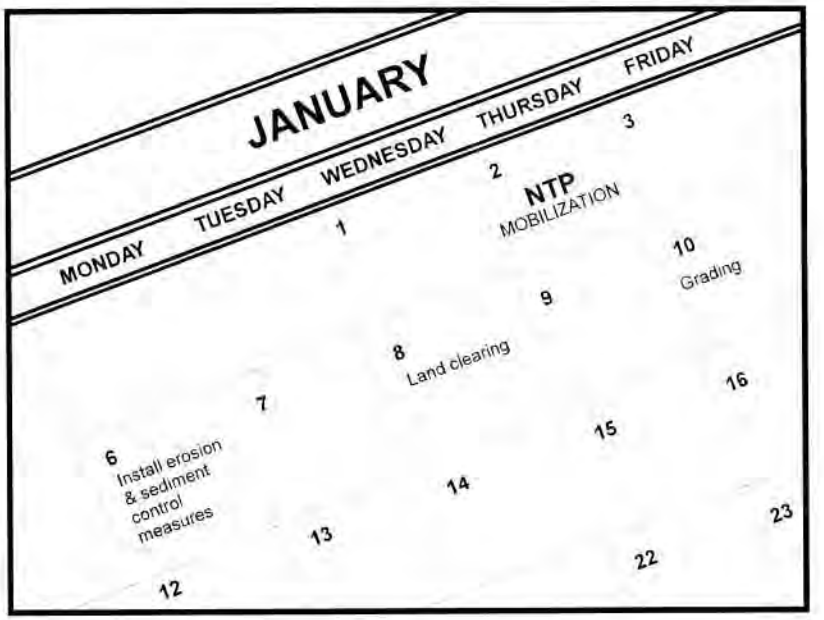
There will be an average and peak workforce of approximately 303 and 729, respectively, of construction craft people, supervisory, support, and construction management personnel on site during construction. The peak construction site workforce level is expected to last from month 10 through month 30 of the 33-month construction period, with the peak being month 23.

Typically, noisy construction will be scheduled to occur between 6:00 a.m. and 7:00 p.m. Monday through Saturday. Additional hours may be necessary to make up schedule deficiencies or to complete critical construction activities (for example, pouring concrete at night during hot weather, working around time-critical shutdowns and constraints). During some construction periods and during the startup phase of the project, some activities will continue 24 hours per day, 7 days per week.

Appendix H
CASQA BMP Handbook Fact Sheets

Scheduling

EC-1



Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

Limitations

- Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.
- Plan the project and develop a schedule showing each phase

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of construction. Clearly show how the rainy season relates to soil disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.

- Include on the schedule, details on the rainy season implementation and deployment of:
  - Erosion control BMPs
  - Sediment control BMPs
  - Tracking control BMPs
  - Wind erosion control BMPs
  - Non-stormwater BMPs
  - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season.
  - Sequence trenching activities so that most open portions are closed before new trenching begins.
  - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
  - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques should be compared with the other less effective erosion and sedimentation controls to achieve a cost effective balance.

Inspection and Maintenance

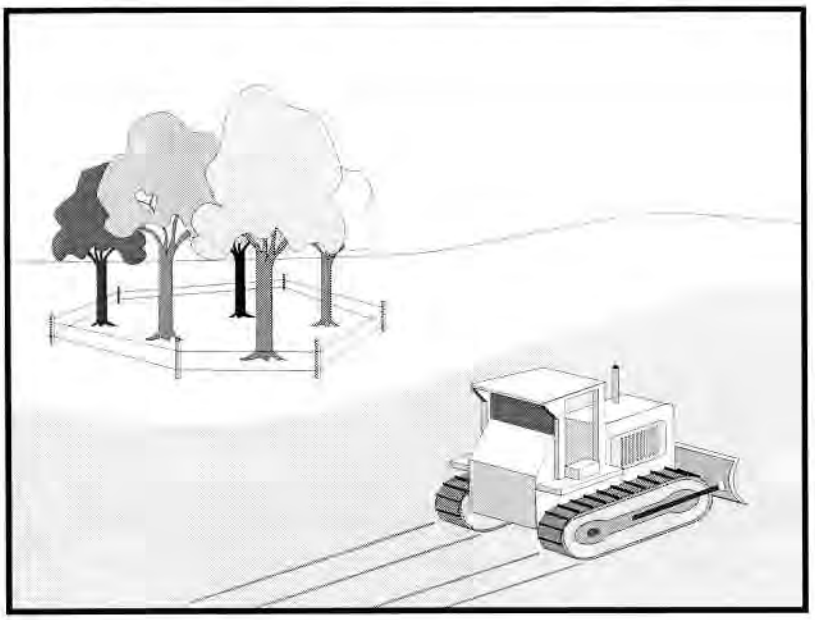
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.

Preservation Of Existing Vegetation EC-2



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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Carefully planned preservation of existing vegetation minimizes the potential of removing or injuring existing trees, vines, shrubs, and grasses that protect soil from erosion.

Suitable Applications

Preservation of existing vegetation is suitable for use on most projects. Large project sites often provide the greatest opportunity for use of this BMP. Suitable applications include the following:

- Areas within the site where no construction activity occurs, or occurs at a later date. This BMP is especially suitable to multi year projects where grading can be phased.
- Areas where natural vegetation exists and is designated for preservation. Such areas often include steep slopes, watercourse, and building sites in wooded areas.
- Areas where local, state, and federal government require preservation, such as vernal pools, wetlands, marshes, certain oak trees, etc. These areas are usually designated on the plans, or in the specifications, permits, or environmental documents.
- Where vegetation designated for ultimate removal can be temporarily preserved and be utilized for erosion control and sediment control.

Limitations

- Requires forward planning by the owner/developer,

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contractor, and design staff.

- Limited opportunities for use when project plans do not incorporate existing vegetation into the site design.
- For sites with diverse topography, it is often difficult and expensive to save existing trees while grading the site satisfactory for the planned development.

Implementation

The best way to prevent erosion is to not disturb the land. In order to reduce the impacts of new development and redevelopment, projects may be designed to avoid disturbing land in sensitive areas of the site (e.g., natural watercourses, steep slopes), and to incorporate unique or desirable existing vegetation into the site's landscaping plan. Clearly marking and leaving a buffer area around these unique areas during construction will help to preserve these areas as well as take advantage of natural erosion prevention and sediment trapping.

Existing vegetation to be preserved on the site must be protected from mechanical and other injury while the land is being developed. The purpose of protecting existing vegetation is to ensure the survival of desirable vegetation for shade, beautification, and erosion control. Mature vegetation has extensive root systems that help to hold soil in place, thus reducing erosion. In addition, vegetation helps keep soil from drying rapidly and becoming susceptible to erosion. To effectively save existing vegetation, no disturbances of any kind should be allowed within a defined area around the vegetation. For trees, no construction activity should occur within the drip line of the tree.

Timing

- Provide for preservation of existing vegetation prior to the commencement of clearing and grubbing operations or other soil disturbing activities in areas where no construction activity is planned or will occur at a later date.

Design and Layout

- Mark areas to be preserved with temporary fencing. Include sufficient setback to protect roots.
  - Orange colored plastic mesh fencing works well.
  - Use appropriate fence posts and adequate post spacing and depth to completely support the fence in an upright position.
- Locate temporary roadways, stockpiles, and layout areas to avoid stands of trees, shrubs, and grass.
- Consider the impact of grade changes to existing vegetation and the root zone.
- Maintain existing irrigation systems where feasible. Temporary irrigation may be required.
- Instruct employees and subcontractors to honor protective devices. Prohibit heavy equipment, vehicular traffic, or storage of construction materials within the protected area.

Costs

There is little cost associated with preserving existing vegetation if properly planned during the project design, and these costs may be offset by aesthetic benefits that enhance property values. During construction, the cost for preserving existing vegetation will likely be less than the cost of applying erosion and sediment controls to the disturbed area. Replacing vegetation inadvertently destroyed during construction can be extremely expensive, sometimes in excess of $10,000 per tree.

Inspection and Maintenance

During construction, the limits of disturbance should remain clearly marked at all times. Irrigation or maintenance of existing vegetation should be described in the landscaping plan. If damage to protected trees still occurs, maintenance guidelines described below should be followed:

- Verify that protective measures remain in place. Restore damaged protection measures immediately.
- Serious tree injuries shall be attended to by an arborist.
- Damage to the crown, trunk, or root system of a retained tree shall be repaired immediately.
- Trench as far from tree trunks as possible, usually outside of the tree drip line or canopy. Curve trenches around trees to avoid large roots or root concentrations. If roots are encountered, consider tunneling under them. When trenching or tunneling near or under trees to be retained, place tunnels at least 18 in. below the ground surface, and not below the tree center to minimize impact on the roots.
- Do not leave tree roots exposed to air. Cover exposed roots with soil as soon as possible. If soil covering is not practical, protect exposed roots with wet burlap or peat moss until the tunnel or trench is ready for backfill.
- Cleanly remove the ends of damaged roots with a smooth cut.
- Fill trenches and tunnels as soon as possible. Careful filling and tamping will eliminate air spaces in the soil, which can damage roots.
- If bark damage occurs, cut back all loosened bark into the undamaged area, with the cut tapered at the top and bottom and drainage provided at the base of the wood. Limit cutting the undamaged area as much as possible.
- Aerate soil that has been compacted over a trees root zone by punching holes 12 in. deep with an iron bar, and moving the bar back and forth until the soil is loosened. Place holes 18 in. apart throughout the area of compacted soil under the tree crown.
- Fertilization
  - Fertilize stressed or damaged broadleaf trees to aid recovery.
  - Fertilize trees in the late fall or early spring.

- Apply fertilizer to the soil over the feeder roots and in accordance with label instructions, but never closer than 3 ft to the trunk. Increase the fertilized area by one-fourth of the crown area for conifers that have extended root systems.

- Retain protective measures until all other construction activity is complete to avoid damage during site cleanup and stabilization.

References

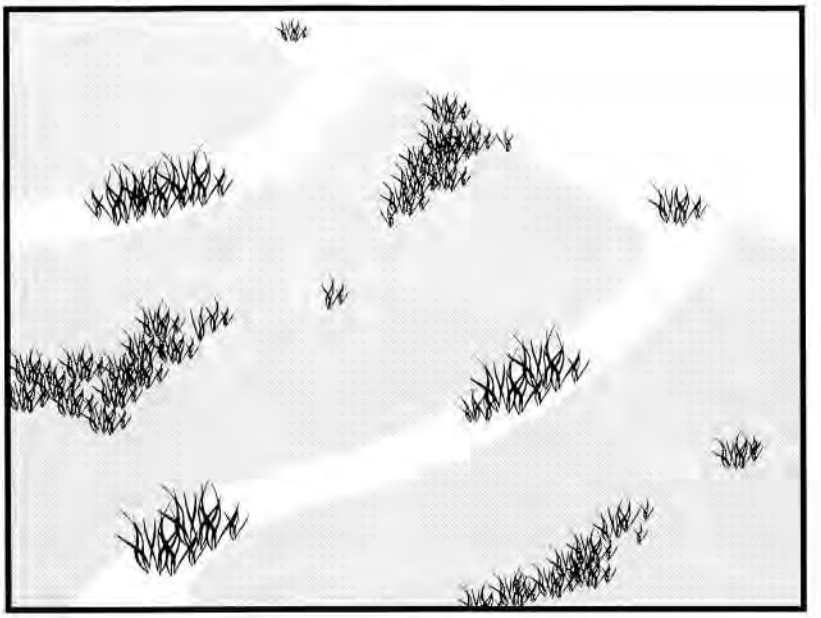
County of Sacramento Tree Preservation Ordinance, September 1981.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for The Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Hydroseeding EC-4



Categories

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SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-5 Soil Binders

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

EC-14 Compost Blanket

EC-16 Non-Vegetative Stabilization

Description and Purpose

Hydroseeding typically consists of applying a mixture of a hydraulic mulch, seed, fertilizer, and stabilizing emulsion with a hydraulic mulcher, to temporarily protect exposed soils from erosion by water and wind. Hydraulic seeding, or hydroseeding, is simply the method by which temporary or permanent seed is applied to the soil surface.

Suitable Applications

Hydroseeding is suitable for disturbed areas requiring temporary protection until permanent stabilization is established, for disturbed areas that will be re-disturbed following an extended period of inactivity, or to apply permanent stabilization measures. Hydroseeding without mulch or other cover (e.g. EC-7, Erosion Control Blanket) is not a stand-alone erosion control BMP and should be combined with additional measures until vegetation establishment.

Typical applications for hydroseeding include:

- Disturbed soil/graded areas where permanent stabilization or continued earthwork is not anticipated prior to seed germination.
- Cleared and graded areas exposed to seasonal rains or temporary irrigation.
- Areas not subject to heavy wear by construction equipment or high traffic.

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Limitations

- Availability of hydroseeding equipment may be limited just prior to the rainy season and prior to storms due to high demand.
- Hydraulic seed should be applied with hydraulic mulch or a stand-alone hydroseed application should be followed by one of the following:
    - Straw mulch (see Straw Mulch EC-6)
    - Rolled erosion control products (see Geotextiles and Mats EC-7)
    - Application of Compost Blanket (see Compost Blanket EC-14)

  Hydraulic seed may be used alone only on small flat surfaces when there is sufficient time in the season to ensure adequate vegetation establishment and coverage to provide adequate erosion control.
- Hydraulic seed without mulch does not provide immediate erosion control.
- Temporary seeding may not be appropriate for steep slopes (i.e., slopes readily prone to rill erosion or without sufficient topsoil).
- Temporary seeding may not be appropriate in dry periods without supplemental irrigation.
- Temporary vegetation may have to be removed before permanent vegetation is applied.
- Temporary vegetation may not be appropriate for short term inactivity (i.e. less than 3-6 months).

Implementation

In order to select appropriate hydraulic seed mixtures, an evaluation of site conditions should be performed with respect to:

- Soil conditions
- Site topography and exposure (sun/wind)
- Season and climate
- Vegetation types
- Maintenance requirements
- Sensitive adjacent areas
- Water availability
- Plans for permanent vegetation

The local office of the U.S.D.A. Natural Resources Conservation Service (NRCS) is an excellent source of information on appropriate seed mixes.

The following steps should be followed for implementation:

- Where appropriate or feasible, soil should be prepared to receive the seed by disking or otherwise scarifying (See EC-15, Soil Preparation) the surface to eliminate crust, improve air and water infiltration and create a more favorable environment for germination and growth.

- Avoid use of hydraulic seed in areas where the BMP would be incompatible with future earthwork activities.
- Hydraulic seed can be applied using a multiple step or one step process.
  - In a multiple step process, hydraulic seed is applied first, followed by mulch or a Rolled Erosion Control Product (RECP).
  - In the one step process, hydraulic seed is applied with hydraulic mulch in a hydraulic matrix. When the one step process is used to apply the mixture of fiber, seed, etc., the seed rate should be increased to compensate for all seeds not having direct contact with the soil.
- All hydraulically seeded areas should have mulch, or alternate erosion control cover to keep seeds in place and to moderate soil moisture and temperature until the seeds germinate and grow.
- All seeds should be in conformance with the California State Seed Law of the Department of Agriculture. Each seed bag should be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. The container should be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained. All legume seed should be pellet inoculated. Inoculant sources should be species specific and should be applied at a rate of 2 lb of inoculant per 100 lb seed.
- Commercial fertilizer should conform to the requirements of the California Food and Agricultural Code, which can be found at http://www.leginfo.ca.gov/.html/fac_table_of_contents.html. Fertilizer should be pelleted or granular form.
- Follow up applications should be made as needed to cover areas of poor coverage or germination/vegetation establishment and to maintain adequate soil protection.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Costs

Average cost for installation and maintenance may vary from as low as $1,900 per acre for flat slopes and stable soils, to $4,000 per acre for moderate to steep slopes and/or erosive soils. Cost of seed mixtures vary based on types of required vegetation.

BMP	Installed Cost per Acre
Hydraulic Seed	$1,900-$4,000

Source: Caltrans Soil Stabilization BMP Research for Erosion and Sediment Controls, July 2007

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Where seeds fail to germinate, or they germinate and die, the area must be re-seeded, fertilized, and mulched within the planting season, using not less than half the original application rates.
- Irrigation systems, if applicable, should be inspected daily while in use to identify system malfunctions and line breaks. When line breaks are detected, the system must be shut down immediately and breaks repaired before the system is put back into operation.
- Irrigation systems should be inspected for complete coverage and adjusted as needed to maintain complete coverage.

References

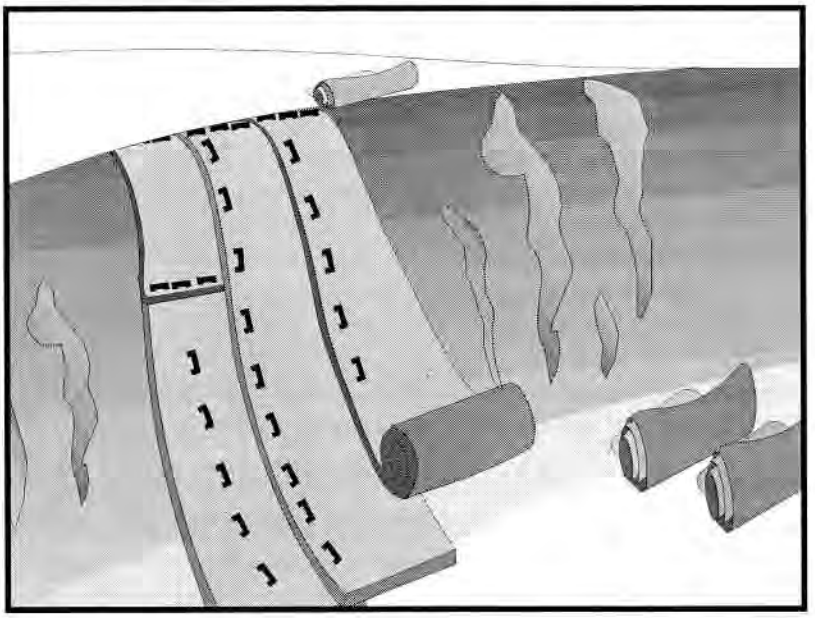
Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.

Geotextiles and Mats

EC-7



Categories

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Legend:

☑ **Primary Category**

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Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

Description and Purpose

Mattings, or Rolled Erosion Control Products (RECPs), can be made of natural or synthetic materials or a combination of the two. RECPs are used to cover the soil surface to reduce erosion from rainfall impact, hold soil in place, and absorb and hold moisture near the soil surface. Additionally, RECPs may be used to stabilize soils until vegetation is established or to reinforce non-woody surface vegetation.

Suitable Applications

RECPs are typically applied on slopes where erosion hazard is high and vegetation will be slow to establish. Mattings are also used on stream banks, swales and other drainage channels where moving water at velocities between 3 ft/s and 6 ft/s are likely to cause scour and wash out new vegetation, and in areas where the soil surface is disturbed and where existing vegetation has been removed. RECPs may also be used when seeding cannot occur (e.g., late season construction and/or the arrival of an early rain season). RECPs should be considered when the soils are fine grained and potentially erosive. RECPs should be considered in the following situations.

- Steep slopes, generally steeper than 3:1 (H:V)
- Slopes where the erosion potential is high
- Slopes and disturbed soils where mulch must be anchored
- Disturbed areas where plants are slow to develop

- Channels with flows exceeding 3.3 ft/s
- Channels to be vegetated
- Stockpiles
- Slopes adjacent to water bodies

Limitations

- RECP installed costs are generally higher than other erosion control BMPs, limiting their use to areas where other BMPs are ineffective (e.g. channels, steep slopes).
- RECPs may delay seed germination, due to reduction in soil temperature.
- RECPs are generally not suitable for excessively rocky sites or areas where the final vegetation will be mowed (since staples and netting can catch in mowers). If a staple or pin cannot be driven into the soil because the underlying soil is too hard or rocky, then an alternative BMP should be selected.
- If used for temporary erosion control, RECPs should be removed and disposed of prior to application of permanent soil stabilization measures.
- The use of plastic should be limited to covering stockpiles or very small graded areas for short periods of time (such as through one imminent storm event) until more environmentally friendly measures, such as seeding and mulching, may be installed.
    - Plastic sheeting is easily vandalized, easily torn, photodegradable, and must be disposed of at a landfill.
    - Plastic sheeting results in 100% runoff, which may cause serious erosion problems in the areas receiving the increased flow.
- RECPs may have limitations based on soil type, slope gradient, or channel flow rate; consult the manufacturer for proper selection.
- Not suitable for areas that have foot traffic (tripping hazard) – e.g., pad areas around buildings under construction.
- RECPs that incorporate a plastic netting (e.g. straw blanket typically uses a plastic netting to hold the straw in place) may not be suitable near known wildlife habitat. Wildlife can become trapped in the plastic netting.
- RECPs may have limitations in extremely windy climates. However, when RECPs are properly trenched at the top and bottom and stapled in accordance with the manufacturer's recommendations, problems with wind can be minimized.

Implementation

Material Selection

- Natural RECPs have been found to be effective where re-vegetation will be provided by re-seeding. The choice of material should be based on the size of area, side slopes, surface conditions such as hardness, moisture, weed growth, and availability of materials.

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

- The following natural and synthetic RECPs are commonly used:

Geotextiles

- Material can be a woven or a non-woven polypropylene fabric with minimum thickness of 0.06 in., minimum width of 12 ft and should have minimum tensile strength of 150 lbs (warp), 80 lbs (fill) in conformance with the requirements in ASTM Designation: D 4632. The permittivity of the fabric should be approximately 0.07 sec^{-1} in conformance with the requirements in ASTM Designation: D4491. The fabric should have an ultraviolet (UV) stability of 70 percent in conformance with the requirements in ASTM designation: D4355. Geotextile blankets must be secured in place with wire staples or sandbags and by keying into tops of slopes to prevent infiltration of surface waters under geotextile. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- Geotextiles may be reused if they are suitable for the use intended.

Plastic Covers

- Generally plastic sheeting should only be used as stockpile covering or for very small graded areas for short periods of time (such as through one imminent storm event). If plastic sheeting must be used, choose a plastic that will withstand photo degradation.

- Plastic sheeting should have a minimum thickness of 6 mils, and must be keyed in at the top of slope (when used as a temporary slope protection) and firmly held in place with sandbags or other weights placed no more than 10 ft apart. Seams are typically taped or weighted down their entire length, and there should be at least a 12 in. to 24 in. overlap of all seams. Edges should be embedded a minimum of 6 in. in soil (when used as a temporary slope protection).

- All sheeting must be inspected periodically after installation and after significant rainstorms to check for erosion, undermining, and anchorage failure. Any failures must be repaired immediately. If washout or breakages occur, the material should be re-installed after repairing the damage to the slope.

Erosion Control Blankets/Mats

- Biodegradable RECPs are typically composed of jute fibers, curled wood fibers, straw, coconut fiber, or a combination of these materials. In order for an RECP to be considered 100% biodegradable, the netting, sewing or adhesive system that holds the biodegradable mulch fibers together must also be biodegradable. See typical installation details at the end of this fact sheet.

- **Jute** is a natural fiber that is made into a yarn that is loosely woven into a biodegradable mesh. The performance of jute as a stand-alone RECP is low. Most other RECPs outperform jute as a temporary erosion control product and therefore jute is not commonly used. It is designed to be used in conjunction with vegetation. The material is supplied in rolled strips, which should be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Excelsior** (curled wood fiber) blanket material should consist of machine produced mats of curled wood excelsior with 80 percent of the fiber 6 in. or longer. The excelsior blanket should be of consistent thickness. The wood fiber must be evenly distributed over the entire area of the blanket. The top surface of the blanket should be covered with a photodegradable extruded plastic mesh. The blanket should be smolder resistant without the use of chemical additives and should be non-toxic and non-injurious to plant and animal life. Excelsior blankets should be furnished in rolled strips, a minimum of 48 in. wide, and should have an average weight of 0.8 lb/yd^2, ±10 percent, at the time of manufacture. Excelsior blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Straw blanket** should be machine produced mats of straw with a lightweight biodegradable netting top layer. The straw should be attached to the netting with biodegradable thread or glue strips. The straw blanket should be of consistent thickness. The straw should be evenly distributed over the entire area of the blanket. Straw blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd^2. Straw blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Wood fiber blanket** is composed of biodegradable fiber mulch with extruded plastic netting held together with adhesives. The material is designed to enhance re-vegetation. The material is furnished in rolled strips, which must be secured to the ground with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Coconut fiber blanket** should be a machine produced mat of 100 percent coconut fiber with biodegradable netting on the top and bottom. The coconut fiber should be attached to the netting with biodegradable thread or glue strips. The coconut fiber blanket should be of consistent thickness. The coconut fiber should be evenly distributed over the entire area of the blanket. Coconut fiber blanket should be furnished in rolled strips with a minimum of 6.5 ft wide, a minimum of 80 ft. long and a minimum of 0.5 lb/yd^2. Coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Coconut fiber mesh** is a thin permeable membrane made from coconut or corn fiber that is spun into a yarn and woven into a biodegradable mat. It is designed to be used in conjunction with vegetation and typically has longevity of several years. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Straw coconut fiber blanket** should be machine produced mats of 70 percent straw and 30 percent coconut fiber with a biodegradable netting top layer and a biodegradable bottom net. The straw and coconut fiber should be attached to the netting with biodegradable thread or glue strips. The straw coconut fiber blanket should be of consistent thickness. The straw and coconut fiber should be evenly distributed over the entire area of the blanket. Straw coconut fiber blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd^2. Straw coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- Non-biodegradable RECPs are typically composed of polypropylene, polyethylene, nylon or other synthetic fibers. In some cases, a combination of biodegradable and synthetic fibers is used to construct the RECP. Netting used to hold these fibers together is typically non-biodegradable as well.

  - **Plastic netting** is a lightweight biaxially oriented netting designed for securing loose mulches like straw or paper to soil surfaces to establish vegetation. The netting is photodegradable. The netting is supplied in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

  - **Plastic mesh** is an open weave geotextile that is composed of an extruded synthetic fiber woven into a mesh with an opening size of less than ¼ in. It is used with re-vegetation or may be used to secure loose fiber such as straw to the ground. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

  - **Synthetic fiber with netting** is a mat that is composed of durable synthetic fibers treated to resist chemicals and ultraviolet light. The mat is a dense, three dimensional mesh of synthetic (typically polyolefin) fibers stitched between two polypropylene nets. The mats are designed to be re-vegetated and provide a permanent composite system of soil, roots, and geomatrix. The material is furnished in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

  - **Bonded synthetic fibers** consist of a three dimensional geomatrix nylon (or other synthetic) matting. Typically it has more than 90 percent open area, which facilitates root growth. It's tough root reinforcing system anchors vegetation and protects against hydraulic lift and shear forces created by high volume discharges. It can be installed over prepared soil, followed by seeding into the mat. Once vegetated, it becomes an invisible composite system of soil, roots, and geomatrix. The material is furnished in rolled strips that must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

  - **Combination synthetic and biodegradable RECPs** consist of biodegradable fibers, such as wood fiber or coconut fiber, with a heavy polypropylene net stitched to the top and a high strength continuous filament geomatrix or net stitched to the bottom. The material is designed to enhance re-vegetation. The material is furnished in rolled strips,

which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

Site Preparation

- Proper soil preparation is essential to ensure complete contact of the RECP with the soil. Soil Roughening is not recommended in areas where RECPs will be installed.
- Grade and shape the area of installation.
- Remove all rocks, clods, vegetation or other obstructions so that the installed blankets or mats will have complete, direct contact with the soil.
- Prepare seedbed by loosening 2 to 3 in. of topsoil.

Seeding/Planting

Seed the area before blanket installation for erosion control and re-vegetation. Seeding after mat installation is often specified for turf reinforcement application. When seeding prior to blanket installation, all areas disturbed during blanket installation must be re-seeded. Where soil filling is specified for turf reinforcement mats (TRMs), seed the matting and the entire disturbed area after installation and prior to filling the mat with soil.

Fertilize and seed in accordance with seeding specifications or other types of landscaping plans. The protective matting can be laid over areas where grass has been planted and the seedlings have emerged. Where vines or other ground covers are to be planted, lay the protective matting first and then plant through matting according to design of planting.

Check Slots

Check slots shall be installed as required by the manufacturer.

Laying and Securing Matting

- Before laying the matting, all check slots should be installed and the seedbed should be friable, made free from clods, rocks, and roots. The surface should be compacted and finished according to the requirements of the manufacturer's recommendations.
- Mechanical or manual lay down equipment should be capable of handling full rolls of fabric and laying the fabric smoothly without wrinkles or folds. The equipment should meet the fabric manufacturer's recommendations or equivalent standards.

Anchoring

- U-shaped wire staples, metal geotextile stake pins, or triangular wooden stakes can be used to anchor mats and blankets to the ground surface.
- Wire staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- Metal stake pins should be 0.188 in. diameter steel with a 1.5 in. steel washer at the head of the pin, and 8 in. in length.
- Wire staples and metal stakes should be driven flush to the soil surface.

Installation on Slopes

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Begin at the top of the slope and anchor the blanket in a 6 in. deep by 6 in. wide trench. Backfill trench and tamp earth firmly.
- Unroll blanket down slope in the direction of water flow.
- Overlap the edges of adjacent parallel rolls 2 to 3 in. and staple every 3 ft (or greater, per manufacturer's specifications).
- When blankets must be spliced, place blankets end over end (shingle style) with 6 in. overlap. Staple through overlapped area, approximately 12 in. apart.
- Lay blankets loosely and maintain direct contact with the soil. Do not stretch.
- Staple blankets sufficiently to anchor blanket and maintain contact with the soil. Staples should be placed down the center and staggered with the staples placed along the edges. Steep slopes, 1:1 (H:V) to 2:1 (H:V), require a minimum of 2 staples/yd^2. Moderate slopes, 2:1 (H:V) to 3:1 (H:V), require a minimum of 1 ½ staples/yd^2. Check manufacturer's specifications to determine if a higher density staple pattern is required.

Installation in Channels

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Dig initial anchor trench 12 in. deep and 6 in. wide across the channel at the lower end of the project area.
- Excavate intermittent check slots, 6 in. deep and 6 in. wide across the channel at 25 to 30 ft intervals along the channels.
- Cut longitudinal channel anchor trenches 4 in. deep and 4 in. wide along each side of the installation to bury edges of matting, whenever possible extend matting 2 to 3 in. above the crest of the channel side slopes.
- Beginning at the downstream end and in the center of the channel, place the initial end of the first roll in the anchor trench and secure with fastening devices at 12 in. intervals. Note: matting will initially be upside down in anchor trench.
- In the same manner, position adjacent rolls in anchor trench, overlapping the preceding roll a minimum of 3 in.
- Secure these initial ends of mats with anchors at 12 in. intervals, backfill and compact soil.
- Unroll center strip of matting upstream. Stop at next check slot or terminal anchor trench. Unroll adjacent mats upstream in similar fashion, maintaining a 3 in. overlap.

- Fold and secure all rolls of matting snugly into all transverse check slots. Lay mat in the bottom of the slot then fold back against itself. Anchor through both layers of mat at 12 in. intervals, then backfill and compact soil. Continue rolling all mat widths upstream to the next check slot or terminal anchor trench.
- Alternate method for non-critical installations: Place two rows of anchors on 6 in. centers at 25 to 30 ft. intervals in lieu of excavated check slots.
- Staple shingled lap spliced ends a minimum of 12 in. apart on 12 in. intervals.
- Place edges of outside mats in previously excavated longitudinal slots; anchor using prescribed staple pattern, backfill, and compact soil.
- Anchor, fill, and compact upstream end of mat in a 12 in. by 6 in. terminal trench.
- Secure mat to ground surface using U-shaped wire staples, geotextile pins, or wooden stakes.
- Seed and fill turf reinforcement matting with soil, if specified.

Soil Filling (if specified for turf reinforcement mat (TRM))

Installation should be in accordance with the manufacturer's recommendations. Typical installation guidelines are as follows:

- After seeding, spread and lightly rake ½-3/4 inches of fine topsoil into the TRM apertures to completely fill TRM thickness. Use backside of rake or other flat implement.
- Alternatively, if allowed by product specifications, spread topsoil using lightweight loader, backhoe, or other power equipment. Avoid sharp turns with equipment.
- Always consult the manufacturer's recommendations for installation.
- Do not drive tracked or heavy equipment over mat.
- Avoid any traffic over matting if loose or wet soil conditions exist.
- Use shovels, rakes, or brooms for fine grading and touch up.
- Smooth out soil filling just exposing top netting of mat.

Temporary Soil Stabilization Removal

- Temporary soil stabilization removed from the site of the work must be disposed of if necessary.

Costs

Installed costs can be relatively high compared to other BMPs. Approximate costs for installed materials are shown below:

Rolled Erosion Control Products		Installed Cost per Acre (2000)[1]	Estimated Cost per Acre (2009)[2]
Biodegradable	Jute Mesh	$6,000-$7,000	$6,600-$7,700
	Curled Wood Fiber	$8,000-$10,500	$8,800-$11,050
	Straw	$8,000-$10,500	$8,800-$11,050
	Wood Fiber	$8,000-$10,500	$8,800-$11,050
	Coconut Fiber	$13,000-$14,000	$14,300-$15,400
	Coconut Fiber Mesh	$30,000-$33,000	$33,000-$36,300
	Straw Coconut Fiber	$10,000-$12,000	$11,000-$13,200
Non-Biodegradable	Plastic Netting	$2,000-$2,200	$2,200-$2,220
	Plastic Mesh	$3,000-$3,500	$3,300-$3,850
	Synthetic Fiber with Netting	$34,000-$40,000	$37,400-$44,000
	Bonded Synthetic Fibers	$45,000-$55,000	$49,500-$60,500
	Combination with Biodegradable	$30,000-$36,000	$33,000-$39,600

1. Source: Erosion Control Pilot Study Report, Caltrans, June 2000.

2. 2009 costs reflect a 10% escalation over year 2000 costs. Escalation based on informal survey of industry trends. Note: Expected cost increase is offset by competitive economic conditions.

Inspection and Maintenance

- RECPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident shall be repaired and BMPs reapplied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.
- If washout or breakage occurs, re-install the material after repairing the damage to the slope or channel.
- Make sure matting is uniformly in contact with the soil.
- Check that all the lap joints are secure.
- Check that staples are flush with the ground.

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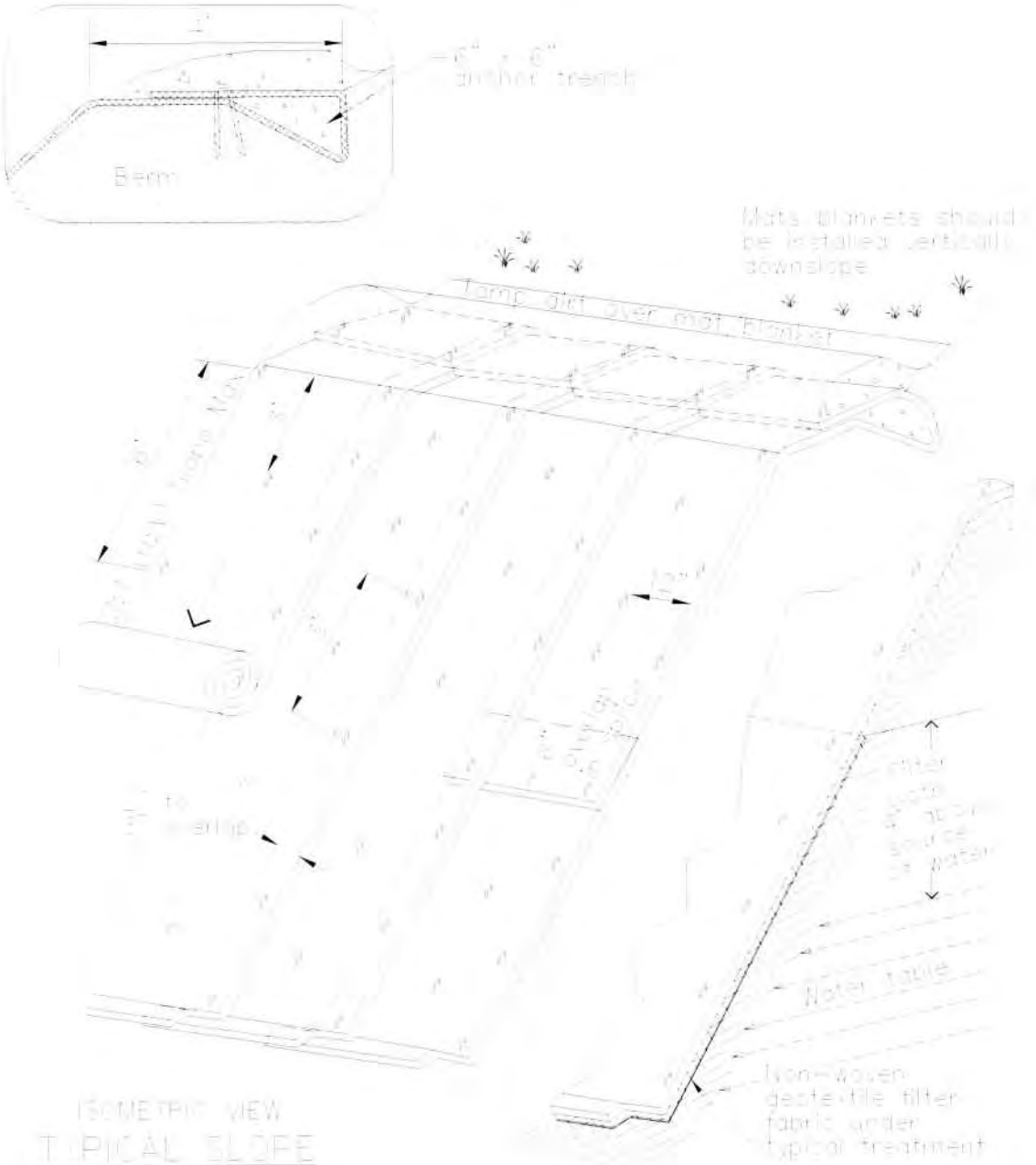


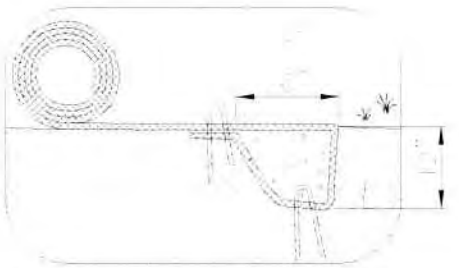
ISOMETRIC VIEW
TYPICAL SLOPE SOIL STABILIZATION
NTS

WET SLOPE LINING
NTS

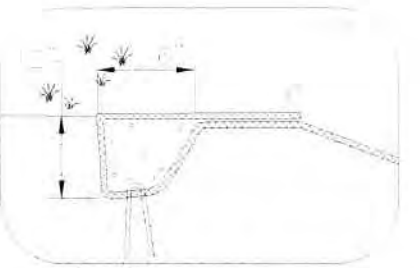
NOTES:

1. Slope surface shall be free of rocks, clods, sticks and grass. Mats/blankets shall have good soil contact.
2. Lay blankets loosely and stake or staple to maintain direct contact with the soil. Do not stretch.
3. Install per manufacturer's recommendations.

TYPICAL INSTALLATION DETAIL



INITIAL CHANNEL ANCHOR TRENCH
NTS



TERMINAL SLOPE AND CHANNEL ANCHOR TRENCH
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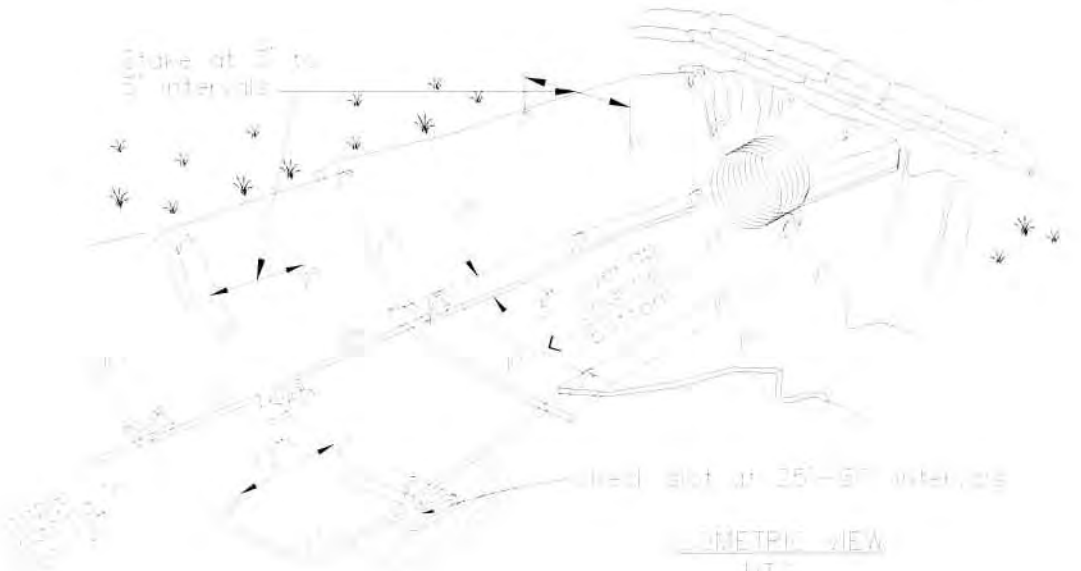
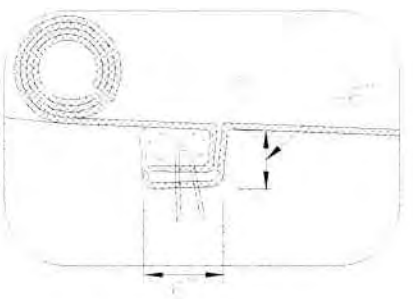
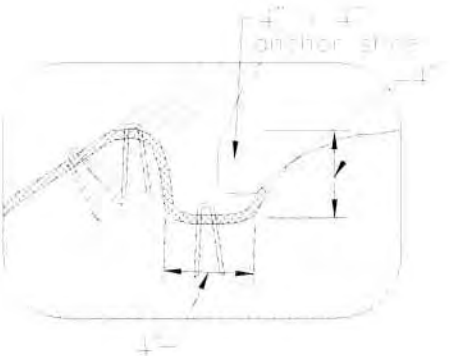


ISOMETRIC VIEW
NTS



INTERMITTENT CHECK SLOT
NTS



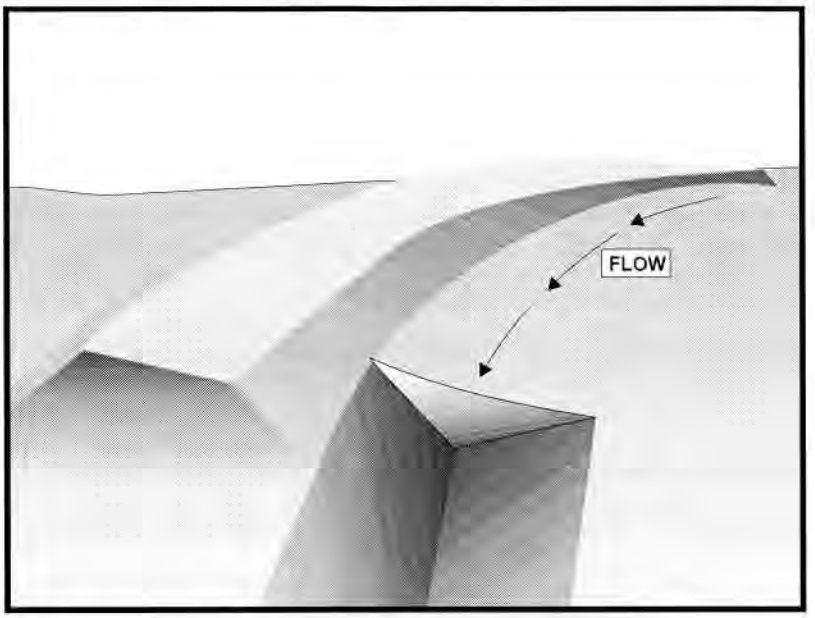
LONGITUDINAL ANCHOR TRENCH
NTS

NOTES:

1. Check slots to be constructed per manufacturers specifications.
2. Stakings or stapling layout per manufacturers specifications.
3. Install per manufacturer's recommendations.

TYPICAL INSTALLATION DETAIL

Earth Dikes and Drainage Swales EC-9



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

An earth dike is a temporary berm or ridge of compacted soil used to divert runoff or channel water to a desired location. A drainage swale is a shaped and sloped depression in the soil surface used to convey runoff to a desired location. Earth dikes and drainage swales are used to divert off site runoff around the construction site, divert runoff from stabilized areas and disturbed areas, and direct runoff into sediment basins or traps.

Suitable Applications

Earth dikes and drainage swales are suitable for use, individually or together, where runoff needs to be diverted from one area and conveyed to another.

- Earth dikes and drainage swales may be used:
  - To convey surface runoff down sloping land
  - To intercept and divert runoff to avoid sheet flow over sloped surfaces
  - To divert and direct runoff towards a stabilized watercourse, drainage pipe or channel
  - To intercept runoff from paved surfaces
  - Below steep grades where runoff begins to concentrate
  - Along roadways and facility improvements subject to flood drainage

CASQA
CALIFORNIA STORMWATER

- At the top of slopes to divert runon from adjacent or undisturbed slopes
- At bottom and mid slope locations to intercept sheet flow and convey concentrated flows
- Divert sediment laden runoff into sediment basins or traps

Limitations

Dikes should not be used for drainage areas greater than 10 acres or along slopes greater than 10 percent. For larger areas more permanent drainage structures should be built. All drainage structures should be built in compliance with local municipal requirements.

- Earth dikes may create more disturbed area on site and become barriers to construction equipment.
- Earth dikes must be stabilized immediately, which adds cost and maintenance concerns.
- Diverted stormwater may cause downstream flood damage.
- Dikes should not be constructed of soils that may be easily eroded.
- Regrading the site to remove the dike may add additional cost.
- Temporary drains and swales or any other diversion of runoff should not adversely impact upstream or downstream properties.
- Temporary drains and swales must conform to local floodplain management requirements.
- Earth dikes/drainage swales are not suitable as sediment trapping devices.
- It may be necessary to use other soil stabilization and sediment controls such as check dams, plastics, and blankets, to prevent scour and erosion in newly graded dikes, swales, and ditches.
- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in drainage swales.

Implementation

The temporary earth dike is a berm or ridge of compacted soil, located in such a manner as to divert stormwater to a sediment trapping device or a stabilized outlet, thereby reducing the potential for erosion and offsite sedimentation. Earth dikes can also be used to divert runoff from off site and from undisturbed areas away from disturbed areas and to divert sheet flows away from unprotected slopes.

An earth dike does not itself control erosion or remove sediment from runoff. A dike prevents erosion by directing runoff to an erosion control device such as a sediment trap or directing runoff away from an erodible area. Temporary diversion dikes should not adversely impact adjacent properties and must conform to local floodplain management regulations, and should not be used in areas with slopes steeper than 10%.

Slopes that are formed during cut and fill operations should be protected from erosion by runoff. A combination of a temporary drainage swale and an earth dike at the top of a slope can divert

runoff to a location where it can be brought to the bottom of the slope (see EC-11, Slope Drains). A combination dike and swale is easily constructed by a single pass of a bulldozer or grader and compacted by a second pass of the tracks or wheels over the ridge. Diversion structures should be installed when the site is initially graded and remain in place until post construction BMPs are installed and the slopes are stabilized.

Diversion practices concentrate surface runoff, increasing its velocity and erosive force. Thus, the flow out of the drain or swale must be directed onto a stabilized area or into a grade stabilization structure. If significant erosion will occur, a swale should be stabilized using vegetation, chemical treatment, rock rip-rap, matting, or other physical means of stabilization. Any drain or swale that conveys sediment laden runoff must be diverted into a sediment basin or trap before it is discharged from the site.

General

- Care must be applied to correctly size and locate earth dikes, drainage swales. Excessively steep, unlined dikes, and swales are subject to erosion and gully formation.
- Conveyances should be stabilized.
- Use a lined ditch for high flow velocities.
- Select flow velocity based on careful evaluation of the risks due to erosion of the measure, soil types, overtopping, flow backups, washout, and drainage flow patterns for each project site.
- Compact any fills to prevent unequal settlement.
- Do not divert runoff onto other property without securing written authorization from the property owner.
- When possible, install and utilize permanent dikes, swales, and ditches early in the construction process.
- Provide stabilized outlets.

Earth Dikes

Temporary earth dikes are a practical, inexpensive BMP used to divert stormwater runoff. Temporary diversion dikes should be installed in the following manner:

- All dikes should be compacted by earth moving equipment.
- All dikes should have positive drainage to an outlet.
- All dikes should have 2:1 or flatter side slopes, 18 in. minimum height, and a minimum top width of 24 in. Wide top widths and flat slopes are usually needed at crossings for construction traffic.
- The outlet from the earth dike must function with a minimum of erosion. Runoff should be conveyed to a sediment trapping device such as a Sediment Trap (SE-3) or Sediment Basin

(SE-2) when either the dike channel or the drainage area above the dike are not adequately stabilized.

- Temporary stabilization may be achieved using seed and mulching for slopes less than 5% and either rip-rap or sod for slopes in excess of 5%. In either case, stabilization of the earth dike should be completed immediately after construction or prior to the first rain.
- If riprap is used to stabilize the channel formed along the toe of the dike, the following typical specifications apply:

Channel Grade	Riprap Stabilization
0.5-1.0%	4 in. Rock
1.1-2.0%	6 in. Rock
2.1-4.0%	8 in. Rock
4.1-5.0%	8 in. -12 in. Riprap

- The stone riprap, recycled concrete, etc. used for stabilization should be pressed into the soil with construction equipment.
- Filter cloth may be used to cover dikes in use for long periods.
- Construction activity on the earth dike should be kept to a minimum.

Drainage Swales

Drainage swales are only effective if they are properly installed. Swales are more effective than dikes because they tend to be more stable. The combination of a swale with a dike on the downhill side is the most cost effective diversion.

Standard engineering design criteria for small open channel and closed conveyance systems should be used (see the local drainage design manual). Unless local drainage design criteria state otherwise, drainage swales should be designed as follows:

- No more than 5 acres may drain to a temporary drainage swale.
- Place drainage swales above or below, not on, a cut or fill slope.
- Swale bottom width should be at least 2 ft
- Depth of the swale should be at least 18 in.
- Side slopes should be 2:1 or flatter.
- Drainage or swales should be laid at a grade of at least 1 percent, but not more than 15 percent.
- The swale must not be overtopped by the peak discharge from a 10-year storm, irrespective of the design criteria stated above.

- Remove all trees, stumps, obstructions, and other objectionable material from the swale when it is built.
- Compact any fill material along the path of the swale.
- Stabilize all swales immediately. Seed and mulch swales at a slope of less than 5 percent, and use rip-rap or sod for swales with a slope between 5 and 15 percent. For temporary swales, geotextiles and mats (EC-7) may provide immediate stabilization.
- Irrigation may be required to establish sufficient vegetation to prevent erosion.
- Do not operate construction vehicles across a swale unless a stabilized crossing is provided.
- Permanent drainage facilities must be designed by a professional engineer (see the local drainage design criteria for proper design).
- At a minimum, the drainage swale should conform to predevelopment drainage patterns and capacities.
- Construct the drainage swale with a positive grade to a stabilized outlet.
- Provide erosion protection or energy dissipation measures if the flow out of the drainage swale can reach an erosive velocity.

Costs

- Cost ranges from $15 to $55 per ft for both earthwork and stabilization and depends on availability of material, site location, and access.
- Small dikes: $2.50 - $6.50/linear ft; Large dikes: $2.50/yd^3.
- The cost of a drainage swale increases with drainage area and slope. Typical swales for controlling internal erosion are inexpensive, as they are quickly formed during routine earthwork.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect ditches and berms for washouts. Replace lost riprap, damaged linings or soil stabilizers as needed.
- Inspect channel linings, embankments, and beds of ditches and berms for erosion and accumulation of debris and sediment. Remove debris and sediment and repair linings and embankments as needed.
- Temporary conveyances should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction

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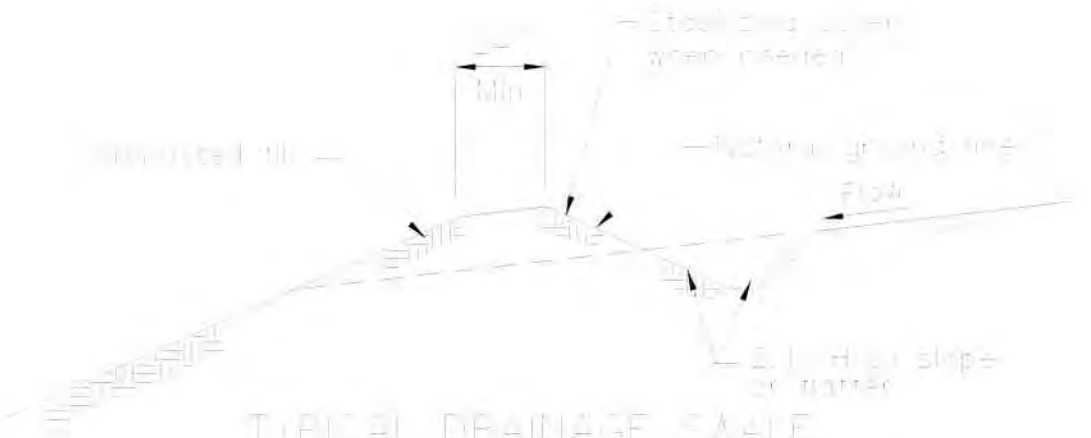
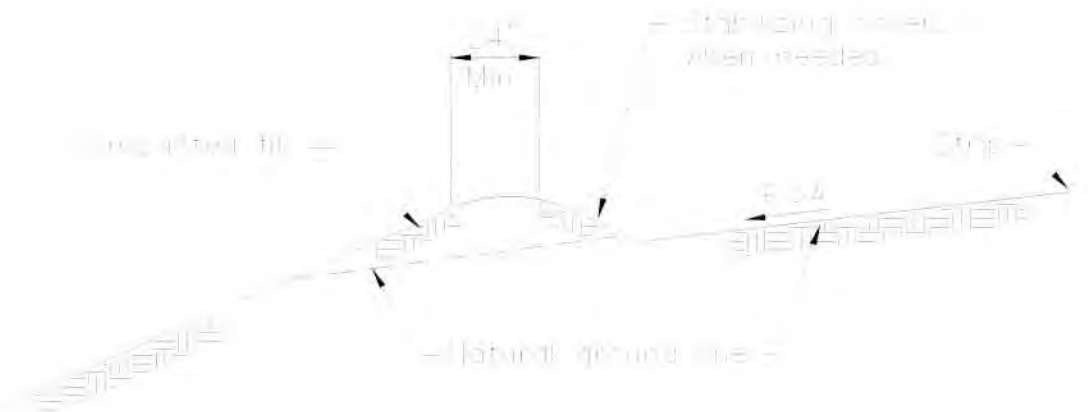


TYPICAL DRAINAGE SWALE
NOT TO SCALE

NOTES:
1. Stabilize swale with seed.
2. Properly compact the subgrade.



TYPICAL EARTH DIKE
NOT TO SCALE

Soil Preparation/Roughening EC-15

Description and Purpose

Soil Preparation/Roughening involves assessment and preparation of surface soils for BMP installation. This can include soil testing (for seed base, soil characteristics, or nutrients), as well as roughening surface soils by mechanical methods (including sheepsfoot rolling, track walking, scarifying, stair stepping, and imprinting) to prepare soil for additional BMPs, or to break up sheet flow. Soil Preparation can also involve tilling topsoil to prepare a seed bed and/or incorporation of soil amendments, to enhance vegetative establishment.

Suitable Applications

Soil preparation: Soil preparation is essential to proper vegetative establishment. In particular, soil preparation (i.e. tilling, raking, and amendment) is suitable for use in combination with any soil stabilization method, including RECPs or sod. Soil preparation should not be confused with roughening.

Roughening: Soil roughening is generally referred to as track walking (sometimes called imprinting) a slope, where treads from heavy equipment run parallel to the contours of the slope and act as mini terraces. Soil preparation is most effective when used in combination with erosion controls. Soil Roughening is suitable for use as a complementary process for controlling erosion on a site. Roughening is not intended to be used as a stand-alone BMP, and should be used with perimeter controls, additional erosion control measures, grade breaks, and vegetative establishment for maximum effectiveness. Roughening is intended to only affect surface soils and should not compromise slope stability or overall compaction. Suitable applications for soil roughening include:

Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-5 Soil Binders

EC-7 Geotextiles and Mats

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- Along any disturbed slopes, including temporary stockpiles, sediment basins, or compacted soil diversion berms and swales.
- Roughening should be used in combination with hydraulically applied stabilization methods, compost blanket, or straw mulch; but should not be used in combination with RECPs or sod because roughening is intended to leave terraces on the slope.

Limitations

- Preparation and roughening must take place prior to installing other erosion controls (such as hydraulically applied stabilizers) or sediment controls (such as fiber rolls) on the faces of slopes.
- In such cases where slope preparation is minimal, erosion control/revegetation BMPs that do not require extensive soil preparation - such as hydraulic mulching and seeding applications - should be employed.
- Consideration should be given to the type of erosion control BMP that follows surface preparation, as some BMPs are not designed to be installed over various types of tillage/roughening, i.e., RECPs (erosion control blankets) should not be used with soil roughening due to a "bridging" effect, which suspends the blanket above the seed bed.
- Surface roughness has an effect on the amount of mulch material that needs to be applied, which shows up as a general increase in mulch material due to an increase in surface area (Topographic Index -see EC-3 Hydraulic Mulching).

Implementation

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

General

A roughened surface can significantly reduce erosion. Based on tests done at the San Diego State Erosion Research Laboratory, various roughening techniques on slopes can result in a 12 - 76% reduction in the erosion rate versus smooth slopes.

Materials

Minimal materials are required unless amendments and/or seed are added to the soil. The majority of soil roughening/preparation can be done with equipment that is on hand at a normal construction site, such as bull dozers and compaction equipment.

Installation Guidelines

Soil Preparation

- Where appropriate or feasible, soil should be prepared to receive the seed by disking or otherwise scarifying the surface to eliminate crust, improve air and water infiltration and create a more favorable environment for germination and growth.
- Based upon soil testing conducted, apply additional soil amendments (e.g. fertilizers, additional seed) to the soil to help with germination. Follow EC-4, Hydroseeding, when selecting and applying seed and fertilizers.

Cut Slope Roughening:

- Stair-step grade or groove the cut slopes that are steeper than 3:1.
- Use stair-step grading on any erodible material soft enough to be ripped with a bulldozer. Slopes consisting of soft rock with some subsoil are particularly suited to stair-step grading.
- Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the "step" in toward the vertical wall.
- Do not make individual vertical cuts more than 2 feet (0.6 m) high in soft materials or more than 3 feet (0.9 m) high in rocky materials.
- Groove the slope using machinery to create a series of ridges and depressions that run across the slope, on the contour.

Fill Slope Roughening:

- Place on fill slopes with a gradient steeper than 3:1 in lifts not to exceed 8 inches (0.2 m), and make sure each lift is properly compacted.
- Ensure that the face of the slope consists of loose, uncompacted fill 4-6 inches (0.1-0.2 m) deep.
- Use grooving or tracking to roughen the face of the slopes, if necessary.
- Do not blade or scrape the final slope face.

Roughening for Slopes to be Mowed:

- Slopes which require mowing activities should not be steeper than 3:1.
- Roughen these areas to shallow grooves by track walking, scarifying, sheepsfoot rolling, or imprinting.
- Make grooves close together (less than 10 inches), and not less than 1 inch deep, and perpendicular to the direction of runoff (i.e., parallel to the slope contours).
- Excessive roughness is undesirable where mowing is planned.

Roughening With Tracked Machinery:

- Limit roughening with tracked machinery to soils with a sandy textural component to avoid undue compaction of the soil surface.
- Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not back-blade during the final grading operation.
- Seed and mulch roughened areas as soon as possible to obtain optimum seed germination and growth.

Costs

Costs are based on the additional labor of tracking or preparation of the slope plus the cost of any required soil amendment materials.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check the seeded slopes for signs of erosion such as rills and gullies. Fill these areas slightly above the original grade, then reseed and mulch as soon as possible.
- Inspect BMPs weekly during normal operations, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Non-Vegetative Stabilization EC-16

Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TR	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Non-vegetative stabilization methods are used for temporary or permanent stabilization of areas prone to erosion and should be used only where vegetative options are not feasible; examples include:

- Areas of vehicular or pedestrian traffic such as roads or paths;
- Arid environments where vegetation would not provide timely ground coverage, or would require excessive irrigation;
- Rocky substrate, infertile or droughty soils where vegetation would be difficult to establish; and
- Areas where vegetation will not grow adequately within the construction time frame.

There are several non-vegetative stabilization methods and selection should be based on site-specific conditions.

Decomposed Granite (DG) is a permanent erosion protection method that consists of a layer of stabilized decomposed granite placed over an erodible surface.

Degradable Mulches of various types (see EC-3, EC-6, EC-8) can be used for temporary non-vegetative stabilization; examples include straw mulch, compost, wood chips or hydraulic mulch.

Geotextiles and Mats can be used for temporary non-vegetative stabilization (see EC-7). These BMPs are typically manufactured

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from degradable or synthetic materials and are designed and specified based on their functional longevity, i.e., how long they will persist and provide erosion protection. All geotextiles and mats should be replaced when they exceed their functional longevity or when permanent stabilization methods are instituted.

Gravel Mulch is a non-degradable erosion control product that is composed of washed and screened coarse to very coarse gravel, 16 mm to 64 mm (0.6" - 2.5"), similar to an AASHTO No. 3 coarse aggregate.

Rock Slope Protection consists of utilizing large rock or rip-rap (4"- 24") to stabilize slopes with a high erosion potential and those subject to scour along waterways.

Soil Binders can be used for temporary non-vegetative stabilization (see EC-5). The key to their use is functional longevity. In most cases, the soil binder will need to be routinely monitored and re-applied to maintain an erosion-resistant coverage.

Suitable Applications

Non-vegetated stabilization methods are suitable for use on disturbed soil areas and on material stockpiles that need to be temporarily or permanently protected from erosion by water and wind. Non-vegetated stabilization should only be utilized when vegetation cannot be established in the required timeframe, due to soil or climactic conditions, or where vegetation may be a potential fire hazard.

Decomposed Granite (DG) and Gravel Mulch are suitable for use in areas where vegetation establishment is difficult, on flat surfaces, trails and pathways, and when used in conjunction with a stabilizer or tackifier, on shallow slopes (i.e., 10:1 [H:V]). DG and gravel can also be used on shallow rocky slopes where vegetation cannot be established for permanent erosion control.

Degradable Mulches can be used to cover and protect soil surfaces from erosion both in temporary and permanent applications. In many cases, the use of mulches by themselves requires routine inspection and re-application. See EC-3 Hydraulic Mulch, EC-6 Straw Mulch, EC-8 Wood Mulch, or EC-14 Compost Blankets for more information.

Geotextiles and Mats can be used as a temporary stand-alone soil stabilization method. Depending on material selection, geotextiles and mats can be a short-term (3 mos – 1 year) or long-term (1-2 years) temporary stabilization method. For more information on geotextiles and mats see EC-7 Geotextiles and Mats.

Rock Slope Protection can be used when the slopes are subject to scour or have a high erosion potential, such as slopes adjacent to flowing waterways or slopes subject to overflow from detention facilities (spillways).

Soil Binders can be used for temporary stabilization of stockpiles and disturbed areas not subject to heavy traffic. See EC-5 Soil Binders for more information.

Limitations

General

- Refer to EC-3, EC-6, EC-8, and EC-14 for limitations on use of mulches. Refer to EC-7 for limitations on use of geotextiles and mats. Refer to EC-5 for limitations on use of Soil Binders.

Decomposed Granite

- Not available in some geographic regions.
- If not tackified, material may be susceptible to erosion even on slight slopes (e.g., 30:1 [H:V]).
- Installed costs may be more expensive than vegetative stabilization methods.

Gravel Mulch

- Availability is limited in some geographic regions.
- If not properly screened and washed, can contain fine material that can erode and/or create dust problems.
- If inadequately sized, material may be susceptible to erosion on sloped areas.
- Pore spaces fill with dirt and debris over time; may provide a growing medium for weeds.

Rock Slope Protection

- Installation is labor intensive.
- Installed costs can be significantly higher than vegetative stabilization methods.
- Rounded stones may not be used on slopes greater than 2:1 [H:V].

Implementation

General

Non-vegetated stabilization should be used in accordance with the following general guidance:

- Should be used in conjunction with other BMPs, including drainage, erosion controls and sediment controls.
- Refer to EC-3, EC-6, EC-8, and EC-14 for implementation details for mulches. Refer to EC-7 for implementation details for geotextiles and mats. Refer to EC-5 for implementation details for soil binders.
- Non-vegetated stabilization measures should be implemented as soon as the disturbance in the areas they are intended to protect has ceased.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Decomposed Granite Stabilization

- If used for a road or path should be installed on a prepared base.

- Should be mixed with a stabilizer if used for roads or pathways, or on slope applications.
- Though porous it is recommended to prevent standing water on or next to a decomposed granite road or pathway.

Gravel Mulch

- Should be sized based on slope, rainfall, and upgradient run-on conditions. Stone size should be increased as potential for erosion increases (steeper slopes, high intensity rainfall).
- If permanent, a weed control fabric should be placed prior to installation.
- Should be installed at a minimum 2" depth.
- Should completely cover all exposed surfaces.

Rock Slope Protection

- Rock slope protection installation should follow Caltrans Standard Specification 72-2: Rock Slope Protection. Refer to the specification for rock conformity requirements and installation methods.
- When using rock slope protection, rock size and installation method should be specified by an Engineer.
- A geotextile fabric should be placed prior to installation.

Costs

- Costs are highly variable depending not only on technique chosen, but also on materials chosen within specific techniques. In addition, availability of certain materials will vary by region/location, which will also affect the cost. Costs of mulches, geotextiles and mats, and soil binders are presented in their respective fact sheets. Costs for decomposed granite, gravel mulch stabilization and rock slope protection may be higher depending on location and availability of materials. Caltrans has provided an estimate for gravel mulch of \$10 - \$15/yd^2 in flat areas and \$11 - \$23/yd^2 on side slopes.

Inspection and Maintenance

General

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- For permanent installation, require inspection periodically and after major storm events to look for signs of erosion or damage to the stabilization.
- All damage should be repaired immediately.
- Refer to EC-3, EC-6, EC-8, and EC-14 for inspection and maintenance requirements for mulches. Refer to EC-7 for inspection and maintenance requirements for geotextiles and mats. Refer to EC-5 for inspection and maintenance requirements for soil binders.

Decomposed Granite and Gravel Mulch Stabilization

- Rake out and add decomposed granite or gravel as needed to areas subject to rill erosion. Inspect upgradient drainage controls and repair/modify as necessary.
- Should remain stable under loose surface material. Any significant problem areas should be repaired to restore uniformity to the installation.

References

Arid Zone Forestry: A Guide for Field Technicians. Food and Agriculture Organization of the United Nations, 1989.

Design of Roadside Channels with Flexible Linings, Hydraulic Engineering Circular Number 15, Third Edition, Federal Highway Administration, 2007.

Design Standards for Urban Infrastructure - Soft Landscape Design, Department of Territory and Municipal Services - Australian Capital Territory http://www.tams.act.gov.au/work/standards_and_procedures/design_standards_for_urban_infrastructure

Erosion and Sediment Control Handbook: A Guide for Protection of State Waters through the use of Best Management Practices during Land Disturbing Activities, Tennessee Department of Environment and Conservation, 2002.

Gravel Mulch, Landscape Architecture Non-Standard Specification 10-2, California Department of Transportation (Caltrans), http://www.dot.ca.gov/hq/LandArch/roadside/detail-gm.htm

Maine Erosion and Sediment Control BMPs, DEPLW0588, Maine Department of Environmental Protection: Bureau of Land and Water Quality, 2003.

National Menu of Best Management Practices, US Environmental Protection Agency, 2006.

Standard Specification 72-2: Rock Slope Protection. California Department of Transportation, 2006.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Water Conservation Practices NS-1

Categories		
EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Water conservation practices are activities that use water during the construction of a project in a manner that avoids causing erosion and the transport of pollutants offsite. These practices can reduce or eliminate non-stormwater discharges.

Suitable Applications

Water conservation practices are suitable for all construction sites where water is used, including piped water, metered water, trucked water, and water from a reservoir.

Limitations

- None identified.

Implementation

- Keep water equipment in good working condition.
- Stabilize water truck filling area.
- Repair water leaks promptly.
- Washing of vehicles and equipment on the construction site is discouraged.
- Avoid using water to clean construction areas. If water must be used for cleaning or surface preparation, surface should be swept and vacuumed first to remove dirt. This will minimize amount of water required.
- Direct construction water runoff to areas where it can soak

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into the ground or be collected and reused.

- Authorized non-stormwater discharges to the storm drain system, channels, or receiving waters are acceptable with the implementation of appropriate BMPs.
- Lock water tank valves to prevent unauthorized use.

Costs

The cost is small to none compared to the benefits of conserving water.

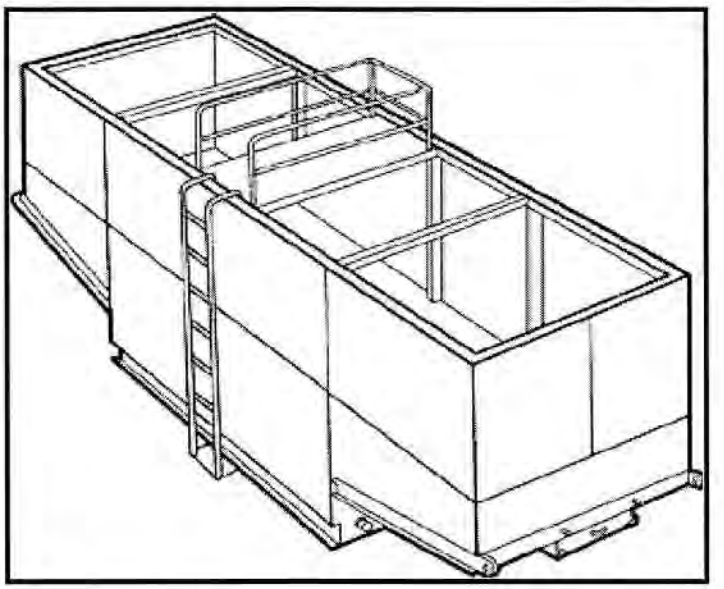
Inspection and Maintenance

- Inspect and verify that activity based BMPs are in place prior to the commencement of authorized non-stormwater discharges.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges are occuring.
- Repair water equipment as needed to prevent unintended discharges.
  - Water trucks
  - Water reservoirs (water buffalos)
  - Irrigation systems
  - Hydrant connections

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Dewatering Operations NS-2



Categories		
EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

SE-5: Fiber Roll

SE-6: Gravel Bag Berm

Description and Purpose

Dewatering operations are practices that manage the discharge of pollutants when non-stormwater and accumulated precipitation (stormwater) must be removed from a work location to proceed with construction work or to provide vector control.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Discharges from dewatering operations can contain high levels of fine sediment that, if not properly treated, could lead to exceedences of the General Permit requirements.

Suitable Applications

These practices are implemented for discharges of non-stormwater from construction sites. Non-stormwaters include, but are not limited to, groundwater, water from cofferdams, water diversions, and waters used during construction activities that must be removed from a work area to facilitate construction.

Practices identified in this section are also appropriate for implementation when managing the removal of accumulated precipitation (stormwater) from depressed areas at a construction site.

Stormwater mixed with non-stormwater should be managed as non-stormwater.

Limitations

- Dewatering operations will require, and should comply with applicable local and project-specific permits and regulations. In some areas, all dewatering activities, regardless of the discharge volume, require a dewatering permit.
- Site conditions will dictate design and use of dewatering operations.
- The controls discussed in this fact sheet primarily address sediment. Other secondary pollutant removal benefits are discussed where applicable.
- The controls detailed in this fact sheet only allow for minimal settling time for sediment particles. Use only when site conditions restrict the use of the other control methods.
- Avoid dewatering discharges where possible by using the water for dust control.

Implementation

- A Construction Site Monitoring Plan (CSMP) should be included in the project Stormwater Pollution Prevention Plan (SWPPP).
- Regional Water Quality Control Board (RWQCB) Regions may require notification and approval prior to any discharge of water from construction sites.
- The destination of discharge from dewatering activities will typically determine the type of permit required by the discharger. For example, when discharging to a water of the U.S., a groundwater extraction permit will be required through the site's governing RWQCB. When discharging to a sanitary sewer or Municipal Separate Storm Sewer System (MS4), a permit may need to be obtained through the owner of the sanitary sewer or MS4 in addition to obtaining an RWQCB dewatering permit. Additional permits or permissions from other agencies may be required for dewatering cofferdams or diversions.
- Dewatering discharges should not cause erosion at the discharge point. Appropriate BMPs should be implemented to maintain compliance with all applicable permits.
- Maintain dewatering records in accordance with all local and project-specific permits and regulations.

Sediment Treatment

A variety of methods can be used to treat water during dewatering operations. Several devices are presented below and provide options to achieve sediment removal. The sediment particle size and permit or receiving water limitations on sediment are key considerations for selecting sediment treatment option(s); in some cases, the use of multiple devices may be appropriate. Use of other enhanced treatment methods (i.e., introduction of chemicals or electric current to enhance flocculation and removal of sediment) must comply with: 1) for storm drain or surface water discharges, the requirements for Active Treatment Systems (SE-11); or 2) for sanitary sewer discharges, the requirements of applicable sanitary sewer discharge permits.

Sediment Basin (see also SE-2)

Description:

- A sediment basin is a temporary basin with a controlled release structure that is formed by excavation or construction of an embankment to detain sediment-laden runoff and allow sediment to settle out before discharging. Sediment basins are generally larger than Sediment Traps (SE-3) and have a designed outlet structure.

Appropriate Applications:

- Effective for the removal of trash, gravel, sand, silt, some metals that settle out with the sediment.

Implementation:

- Excavation and construction of related facilities is required.
- Temporary sediment basins should be fenced if safety is a concern.
- Outlet protection is required to prevent erosion at the outfall location.

Maintenance:

- Maintenance is required for safety fencing, vegetation, embankment, inlet and outlet, as well as other features.
- Removal of sediment is required when the storage volume is reduced by one-third.

Sediment Trap (See also SE-3)

Description:

- A sediment trap is a temporary basin formed by excavation and/or construction of an earthen embankment across a waterway or low drainage area to detain sediment-laden runoff and allow sediment to settle out before discharging. Sediment traps are generally smaller than Sediment Basins (SE-2) and do not have a designed outlet (but do have a spillway or overflow).

Appropriate Applications:

Effective for the removal of large and medium sized particles (sand and gravel) and some metals that settle out with the sediment.

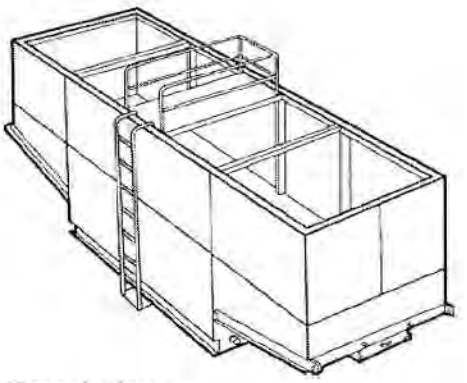
Implementation:

- Excavation and construction of related facilities is required.
- Trap inlets should be located to maximize the travel distance to the trap outlet.
- Use rock or vegetation to protect the trap outlets against erosion.

Maintenance:

- Maintenance is required for vegetation, embankment, inlet and outfall structures, as well as other features.
- Removal of sediment is required when the storage volume is reduced by one-third.

Weir Tanks



Description:

- A weir tank separates water and waste by using weirs. The configuration of the weirs (over and under weirs) maximizes the residence time in the tank and determines the waste to be removed from the water, such as oil, grease, and sediments.

Appropriate Applications:

- The tank removes trash, some settleable solids (gravel, sand, and silt), some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

Implementation:

- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors should be consulted to appropriately size tank.
- Treatment capacity (i.e., volume and number of tanks) should provide at a minimum the required volume for discrete particle settling for treatment design flows.

Maintenance:

- Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal should be conducted by a licensed waste disposal company.

Dewatering Tanks

Description:

- A dewatering tank removes debris and sediment. Flow enters the tank through the top, passes through a fabric filter, and is discharged through the bottom of the tank. The filter separates the solids from the liquids.

Appropriate Applications:

- The tank removes trash, gravel, sand, and silt, some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

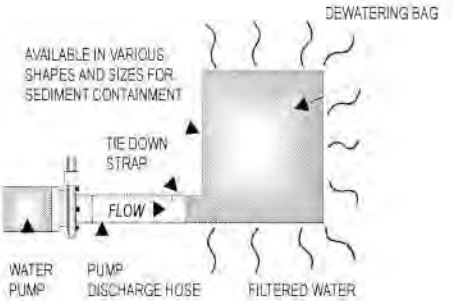
Implementation:

- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors should be consulted to appropriately size tank.

Maintenance:

- Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal should be conducted by licensed waste disposal company.

Gravity Bag Filter



Description:

- A gravity bag filter, also referred to as a dewatering bag, is a square or rectangular bag made of non-woven geotextile fabric that collects gravel, sand, silt, and fines.

Appropriate Applications:

- Effective for the removal of sediments (gravel, sand, silt, and fines). Some metals are removed with the sediment.

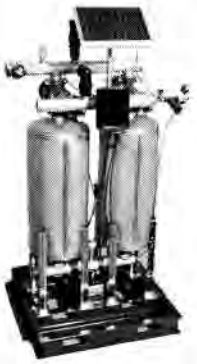
Implementation:

- Water is pumped into one side of the bag and seeps through the top, bottom, and sides of the bag.
- Place filter bag on pavement or a gravel bed or paved surface. Avoid placing a dewatering bag on unprotected bare soil. If placing the bag on bare soil is unavoidable, a secondary barrier should be used, such as a rock filter bed placed beneath and beyond the edges of the bag to, prevent erosion and capture sediments that escape the bag.
- Perimeter control around the downstream end of the bag should be implemented. Secondary sediment controls are important especially in the initial stages of discharge, which tend to allow fines to pass through the bag.

Maintenance:

- Inspection of the flow conditions, bag condition, bag capacity, and the secondary barrier (as applicable) is required.
- Replace the bag when it no longer filters sediment or passes water at a reasonable rate.
- Caution should be taken when removing and disposing of the bag, to prevent the release of captured sediment
- Properly dispose of the bag offsite. If sediment is removed from the bag prior to disposal (bags can potentially be reused depending upon their condition), dispose of sediment in accordance with the general maintenance procedures described at the end of this BMP Fact Sheet.

Sand Media Particulate Filter



Description:

- Water is treated by passing it through canisters filled with sand media. Generally, sand filters provide a final level of treatment. They are often used as a secondary or higher level of treatment after a significant amount of sediment and other pollutants have been removed using other methods.

Appropriate Applications:

- Effective for the removal of trash, gravel, sand, and silt and some metals, as well as the reduction of biochemical oxygen demand (BOD) and turbidity.
- Sand filters can be used for stand-alone treatment or in conjunction with bag and cartridge filtration if further treatment is required.
- Sand filters can also be used to provide additional treatment to water treated via settling or basic filtration.

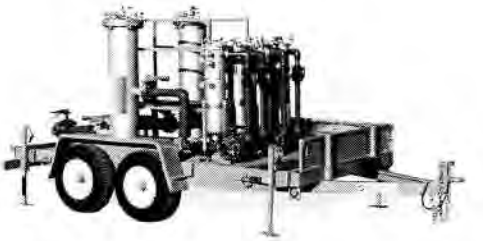
Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance with installation and operation.

Maintenance:

- The filters require regular service to monitor and maintain the level of the sand media. If subjected to high loading rates, filters can plug quickly.
- Venders generally provide data on maximum head loss through the filter. The filter should be monitored daily while in use, and cleaned when head loss reaches target levels.
- If cleaned by backwashing, the backwash water may need to be hauled away for disposal, or returned to the upper end of the treatment train for another pass through the series of dewatering BMPs.

Pressurized Bag Filter



Description:

- A pressurized bag filter is a unit composed of single filter bags made from polyester felt material. The water filters through the unit and is discharged through a header. Vendors provide bag filters in a variety of configurations. Some units include a combination of bag filters and cartridge filters for enhanced contaminant removal.

Appropriate Applications:

- Effective for the removal of sediment (sand and silt) and some metals, as well as the reduction of BOD, turbidity, and hydrocarbons. Oil absorbent bags are available for hydrocarbon removal.
- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.

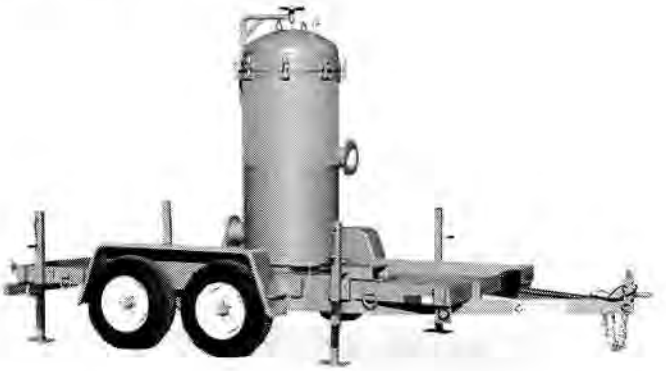
Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance with installation and operation.

Maintenance:

- The filter bags require replacement when the pressure differential equals or exceeds the manufacturer's recommendation.

Cartridge Filter



Description:

- Cartridge filters provide a high degree of pollutant removal by utilizing a number of individual cartridges as part of a larger filtering unit. They are often used as a secondary or higher (polishing) level of treatment after a significant amount of sediment and other pollutants are removed. Units come with various cartridge configurations (for use in series with bag filters) or with a larger single cartridge filtration unit (with multiple filters within).

Appropriate Applications:

- Effective for the removal of sediment (sand, silt, and some clays) and metals, as well as the reduction of BOD, turbidity, and hydrocarbons. Hydrocarbons can effectively be removed with special resin cartridges.

- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance.

Maintenance:

- The cartridges require replacement when the pressure differential equals or exceeds the manufacturer's recommendation.

Costs

- Sediment control costs vary considerably depending on the dewatering and sediment treatment system that is selected. Pressurized filters tend to be more expensive than gravity settling, but are often more effective. Simple tanks are generally rented on a long-term basis (one or more months) and can range from $360 per month for a 1,000 gallon tank to $2,660 per month for a 10,000 gallon tank. Mobilization and demobilization costs vary considerably.

Inspection and Maintenance

- Inspect and verify that dewatering BMPs are in place and functioning prior to the commencement of activities requiring dewatering.

- Inspect dewatering BMPs daily while dewatering activities are being conducted.

- Inspect all equipment before use. Monitor dewatering operations to ensure they do not cause offsite discharge or erosion.
- Sample dewatering discharges as required by the General Permit.
- Unit-specific maintenance requirements are included with the description of each unit.
- Sediment removed during the maintenance of a dewatering device may be either spread onsite and stabilized, or disposed of at a disposal site as approved by the owner.
- Sediment that is commingled with other pollutants should be disposed of in accordance with all applicable laws and regulations and as approved by the owner.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

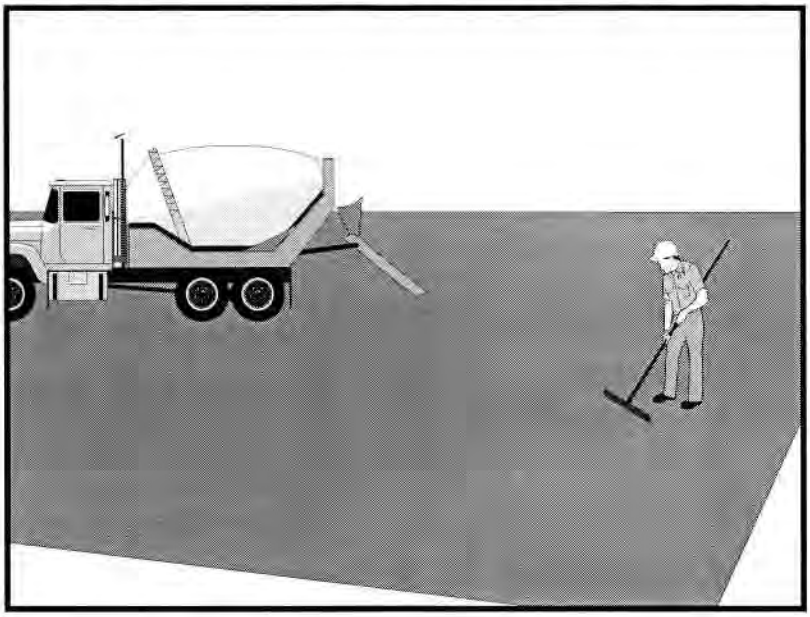
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003; Updated March 2004.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Labor Surcharge & Equipment Rental Rates, April 1, 2002 through March 31, 2003, California Department of Transportation (Caltrans).

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Paving and Grinding Operations NS-3



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	☒

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants from paving operations, using measures to prevent runon and runoff pollution, properly disposing of wastes, and training employees and subcontractors.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH and turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials associated with paving and grinding operations, including mortar, concrete, and cement and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures are implemented where paving, surfacing, resurfacing, or sawcutting, may pollute stormwater runoff or discharge to the storm drain system or watercourses.

Limitations

- Paving opportunities may be limited during wet weather.
- Discharges of freshly paved surfaces may raise pH to environmentally harmful levels and trigger permit violations.

Implementation

General

- Avoid paving during the wet season when feasible.
- Reschedule paving and grinding activities if rain is forecasted.
- Train employees and sub-contractors in pollution prevention and reduction.
- Store materials away from drainage courses to prevent stormwater runon (see WM-1, Material Delivery and Storage).
- Protect drainage courses, particularly in areas with a grade, by employing BMPs to divert runoff or to trap and filter sediment.
- Stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses. These materials should be stored consistent with WM-3, Stockpile Management.
- Disposal of PCC (Portland cement concrete) and AC (asphalt concrete) waste should be in conformance with WM-8, Concrete Waste Management.

Saw Cutting, Grinding, and Pavement Removal

- Shovel or vacuum saw-cut slurry and remove from site. Cover or barricade storm drains during saw cutting to contain slurry.
- When paving involves AC, the following steps should be implemented to prevent the discharge of grinding residue, uncompacted or loose AC, tack coats, equipment cleaners, or unrelated paving materials:
  - AC grindings, pieces, or chunks used in embankments or shoulder backing should not be allowed to enter any storm drains or watercourses. Install inlet protection and perimeter controls until area is stabilized (i.e. cutting, grinding or other removal activities are complete and loose material has been properly removed and disposed of)or permanent controls are in place. Examples of temporary perimeter controls can be found in EC-9, Earth Dikes and Drainage Swales; SE-1, Silt Fence; SE-5, Fiber Rolls, or SE-13 Compost Socks and Berms
  - Collect and remove all broken asphalt and recycle when practical. Old or spilled asphalt should be recycled or disposed of properly.
- Do not allow saw-cut slurry to enter storm drains or watercourses. Residue from grinding operations should be picked up by a vacuum attachment to the grinding machine, or by sweeping, should not be allowed to flow across the pavement, and should not be left on the surface of the pavement. See also WM-8, Concrete Waste Management, and WM-10, Liquid Waste Management.
- Pavement removal activities should not be conducted in the rain.
- Collect removed pavement material by mechanical or manual methods. This material may be recycled for use as shoulder backing or base material.

- If removed pavement material cannot be recycled, transport the material back to an approved storage site.

Asphaltic Concrete Paving

- If paving involves asphaltic cement concrete, follow these steps:
  - Do not allow sand or gravel placed over new asphalt to wash into storm drains, streets, or creeks. Vacuum or sweep loose sand and gravel and properly dispose of this waste by referring to WM-5, Solid Waste Management.
  - Old asphalt should be disposed of properly. Collect and remove all broken asphalt from the site and recycle whenever possible.

Portland Cement Concrete Paving

- Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect waste materials by dry methods, such as sweeping or shoveling, and return to aggregate base stockpile or dispose of properly. Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in WM-8, Concrete Waste Management, or pump the water to the sanitary sewer if authorized by the local wastewater authority.

Sealing Operations

- During chip seal application and sweeping operations, petroleum or petroleum covered aggregate should not be allowed to enter any storm drain or water courses. Apply temporary perimeter controls until structure is stabilized (i.e. all sealing operations are complete and cured and loose materials have been properly removed and disposed).
- Inlet protection (SE-10, Storm Drain Inlet Protection) should be used during application of seal coat, tack coat, slurry seal, and fog seal.
- Seal coat, tack coat, slurry seal, or fog seal should not be applied if rainfall is predicted to occur during the application or curing period.

Paving Equipment

- Leaks and spills from paving equipment can contain toxic levels of heavy metals and oil and grease. Place drip pans or absorbent materials under paving equipment when not in use. Clean up spills with absorbent materials and dispose of in accordance with the applicable regulations. See NS-10, Vehicle and Equipment Maintenance, WM-4, Spill Prevention and Control, and WM-10, Liquid Waste Management.
- Substances used to coat asphalt transport trucks and asphalt spreading equipment should not contain soap and should be non-foaming and non-toxic.
- Paving equipment parked onsite should be parked over plastic to prevent soil contamination.
- Clean asphalt coated equipment offsite whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as described in WM-5, Solid Waste Management. Any cleaning onsite should follow NS-8, Vehicle and Equipment Cleaning.

Thermoplastic Striping

- Thermoplastic striper and pre-heater equipment shutoff valves should be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the stormwater drainage system, or watercourses.
- Pre-heaters should be filled carefully to prevent splashing or spilling of hot thermoplastic. Leave six inches of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move.
- Do not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.
- Clean truck beds daily of loose debris and melted thermoplastic. When possible, recycle thermoplastic material.

Raised/Recessed Pavement Marker Application and Removal

- Do not transfer or load bituminous material near drain inlets, the stormwater drainage system, or watercourses.
- Melting tanks should be loaded with care and not filled to beyond six inches from the top to leave room for splashing.
- When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.
- On large-scale projects, use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.

Costs

- All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of paving and grinding operations.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Sample stormwater runoff required by the General Permit.
- Keep ample supplies of drip pans or absorbent materials onsite.
- Inspect and maintain machinery regularly to minimize leaks and drips.

References

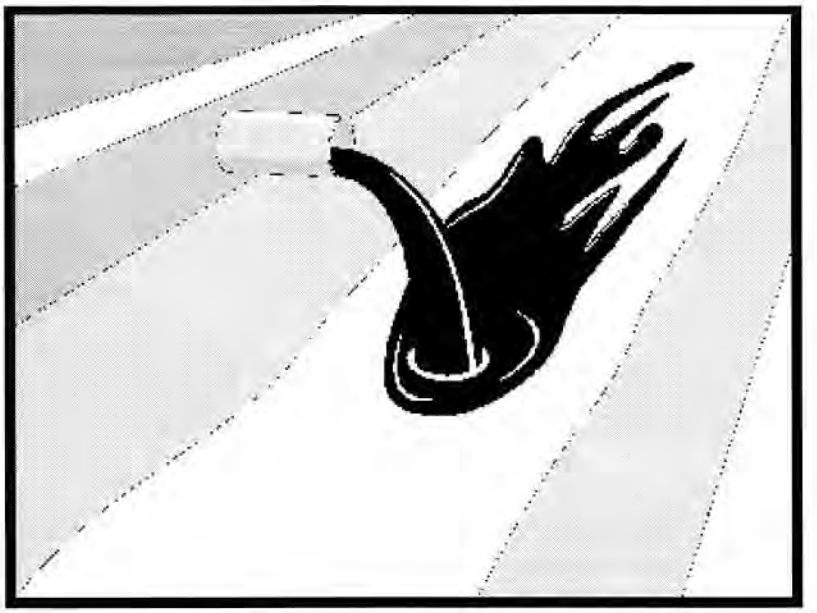
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Hot Mix Asphalt-Paving Handbook AC 150/5370-14, Appendix I, U.S. Army Corps of Engineers, July 1991.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Illicit Connection/Discharge NS-6



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Procedures and practices designed for construction contractors to recognize illicit connections or illegally dumped or discharged materials on a construction site and report incidents.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Illicit connection/discharge and reporting is applicable anytime an illicit connection or discharge is discovered or illegally dumped material is found on the construction site.

Limitations

Illicit connections and illegal discharges or dumping, for the purposes of this BMP, refer to discharges and dumping caused by parties other than the contractor. If pre-existing hazardous materials or wastes are known to exist onsite, they should be identified in the SWPPP and handled as set forth in the SWPPP.

Implementation

Planning

- Review the SWPPP. Pre-existing areas of contamination should be identified and documented in the SWPPP.
- Inspect site before beginning the job for evidence of illicit connections, illegal dumping or discharges. Document any pre-existing conditions and notify the owner.
- Inspect site regularly during project execution for evidence

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of illicit connections, illegal dumping or discharges.

- Observe site perimeter for evidence for potential of illicitly discharged or illegally dumped material, which may enter the job site.

Identification of Illicit Connections and Illegal Dumping or Discharges

- **General** – unlabeled and unidentifiable material should be treated as hazardous.
- **Solids** - Look for debris, or rubbish piles. Solid waste dumping often occurs on roadways with light traffic loads or in areas not easily visible from the traveled way.
- **Liquids** - signs of illegal liquid dumping or discharge can include:
  - Visible signs of staining or unusual colors to the pavement or surrounding adjacent soils
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Abnormal water flow during the dry weather season
- **Urban Areas** - Evidence of illicit connections or illegal discharges is typically detected at storm drain outfall locations or at manholes. Signs of an illicit connection or illegal discharge can include:
  - Abnormal water flow during the dry weather season
  - Unusual flows in sub drain systems used for dewatering
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Excessive sediment deposits, particularly adjacent to or near active offsite construction projects
- **Rural Areas** - Illicit connections or illegal discharges involving irrigation drainage ditches are detected by visual inspections. Signs of an illicit discharge can include:
  - Abnormal water flow during the non-irrigation season
  - Non-standard junction structures
  - Broken concrete or other disturbances at or near junction structures

Reporting

Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery. For illicit connections or discharges to the storm drain system, notify the local stormwater management agency. For illegal dumping, notify the local law enforcement agency.

Cleanup and Removal

The responsibility for cleanup and removal of illicit or illegal dumping or discharges will vary by location. Contact the local stormwater management agency for further information.

Costs

Costs to look for and report illicit connections and illegal discharges and dumping are low. The best way to avoid costs associated with illicit connections and illegal discharges and dumping is to keep the project perimeters secure to prevent access to the site, to observe the site for vehicles that should not be there, and to document any waste or hazardous materials that exist onsite before taking possession of the site.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect the site regularly to check for any illegal dumping or discharge.
- Prohibit employees and subcontractors from disposing of non-job related debris or materials at the construction site.
- Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery.

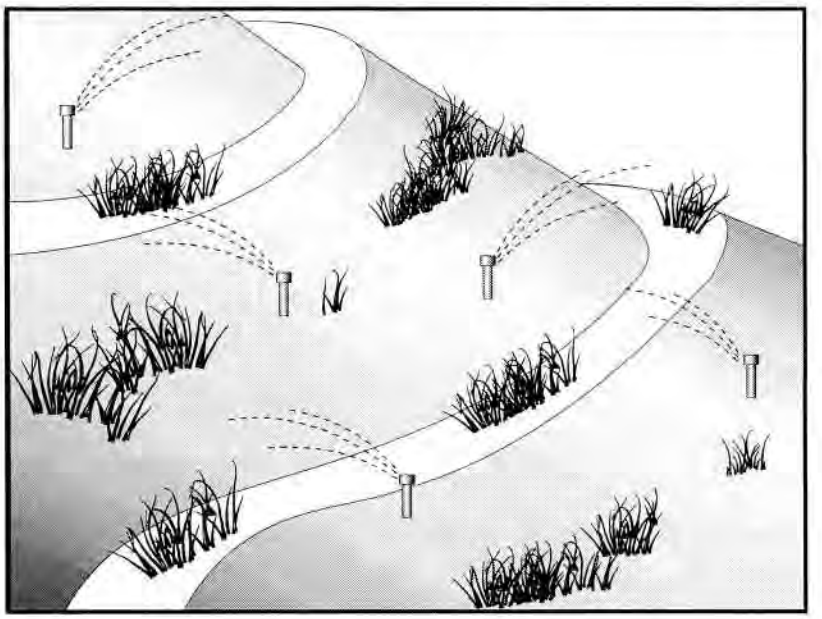
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Potable Water/Irrigation NS-7



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

Potable Water/Irrigation consists of practices and procedures to manage the discharge of potential pollutants generated during discharges from irrigation water lines, landscape irrigation, lawn or garden watering, planned and unplanned discharges from potable water sources, water line flushing, and hydrant flushing.

Suitable Applications

Implement this BMP whenever potable water or irrigation water discharges occur at or enter a construction site.

Limitations

None identified.

Implementation

- Direct water from offsite sources around or through a construction site, where feasible, in a way that minimizes contact with the construction site.
- Discharges from water line flushing should be reused for landscaping purposes where feasible.
- Shut off the water source to broken lines, sprinklers, or valves as soon as possible to prevent excess water flow.
- Protect downstream stormwater drainage systems and watercourses from water pumped or bailed from trenches excavated to repair water lines.
- Inspect irrigated areas within the construction limits for

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excess watering. Adjust watering times and schedules to ensure that the appropriate amount of water is being used and to minimize runoff. Consider factors such as soil structure, grade, time of year, and type of plant material in determining the proper amounts of water for a specific area.

Costs

Cost to manage potable water and irrigation are low and generally considered to be a normal part of related activities.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Repair broken water lines as soon as possible.
- Inspect irrigated areas regularly for signs of erosion and/or discharge.

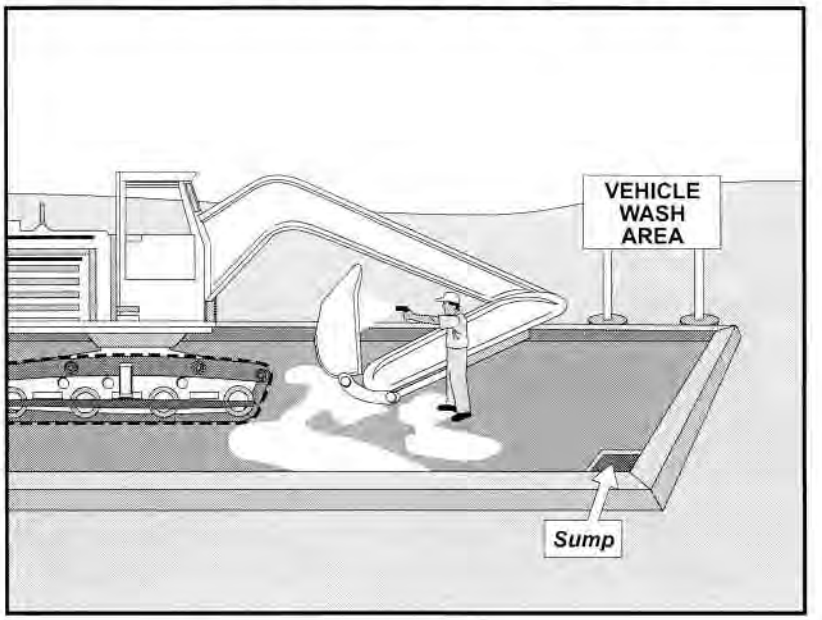
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Vehicle and Equipment Cleaning NS-8



Categories

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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Vehicle and equipment cleaning procedures and practices eliminate or reduce the discharge of pollutants to stormwater from vehicle and equipment cleaning operations. Procedures and practices include but are not limited to: using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors in proper cleaning procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment cleaning is performed.

Limitations

Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Implementation

Other options to washing equipment onsite include contracting with either an offsite or mobile commercial washing business. These businesses may be better equipped to handle and dispose of the wash waters properly. Performing this work offsite can also be economical by eliminating the need for a separate washing operation onsite.

If washing operations are to take place onsite, then:

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- Use phosphate-free, biodegradable soaps.
- Educate employees and subcontractors on pollution prevention measures.
- Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates.
- Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site unless resulting wastes are fully contained and disposed of. Resulting wastes should not be discharged or buried, and must be captured and recycled or disposed according to the requirements of WM-10, Liquid Waste Management or WM-6, Hazardous Waste Management, depending on the waste characteristics. Minimize use of solvents. Use of diesel for vehicle and equipment cleaning is prohibited.
- All vehicles and equipment that regularly enter and leave the construction site must be cleaned offsite.
- When vehicle and equipment washing and cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area should have the following characteristics:
  - Located away from storm drain inlets, drainage facilities, or watercourses
  - Paved with concrete or asphalt and bermed to contain wash waters and to prevent runon and runoff
  - Configured with a sump to allow collection and disposal of wash water
  - No discharge of wash waters to storm drains or watercourses
  - Used only when necessary
- When cleaning vehicles and equipment with water:
  - Use as little water as possible. High-pressure sprayers may use less water than a hose and should be considered
  - Use positive shutoff valve to minimize water usage
  - Facility wash racks should discharge to a sanitary sewer, recycle system or other approved discharge system and must not discharge to the storm drainage system, watercourses, or to groundwater

Costs

Cleaning vehicles and equipment at an offsite facility may reduce overall costs for vehicle and equipment cleaning by eliminating the need to provide similar services onsite. When onsite cleaning is needed, the cost to establish appropriate facilities is relatively low on larger, long-duration projects, and moderate to high on small, short-duration projects.

Inspection and Maintenance

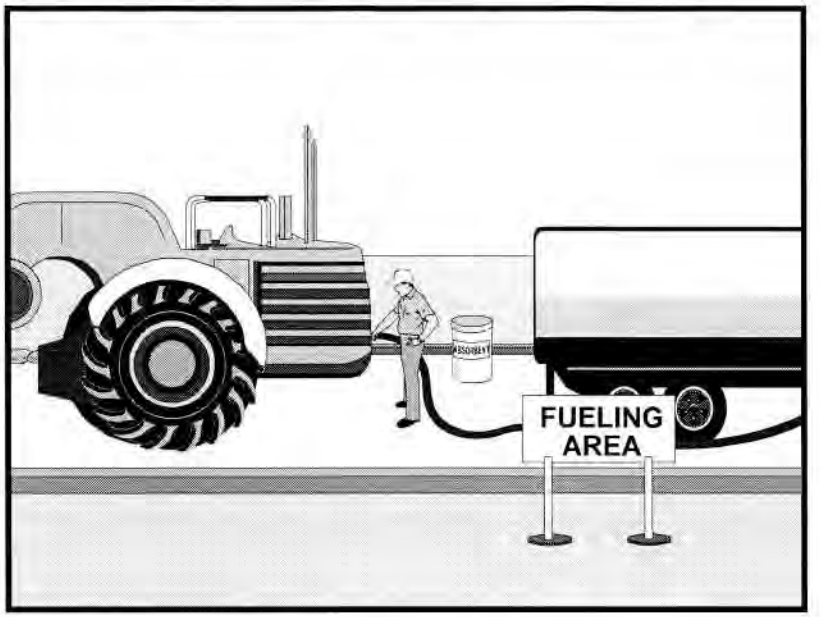
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspection and maintenance is minimal, although some berm repair may be necessary.
- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
- Inspect sump regularly and remove liquids and sediment as needed.
- Prohibit employees and subcontractors from washing personal vehicles and equipment on the construction site.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Swisher, R.D. Surfactant Biodegradation, Marcel Decker Corporation, 1987.

Vehicle and Equipment Fueling NS-9



Categories		
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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of stormwater. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment fueling takes place.

Limitations

Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/ Exit.

Implementation

- Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.
- Discourage "topping-off" of fuel tanks.
- Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks, and should

be disposed of properly after use.

- Drip pans or absorbent pads should be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the adsorbent materials promptly and dispose of properly.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- When fueling must take place onsite, designate an area away from drainage courses to be used. Fueling areas should be identified in the SWPPP.
- Dedicated fueling areas should be protected from stormwater runon and runoff, and should be located at least 50 ft away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Protect fueling areas with berms and dikes to prevent runon, runoff, and to contain spills.
- Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.
- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).
- Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

Costs

- All of the above measures are low cost except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.

Inspection and Maintenance

- Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.
- Keep ample supplies of spill cleanup materials onsite.
- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

References

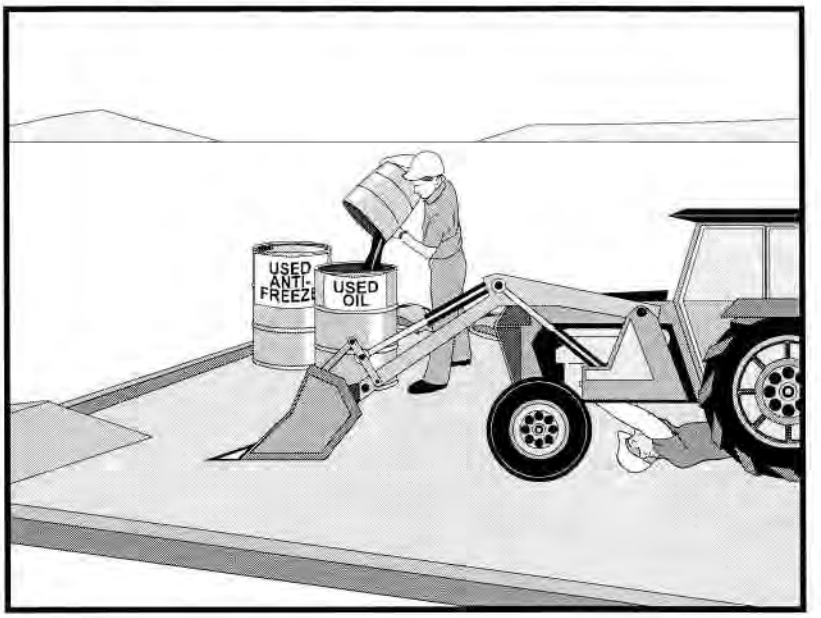
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Vehicle & Equipment Maintenance NS-10



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the contamination of stormwater resulting from vehicle and equipment maintenance by running a "dry and clean site". The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures.

Suitable Applications

These procedures are suitable on all construction projects where an onsite yard area is necessary for storage and maintenance of heavy equipment and vehicles.

Limitations

Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Outdoor vehicle or equipment maintenance is a potentially significant source of stormwater pollution. Activities that can contaminate stormwater include engine repair and service, changing or replacement of fluids, and outdoor equipment storage and parking (engine fluid leaks). For further information on vehicle or equipment servicing, see NS-8, Vehicle and Equipment Cleaning, and NS-9, Vehicle and

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Equipment Fueling.

Implementation

- Use offsite repair shops as much as possible. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate maintenance area.
- If maintenance must occur onsite, use designated areas, located away from drainage courses. Dedicated maintenance areas should be protected from stormwater runon and runoff, and should be located at least 50 ft from downstream drainage facilities and watercourses.
- Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.
- Use adsorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- Inspect onsite vehicles and equipment daily at startup for leaks, and repair immediately.
- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.
- Train employees and subcontractors in proper maintenance and spill cleanup procedures.
- Drip pans or plastic sheeting should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.
- For long-term projects, consider using portable tents or covers over maintenance areas if maintenance cannot be performed offsite.
- Consider use of new, alternative greases and lubricants, such as adhesive greases, for chassis lubrication and fifth-wheel lubrication.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose of or recycle used batteries.
- Do not bury used tires.

- Repair leaks of fluids and oil immediately.

Listed below is further information if you must perform vehicle or equipment maintenance onsite.

Safer Alternative Products

- Consider products that are less toxic or hazardous than regular products. These products are often sold under an "environmentally friendly" label.
- Consider use of grease substitutes for lubrication of truck fifth-wheels. Follow manufacturers label for details on specific uses.
- Consider use of plastic friction plates on truck fifth-wheels in lieu of grease. Follow manufacturers label for details on specific uses.

Waste Reduction

Parts are often cleaned using solvents such as trichloroethylene, trichloroethane, or methylene chloride. Many of these cleaners are listed in California Toxic Rule as priority pollutants. These materials are harmful and must not contaminate stormwater. They must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, one solvent can perform a job as well as two different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check the list of active ingredients to see whether it contains chlorinated solvents. The "chlor" term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

Recycling and Disposal

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous wastes separate, do not mix used oil solvents, and keep chlorinated solvents (like,-trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around. Provide cover and secondary containment until these materials can be removed from the site.

Oil filters can be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Costs

All of the above are low cost measures. Higher costs are incurred to setup and maintain onsite maintenance areas.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Keep ample supplies of spill cleanup materials onsite.
- Maintain waste fluid containers in leak proof condition.
- Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately or the problem vehicle(s) or equipment should be removed from the project site.
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

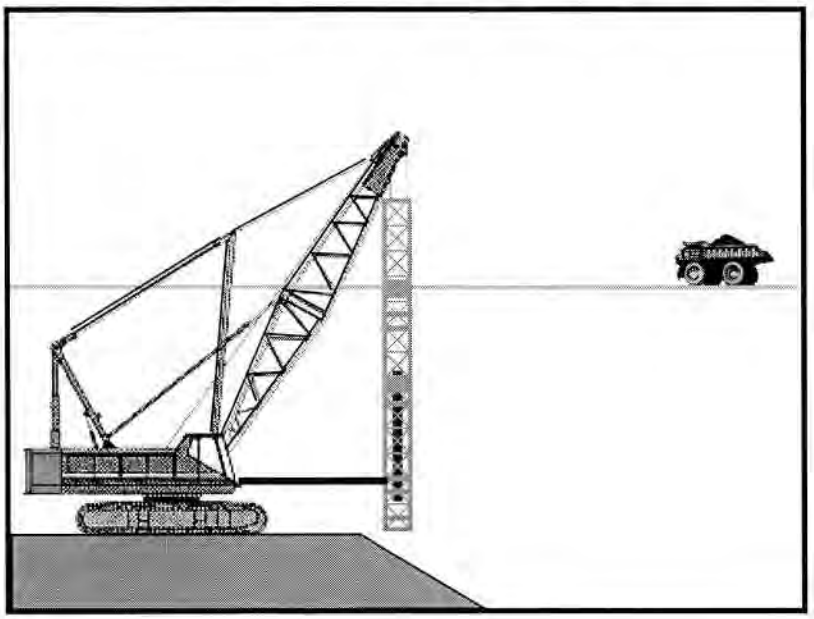
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Pile Driving Operations NS-11



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

The construction and retrofit of bridges and retaining walls often include driving piles for foundation support and shoring operations. Driven piles are typically constructed of precast concrete, steel, or timber. Driven sheet piles are also used for shoring and cofferdam construction. Proper control and use of equipment, materials, and waste products from pile driving operations will reduce or eliminate the discharge of potential pollutants to the storm drain system, watercourses, and waters of the United States.

Suitable Applications

These procedures apply to all construction sites near or adjacent to a watercourse or groundwater where permanent and temporary pile driving (impact and vibratory) takes place, including operations using pile shells as well as construction of cast-in-steel-shell and cast-in-drilled-hole piles.

Limitations

None identified.

Implementation

- Use drip pans or absorbent pads during vehicle and equipment operation, maintenance, cleaning, fueling, and storage. Refer to NS-8, Vehicle and Equipment Cleaning, NS-9, Vehicle and Equipment Fueling, and NS-10, Vehicle and Equipment Maintenance.
- Have spill kits and cleanup materials available at all locations of pile driving. Refer to WM-4, Spill Prevention

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and Control.

- Equipment that is stored or in use in streambeds, or on docks, barges, or other structures over water bodies should be kept leak free.
- Park equipment over plastic sheeting or equivalent where possible. Plastic is not a substitute for drip pans or absorbent pads. The storage or use of equipment in streambeds or other bodies of water must comply with all applicable permits.
- Implement other BMPs as applicable, such as NS-2, Dewatering Operations, WM-5, Solid Waste Management, WM-6, Hazardous Waste Management, and WM-10, Liquid Waste Management.
- When not in use, store pile-driving equipment away from concentrated flows of stormwater, drainage courses, and inlets. Protect hammers and other hydraulic attachments from runon and runoff by placing them on plywood and covering them with plastic or a comparable material prior to the onset of rain.
- Use less hazardous products, e.g., vegetable oil, when practicable.

Costs

All of the above measures can be low cost.

Inspection and Maintenance

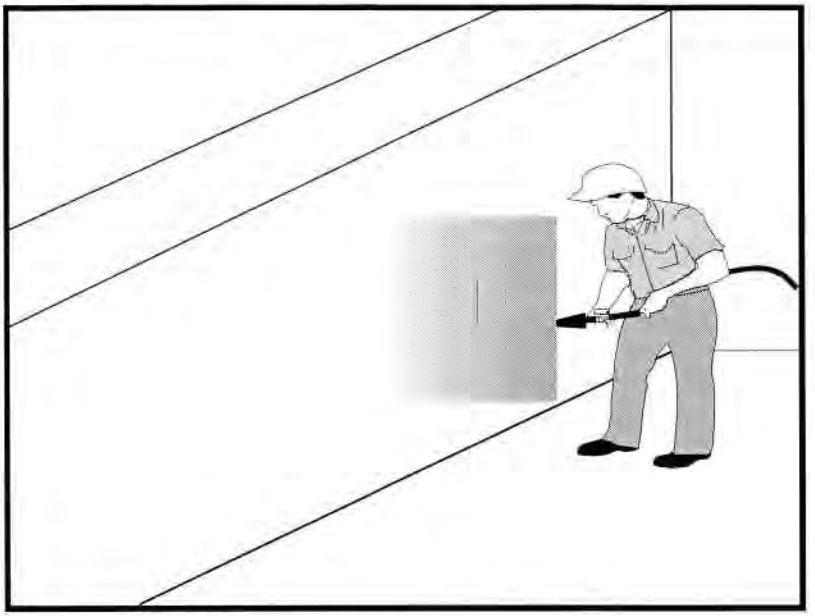
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect equipment every day at startup and repair equipment as needed (i.e., worn or damaged hoses, fittings, and gaskets). Recheck equipment at shift changes or at the end of the day and scheduled repairs as needed.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Concrete Curing NS-12



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Concrete curing is used in the construction of structures such as bridges, retaining walls, pump houses, large slabs, and structured foundations. Concrete curing includes the use of both chemical and water methods.

Concrete and its associated curing materials have basic chemical properties that can raise the pH of water to levels outside of the permitted range. Discharges of stormwater and non-stormwater exposed to concrete during curing may have a high pH and may contain chemicals, metals, and fines. The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Proper procedures and care should be taken when managing concrete curing materials to prevent them from coming into contact with stormwater flows, which could result in a high pH discharge.

Suitable Applications

Suitable applications include all projects where Portland Cement Concrete (PCC) and concrete curing chemicals are placed where they can be exposed to rainfall, runoff from other areas, or where runoff from the PCC will leave the site.

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Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Implementation

Chemical Curing

- Avoid over spray of curing compounds.
- Minimize the drift by applying the curing compound close to the concrete surface. Apply an amount of compound that covers the surface, but does not allow any runoff of the compound.
- Use proper storage and handling techniques for concrete curing compounds. Refer to WM-1, Material Delivery and Storage.
- Protect drain inlets prior to the application of curing compounds.
- Refer to WM-4, Spill Prevention and Control.

Water Curing for Bridge Decks, Retaining Walls, and other Structures

- Direct cure water away from inlets and watercourses to collection areas for evaporation or other means of removal in accordance with all applicable permits. See WM-8 Concrete Waste Management.
- Collect cure water at the top of slopes and transport to a concrete waste management area in a non-erosive manner. See EC-9 Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Utilize wet blankets or a similar method that maintains moisture while minimizing the use and possible discharge of water.

Education

- Educate employees, subcontractors, and suppliers on proper concrete curing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete curing procedures.

Costs

All of the above measures are generally low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts uncured and partially cured concrete as required by the General Permit.
- Ensure that employees and subcontractors implement appropriate measures for storage, handling, and use of curing compounds.
- Inspect cure containers and spraying equipment for leaks.

References

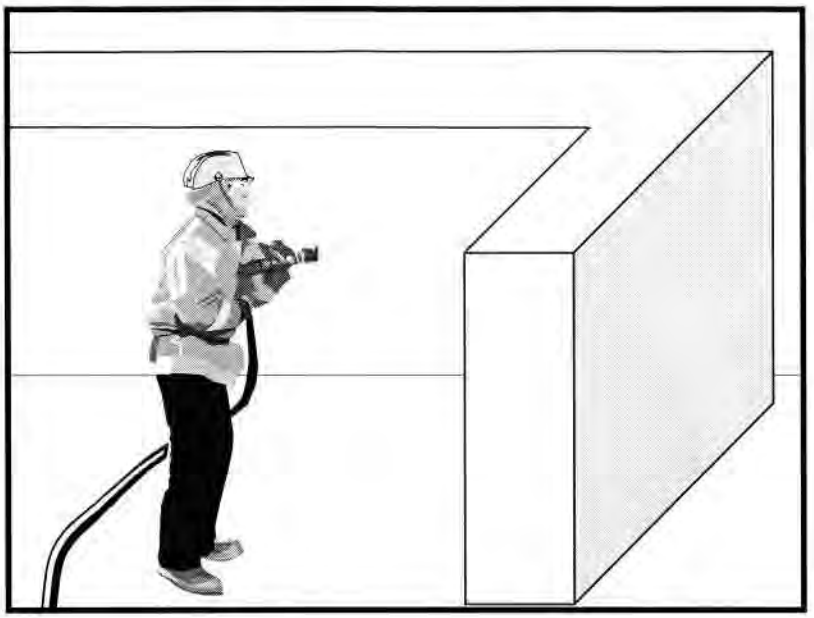
Blue Print for a Clean Bay-Construction-Related Industries: Best Management Practices for Stormwater Pollution Prevention; Santa Clara Valley Non Point Source Pollution Control Program, 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Concrete Finishing NS-13



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

Concrete finishing methods are used for bridge deck rehabilitation, paint removal, curing compound removal, and final surface finish appearances. Methods include sand blasting, shot blasting, grinding, or high pressure water blasting. Stormwater and non-stormwater exposed to concrete finishing by-products may have a high pH and may contain chemicals, metals, and fines. Proper procedures and implementation of appropriate BMPs can minimize the impact that concrete-finishing methods may have on stormwater and non-stormwater discharges.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Concrete and its associated curing materials have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures apply to all construction locations where concrete finishing operations are performed.

Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Implementation

- Collect and properly dispose of water from high-pressure water blasting operations.
- Collect contaminated water from blasting operations at the top of slopes. Transport or dispose of contaminated water while using BMPs such as those for erosion control. Refer to EC-9, Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Direct water from blasting operations away from inlets and watercourses to collection areas for infiltration or other means of removal (dewatering). Refer to NS-2 Dewatering Operations.
- Protect inlets during sandblasting operations. Refer to SE-10, Storm Drain Inlet Protection.
- Refer to WM-8, Concrete Waste Management for disposal of concrete debris.
- Minimize the drift of dust and blast material as much as possible by keeping the blasting nozzle close to the surface.
- When blast residue contains a potentially hazardous waste, refer to WM-6, Hazardous Waste Management.

Education

- Educate employees, subcontractors, and suppliers on proper concrete finishing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete finishing procedures.

Costs

These measures are generally of low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts concrete dust and debris as required by the General Permit.

- Sweep or vacuum up debris from sandblasting at the end of each shift.
- At the end of each work shift, remove and contain liquid and solid waste from containment structures, if any, and from the general work area.
- Inspect containment structures for damage prior to use and prior to onset of forecasted rain.

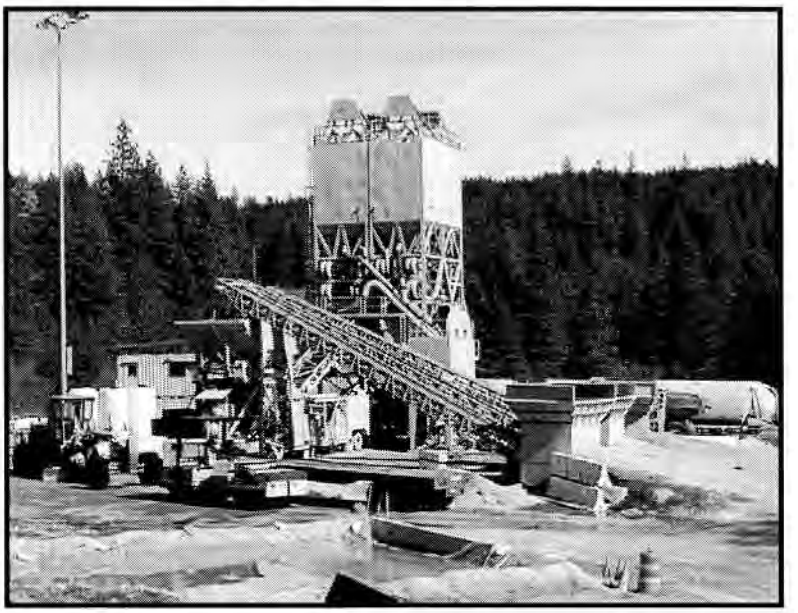
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Temporary Batch Plants NS-16



Description and Purpose

The construction of roads, bridges, retaining walls, and other large structures in remote areas, often requires temporary batch plant facilities to manufacture Portland Cement Concrete (PCC) or asphalt cement (AC). Temporary batch plant facilities typically consist of silos containing fly ash, lime, and cement; heated tanks of liquid asphalt; sand and gravel material storage areas; mixing equipment; above ground storage tanks containing concrete additives and water; and designated areas for sand and gravel truck unloading, concrete truck loading, and concrete truck washout. Proper control and use of equipment, materials, and waste products from temporary batch plant facilities will reduce the discharge of potential pollutants to the storm drain system or watercourses, reduce air emissions, and mitigate noise impacts.

The General Permit draft incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements). Many types of batch plant materials, including mortar, concrete, cement and block and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows which may cause an exceedence of the General Permit Requirements.

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Suitable Applications

These procedures typically apply to construction sites where temporary batch plant facilities are used; however, some of the practices described are applicable to construction sites with general concrete use.

Limitations

The General Permit for discharges of stormwater associated with industrial activities (General Industrial Permit) may be applicable to temporary batch plants.

Specific permit requirements or mitigation measures such as Air Resources Board (ARB), Air Quality Management District (AQMD), Air Pollution Control District (APCD, Regional Water Quality Control Board (RWQCB), county ordinances and city ordinances may require alternative mitigation measures for temporary batch plants. Contact the local regulatory agencies to determine if a permit is required.

Implementation

Planning

- Temporary batch plants may be subject to the General Industrial Permit. To obtain a copy of this permit and the application forms, visit http://www.waterboards.ca.gov or contact the State Water Resources Control Board.
- Proper planning, design, and construction of temporary batch plants should be implemented to minimize potential water quality, air pollution, and noise impacts associated with temporary batch plants.
- BMPs and a Construction Site Monitoring Plan (CSMP) should be included in the project Stormwater Pollution Prevention Plan (SWPPP). BMPs should be implemented, inspected, and maintained in accordance with these plans.
- Temporary batch plants should be managed to comply with AQMD Statewide Registration Program and/or local AQMD Portable Equipment Registration requirements.
- Construct temporary batch plants downwind of existing developments whenever possible.
- Placement of access roads should be planned to mitigate water and air quality impacts.

Layout and Design

- Temporary batch plants should be properly located and designed to mitigate water quality impacts to receiving water bodies. Batch plants should be located away from watercourses, drainage courses, and drain inlets. Batch plants should be located to minimize the potential for stormwater runon onto the site.
- Temporary batch plant facilities (including associated stationary equipment and stockpiles) should be located at least 300 ft from any recreational area, school, residence, or other structure not associated with the construction project.
- Construct continuous interior AC or PCC berms around batch plant equipment (mixing equipment, silos, concrete drop points, conveyor belts, admixture tanks, etc.) to facilitate

proper containment and cleanup of releases. Rollover or flip top curbs or dikes should be placed at ingress and egress points (SE-12, Temporary Silt Dike).

- Direct runoff from the paved or unpaved portion of the batch plant into a sump and pipe to a lined washout area or dewatering tank.
- Direct stormwater and non-stormwater runoff from unpaved portions of batch plant facility to catchment ponds or tanks.
- Construct and remove concrete washout facilities in accordance with WM-8, Concrete Waste Management.
- Layout of a typical batch plant and associated BMP is located at the end of this BMP fact sheet.

Operational Procedures

- Washout of concrete trucks should be conducted in a designated area in accordance with WM-8, Concrete Waste Management.
- Do not dispose of concrete into drain inlets, the stormwater drainage system, or watercourses.
- Washing of concrete mixing and transport equipment (including concrete truck washout) should occur in a designated area in accordance with WM-8, Concrete Waste Management.
- Washing equipment, tools, or vehicles to remove PCC should be conducted in accordance with NS-7, Potable Water/Irrigation, NS-8, Vehicle and Equipment Cleaning, and WM-8, Concrete Waste Management..
- All dry material transfer points should be ducted through a fabric or cartridge type filter unless there are no visible emissions from the transfer point.
- Equip all bulk storage silos, including auxiliary bulk storage trailers, with fabric or cartridge type filter(s).
- Maintain silo vent filters in proper operating condition.
- Equip silos and auxiliary bulk storage trailers with dust-tight service hatches.
- Fabric dust collection system should be capable of controlling particulate matter in accordance with the California Air Resources Control Board and local Air Pollution Control District Regulations.
- Fabric dust collectors (except for vent filters) should be equipped with an operational pressure differential gauge to measure the pressure drop across the filters.
- All transfer points should be equipped with a wet suppression system to control fugitive particulate emissions unless there are no visible emissions.
- All conveyors should be covered, unless the material being transferred results in no visible emissions.

- There should be no visible emissions beyond the property line, while the equipment is being operated.
- Collect dust emissions from the loading of open-bodied trucks, at the drip point of dry batch plants, or dust emissions from the drum feed for central mix plants.
- Equip silos and auxiliary bulk storage trailers with a visible and/or audible warning mechanism to warn operators that the silo or trailer is full.
- All open-bodied vehicles transporting material should be loaded with a final layer of wet sand and the truck should be covered with a tarp to reduce emissions.

Tracking Control

- Plant roads (batch truck and material delivery truck roads) and areas between stockpiles and conveyor hoppers should be stabilized (TC-2, Stabilized Construction Roadway), watered, treated with dust-suppressant chemicals (WE-1, Wind Erosion Control), or paved with a cohesive hard surface that can be repeatedly swept, maintained intact, and cleaned as necessary to control dust emissions.
- Trucks should not track PCC from plants onto public roads. Use appropriate practices from TC-1, Stabilized Construction Entrance/Exit, to prevent tracking.

Materials Storage

- WM-1, Material Delivery and Storage, should be implemented at all batch plants using concrete components or compounds. An effective strategy is to cover and contain materials.
- WM-2, Material Use should be conducted in a way to minimize or eliminate the discharge of materials to storm drain system or watercourse.
- Ensure that finer materials are not dispersed into the air during operations, such as unloading of cement delivery trucks.
- Stockpiles should be covered and enclosed with perimeter sediment barriers per WM-3, Stockpile Management. Uncovered stockpiles should be sprayed with water and/or dust-suppressant chemicals as necessary to control dust emissions, unless the stockpiled material results in no visible emissions. An operable stockpile watering system should be onsite at all times.
- Store bagged and boxed materials on pallets and cover or store in a completely enclosed storage area on non-working days and prior to rain.
- Minimize stockpiles of demolished PCC by recycling them in a timely manner.
- Provide secondary containment for liquid materials (WM-1, Material Delivery and Storage, WM-10, Liquid Waste Management). Containment should provide sufficient volume to contain precipitation from a 25-year storm plus 10% of the aggregate volume of all containers or plus 100% of the largest container, whichever is greater.
- Handle solid and liquid waste in accordance with WM-5, Solid Waste Management, WM-10, Liquid Waste Management, and WM-8, Concrete Waste Management.

- Maintain adequate supplies of spill cleanup materials and train staff to respond to spills per WM-4, Spill Prevention and Control.
- Immediately contain and clean up spilled cement and fly ash and contain.

Equipment Maintenance

- Equipment should be maintained to prevent fluid leaks and spills per NS-9, Vehicle and Equipment Fueling, and NS-10, Vehicle and Equipment Maintenance.
- Maintain adequate supplies of spill cleanup materials and train staff to respond to spills per WM-4, Spill Prevention and Control.
- Incorporate other BMPs such as WM-5, Solid Waste Management, WM-6, Hazardous Waste Management, and WM-10, Liquid Waste Management.

Costs

Costs will vary depending on the size of the facility and combination of BMPs implemented.

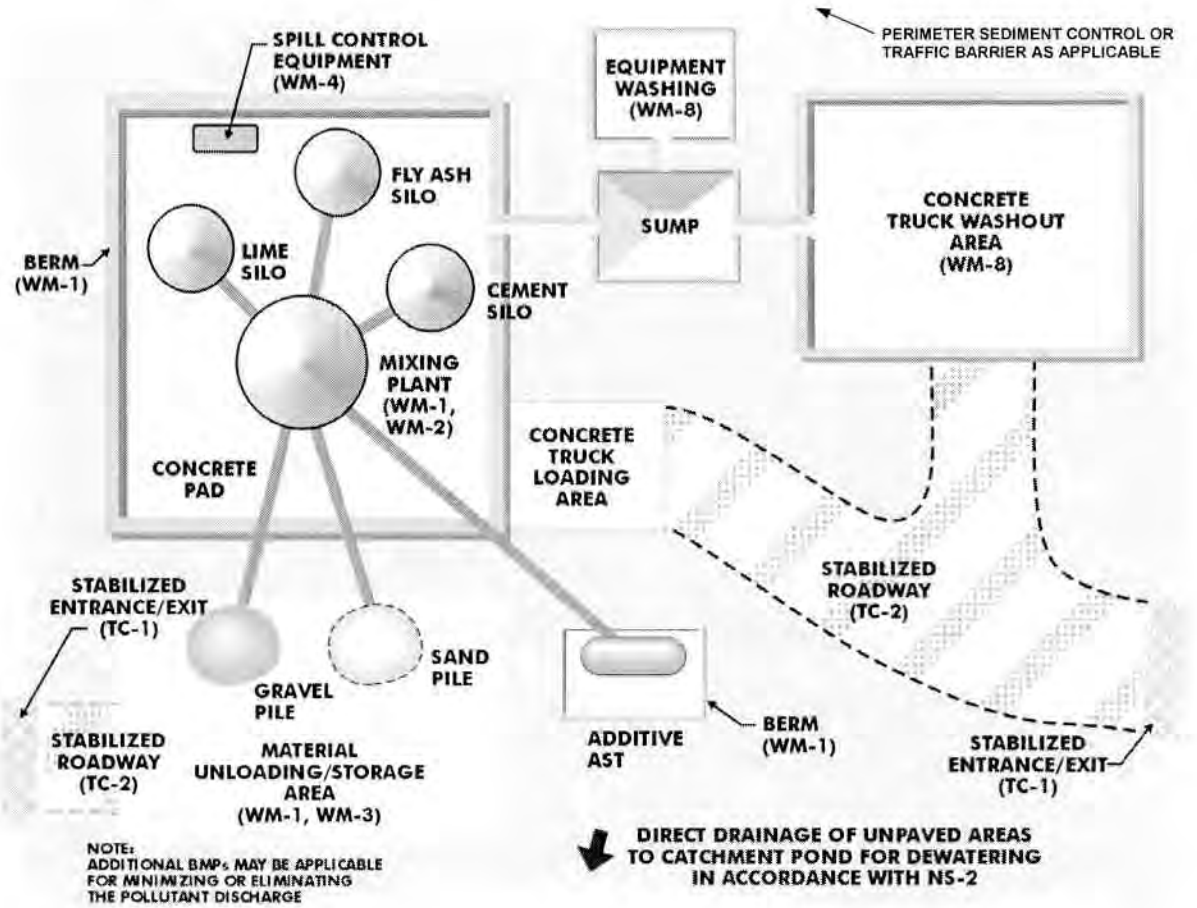
Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts cementitious materials or fly ash as required by the General Permit.
- Inspect and repair equipment (for damaged hoses, fittings, and gaskets).
- Inspect and maintain a Stabilized Construction Entrance/Exit (TC-1) as needed.
- Inspect and maintain stabilized haul roads as needed (TC-2, Stabilized Construction Roadway).
- Inspect and maintain materials and waste storage areas as needed.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

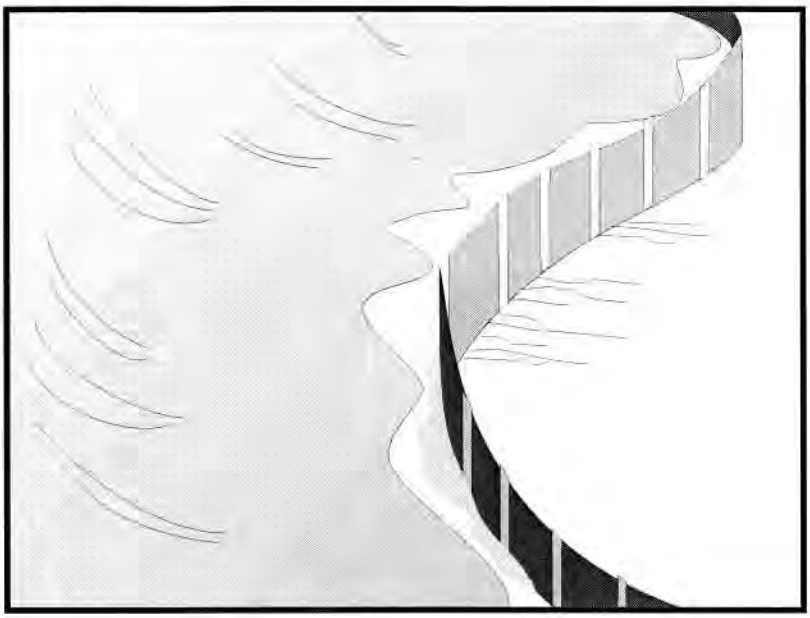
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.



Typical Temporary Batch

Appendix H
CASQA BMP Handbook Fact Sheets

Silt Fence SE-1



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-10 Storm Drain Inlet Protection

SE-14 Biofilter Bags

Description and Purpose

A silt fence is made of a woven geotextile that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They could also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion and around inlets within disturbed areas (SE-10). Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows. Silt fences are most effective when used in combination with erosion controls. Suitable applications include:

- Along the perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Around inlets.
- Below other small cleared areas.

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Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.
- Do not use in locations where ponded water may cause a flooding hazard. Runoff typically ponds temporarily on the upstream side of silt fence.
- Do not use silt fence to divert water flows or place across any contour line. Fences not constructed on a level contour, or fences used to divert flow will concentrate flows resulting in additional erosion and possibly overtopping or failure of the silt fence.
- Improperly installed fences are subject to failure from undercutting, overtopping, or collapsing.
- Not effective unless trenched and keyed in.
- Not intended for use as mid-slope protection on slopes greater than 4:1 (H:V).
- Do not use on slopes subject to creeping, slumping, or landslides.

Implementation

General

A silt fence is a temporary sediment barrier consisting of woven geotextile stretched across and attached to supporting posts, trenched-in, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap sediment by intercepting and detaining small amounts of sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

The following layout and installation guidance can improve performance and should be followed:

- Use principally in areas where sheet flow occurs.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- The maximum length of slope draining to any point along the silt fence should be 200 ft or less.
- The maximum slope perpendicular to the fence line should be 1:1.
- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft^2 of ponding area should be provided for every acre draining to the fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.

- Silt fences should remain in place until the disturbed area is permanently stabilized, after which, the silt fence should be removed and properly disposed.
- Silt fence should be used in combination with erosion source controls up slope in order to provide the most effective sediment control.
- Be aware of local regulations regarding the type and installation requirements of silt fence, which may differ from those presented in this fact sheet.

Design and Layout

The fence should be supported by a plastic or wire mesh if the fabric selected does not have sufficient strength and bursting strength characteristics for the planned application (as recommended by the fabric manufacturer). Woven geotextile material should contain ultraviolet inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 °F to 120 °F.

- Layout in accordance with attached figures.
- For slopes steeper than 2:1 (H:V) and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence. Additional protection may be a chain link fence or a cable fence.
- For slopes adjacent to sensitive receiving waters or Environmentally Sensitive Areas (ESAs), silt fence should be used in conjunction with erosion control BMPs.

Standard vs. Heavy Duty Silt Fence

Standard Silt Fence

- Generally applicable in cases where the slope of area draining to the silt fence is 4:1 (H:V) or less.
- Used for shorter durations, typically 5 months or less
- Area draining to fence produces moderate sediment loads.

Heavy Duty Silt Fence

- Use is generally limited to 8 months or less.
- Area draining to fence produces moderate sediment loads.
- Heavy duty silt fence usually has 1 or more of the following characteristics, not possessed by standard silt fence.
  - Fence fabric has higher tensile strength.
  - Fabric is reinforced with wire backing or additional support.
  - Posts are spaced closer than pre-manufactured, standard silt fence products.
  - Posts are metal (steel or aluminum)

Materials

<u>Standard Silt Fence</u>

- Silt fence material should be woven geotextile with a minimum width of 36 in. and a minimum tensile strength of 100 lb force. The fabric should conform to the requirements in ASTM designation D4632 and should have an integral reinforcement layer. The

reinforcement layer should be a polypropylene, or equivalent, net provided by the manufacturer. The permittivity of the fabric should be between 0.1 sec^{-1} and 0.15 sec^{-1} in conformance with the requirements in ASTM designation D4491.

- Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

Heavy-Duty Silt Fence

- Some silt fence has a wire backing to provide additional support, and there are products that may use prefabricated plastic holders for the silt fence and use metal posts or bar reinforcement instead of wood stakes. If bar reinforcement is used in lieu of wood stakes, use number four or greater bar. Provide end protection for any exposed bar reinforcement for health and safety purposes.

Installation Guidelines – Traditional Method

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line of the proposed silt fence (trenches should not be excavated wider or deeper than necessary for proper silt fence installation).

- Bottom of the silt fence should be keyed-in a minimum of 12 in.

- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.

- When standard strength geotextile is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy–duty wire staples at least 1 in. long. The mesh should extend into the trench.

- When extra-strength geotextile and closer post spacing are used, the mesh support fence may be eliminated.

- Woven geotextile should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, geotextile should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.

- The trench should be backfilled with native material and compacted.

- Construct silt fences with a setback of at least 3 ft from the toe of a slope. Where, due to specific site conditions, a 3 ft setback is not available, the silt fence may be constructed at the

toe of the slope, but should be constructed as far from the toe of the slope as practicable. Silt fences close to the toe of the slope will be less effective and more difficult to maintain.

- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.
- Cross barriers should be a minimum of $^1/_3$ and a maximum of ½ the height of the linear barrier.
- See typical installation details at the end of this fact sheet.

Installation Guidelines - Static Slicing Method

- Static Slicing is defined as insertion of a narrow blade pulled behind a tractor, similar to a plow blade, at least 10 inches into the soil while at the same time pulling silt geotextile fabric into the ground through the opening created by the blade to the depth of the blade. Once the gerotextile is installed, the soil is compacted using tractor tires.
- This method will not work with pre-fabricated, wire backed silt fence.
- Benefits:
    - Ease of installation (most often done with a 2 person crew). In addition, installation using static slicing has been found to be more efficient on slopes, in rocky soils, and in saturated soils.
    - Minimal soil disturbance.
    - Greater level of compaction along fence, leading to higher performance (i.e. greater sediment retention).
    - Uniform installation.
    - Less susceptible to undercutting/undermining.

Costs

- It should be noted that costs vary greatly across regions due to available supplies and labor costs.
- Average annual cost for installation using the traditional silt fence installation method (assumes 6 month useful life) is $7 per linear foot based on vendor research. Range of cost is $3.50 - $9.10 per linear foot.
- In tests, the slicing method required 0.33 man hours per 100 linear feet, while the trenched based systems required as much as 1.01 man hours per linear foot.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair undercut silt fences.

- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Silt fences should be left in place until the upstream area is permanently stabilized. Until then, the silt fence should be inspected and maintained regularly.
- Remove silt fence when upgradient areas are stabilized. Fill and compact post holes and anchor trench, remove sediment accumulation, grade fence alignment to blend with adjacent ground, and stabilize disturbed area.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

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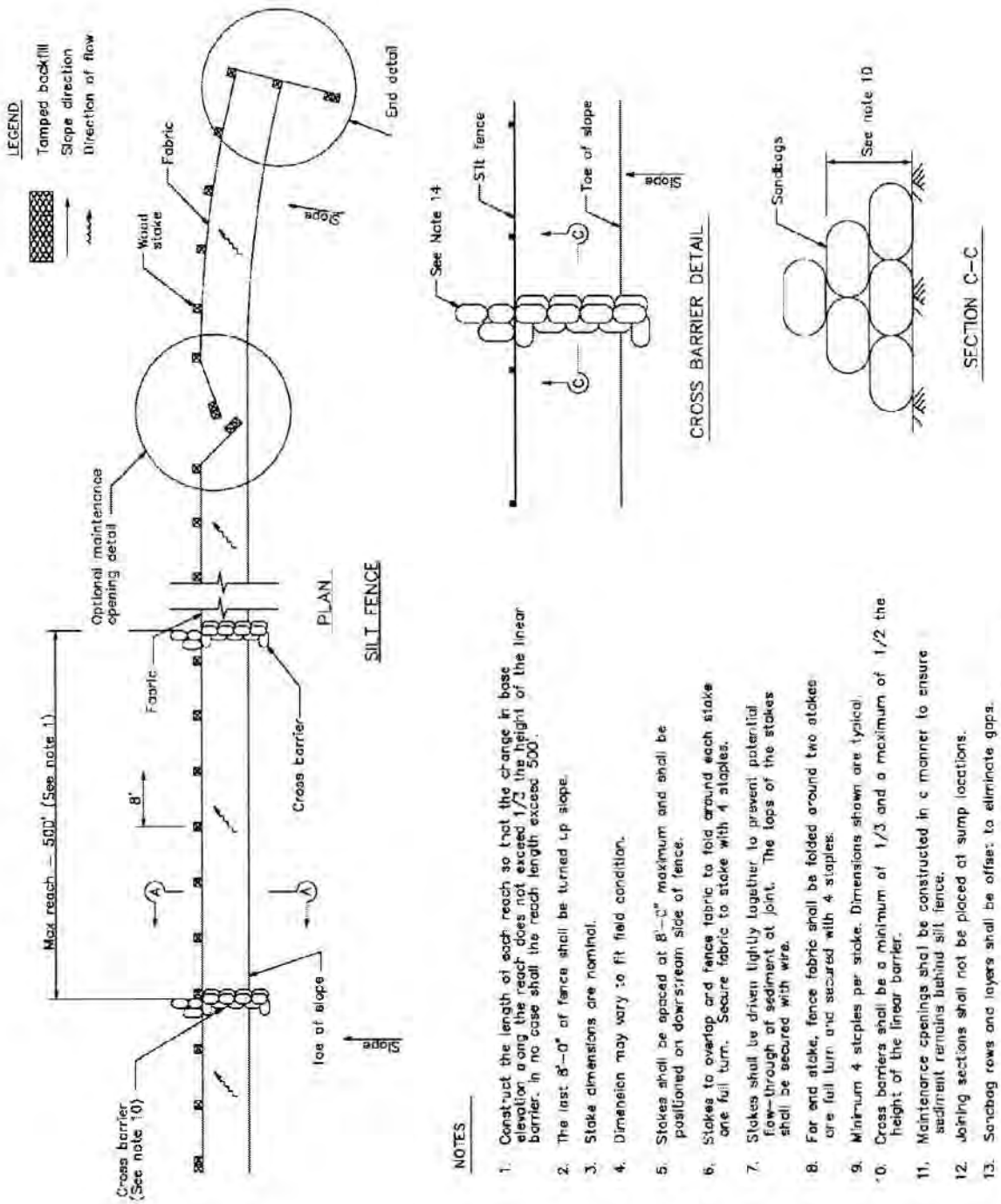
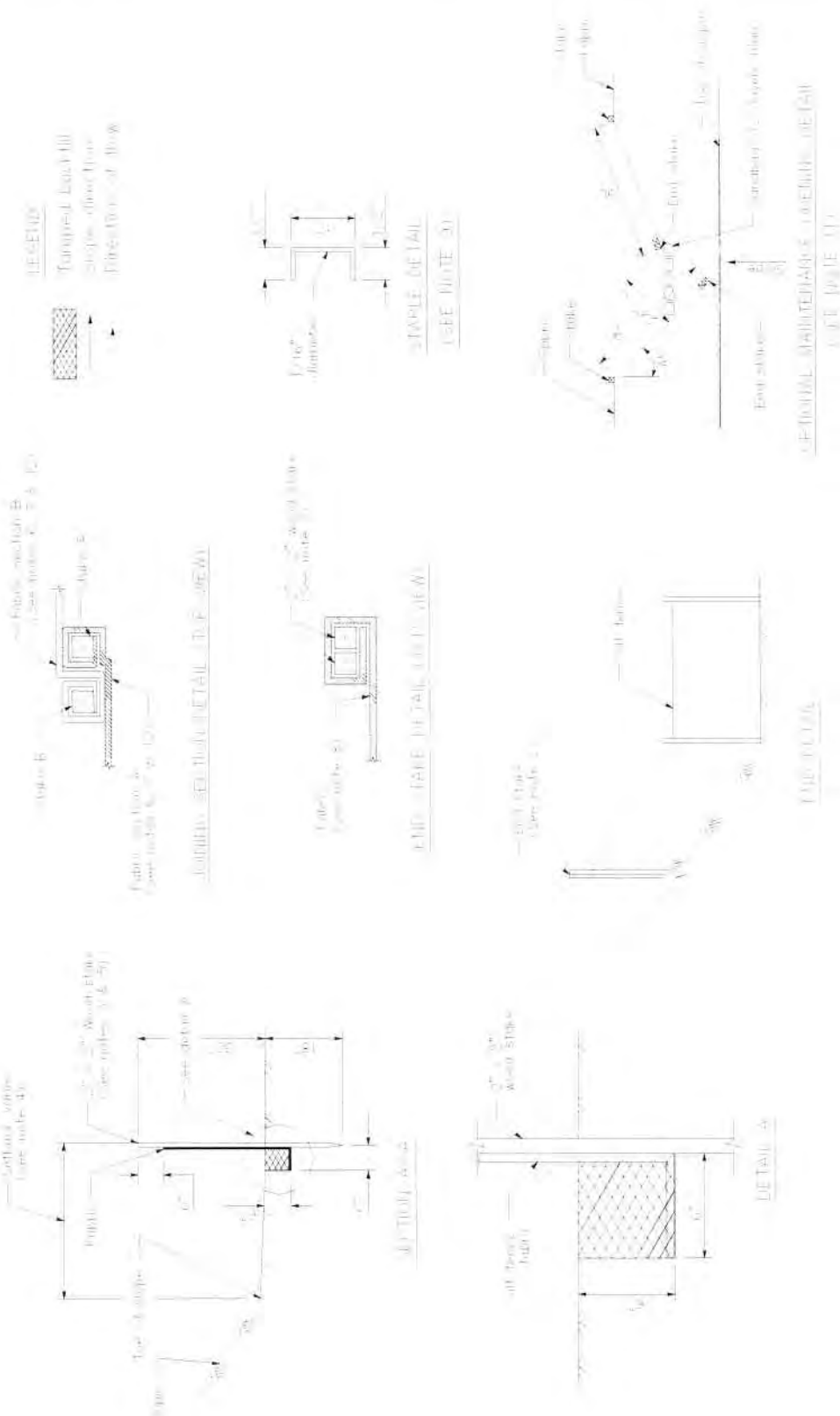
Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

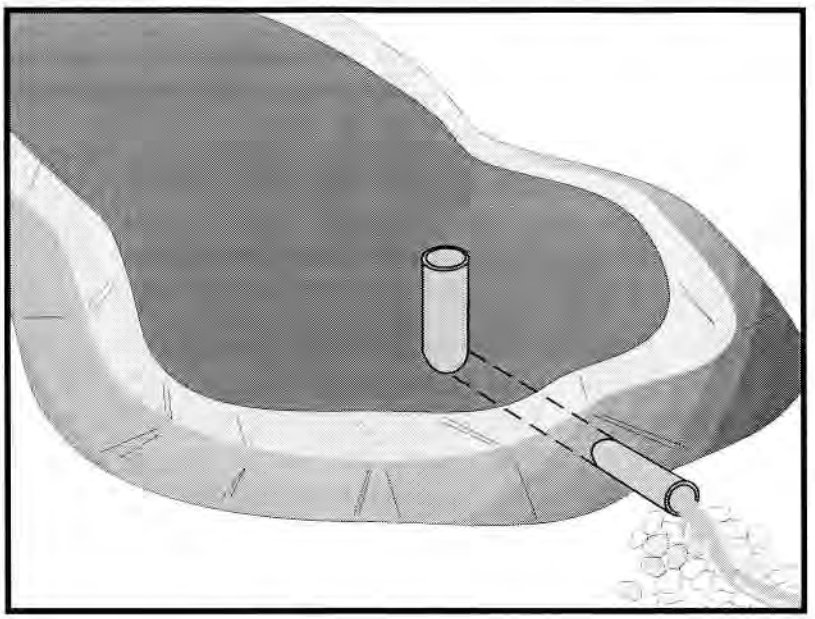


NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier. In no case shall the reach length exceed 500'.
2. The last 8'-0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 8'-0" maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow-through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.
14. Add 3-4 bags to cross barrier on downgradient side of silt fence as needed to prevent bypass or undermining and as allowable based on site limits of disturbance.



Sediment Basin SE-2



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-3 Sediment Trap (for smaller areas)

Description and Purpose

A sediment basin is a temporary basin formed by excavation or by constructing an embankment so that sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out before the runoff is discharged.

Sediment basin design guidance presented in this fact sheet is intended to provide options, methods, and techniques to optimize temporary sediment basin performance and basin sediment removal. Basin design guidance provided in this fact sheet is not intended to guarantee basin effluent compliance with numeric discharge limits (numeric action levels or numeric effluent limits for turbidity). Compliance with discharge limits requires a thoughtful approach to comprehensive BMP planning, implementation, and maintenance. Therefore, optimally designed and maintained sediment basins should be used in conjunction with a comprehensive system of BMPs that includes:

- Diverting runoff from undisturbed areas away from the basin
- Erosion control practices to minimize disturbed areas on-site
  and to provide temporary stabilization and interim sediment controls (e.g., stockpile perimeter control, check dams, perimeter controls around individual lots) to reduce the basin's influent sediment concentration.

At some sites, sediment basin design enhancements may be required to adequately remove sediment. Traditional

(aka "physical") enhancements such as alternative outlet configurations or flow deflection baffles increase detention time and other techniques such as outlet skimmers preferentially drain flows with lower sediment concentrations. These "physical" enhancement techniques are described in this fact sheet. To further enhance sediment removal particularly at sites with fine soils or turbidity sensitive receiving waters, some projects may need to consider implementing Active Treatment Systems (ATS) whereby coagulants and flocculants are used to enhance settling and removal of suspended sediments. Guidance on implementing ATS is provided in SE-11.

Suitable Applications

Sediment basins may be suitable for use on larger projects with sufficient space for constructing the basin. Sediment basins should be considered for use:

- Where sediment-laden water may enter the drainage system or watercourses
- On construction projects with disturbed areas during the rainy season
- At the outlet of disturbed watersheds between 5 acres and 75 acres and evaluated on a site by site basis
- Where post construction detention basins are required
- In association with dikes, temporary channels, and pipes used to convey runoff from disturbed areas

Limitations

Sediment basins must be installed only within the property limits and where failure of the structure will not result in loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities. In addition, sediment basins are attractive to children and can be very dangerous. Local ordinances regarding health and safety must be adhered to. If fencing of the basin is required, the type of fence and its location should be shown in the SWPPP and in the construction specifications.

- As a general guideline, sediment basins are suitable for drainage areas of 5 acres or more, but not appropriate for drainage areas greater than 75 acres. However, the tributary area should be evaluated on a site by site basis.
- Sediment basins may become an "attractive nuisance" and care must be taken to adhere to all safety practices. If safety is a concern, basin may require protective fencing.
- Sediment basins designed according to this fact sheet are only effective in removing sediment down to about the silt size fraction. Sediment-laden runoff with smaller size fractions (fine silt and clay) may not be adequately treated unless chemical (or other appropriate method) treatment is used in addition to the sediment basin.
- Basins with a height of 25 ft or more or an impounding capacity of 50 ac-ft or more must obtain approval from California Department of Water Resources Division of Safety of Dams (http://www.water.ca.gov/damsafety/).

- Water that stands in sediment basins longer than 96 hours may become a source of mosquitoes (and midges), particularly along perimeter edges, in shallow zones, in scour or below-grade pools, around inlet pipes, along low-flow channels, and among protected habitats created by emergent or floating vegetation (e.g. cattails, water hyacinth), algal mats, riprap, etc.
- Basins require large surface areas to permit settling of sediment. Size may be limited by the available area.

Implementation

General

A sediment basin is a controlled stormwater release structure formed by excavation or by construction of an embankment of compacted soil across a drainage way, or other suitable location. It is intended to trap sediment before it leaves the construction site. The basin is a temporary measure expected to be used during active construction in most cases and is to be maintained until the site area is permanently protected against erosion or a permanent detention basin is constructed.

Sediment basins are suitable for nearly all types of construction projects. Whenever possible, construct the sediment basins before clearing and grading work begins. Basins should be located at the stormwater outlet from the site but not in any natural or undisturbed stream. A typical application would include temporary dikes, pipes, and/or channels to convey runoff to the basin inlet.

Many development projects in California are required by local ordinances to provide a stormwater detention basin for post-construction flood control, desilting, or stormwater pollution control. A temporary sediment basin may be constructed by rough grading the post-construction control basins early in the project.

Sediment basins if properly designed and maintained can trap a significant amount of the sediment that flows into them. However, traditional basins do not remove all inflowing sediment. Therefore, they should be used in conjunction with erosion control practices such as temporary seeding, mulching, diversion dikes, etc., to reduce the amount of sediment flowing into the basin.

Planning

To improve the effectiveness of the basin, it should be located to intercept runoff from the largest possible amount of disturbed area. Locations best suited for a sediment basin are generally in lower elevation areas of the site (or basin tributary area) where site drainage would not require significant diversion or other means to direct water to the basin but outside jurisdictional waterways. However, as necessary, drainage into the basin can be improved by the use of earth dikes and drainage swales (see BMP EC-9). . The basin should not be located where its failure would result in the loss of life or interruption of the use or service of public utilities or roads.

Construct before clearing and grading work begins when feasible.

- Do not locate the basin in a jurisdictional stream.

- Basin sites should be located where failure of the structure will not cause loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities.
- Basins with a height of 25 ft or more or an impounding capacity of 50 ac-ft must obtain approval from the Division of Dam Safety. Local dam safety requirements may be more stringent.
- Limit the contributing area to the sediment basin to only the runoff from the disturbed soil areas. Use temporary concentrated flow conveyance controls to divert runoff from undisturbed areas away from the sediment basin.
- The basin should be located: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where post-construction (permanent) detention basins will be constructed, and (3) where the basins can be maintained on a year-round basis to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area, and to maintain the basin to provide the required capacity.

Design

When designing a sediment basin, designers should evaluate the site constraints that could affect the efficiency of the BMP. Some of these constraints include: the relationship between basin capacity, anticipated sediment load, and freeboard, available footprint for the basin, maintenance frequency and access, and hydraulic capacity and efficiency of the temporary outlet infrastructure. Sediment basins should be designed to maximize sediment removal and to consider sediment load retained by the basin as it affects basin performance.

Three Basin Design Options (Part A) are presented below along with a Typical Sediment/Detention Basin Design Methodology (Part B). Regardless of the design option that is selected, designers also need to evaluate the sediment basin capacity with respect to sediment accumulation (See "*Step 3. Evaluate the Capacity of the Sediment Basin*"), and should incorporate approaches identified in "*Step 4. Other Design Considerations*" to enhance basin performance.

A) Basin Design Options:

Option 1:

Design sediment basin(s) using the standard equation:

$$A_s = \frac{1.2Q}{V_s} \qquad \text{(Eq. 1)}$$

Where:

A_s = Minimum surface area for trapping soil particles of a certain size

V_s = Settling velocity of the design particle size chosen (V_s = 0.00028 ft/s for a design particle size of 0.01 mm at 68°F)

1.2 = Factor of safety recommended by USEPA to account for the reduction in basin efficiency caused due to turbulence and other non ideal conditions.

$Q = CIA$ (Eq.2)

Where

Q = Discharge rate measured in cubic feet per second

C = Runoff coefficient (unitless)

I = Peak rainfall intensity for the 10-year, 6-hour rain event (in/hr)

A = Area draining into the sediment basin in acres

The design particle size should be the smallest soil grain size determined by wet sieve analysis, or the fine silt sized (0.01 mm [or 0.0004 in.]) particle, and the Vs used should be 100 percent of the calculated settling velocity.

This sizing basin method is dependent on the outlet structure design or the total basin length with an appropriate outlet. If the designer chooses to utilize the outlet structure to control the flow duration in the basin, the basin length (distance between the inlet and the outlet) should be a minimum of twice the basin width; the depth should not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency (2 ft of sediment storage, 2 ft of capacity). If the designer chooses to utilize the basin length (with appropriate basin outlet) to control the flow duration in the basin, the basin length (distance between the inlet and the outlet) should be a specifically designed to capture 100% of the design particle size; the depth should not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency (2 ft of sediment storage, 2 ft of capacity).

The basin should be located on the site where it can be maintained on a year-round basis and should be maintained on a schedule to retain the 2 ft of capacity.

Option 2:

Design pursuant to local ordinance for sediment basin design and maintenance, provided that the design efficiency is as protective or more protective of water quality than Option 1.

Option 3:

The use of an equivalent surface area design or equation provided that the design efficiency is as protective or more protective of water quality than Option 1.

B) Typical Sediment/Detention Basin Design Methodology:

Design of a sediment basin requires the designer to have an understanding of the site constraints, knowledge of the local soil (e.g., particle size distribution of potentially contributing soils), drainage area of the basin, and local hydrology. Designers should not assume that a sediment basin for location A is applicable to location B. Therefore, designers can use this factsheet as guidance but will need to apply professional judgment and knowledge of the site to design an effective and efficient sediment basin. The following provides a general overview of typical design methodologies:

Step 1. Hydrologic Design

- Evaluate the site constraints and assess the drainage area for the sediment basin. Designers should consider on- and off-site flows as well as changes in the drainage area associated with site construction/disturbance. To minimize additional construction during the course of the project, the designer should consider identifying the maximum drainage area when calculating the basin dimensions.

- If a local hydrology manual is not available it is recommended to follow standard rational method procedures to estimate discharge. The references section of this factsheet provides a reference to standard hydrology textbooks that can provide standard methodologies. If local rainfall depths are not available, values can be obtained from standard precipitation frequency maps from NOAA (downloaded from http://www.wrcc.dri.edu/pcpnfreq.html).

Step 2. Hydraulic Design

- Calculate the surface area required for the sediment basin using Equation 1. In which discharge is estimated for a 10-yr 6-hr event using rational method procedure listed in local hydrology manual and Vs is estimated using Stokes Law presented in Equation 3.

$$V_s = 2.81d^2 \qquad \text{(Eq.3)}$$

Where

V_s = Settling velocity in feet per second at 68°F

d = diameter of sediment particle in millimeters (smallest soil grain size determined by wet sieve analysis or fine silt (0.01 mm [or 0.0004 in.])

- In general the basin outlet design requires an iterative trial and error approach that considered the maximum water surface elevation, the elevation versus volume (stage-storage) relationship, the elevation verses discharge (stage-discharge) relationship, and the estimated inflow hydrograph. To adequately design the basins to settle sediment, the outlet configuration and associated outflow rates can be estimated by numerous methodologies. The following provides some guidance for design the basin outlet:

  - An outlet should have more than one orifice.

  - An outlet design typically utilizes multiple horizontal rows of orifices (approximately 3 or more) with at least 2 orifices per row (see Figures 1 and 2 at the end of this fact sheet).

  - Orifices can vary in shape.

  - Select the appropriate orifice diameter and number of perforations per row with the objective of minimizing the number of rows while maximizing the detention time.

- The diameter of each orifice is typically a maximum of 3-4 inches and a minimum of 0.25-0.5 inches.
- If a rectangular orifice is used, it is recommended to have minimum height of 0.5 inches and a maximum height of 6 inches.
- Rows are typically spaced at three times the diameter center to center vertically with a minimum distance of approximately 4 inches on center and a maximum distance of 1 foot on center.
- To estimate the outflow rate, each row is calculated separately based on the flow through a single orifice then multiplied by the number of orifices in the row. This step is repeated for each of the rows. Once all of the orifices are estimated, the total outflow rate versus elevation (stage-discharge curve) is developed to evaluate the detention time within the basin.
- Flow through a single orifice can be estimated using an Equation 4:

$$Q = BC' A(2gH)^{0.5} \qquad \text{(Eq.4)}$$

Where
Q = Discharge in ft^3/s
C′ = Orifice coefficient (unitless)
A = Area of the orifice (ft^2)
g = acceleration due to gravity (ft^3/s)
H = Head above the orifice (ft)
B = Anticipated Blockage or clogging factor (unitless), It is dependent on anticipated sediment and debris load, trash rack configuration etc, so the value is dependent on design engineers professional judgment and/or local requirements (B is never greater than 1 and a value of 0.5 is generally used)

  - Care must be taken in the selection of orifice coefficient ("C′"); 0.60 is most often recommended and used. However, based on actual tests, Young and Graziano (1989), "Outlet Hydraulics of Extended Detention Facilities for Northern Virginia Planning District Commission", recommends the following:
    - C′ = 0.66 for thin materials; where the thickness is equal to or less than the orifice diameter, or
    - C′ = 0.80 when the material is thicker than the orifice diameter
- If different sizes of orifices are used along the riser then they have to be sized such that not more than 50 percent of the design storm event drains in one-third of the drawdown time (to provide adequate settling time for events smaller than the design storm event) and the entire volume drains within 96 hours or as regulated by the local vector control agency. If a basin fails to drain within 96 hours, the basin must be pumped dry.

- Because basins are not maintained for infiltration, water loss by infiltration should be disregarded when designing the hydraulic capacity of the outlet structure.

- Floating Outlet Skimmer: The floating skimmer (see Figure 3 at the end of this fact sheet is an alternative outlet configuration (patented) that drains water from upper portion of the water column. This configuration has been used for temporary and permanent basins and can improve basin performance by eliminating bottom orifices which have the potential of discharging solids. Some design considerations for this alternative outlet device includes the addition of a sand filter or perforated under drain at the low point in the basin and near the floating skimmer. These secondary drains allow the basin to fully drain. More detailed guidelines for sizing the skimmer can be downloaded from http://www.fairclothskimmer.com/.

- Hold and Release Valve: An ideal sediment/detention basin would hold all flows to the design storm level for sufficient time to settle solids, and then slowly release the storm water. Implementing a reliable valve system for releasing detention basins is critical to eliminate the potential for flooding in such a system. Some variations of hold and release valves include manual valves, bladder devices or electrically operated valves. When a precipitation event is forecast, the valve would be close for the duration of the storm and appropriate settling time. When the settling duration is met (approximately 24 or 48 hours), the valve would be opened and allow the stormwater to be discharged at a rate that does not resuspend settled solids and in a non-erosive manner. If this type of system is used the valve should be designed to empty the entire basin within 96 hours or as stipulated by local vector control regulations.

Step 3. Evaluate the Capacity of the Sediment Basin

- Typically, sediment basins do not perform as designed when they are not properly maintained or the sediment yield to the basin is larger than expected. As part of a good sediment basin design, designers should consider maintenance cycles, estimated soil loss and/or sediment yield, and basin sediment storage volume. The two equations below can be used to quantify the amount of soil entering the basin.

- The Revised Universal Soil Loss Equation (RUSLE, Eq.5) can be used to estimate annual soil loss and the Modified Universal Soil Equation (MUSLE, Eq.6) can be used to estimate sediment yield from a single storm event.

$$A = R \times K \times LS \times C \times P \qquad \text{(Eq.5)}$$

$$Y = 95\left(Q \times q_p\right)^{0.56} \times K \times LS \times C \times P \qquad \text{(Eq.6)}$$

Where:

A = annual soil loss, tons/acre-year

R = rainfall erosion index, in 100 ft.tons/acre.in/hr

K = soil erodibility factor, tons/acre per unit of R

LS = slope length and steepness factor (unitless)

C = vegetative cover factor (unitless)

P = erosion control practice factor (unitless)

Y = single storm sediment yield in tons

Q = runoff volume in acre-feet

q_p = peak flow in cfs

- Detailed descriptions and methodologies for estimating the soil loss can be obtained from standard hydrology text books (See References section).
- Determination of the appropriate equation should consider construction duration and local environmental factors (soils, hydrology, etc.). For example, if a basin is planned for a project duration of 1 year and the designer specifies one maintenance cycle, RUSLE could be used to estimate the soil loss and thereby the designer could indicate that the sediment storage volume would be half of the soil loss value estimated. As an example for use of MUSLE, a project may have a short construction duration thereby requiring fewer maintenance cycles and a reduced sediment storage volume. MUSLE would be used to estimate the anticipated soil loss based on a specific storm event to evaluate the sediment storage volume and appropriate maintenance frequency.
- The soil loss estimates are an essential step in the design and it is essential that the designer provide construction contractors with enough information to understand maintenance frequency and/or depths within the basin that would trigger maintenance. Providing maintenance methods, frequency and specification should be included in design bid documents such as the SWPPP Site Map.
- Once the designer has quantified the amount of soil entering the basin, the depth required for sediment storage can be determined by dividing the estimated sediment loss by the surface area of the basin.

Step 4. Other Design Considerations

- Consider designing the volume of the settling zone for the total storm volume associated with the 2-year event or other appropriate design storms specified by the local agency. This volume can be used as a guide for sizing the basin without iterative routing calculations. The depth of the settling zone can be estimated by dividing the estimated 2-yr storm volume by the surface area of the basin.
- The basin volume consists of two zones:
  - A sediment storage zone at least 1 ft deep.
  - A settling zone at least 2 ft deep.
  - The basin depth must be no less than 3 ft (not including freeboard).
- Proper hydraulic design of the outlet is critical to achieving the desired performance of the basin. The outlet should be designed to drain the basin within 24 to 96 hours (also referred

to as "drawdown time"). The 24-hour limit is specified to provide adequate settling time; the 96-hour limit is specified to mitigate vector control concerns.

- Confirmation of the basin performance can be evaluated by routing the design storm (10-yr 6-hr, or as directed by local regulations) through the basin based on the basin volume (stage-storage curve) and the outlet design (stage-discharge curve based on the orifice configuration or equivalent outlet design).

- Sediment basins, regardless of size and storage volume, should include features to accommodate overflow or bypass flows that exceed the design storm event.

  - Include an emergency spillway to accommodate flows not carried by the principal spillway. The spillway should consist of an open channel (earthen or vegetated) over undisturbed material (not fill) or constructed of a non-erodible riprap (or equivalent protection) on fill slopes.

  - The spillway control section, which is a level portion of the spillway channel at the highest elevation in the channel, should be a minimum of 20 ft in length.

- Rock, vegetation or appropriate erosion control should be used to protect the basin inlet, outlet, and slopes against erosion.

- The total depth of the sediment basin should include the depth required for sediment storage, depth required for settling zone and freeboard of at least 1 foot or as regulated by local flood control agency for a flood event specified by the local agency.

- The length to settling depth ratio (L/SD) should be less than 200.

- The basin alignment should be designed such that the length of the basin is more than twice the width of the basin; the length should be determined by measuring the distance between the inlet and the outlet. If the site topography does not allow for this configuration baffles should be installed so that the ratio is satisfied. If a basin has more than one inflow point, any inflow point that conveys more than 30 percent of the total peak inflow rate has to meet the required length to width ratio.

- An alternative basin sizing method proposed by Fifield (2004) can be consulted to estimate an alternative length to width ratio and basin configuration. These methods can be considered as part of Option 3 which allows for alternative designs that are protective or more protective of water quality.

- Baffles (see Figure 4 at the end of this fact sheet) can be considered at project sites where the existing topography or site constraints limit the length to width ratio. Baffles should be constructed of earthen berms or other structural material within the basin to divert flow in the basin, thus increasing the effective flow length from the basin inlet to the outlet riser. Baffles also reduce the change of short circuiting and allows for settling throughout the basin.

- Baffles are typically constructed from the invert of the basin to the crest of the emergency spillway (i.e., design event flows are meant to flow around the baffles and flows greater than the design event would flow over the baffles to the emergency spillway).

- Use of other materials for construction of basin baffles (such as silt fence) may not be appropriate based on the material specifications and will require frequent maintenance (maintain after every storm event). Maintenance may not be feasible when required due to flooded conditions resulting from frequent (i.e., back to back) storm events. Use of alternative baffle materials should not deviate from the intended purpose of the material, as described by the manufacturer.
- Sediment basins are best used in conjunction with erosion controls.
- Basins with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and basins capable of impounding more than 35,000 ft^3, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the basin outlet and bypass structures.
- A forebay, constructed upstream of the basin may be provided to remove debris and larger particles.
- The outflow from the sediment basin should be provided with velocity dissipation devices (see BMP EC-10) to prevent erosion and scouring of the embankment and channel.
- The principal outlet should consist of a corrugated metal, high density polyethylene (HDPE), or reinforced concrete riser pipe with dewatering holes and an anti-vortex device and trash rack attached to the top of the riser, to prevent floating debris from flowing out of the basin or obstructing the system. This principal structure should be designed to accommodate the inflow design storm.
- A rock pile or rock-filled gabions can serve as alternatives to the debris screen, although the designer should be aware of the potential for extra maintenance involved should the pore spaces in the rock pile clog.
- The outlet structure should be placed on a firm, smooth foundation with the base securely anchored with concrete or other means to prevent floatation.
- Attach riser pipe (watertight connection) to a horizontal pipe (barrel). Provide anti-seep collars on the barrel.
- Cleanout level should be clearly marked on the riser pipe.

Installation

- Securely anchor and install an anti-seep collar on the outlet pipe/riser and provide an emergency spillway for passing major floods (see local flood control agency).
- Areas under embankments must be cleared and stripped of vegetation.
- Chain link fencing should be provided around each sediment basin to prevent unauthorized entry to the basin or if safety is a concern.

Costs

The cost of a sediment basin is highly variable and is dependent of the site configuration. To decrease basin construction costs, designers should consider using existing site features such as berms or depressed area to site the sediment basin. Designers should also consider potential savings associated with designing the basin to minimize the number of maintenance cycles and siting the basin in a location where a permanent BMP (e.g., extended detention basin) is required for the project site.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level and as required by local requirements. It is recommended that at a minimum, basins be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Examine basin banks for seepage and structural soundness.
- Check inlet and outlet structures and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.
- Check inlet and outlet area for erosion and stabilize if required.
- Check fencing for damage and repair as needed.
- Sediment that accumulates in the basin must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-half the designated sediment storage volume. Sediment removed during maintenance should be managed properly. The sediment should be appropriately evaluated and used or disposed of accordingly. Options include: incorporating sediment into earthwork on the site (only if there is no risk that sediment is contaminated); or off-site export/disposal at an appropriate location (e.g., sediment characterization and disposal to an appropriate landfill).
- Remove standing water from basin within 96 hours after accumulation.
- If the basin does not drain adequately (e.g., due to storms that are more frequent or larger than the design storm or other unforeseen site conditions), dewatering should be conducted in accordance with appropriate dewatering BMPs (see NS-2) and in accordance with local permits as applicable.
- To minimize vector production:
  - Remove accumulation of live and dead floating vegetation in basins during every inspection.
  - Remove excessive emergent and perimeter vegetation as needed or as advised by local or state vector control agencies.

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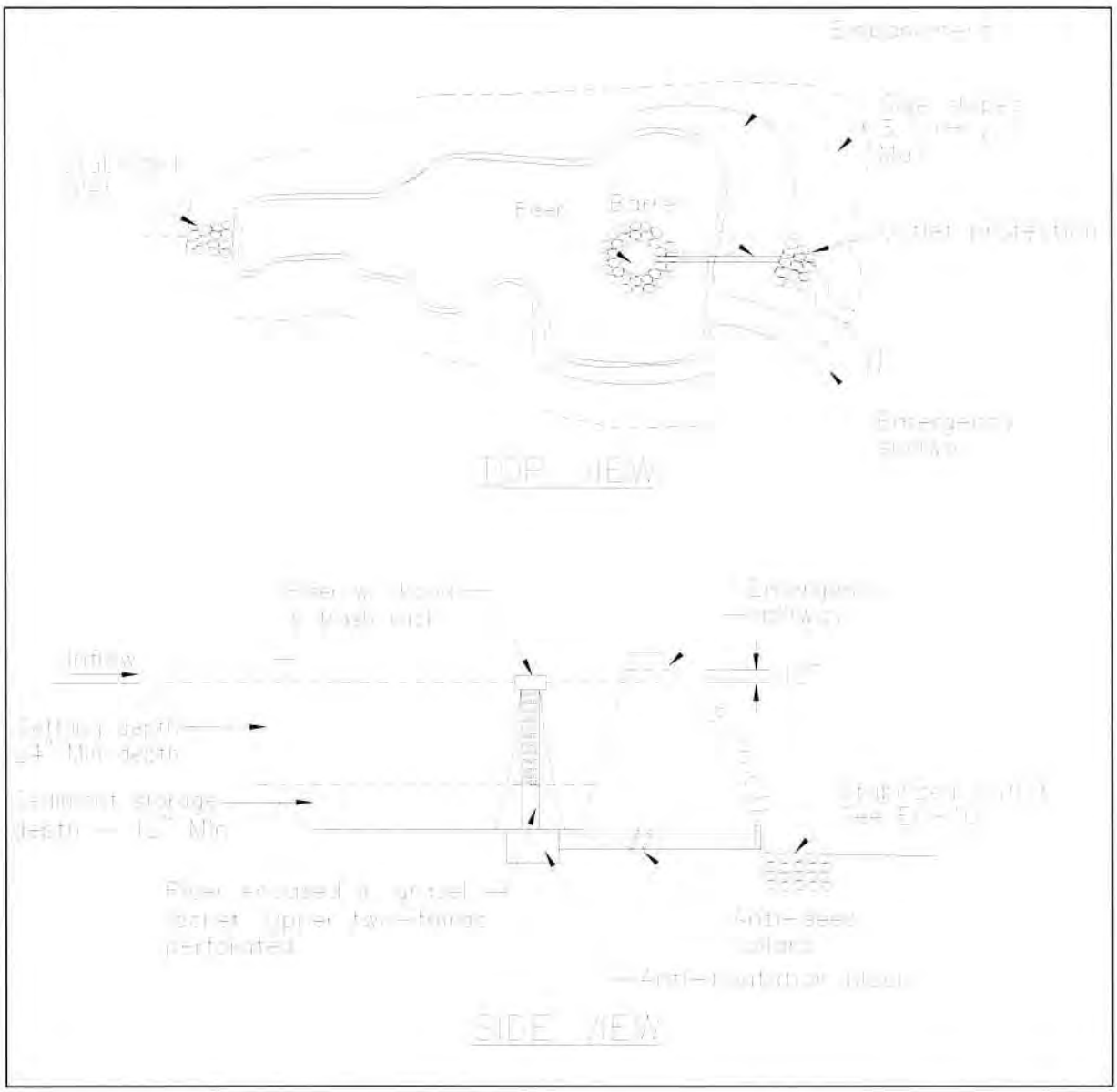


FIGURE 1: TYPICAL TEMPORARY SEDIMENT BASIN
MULTIPLE ORIFICE DESIGN
NOT TO SCALE

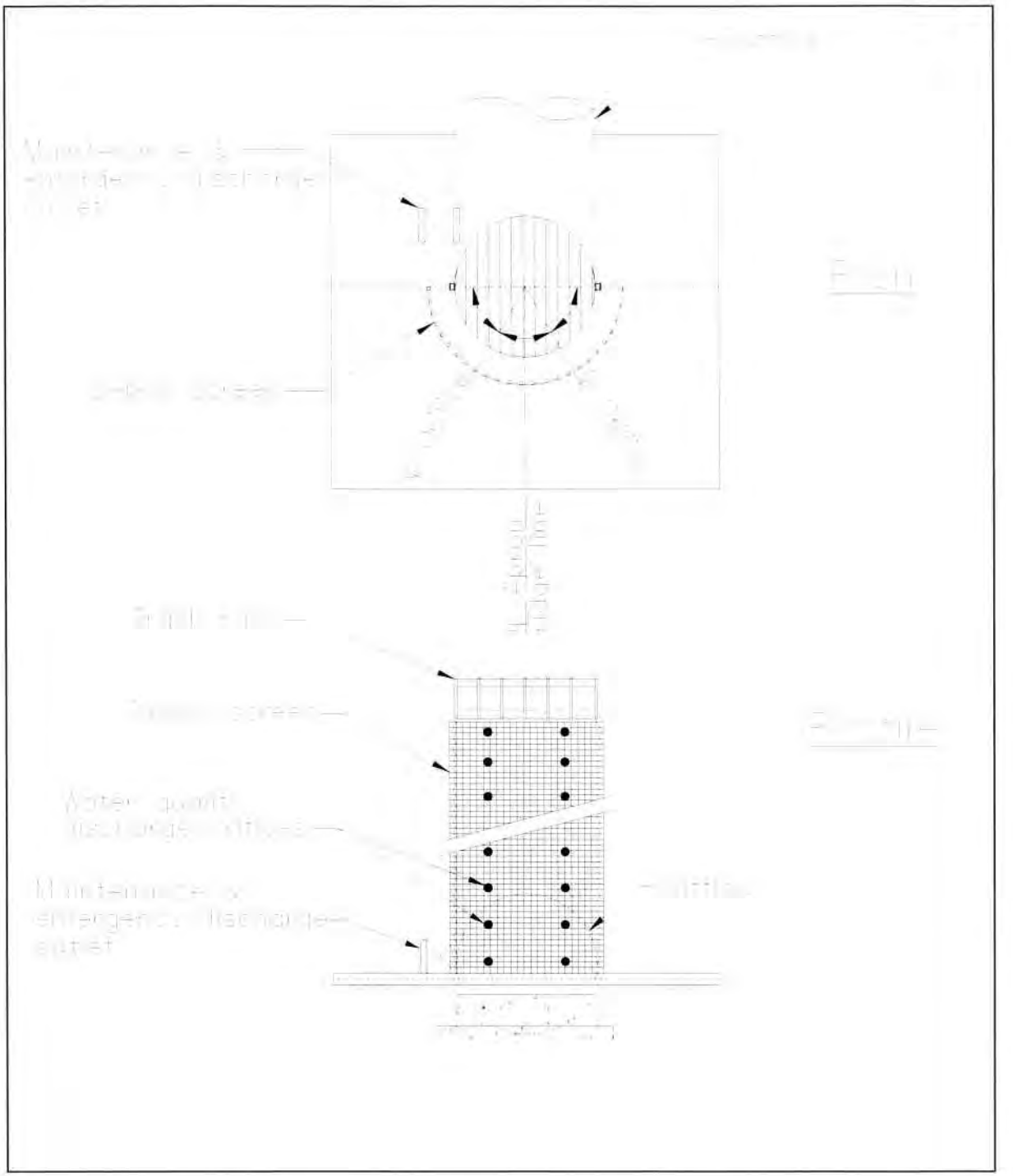


FIGURE 2: MULTIPLE ORIFICE OUTLET RISER

NOT TO SCALE

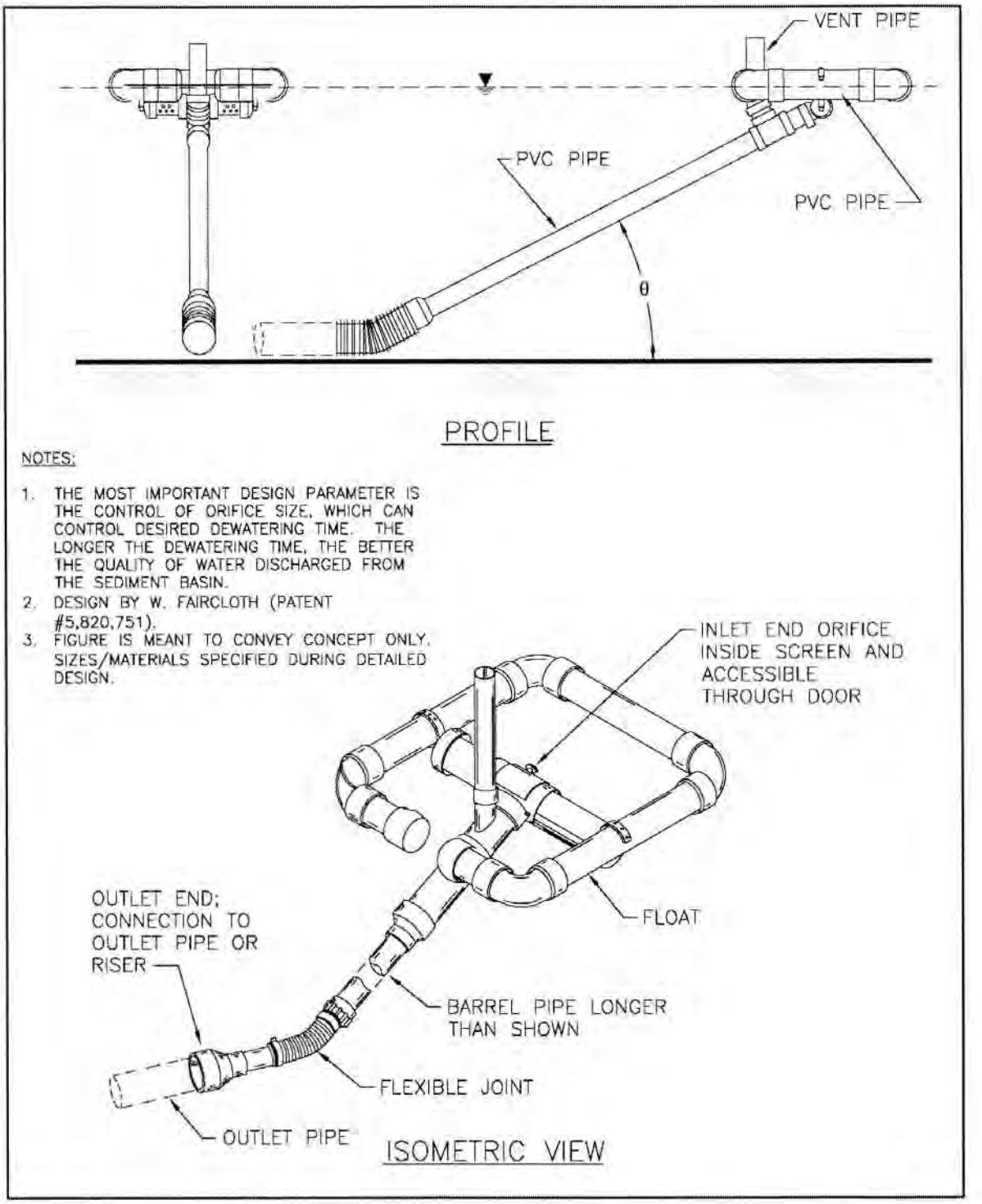


FIGURE 3: TYPICAL SKIMMER

NOT TO SCALE

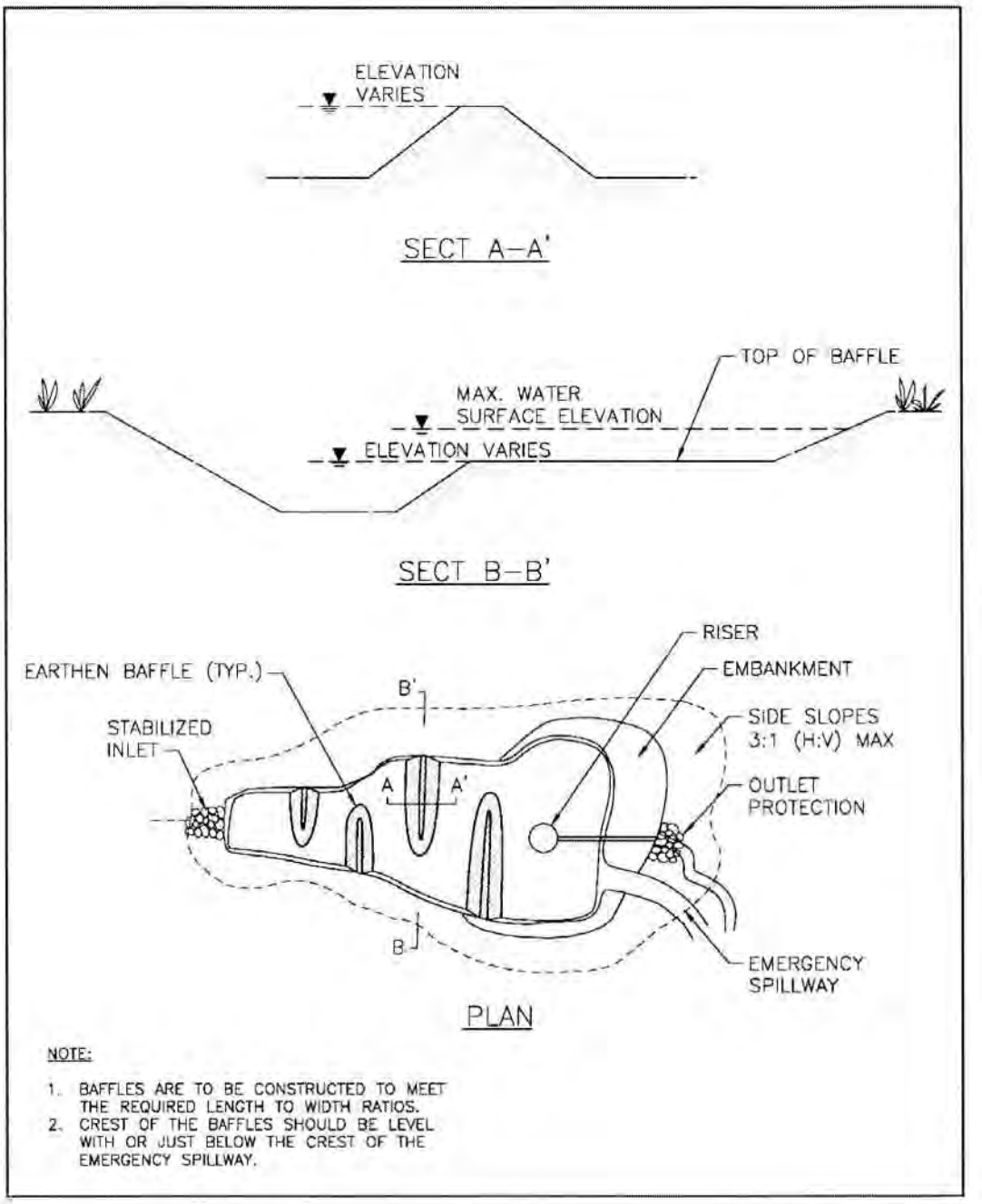
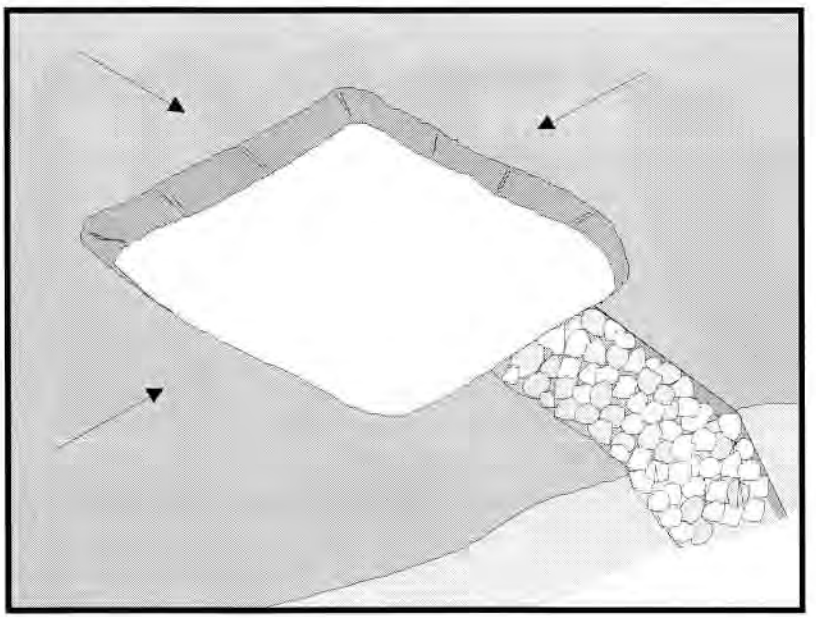


FIGURE 4: TYPICAL TEMPORARY SEDIMENT BASIN WITH BAFFLES

NOT TO SCALE

Sediment Trap SE-3



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-2 Sediment Basin (for larger areas)

Description and Purpose

A sediment trap is a containment area where sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out or before the runoff is discharged. Sediment traps are formed by excavating or constructing an earthen embankment across a waterway or low drainage area.

Suitable Applications

Sediment traps should be considered for use:

- At the perimeter of the site at locations where sediment-laden runoff is discharged offsite.
- At multiple locations within the project site where sediment control is needed.
- Around or upslope from storm drain inlet protection measures.
- Sediment traps may be used on construction projects where the drainage area is less than 5 acres. Traps would be placed where sediment-laden stormwater may enter a storm drain or watercourse. SE-2, Sediment Basins, must be used for drainage areas greater than 5 acres.
- As a supplemental control, sediment traps provide additional protection for a water body or for reducing sediment before it enters a drainage system.

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CALIFORNIA STORMWATER

Limitations

- Requires large surface areas to permit infiltration and settling of sediment.
- Not appropriate for drainage areas greater than 5 acres.
- Only removes large and medium sized particles and requires upstream erosion control.
- Attractive and dangerous to children, requiring protective fencing.
- Conducive to vector production.
- Should not be located in live streams.

Implementation

Design

A sediment trap is a small temporary ponding area, usually with a gravel outlet, formed by excavation or by construction of an earthen embankment. Its purpose is to collect and store sediment from sites cleared or graded during construction. It is intended for use on small drainage areas with no unusual drainage features and projected for a quick build-out time. It should help in removing coarse sediment from runoff. The trap is a temporary measure with a design life of approximately six months to one year and is to be maintained until the site area is permanently protected against erosion by vegetation and/or structures.

Sediment traps should be used only for small drainage areas. If the contributing drainage area is greater than 5 acres, refer to SE-2, Sediment Basins, or subdivide the catchment area into smaller drainage basins.

Sediment usually must be removed from the trap after each rainfall event. The SWPPP should detail how this sediment is to be disposed of, such as in fill areas onsite, or removal to an approved offsite dump. Sediment traps used as perimeter controls should be installed before any land disturbance takes place in the drainage area.

Sediment traps are usually small enough that a failure of the structure would not result in a loss of life, damage to home or buildings, or interruption in the use of public roads or utilities. However, sediment traps are attractive to children and can be dangerous. The following recommendations should be implemented to reduce risks:

- Install continuous fencing around the sediment trap or pond. Consult local ordinances regarding requirements for maintaining health and safety.
- Restrict basin side slopes to 3:1 or flatter.

Sediment trap size depends on the type of soil, size of the drainage area, and desired sediment removal efficiency (see SE-2, Sediment Basin). As a rule of thumb, the larger the basin volume the greater the sediment removal efficiency. Sizing criteria are typically established under the local grading ordinance or equivalent. The runoff volume from a 2-year storm is a common design criteria for a sediment trap. The sizing criteria below assume that this runoff volume is 0.042 acre-ft/acre (0.5 in. of runoff). While the climatic, topographic, and soil type extremes make it difficult to establish a statewide standard, the following criteria should trap moderate to high amounts of sediment in most areas of California:

- Locate sediment traps as near as practical to areas producing the sediment.
- Trap should be situated according to the following criteria: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where failure would not cause loss of life or property damage, and (3) to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area.
- Trap should be sized to accommodate a settling zone and sediment storage zone with recommended minimum volumes of 67 yd^3/acre and 33 yd^3/acre of contributing drainage area, respectively, based on 0.5 in. of runoff volume over a 24-hour period. In many cases, the size of an individual trap is limited by available space. Multiple traps or additional volume may be required to accommodate specific rainfall, soil, and site conditions.
- Traps with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and traps capable of impounding more than 35,000 ft^3, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the trap outlet and bypass structures.
- The outlet pipe or open spillway must be designed to convey anticipated peak flows.
- Use rock or vegetation to protect the trap outlets against erosion.
- Fencing should be provided to prevent unauthorized entry.

Installation

Sediment traps can be constructed by excavating a depression in the ground or creating an impoundment with a small embankment. Sediment traps should be installed outside the area being graded and should be built prior to the start of the grading activities or removal of vegetation. To minimize the area disturbed by them, sediment traps should be installed in natural depressions or in small swales or drainage ways. The following steps must be followed during installation:

- The area under the embankment must be cleared, grubbed, and stripped of any vegetation and root mat. The pool area should be cleared.
- The fill material for the embankment must be free of roots or other woody vegetation as well as oversized stones, rocks, organic material, or other objectionable material. The embankment may be compacted by traversing with equipment while it is being constructed.
- All cut-and-fill slopes should be 3:1 or flatter.
- When a riser is used, all pipe joints must be watertight.
- When a riser is used, at least the top two-thirds of the riser should be perforated with 0.5 in. diameter holes spaced 8 in. vertically and 10 to 12 in. horizontally. See SE-2, Sediment Basin.
- When an earth or stone outlet is used, the outlet crest elevation should be at least 1 ft below the top of the embankment.

- When crushed stone outlet is used, the crushed stone used in the outlet should meet AASHTO M43, size No. 2 or 24, or its equivalent such as MSHA No. 2. Gravel meeting the above gradation may be used if crushed stone is not available.

Costs

Average annual cost per installation and maintenance (18 month useful life) is $0.73 per ft^3 ($1,300 per drainage acre). Maintenance costs are approximately 20% of installation costs.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect outlet area for erosion and stabilize if required.
- Inspect trap banks for seepage and structural soundness, repair as needed.
- Inspect outlet structure and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.
- Inspect fencing for damage and repair as needed.
- Inspect the sediment trap for area of standing water during every visit. Corrective measures should be taken if the BMP does not dewater completely in 72 hours or less to prevent vector production.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the trap capacity. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed of at an appropriate location.
- Remove vegetation from the sediment trap when first detected to prevent pools of standing water and subsequent vector production.
- BMPs that require dewatering shall be continuously attended while dewatering takes place. Dewatering BMPs shall be implemented at all times during dewatering activities.

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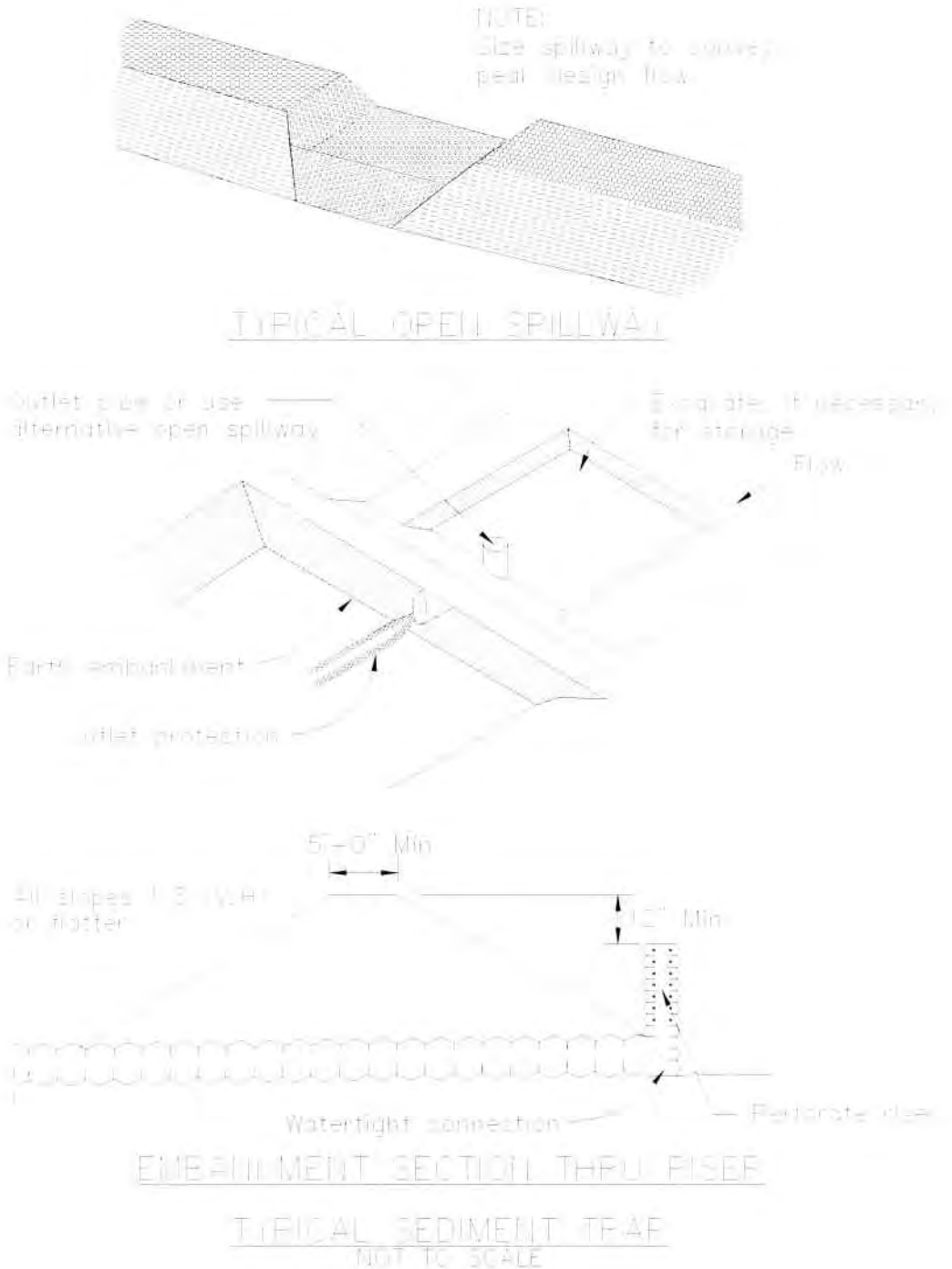
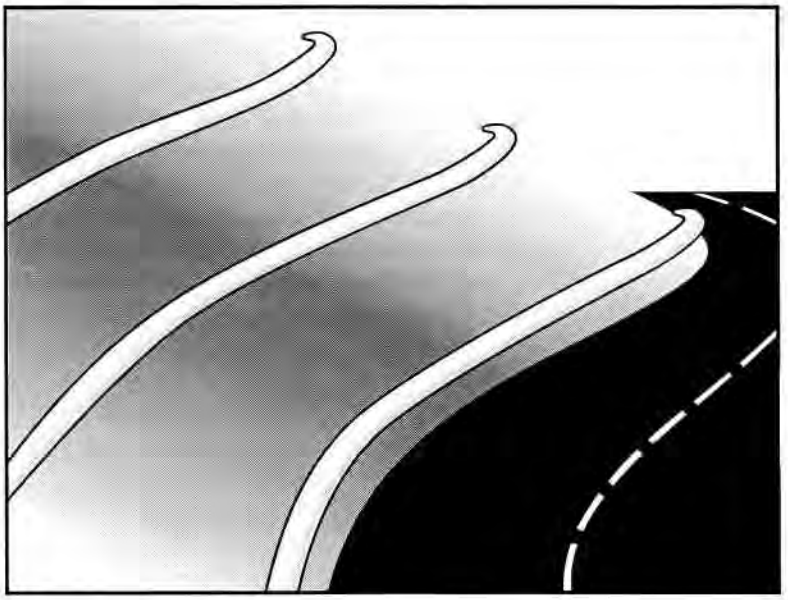

NOTE:
Size spillway to convey peak design flow.
TYPICAL OPEN SPILLWAY
Outlet pipe or use alternative open spillway
Excavate, if necessary, for storage
Flow
Earth embankment
Outlet protection
5'-0" Min
All slopes 1:3 (V:H) or flatter
12" Min
Watertight connection
Perforate riser
EMBANKMENT SECTION THRU RISER
TYPICAL SEDIMENT TRAP
NOT TO SCALE

Fiber Rolls

SE-5



Categories

EC	Erosion Control	☒
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Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

Description and Purpose

A fiber roll consists of straw, coir, or other biodegradable materials bound into a tight tubular roll wrapped by netting, which can be photodegradable or natural. Additionally, gravel core fiber rolls are available, which contain an imbedded ballast material such as gravel or sand for additional weight when staking the rolls are not feasible (such as use as inlet protection). When fiber rolls are placed at the toe and on the face of slopes along the contours, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff (through sedimentation). By interrupting the length of a slope, fiber rolls can also reduce sheet and rill erosion until vegetation is established.

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- At the end of a downward slope where it transitions to a steeper slope.
- Along the perimeter of a project.
- As check dams in unlined ditches with minimal grade.
- Down-slope of exposed soil areas.
- At operational storm drains as a form of inlet protection.

- Around temporary stockpiles.

Limitations

- Fiber rolls are not effective unless trenched in and staked.
- Not intended for use in high flow situations.
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.
- Rolls typically function for 12-24 months depending upon local conditions.

Implementation

Fiber Roll Materials

- Fiber rolls should be prefabricated.
- Fiber rolls may come manufactured containing polyacrylamide (PAM), a flocculating agent within the roll. Fiber rolls impregnated with PAM provide additional sediment removal capabilities and should be used in areas with fine, clayey or silty soils to provide additional sediment removal capabilities. Monitoring may be required for these installations.
- Fiber rolls are made from weed free rice straw, flax, or a similar agricultural material bound into a tight tubular roll by netting.
- Typical fiber rolls vary in diameter from 9 in. to 20 in. Larger diameter rolls are available as well.

Installation

- Locate fiber rolls on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
  - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Prepare the slope before beginning installation.
- Dig small trenches across the slope on the contour. The trench depth should be ¼ to 1/3 of the thickness of the roll, and the width should equal the roll diameter, in order to provide area to backfill the trench.

- It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.
- Start building trenches and installing rolls from the bottom of the slope and work up.
- It is recommended that pilot holes be driven through the fiber roll. Use a straight bar to drive holes through the roll and into the soil for the wooden stakes.
- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.
- Stake fiber rolls into the trench.
  - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.
  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.
- See typical fiber roll installation details at the end of this fact sheet.

Removal

- Fiber rolls can be left in place or removed depending on the type of fiber roll and application (temporary vs. permanent installation). Typically, fiber rolls encased with plastic netting are used for a temporary application because the netting does not biodegrade. Fiber rolls used in a permanent application are typically encased with a biodegradeable material and are left in place. Removal of a fiber roll used in a permanent application can result in greater disturbance.
- Temporary installations should only be removed when up gradient areas are stabilized per General Permit requirements, and/or pollutant sources no longer present a hazard. But, they should also be removed before vegetation becomes too mature so that the removal process does not disturb more soil and vegetation than is necessary.

Costs

Material costs for regular fiber rolls range from $20 - $30 per 25 ft roll.

Material costs for PAM impregnated fiber rolls range between 7.00-$9.00 per linear foot, based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP should be periodically removed

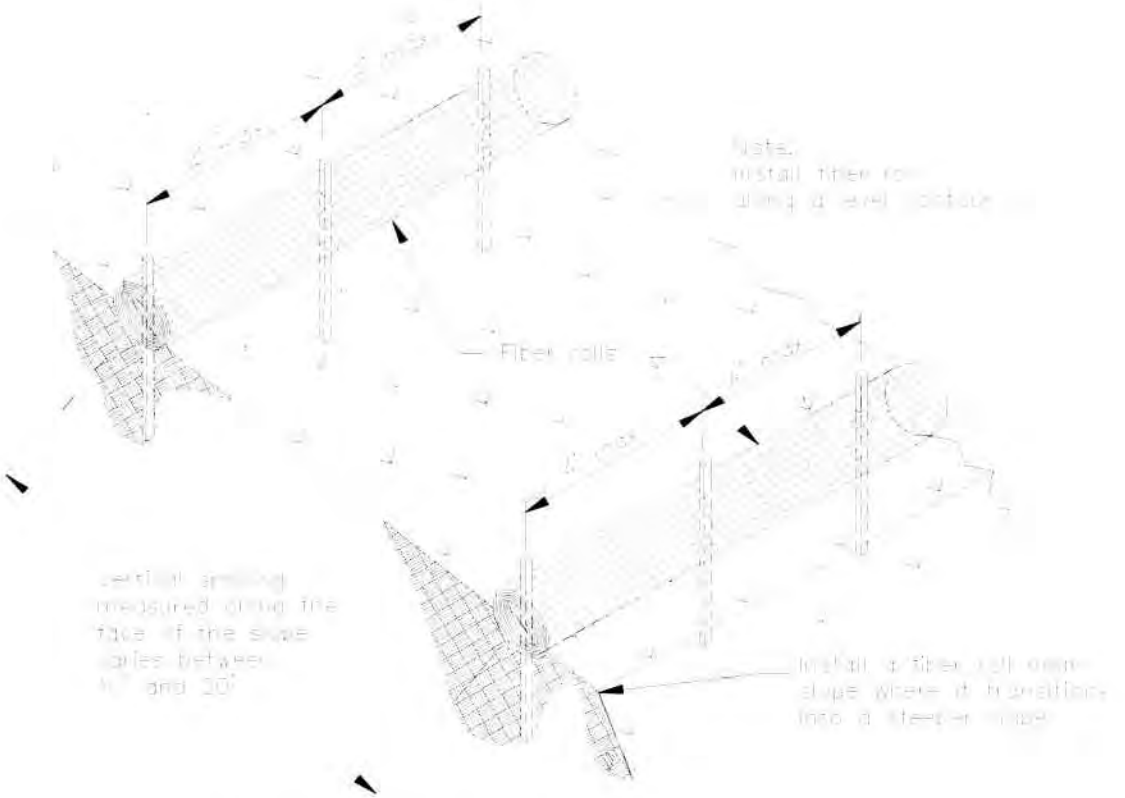
in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-third the designated sediment storage depth.

- If fiber rolls are used for erosion control, such as in a check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.
- Repair any rills or gullies promptly.

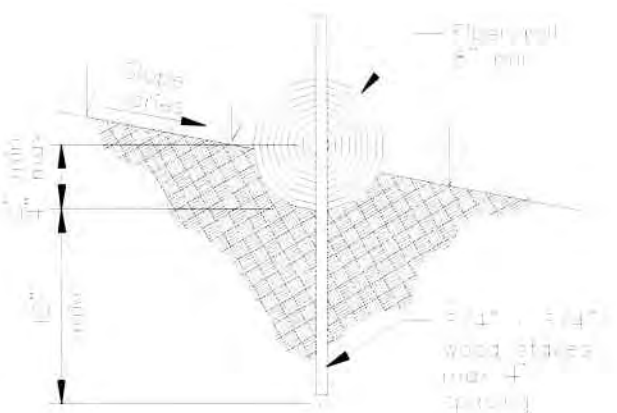
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



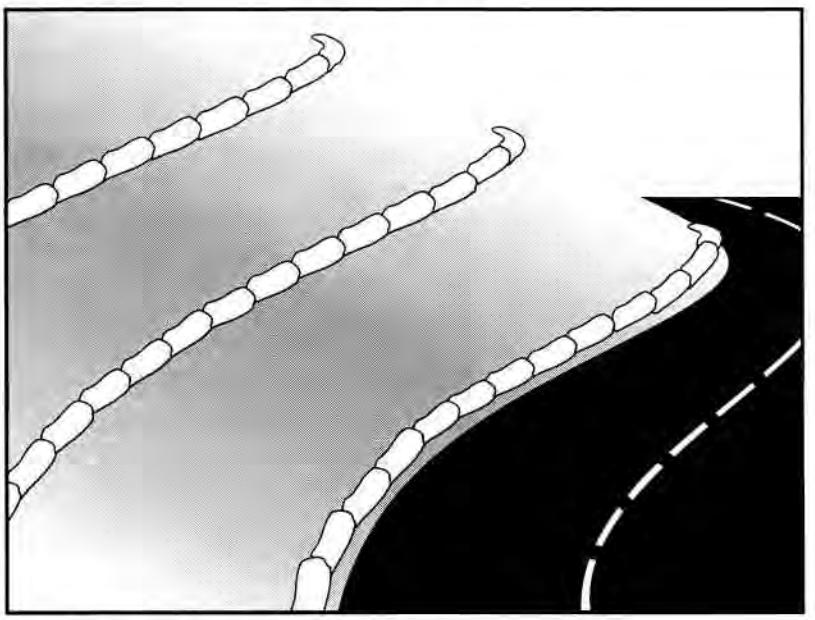
TYPICAL FIBER ROLL INSTALLATION



ENTRENCHMENT DETAIL

Gravel Bag Berm

SE-6



Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Roll

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

Description and Purpose

A gravel bag berm is a series of gravel-filled bags placed on a level contour to intercept sheet flows. Gravel bags pond sheet flow runoff, allowing sediment to settle out, and release runoff slowly as sheet flow, preventing erosion.

Suitable Applications

Gravel bag berms may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As a linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

- At the top of slopes to divert runoff away from disturbed slopes.
- As chevrons (small check dams) across mildly sloped construction roads. For use check dam use in channels, see SE-4, Check Dams.

Limitations

- Gravel berms may be difficult to remove.
- Removal problems limit their usefulness in landscaped areas.
- Gravel bag berm may not be appropriate for drainage areas greater than 5 acres.
- Runoff will pond upstream of the berm, possibly causing flooding if sufficient space does not exist.
- Degraded gravel bags may rupture when removed, spilling contents.
- Installation can be labor intensive.
- Durability of gravel bags is somewhat limited and bags may need to be replaced when installation is required for longer than 6 months.
- Easily damaged by construction equipment.
- When used to detain concentrated flows, maintenance requirements increase.

Implementation

General

A gravel bag berm consists of a row of open graded gravel-filled bags placed on a level contour. When appropriately placed, a gravel bag berm intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. The open graded gravel in the bags is porous, which allows the ponded runoff to flow slowly through the bags, releasing the runoff as sheet flows. Gravel bag berms also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils. Gravel bag berms are similar to sand bag barriers, but are more porous. Generally, gravel bag berms should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

Design and Layout

- Locate gravel bag berms on level contours.
- When used for slope interruption, the following slope/sheet flow length combinations apply:
  - Slope inclination of 4:1 (H:V) or flatter: Gravel bags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slope inclination between 4:1 and 2:1 (H:V): Gravel bags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.

Slope inclination 2:1 (H:V) or greater: Gravel bags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.

- Turn the ends of the gravel bag barriers up slope to prevent runoff from going around the berm.
- Allow sufficient space up slope from the gravel bag berm to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, gravel bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the gravel bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- In Non-Traffic Areas:
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Top width = 12 in. minimum for one or two layer construction
  - Side slopes = 2:1 (H:V) or flatter
- In Construction Traffic Areas:
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Top width = 12 in. minimum for one or two layer construction.
  - Side slopes = 2:1 (H:V) or flatter.
- Butt ends of bags tightly.
- On multiple row, or multiple layer construction, overlap butt joints of adjacent row and row beneath.
- Use a pyramid approach when stacking bags.

Materials

- ***Bag Material:*** Bags should be woven polypropylene, polyethylene or polyamide fabric or burlap, minimum unit weight of 4 ounces/yd^2, Mullen burst strength exceeding 300 lb/in^2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.

- ***Bag Size:*** Each gravel-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.

- ***Fill Material:*** Fill material should be 0.5 to 1 in. crushed rock, clean and free from clay, organic matter, and other deleterious material, or other suitable open graded, non-cohesive, porous gravel.

Costs

Material costs for gravel bags are average and are dependent upon material availability. $2.50-3.00 per filled gravel bag is standard based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Gravel bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.

- Reshape or replace gravel bags as needed.

- Repair washouts or other damage as needed.

- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.

- Remove gravel bag berms when no longer needed and recycle gravel fill whenever possible and properly dispose of bag material. Remove sediment accumulation and clean, re-grade, and stabilize the area.

References

Handbook of Steel Drainage and Highway Construction, American Iron and Steel Institute, 1983.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Pollution Plan Handbook, First Edition, State of California, Department of Transportation Division of New Technology, Materials and Research, October 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Street Sweeping and Vacuuming SE-7

Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.
- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.

- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd^3 hopper) to $88/hour (9 yd^3 hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

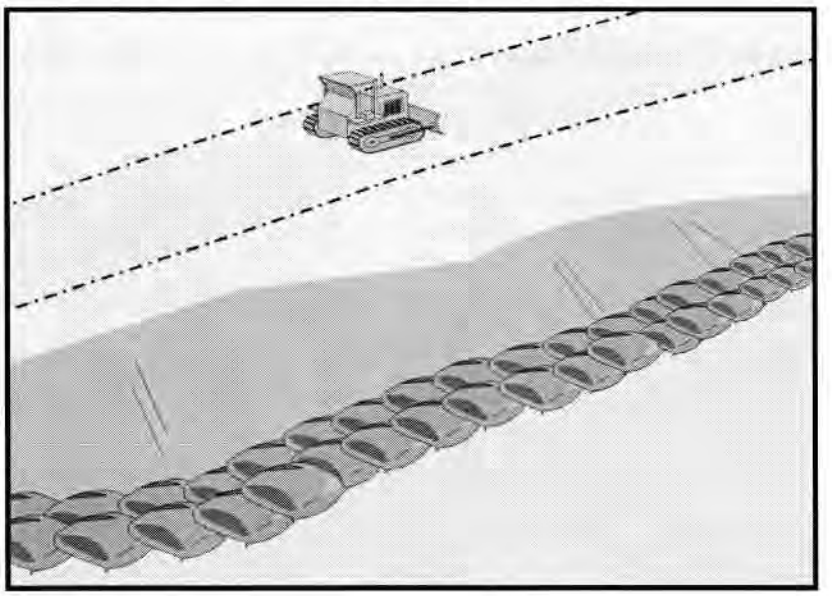
- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

Sandbag Barrier SE-8



Categories		
EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-14 Biofilter Bags

Description and Purpose

A sandbag barrier is a series of sand-filled bags placed on a level contour to intercept or to divert sheet flows. Sandbag barriers placed on a level contour pond sheet flow runoff, allowing sediment to settle out.

Suitable Applications

Sandbag barriers may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes.
  - As sediment traps at culvert/pipe outlets.
  - Below other small cleared areas.
  - Along the perimeter of a site.
  - Down slope of exposed soil areas.
  - Around temporary stockpiles and spoil areas.
  - Parallel to a roadway to keep sediment off paved areas.
  - Along streams and channels.
- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

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- At the top of slopes to divert runoff away from disturbed slopes.
- As check dams across mildly sloped construction roads.

Limitations

- It is necessary to limit the drainage area upstream of the barrier to 5 acres.
- Sandbags are not intended to be used as filtration devices.
- Easily damaged by construction equipment.
- Degraded sandbags may rupture when removed, spilling sand.
- Sand is easily transported by runoff if bag is damaged or ruptured.
- Installation can be labor intensive.
- Durability of sandbags is somewhat limited and bags may need to be replaced when installation is required for longer than 6 months. When used to detain concentrated flows, maintenance requirements increase.
- Burlap should not be used for sandbags.

Implementation

General

A sandbag barrier consists of a row of sand-filled bags placed on a level contour. When appropriately placed, a sandbag barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. Sand-filled bags have limited porosity, which is further limited as the fine sand tends to quickly plug with sediment, limiting or completely blocking the rate of flow through the barrier. If a porous barrier is desired, consider SE-1, Silt Fence, SE-5, Fiber Rolls, SE-6, Gravel Bag Berms or SE-14, Biofilter Bags. Sandbag barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets which erode rills, and ultimately gullies, into disturbed, sloped soils. Sandbag barriers are similar to gravel bag berms, but less porous. Generally, sandbag barriers should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

Design and Layout

- Locate sandbag barriers on a level contour.
- When used for slope interruption, the following slope/sheet flow length combinations apply:
  - Slope inclination of 4:1 (H:V) or flatter: Sandbags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slope inclination between 4:1 and 2:1 (H:V): Sandbags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.

    Slope inclination 2:1 (H:V) or greater: Sandbags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.

- Turn the ends of the sandbag barrier up slope to prevent runoff from going around the barrier.
- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, sand bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the sand bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- Stack sandbags at least three bags high.
- Butt ends of bags tightly.
- Overlap butt joints of row beneath with each successive row.
- Use a pyramid approach when stacking bags.
- In non-traffic areas
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Side slope = 2:1 (H:V) or flatter
- In construction traffic areas
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Side slopes = 2:1 (H:V) or flatter.
- See typical sandbag barrier installation details at the end of this fact sheet.

Materials

- ***Sandbag Material:*** Sandbag should be woven polypropylene, polyethylene or polyamide fabric, minimum unit weight of 4 ounces/yd^2, Mullen burst strength exceeding 300 lb/in^2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355. Use of burlap is not an acceptable substitute, as sand can more easily mobilize out of burlap.
- ***Sandbag Size:*** Each sand-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.

- ***Fill Material:*** All sandbag fill material should be non-cohesive, Class 3 (Caltrans Standard Specification, Section 25) permeable material free from clay and deleterious material, such as recycled concrete or asphalt..

Costs

Empty sandbags cost $0.25 - $0.75. Average cost of fill material is $8 per yd^3. Additional labor is required to fill the bags. Pre-filled sandbags are more expensive at $1.50 - $2.00 per bag. These costs are based upon vendor research.

Inspection and Maintenance

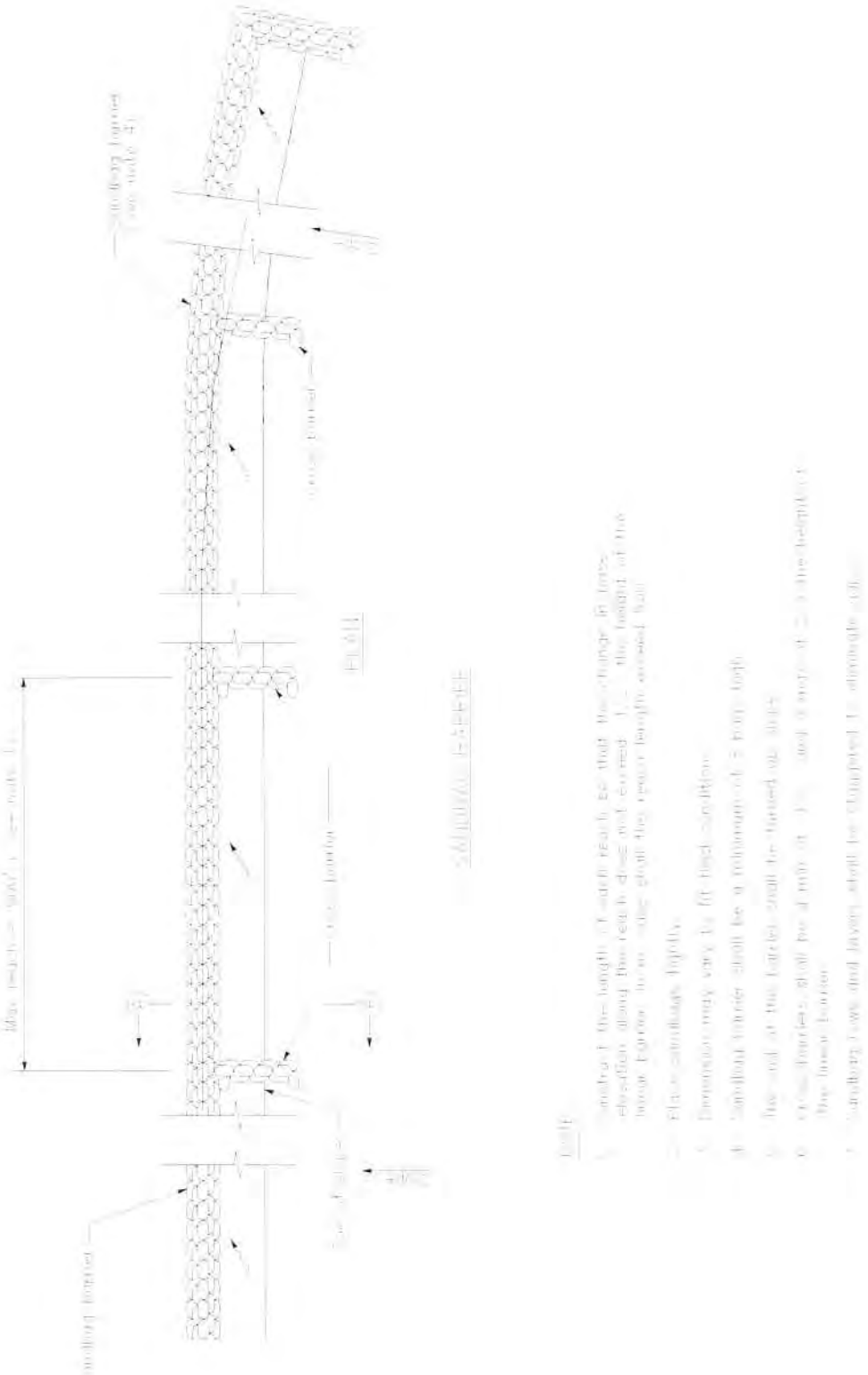
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Sandbags exposed to sunlight will need to be replaced every two to three months due to degradation of the bags.
- Reshape or replace sandbags as needed.
- Repair washouts or other damage as needed.
- Sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Remove sandbags when no longer needed and recycle sand fill whenever possible and properly dispose of bag material. Remove sediment accumulation, and clean, re-grade, and stabilize the area.

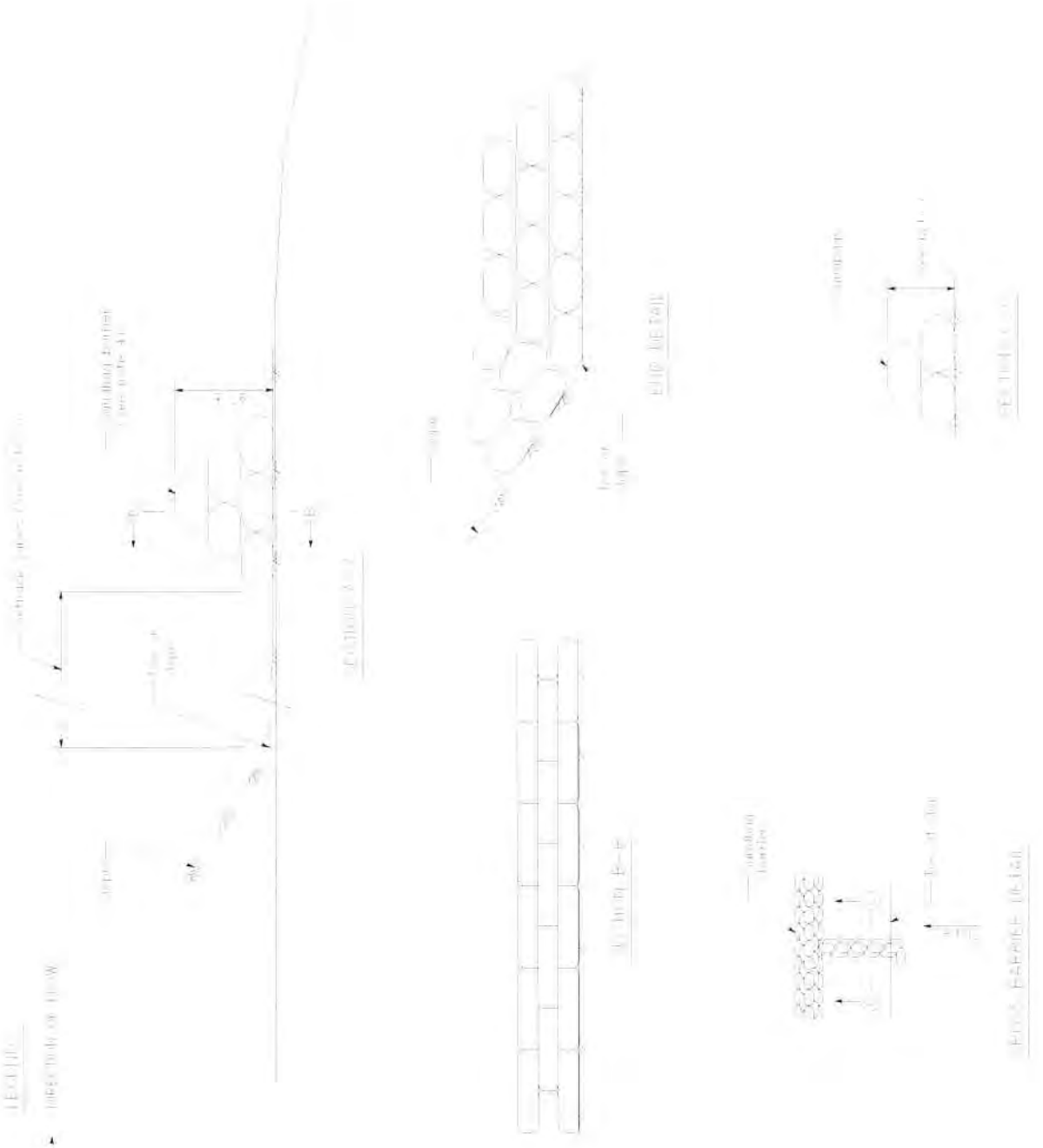
References

Standard Specifications for Construction of Local Streets and Roads, California Department of Transportation (Caltrans), July 2002.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.





- At the top of slopes to divert runoff away from disturbed slopes
- As check dams across mildly sloped construction roads

Limitations

Straw bale barriers:

- Are not to be used for extended periods of time because they tend to rot and fall apart
- Are suitable only for sheet flow on slopes of 10 % or flatter
- Are not appropriate for large drainage areas, limit to one acre or less
- May require constant maintenance due to rotting
- Are not recommended for concentrated flow, inlet protection, channel flow, and live streams
- Cannot be made of bale bindings of jute or cotton
- Require labor-intensive installation and maintenance
- Cannot be used on paved surfaces
- Should not to be used for drain inlet protection
- Should not be used on lined ditches
- May introduce undesirable non-native plants to the area

Implementation

General

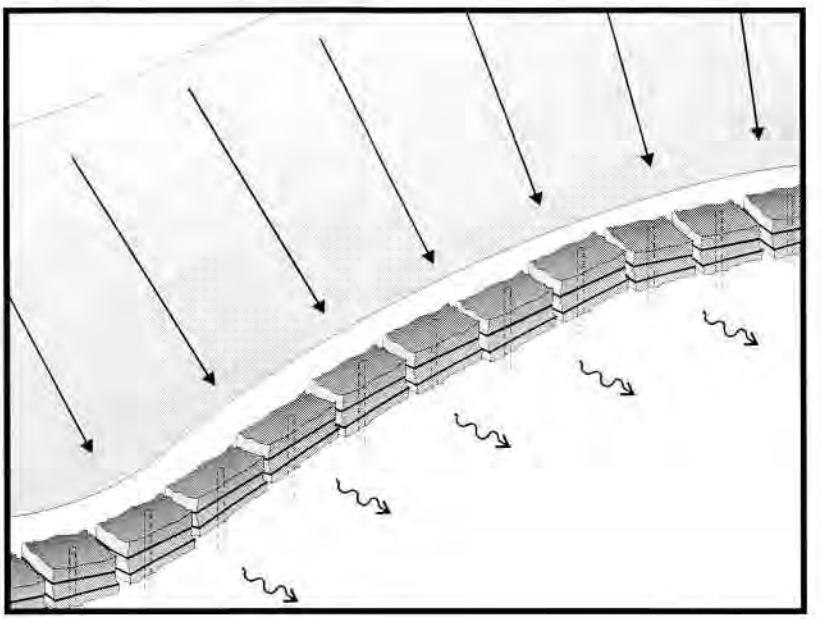
A straw bale barrier consists of a row of straw bales placed on a level contour. When appropriately placed, a straw bale barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. Straw bale barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils.

Straw bale barriers have not been as effective as expected due to improper use. These barriers have been placed in streams and drainage ways where runoff volumes and velocities have caused the barriers to wash out. In addition, failure to stake and entrench the straw bale has allowed undercutting and end flow. Use of straw bale barriers in accordance with this BMP should produce acceptable results.

Design and Layout

- Locate straw bale barriers on a level contour.
  - Slopes up to 10:1 (H:V): Straw bales should be placed at a maximum interval of 50 ft (a closer spacing is more effective), with the first row near the toe of slope.
  - Slopes greater than 10:1 (H:V): Not recommended.

Straw Bale Barrier SE-9



Description and Purpose

A straw bale barrier is a series of straw bales placed on a level contour to intercept sheet flows. Straw bale barriers pond sheet- flow runoff, allowing sediment to settle out.

Suitable Applications

Straw bale barriers may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow

Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

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- Turn the ends of the straw bale barrier up slope to prevent runoff from going around the barrier.
- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, consider moving the barrier away from the slope toe to facilitate cleaning. To prevent flow behind the barrier, sand bags can be placed perpendicular to the barrier to serve as cross barriers.
- Drainage area should not exceed 1 acre, or 0.25 acre per 100 ft of barrier.
- Maximum flow path to the barrier should be limited to 100 ft.
- Straw bale barriers should consist of two parallel rows.
  - Butt ends of bales tightly
  - Stagger butt joints between front and back row
  - Each row of bales must be trenched in and firmly staked
- Straw bale barriers are limited in height to one bale laid on its side.
- Anchor bales with either two wood stakes or four bars driven through the bale and into the soil. Drive the first stake towards the butt joint with the adjacent bale to force the bales together.
- See attached figure for installation details.

Materials

- ***Straw Bale Size:*** Each straw bale should be a minimum of 14 in. wide, 18 in. in height, 36 in. in length and should have a minimum mass of 50 lbs. The straw bale should be composed entirely of vegetative matter, except for the binding material.
- ***Bale Bindings:*** Bales should be bound by steel wire, nylon or polypropylene string placed horizontally. Jute and cotton binding should not be used. Baling wire should be a minimum diameter of 14 gauge. Nylon or polypropylene string should be approximately 12 gauge in diameter with a breaking strength of 80 lbs force.
- ***Stakes:*** Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake, or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable. Steel bar reinforcement should be equal to a #4 designation or greater. End protection should be provided for any exposed bar reinforcement.

Costs

Straw bales cost $5 - $7 each. Adequate labor should be budgeted for installation and maintenance.

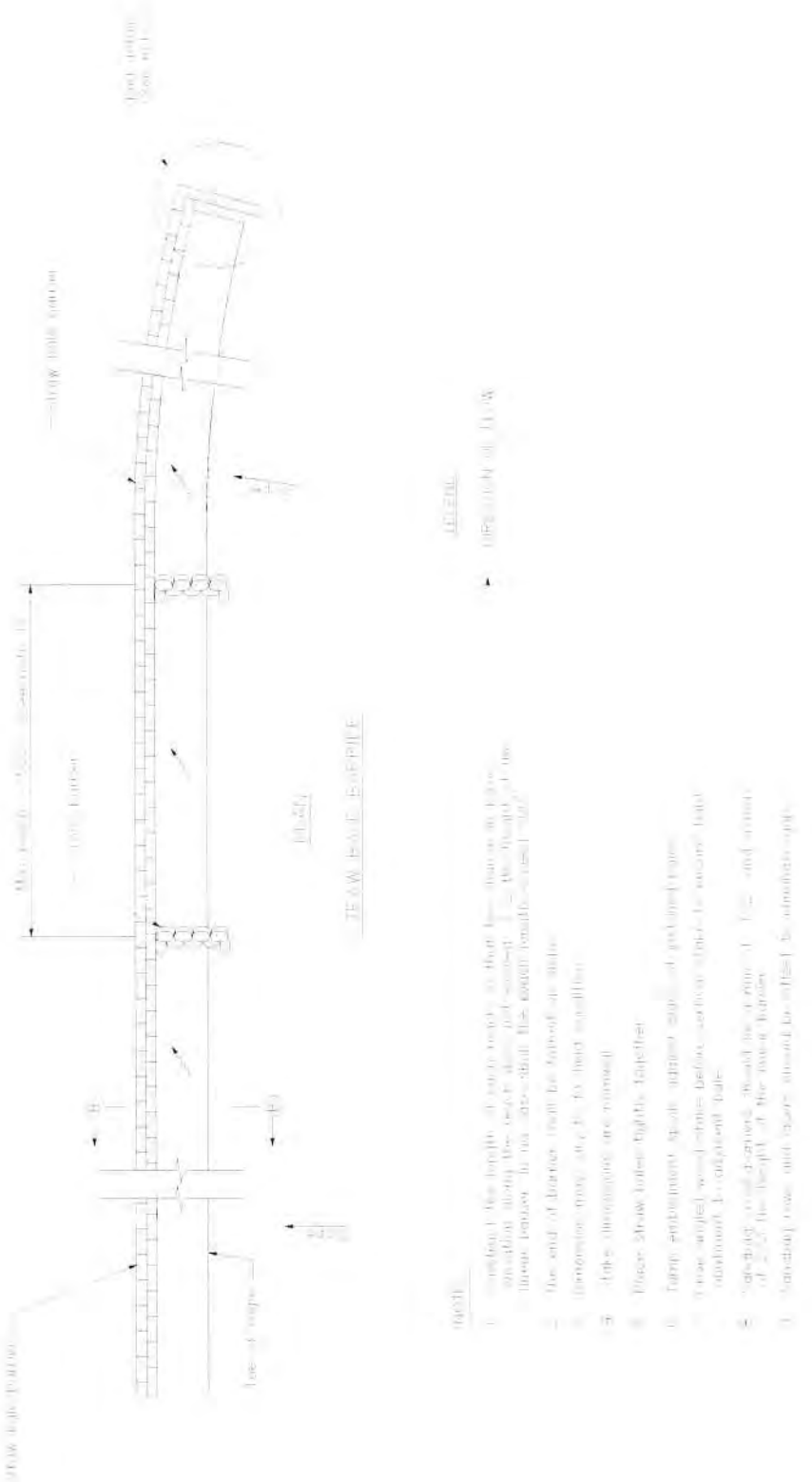
Inspection and Maintenance

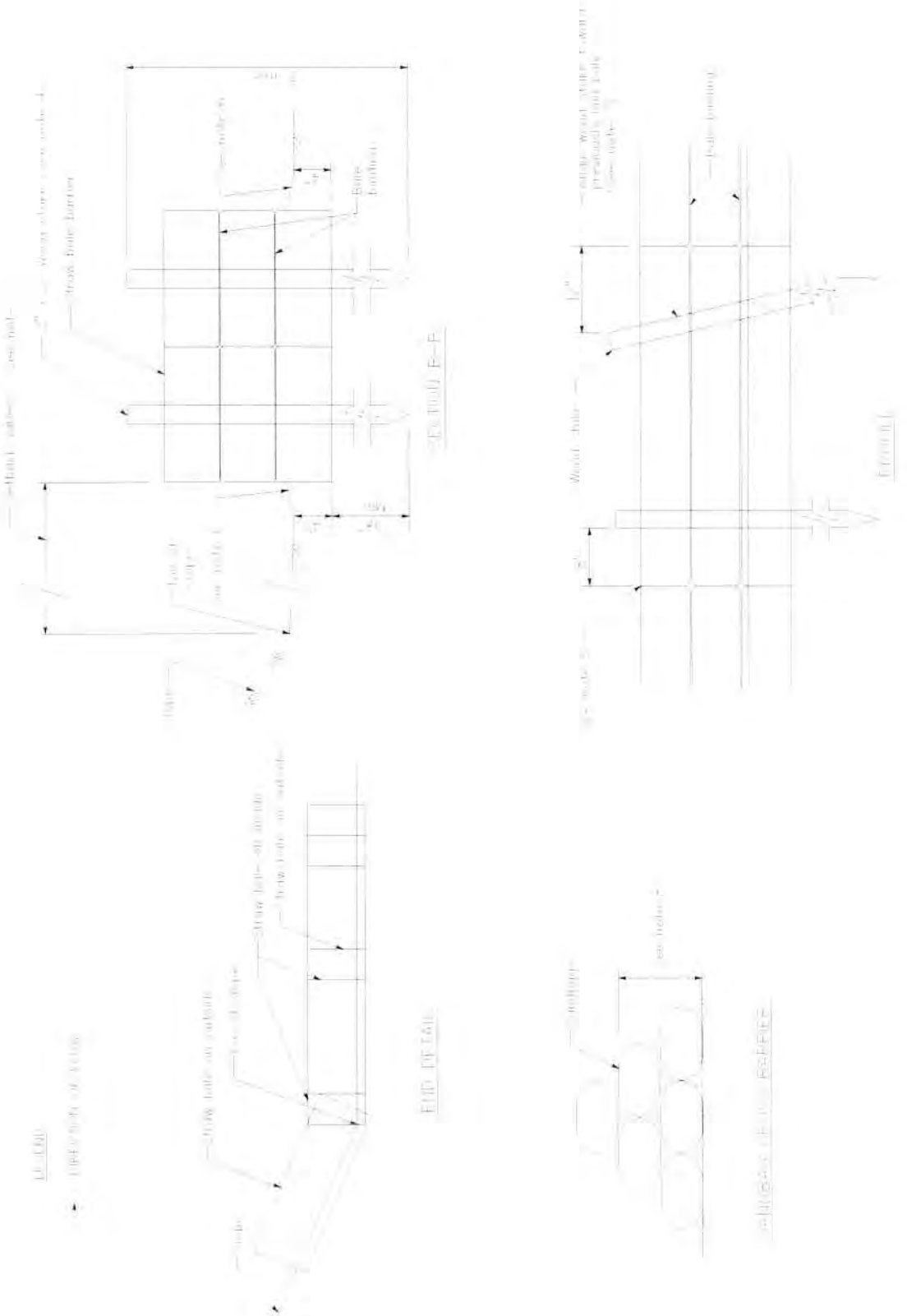
Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Straw bales degrade, especially when exposed to moisture. Rotting bales will need to be replaced on a regular basis.
- Replace or repair damaged bales as needed.
- Repair washouts or other damages as needed.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Remove straw bales when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilize the area. Removed sediment should be incorporated in the project or disposed of.

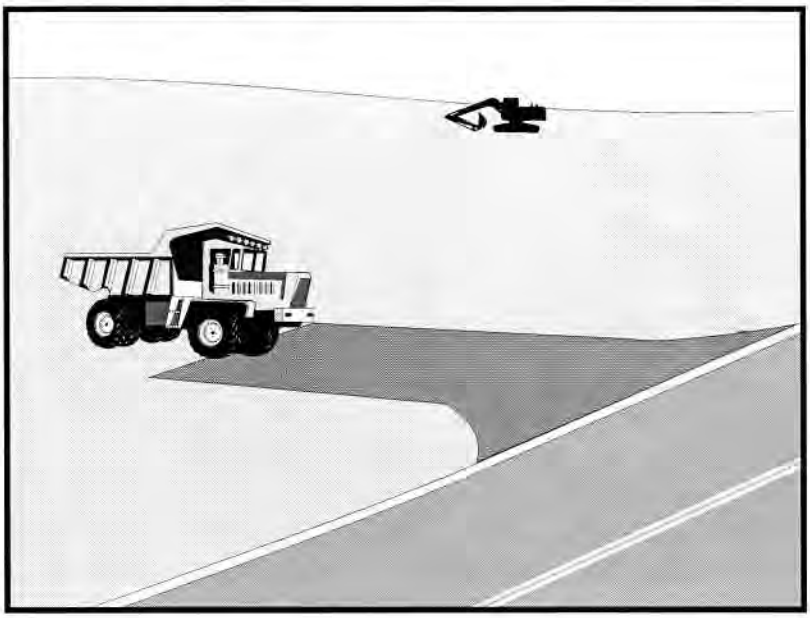
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.





Stabilized Construction Entrance/Exit TC-1



Categories		
EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water

CASQA
CALIFORNIA STORMWATER

runoff.

Implementation

General

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

Design and Layout

- Construct on level ground where possible.
- Select 3 to 6 in. diameter stones.
- Use minimum depth of stones of 12 in. or as recommended by soils engineer.
- Construct length of 50 ft minimum, and 30 ft minimum width.
- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
- Provide ample turning radii as part of the entrance.
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.

- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use asphalt concrete (AC) grindings for stabilized construction access/roadway.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.
- Implement SE-7, Street Sweeping and Vacuuming, as needed.
- All exit locations intended to be used for more than a two-week period should have stabilized construction entrance/exit BMPs.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMPs are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.
- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.
- Keep all temporary roadway ditches clear.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.
- Remove all sediment deposited on paved roadways within 24 hours.
- Remove gravel and filter fabric at completion of construction

Costs

Average annual cost for installation and maintenance may vary from $1,200 to $4,800 each, averaging $2,400 per entrance. Costs will increase with addition of washing rack, and sediment trap. With wash rack, costs range from $1,200 - $6,000 each, averaging $3,600 per entrance.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

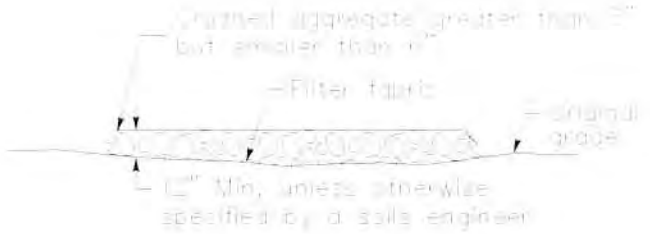
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Stabilized Construction Entrance/Exit TC-1



SECTION B–B
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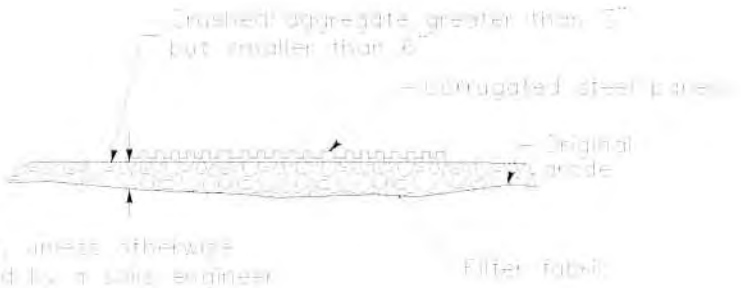
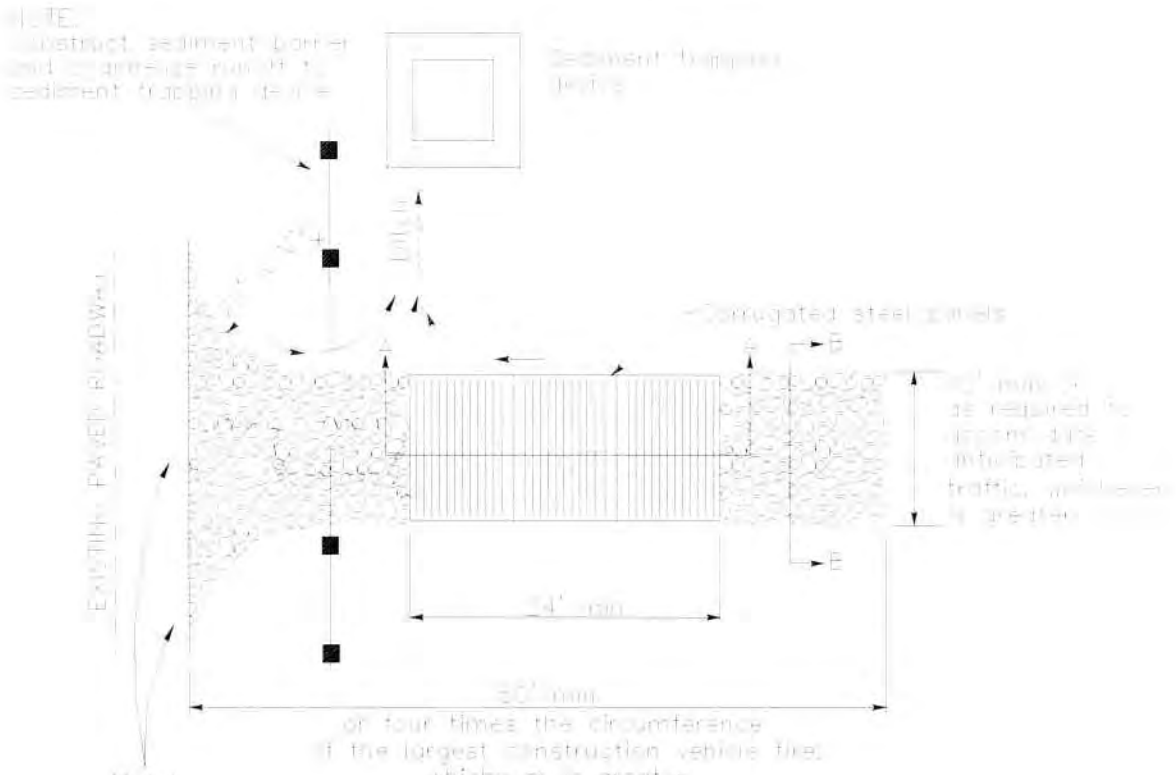


SECTION A–A
NOT TO SCALE



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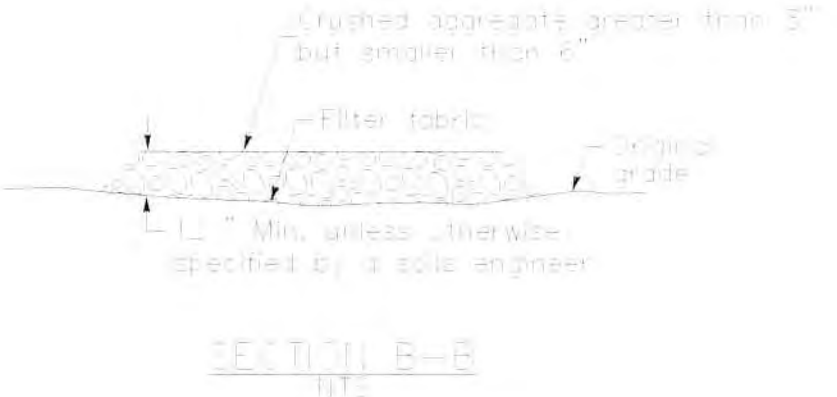
Stabilized Construction Entrance/Exit TC-1



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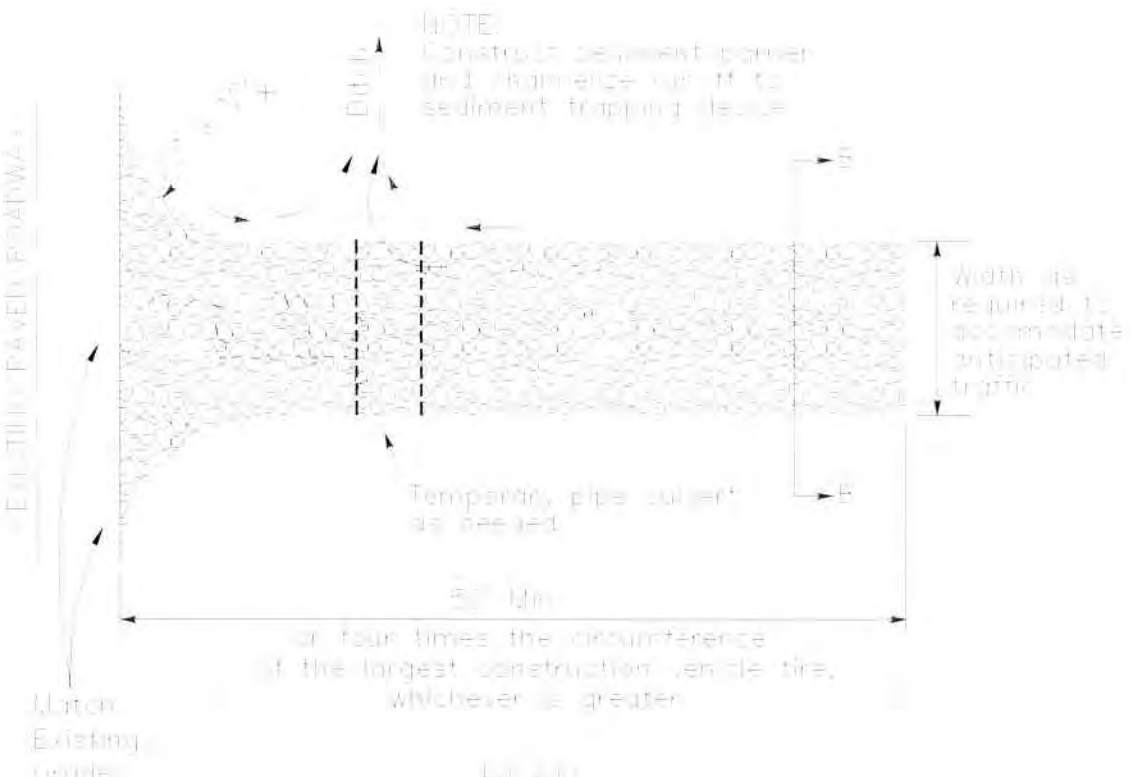

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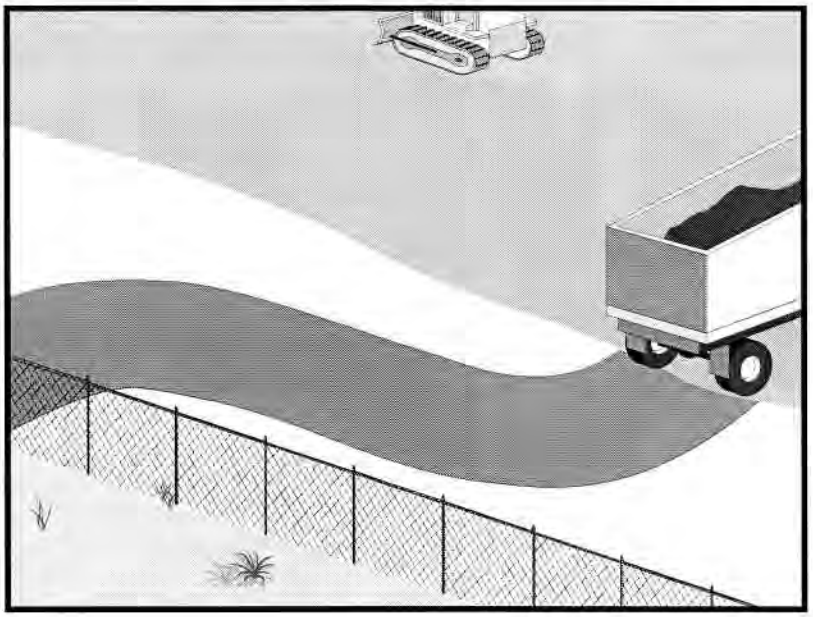
Stabilized Construction Roadway TC-2



Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Access roads, subdivision roads, parking areas, and other onsite vehicle transportation routes should be stabilized immediately after grading, and frequently maintained to prevent erosion and control dust.

Suitable Applications

This BMP should be applied for the following conditions:

- Temporary Construction Traffic:
  - Phased construction projects and offsite road access
  - Construction during wet weather
- Construction roadways and detour roads:
  - Where mud tracking is a problem during wet weather
  - Where dust is a problem during dry weather
  - Adjacent to water bodies
  - Where poor soils are encountered

Limitations

- The roadway must be removed or paved when construction is complete.
- Certain chemical stabilization methods may cause stormwater or soil pollution and should not be used. See WE-1, Wind Erosion Control.

Appendix H
CASQA BMP Handbook Fact Sheets

- Management of construction traffic is subject to air quality control measures. Contact the local air quality management agency.
- Materials will likely need to be removed prior to final project grading and stabilization.
- Use of this BMP may not be applicable to very short duration projects.

Implementation

General

Areas that are graded for construction vehicle transport and parking purposes are especially susceptible to erosion and dust. The exposed soil surface is continually disturbed, leaving no opportunity for vegetative stabilization. Such areas also tend to collect and transport runoff waters along their surfaces. During wet weather, they often become muddy quagmires that generate significant quantities of sediment that may pollute nearby streams or be transported offsite on the wheels of construction vehicles. Dirt roads can become so unstable during wet weather that they are virtually unusable.

Efficient construction road stabilization not only reduces onsite erosion but also can significantly speed onsite work, avoid instances of immobilized machinery and delivery vehicles, and generally improve site efficiency and working conditions during adverse weather

Installation/Application Criteria

Permanent roads and parking areas should be paved as soon as possible after grading. As an alternative where construction will be phased, the early application of gravel or chemical stabilization may solve potential erosion and stability problems. Temporary gravel roadway should be considered during the rainy season and on slopes greater than 5%.

Temporary roads should follow the contour of the natural terrain to the maximum extent possible. Slope should not exceed 15%. Roadways should be carefully graded to drain transversely. Provide drainage swales on each side of the roadway in the case of a crowned section or one side in the case of a super elevated section. Simple gravel berms without a trench can also be used.

Installed inlets should be protected to prevent sediment laden water from entering the storm sewer system (SE-10, Storm Drain Inlet Protection). In addition, the following criteria should be considered.

- Road should follow topographic contours to reduce erosion of the roadway.
- The roadway slope should not exceed 15%.
- Chemical stabilizers or water are usually required on gravel or dirt roads to prevent dust (WE-1, Wind Erosion Control).
- Properly grade roadway to prevent runoff from leaving the construction site.
- Design stabilized access to support heaviest vehicles and equipment that will use it.

- Stabilize roadway using aggregate, asphalt concrete, or concrete based on longevity, required performance, and site conditions. The use of cold mix asphalt or asphalt concrete (AC) grindings for stabilized construction roadway is not allowed.
- Coordinate materials with those used for stabilized construction entrance/exit points.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, impact weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Keep all temporary roadway ditches clear.
- When no longer required, remove stabilized construction roadway and re-grade and repair slopes.
- Periodically apply additional aggregate on gravel roads.
- Active dirt construction roads are commonly watered three or more times per day during the dry season.

Costs

Gravel construction roads are moderately expensive, but cost is often balanced by reductions in construction delay. No additional costs for dust control on construction roads should be required above that needed to meet local air quality requirements.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

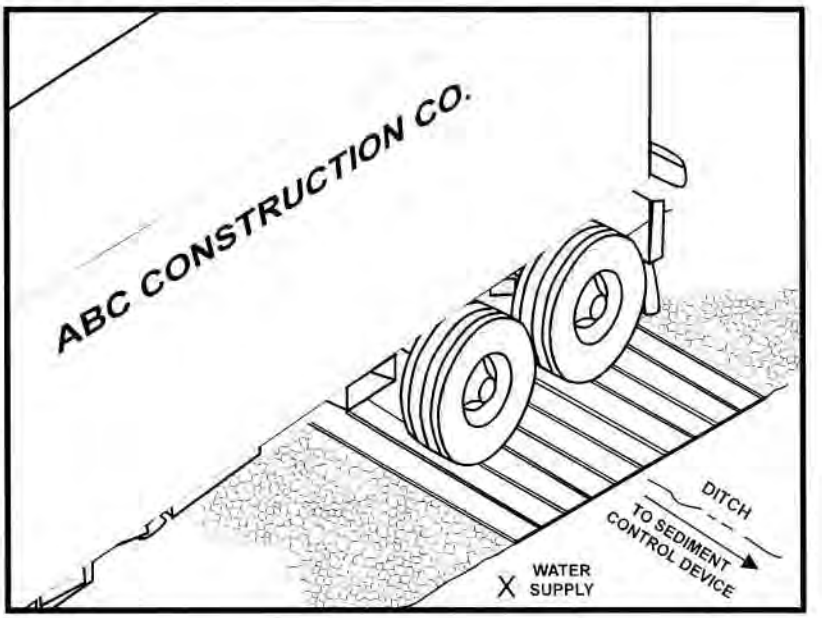
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Entrance/Outlet Tire Wash TC-3



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

TC-1 Stabilized Construction Entrance/Exit

Description and Purpose

A tire wash is an area located at stabilized construction access points to remove sediment from tires and under carriages and to prevent sediment from being transported onto public roadways.

Suitable Applications

Tire washes may be used on construction sites where dirt and mud tracking onto public roads by construction vehicles may occur.

Limitations

- The tire wash requires a supply of wash water.
- A turnout or doublewide exit is required to avoid having entering vehicles drive through the wash area.
- Do not use where wet tire trucks leaving the site leave the road dangerously slick.

Implementation

- Incorporate with a stabilized construction entrance/exit. See TC-1, Stabilized Construction Entrance/Exit.
- Construct on level ground when possible, on a pad of coarse aggregate greater than 3 in. but smaller than 6 in. A geotextile fabric should be placed below the aggregate.
- Wash rack should be designed and constructed/manufactured for anticipated traffic loads.

- Provide a drainage ditch that will convey the runoff from the wash area to a sediment trapping device. The drainage ditch should be of sufficient grade, width, and depth to carry the wash runoff.
- Use hoses with automatic shutoff nozzles to prevent hoses from being left on.
- Require that all employees, subcontractors, and others that leave the site with mud caked tires and undercarriages to use the wash facility.
- Implement SC-7, Street Sweeping and Vacuuming, as needed.

Costs

Costs are low for installation of wash rack.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Remove accumulated sediment in wash rack and/or sediment trap to maintain system performance.
- Inspect routinely for damage and repair as needed.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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SECTION A–A
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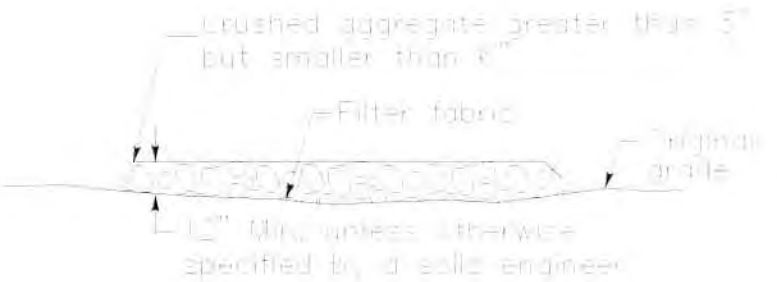

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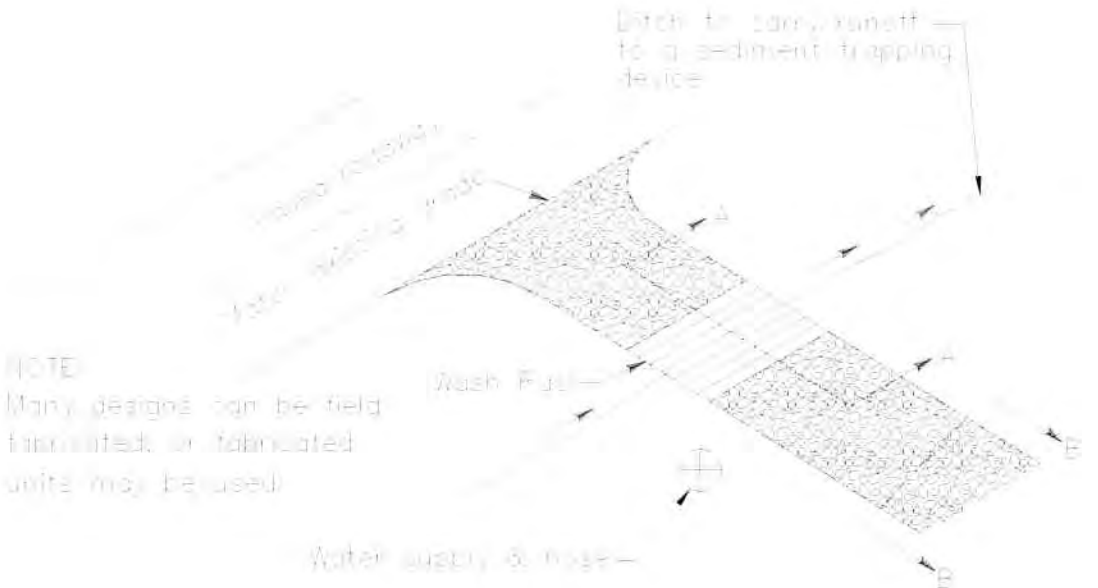
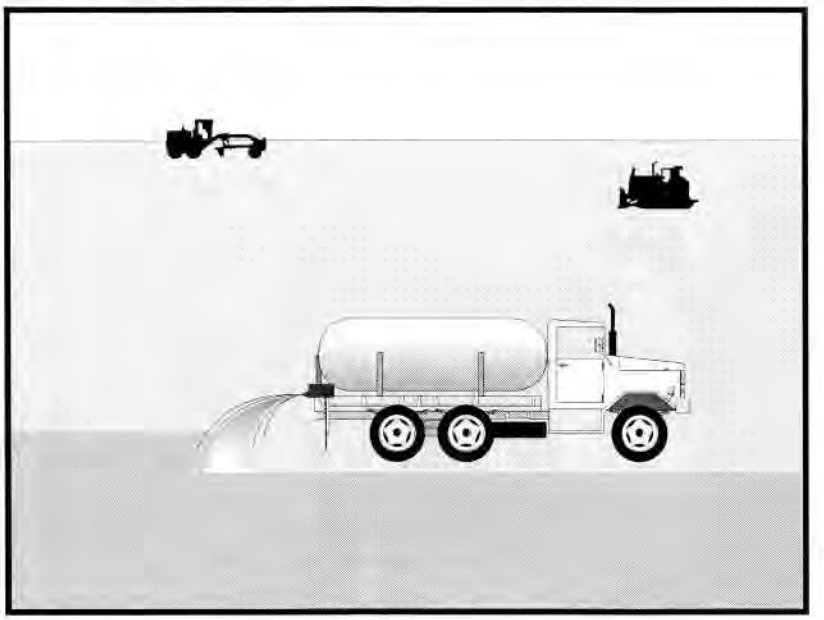


TYPICAL TIRE WASH
NOT TO SCALE

Wind Erosion Control WE-1



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	☑
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-5 Soil Binders

Description and Purpose

Wind erosion or dust control consists of applying water or other chemical dust suppressants as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

California's Mediterranean climate, with a short "wet" season and a typically long, hot "dry" season, allows the soils to thoroughly dry out. During the dry season, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment. Site conditions and climate can make dust control more of an erosion problem than water based erosion. Additionally, many local agencies, including Air Quality Management Districts, require dust control and/or dust control permits in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. Wind erosion control is required to be implemented at all construction sites greater than 1 acre by the General Permit.

Suitable Applications

Most BMPs that provide protection against water-based erosion will also protect against wind-based erosion and dust control requirements required by other agencies will generally meet wind erosion control requirements for water quality protection. Wind erosion control BMPs are suitable during the following construction activities:

- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

Limitations

- Watering prevents dust only for a short period (generally less than a few hours) and should be applied daily (or more often) to be effective.
- Over watering may cause erosion and track-out.
- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Chemical dust suppression agents may have potential environmental impacts. Selected chemical dust control agents should be environmentally benign.
- Effectiveness of controls depends on soil, temperature, humidity, wind velocity and traffic.
- Chemical dust suppression agents should not be used within 100 feet of wetlands or water bodies.
- Chemically treated subgrades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.
- If the soil surface has minimal natural moisture, the affected area may need to be pre-wetted so that chemical dust control agents can uniformly penetrate the soil surface.

Implementation

Dust Control Practices

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table presents dust control practices that can be applied to varying site conditions that could potentially cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph or less, and controlling the number and activity of vehicles on a site at any given time.

Chemical dust suppressants include: mulch and fiber based dust palliatives (e.g. paper mulch with gypsum binder), salts and brines (e.g. calcium chloride, magnesium chloride), non-petroleum based organics (e.g. vegetable oil, lignosulfonate), petroleum based organics (e.g. asphalt emulsion, dust oils, petroleum resins), synthetic polymers (e.g. polyvinyl acetate, vinyls, acrylic), clay additives (e.g. bentonite, montimorillonite) and electrochemical products (e.g. enzymes, ionic products).

Site Condition	Dust Control Practices							
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Temporary Gravel Construction Entrances/Equipment Wash Down	Synthetic Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	X	X	X	X	X			X
Disturbed Areas Subject to Traffic			X	X	X	X		X
Material Stockpiles		X	X	X			X	X
Demolition			X			X	X	
Clearing/ Excavation			X	X				X
Truck Traffic on Unpaved Roads			X	X	X	X	X	
Tracking					X	X		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (see EC-1, Scheduling).
- Quickly treat exposed soils using water, mulching, chemical dust suppressants, or stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Restrict construction traffic to stabilized roadways within the project site, as practicable.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.
- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality

Control Board (RWQCB) requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."

- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and wheel wash areas.
- Stabilize inactive areas of construction sites using temporary vegetation or chemical stabilization methods.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater and should meet all applicable regulatory requirements.

Costs

Installation costs for water and chemical dust suppression vary based on the method used and the length of effectiveness. Annual costs may be high since some of these measures are effective for only a few hours to a few days.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check areas protected to ensure coverage.
- Most water-based dust control measures require frequent application, often daily or even multiple times per day. Obtain vendor or independent information on longevity of chemical dust suppressants.

References

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

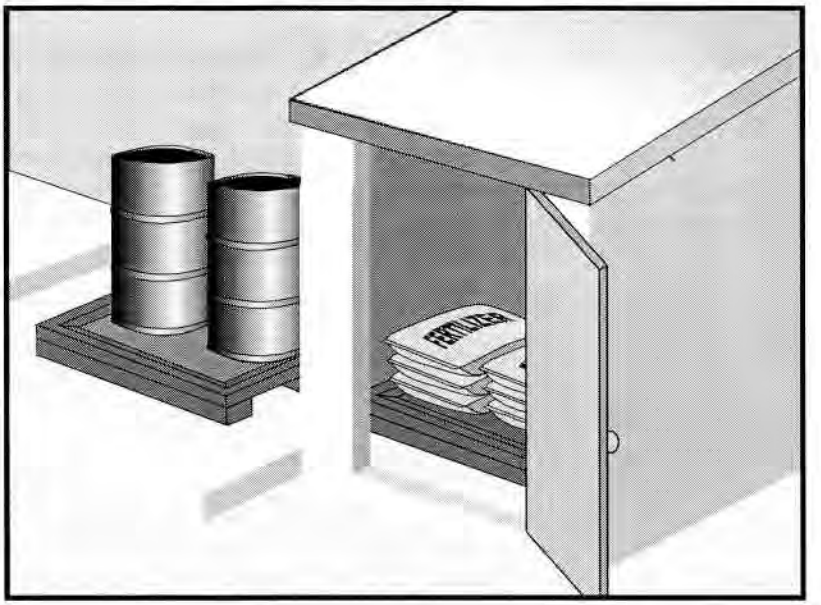
California Air Pollution Control Laws, California Air Resources Board, updated annually.

Construction Manual, Chapter 4, Section 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative", California Department of Transportation (Caltrans), July 2001.

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Material Delivery and Storage WM-1



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in watertight containers and/or a completely enclosed designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see WM-2, Material Use, or WM-4, Spill Prevention and Control. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Soil stabilizers and binders
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease

- Asphalt and concrete components
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations

- Space limitation may preclude indoor storage.
- Storage sheds often must meet building and fire code requirements.

Implementation

The following steps should be taken to minimize risk:

- Chemicals must be stored in water tight containers with appropriate secondary containment or in a storage shed.
- When a material storage area is located on bare soil, the area should be lined and bermed.
- Use containment pallets or other practical and available solutions, such as storing materials within newly constructed buildings or garages, to meet material storage requirements.
- Stack erodible landscape material on pallets and cover when not in use.
- Contain all fertilizers and other landscape materials when not in use.
- Temporary storage areas should be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) should be available on-site for all materials stored that have the potential to effect water quality.
- Construction site areas should be designated for material delivery and storage.
- Material delivery and storage areas should be located away from waterways, if possible.
  - Avoid transport near drainage paths or waterways.
  - Surround with earth berms or other appropriate containment BMP. See EC-9, Earth Dikes and Drainage Swales.
  - Place in an area that will be paved.
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.
- An up to date inventory of materials delivered and stored onsite should be kept.

- Hazardous materials storage onsite should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- Keep ample spill cleanup supplies appropriate for the materials being stored. Ensure that cleanup supplies are in a conspicuous, labeled area.
- Employees and subcontractors should be trained on the proper material delivery and storage practices.
- Employees trained in emergency spill cleanup procedures must be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose of materials and any contaminated soil. See WM-7, Contaminated Soil Management. If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 should be stored in approved containers and drums and should not be overfilled. Containers and drums should be placed in temporary containment facilities for storage.
- A temporary containment facility should provide for a spill containment volume able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility should be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be collected and placed into drums. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids should be sent to an approved disposal site.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Materials should be covered prior to, and during rain events.
- Materials should be stored in their original containers and the original product labels should be maintained in place in a legible condition. Damaged or otherwise illegible labels should be replaced immediately.

- Bagged and boxed materials should be stored on pallets and should not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials should be covered during non-working days and prior to and during rain events.
- Stockpiles should be protected in accordance with WM-3, Stockpile Management.
- Materials should be stored indoors within existing structures or completely enclosed storage sheds when available.
- Proper storage instructions should be posted at all times in an open and conspicuous location.
- An ample supply of appropriate spill clean up material should be kept near storage areas.
- Also see WM-6, Hazardous Waste Management, for storing of hazardous wastes.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored onsite.
- Arrange for employees trained in emergency spill cleanup procedures to be present when dangerous materials or liquid chemicals are unloaded.

Spill Cleanup

- Contain and clean up any spill immediately.
- Properly remove and dispose of any hazardous materials or contaminated soil if significant residual materials remain on the ground after construction is complete. See WM-7, Contaminated Soil Management.
- See WM-4, Spill Prevention and Control, for spills of chemicals and/or hazardous materials.
- If spills or leaks of materials occur that are not contained and could discharge to surface waters, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

Cost

- The largest cost of implementation may be in the construction of a materials storage area that is covered and provides secondary containment.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Keep storage areas clean and well organized, including a current list of all materials onsite.
- Inspect labels on containers for legibility and accuracy.

- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

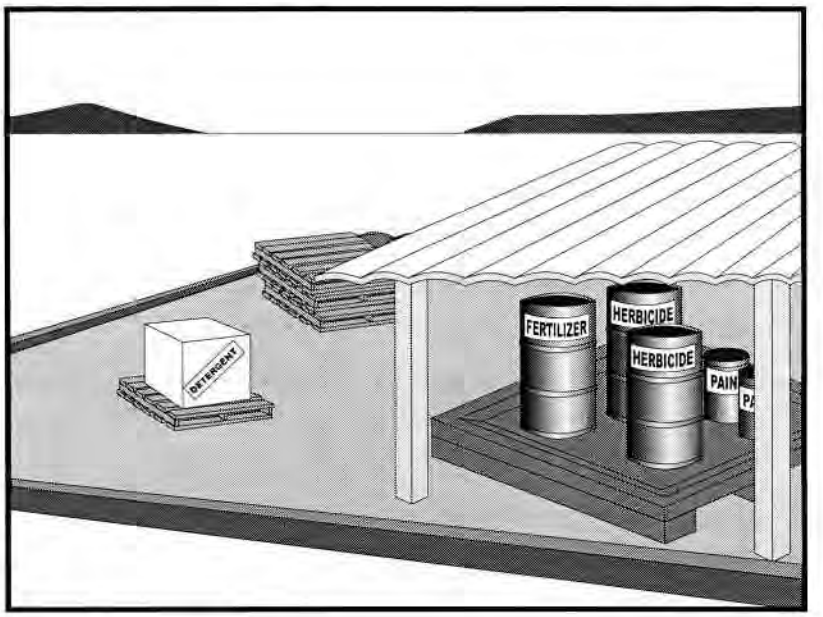
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Material Use

WM-2



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use onsite, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for use at all construction projects. These procedures apply when the following materials are used or prepared onsite:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Other hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Other materials that may be detrimental if released to the environment

Limitations

Safer alternative building and construction products may not be available or suitable in every instance.

Implementation

The following steps should be taken to minimize risk:

- Minimize use of hazardous materials onsite.
- Follow manufacturer instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.
- Train personnel who use pesticides. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct onsite inspections.
- The preferred method of termiticide application is soil injection near the existing or proposed structure foundation/slab; however, if not feasible, soil drench application of termiticides should follow EPA label guidelines and the following recommendations (most of which are applicable to most pesticide applications):
  - Do not treat soil that is water-saturated or frozen.
  - Application shall not commence within 24-hours of a predicted precipitation event with a 40% or greater probability. Weather tracking must be performed on a daily basis prior to termiticide application and during the period of termiticide application.
  - Do not allow treatment chemicals to runoff from the target area. Apply proper quantity to prevent excess runoff. Provide containment for and divert stormwater from application areas using berms or diversion ditches during application.
  - Dry season: Do not apply within 10 feet of storm drains. Do not apply within 25 feet of aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds).
  - Wet season: Do not apply within 50 feet of storm drains or aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds) unless a vegetative buffer is present (if so, refer to dry season requirements).
  - Do not make on-grade applications when sustained wind speeds are above 10 mph (at application site) at nozzle end height.
  - Cover treatment site prior to a rain event in order to prevent run-off of the pesticide into non-target areas. The treated area should be limited to a size that can be backfilled and/or covered by the end of the work shift. Backfilling or covering of the treated area shall be done by the end of the same work shift in which the application is made.
  - The applicator must either cover the soil him/herself or provide written notification of the above requirement to the contractor on site and to the person commissioning the

application (if different than the contractor). If notice is provided to the contractor or the person commissioning the application, then they are responsible under the Federal Insecticide Fungicide, and Rodenticide Act (FIFRA) to ensure that: 1) if the concrete slab cannot be poured over the treated soil within 24 hours of application, the treated soil is covered with a waterproof covering (such as polyethylene sheeting), and 2) the treated soil is covered if precipitation is predicted to occur before the concrete slab is scheduled to be poured.

- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydraulic application. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried offsite by runoff. Do not apply these chemicals before predicted rainfall.
- Train employees and subcontractors in proper material use.
- Supply Material Safety Data Sheets (MSDS) for all materials.
- Dispose of latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, with other construction debris.
- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.
- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled, as hazardous waste.
- For water-based paint, clean brushes to the extent practicable, and rinse to a drain leading to a sanitary sewer where permitted, or contain for proper disposal off site. For oil-based paints, clean brushes to the extent practicable, and filter and reuse thinners and solvents.
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.
- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials onsite when practical.
- Document the location, time, chemicals applied, and applicator's name and qualifications.
- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.
- Discontinue use of erodible landscape material within 2 days prior to a forecasted rain event and materials should be covered and/or bermed.

- Provide containment for material use areas such as masons' areas or paint mixing/preparation areas to prevent materials/pollutants from entering stormwater.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Ensure employees and subcontractors throughout the job are using appropriate practices.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

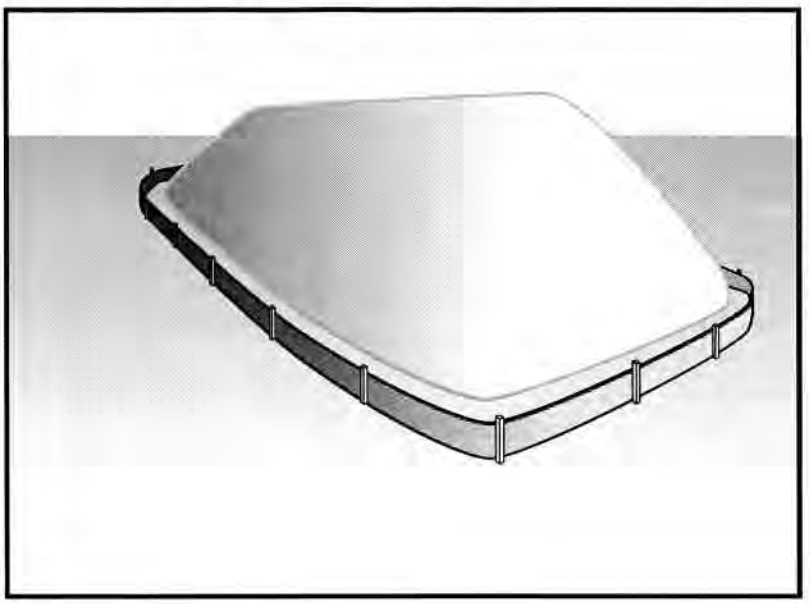
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Comments on Risk Assessments Risk Reduction Options for Cypermethrin: Docket No. OPP–2005–0293; California Stormwater Quality Association (CASQA) letter to USEPA, 2006.Environmental Hazard and General Labeling for Pyrethroid Non-Agricultural Outdoor Products, EPA-HQ-OPP-2008-0331-0021; USEPA, 2008.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Stockpile Management WM-3



Categories		
EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Stockpile management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, soil amendments, sand, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.

Suitable Applications

Implement in all projects that stockpile soil and other loose materials.

Limitations

- Plastic sheeting as a stockpile protection is temporary and hard to manage in windy conditions. Where plastic is used, consider use of plastic tarps with nylon reinforcement which may be more durable than standard sheeting.
- Plastic sheeting can increase runoff volume due to lack of infiltration and potentially cause perimeter control failure.
- Plastic sheeting breaks down faster in sunlight.
- The use of Plastic materials and photodegradable plastics should be avoided.

Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

- On larger sites, a minimum of 50 ft separation from concentrated flows of stormwater, drainage courses, and inlets is recommended.
- All stockpiles are required to be protected immediately if they are not scheduled to be used within 14 days.
- Protect all stockpiles from stormwater runon using temporary perimeter sediment barriers such as compost berms (SE-13), temporary silt dikes (SE-12), fiber rolls (SE-5), silt fences (SE-1), sandbags (SE-8), gravel bags (SE-6), or biofilter bags (SE-14). Refer to the individual fact sheet for each of these controls for installation information.
- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1, Wind Erosion Control.
- Manage stockpiles of contaminated soil in accordance with WM-7, Contaminated Soil Management.
- Place bagged materials on pallets and under cover.
- Ensure that stockpile coverings are installed securely to protect from wind and rain.
- Some plastic covers withstand weather and sunlight better than others. Select cover materials or methods based on anticipated duration of use.

Protection of Non-Active Stockpiles

Non-active stockpiles of the identified materials should be protected further as follows:

Soil stockpiles

- Soil stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- Temporary vegetation should be considered for topsoil piles that will be stockpiled for extended periods.

Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub base

- Stockpiles should be covered and protected with a temporary perimeter sediment barrier at all times.

Stockpiles of "cold mix"

- Cold mix stockpiles should be placed on and covered with plastic sheeting or comparable material at all times and surrounded by a berm.

Stockpiles of fly ash, stucco, hydrated lime

- Stockpiles of materials that may raise the pH of runoff (i.e., basic materials) should be covered with plastic and surrounded by a berm.

Stockpiles/Storage of wood (Pressure treated with chromated copper arsenate or ammoniacal copper zinc arsenate

- Treated wood should be covered with plastic sheeting or comparable material at all times and surrounded by a berm.

Protection of Active Stockpiles

Active stockpiles of the identified materials should be protected as follows:

- All stockpiles should be covered and protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of "cold mix" and treated wood, and basic materials should be placed on and covered with plastic sheeting or comparable material and surrounded by a berm prior to the onset of precipitation.
- The downstream perimeter of an active stockpile should be protected with a linear sediment barrier or berm and runoff should be diverted around or away from the stockpile on the upstream perimeter.

Costs

For cost information associated with stockpile protection refer to the individual erosion or sediment control BMP fact sheet considered for implementation (For example, refer to SE-1 Silt Fence for installation of silt fence around the perimeter of a stockpile.)

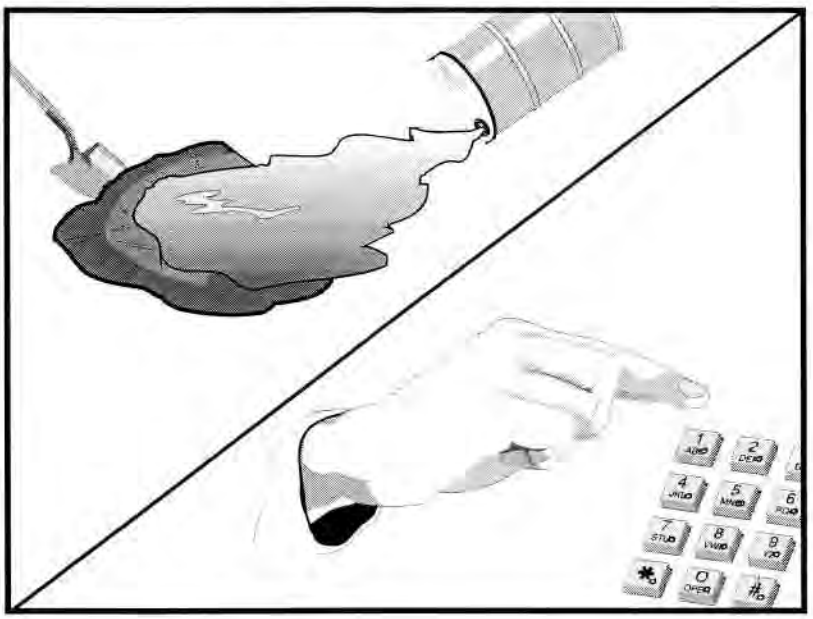
Inspection and Maintenance

- Stockpiles must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- It may be necessary to inspect stockpiles covered with plastic sheeting more frequently during certain conditions (for example, high winds or extreme heat).
- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.
- Sediment shall be removed when it reaches one-third of the barrier height.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Spill Prevention and Control WM-4



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1, Materials Delivery and Storage, and WM-2, Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals

- Fuels
- Lubricants
- Other petroleum distillates

Limitations

- In some cases it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite

Implementation

The following steps will help reduce the stormwater impacts of leaks and spills:

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runon during rainfall to the extent that it doesn't compromise clean up activities.
- Do not bury or wash spills with water.

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
  - Contain the spread of the spill.
  - Recover spilled materials.
  - Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

- Spills should be cleaned up immediately:
  - Contain spread of the spill.
  - Notify the project foreman immediately.
  - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
  - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
  - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
  - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
  - Notify the Governor's Office of Emergency Services Warning Center, (916) 845-8911.
  - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
  - Notification should first be made by telephone and followed up with a written report.
  - The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
  - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

Costs

Prevention of leaks and spills is inexpensive. Treatment and/ or disposal of contaminated soil or water can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

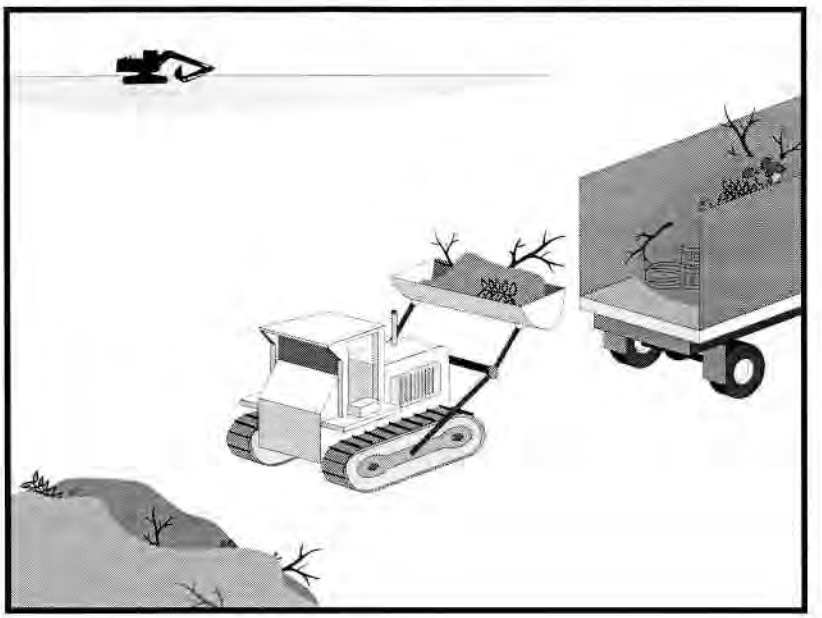
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Solid Waste Management WM-5



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Solid waste management procedures and practices are designed to prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for construction sites where the following wastes are generated or stored:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
- Packaging materials including wood, paper, and plastic
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces and masonry products
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials
- Highway planting wastes, including vegetative material,

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CALIFORNIA STORMWATER

plant containers, and packaging materials

Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Implementation

The following steps will help keep a clean site and reduce stormwater pollution:

- Select designated waste collection areas onsite.
- Inform trash-hauling contractors that you will accept only watertight dumpsters for onsite use. Inspect dumpsters for leaks and repair any dumpster that is not watertight.
- Locate containers in a covered area or in a secondary containment.
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy.
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Collect site trash daily, especially during rainy and windy conditions.
- Remove this solid waste promptly since erosion and sediment control devices tend to collect litter.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling contractor.
- Arrange for regular waste collection before containers overflow.
- Clean up immediately if a container does spill.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.

Education

- Have the contractor's superintendent or representative oversee and enforce proper solid waste management procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Minimize production of solid waste materials wherever possible.

Collection, Storage, and Disposal

- Littering on the project site should be prohibited.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.
- Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters at least weekly, regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.
- Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project.
- Full dumpsters should be removed from the project site and the contents should be disposed of by the trash hauling contractor.
- Construction debris and waste should be removed from the site biweekly or more frequently as needed.
- Construction material visible to the public should be stored or stacked in an orderly manner.
- Stormwater runon should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas should be located at least 50 ft from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters should be securely covered from wind and rain by covering the waste with tarps or plastic.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- For disposal of hazardous waste, see WM-6, Hazardous Waste Management. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.

- Salvage or recycle useful vegetation debris, packaging and surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Inspect construction waste area regularly.
- Arrange for regular waste collection.

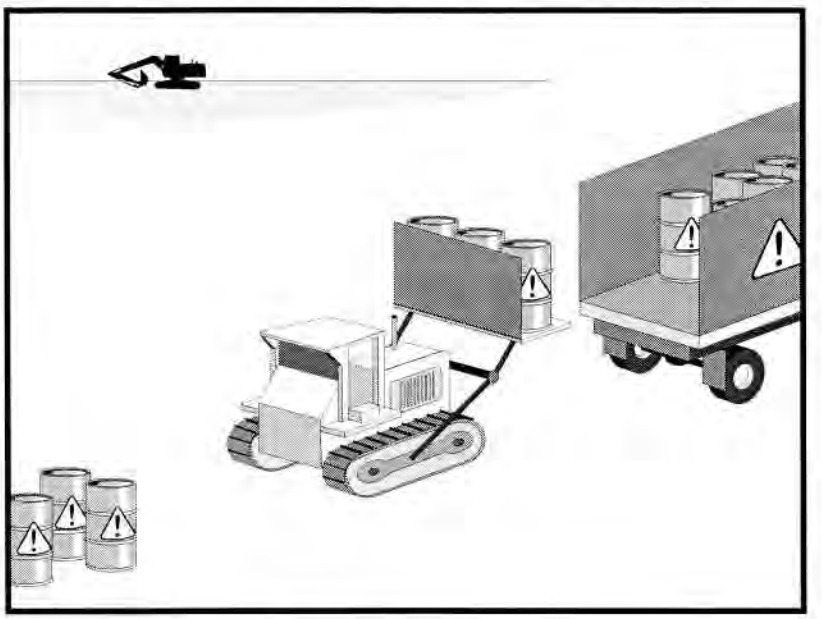
References

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Hazardous Waste Management WM-6



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Hazardous waste management practices are implemented on construction projects that generate waste from the use of:

- Petroleum Products
- Concrete Curing Compounds
- Palliatives
- Septic Wastes
- Stains
- Wood Preservatives
- Asphalt Products
- Pesticides
- Acids
- Paints
- Solvents
- Roofing Tar
- Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302

In addition, sites with existing structures may contain wastes, which must be disposed of in accordance with federal, state, and local regulations. These wastes include:

- Sandblasting grit mixed with lead-, cadmium-, or chromium-based paints
- Asbestos
- PCBs (particularly in older transformers)

Limitations

- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Nothing in this BMP relieves the contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.
- This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to WM-7, Contaminated Soil Management.

Implementation

The following steps will help reduce stormwater pollution from hazardous wastes:

Material Use

- Wastes should be stored in sealed containers constructed of a suitable material and should be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 172, 173, 178, and 179.
- All hazardous waste should be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.
- Waste containers should be stored in temporary containment facilities that should comply with the following requirements:
  - Temporary containment facility should provide for a spill containment volume equal to 1.5 times the volume of all containers able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest tank within its boundary, whichever is greater.
  - Temporary containment facility should be impervious to the materials stored there for a minimum contact time of 72 hours.
  - Temporary containment facilities should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be placed into drums after each rainfall. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids should be sent to an approved disposal site.
  - Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.

- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Throughout the rainy season, temporary containment facilities should be covered during non-working days, and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs.

- Drums should not be overfilled and wastes should not be mixed.
- Unless watertight, containers of dry waste should be stored on pallets.
- Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to one large application. Allow time for infiltration and avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains. People applying pesticides must be certified in accordance with federal and state regulations.
- Paint brushes and equipment for water and oil based paints should be cleaned within a contained area and should not be allowed to contaminate site soils, watercourses, or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused should be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths should be disposed of as solid waste.
- Do not clean out brushes or rinse paint containers into the dirt, street, gutter, storm drain, or stream. "Paint out" brushes as much as possible. Rinse water-based paints to the sanitary sewer. Filter and reuse thinners and solvents. Dispose of excess oil-based paints and sludge as hazardous waste.
- The following actions should be taken with respect to temporary contaminant:
  - Ensure that adequate hazardous waste storage volume is available.
  - Ensure that hazardous waste collection containers are conveniently located.
  - Designate hazardous waste storage areas onsite away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.
  - Minimize production or generation of hazardous materials and hazardous waste on the job site.
  - Use containment berms in fueling and maintenance areas and where the potential for spills is high.
  - Segregate potentially hazardous waste from non-hazardous construction site debris.
  - Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.

- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.
- Place hazardous waste containers in secondary containment.
- Do not allow potentially hazardous waste materials to accumulate on the ground.
- Do not mix wastes.
- Use all of the product before disposing of the container.
- Do not remove the original product label; it contains important safety and disposal information.

Waste Recycling Disposal

- Select designated hazardous waste collection areas onsite.
- Hazardous materials and wastes should be stored in covered containers and protected from vandalism.
- Place hazardous waste containers in secondary containment.
- Do not mix wastes, this can cause chemical reactions, making recycling impossible and complicating disposal.
- Recycle any useful materials such as used oil or water-based paint.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Arrange for regular waste collection before containers overflow.
- Make sure that hazardous waste (e.g., excess oil-based paint and sludge) is collected, removed, and disposed of only at authorized disposal areas.

Disposal Procedures

- Waste should be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Hazardous Waste Manifest forms.
- A Department of Health Services certified laboratory should sample waste to determine the appropriate disposal facility.
- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.
- Attention is directed to "Hazardous Material", "Contaminated Material", and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.

Education

- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The contractor's superintendent or representative should oversee and enforce proper hazardous waste management procedures and practices.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Warning signs should be placed in areas recently treated with chemicals.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- If a container does spill, clean up immediately.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Hazardous waste should be regularly collected.
- A foreman or construction supervisor should monitor onsite hazardous waste storage and disposal procedures.
- Waste storage areas should be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.
- Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.
- Hazardous spills should be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.

- The National Response Center, at (800) 424-8802, should be notified of spills of federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302. Also notify the Governors Office of Emergency Services Warning Center at (916) 845-8911.
- A copy of the hazardous waste manifests should be provided.

References

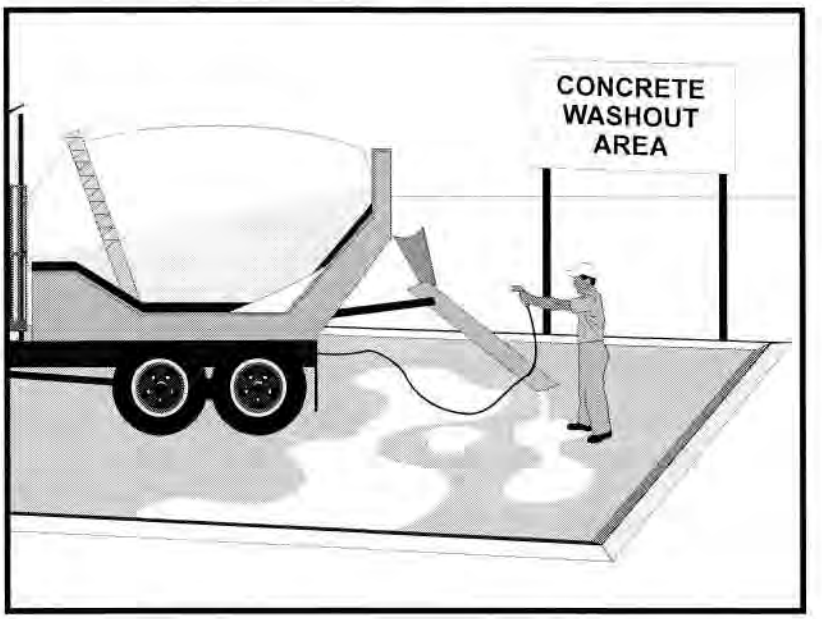
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Concrete Waste Management WM-8



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Prevent the discharge of pollutants to stormwater from concrete waste by conducting washout onsite or offsite in a designated area, and by employee and subcontractor training.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials, including mortar, concrete, stucco, cement and block and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows and raising pH to levels outside the accepted range.

Suitable Applications

Concrete waste management procedures and practices are implemented on construction projects where:

- Concrete is used as a construction material or where concrete dust and debris result from demolition activities.
- Slurries containing portland cement concrete (PCC) are generated, such as from saw cutting, coring, grinding, grooving, and hydro-concrete demolition.

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- Concrete trucks and other concrete-coated equipment are washed onsite.
- Mortar-mixing stations exist.
- Stucco mixing and spraying .
- See also NS-8, Vehicle and Equipment Cleaning.

Limitations

- Offsite washout of concrete wastes may not always be possible.
- Multiple washouts may be needed to assure adequate capacity and to allow for evaporation.

Implementation

The following steps will help reduce stormwater pollution from concrete wastes:

- Incorporate requirements for concrete waste management into material supplier and subcontractor agreements.
- Store dry and wet materials under cover, away from drainage areas. Refer to WM-1, Material Delivery and Storage for more information.
- Avoid mixing excess amounts of concrete.
- Perform washout of concrete trucks in designated areas only, where washout will not reach stormwater.
- Do not wash out concrete trucks into storm drains, open ditches, streets, streams or onto the ground. Trucks should always be washed out into designated facilities.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- For onsite washout:
  - On larger sites, it is recommended to locate washout areas at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste.
  - Washout wastes into the temporary washout where the concrete can set, be broken up, and then disposed properly.
  - Washout should be lined so there is no discharge into the underlying soil.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose in the trash.
- See typical concrete washout installation details at the end of this fact sheet.

Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.

- Arrange for contractor's superintendent or representative to oversee and enforce concrete waste management procedures.
- Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.

Concrete Demolition Wastes

- Stockpile concrete demolition waste in accordance with BMP WM-3, Stockpile Management.
- Dispose of or recycle hardened concrete waste in accordance with applicable federal, state or local regulations.

Concrete Slurry Wastes

- PCC and AC waste should not be allowed to enter storm drains or watercourses.
- PCC and AC waste should be collected and disposed of or placed in a temporary concrete washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below).
- A foreman or construction supervisor should monitor onsite concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.
- Saw-cut concrete slurry should not be allowed to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine or by sweeping. Saw cutting residue should not be allowed to flow across the pavement and should not be left on the surface of the pavement. See also NS-3, Paving and Grinding Operations; and WM-10, Liquid Waste Management.
- Concrete slurry residue should be disposed in a temporary washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below) and allowed to dry. Dispose of dry slurry residue in accordance with WM-5, Solid Waste Management.

Onsite Temporary Concrete Washout Facility, Transit Truck Washout Procedures

- Temporary concrete washout facilities should be located a minimum of 50 ft from storm drain inlets, open drainage facilities, and watercourses. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking.
- A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.
- Temporary concrete washout facilities should be constructed above grade or below grade at the option of the contractor. Temporary concrete washout facilities should be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

- Temporary washout facilities should have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.
- Temporary washout facilities should be lined to prevent discharge to the underlying ground or surrounding area.
- Washout of concrete trucks should be performed in designated areas only.
- Only concrete from mixer truck chutes should be washed into concrete wash out.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed of or recycled offsite.
- Once concrete wastes are washed into the designated area and allowed to harden, the concrete should be broken up, removed, and disposed of per WM-5, Solid Waste Management. Dispose of or recycle hardened concrete on a regular basis.
- Temporary Concrete Washout Facility (Type Above Grade)
  - Temporary concrete washout facility (type above grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft; however, smaller sites or jobs may only need a smaller washout facility. With any washout, always maintain a sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
  - Materials used to construct the washout area should conform to the provisions detailed in their respective BMPs (e.g., SE-8 Sandbag Barrier).
  - Plastic lining material should be a minimum of 10 mil in polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
  - Alternatively, portable removable containers can be used as above grade concrete washouts. Also called a "roll-off"; this concrete washout facility should be properly sealed to prevent leakage, and should be removed from the site and replaced when the container reaches 75% capacity.
- Temporary Concrete Washout Facility (Type Below Grade)
  - Temporary concrete washout facilities (type below grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft. The quantity and volume should be sufficient to contain all liquid and concrete waste generated by washout operations.
  - Lath and flagging should be commercial type.
  - Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

- The base of a washout facility should be free of rock or debris that may damage a plastic liner.

Removal of Temporary Concrete Washout Facilities

- When temporary concrete washout facilities are no longer required for the work, the hardened concrete should be removed and properly disposed or recycled in accordance with federal, state or local regulations. Materials used to construct temporary concrete washout facilities should be removed from the site of the work and properly disposed or recycled in accordance with federal, state or local regulations..

- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities should be backfilled and repaired.

Costs

All of the above are low cost measures. Roll-off concrete washout facilities can be more costly than other measures due to removal and replacement; however, provide a cleaner alternative to traditional washouts. The type of washout facility, size, and availability of materials will determine the cost of the washout.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Temporary concrete washout facilities should be maintained to provide adequate holding capacity with a minimum freeboard of 4 in. for above grade facilities and 12 in. for below grade facilities. Maintaining temporary concrete washout facilities should include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials should be removed and properly disposed or recycled in accordance with federal, state or local regulations.

- Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.

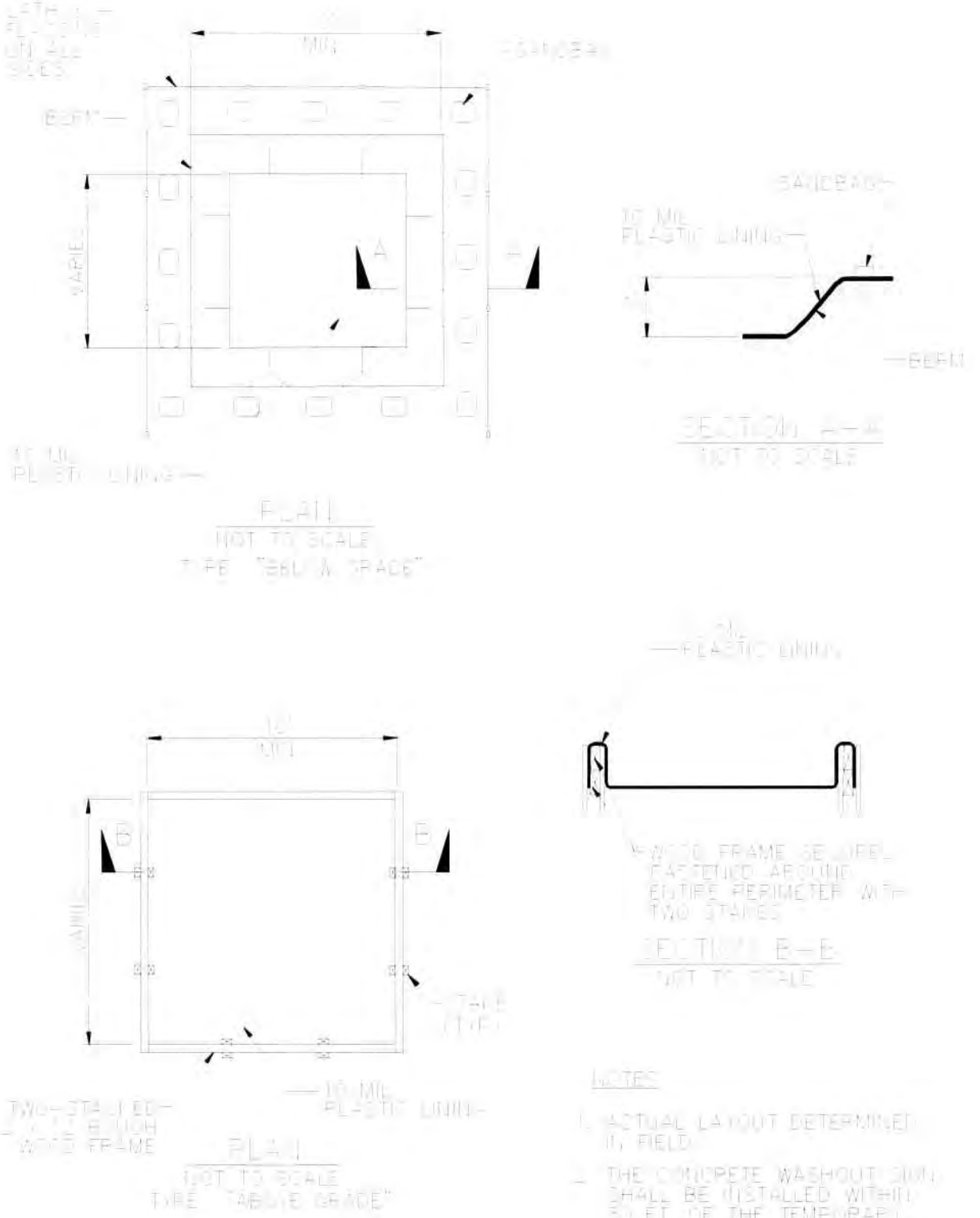
- Inspect washout facilities for damage (e.g. torn liner, evidence of leaks, signage, etc.). Repair all identified damage.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000, Updated March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.


MIN
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TYPE "ABOVE GRADE"
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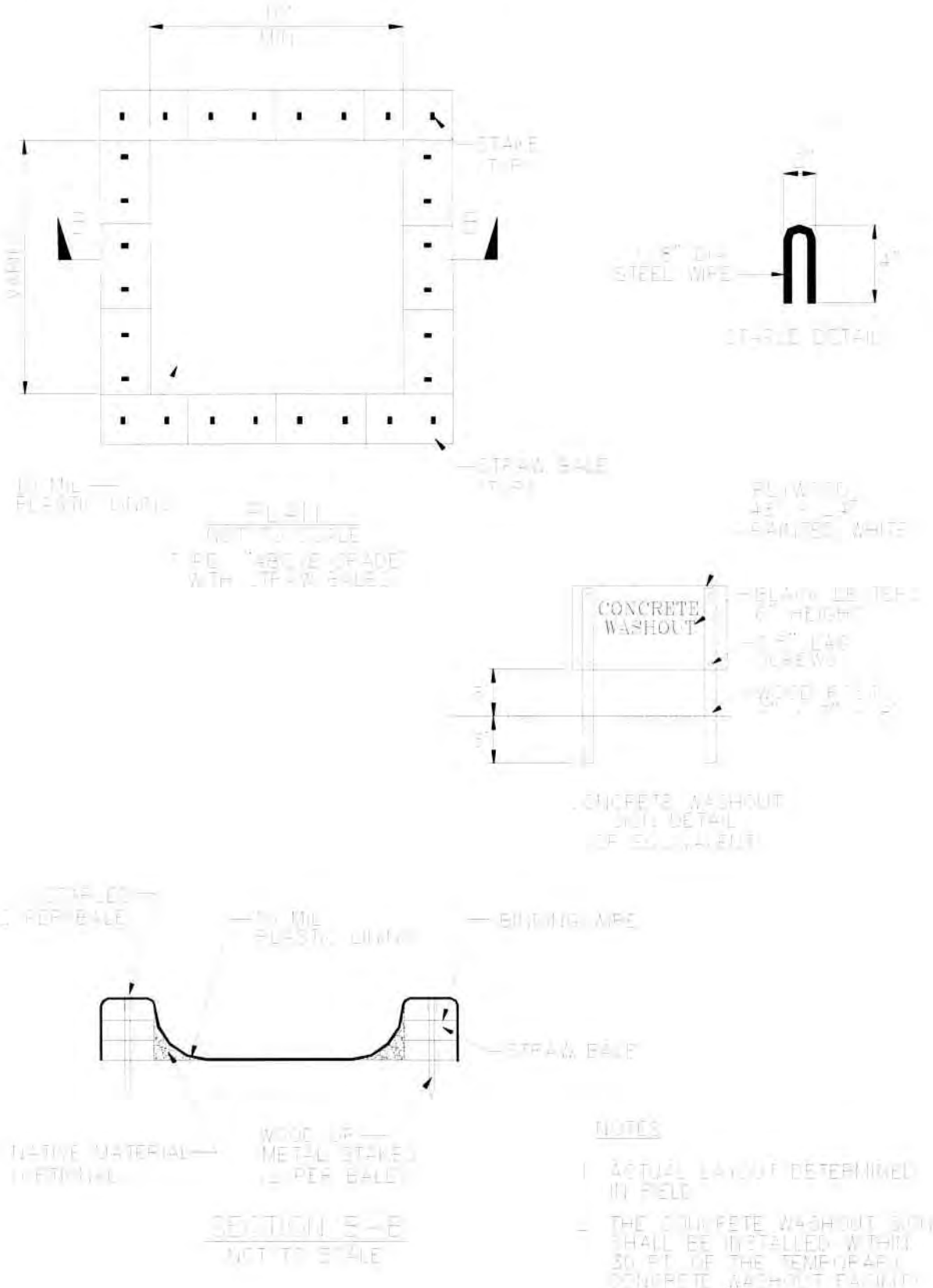
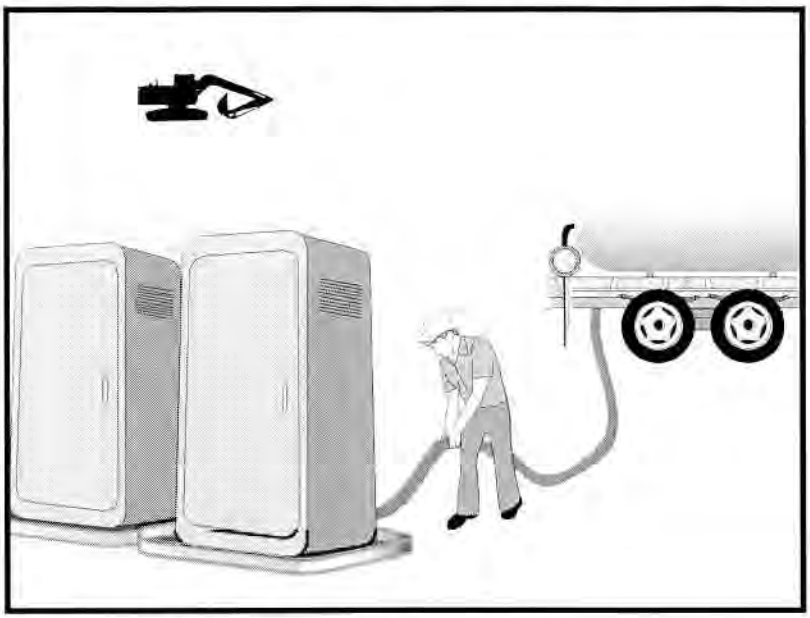
SECTION A-A
NOT TO SCALE
PLASTIC LINING
WOOD FRAME SECURELY
FASTENED AROUND
ENTIRE PERIMETER WITH
TWO STAPLES
SECTION B-B
NOT TO SCALE
B
B
10 MIL
PLASTIC LINING
TWO-STAPLED
WOOD FRAME
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"
NOTES
1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 50 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.


CONCRETE WASHOUT

Sanitary/Septic Waste Management WM-9



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
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WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents	
Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	☑
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

Limitations

None identified.

Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and from traffic circulation. If site conditions allow, place portable facilities a minimum of 50 feet from drainage conveyances and traffic areas. When subjected to high winds or risk of high winds, temporary sanitary facilities should be secured to prevent overturning.

- Temporary sanitary facilities must be equipped with containment to prevent discharge of pollutants to the stormwater drainage system of the receiving water.
- Consider safety as well as environmental implications before placing temporary sanitary facilities.
- Wastewater should not be discharged or buried within the project site.
- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the local health agency, city, county, and sewer district requirements.
- Only reputable, licensed sanitary and septic waste haulers should be used.
- Sanitary facilities should be located in a convenient location.
- Temporary septic systems should treat wastes to appropriate levels before discharging.
- If using an onsite disposal system (OSDS), such as a septic system, local health agency requirements must be followed.
- Temporary sanitary facilities that discharge to the sanitary sewer system should be properly connected to avoid illicit discharges.
- Sanitary and septic facilities should be maintained in good working order by a licensed service.
- Regular waste collection by a licensed hauler should be arranged before facilities overflow.
- If a spill does occur from a temporary sanitary facility, follow federal, state and local regulations for containment and clean-up.

Education

- Educate employees, subcontractors, and suppliers on sanitary and septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary and septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary and septic waste.
- Hold regular meetings to discuss and reinforce the use of sanitary facilities (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Costs

All of the above are low cost measures.

Inspection and Maintenance

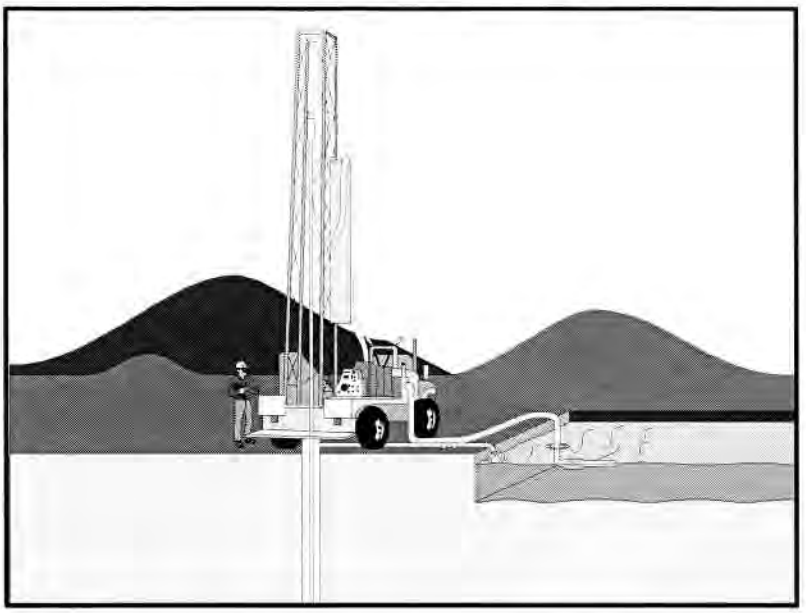
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange for regular waste collection.
- If high winds are expected, portable sanitary facilities must be secured with spikes or weighed down to prevent over turning.
- If spills or leaks from sanitary or septic facilities occur that are not contained and discharge from the site, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Liquid Waste Management WM-10



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WE	Wind Erosion Control	
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WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Liquid waste management includes procedures and practices to prevent discharge of pollutants to the storm drain system or to watercourses as a result of the creation, collection, and disposal of non-hazardous liquid wastes.

Suitable Applications

Liquid waste management is applicable to construction projects that generate any of the following non-hazardous by-products, residuals, or wastes:

- Drilling slurries and drilling fluids
- Grease-free and oil-free wastewater and rinse water
- Dredgings
- Other non-stormwater liquid discharges not permitted by separate permits

Limitations

- Disposal of some liquid wastes may be subject to specific laws and regulations or to requirements of other permits secured for the construction project (e.g., NPDES permits, Army Corps permits, Coastal Commission permits, etc.).
- Liquid waste management does not apply to dewatering operations (NS-2 Dewatering Operations), solid waste management (WM-5, Solid Waste Management), hazardous wastes (WM-6, Hazardous Waste Management), or concrete slurry residue (WM-8, Concrete Waste

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Management).

- Typical permitted non-stormwater discharges can include: water line flushing; landscape irrigation; diverted stream flows; rising ground waters; uncontaminated pumped ground water; discharges from potable water sources; foundation drains; irrigation water; springs; water from crawl space pumps; footing drains; lawn watering; flows from riparian habitats and wetlands; and discharges or flows from emergency fire fighting activities.

Implementation

General Practices

- Instruct employees and subcontractors how to safely differentiate between non-hazardous liquid waste and potential or known hazardous liquid waste.
- Instruct employees, subcontractors, and suppliers that it is unacceptable for any liquid waste to enter any storm drainage device, waterway, or receiving water.
- Educate employees and subcontractors on liquid waste generating activities and liquid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Verify which non-stormwater discharges are permitted by the statewide NPDES permit; different regions might have different requirements not outlined in this permit.
- Apply NS-8, Vehicle and Equipment Cleaning for managing wash water and rinse water from vehicle and equipment cleaning operations.

Containing Liquid Wastes

- Drilling residue and drilling fluids should not be allowed to enter storm drains and watercourses and should be disposed of.
- If an appropriate location is available, drilling residue and drilling fluids that are exempt under Title 23, CCR § 2511(g) may be dried by infiltration and evaporation in a containment facility constructed in conformance with the provisions concerning the Temporary Concrete Washout Facilities detailed in WM-8, Concrete Waste Management.
- Liquid wastes generated as part of an operational procedure, such as water-laden dredged material and drilling mud, should be contained and not allowed to flow into drainage channels or receiving waters prior to treatment.
- Liquid wastes should be contained in a controlled area such as a holding pit, sediment basin, roll-off bin, or portable tank.
- Containment devices must be structurally sound and leak free.
- Containment devices must be of sufficient quantity or volume to completely contain the liquid wastes generated.

- Precautions should be taken to avoid spills or accidental releases of contained liquid wastes. Apply the education measures and spill response procedures outlined in WM-4, Spill Prevention and Control.

- Containment areas or devices should not be located where accidental release of the contained liquid can threaten health or safety or discharge to water bodies, channels, or storm drains.

Capturing Liquid Wastes

- Capture all liquid wastes that have the potential to affect the storm drainage system (such as wash water and rinse water from cleaning walls or pavement), before they run off a surface.

- Do not allow liquid wastes to flow or discharge uncontrolled. Use temporary dikes or berms to intercept flows and direct them to a containment area or device for capture.

- Use a sediment trap (SE-3, Sediment Trap) for capturing and treating sediment laden liquid waste or capture in a containment device and allow sediment to settle.

Disposing of Liquid Wastes

- A typical method to handle liquid waste is to dewater the contained liquid waste, using procedures such as described in NS-2, Dewatering Operations, and SE-2, Sediment Basin, and dispose of resulting solids per WM-5, Solid Waste Management.

- Methods of disposal for some liquid wastes may be prescribed in Water Quality Reports, NPDES permits, Environmental Impact Reports, 401 or 404 permits, and local agency discharge permits, etc. Review the SWPPP to see if disposal methods are identified.

- Liquid wastes, such as from dredged material, may require testing and certification whether it is hazardous or not before a disposal method can be determined.

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management.

- If necessary, further treat liquid wastes prior to disposal. Treatment may include, though is not limited to, sedimentation, filtration, and chemical neutralization.

Costs

Prevention costs for liquid waste management are minimal. Costs increase if cleanup or fines are involved.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Remove deposited solids in containment areas and capturing devices as needed and at the completion of the task. Dispose of any solids as described in WM-5, Solid Waste Management.
- Inspect containment areas and capturing devices and repair as needed.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Appendix I
Authorized Inspection Individuals

Authorized Inspection Individuals

The QSD (or designee) will maintain a list of authorized inspection individuals for the SWPPP (Appendix I), including the QSD and the QSP. Include a copy of all training certificates or other verification of training.

Date	Name	Phone Number	Date of Training	Name and Date of Training Certificate	Description of Role on Project

Name	Phone	Phone Number	Address	Emergency Contact Information (name and ph.)	Description of Work

Appendix J
Construction Site Inspection Report Forms

Risk Level 1, 2, 3
Visual Inspection Field Log Sheet

Date and Time of Inspection:	Report Date:

Inspection Type:	☐ Weekly	☐ Before predicted rain	☐ During rain event	☐ Following qualifying rain event	☐ Contained stormwater release	☐ Quarterly non-stormwater

Site Information

Construction Site Name:	
Construction stage and completed activities:	Approximate area of exposed site:

Weather and Observations

Date Rain Predicted to Occur:		Predicted % chance of rain:	
Estimate storm beginning: _____ (date and time)	Estimate storm duration:_____ (hours)	Estimate time since last storm: _____ (days or hours)	Rain gauge reading: _____ (inches)

Observations: If yes identify location		
Odors	Yes ☐	No ☐
Floating material	Yes ☐	No ☐
Suspended Material	Yes ☐	No ☐
Sheen	Yes ☐	No ☐
Discolorations	Yes ☐	No ☐
Turbidity	Yes ☐	No ☐

Site Inspections

Outfalls or BMPs Evaluated	Deficiencies Noted
(add additional sheets or attached detailed BMP Inspection Checklists)	

Photos Taken:	Yes ☐	No ☐	Photo Reference IDs:

Corrective Actions Identified (note if SWPPP/REAP change is needed)

Inspector Information

Inspector Name:	Inspector Title:
Signature:	Date:

Appendix K
Training Reporting Form

Training Reporting Form

Storm Water Management Training Log

Project Name: _____

Project Number/Location: _____

Storm Water Management Topic: (check as appropriate)

- ❑ Erosion Control
- ❑ Sediment Control
- ❑ Wind Erosion Control
- ❑ Tracking Control
- ❑ Non-storm water management
- ❑ Waste Management and Materials Pollution Control
- ❑ Storm Water Sampling

Specific Training Objective: _____

Location: _____ Date: _____

Instructor: _____ Telephone: _____

Course Length (hours): _____

Attendee Roster (attach additional forms if necessary)

Name	Company	Phone

Name	Company	Phone

COMMENTS:

Appendix L
Responsible Parties

Responsible Parties

Include in this Section:

Name of Approved Signatory or LRP (Legally Responsible Person)

Copy of the written agreement or other mechanism that provides this authority from the LRP.

Appendix M
Contractors and Subcontractors

Contractors and Subcontractors

The General Permit requires (Section VII.B.5) that the SWPPP include a list of names of all contractors, subcontractors, and individuals who will be directed by the QSP.

Contents of the list include telephone numbers, work addresses, and the specific areas of responsibility for each contractor, and emergency contact numbers. Section 6.2.

Name	Phone	Address	Emergency Contact Information (name and ph.)	Description of Work

Name	Phone	Address	Emergency Contact Information (name and ph.)	Description of Work

Appendix N
Construction Site Monitoring Program

Draft

Oakley Generation Station Project (09-AFC-4)

Construction Site Monitoring Program

Prepared for

February 2010

CH2MHILL
2485 Natomas Park Drive
Sacramento, California 95833

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Table

1 Potential Non-visible Pollutants Based on Common Construction Activities

Figure

1 CSMP Sampling and Observation Locations

Attachment

Field Log

Construction Site Monitoring Program
Oakley Generating Station

1.0 Purpose

The General Permit requires that all construction projects develop and implement a site-specific Construction Site Monitoring Plan prior to the commencement of construction activities, and be revised as necessary to reflect project revisions. The CSMP must be a part of the SWPPP. The CSMP must include the monitoring procedures and instructions, location maps, form, and checklists necessary to implement the visual and water quality monitoring for the site.

2.0 Applicability of Permit Requirements

The OGS CSMP is designed to meet the specific requirements and objectives identified in the General Permit for Risk Level 1 sites. These requirements are described in the following sections.

Each construction site must have a Qualified SWPPP Practitioner (QSP) to oversee the implementation of the CSMP including the BMP inspections, rain-event triggered inspections, and the collection of water quality samples. The QSP may delegate any or all of these activities to an employee trained to do the task(s) but the QSP must supervise the delegated tasks. Monitoring at the OGS site includes visual monitoring (inspections) and sampling and analysis.

2.1 Qualifying Storm Event

Any event that produces 0.5 inches or more precipitation with a 48 hour or greater period between rain events is considered a qualifying storm event.

3.0 Monitoring Locations

Figure 1 shows the locations of potential sampling and observation points within the Project Site. These locations are typically located in low-lying areas, upslope of the wetlands, yet down slope of potential areas that may discharge non-visible pollutants and sediment. Sampling of wetlands shall occur throughout the entire construction period. A sampling point located near the temporary bioswale in the laydown area is also delineated and will be monitored and sampled as required during construction activities. These locations will be verified in the field prior to sampling events and may change due to field conditions. Any changes will be documented in the Amendment Section of the SWPPP (Appendix C) and this CSMP. Sampling points along the linear utility line will be specified as site plans are developed.

4.0 Safety

If the construction site is safely accessible during inclement weather, the monitor shall list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-stormwater controls. If inclement weather presents a safety hazard, at a minimum, the inspector will list the results of visual inspections at all relevant outfalls, discharge points, downstream locations, and identify any projected post-rain event maintenance activities.

5.0 Visual Monitoring (Inspection)

All sites (Risk Levels 1, 2, and 3) are required to conduct visual monitoring (inspections). Visual monitoring includes inspections of BMPs, inspections before and after qualifying rain events, and inspection for non-stormwater discharges. Visual inspections are required for the duration of the project with the goal of confirming that appropriately selected BMPs have been implemented, are being maintained, and are effective in preventing potential pollutants from coming in contact with stormwater.

5.1 BMP Inspections

The General Permit requires that BMPs be inspected weekly and once each 24-hour period during extended storm events. The purpose of these inspections is to identify BMPs that need maintenance to operate effectively, have failed, or could fail to operate as intended. If deficiencies are identified during BMP inspections, repairs or design changes to BMPs must be initiated within 72 hours of identification and need to be completed as soon as possible.

All BMP inspections will be documented on the inspection checklist located in the Attachment. This form will be supplemented with the Construction Site Inspection Report Forms located in Appendix J of the SWPPP.

5.2 Qualifying Rain Event Inspections

The construction site will be inspected within two days prior to a predicted qualifying rain event is and within two days after a qualifying rain event. These inspections are only required during normal business hours of the construction site. The General Permit requires that dischargers only use weather forecasts from the National Oceanographic and Atmospheric Administration (NOAA). Pre-project inspections should be initiated after consulting NOAA for a qualifying rain event with 50 percent or greater probability of precipitation (PoP). These forecasts can be obtained at http://www.srh.noaa.gov/. Rain event records will be recorded in the Visual Inspection Field Log (see Attachment).

5.3 Pre-Rain Event Inspection

The purpose of the pre-rain event inspection is to make sure the site and the BMPs are ready for the predicted rain. The pre-rain event inspection includes the following information:

- All stormwater drainage areas to identify any spills, leaks, or uncontrolled pollutant sources
- All BMPs to identify whether they have been properly implemented per the SWPPP

- Stormwater storage and containment areas to detect leaks and ensure maintenance of adequate freeboard
- The presence or absence of floating and suspended materials, a sheen on the surface
- Discolorations, turbidity, odors, and source(s) of any observed pollutants within stored stormwater

5.4 Post-Rain Event Inspection

The purpose of the post-rain event inspection is to observe the discharge locations and the discharge of any stored or contained rainwater; determine if BMPs functioned as designed; and identify if any additional BMPs are required. The post-rain event inspection includes the following information:

- All stormwater discharge locations.
- The discharge of stored or contained stormwater that is derived from and discharged subsequent to a qualifying rain event.
- All BMPs to determine if they were adequately designed, implemented, and effective. After assessing BMPs it should be noted on the inspection form whether the BMPs need maintenance.

5.5 Non-Stormwater Discharges Inspections

The General Permit requires that construction sites, regardless of risk level, be inspected quarterly for the presence of non-stormwater discharges. Records must be kept of all inspections and must be maintained on site. Non-stormwater discharge inspections are only required during normal business hours of the construction site. The purpose of these inspections is to detect unauthorized non-stormwater discharges and observe authorized non-stormwater discharges. Quarterly inspections need to include each drainage area of the project and document the following information:

- Presence or indications of unauthorized and authorized non-stormwater discharges and their sources
- Pollutant characteristics of the non-stormwater discharge (floating and suspended)
- Material, sheen, discoloration, turbidity, odor, etc
- Personnel performing the observations
- Dates and approximate time each drainage area and non-stormwater discharge was observed
- Response taken to observations

Quarterly inspections will be recorded on the Visual Inspection Field Log Sheet located in the Attachment.

6.0 Water Quality Sampling and Analysis

Risk Level 1 projects are only required to collect water quality samples if there is a BMP breach, malfunction, leakage, or spill. Water quality samples will be taken for nonvisible pollutants that may have been discharged from the site.

6.1 Non-Visible Pollutants

Monitoring for pollutants not visually detectable is only required if those pollutants are determined to be potentially present in stormwater leaving the construction site; and is typically the result of a BMP failure or spill on the construction site. This determination is documented in the pollutant source assessment in the SWPPP.

Projects should attempt to eliminate the exposure of construction materials to prevent stormwater pollution and limit sampling and analysis requirements. It is important to note that covered construction materials or those that are in their final constructed form, do not need to be monitored. Materials that are stored exposed to precipitation and may generate runoff need to be considered for non-visible pollutant monitoring.

Non-visible pollutants may also exist on the project site as a result of the land use prior to the start of the construction activity and will be monitored for non-visible polluting. A significant soil characteristic concerning the proposed 20-acre laydown area is the presence of waste titanium dioxide. A portion of this area was historically used for disposal of titanium dioxide waste during manufacturing operations at the DuPont facilities. Titanium dioxide (TiO_2) is an inert mineral pigment primarily used in paints, paper, and plastics, and is produced by reacting the mineral rutile, removing impurities, and oxidizing to TiO_2, a very fine pure white powder (DuPont, 2003). During active manufacturing at the DuPont facility, the proposed laydown area was a TiO_2 landfill that was used for disposal of spent ore from the TiO_2 process after being acid-leached and settling in retention basins (DuPont, 2003). This material is estimated to be approximately 3 feet thick (DuPont, 2006); thus, soil material that is present in this area likely does not reflect characteristics of mapped soils. The fill material is not expected to present a human health or wildlife risk (DuPont, 2006).

6.2 Sample Collection and Handling

It is important to use the correct methods to collect and handle samples to ensure the samples are valid. While the handling requirements apply primarily to grab samples collected for laboratory analysis, field measurements can be affected by sample collection procedures.

The General Permit requires dischargers to designate and train personnel to collect, maintain, and ship water quality samples in accordance with the *Surface Water Ambient Monitoring Program (SWAMP) 2008 Quality Assurance Program Plan (QAPrP)*, which is available at http://www.swrcb.ca.gov/water_issues/programs/swamp/tools.shtml#qa.

Sampling methods, handling procedures, and locations should be identified in advance of the sampling event in order to provide sufficient time to gather the supplies and equipment necessary to sample and plan for safe access by the sampling crew(s).

Adherence to SWAMP sampling guidance and proper development of a sampling plan provides for consistent, reproducible, and accurate results. Design of the field sampling procedures should carefully consider contamination potential from sample location (e.g., sediment disturbances, equipment exhaust), sampling techniques, and sample handling.

The following "clean technique" approach and protocol will be used when sampling at the OGS site:

- Samples (for laboratory analysis) are collected only in analytical laboratory-provided sample containers
- Clean, powder-free nitrile gloves should be worn for collection of samples
- Gloves are changed whenever something not known to be clean has been touched
- Decontaminate all equipment (e.g. bucket, tubing) except laboratory provided sample containers, prior to sample collection using a trisodium phosphate (TSP)-soapy water wash, distilled water rinse, and final rinse with distilled water. (Dispose of wash and rinse water appropriately, i.e., do not discharge to storm drain or receiving water)
- To reduce potential contamination, sample collection personnel must adhere to the following rules while collecting samples:
  - No smoking
  - Never sample near a running vehicle
  - Do not park vehicles in the immediate sample collection area (even non-running vehicles)
  - Do not eat or drink during sample collection
  - Do not breathe, sneeze, or cough in the direction of an open sample container

Water quality samples should be collected in appropriate sample containers and be of adequate volume to conduct the required measurements or laboratory analyses. The most important aspect of grab sampling is to make sure that the sample best represents the entire runoff stream. Typically, samples are collected by dipping the collection container in the runoff flow paths and streams as noted below.

i. For small streams and flow paths, simply dip the bottle facing upstream until full.

ii. For larger stream that can be safely accessed, collect a sample in the middle of the flow stream by directly dipping the mouth of the bottle. Once again making sure that the opening of the bottle is facing upstream as to avoid any contamination by the sampler.

iii. Avoid collecting samples from ponded, sluggish or stagnant water.

All samples must be maintained between 0-6 degrees Celsius during delivery to the laboratory. Samples must be kept on ice, or refrigerated, from sample collection through delivery to the laboratory. Shipped samples should be placed inside coolers with ice. Make sure the sample bottles are well packaged to prevent breakage and secure cooler lids with packaging tape. Ship samples that will be laboratory analyzed to the analytical laboratory right away. Many analytical methods have short hold-times before which the analysis must be started. Hold times are measured from the time the sample is collected to the time the

sample is analyzed. The General Permit requires that samples be received by the analytical laboratory within 48 hours of the physical sampling (unless otherwise required by the analytical laboratory).

Collect proper information regarding time and sampling conditions, appropriately label the bottles, and fill out the required chain of custody forms and field logs.

6.3 Analytical Methods

All laboratory analyses must be conducted according to analytical procedures specified in 40 Code of Federal Regulations (CFR) Part 136, unless other analytical procedures have been specified in the General Permit or by the RWQCB. With the exception of field analyses conducted by the discharger for turbidity and pH, all analyses must be sent to and conducted by a state-certified analytical laboratory. Currently, the SSC method is not state certified and a limited number of laboratories have the capability of doing this analysis.

Analytical laboratories should be contacted and a contract should be worked out before the wet season to minimize potential disruptions during the critical sampling period. A laboratory should be chosen foremost by their accreditation, ability to perform the required samples in the desired turn-around-time, and then by their proximity for ease of sample delivery. Although with overnight mail delivery, proximity is less important, it may still be an important factor to avoid bottle breakage during shipment.

State-certified analytical laboratories can be found by using the Environmental Laboratory Accreditation Program's (ELAP) website at:
http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx.

Non-visible pollutants may include a wide range of analytical methods. A list of potential nonvisible pollutants based on common construction activities is shown in Table 1. This list is not meant to be inclusive but to provide general guidance for projects. Consult with the analytical laboratory or 40 CFR Part 136 to identify specific analytical methods, sample volume, and containers needed for the expected non-visible pollutants.

Dischargers can perform pH analysis on site with a calibrated pH meter, or pH test kit. Dischargers can perform turbidity analysis using a calibrated turbidity meter (turbidimeter), either on site or at an accredited analytical laboratory. Many manufacturers offer single parameter meters or multiple parameter meters with various optional probes. Dischargers will need to determine the best type of meter for their individual situation. Any meter selected for field monitoring should have the ability to be calibrated, be accompanied by detailed operation instructions, and should be ruggedly designed for field use and long term storage (you are unlikely to need it during the dry season).

TABLE 1
Potential Non-visible Pollutants Based on Common Construction Activities

Activity	Potential Pollutant Source	Laboratory Analysis
Water line flushing	Chlorinated water	Residual chlorine
Portable toilets	Bacteria, disinfectants	Total/fecal coliform
Concrete & Masonry	Acid wash	pH
Curing compounds		pH, alkalinity,
		Volatile organic compounds (VOCs)
Concrete rinse water		pH
Painting	Resins	Semi-volatile organic compounds (SVOCs)
Thinners	Phenols, VOCs	
Paint Strippers	VOCs	
Solvents	Phenols, VOCs	
Adhesives	Phenols, SVOCs	
Sealants	SVOCs	
		Methylene Blue Activated Substances (MBAS),
		phosphates
Cleaning	Detergents	
Bleaches	Residual chlorine	
Solvents	VOCs	
Landscaping	Pesticides/Herbicides	Check with analytical laboratory
Fertilizers	$NO_3/NH_3/P$	
Lime and gypsum	Acidity/alkalinity	
Aluminum sulfate, sulfur	Total dissolved solids (TDS), alkalinity	
Treated wood	Copper, arsenic, selenium	Metals
Soil amendments &		
dust control		
Lime, gypsum		pH
Plant gums	Biochemical oxygen demand (BOD)	
Magnesium chloride	Alkalinity, TDS	
Calcium chloride	Alkalinity, TDS	
Natural brines	Alkalinity, TDS	
Lignosulfonates	Alkalinity, TDS	

Hach, Hydrolab, Global Water, Fisher Scientific, and LaMott are some known manufacturers and/or vendors of turbidity and pH meters. Whichever turbidimeter is selected, it is important to use the same meter; different meters may have different results even if properly calibrated. If you need to use several turbidimeters, then assign to each meter to a specific location.

Dischargers utilizing a sediment basin are required to conduct a soil particle analysis.

Dischargers may also want to conduct this analysis to establish site-specific particle size information, which can be used to justify the project risk level using RUSLE. (The particle size analysis provides the K factor.) The soil particle analysis is conducted using the American Society for Testing and Materials (ASTM) test method ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, to determine the percentages of sand, very fine sand, silt, and clay on the site. The percentages of particles less than 0.02 mm in diameter must also be determined. This analysis is conducted before construction starts and is reported with the Permit Registration Documents (PRDs).

Dischargers are not required to physically collect samples or conduct visual observations during dangerous weather conditions (flooding, electrical storms, etc.) or outside of scheduled construction site business hours. An explanation must be provided in the Annual Report if a project was unable to collect required samples or visual observations because of dangerous weather conditions.

7.0 Watershed Monitoring Option

This option does not apply to the OGS site.

8.0 Quality Assurance/Quality Control

An effective QA/QC plan will be implemented as part of the CSMP to ensure that analytical data can be used with confidence. QA/QC procedures to be initiated include the following:

- Field logs
- Clean sampling techniques
- Sample Chains of Custody (COCs)
- Data verification

Each of these procedures is discussed in more detail in the following sections.

8.1 Field Logs

The purpose of field logs is to record sampling information and field observations during monitoring that may explain any uncharacteristic analytical results. Sampling information to be included in the field log include the date and time of water quality sample collection, sampling personnel, sample container identification numbers, and types of samples that were collected. Field observations should be noted in the field log for any abnormalities at the sampling location (color, odor, BMPs, etc.). Field measurements for pH and turbidity should also be recorded in the field log. The field log is located in the Attachment.

Clean Sampling Techniques

Clean sampling techniques involve the use of certified clean containers for sample collection and clean powder-free nitrile gloves during sample collection and handling. As discussed previously, adoption of a clean sampling approach will minimize the chance of field contamination and questionable data results.

Sample Chain-of-Custody

The sample COC is an important documentation step that tracks samples from collection through analysis to ensure the validity of the sample. Sample COC procedures include the following:

- Proper labeling of samples;
- Use of COC forms for all samples; and
- Prompt sample delivery to the analytical laboratory.

Analytical laboratories usually provide COC forms to be filled out for sample containers.

Data Verification- sampling

After analytical results are received from the analytical laboratory, the data should be verified to ensure that it is complete, accurate, and the appropriate QA/QC requirements were met. Data should be verified as soon as the data reports are received.

The COC and laboratory reports need to be checked to make sure all requested analysis were performed and all samples are accounted for in the reports. Laboratory reports will be checked to make sure hold times were met and that the reporting levels meet or are lower than the reporting levels agreed to in the contract. Date will be checked for outlier values and will be followed up with the laboratory. Occasionally typographical errors, unit reporting errors, or incomplete results are reported and should be easily detected. These errors need to be identified, clarified, and corrected quickly by the laboratory. Attention should be paid to data that is an order of magnitude or more different than similar locations, or is inconsistent with previous data from the same location.

For laboratory analyses, EPA establishes QA/QC checks and acceptable criteria. These data are typically reported along with the sample results. Data reviewers should evaluate the reported QA/QC data to check for contamination (look at method, field, and equipment blanks), precision (laboratory matrix spike duplicates), and accuracy (matrix spikes and laboratory control samples). When QA/QC checks are outside acceptable ranges, the laboratory must flag the data, and usually provides an explanation of the potential impact to the sample results.

The data set will be checked for outlier values and, accordingly, results will be confirmed, and samples re-analyzed where appropriate. Sample re-analysis will only be undertaken when it appears that some part of the QA/QC resulted in a value out of the expected range. Initial data, even if outside the expected range may not be discounted unless the analytical laboratory identifies the required QA/QC criteria were not met. If this occurs, the project should obtain a written statement from the analytical laboratory regarding the validity of the sample result.

Similarly, field data needs to be checked as soon as possible to identify potential errors. Reported data and observations should be verified to ensure that it is complete and accurate and as soon as the field logs are received. Field logs should be checked to make sure all required measurements were completed and appropriately documented. Crews may occasionally miss-record a value. Reported values that appear out of the typical range or inconsistent, should be followed up on immediately to identify potential reporting or equipment problems. Equipment calibration notations should be verified for outlier data, and if appropriate equipment calibrations should be checked after sampling. Observations noted on the field logs can also help to identify potential interferences. Notations should be made of any errors and actions taken to correct the equipment or recording errors.

When using a field meter it is important to record the value and then make note of any possible meter failures or interferences that could have led to an exceedance. Some possible instrument problems may include the need to recalibrate; the need to replace the battery; problems with the sample container (such as scratches on glass or plastic optical sample cells or particles on the outside of the optical sample cells); or fouled probes.

9.0 Reporting and Records Retention

9.1 Annual Report

All dischargers are required to prepare and electronically submit an Annual Report no later than September 1 each year. The Annual Reports must be certified in accordance with the Special Provisions in the General Permit. The Annual Report must include the following stormwater monitoring information:

- A summary and evaluation of all sampling and analysis results, including original laboratory reports
- The analytical method(s), method reporting unit(s), and MDL(s) of each analytical parameter (analytical results that are less than the MDL must be reported as “less than the MDL” or “<MDL”)
- A summary of all corrective actions taken during the compliance year
- Identification of any compliance activities or corrective actions that were not implemented
- A summary of all violations of the General Permit
- The individual(s) who performed facility inspections, sampling, visual observation (inspections), and/or measurements
- The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation (rain gauge)
- The visual observations and sample collection exception records and reports

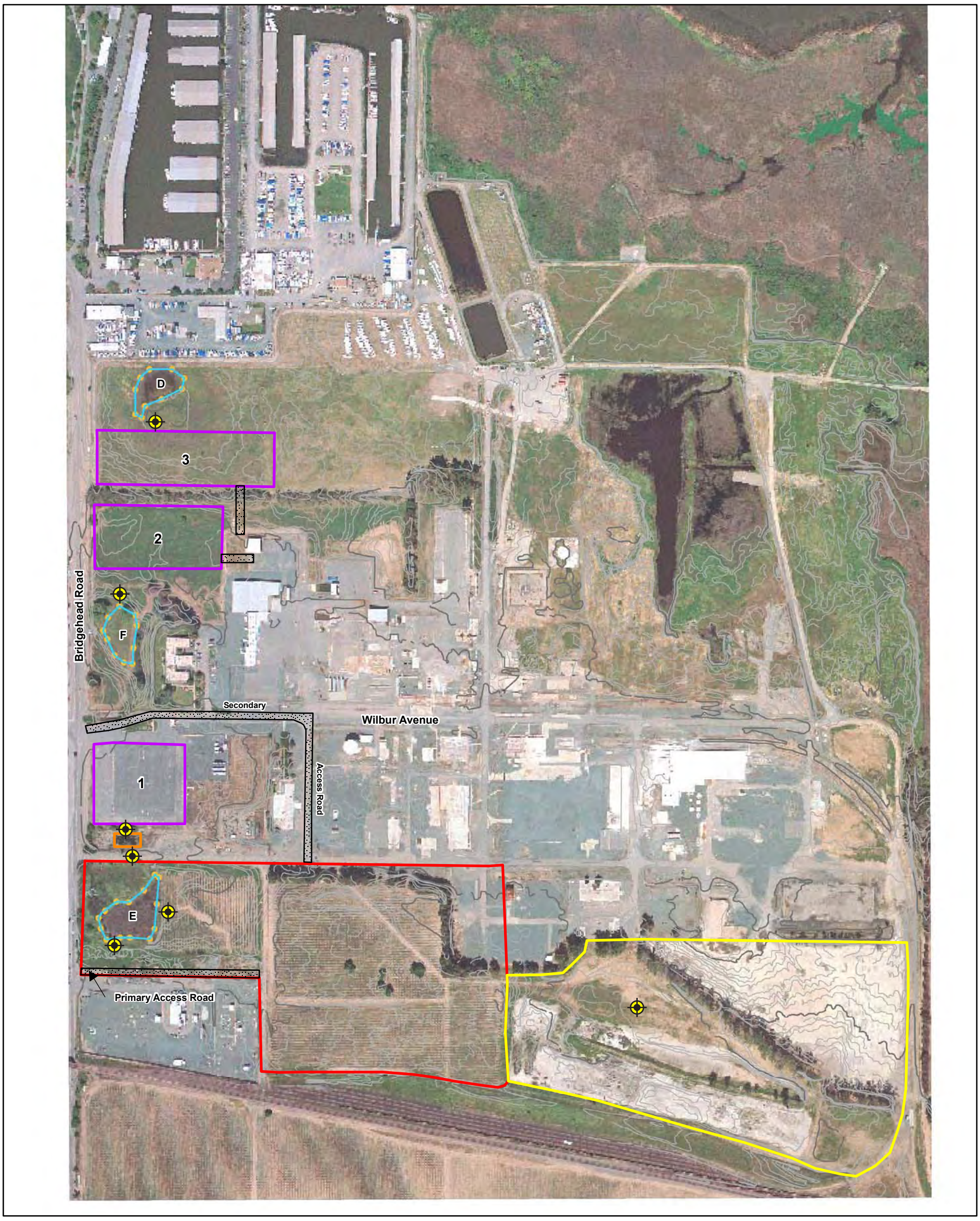
9.2 Records Retention

Dischargers must retain records of all stormwater monitoring information and copies of all reports (including Annual Reports) for a period of at least three years from date of submittal or longer if required by the RWQCB. ATS dischargers must retain all records for three years after the completion of the construction project. Records are to be kept on site while construction is ongoing. These records include:

- The date, place, and time of facility inspections, sampling, visual observations (inspections), and/or measurements, including precipitation
- The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and/or measurements
- The date and approximate time of analyses
- The individual(s) who performed the analyses
- A summary of all analytical results from the last three years, the method detection limits and reporting limits, and the analytical techniques or methods used
- Rain gauge readings from site inspections
- QA/QC records and results
- Non-stormwater discharge inspections and visual observations (inspections) and stormwater discharge visual observation records
- Visual observation and sample collection exemption records
- NAL Exceedance Reports and NEL Violation Reports
- The records of any corrective actions and follow-up activities that resulted from analytical results, visual observations (inspections), or inspections.

Results of field measurements and laboratory analyses must be kept in the SWPPP. It is also recommended that training logs, COCs, and other documentation related to sampling and analysis be kept with the project's SWPPP.

Figure 1
CSMP Sampling and Observation Locations



LEGEND

- Wetland
- Facility Site
- Laydown Area
- Stockpiles
- Access Road
- Existing Retention Basin
- Sampling and Observation Locations

N

0 175 350
Feet

VICINITY MAP

FIGURE 1
CSMP Sampling and Observation Locations
Oakley Generating Station DESCP/SWPPP
Oakley, California

CH2MHILL

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IS012010223151SAC Figure_1.ai 02.24.2010 tdaus

Attachment
Field Log

Risk Level 1, 2, 3
Visual Inspection Field Log Sheet

Date and Time of Inspection:	Report Date:

Inspection Type:	☐ Weekly	☐ Before predicted rain	☐ During rain event	☐ Following qualifying rain event	☐ Contained stormwater release	☐ Quarterly non-stormwater

Site Information

Construction Site Name:	
Construction stage and completed activities:	Approximate area of exposed site:

Weather and Observations

Date Rain Predicted to Occur:	Predicted % chance of rain:

Estimate storm beginning: _____ (date and time)	Estimate storm duration:_____ (hours)	Estimate time since last storm: _____ (days or hours)	Rain gauge reading: _____ (inches)

Observations: If yes identify location		
Odors	Yes ☐	No ☐
Floating material	Yes ☐	No ☐
Suspended Material	Yes ☐	No ☐
Sheen	Yes ☐	No ☐
Discolorations	Yes ☐	No ☐
Turbidity	Yes ☐	No ☐

Site Inspections

Outfalls or BMPs Evaluated	**Deficiencies Noted**
(add additional sheets or attached detailed BMP Inspection Checklists)	

Photos Taken:	Yes ☐	No ☐	Photo Reference IDs:

Corrective Actions Identified (note if SWPPP/REAP change is needed)

Inspector Information

Inspector Name:	Inspector Title:
Signature:	Date:

Risk Level 2 ***Effluent Sampling Field Log Sheets***			
Construction Site Name:		Date:	Time Start:
Sampler:			
Sampling Event Type:	☐ Stormwater	☐ Non-stormwater	☐ Non-visible pollutant

Field Meter Calibration	
pH Meter ID No./Desc.: Calibration Date/Time:	Turbidity Meter ID No./Desc.: Calibration Date/Time:

Field pH and Turbidity Measurements			
Discharge Location Description	pH	Turbidity	Time

Grab Samples Collected		
Discharge Location Description	Sample Type	Time

Additional Sampling Notes:
Time End:

Risk Level 3 ***Effluent Sampling Field Log Sheets***				
Construction Site Name:		Date:		Time Start:
Sampler:				
Sampling Event Type:	☐ Stormwater	☐ Non-stormwater	☐ Non-visible pollutant	☐ Post NEL Exceedance

Field Meter Calibration	
pH Meter ID No./Desc.: Calibration Date/Time:	Turbidity Meter ID No./Desc.: Calibration Date/Time:

Field pH and Turbidity Measurements			
Discharge Location Description	pH	Turbidity	Time

Grab Samples Collected			
Discharge Location Description	SSC	Other (specify)	Time

Additional Sampling Notes:
Time End:

Risk Level 3
Receiving Water Sampling Field Log Sheets

Construction Site Name:	Date:	Time Start:
Sampler:		

Receiving Water Description and Observations

Receiving Water Name/ID:		
Observations:		
Odors	Yes ☐	No ☐
Floating material	Yes ☐	No ☐
Suspended Material	Yes ☐	No ☐
Sheen	Yes ☐	No ☐
Discolorations	Yes ☐	No ☐
Turbidity	Yes ☐	No ☐

Field Meter Calibration

pH Meter ID No./Desc.:	Turbidity Meter ID No./Desc.:
Calibration Date/Time:	Calibration Date/Time:

Field pH and Turbidity Measurements and SSC Grab Sample

Upstream Location

Type	Result	Time	Notes
pH			
Turbidity			
SSC	Collected Yes ☐ No ☐		

Downstream Location

Type	Result	Time	Notes
pH			
Turbidity			
SSC	Collected Yes ☐ No ☐		

Additional Sampling Notes:

Time End:

Appendix O
Notice of Discharge

Notice of Discharge, Written Notice, or Order

Instructions

- This form will used to report instances of discharges. The completed form will be submitted to the Project Manager within 7 days of the assessment of discharge, written notice, or orders from a regulatory agency. A report of all discharges will also be submitted to the SMARTS system.
- It is recommended that photographs (before and after the discharge) are also submitted with this report.

Notice of Discharge, Written Notice, or Order

(copy this form as needed)

To: _____ Date: _____
Project Manager

FROM: _____
QSD

Subject: Notice of Discharge

Project Name: _____

Contract Number: _____

In accordance with the NPDES Statewide Permit for Storm Water Discharges Associated with Construction Activity, the following instance of discharge is noted:

Date, time, and location of discharge.

Nature of the operation that caused the discharge.

Initial assessment of any impact cause by the discharge.

Existing BMP(s) in place prior to discharge event.

Date of deployment and type of BMPs deployed after the discharge.

Steps taken or planned to reduce, eliminate and/or prevent recurrence of the discharge.

Implementation and maintenance schedule for any affected BMPs.

SWPPP Amendments:

If further information or a modification to the above schedule is required, notify the contact person below.

Name of Contact Person	Title QSD
Company CH2M HILL	Telephone Number
Signature	Date

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
1516 NINTH STREET, SACRAMENTO, CA 95814
1-800-822-6228 – WWW.ENERGY.CA.GOV

APPLICATION FOR CERTIFICATION
FOR THE *OAKLEY GENERATING STATION*

Docket No. 09-AFC-4
PROOF OF SERVICE
(Revised 2/4/2010)

APPLICANT

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*indicates change

DECLARATION OF SERVICE

I, Mary Finn, declare that on March 9, 2010, I served and filed copies of the attached Oakley Generating Station Project (9-AFC-4)Response to Data Requests # 44–67. The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at: **[http://www.energy.ca.gov/sitingcases/contracosta/index.html].** The document has been sent to both the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

(*Check all that Apply*)

For service to all other parties:

____ sent electronically to all email addresses on the Proof of Service list;

__x__ by personal delivery or by depositing in the United States mail at Sacramento, California with first-class postage thereon fully prepaid and addressed as provided on the Proof of Service list above to those addresses **NOT** marked "email preferred."

AND

For filing with the Energy Commission:

_____ **sending an original paper copy and one electronic copy, mailed and emailed respectively, to the address below (preferred method);**

OR

___x__depositing in the mail an original and 12 paper copies, as follows:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 09-AFC-4
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512
docket@energy.state.ca.us

I declare under penalty of perjury that the foregoing is true and correct.

Mary Finn