TETRA TECH EC, INC.

September 24, 2012

Mr. Eric Solorio
California Energy Commission
Docket No. 11-AFC-3
1516 9th St.
Sacramento, CA 95814

Cogentrix Quail Brush Generation Project - Docket Number 11-AFC-3, Water Quality Technical Report for the Quail Brush Generation Project San Diego, California for the Quail Brush Power Project

Docket Clerk:

Pursuant to the provisions of Title 20, California Code of Regulation, and on behalf of Quail Brush Genco, LLC, a wholly owned subsidiary of Cogentrix Energy, LLC, Tetra Tech hereby submits the *Water Quality Technical Report for the Quail Brush Generation Project San Diego, California* for the Quail Brush Power Project (11-AFC-3). The Quail Brush Generation Project is a 100 megawatt natural gas fired electric generation peaking facility to be located in the City of San Diego, California.

If you have any questions regarding this submittal, please contact Rick Neff at (704) 525-3800 or me at (303) 980-3653.

Sincerely,

Constance E. Farmer
Project Manager/Tetra Tech

cc: Lori Ziebart, Cogentrix
John Collins, Cogentrix
Rick Neff, Cogentrix
Proof of Service List

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
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1-800-822-6228 – WWW.ENERGY.CA.GOV

APPLICATION FOR CERTIFICATION
FOR THE *QUAIL BRUSH GENERATION PROJECT*

DOCKET NO. 11-AFC-03
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(Revised 8/14/2012)

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DECLARATION OF SERVICE

I, Constance Farmer, declare that on September 24, 2012, I served and filed a copy of the *Water Quality Technical Report for the Quail Brush Generation Project San Diego, California* (11-AFC-03). This document is accompanied by the most recent Proof of Service list, located on the web page for this project at: [http://www.energy.ca.gov/sitingcases/quailbrush/index.html].

The document has been sent to the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit or Chief Counsel, as appropriate, in the following manner:

(Check all that Apply)
For service to all other parties:

☒ Served electronically to all e-mail addresses on the Proof of Service list;

☒ Served by delivering on this date, either personally, or for mailing with the U.S. Postal Service with first- class postage thereon fully prepaid, to the name and address of the person served, for mailing that same day in the ordinary course of business; that the envelope was sealed and placed for collection and mailing on that date to those addresses **NOT** marked "e-mail preferred."

AND

For filing with the Docket Unit at the Energy Commission:

☒ by sending an electronic copy to the e-mail address below (preferred method); ***OR***

☐ by depositing an original and 12 paper copies in the mail with the U.S. Postal Service with first class postage thereon fully prepaid, as follows:

CALIFORNIA ENERGY COMMISSION – DOCKET UNIT
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OR, if filing a Petition for Reconsideration of Decision or Order pursuant to Title 20, § 1720:

☐ Served by delivering on this date one electronic copy by e-mail, and an original paper copy to the Chief Counsel at the following address, either personally, or for mailing with the U.S. Postal Service with first class postage thereon fully prepaid:

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I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, that I am employed in the county where this mailing occurred, and that I am over the age of 18 years and not a party to the proceeding.

Constance C. Farmer

CALIFORNIA ENERGY COMMISSION
1516 NINTH STREET
SACRAMENTO, CA 95814-5512
www.energy.ca.gov

TO: *All Parties* *Date: August 14*, 2012

RE: ***QUAIL BRUSH GENERATION PROJECT***
Proof of Service List
Docket No. 11-AFC-03

Attached is the ***newly revised*** Proof of Service List for the above-mentioned project, current as of August 14, 2012.

Note that the presumptions about e-mail only service of documents on the parties have changed. Formerly, you had to affirmatively indicate your willingness to accept e-mail only service. Now all parties are presumed to accept e-mail only service unless they specifically inform us that they wish to receive paper copies.

Pursuant to the "General Orders Regarding Electronic Document Formats, Filing and Service of Documents and Other Matters" adopted in this proceeding, until a party indicates to the Presiding Member or Hearing Adviser that it requires a hard copy, an e-mailed copy of all electronic documents of 5 megabytes maximum file size is sufficient for service in this proceeding. No hard copy of an e-mailed document need be provided. Where a party is designated on the Proof of Service List for this proceeding as "hard copy required" or similar words, parties shall deliver a paper copy of all written material they file in this proceeding in person or by first class mail, or other equivalent delivery service, with postage prepaid to the person so designated. Regardless whether a party has indicated a preference for hard copies, documents larger than 50 pages may alternatively be sent in the form of an electronic file recorded on a compact disk rather than as a paper copy, provided that the party is offered the opportunity to request a paper copy.

Unless otherwise specified in a regulation, all materials filed with the Commission must also be filed with the Docket Unit. (Cal. Code Regs., tit. 20, § 1209(d).) Some regulations require filing with the Commission's Chief Counsel instead of the Docket Unit. For example, Section 1720 requires a petition for reconsideration to be filed with the Chief Counsel and served on the parties. Service on the attorney representing Commission staff does not satisfy this requirement. This Proof of Service form is not appropriate for use when filing a document with the Chief Counsel under Title 20, sections 1231 (Complaint and Request for Investigation) or 2506 (Petition for

Inspection or Copying of Confidential Records). The Public Advisor can answer any questions related to filing under these sections.

New addition(s) to the Proof of Service are indicated in **bold font** and marked with an asterisk (*).

Use this newly revised list for all future filings and submittals. This Proof of Service List will also be available on the Commission's project web site at:

http://www.energy.ca.gov/sitingcases/quailbrush/index.html

Please review the information and contact me at maggie.read@energy.ca.gov or (916) 654-3893, if you would like to be removed from the Proof of Service or if there are any changes to your contact information.

Maggie Read
Hearing Adviser's Office

Water Quality Technical Report
for the
Quail Brush Generation Project
San Diego, California

September 2012

Prepared for

Quail Brush Genco, LLC

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ABBREVIATIONS AND ACRONYMS

AFC	Application for Certification
ALTA	American Land Title Association
amsl	above mean sea level
APN	Assessor's Parcel Number
Applicant or Owner	Quail Brush Genco, LLC
ASCM	American Congress on Surveying and Mapping
BMP	Best Management Practice
CEC	California Energy Commission
cfs	cubic feet per second
CWA	Clean Water Act
DMA	Drainage Management Area
gen-tie	generation tie line
HMP	Hydromodification Management Plan
IMP	Integrated Management Practices
IPM	integrated pest management
kV	kilovolt
LID	low impact development
MMBtu/hr	million British thermal units per hour
MW	megawatt
PDP	Priority Development Project
Project	Quail Brush Generation Project
SDG&E	San Diego Gas and Electric
SDRWQCB	California Regional Water Quality Control Board San Diego Region 9
SR	State Route
Storm Water Standards	City of San Diego, Storm Water Standards, January 20, 2012
Tetra Tech	Tetra Tech EC, Inc.
TMDL	Total Maximum Daily Load
U.C. Davis	University of California, Davis

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1.0 INTRODUCTION

This Water Quality Technical Report (Report) has been developed for Quail Brush Genco, LLC by Tetra Tech EC, Inc. (Tetra Tech) to identify and summarize the permanent stormwater management features for the proposed Quail Brush Generation Project (Project).

1.1 PROJECT BACKGROUND AND OVERVIEW

On August 25, 2011, Quail Brush Genco, LLC (Applicant or Owner) docketed with the California Energy Commission (CEC) an Application for Certification (AFC) 11-AFC-03 for its proposed Project. A Supplement to the AFC was docketed with the CEC on October 24, 2011 providing additional information, and the CEC determined that the AFC was data adequate on November 16, 2011. Following data adequacy, the Project has been modified to reduce environmental impacts. Supplement 2 to the AFC was docketed with the CEC on February 8, 2012, and presented information regarding proposed changes to the Project, including the change to a 138 kV generation tie line (gen tie) from the proposed Project site to the Carlton Hills Substation (including ancillary facilities), and a revised laydown area for the Project. Supplement 3 was docketed with the CEC on August 31, 2012, and provided information regarding additional proposed changes to the plant layout and facilities, as well as changes to the proposed gen tie and the interconnection to the electrical grid.

The proposed Project will be a nominal 100-megawatt (MW) intermediate/peaking load electrical generating facility using natural gas-fired reciprocating engine technology. The Project will be located on a 21.6 acre parcel (Assessor's Parcel Number [APN] 366-081-42) on Sycamore Landfill Road within the City of San Diego. The power generated by the Project will be delivered to the San Diego Gas and Electric (SDG&E) electrical grid at the Carlton Hills substation. In addition to the power plant, new access roads and a new SDG&E 138 kilovolt (kV) utility switchyard will be located within the 21.6-acre site. A new 138 kV line loop will extend into the new utility switchyard from the existing 138 kV transmission line that runs east-west, approximately 0.5 mile north of the switchyard.

The following sections provide additional details about the Project and the new utility switchyard.

1.2 FACILITY DESCRIPTION

1.2.1 Power Plant Site Arrangement and Layout

The Project site is located on Sycamore Landfill Road, approximately 0.5 mile northwest of Mast Boulevard (Figure 1-1). The major features associated with the installation of the proposed Project include the following:

- Eleven nominal 9.3 MW (gross) Wartsila model 20V34SG natural gas-fired reciprocating engines
- Eleven separate state-of-the-art air pollution control systems (one system per reciprocating engine)
- Eleven stacks, approximately 48-inch diameter x 70-foot tall
- An acoustically engineered building (engine hall) enclosing all 11 reciprocating engines
- Closed loop cooling systems (fan-cooled radiator assemblies)

- A 4 million British thermal units per hour (MMBtu/hr) natural gas-fired heater, used for heating of the natural gas fuel to the reciprocating engines
- A 4 MMBtu/hr natural gas-fired heater, used for heating of the engine cooling water system for 10-minute start capability
- An engine standby heater
- A diesel-fueled fire pump engine, rated at approximately 144 brake horsepower unit
- Storage Tanks:
  - A new lube oil tank, approximately 10,000 gallons
  - A used lube oil tank, approximately 10,000 gallons
  - A maintenance service oil tank, approximately 6,000 gallons
  - A diesel storage tank, approximately 250 gallons
  - An urea storage tank, approximately 20,000 gallons
  - Two maintenance water tanks, approximately 5,000 gallons each
  - Two bunkered wastewater holding tanks, approximately 3,000 gallons each
  - A fire water tank, approximately 600,000 gallons, and associated fire water system
  - A domestic water storage tank, approximately 10,000 gallons
- An onsite septic tank
- An access road between the power plant and Sycamore Landfill Road, approximately 850 foot long
- The main voltage step-up transformer, associated switchgear, and disconnects
- An onsite 138 kV Project switchyard including switchgear, circuit breakers, and disconnects
- An 8-inch diameter natural gas pipeline lateral, approximately 2,200 feet long between the Project site and the existing SDG&E 20-inch diameter high pressure natural gas pipeline located across Mast Avenue from the landfill entrance and associated onsite metering station

The power plant will occupy approximately 4.3 acres, and will be enclosed by a combination of chain-link and concrete block wall security fencing. The facility entrance will be on the southeast corner of the power plant through a secured entrance gate on the access road leading from Sycamore Landfill Road to the facility. The arrangement of the power plant and associated equipment is shown in Figure 1-2.

The power plant will have a 20-foot wide, asphalt-paved perimeter road which encircles the plant. Short stub roads will provide access to the engine hall and switch gear/control room. The remainder of the power plant will have a crushed rock surface. Landscaping with native vegetation will be used on the disturbed areas outside of the power plant's security fencing. The Project will integrate landscaping into the stormwater controls to improve the overall aesthetics of the site.

1.2.2 SDG&E Utility Switchyard Arrangement

The new onsite SDG&E 138 kV utility switchyard will be located northeast of the power plant and the onsite 138 kV Project switchyard (Figure 1-2). It would be aligned in a northeast direction in the corner of the 21.6-acre Project site and would encompass approximately 1.0 acre. The approximately 430-foot long access road to the SDG&E utility switchyard will extend north from the power plant access road to the switchyard.

The switchyard will include the electrical switching equipment to interconnect the output from the power plant to the electrical grid. The switchyard would utilize a radial switching scheme, with a main rigid bus with four radial circuit bays: one for the Project gen tie, two for the 138 kV loop, and one for an auxiliary transformer associated with switchyard loads. There will be three dead-end structures provided in the switchyard, one to accept the gen tie and two others to allow looping facilities for the 138 kV transmission line loop.

The SDG&E utility switchyard will be enclosed by an 8-foot high security fence with two access gates. The switchyard will have an internal asphalt-paved road which provides access on three sides of the switchyard. The remainder of the utility switchyard will have a crushed rock surface.

1.3 DETERMINATION OF PERMANENT BEST MANAGEMENT PRACTICE REQUIREMENTS

The City of San Diego's Storm Water Requirements Applicability Checklist establishes the criteria and requirements for permanent Best Management Practices (BMPs). Projects are identified by three categories:

- Priority Development Project
- Standard Development Project
- Exempted Project

The proposed Project is a Priority Development Project (PDP), based on the 2012 City of San Diego *Storm Water Standards* manual (Storm Water Standards) (City of San Diego 2012). The following PDP categories apply to the Project, based on the City of San Diego's Storm Water Requirements Applicability Checklist (Appendix B in the Storm Water Standards):

- Heavy industrial development greater than 1 acre
- Hillside development greater than 5,000 square feet
- Parking lot with a minimum area of 5,000 square feet or a minimum of 15 parking spaces
- Street, road, highways, or freeway (greater than 5,000 square feet)

A copy of the Storm Water Requirements Applicability Checklist for the Project is included in Appendix A of this Report.

1.4 DRAINAGE AREA CHARACTERISTICS

1.4.1 Existing Watersheds Drainage

The proposed Project is located in the eastern portion of the City of San Diego, approximately 1 mile west of the San Diego/Santee municipal border. The plant site footprint is located on the east side of Sycamore Landfill Road, approximately 0.5 mile north of the San Diego River, east of Little Sycamore Canyon, and south of the Sycamore Landfill. The Project site lies within the San Diego River watershed with the primary drainage for Little Sycamore Canyon passing west of the Project site, along the west side of Sycamore Landfill Road. This drainage flows south under State Route (SR) 52 and enters the San Diego River as it flows toward the Pacific Ocean.

The proposed Project site is located on the furthest southwestern side slope of a north-south-trending ridgeline between Little Sycamore Canyon (to the west) and Quail Canyon and Sycamore Canyon (to the east). On the Quail Brush site, topography consists of southwest-trending ridgelines and tributary drainages. Elevations range from approximately 555 feet above mean sea level (amsl) in the northeastern portion of the site to approximately 375 feet amsl in the southwestern portion of the site. The site is overgrown with thick, low to medium weeds, native grasses, brush, and occasional small trees (Petra 2011).

The general stormwater flow pattern in the vicinity of the Project is from the higher elevations east of the site downslope towards Sycamore Landfill Road. The existing drainage for the slopes located east of Sycamore Landfill Road is either by sheet flow across the road, or south along the east side of the road to several locations where there are existing catch basins and culverts under the road as shown in Figure 1-1.

A preliminary assessment of the local watersheds that currently generate stormwater runoff through the undeveloped Project site identified three small watersheds totaling approximately 48.3 acres (Figure 1-3), identified as North (15.9 acres), Central (14.9 acres), and South (17.5 acres) (Tetra Tech 2012). The Central watershed encompasses the majority of the Project footprint, including the power plant site and the SDG&E utility switchyard, while the South watershed encompasses a small percentage of the power plant site and the area that will be used for the access road to the power plant. The three watersheds drain naturally toward Sycamore Landfill Road.

The existing stormwater drainage (runoff) from each of the identified watersheds was estimated using the following basis:

- Data for the watershed elevation contours were based on a digital terrain model generated from the American Land Title Association/American Congress on Surveying and Mapping (ALTA)/(ACSM) Land Title Survey data by RBF Consulting together with the airborne Interferometric Synthetic Aperture Radar data processed by Intermap Technologies, Inc.
- The time of concentration was estimated utilizing the Federal Aviation Administration Formula (which uses the Rational Coefficient) and Kirpich's Formula, appropriate for small mountainous basins.
- The peak runoff flow rates, in cubic feet per second (cfs), were computed with the Rational Method per the San Diego County Hydrology Manual (County of San Diego 2003).

- Runoff flow rate estimates and volumes were developed for design storm events with a return of 2, 5, 10, 25, 50, and 100 years (i.e., QP-x and VP-x where "x" is the year).
- The analysis was performed in general accordance with the City of San Diego Drainage Design Manual (City of San Diego 1984) and the San Diego County Hydrology Manual (County of San Diego 2003).

Table 1-1 shows the estimated flow rates (in cfs) for runoff (Q) from the undeveloped site for the 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year storm events. The preliminary assessment also included estimation of runoff rates for the 85th percentile design storm event (Q_{85}), which is required for designing BMPs as guided by the San Diego County Hydrology Manual (County of San Diego 2003). Table 1-2 presents the corresponding estimated volumes of runoff (V) from the undeveloped site in acre-feet.

Table 1-1. Summary of Preliminary Runoff Design Flow Rates from Undeveloped Site

	Pre-Development Peak Runoff Design Flow Rates (cfs)						
Watershed Area	Q_{85}	Q_{p-2}	Q_{p-5}	Q_{p-10}	Q_{p-25}	Q_{p-50}	Q_{p-100}
North Watershed	12.5	25.0	33.3	37.4	41.6	49.9	52.0
Central Watershed	12.3	24.6	32.8	36.9	41.0	49.2	51.2
South Watershed	13.4	26.9	35.9	40.3	44.8	53.8	56.0

Table 1-2. Summary of Preliminary Runoff Design Volumes from Undeveloped Site

	Pre-Development Peak Runoff Design Volumes (acre-feet)						
Watershed Area	V_{85}	V_{p-2}	V_{p-5}	V_{p-10}	V_{p-25}	V_{p-50}	V_{p-100}
North Watershed	0.51	1.02	1.36	1.53	1.70	2.04	2.13
Central Watershed	0.48	0.96	1.27	1.43	1.59	1.91	1.99
South Watershed	0.56	1.12	1.49	1.67	1.86	2.23	2.33

Stormwater draining from the North watershed intersects Sycamore Landfill Road approximately 200 feet north of the plant site parcel. The stormwater appears to pond along the side of the road until it either flows over the road or southward along the eastern side of the road through a normally dry swale to a point where it crosses the road.

Two existing catch basins and associated culverts under Sycamore Landfill Road drain the stormwater from the two watersheds that cross the Project parcel. The Central watershed drains to the northern catch basin just east of the road. Stormwater flow from the northern catch basin drains into an open area west of Sycamore Landfill Road where it merges with stormwater draining southwards along the west side of the road and continues to the south, where it flows under SR 52.

The South watershed drains a slightly larger area, with headwaters upgradient of the proposed plant site heading in a southerly direction and shifting to the southwest through the site towards Sycamore Landfill Road. A portion of the stormwater enters a V-shaped, concrete drainage ditch on the southern edge of the parcel. The ditch transports any flows south, toward a low point ponding area and catch basin that also collects stormwater draining the rest of the South

watershed. A culvert under Sycamore Landfill Road and SR 52 drains the stormwater from the ponding area. The culvert discharges any flows to the wash along the southwestern side of SR 52. The stormwater eventually drains into the San Diego River within the Mission Trails Regional Park.

1.4.2 Power Plant Internal Drainage System

The power plant is located in roughly the center of the parcel, at an elevation of 465 feet amsl. The power plant will be nearly flat, with only enough grading to direct the stormwater away from the building and equipment. An internal stormwater drainage and runoff control system, which is described in Sections 3 and 4 of this Report, will provide the treatment and control measures before the stormwater rejoins the runoff from the surrounding watersheds.

Individual pieces of equipment or storage tanks that contain chemicals and might leak will be provided with secondary containment structures. Stormwater from these containment structures will only be released after visual inspection of the collected stormwater.

2.0 IDENTIFICATION OF POLLUTANTS OF CONCERN

The Project is a PDP, as discussed in Section 1.3, based on the Storm Water Standards. This section of the Report begins with identification of pollutants of concern, a two-step process described in Section 4.1.5 and 4.1.6 of the Storm Water Standards. The following discussions address each step to identify pollutants of concern.

2.1 POTENTIAL PROJECT POLLUTANTS

The power plant and utility switchyard are by definition industrial projects. The Project will include land use types, each of which characteristically generates different potential pollutants. The land use types associated with the Project include industrial development, steep hillside development, parking lots, and roads. The Storm Water Standards manual lists general categories of pollutants that each land use may generate and these are identified in Table 2-1.

Table 2-1. Anticipated and Potential Pollutants Generated by the Project, Based on Land Use Type

General Project Categories	General Pollutant Categories								
	Sediments	Nutrients	Heavy Metals	Organic Compounds	Trash & Debris	Oxygen Demanding Substances	Oil & Grease	Bacteria & Viruses	Pesticides
Detached Residential Housing Development	NA	NA	NA	NA	NA	NA	NA	NA	NA
Attached Residential Development	NA	NA	NA	NA	NA	NA	NA	NA	NA
Commercial Development	NA	NA	NA	NA	NA	NA	NA	NA	NA
Industrial Development	X		X	X	X	X	X		
Automotive Repair Shops	NA	NA	NA	NA	NA	NA	NA	NA	NA
Restaurants	NA	NA	NA	NA	NA	NA	NA	NA	NA
Steep Hillside Developments	X	X			X	X	X		X
Parking Lots	P(1)	P(1)	X		X	P(1)	X		P(1)
Streets, Highways and Freeways	X	P(1)	X	X(4)	X	P(5)	X	X	P(1)
Retail Gasoline Outlets ("RGO")	NA	NA	NA	NA	NA	NA	NA	NA	NA

Key:
NA – Category not applicable to Project
X – Anticipated
P – Potential
(1) A potential pollutant if landscaping exists on site
(2) A potential pollutant if the project includes uncovered parking areas
(3) A potential pollutant if the land use involves food or animal waste products
(4) Including petroleum hydrocarbons
(5) Including solvents
Source: Storm Water Standards Table 4-1, City of San Diego 2012

2.2 POLLUTANTS OF CONCERN FOR THE RECEIVING WATER

Pollutants of concern for the receiving water are determined based on several factors. After the nature of the project and potential pollutants from that kind of project have been identified, the water that would receive the stormwater from the project is identified. The Section 303(d) List of Water Quality Limited Segments of the Clean Water Act (CWA) lists pollutants that have been identified as currently causing impairment of that receiving water. Then an evaluation of the potential project pollutants with those pollutants that currently are impairing the receiving water is conducted. The following sections describe the project site, the receiving waters, and the pollutants on the Section 303d list for the receiving waters.

2.2.1 Identification of Receiving Water

The Project is within the jurisdiction of the California Regional Water Quality Control Board San Diego Region 9 (SDRWQCB) in the San Diego Hydrologic Unit. The San Diego Hydrologic Unit is a long, triangular-shaped area of about 440 square miles. It is drained by the San Diego River, which discharges into the Pacific Ocean at the community of Ocean Beach. The major water storage facilities in the San Diego Hydrologic Unit are El Capitan, San Vicente, Cuyamaca, and Jennings reservoirs (all located upstream of the Project), as well as Murray reservoir (located on the southern portion of the hydrologic unit, across the San Diego River from the Project). The San Diego Hydrologic Unit is comprised of four hydrologic areas, with the Project site located in the Lower San Diego Hydrologic Area. Within that hydrologic area, the site is located within the Santee Hydrologic Subarea (identified as 907.12) (Figure 1-1) (SDRWQCB 2007b).

Stormwater from the Project site will flow west and south into the drainage from Little Sycamore Canyon, eventually reaching the San Diego River south of SR 52.

2.2.2 Identification of Receiving Water Impairments

The San Diego River near the Project site is on the 2008-2010 CWA Section 303(d) list of impaired waters for several constituents (listed in Table 2-2) identified as exceeding water quality standards. The 2008-2010 303(d) list is currently under review by the U.S. Environmental Protection Agency. Of the listed pollutants, low dissolved oxygen, phosphorus, and total dissolved solids extend into the Santee Hydrologic Subarea. In addition, the U.S. Environmental Protection Agency is considering whether to maintain Sycamore Canyon, an intermittent stream east of the Project, on the 303(d) list for chlorine. After review of the available water quality data, the State Water Resources Control Board recommended that this segment be removed from the 303(d) list because applicable water quality standards are not exceeded.

Table 2-2. Pollutants Listed on 2008-2010 303(d) List for San Diego River Near the Project

Pollutants	Potential Sources	Estimated TMDL Completion	Comments
Enterococcus	Nonpoint source, point source, urban runoff/storm sewers	2021	
Low Dissolved Oxygen	Unknown nonpoint source, unknown point source, urban runoff/storm sewers	2019	San Diego River impairment transcends Santee Hydrologic Subarea
Manganese	Source unknown	2021	
Nitrogen	Nonpoint source, point source, urban runoff/storm sewers	2021	
Phosphorus	Unknown nonpoint source, unknown point source, urban runoff/storm sewers	2019	San Diego River impairment transcends Santee Hydrologic Subarea
Total Dissolved Solids	Flow regulation/modification, natural sources, unknown nonpoint source, unknown point source, urban runoff/storm sewers	2019	San Diego River impairment transcends Santee Hydrologic Subarea
Toxicity	Nonpoint source, other urban runoff, unknown point source	2021	

TMDL –Total Maximum Daily Load
Source: SDRWQCB 2010

2.3 PROJECT-RELATED POLLUTANTS OF CONCERN

Based on the anticipated Project pollutants (Table 2-1) and those of the Receiving Waters (Table 2-2), the most significant pollutants of concern for the Project are those that both are anticipated and are a concern for the receiving water.

Based on Table 2-1 and Table 2-2, the Project's pollutants of concern are shown in Table 2-3.

Table 2-3. Summary of Project Related Pollutants

Pollutant Category	Anticipated Due to Land Use (Table 2-1)	Receiving Waters Pollutant (Table 2-2)	Project-Related Pollutant of Concern
Sediment (Total Dissolved Solids)	X	X	X
Nutrients (Low Dissolved Oxygen, Manganese, Nitrogen, Phosphorus)	X	X	X
Heavy Metals	X		
Organic Compounds (Low Dissolved Oxygen)	X	X	X
Trash and Debris	X		
Oxygen Demanding Substances (Low Dissolved Oxygen	X	X	X
Oil and Grease	X		
Bacteria and Viruses (Enterococcus)	X	X	X
Pesticides (Toxicity)	X	X	X

This information will be utilized in the selection procedure for treatment BMPs described in the following section of this Report.

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3.0 IDENTIFICATION OF PERMANENT STORMWATER CONTROLS

Because the Project is a PDP, source control BMPs must be incorporated into the design of the Project to address the anticipated pollutants. Projects subject to PDP requirements must implement applicable source control BMPs as well as low impact development (LID) design practices, as described in the Storm Water Standards.

3.1 SOURCE CONTROL BEST MANAGEMENT PRACTICES

Source control BMPs generally refer to land use or site planning practices, or structures which are focused on the prevention of urban runoff pollution. These BMPs are designed to reduce the potential for contamination by controlling it at the source. Source control BMPs minimize the contact between pollutants and urban runoff. The following discussion addresses the source control BMPs, identified in Section 4.2 of the Storm Water Standards, that are applicable to the Project. Table 3-1 provides a summary of the source control BMPs, the associated activities, and the applicability to the Project.

Table 3-1. Source Control BMPs – Categories

Source Activity	Applicable to Project	Comments
Maintenance Bays	No	Wartsila engines will be located inside Engine Hall which is fully contained.
Vehicle and Equipment Wash Areas	No	No vehicular washing will be conducted on site and the exposed equipment on site is not intended to be routinely washed.
Outdoor Processing Areas	No	No outdoor processing areas are included in the Project.
Retail and Non-retail Fueling Areas	No	No fueling areas are present on site.
Steep Hillside Landscaping	Yes	
Efficient Irrigation Systems and Landscape Design	Yes	
Trash Storage Areas	Yes	
Outdoor Material Storage Areas	Yes	Storage tanks will be located on the site.
Loading Docks	Yes	The Project does not propose any loading docks. However, an unloading area for tank trucks is located on the western side of the plant for transfer of oil and chemicals.
Integrated Pest Management	Yes	
Stormwater Conveyance System Stampage/Signage	Yes	
Fire Sprinkler Discharges	Yes	
Air Conditioning Condensate	Yes	
Non-toxic Roofing Materials	Yes	
Other Source Control Requirements	Yes	Oil and chemical transfer areas will be present on site.

The preliminary geotechnical investigation conducted by Petra Geotechnical Inc. (Petra 2011) did not include infiltration testing, so there is no basis for sizing any BMP or LID source control or treatment facilities that rely on infiltration of the stormwater runoff. Additionally, the Project will require structural fill with a high degree of compaction of the surficial soils throughout the Project. Infiltration in these areas is not desirable. Therefore, no BMPs or LID features that include a major infiltration component are considered.

Sources that are identified as applicable to the Project are discussed in more detail in the following subsections. Those sources that are identified as not applicable to the Project are not included in the discussions that follow.

Italicized text in the subsequent sections is taken from Section 3.1 of the Storm Water Standards and reproduced for this Report for clarity. Portions of the italicized text are condensed from the Storm Water Standards. Immediately following and written in regular text is a description of how the Project will respond to the requirements.

3.1.1 Steep Hillside Landscaping

- *Steep hillside areas disturbed by project development shall be landscaped with deep-rooted, drought tolerant and/or native plans species selected for erosion control, in accordance with the Landscape Technical Manual.*

The Project site, including any steep hillsides and other proposed slopes, will be landscaped with native plants selected for erosion control in accordance with the landscaping plan and the brush management plan.

3.1.2 Efficient Irrigation Systems and Landscape Design

- *Implement rain shutoff devices to prevent irrigation during and after precipitation events in accordance with section 2.3-4 of the City of San Diego's Landscape Standards (See Suggested Resources in Appendix A* [of the Storm Water Standards]*).*
- *Reduce irrigation contribution to dry-weather runoff by avoiding spray irrigation patterns where overspray to paved surfaces or drain inlets will occur.*
- *To avoid overwatering and potential irrigation runoff, design the irrigation systems to each landscape area's specific water requirement.*
- *Implement flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.*
- *Avoid locating drain inlets in lawn areas, since such inlets tend to be sources of irrigation runoff and the transport mechanism for lawn care products. Design the grading and drainage systems such that drain inlets can be located outside of the lawn area or include a non-turf buffer around the inlet.*

New plant material will be low growing, native trees and shrubs, located to reduce the possibility of transmitting fire. Low flow rate spray heads will be used and the irrigation systems for the Project will be designed in accordance with the above guidelines.

3.1.3 Trash Storage Areas

- *Trash storage areas shall:*
  1. *Be paved with an impervious surface designed to prevent run-on from adjoining areas and screened or walled to prevent off-site transport of trash.*
  2. *Contain attached lids on all trash containers to prevent rainfall intrusion.*
  3. *Contain a roof or awning, at the discretion of the City, for high usage trash areas such as those for fast food establishments, convenience stores, and high density residential developments.*

The trash storage areas for the Project will be designed pursuant to the above guidelines. The Project will not have any high usage trash areas.

3.1.4 Outdoor Material Storage Areas Generation Plant Controls

- *Materials with the potential to contaminate urban runoff shall be:*
  1. *Placed in an enclosure such as a cabinet, shed, or other structure that prevents contact with rainfall or runoff and prevents spillage to the storm water conveyance system, and*
  2. *Protected by secondary containment structures such as berms, dikes, or curbs when the material storage area includes hazardous materials. The storage areas shall be paved and sufficiently impervious to contain leaks and spills and to be covered by a roof or awning to minimize direct precipitation within the secondary containment area.*

The outdoor storage of materials will typically include storage tanks for the liquid materials. These tanks will be located inside secondary containment structures to prevent the accidental release of the stored material.

3.1.5 Outdoor Material Storage Areas Generation Plant Controls

- *Loading dock areas shall:*
  1. *Provide overhead cover where appropriate to prevent precipitation contact with debris and potential spills, and*
  2. *Isolate drainage in the loading dock areas through the use of paved berms and/or grade breaks to prevent adjacent runoff from entering the loading area and to prevent liquid spills from discharging from the loading area.*
  3. *Include an acceptable method of spill containment such as a shut-off valve and containment areas.*

The Project does not propose any loading docks.

An unloading area for tank trucks will be located on the western side of the plant for transfer of oil and chemicals. This area will be paved and have berms to contain the contents of the truck in the event of a release. Drainage from this area will be manual, requiring an operator to physically inspect the area and any liquids in the containment prior to either discharging clean stormwater or having any liquids that are contaminated pumped out and removed from the site.

3.1.6 Integrated Pest Management

- *Integrated pest management (IPM) is an ecosystem-based pollution prevention strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as:*
  1. *Biological Control*
  2. *Habitat Manipulation*
  3. *Use of resistant plant varieties*

- *Pesticides are used only after monitoring indicates they are needed according to established guidelines. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and non-target organisms, and the surrounding environment. More information regarding pesticide application may be obtained at the following University of California, Davis (UC Davis) website: http://www.ipm.cdavis.edu/WATER/U/index.html.*
- *To eliminate or reduce the need for pesticide use, the following strategies can be used:*
  1. *Plant pest-resistant or well-adapted plant varieties*
  2. *Discourage pests by modifying the site and landscape design*
- *IPM educational materials should be distributed to future site residents and tenants. These materials should address the following:*
  1. *Use of barriers, screens, and caulking to keep pests out of buildings and landscaping*
  2. *Physical pest elimination techniques, such as weeding, washing, or trapping pests*
  3. *Relying on natural enemies to eliminate pests*
  4. *Proper use of pesticides as a last line of defense*

Pest management will be carried out pursuant to the guidelines shown above.

3.1.7 Stormwater Conveyance System Stampage/Signage

- *Concrete stamping, or approved equivalent method, shall be provided for all storm water conveyance system inlets and catch basins within the project area.*
- *Language associated with the stamping (e.g., "No Dumping- I Live in San Diego Bay") must be satisfactory to the City Engineer. Stamping may also be required in Spanish.*
- *Post signs and prohibitive language (with graphical icons) which prohibit illegal dumping at trailheads, parks, building entrances, and public access points along channels and creeks within the project area.*

All new stormwater conveyance system inlets and catch basins with the Project area will be signed and stamped pursuant to the guidelines shown above. No public access is intended within the Project area.

3.1.8 Fire Sprinkler Discharges

- *For new buildings with fire sprinkler systems, design fire sprinkler system as follows:*
  1. *Contain discharged from sprinkler systems' operational maintenance and testing and convey discharges to the sanitary sewer system.*

There will be a fire sprinkler system in the Engine Hall area to protect the engine/generator sets. The building is designed to contain the volume of water discharged from a fire sprinkler discharge. This water would be pumped out and transported to an appropriate disposal facility.

3.1.9 Air Conditioning Condensate

- *Air conditioning condensate is a source of dry-weather runoff and elevated copper levels. Include design features to manage this pollutant source, including the following:*
  1. Direct air conditioning condensate to the sanitary sewer system
  2. Direct air conditioning condensate to landscaping areas

The power plant control room will be air conditioned. Condensate from the air conditioning system will be directed to the appropriate landscaping area.

3.1.10 Non-toxic Roofing Materials

- *Avoid the use of galvanized steel or copper for roofs, gutters, and downspouts*
- *If using such materials, reduce the potential for leaching of metals by applying a coating or patina*
- *Avoid composite roofing materials that contain copper*

The above requirements will be incorporated to the extent possible in the selection of roofing materials for the building design.

3.1.11 Other Source Control Requirements

- *Require implementation of post-construction soil stabilization practices, such as the re-vegetation of construction sites, in conformance with the approved Landscaping Plan and Grading Plans*
- *Provide for pet waste and collection dispensers where applicable*
- *Restrict the use of galvanized and copper roofing materials*

The Project will implement soil stabilization measures in compliance with the grading plans and landscape plans. No pets will be allowed within the Project area and the Project will meet all applicable Source Control guidelines above.

3.2 LOW IMPACT DEVELOPMENT DESIGN PRACTICES

The PDP are subject to LID design standards to meet the Storm Water Standards requirements. LID design refers to an approach to stormwater management and land development that emphasizes the use of onsite natural features integrated with engineered, small-scale hydrologic controls to more closely reflect pre-development hydrologic functions.

3.2.1 LID Strategies for this Priority Development Project

Suitable LID facilities are those facilities that retain, reuse, or promote evapotranspiration of stormwater. This Project proposes the use of bioretention areas, bioretention basins (or detention basins), and flow-through planter areas within the Project. Bioretention basins are anticipated instead of detention basins to improve the treatment capacity for the potential pollutants.

3.2.1.1 Optimize Project Site Layout

The Project site topography consists of southwest-trending ridgelines and tributary drainages. Elevations range from approximately 555 feet amsl in the northeastern portion of the site to approximately 375 feet amsl in the southwestern portion of the site. Within the Project site, the arrangement of the Project facilities, such as the main plant site area, access road, the SDG&E utility switchyard, and its associated access road has been optimized to the extent possible. The main plant site footprint has been optimized to a minimal area through careful placement and spacing of the equipment, buildings, tanks, internal roads, and other components.

The finished surface for the power plant area must be generally level for proper site drainage and operation of the equipment. For proper drainage, minor and localized grading (approximately 0.5 percent slopes) will be necessary to direct water into the proposed underground storm drain system within the main plant site area that will eventually discharge to the perimeter surface system. Similarly, concrete pads for the components of the power plant that will require secondary containment also will be sloped slightly to a sump area for collection of collected liquids.

Additional grading has been minimized through the use of stepped retaining wall structures. The area between the retaining walls will be designed to allow their use as flow-through planter areas when possible.

The main Project access road has been aligned with the existing slopes to the extent possible to allow the rise from the Sycamore Landfill Road to the main plant site elevation. This minimizes switchbacks and the subsequent length of the road.

3.2.1.2 Minimize Impervious Footprint

Due to the nature of the Project, the power plant footprint will be virtually impervious. The equipment located within the main plant site area is very heavy and requires structural fill and highly compacted subsurface soil to prevent settling and damage to the equipment. Therefore, this area will be considered impervious for the hydrology evaluations, although there may be a small amount of infiltration into the surficial soil.

The access road leading to the main plant site area must be capable of supporting large, heavy trucks including cranes, flatbed trucks with new or replacement equipment and/or supplies, or tank trucks carrying water, oils, and other chemicals throughout the life of the Project. Therefore, the use of pervious paving for the access road is not currently included in the Project. During the detailed design of the access roads the application of pervious surfaces may be evaluated.

3.2.1.3 Disperse Runoff to Adjacent Landscaping

Drainage from the various areas within the Project footprint will be directed to various stormwater drains and controls. These drains will be typically dispersed to bioretention areas. Rooftop downspouts will be directed to bioretention areas or flow-through planter areas with landscaping. Runoff from parking and road areas within the Project will be directed to the bioretention basins or other similar treatment areas.

3.2.1.4 Design and Implementation of Pervious Surfaces

A majority of the Project (i.e., the main plant site area, access roads, retaining walls, and the SDG&E utility switchyard) requires soil compaction to support the foundations and surface loads. The use of pervious surfaces in these areas will be limited. Drainage slopes and the top surfaces of the areas between retaining walls will be designed to implement pervious surfaces and will include landscaping or flow-through planters.

3.2.1.5 Construction Considerations

A majority of the Project site will require soil compaction. However, for areas outside of those requiring compaction for structural support, lower compaction values may be identified. This would apply to those areas where landscaping will be located following the construction. Soil amendments may be used in areas where new plants are being located, as well as in bioretention areas.

3.2.1.6 Additional Considerations

Disturbed soils and slopes will be vegetated to stabilize the site with drought tolerant vegetation. Runoff will be conveyed away from tops of slopes throughout the Project. Additionally, energy dissipation devices and controls will be placed at locations where stormwater flows may cause erosion or other damage to reduce the potential for impacts to receiving waters.

Secondary containment structures will be located under tanks and equipment that contain oil or chemicals that would pose a threat to the environment if they were released.

3.3 STRUCTURAL TREATMENT CONTROL BMPS

Structural treatment control BMP facilities provide treatment of pollutants that are contained in stormwater runoff. The pollutant treatment methods include sedimentation or settling, filtration, plant uptake, adsorption, and bacterial decomposition. Pollutants that float on the water, such as oil and debris, can be removed with separator structures. Because stormwater may contain multiple pollutants, treatment control facilities may need to be used in series as a “Treatment Train” to achieve the desired level of pollutant removal for the different pollutants.

Treatment control BMPs that infiltrate, filter, and/or treat runoff from the various Project areas requiring treatment must be designed to meet numeric standards. These treatment standards for structural treatment control BMPs require the BMPs to:

- Be designed to remove pollutants to the maximum extent possible based on ratings for pollutant removal efficiency,
- Meet the minimum criteria of “medium removal efficiency” for the most significant pollutants of concern for the Project,
- Be correctly sized, according to numeric sizing requirements, and
- Be implemented close to pollutant sources to the extent feasible.

The use of structural control BMPs that rely on infiltration of stormwater runoff have not been included in the Project at this time. The preliminary geotechnical investigation conducted by Petra Geotechnical, Inc. (Petra 2011) did not include infiltration testing, so there is no basis for

sizing such devices. The need for highly compacted surficial soils throughout the Project also restricts the implementation of infiltration devices in or near those areas. If the final geotechnical investigation provides infiltration test results that indicate the use of infiltration-based stormwater controls is feasible, additional structural BMPs may be added or switched with those currently proposed.

3.3.1 Structural Treatment BMP Selection Procedure

As a PDP, the stormwater control measures for this Project must be designed either individually or in combination to incorporate treatment control BMPs to infiltrate, filter, and/or treat runoff from the Project footprint. Selection of treatment control BMPs must be based on the following criteria, in conjunction with the performance ratings provided in the Storm Water Standards, Table 4-3:

- For the anticipated Project pollutants identified in Section 2.1, the highest performing BMPs available must be considered. Site constraints that limit the selection must be described in the Water Quality Technical Report.
- The most significant pollutants of concern for the Project are those that both are anticipated and are a concern for the receiving water as discussed in Section 2.3. The minimum performance for the most significant pollutants of concern is "medium removal efficiency."

PDP are required to select individual or combination treatment BMPs from the categories shown in Table 3-2 that maximize pollutant removal for the particular pollutants of concern (see Table 2-3). This means that the selected treatment control BMPs must collectively provide minimum pollutant removal efficiencies of "medium" or "high" for all pollutants of concern. The removal efficiency ratings are shown in Table 3-2.

The anticipated treatment control methods for the Project are highlighted in blue in Table 3-2.

Table 3-2. Structural BMP Treatment Control Selection Matrix

BMP	LID	HMP Control	Sediment	Nutrients	Trash	Metals	Bacteria	Oils and Grease	Organics
Infiltration Basin	Y	Y	H	H	H	H	H	H	H
Bioretention Basin	Y	Y	H	M	H	H	H	H	H
Cistern Plus Bioretention	Y	Y	H	M	H	H	H	H	H
Vault Plus Bioretention	Y	Y	H	M	H	H	H	H	H
Self-retaining Area	Y	Y	H	H	H	H	H	H	H
Dry Wells	Y	Y	H	H	H	H	H	H	H
Constructed Wetlands	Y	Y	H	M	H	H	H	H	H
Extended Detention Basin	Y	N	M	L	H	M	M	M	M
Vegetated Swale	Y	N	M	L	L	M	L	M	M
Vegetated Buffer Strips	Y	N	H	L	M	H	L	H	M

BMP	LID	HMP Control	Sediment	Nutrients	Trash	Metals	Bacteria	Oils and Grease	Organics
Flow-Through Planter Boxes	Y	Y	H	M	H	H	H	H	H
Vortex Separator or Wet Vault	N	N	M	L	M	L	L	L	L
Media Filter	N	N	H	L	H	H	M	H	H

H – High removal efficiency
M – Medium removal efficiency
L – Low removal efficiency
HMP –Hydromodification Plan
Source: Storm Water Standards Table 4-3, City of San Diego 2012

The following discussion identifies the treatment control BMPs proposed for the Project.

3.3.2 Numeric Sizing Requirements for Treatment Control BMPs

In general for the flow-based and volume-based treatment control BMPs, the water quality design storm event was determined as either the peak flow rate or the volume of runoff produced from an 85th percentile storm event. The sizing for flow-based treatment control BMPs requires that the resultant maximum flow rate of runoff produced by the 85th percentile event be multiplied by a factor of two. The water quality treatment design storm events were calculated based on the Rational Method outlined in the San Diego County Hydrology Manual together with isopluvial maps for the 85th percentile storm event, determined from the local historical rainfall record, that are provided in the County of San Diego Hydrology Manual (County of San Diego 2003).

More specifically, treatment control BMPs were sized using the "Low Impact Development Design Guide" located in Appendix I of the Storm Water Standards, which was extracted from the Countywide Model for Standard Urban Stormwater Mitigation Plan.

The Project design directs runoff into BMPs or Integrated Management Practices (IMPs) as well as dispersing runoff to adjacent pervious areas where plausible in accordance with the Storm Water Standards. The following BMPs or IMPs are proposed for the Project and will be developed with site-specific design criteria as outlined in Appendix I of the Storm Water Standards:

- Bioretention facilities that can be designed as swales, basins, free-form areas, or planters to be incorporated with the proposed landscaping configuration
- Flow-through planters that can be utilized within the Project's retaining wall structures as well as near building foundations and other locations where infiltration to native or engineered soils is not recommended

In addition, cisterns or vaults may be utilized for volume-based treatment in combination with bioretention facilities or flow-through planters. Infiltration facilities are not considered at this time as there is no geotechnical data on infiltration rates. An important note is that volume-based treatment facilities must be designed to empty within 24 hours in order for runoff from additional storms that may follow is also captured and treated.

The Project design will also provide hydromodification flow control in addition to water quality treatment. The minimum area required for specific bioretention facilities and flow-through planters is found by adding up the contributions of the individual and discrete Drainage Management Areas (DMAs) that are each multiplied by adjustment runoff factors for surface types and area or volume sizing factors based upon the prescribed low flow threshold, soil type, slope, and rain basin.

It is important to note that since the proposed Project BMPs or IMPs are designed to provide hydromodification flow control as well as water quality treatment, then the appropriate hydromodification sizing factors, which are greater in magnitude than the "water quality only" sizing factors, will be used in accordance with Appendix I in the Storm Water Standards. Moreover, water will not be stored longer than 96 hours in order to prevent the harborage of mosquitoes in accordance with the requirements of the San Diego County Department of Environmental Health.

The details on the proposed Project BMPs or IMPs are described in Section 4.

4.0 HYDROMODIFICATION MANAGEMENT

California Regional Water Quality Control Board San Diego Region Permit Order R9-2007-0001 (SDRWQCB 2007a) requires the San Diego Stormwater Copermittees (including the City of San Diego) to implement a Hydromodification Management Plan (HMP). Hydromodification refers to changes in a watershed's runoff characteristics resulting from development, together with associated morphological changes to channels receiving the runoff, such as changes in sediment transport characteristics and the hydraulic geometry (width, depth, and slope) of channels. These changes can result in stream bank erosion and sedimentation, leading to habitat degradation due to loss of overhead cover and loss of in-stream habitat structures.

As required by Permit Order No. R9-2007-0001, each of the Copermittees was required to incorporate the approved HMP into its local Standard Urban Storm Water Mitigation Plan and implement the HMP for all applicable PDPs by January 14, 2011. The Storm Water Standards require all PDPs to be designed so that runoff rates and durations are controlled to maintain or reduce pre-project downstream erosion conditions and protect stream habitat.

4.1 HYDROMODIFICATION MANAGEMENT PLAN BACKGROUND

As a PDP, the Project is subject to the Final Hydromodification Management Criteria. Therefore, a hydromodification management strategy has been developed for the Project based on the Final HMP, dated March 2011 (Brown and Caldwell 2011). In association with the development of the Final HMP, an automated BMP sizing computer program titled the "San Diego BMP Sizing Calculator" (or BMP Sizing Calculator), was developed. The Sizing Calculator is a web-based computer program and is also available on the "Project Clean Water" website (www.projectcleanwater.org) (Project Clean Water 2011).

The BMP Sizing Calculator is the "recommended" tool to analyze a proposed project for compliance with final hydromodification management requirements. The BMP Sizing Calculator is capable of modeling hydromodification management facilities to mitigate the effects of increased runoff from the post-project land use changes that may cause negative impacts (i.e., erosion) to downstream channels. The BMP Sizing Calculator includes sizing factors for sizing LID facilities and includes a pond sizing algorithm for sizing flow control ponds.

The HMP analyses for this Project were performed for sizing the proposed Project BMPs using Version 3.0 of the BMP Sizing Calculator, dated April 2011.

4.2 STORMWATER FLOW MODELING REQUIREMENTS

The Final HMP requires a range of runoff flow rates to be determined to identify the range for which the PDP post-project runoff flows and durations should not exceed pre-project runoff flows and durations. In order to meet these criteria, the results of a hydromodification management analysis must meet the following criteria:

- For flow rates between the pre-project lower flow threshold and the pre-project 10-year event, the post-project discharge rates and durations may not deviate above the pre-project rates and durations by more than 10 percent over and more than 10 percent of the length of the flow duration curve.

- Lower flow thresholds may be determined using the HMP Decision Matrix along with a critical flow calculator and channel screening tools developed by the Southern California Coastal Water Research Project. These methods identify lower flow thresholds for a range of channel conditions. The critical flow calculator recommends a lower flow value of 0.1Q2, 0.3Q2, or 0.5Q2 dependent on the receiving channel material and dimensions. This value will be compared to the channel susceptibility rating (High, Medium, or Low) as determined from the Southern California Coastal Water Research Project screening tools to determine the final lower flow threshold.
- The lower flow threshold may alternately be determined as 10 percent of the pre-project 2-year runoff event, or 0.1Q2. This approach, which is outlined in the HMP Decision Matrix, is available if the project applicant chooses not to complete the channel screening analysis.

While the channel screening analysis may be performed to determine the lower flow threshold, the lower flow threshold of 0.1Q2 has been used to perform the HMP analyses for this Project. The Project demonstrated compliance with hydromodification criteria by using the integrated design approach defined in Appendix I of the Storm Water Standards, which is further streamlined through the use of BMP Sizing Calculator as an implementation tool. The BMP Sizing Calculator uses pre-determined runoff and sizing factors, based upon continuous simulation hydrologic analyses, to estimate the required areas and sizes for hydromodification flow control BMPs. The BMP Sizing Calculator also includes an automated planning tool for pond sizing in order to assist in the design of extended detention facilities for mitigation of hydromodification effects.

The water quality and hydromodification flow control treatment calculations are included in Appendix B of this report. Typical details of the selected treatment control BMPs are included in Appendix C. The locations of all stormwater management features are shown on Figure 4-1.

As previously discussed, the BMP Sizing Calculator was employed as a planning tool to estimate the minimum areas and storage volumes required for the Project's proposed bioretention facilities and flow-through planters, providing for both hydromodification flow control and water quality treatment as the design goal in accordance with the HMP.

Based upon the location of the Project, Oceanside was selected as the appropriate rain basin within the BMP Sizing Calculator corresponding to a mean annual precipitation of 13.3 inches. The Project was analyzed for two separate basins for purposes of the HMP, the Central watershed and the South watershed that drain to their corresponding catch basins as described in Section 1.4.1. As a result, the Central and South catch basins were designated as the respective points of compliance.

As noted earlier, the Central watershed encompasses the majority of the Project footprint where approximately 6.8 acres are slated to be developed. The South watershed encompasses approximately one-third of the Project footprint where the developed area comprises 3.4 acres. Based upon the current grading plan, the development of the Project will result in a slight reduction in the Central watershed's acreage from 14.9 acres to 14.2 acres and correspondingly a slight increase in the South watershed's acreage, from 17.5 acres to 18.2 acres.

The Project design provides hydromodification flow control that intrinsically includes water quality treatment. The minimum areas required for the Project's proposed bioretention facilities

and flow-through planters were analyzed by the BMP Sizing Calculator based upon the individual contributions of the DMAs reporting to each respective BMP. Summaries of the DMAs analyzed for the Central and South watersheds are included in the following Tables 4-1 and 4-2.

Table 4-1. Central Watershed DMA Summary Table

DMA	DMA Description	Area (acre)	Post Development Surface	Slope
C02	Landscaping, Walls, Slopes	0.27	Landscaping	Steep
C03-A	SDGE Switch Yard Pavement	0.25	Concrete/Asphalt	Flat
C03-B	SDGE Switch Yard Gravel	0.70	Crushed Aggregate	Flat
C03-C	SDGE Switch Yard Landscaping, Slopes	0.35	Landscaping	Steep
C03-D	SDGE Switch Yard Building	0.03	Roofs	Flat
C04	Landscaping, Drainages	0.25	Landscaping	Flat
C05-A	NE Plant Pavement	0.23	Concrete/Asphalt	Flat
C05-B	NE Plant Gravel	0.42	Crushed Aggregate	Flat
C05-C	NE Plant Landscaping	0.13	Landscaping	Flat
C05-D	NE Plant Miscellaneous Structures	0.25	Roofs	Flat
C05-E	NE Plant Containment Structures	0.09	Roofs	Flat
C06-A	NW Plant Pavement	0.26	Concrete/Asphalt	Flat
C06-B	NW Plant Gravel	0.48	Crushed Aggregate	Flat
C06-C	NW Plant Landscaping	0.11	Landscaping	Flat
C06-D	NW Plant Miscellaneous Structures	0.21	Roofs	Flat
C06-E	NW Plant Containment Structures	0.21	Roofs	Flat
C07-A	Plant Switch Yard Pavement	0.01	Concrete/Asphalt	Flat
C07-B	Plant Switch Yard Gravel	0.29	Crushed Aggregate	Flat
C07-C	Plant Switch Yard Building	0.00	Roofs	Flat
C08-A	Landscaping, Walls, Slopes, Access	0.52	Landscaping	Steep
C08-B	Landscaping, Drainages, Slopes, Access	0.22	Landscaping	Steep
C09	Plant Main Buildings	0.68	Roofs	Flat
C10	Landscaping, Walls, Slopes	0.37	Landscaping	Steep
C11	Landscaping, Walls, Slopes	0.51	Landscaping	Steep
	Total:	**6.8**		

Table 4-2. South Watershed DMA Summary Table

DMA	DMA Description	Area (acre)	Post Development Surface	Slope
S02	Landscaping, Walls, Slope	0.33	Landscaping	Steep
S03-A	Access Road Pavement	0.26	Concrete/Asphalt	Flat
S03-B	Landscaping, Walls, Drainages, Slopes	0.26	Landscaping	Flat
S04-A	Plant Pavement	0.46	Concrete/Asphalt	Flat
S04-B	Plant Gravel	0.24	Crushed Aggregate	Flat
S04-C	Plant Landscaping	0.16	Landscaping	Flat
S04-D	Plant Misc Structures	0.16	Roofs	Flat
S05	Landscaping, Walls	0.20	Landscaping	Flat
S06-A	Access Road Pavement	0.19	Concrete/Asphalt	Moderate
S06-B	Landscaping, Walls, Drainages, Slopes	0.21	Landscaping	Moderate
S07-A	Access Road Pavement	0.19	Concrete/Asphalt	Moderate
S07-B	Landscaping, Walls, Drainages, Slopes	0.56	Landscaping	Moderate
S08-A	Access Road Pavement	0.07	Concrete/Asphalt	Moderate
S08-B	Landscaping, Walls, Drainages, Slopes	0.09	Landscaping	Moderate
	Total:	**3.4**		

Within the BMP Sizing Calculator, the discrete DMAs are multiplied by adjustment runoff factors for various surface types as well as area and volume sizing factors based upon the prescribed low flow threshold, soil type, slope, and rain basin. Although the Project lies within boundaries that are designated as Type D soils, it was deemed appropriate to conservatively analyze this Project for the anticipated developed conditions where Type C soils are expected to be used for construction of final surfaces, landscaping, and BMPs, and the main Project areas will be graded with flat slopes relative to the steep existing terrain. Surface runoff factors utilized for the HMP analyses are included in Table 4-3.

Table 4-3. Runoff Factors for Surfaces

Surface Type	Factor
Roofs	1.0
Concrete	1.0
Pervious Concrete	0.1
Porous Asphalt	0.1
Grouted Unit Pavers	1.0
Solid Unit Pavers	0.2
Crushed Aggregate	0.1
Turfblock	0.1
Amended, mulched soil	0.1
Landscape	0.1

The area and volume sizing factors utilized for the HMP analyses are included in Tables 4-4 and 4-5 respectively.

Table 4-4. Sizing Factors for Bioretention Facilities

Flow Threshold	Soil Group	Slope	Rain Gauge	Area (square feet)	Volume 1 (cubic feet)	Volume 2 (cubic feet)
0.1Q2	A	Flat	Oceanside	0.07	0.0583	N/A
0.1Q2	A	Moderate	Oceanside	0.065	0.0542	N/A
0.1Q2	A	Steep	Oceanside	0.06	0.05	N/A
0.1Q2	B	Flat	Oceanside	0.103	0.0854	N/A
0.1Q2	B	Moderate	Oceanside	0.09	0.075	N/A
0.1Q2	B	Steep	Oceanside	0.075	0.0625	N/A
0.1Q2	C	Flat	Oceanside	0.13	0.1083	0.078
0.1Q2	C	Moderate	Oceanside	0.13	0.1083	0.078
0.1Q2	C	Steep	Oceanside	0.11	0.0917	0.066
0.1Q2	D	Flat	Oceanside	0.13	0.1083	0.078
0.1Q2	D	Moderate	Oceanside	0.13	0.1083	0.078
0.1Q2	D	Steep	Oceanside	0.065	0.0542	0.039

Based on 2012 Storm Water Standards, Appendix I

Table 4-5. Sizing Factors for Flow-Through Planters

Flow Threshold	Soil Group	Slope	Rain Gauge	Area (square feet)	Volume 1 (cubic feet)	Volume 2 (cubic feet)
0.1Q2	A	Moderate	Oceanside	N/A	N/A	N/A
0.1Q2	A	Steep	Oceanside	N/A	N/A	N/A
0.1Q2	B	Flat	Oceanside	N/A	N/A	N/A
0.1Q2	B	Moderate	Oceanside	N/A	N/A	N/A
0.1Q2	B	Steep	Oceanside	N/A	N/A	N/A
0.1Q2	C	Flat	Oceanside	0.19	0.1583	0.114
0.1Q2	C	Moderate	Oceanside	0.19	0.1583	0.114
0.1Q2	C	Steep	Oceanside	0.14	0.1167	0.084
0.1Q2	D	Flat	Oceanside	0.16	0.1333	0.096
0.1Q2	D	Moderate	Oceanside	0.16	0.1333	0.096
0.1Q2	D	Steep	Oceanside	0.105	0.0875	0.063

Based on 2012 Storm Water Standards, Appendix I

4.3 DRAINAGE CHARACTERISTICS AND HMP STRATEGIES

The hydrologic and hydraulic analyses for the Project during various design storm events is included in a parallel document titled "Drainage Study for the Quail Brush Generation Project" (Drainage Study) and dated September 2012 (Tetra Tech 2012). A detailed description of drainage characteristics flow patterns, existing and post development hydrology, and hydraulics are discussed in this Drainage Study.

The objective for siting treatment facilities is to make the most efficient and practical use of the Project site and to integrate BMPs or IMPs into the ultimate site landscaping, thus maximizing the overall aesthetics of the Project area. In addition, locating the Project's hydromodification treatment and flow-control facilities within areas identified as setbacks, buffers, easements, or other non-buildable areas minimizes the aerial footprint of the Project. In several areas, the nature of the site drainage provides a redundancy in the BMPs, where the stormwater flowing out of one BMP blends with stormwater from another area and ultimately passes through a subsequent BMP. The drainage from the south plant area and portions of the SDG&E switchyard access road are examples of this redundancy.

In general, the bioretention areas, basins, and flow-through planters included in the Project are typically graded as level or gently sloped facilities, but with sufficient slope to drain. Some bioretention BMPs can be designed as swales that are gradually sloped in the linear direction of the flow and having opposite sides at the same elevation. Moreover, designing BMPs that drain by gravity flow is preferred for effective and low-maintenance operations as mechanical systems, while possible, are generally more expensive, frequently require some electrical source at the BMP, and are not practical for efficient operations and maintenance.

In addition, since the Project's proposed BMPs require the same equipment utilized for maintaining the implemented landscape features, bioretention facilities and flow-through planters will be designed with adequate access necessary for their maintenance. The management and flow of stormwater together with the hydromodification BMP facilities are shown on Figure 4-1 as well as being detailed in Appendix C. Typical details of the selected flow-control and treatment-control BMPs are included in Appendix C.

The bioretention facilities are generally located along the perimeter of the Project's key features. These facilities are designed to detain surface water runoff and treat the water as it filters through plant roots and a biologically active soil mix. After passing through the soil zone, the water infiltrates to a perforated-pipe underdrain system that conveys the treated runoff to the perimeter surface drainage system. The design of bioretention facilities are flexible in nature and, based upon the Project's final grading plan, can be constructed in a variety of configurations as in-ground or aboveground areas. They can also be designed as linear swales where they have the ability to convey high flows while percolating and treating lower flows.

Bioretention facilities normally are constructed as a basin, or series of basins, with the circumference of each basin set level. It may be necessary to add curbs or low retaining walls if the basin is on a slope. A series of basins, with a cascading flow from basin to basin may also be considered in sloping areas. If linear swales are employed, check dams will be included and set so the lip of each dam is at least as high as the toe of the next upstream dam. Linear swales are better suited for areas that do not require treatment, as they generally are rated lower than basins for treatment of pollutants.

The flow-through planters proposed for the Project are similar to the bioretention facilities in that they treat and detain runoff, although they are designed with a liner in order to prevent seepage into the underlying soils. They are generally designed to be incorporated into the Project's retaining wall structures, although they can also be located where feasible near building foundations, on slopes where stability might be affected by adding soil moisture, and at other locations where infiltration to native or engineered soils is not recommended.

The flow-through planters located along the Project's western retaining walls will receive runoff from the plant's adjacent engine hall building roof through the downspouts and a below grade drainage system. In addition, the flow-through planters can also be set in-ground and receive sheet flow from adjacent paved areas if desired for other Project areas.

4.4 BMP SIZING CALCULATOR MODELING RESULTS AND OUTPUT

Six BMPs (i.e., BMP C1 to C6) were identified for the Central watershed. The BMPs for the Central watershed and the associated DMAs are described in Table 4.6. Five BMPs (BMP S1 to C5) were identified for the South watershed. The BMPs for the South watershed and the associated DMAs are described in Table 4-7. The locations of all stormwater management and hydromodification BMP features are shown on Figure 4-1.

The principal BMPs C6 and S5 (Figure 4-1) were initially sized as detention basins. However, after the evaluation of the Project pollutants of concern and the identification of the need for treatment of these pollutants, these BMPs were changed to bioretention basins. Bioretention basins were selected as the preferable design over the detention basins in order to maximize the pollutant removal efficiency. This will provide more robust water quality and hydromodification controls to address the potential Project pollutants of concern. The areas where there are sequential (redundant) BMPs provide additional treatment and control BMP capacity above that identified as required by the BMP Sizing Calculator, because the downstream BMP is sized for the full flow entering it without regard to the upstream BMP.

While the Central and South watersheds' catch basins are designated as the respective points of compliance, the primary points of control for the Project will be the main bioretention basins

for the corresponding Central and South watersheds, BMP C6 and BMP S5, respectively. These BMPs will receive the bulk of the Project runoff yielding the principal source pollutants from the main plant and access road areas. Secondary points of control may also be recommended and strategically located where they are needed and where they are practical.

Table 4-6. Central Watershed BMP Summary Table

BMP ID	BMP Type	Reporting DMA	Available Area (square feet)	Minimum Area (square feet)	Minimum Volume 1 (cubic feet)	Minimum Volume 2 (cubic feet)
BMP C1	Flow-Through Planter	C02	2,529	164	137	98
BMP C2	Bioretention Area	C03	3,181	2,091	1,743	1,255
BMP C3	Bioretention Area	C04 and C07	3,431	362	301	217
BMP C4	Flow-Through Planter	C08-B	420	134	111	80
BMP C5	Flow-Through Planter	C09, C10 and C11	7,366	5,410	4,508	3,246
BMP C6	Bioretention Basin	C05, C06 and C08-A	8,914	6,126	5,104	3,675
		Total:	**25,841**	**14,287**		

Table 4-7. South Watershed BMP Summary Table

BMP ID	BMP Type	Reporting DMA	Available Area (square feet)	Minimum Area (square feet)	Minimum Volume 1 (cubic feet)	Minimum Volume 2 (cubic feet)
BMP S1	Flow-Through Planter	S02	3,419	201	167	120
BMP S2	Bioretention Area	S03	3,457	1,619	1,349	971
BMP S3	Bioretention Area	S04 and S05	7,741	3,850	3,208	2,310
BMP S4	Bioretention Area	S08	975	447	372	268
BMP S5	Bioretention Basin	S02 through S07	8,298	8,115	6,761	4,869
		Total:	**23,891**	**14,232**		

The water quality and hydromodification flow control treatment calculations are included in Appendix B. A compact disc is also provided in Appendix B that includes the electronic files (i.e., Project and LID Output files) for the BMP Sizing Calculator.

Typical details of the selected treatment control BMPs are included in Appendix C.

4.5 CONCLUSION – HMP ANALYSES

In addition to complying with the water quality requirements, the HMP analyses using the BMP Sizing Calculator has been prepared for the Project to meet the water quality and flow control requirements. The results demonstrate compliance with the Final HMP and the available areas designated for the Project's hydromodification purposes more than exceed the minimum areas required. The redundancy or sequential BMPs in several areas provides additional treatment and control in those areas, which is not considered by the BMP Sizing Calculator. This redundancy will help with the control and treatment of the stormwater. The specific and detailed grading and hydraulic works necessary for the HMP will be provided during final engineering design.

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5.0 OPERATION AND MAINTENANCE OF STORMWATER CONTROL MEASURES

5.1 OWNERSHIP AND MAINTENANCE RESPONSIBILITY

The Applicant will own the stormwater control measures and BMPs associated with the Project and also be responsible for the maintenance of these permanent BMPs for the life of the Project.

5.2 INSPECTION AND MAINTENANCE ACTIVITIES

The following LID and source control BMPs and treatment control BMPs for the Project require permanent maintenance: bioretention basins, landscaped areas, outlet protection, concrete stamping, and irrigation systems within the landscaped areas.

The discussions below provide inspection criteria, maintenance indicators, and maintenance activities for the above-listed LID and BMPs that require permanent maintenance.

5.2.1 Bioretention Basin

During inspection, the following maintenance indicators should be checked:

- Accumulation of sediment, litter, and/or debris at the inlets/outlets
- Standing water in the storage and draining layer indicating clogging in the underdrains

Routine maintenance of the bioretention basins will include removal and proper disposal of accumulated materials (e.g., sediment, litter).

If the inspection indicates that the underdrains for the bioretention basin are clogged, additional non-routine maintenance will be required to backwash and clear the underdrains. The Owner will ensure implementation and funding of maintenance of permanent BMPs. The Owner may self-perform the inspection and maintenance of the BMPs or may contract for additional cleaning and disposal services as necessary.

5.2.2 Landscaped Areas

There will be a number of vegetated areas within the Project site. Inspection and maintenance of the vegetated areas may be performed by the Owner or a landscape maintenance contractor.

The inspector will check the landscaped areas for the maintenance indicators given below:

- Erosion in the form of rills or gullies
- Ponding water
- Bare areas or less than 70 percent vegetation cover
- Animal burrows, holes, or mounds
- Trash and debris

Routine maintenance of vegetated areas will include pruning and trimming vegetation as identified in the landscape plan. Any trash that is found in the landscaped areas will be removed and disposed of properly.

If erosion, ponding water, bare areas, poor vegetation establishment, or disturbance by animals are identified during the inspection, additional (non-routine) maintenance will be required to correct the problem. (For erosion or ponding water, see the inspection and maintenance measures for irrigation systems.)

In the event that any non-routine maintenance issues are persistently encountered such as poor vegetation establishment, erosion in the form of rills or gullies, or ponding water, the Owner will consult a licensed landscape architect or engineer as applicable to develop remedies.

As applicable, IPM procedures must be incorporated in any corrective measures that are implemented in response to damage by pests. This may include using physical barriers to keep pests out of landscaping; physical pest elimination techniques, such as weeding, squashing, trapping, washing, or pruning out pests; relying on natural enemies to eat pests; or proper use of pesticides as a last line of defense. More information can be obtained at the UC Davis website http://www.ipm.ucdavis.edu/WATER/U/index.html.

5.2.3 Outlet Protection

Routine maintenance of outlet protection will include removing trash, debris, and leaves from the outlets. Any damage to roof drains should be repaired to maintain operability. All displaced energy dissipaters used for outlet protection should immediately be repositioned or replaced, if necessary. If soil erosion is found around an energy dissipater (i.e., riprap, landscape rocks, and/or splash pads) reposition or increase the limits of the energy dissipater to fully cover the eroded area.

5.2.4 Concrete Stamping (or equivalent method)

Inspection/maintenance of the concrete stamping may be performed by the power plant maintenance staff or other employees, as applicable. Alternately, the Owner may retain a storm drain maintenance contractor to perform this inspection service.

The inspector should check for faded, vandalized, or otherwise unreadable concrete stamping or images to prevent dumping into the drains.

There are no routine maintenance activities for the concrete stamping. If inspection indicates the concrete stamping is intact, no action is required. If inspection indicates the concrete stamping is not legible, the concrete stamping shall be repaired or replaced as applicable.

5.2.5 Irrigation Systems

Inspection and maintenance of the irrigation system may be performed by the plant maintenance staff or a landscape maintenance contractor retained by the Owner.

The inspector should check for eroded areas due to concentrated flow, signs of ponding water, broken sprinkler heads or pipes, damaged valves, controllers, or other equipment associated with the irrigation system. The inspector should refer to any proprietary product information for

the irrigation system and for routine maintenance activities or other maintenance indicators for the irrigation system. If no issues are identified during inspection of the irrigation system, no other action is required.

If any of the maintenance indicators listed above is identified during the inspection, additional (non-routine) maintenance will be required to restore the irrigation system to an operable condition. If inspection indicates breaks or leaks in the irrigation lines or individual sprinkler heads, the affected portion of the irrigation system will be repaired. If inspection indicates eroded areas due to concentrated flow from the irrigation system, the eroded areas will be repaired and the irrigation system will be adjusted or repaired as applicable to prevent further erosion. If inspection indicates ponding water resulting from the irrigation system, the irrigation system operator will identify the cause of the ponded water and adjust or repair the irrigation system as applicable to prevent ponding water. Refer to proprietary product information for the irrigation system for other non-routine maintenance activities as applicable.

5.3 INSPECTION AND MAINTENANCE FREQUENCY

A listing of BMPs to be inspected and maintained and the suggested minimum frequency of inspection and maintenance activities is shown in Table 5-1.

Table 5-1. Summary Table of Inspection and Maintenance Frequency

BMP	Inspection Frequency	Maintenance Frequency
Bioretention Basins (LID and treatment control BMP)	Annual, and after major storm events	Routine maintenance to remove accumulated materials at the inlets and outlets: annually, on, or before September 30th. As-needed maintenance based on maintenance indicators in Section 5.2.1.
Landscaped Areas	Monthly	Routine pruning and trimming and trash removal: monthly. Non-routine maintenance as-needed based on maintenance indicators in Section 5.2.2.
Outlet Protection	Monthly	Routine maintenance to remove trash, debris, and leaves. Repair any damage to roof drains. Immediately reposition all displaced energy dissipaters. If soil erosion is found, reposition or increase limits of energy dissipater to fully cover eroded area. Non-routine maintenance as-needed.
Concrete Stamping (or equivalent)	Annual	As-needed based on maintenance indicators in Section 5.2.4.
Irrigation Systems	Monthly	As-needed based on maintenance indicators in Section 5.2.5.

The frequencies listed in Table 5-1 for Inspection and Maintenance Frequency are minimum recommended frequencies for the Project. Typically, the frequency of maintenance required for permanent BMPs is site and drainage area specific. If it is determined during the regularly scheduled inspection and/or routine maintenance that a BMP requires more frequent maintenance (e.g., to remove accumulated trash), it may be necessary to increase the frequency of inspection and/or routine maintenance.

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6.0 SUMMARY OF STORMWATER MANAGEMENT

This Report summarizes permanent stormwater management features proposed for the Project that will collectively meet the requirements for LID, water quality treatment BMPs, and hydromodification management criteria.

The Project is a "Priority Development Project," based on the 2012 Storm Water Standards. The following PDP categories apply to the Project, based on the City of San Diego's Storm Water Requirements Applicability Checklist:

- Heavy industrial development greater than one acre
- Hillside development greater than 5,000 square feet
- Parking lot with a minimum area of 5,000 square feet or a minimum of 15 parking spaces
- Street, road, highways, or freeway (greater than 5,000 square feet)

Based on the review of the anticipated pollutants of concern that the Project may generate and the pollutants that have impacted the receiving waters, the following are the Project's pollutants of concern: sediments, nutrients, heavy metals, organic compounds, trash and debris, oxygen demanding substances, oil and grease, bacteria and viruses, and pesticides.

The Project will incorporate water quality and hydromodification flow control BMPs as well as source control BMPs and LID facilities as described in detail in this Report. The BMP Sizing Calculator program was used to develop the detailed dimensions and capacities for the various BMPs, and comply with the HMP criteria.

The Project includes stormwater management features dispersed throughout the site that will meet the HMP requirements for treatment and flow control BMPs. The primary treatment control BMPs selected for the Project include bioretention basins and flow-through planters. These BMPs provide either Medium or High removal efficiencies for the Project's pollutants of concern, as required by the Storm Water Standards.

Source control BMPs included in the Project's design are:

- Maintenance will be performed in the building
- Secondary containment structures are provided for the storage tanks and unloading areas
- Efficient use of landscaping to minimize water consumption and the use of low flow rate and effective irrigation systems to irrigate landscape plants
- Trash disposal areas will be kept clean and bins covered
- Pesticide use will be minimized
- Discharges from fire sprinklers will be contained within the building
- Discharges from the fire deluge system for the project's main step-up transformer will be held within a properly designed secondary containment system
- Air conditioning condensate will be directed to a landscape area
- Roofing material will minimize potential contaminants, such as copper or zinc

Some Project BMPs will require permanent maintenance: bioretention basins, landscaped areas, outlet protection, concrete stamping, and irrigation systems. The Applicant will own the stormwater control BMPs and will also be responsible for their maintenance. The operation and maintenance information provided in Section 5 of this Report provides inspection criteria, maintenance indicators, and maintenance activities for the above-listed BMPs that require permanent maintenance.

The Project has incorporated stormwater management features to provide LID site design, source control, treatment control, and hydromodification management BMPs in accordance with the 2012 City of San Diego Storm Water Standards.

7.0 REFERENCES

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FIGURES

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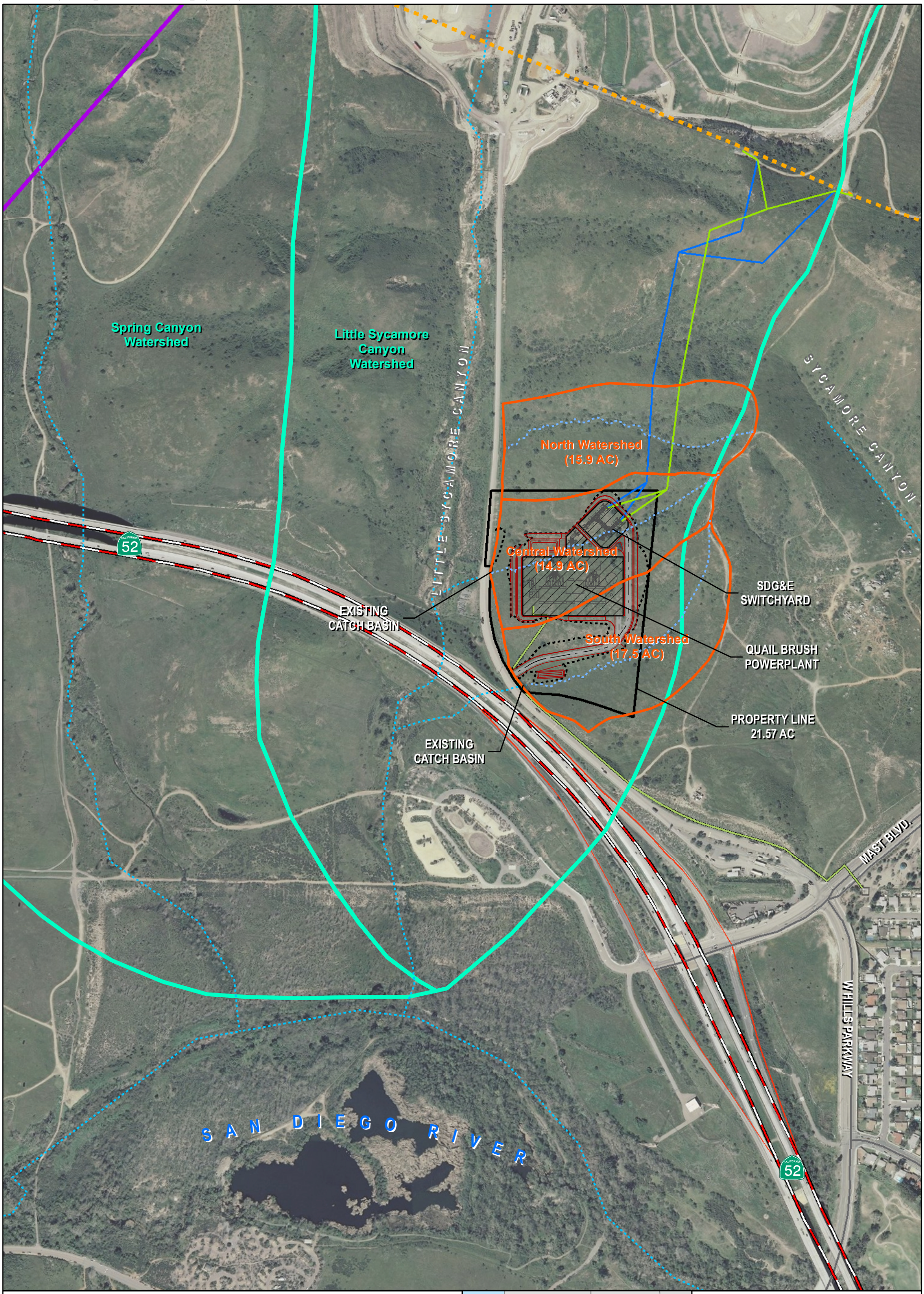
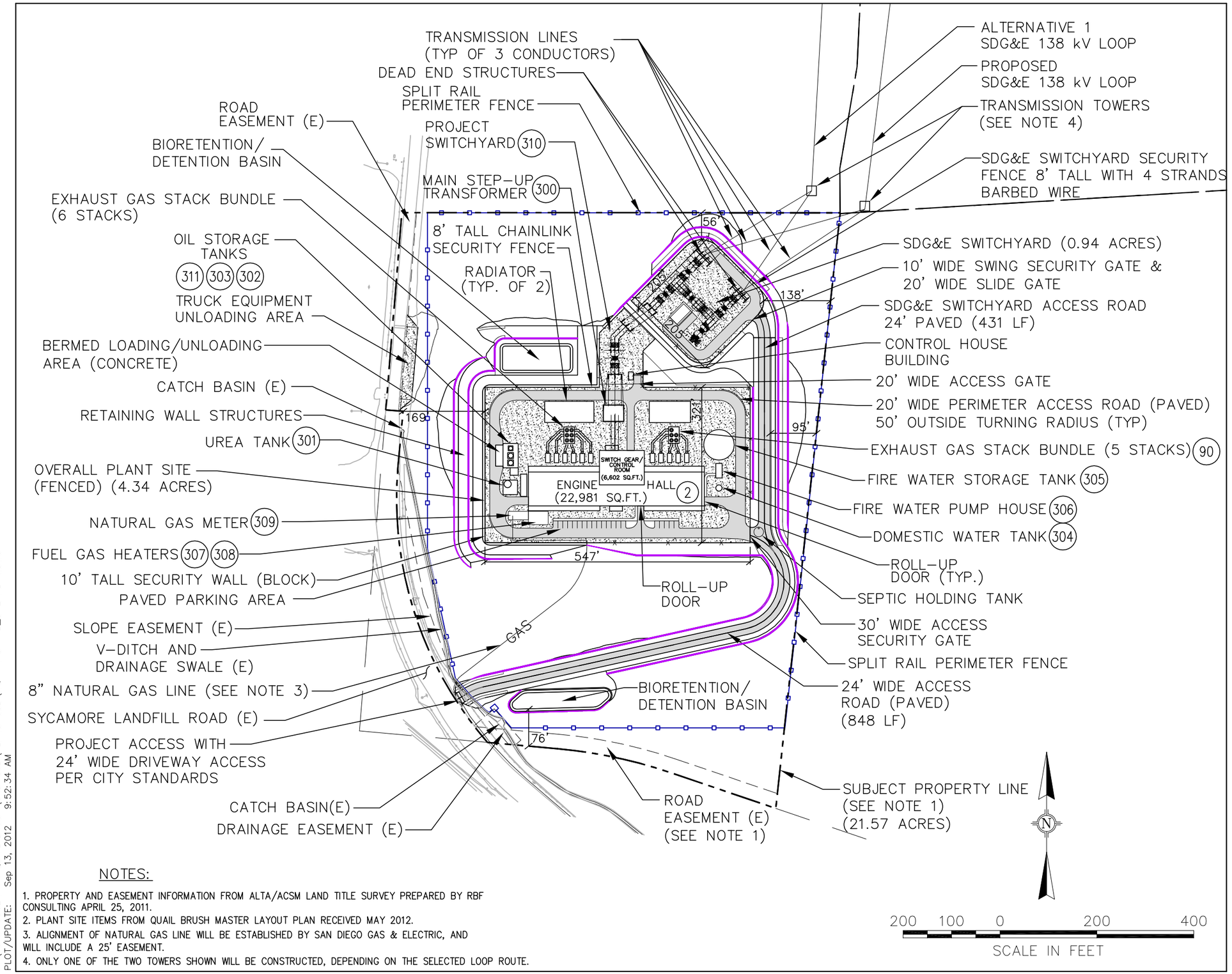
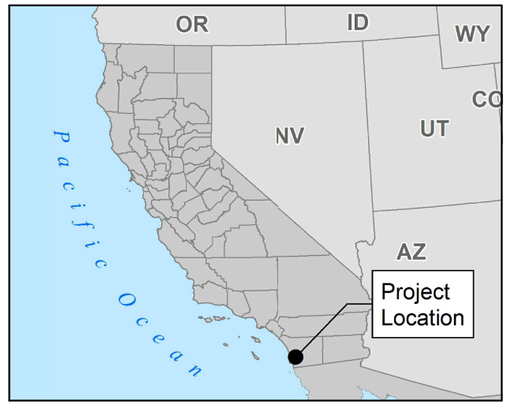






LEGEND:

GAL.	GALLON
L.F.	LINEAR FEET
SQ.FT.	SQUARE FEET
TYP.	TYPICAL
(E)	EXISTING
SDG&E	SAN DIEGO GAS AND ELECTRIC
310	ITEM NO.
	ASPHALT PAVEMENT
	GRAVEL
x	CHAINLINK FENCE
	PARCEL BOUNDARY
GAS	NEW NATURAL GAS LINE
	RETAINING WALLS

POWER PLANT EQUIPMENT (SEE NOTE 2)

Item No	Pcs.	DESCRIPTION	DESCRIPTION Dia.	Ht.	Cap.(G)
2	1	Engine Hall	–	24'	
71	2	Radiator Sets		18' H	
90	11	Exhaust gas Stack	4' ø	70' H	
300	1	Main Step-Up Transformer		30' H	
301	1	UreaTank	13' ø	22' H	20,000
302	1	Used Oil Tank	10' ø	20' H	10,000
303	1	New Oil Tank	10' ø	20' H	10,000
304	1	Domestic Water Tank	10' ø	20' H	10,000
305	1	Fire Water Tank	60' ø	30' H	600,000
306	1	Fire Water Pumphouse		STACK=30'H	
307	1	Warm Start Gas Heater		STACK=30'H	
308	1	Fuel Gas Heater		STACK=30'H	
309	1	Natural Gas Metering Station		6' H	
310	1	Facility 230kV Switchyard		52' H Mast	
311	1	Maintenance Oil Tank	8' ø	16' H	6,000

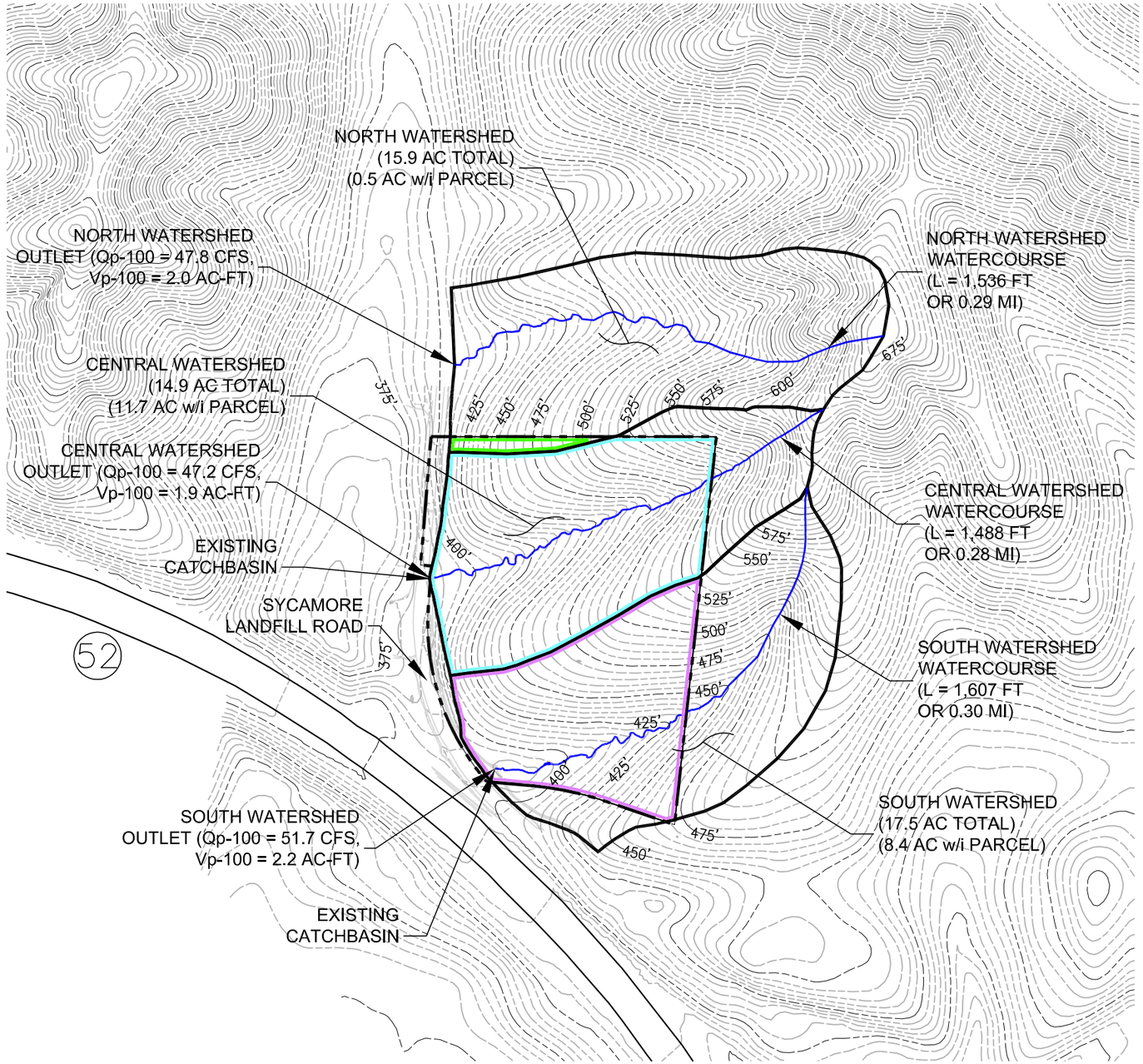
NOTES:

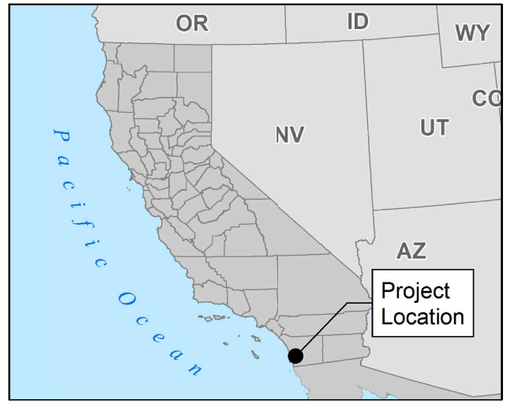
1. PROPERTY AND EASEMENT INFORMATION FROM ALTA/ACSM LAND TITLE SURVEY PREPARED BY RBF CONSULTING APRIL 25, 2011.
2. PLANT SITE ITEMS FROM QUAIL BRUSH MASTER LAYOUT PLAN RECEIVED MAY 2012.
3. ALIGNMENT OF NATURAL GAS LINE WILL BE ESTABLISHED BY SAN DIEGO GAS & ELECTRIC, AND WILL INCLUDE A 25' EASEMENT.
4. ONLY ONE OF THE TWO TOWERS SHOWN WILL BE CONSTRUCTED, DEPENDING ON THE SELECTED LOOP ROUTE.

QUAIL BRUSH GENERATION PROJECT

FIGURE 1-2
SITE PLAN

TETRA TECH EC, INC. Cogentrix





LEGEND:

AC	ACRES
CFS	CUBIC FEET PER SECOND
FT	FEET
L	LENGTH
MI	MILE
Q	FLOWRATE
Vp	PEAK RUNOFF VOLUME (AC-FT)

- 500' — EXISTING CONTOUR
- EXISTING CONTOUR
- PARCEL BOUNDARY
- WATERSHED BOUNDARY (APPROXIMATE)
- ESTIMATED DRAINAGE WATERCOURSE
- PORTION OF NORTH WATERSHED WITHIN PARCEL BOUNDARY
- PORTION OF CENTRAL WATERSHED WITHIN PARCEL BOUNDARY
- PORTION OF SOUTH WATERSHED WITHIN PARCEL BOUNDARY

NOTES:

1. TOPOGRAPHY FROM INTERMAP TECHNOLOGIES VERSION 1.5 DIGITAL TERRAIN MODEL DATA.
2. PROPERTY INFORMATION FROM ALTA/ACSM LAND TITLE SURVEY PREPARED BY RBF CONSULTING APRIL 25, 2011.

QUAIL BRUSH GENERATION PROJECT

FIGURE 1-3
EXISTING HYDROLOGY

TETRA TECH EC, INC.

Cogentrix

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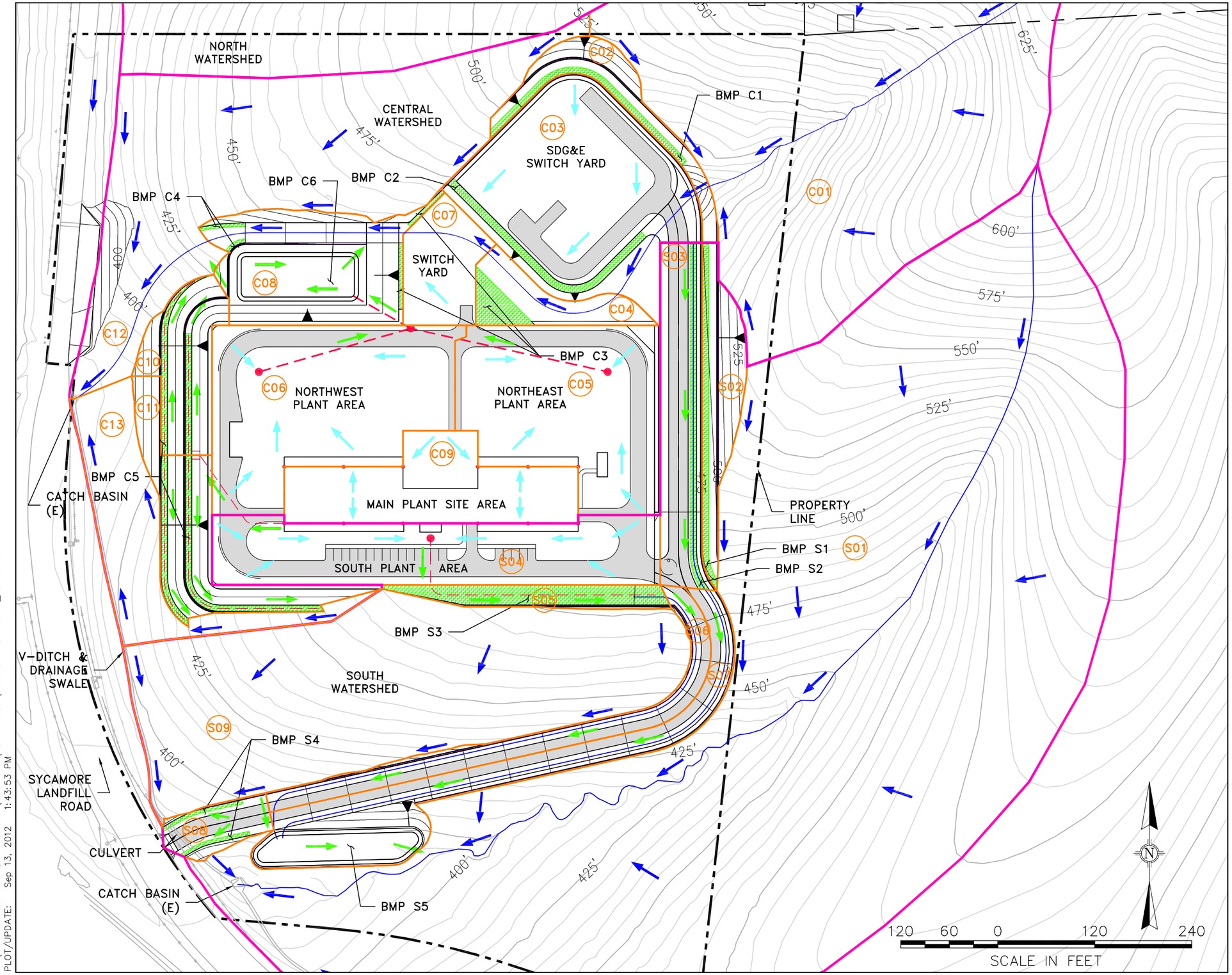

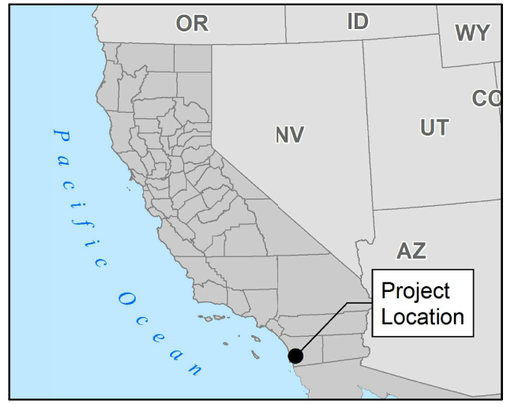

LEGEND:

SF	SQUARE FEET
E	EXISTING
U/G	UNDERGROUND
C	CENTRAL WATERSHED
S	SOUTH WATERSHED
C01	SUB-BASIN AREA ID
SDG&E	SAN DIEGO GAS & ELECTRIC
	PAVEMENT
	BMP/LID
	EXISTING DRAINAGE WATERCOURSE
	PROPOSED DRAINAGE WATERCOURSE
500'	EXISTING CONTOUR
	WATERSHED BOUNDARY
	SUB-BASIN AREA
	SURFACE WATER FLOW
	PLANT SURFACE WATER FLOW
	BMP/LID SURFACE WATER FLOW
	DROP INLET WITH U/G DRAIN

NOTES:

1. TOPOGRAPHY FROM INTERMAP TECHNOLOGIES VERSION 1.5 DIGITAL TERRAIN MODEL DATA.
2. PROPERTY INFORMATION FROM ALTA/ACSM LAND TITLE SURVEY PREPARED BY RBF CONSULTING APRIL 25, 2011.

QUAIL BRUSH GENERATION PROJECT

FIGURE 4-1
STORMWATER MANAGEMENT FEATURE LOCATIONS

TETRA TECH EC, INC.

Cogentrix

P:\4346-COGENTRIX QUAIL BRUSH\CAD-S3B\PLANS-S3B\FIGURE 4-2 - BMP_TEXT.DWG
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APPENDIX A
Storm Water Requirements Applicability Checklist

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THE CITY OF SAN DIEGO
City of San Diego
Development Services
1222 First Ave., MS-302
San Diego, CA 92101
(619) 446-5000

Storm Water Requirements Applicability Checklist

FORM DS-560
JANUARY 2011

Project Address:	Project Number *(for City Use Only):*
Sycamore Landfill Road, San Diego CA	

SECTION 1. Permanent Storm Water BMP Requirements:
Additional information for determining the requirements is found in the Storm Water Standards Manual.

Part A: Determine if Exempt from Permanent Storm Water BMP Requirements.
Projects that are considered maintenance, or are otherwise not categorized as "development projects" or "redevelopment projects" according to the Storm Water Standards manual are not required to install permanent storm water BMPs. **If "Yes" is checked for any line in Part A, proceed to Part C and check the box labeled "Exempt Project." If "No" is checked for all of the lines, continue to Part B.**

1.	The project is not a Development Project as defined in the Storm Water Standards Manual: for example habitat restoration projects, and construction inside an existing building.	☐ Yes ☑ No
2.	The project is only the construction of underground or overhead linear utilities.	☐ Yes ☑ No
3.	The project qualifies as routine maintenance (replaces or renews existing surface materials because of failed or deteriorating condition). This includes roof replacement, pavement spot repairs and resurfacing treatments such as asphalt overlay or slurry seal, and replacement of damaged pavement.	☐ Yes ☑ No
4.	The project only installs sidewalks, bike lanes, or pedestrian ramps on an existing road, and does not change sheet flow condition to a concentrated flow condition.	☐ Yes ☑ No

Part B: Determine if Subject to Priority Development Project Requirements.
Projects that match one of the definitions below are subject to additional requirements including preparation of a Water Quality Technical Report.
If "Yes" is checked for any line in Part B, proceed to Part C and check the box labeled "Priority Development Project." If "No" is checked for all of the lines, continue to Part C and check the box labeled "Standard Development Project."

1.	**Residential development of 10 or more units.**	☐ Yes ☑ No
2.	**Commercial development and similar non-residential development greater than one acre.** Hospitals; laboratories and other medical facilities; educational institutions; recreational facilities; municipal facilities; commercial nurseries; multi-apartment buildings; car wash facilities; mini-malls and other business complexes; shopping malls; hotels; office buildings; public warehouses; automotive dealerships; and other light industrial facilities.	☐ Yes ☑ No
3.	**Heavy industrial development greater than one acre.** Manufacturing plants, food processing plants, metal working facilities, printing plants, and fleet storage areas.	☑ Yes ☐ No
4.	**Automotive repair shop.** Facilities categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539.	☐ Yes ☑ No
5.	**Restaurant.** Facilities that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC code 5812), and where the land area for development is greater than 5,000 square feet.	☐ Yes ☑ No
6.	**Hillside development greater than 5,000 square feet.** Development that creates 5,000 square feet of impervious surface and is located in an area with known erosive soil conditions and where the development will grade on any natural slope that is twenty-five percent or greater.	☑ Yes ☐ No
7.	**Water Quality Sensitive Area.** Development located within, directly adjacent to, or discharging directly to a Water Quality Sensitive Area (as depicted in Appendix C) in which the project either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition. "Directly adjacent" is defined as being situated within 200 feet of the Water Quality Sensitive Area. "Discharging directly to" is defined as outflow from a drainage conveyance system that is composed entirely of flows from the subject development or redevelopment site, and not commingled with flows from adjacent lands.	☑ Yes ☐ No
8.	**Parking lot with a minimum area of 5,000 square feet or a minimum of 15 parking spaces** and potential exposure to urban runoff (unless it meets the exclusion for parking lot reconfiguration on line 11).	☑ Yes ☑ No

9.	**Street, road, highway, or freeway.** New paved surface in excess of 5,000 square feet used for the transportation of automobiles, trucks, motorcycles, and other vehicles (unless it meets the exclusion for road reconfiguration on line 11).	☑ Yes ☐ No
10.	**Retail Gasoline Outlet (RGO)** that is: (a) 5,000 square feet or more or (b) has a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.	☐ Yes ☑ No
11.	**Significant Redevelopment**; project installs and/or replaces 5,000 square feet or more of impervious surface and the existing site meets at least one of the categories above. The project is not considered Significant Redevelopment if reconfiguring an existing road or parking lot without a change to the footprint of an existing developed road or parking lot. The existing footprint is defined as the outside curb or the outside edge of pavement when there is no curb.	☐ Yes ☑ No
12.	**Other Pollutant Generating Project.** Any other project not covered in the categories above, that disturbs one acre or more and is not excluded by the criteria below.	☐ Yes ☑ No

Projects creating less than 5,000 sf of impervious surface and where added landscaping does not require regular use of pesticides and fertilizers, such as slope stabilization using native plants. Calculation of the square footage of impervious surface need not include linear pathways that are for infrequent vehicle use, such as emergency maintenance access or bicycle pedestrian use, if they are built with pervious surfaces or if they sheet flow to surrounding pervious surfaces.

Part C: Select the appropriate category based on the outcome of Parts A & B.

1.	If "Yes" is checked for any line in Part A, then check this box. Continue to Section 2.	☐ Exempt Project
2.	If "No" is checked for all lines in Part A, and Part B, then check this box. Continue to Section 2.	☐ Standard Development Project
3.	If "No" is checked for all lines in Part A, and "Yes" is checked for at least one of the lines in Part B, then check this box. Continue to Section 2. See the Storm Water Standards Manual for guidance on determining if Hydromodification Management Plan requirements apply.	☑ Priority Development Project

SECTION 2. Construction Storm Water BMP Requirements:
For all projects, complete Part D. If "Yes" is checked for any line in Part D, then continue to Part E.

Part D: Determine Construction Phase Storm Water Requirements.

1.	Is the project subject to California's statewide General NPDES Permit for Storm Water Discharges Associated with Construction Activities? (See State Water Resources Control Board Order No. 2009-0009-DWQ for rules on enrollment)	☑ Yes ☐ No
2.	Does the project propose grading or soil disturbance?	☑ Yes ☐ No
3.	Would storm water or urban runoff have the potential to contact any portion of the construction area, including washing and staging areas?	☑ Yes ☐ No
4.	Would the project use any construction materials that could negatively affect water quality if discharged from the site (such as, paints, solvents, concrete, and stucco)?	☑ Yes ☐ No
5.	Check this box if "Yes" is checked for line 1. Continue to Part E.	☑ SWPPP Required
6.	Check this box if "No" is checked for line 1, and "Yes is checked for any line 2-4. Continue to Part E.	☐ WPCP Required
7.	Check this box if "No" is checked for all lines 1-4. Part E does not apply.	☐ No Document Required

Part E: Determine Construction Site Priority

This prioritization must be completed with this form, noted on the plans, and included in the SWPPP or WPCP. The City reserves the right to adjust the priority of the projects both before and during construction. [Note: The construction priority does NOT change construction BMP requirements that apply to projects; rather, it determines the frequency of inspections that will be conducted by City staff.]

☑ 1. **High Priority**
- a) Projects where the site is 50 acres or more and grading will occur during the wet season
- b) Projects 1 acre or more and tributary to an impaired water body for sediment (e.g., Peñasquitos watershed)
- c) Projects 1 acre or more within or directly adjacent to or discharging directly to a coastal lagoon or other receiving water within a Water Quality Sensitive Area.
- d) Projects subject to phased grading or advanced treatment requirements.

☐ **2 Medium Priority**. Projects 1 acre or more but not subject to a high priority designation.

☐ **3 Low Priority.** Projects requiring a Water Pollution Control Plan but not subject to a medium or high priority designation.

Name of Owner or Agent *(Please Print):* Title:

Signature: Date:

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APPENDIX B
Water Quality and Hydromodification Flow Control Treatment Calculations

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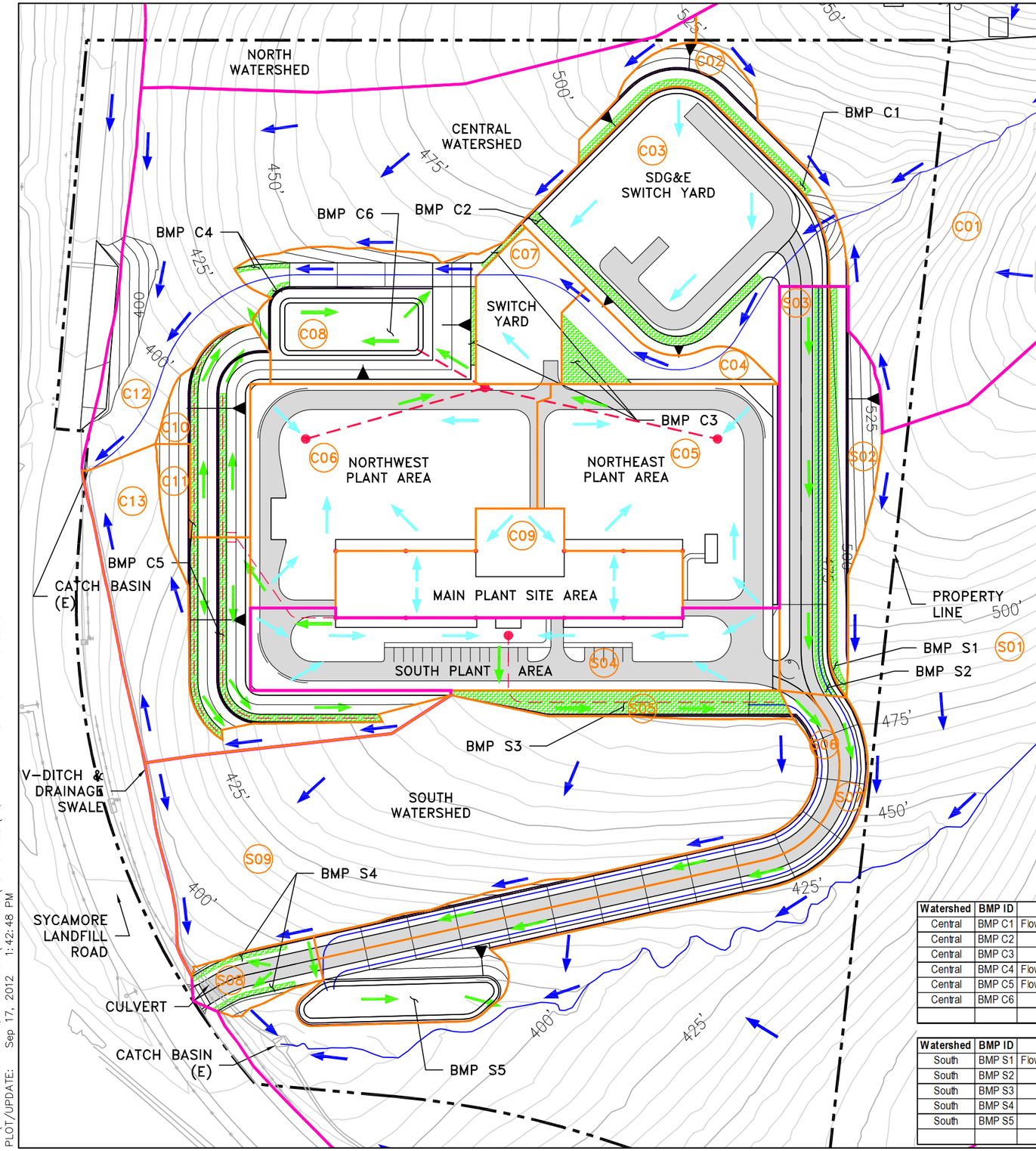
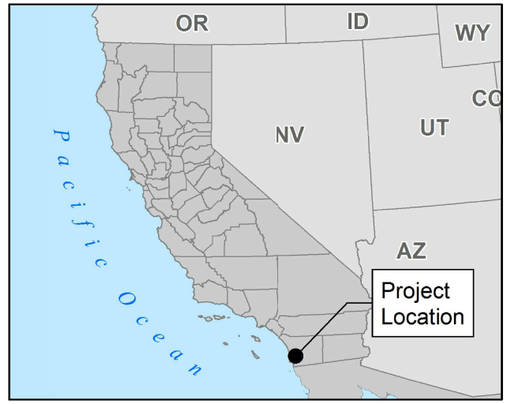


Watershed	Subarea	DMA Description	Area (ac)
Central	C02	Landscaping, Retaining Walls, Slopes	0.27
Central	C03-A	SDGE Switch Yard Pavement	0.25
Central	C03-B	SDGE Switch Yard Gravel	0.70
Central	C03-C	SDGE Switch Yard Landscaping, Drainages, Slopes	0.35
Central	C03-D	SDGE Switch Yard Building	0.03
Central	C04	Landscaping, Drainages	0.25
Central	C05-A	NE Plant Pavement	0.23
Central	C05-B	NE Plant Gravel	0.42
Central	C05-C	NE Plant Landscaping	0.13
Central	C05-D	NE Plant Misc Structures	0.25
Central	C05-E	NE Plant Containment Structures	0.09
Central	C06-A	NW Plant Pavement	0.26
Central	C06-B	NW Plant Gravel	0.48
Central	C06-C	NW Plant Landscaping	0.11
Central	C06-D	NW Plant Misc Structures	0.21
Central	C06-E	NW Plant Containment Structures	0.21
Central	C07-A	Plant Switch Yard Pavement	0.01
Central	C07-B	Plant Switch Yard Gravel	0.29
Central	C07-C	Plant Switch Yard Building	0.00
Central	C08-A	Landscaping, Retaining Walls, Slopes, Pond, Access	0.52
Central	C08-B	Landscaping, Drainages, Slopes, Access	0.22
Central	C09	Plant Main Buildings	0.68
Central	C10	Landscaping, Retaining Walls, Slopes	0.37
Central	C11	Landscaping, Retaining Walls, Slopes	0.51
		Total:	6.8

Watershed	Subarea	DMA Description	Area (ac)
South	S02	Landscaping, Retaining Walls, Slope	0.33
South	S03-A	Access Road Pavement	0.26
South	S03-B	Landscaping, Retaining Walls, Drainages, Slopes	0.26
South	S04-A	Plant Pavement	0.46
South	S04-B	Plant Gravel	0.24
South	S04-C	Plant Landscaping	0.16
South	S04-D	Plant Misc Structures	0.16
South	S05	Landscaping, Retaining Walls	0.20
South	S06-A	Access Road Pavement	0.19
South	S06-B	Landscaping, Retaining Walls, Drainages, Slopes	0.21
South	S07-A	Access Road Pavement	0.19
South	S07-B	Landscaping, Retaining Walls, Drainages, Slopes, Pond	0.56
South	S08-A	Access Road Pavement	0.07
South	S08-B	Landscaping, Retaining Walls, Drainages, Slopes	0.09
		Total:	3.4

Watershed	BMP ID	Type	Description/Reporting DMA	Available Area (SF)	Min. Plan Area (SF)
Central	BMP C1	Flow-Through Planter	C02	2,529	164
Central	BMP C2	Bioretention	C03	3,181	2,091
Central	BMP C3	Bioretention	C04 and C07	3,431	362
Central	BMP C4	Flow-Through Planter	C08-B	420	134
Central	BMP C5	Flow-Through Planter	C09, C10 and C11	7,366	5,410
Central	BMP C6	Bioretention	C05, C06 and C08-A	8,914	6,126
			Total:	25,841	14,287

Watershed	BMP ID	Type	Description/Reporting DMA	Available Area (SF)	Min. Plan Area (SF)
South	BMP S1	Flow-Through Planter	S02	3,419	201
South	BMP S2	Bioretention	S03	3,457	1,619
South	BMP S3	Bioretention	S04 and S05	7,741	3,850
South	BMP S4	Bioretention	S08	975	447
South	BMP S5	Bioretention	S02 through S07	8,298	8,115
			Total:	23,891	14,232



LEGEND:

SF	SQUARE FEET
E	EXISTING
U/G	UNDERGROUND
C	CENTRAL WATERSHED
S	SOUTH WATERSHED
C01	SUB-BASIN AREA ID
SDG&E	SAN DIEGO GAS & ELECTRIC
	PAVEMENT
	BMP/LID
	EXISTING DRAINAGE WATERCOURSE
	PROPOSED DRAINAGE WATERCOURSE
500'	EXISTING CONTOUR
	WATERSHED BOUNDARY
	SUB-BASIN AREA
	SURFACE WATER FLOW
	PLANT SURFACE WATER FLOW
	BMP/LID SURFACE WATER FLOW
	DROP INLET WITH U/G DRAIN

NOTES:

1. TOPOGRAPHY FROM INTERMAP TECHNOLOGIES VERSION 1.5 DIGITAL TERRAIN MODEL DATA.
2. PROPERTY INFORMATION FROM ALTA/ACSM LAND TITLE SURVEY PREPARED BY RBF CONSULTING APRIL 25, 2011.

QUAIL BRUSH GENERATION PROJECT

FIGURE B-1
CONCEPTUAL BMP/LID LOCATIONS

TETRA TECH EC, INC.

Cogentrix

P:\4346-COGENTRIX QUAIL BRUSH\CAD-S3B\PLANS-S3B\WQTR-APP-FIG B-1-SW MANG LOC.DWG
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Project Summary

Project Name	Quail Brush Generation Project
Project Applicant	Quail Brush Genco, LLC
Jurisdiction	City of San Diego
Parcel (APN)	
Hydrologic Unit	San Diego

Compliance Basin Summary

Basin Name:	Central Watershed - North Plant, Plant & SGDE Switch Yards, Slopes, Walls, Pond
Receiving Water:	Central Culvert
Rainfall Basin	Oceanside
Mean Annual Precipitation (inches)	13.3
Project Basin Area (acres):	6.83
Watershed Area (acres):	0.00
SCCWRP Lateral Channel Susceptiblity (H, M, L):	
SCCWRP Vertifical Channel Susceptiblity (H, M, L):	
Overall Channel Susceptibility (H, M, L):	HIGH
Lower Flow Threshold (% of 2-Year Flow):	0.1

Drainage Management Area Summary

ID	Type	BMP ID	Description	Area (ac)	Pre-Project Cover	Post Surface Type	Drainage Soil	Slope
15128	Drains to LID	BMP 1	C02: Landscaping, Retaining Walls, Slopes	0.27	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)
15129	Drains to LID	BMP 2	C03-A: SDGE Switch Yard Pavement	0.25	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Flat - slope (less ...
15130	Drains to LID	BMP 2	C03-B: SDGE Switch Yard Gravel	0.7	Pervious (Pre)	Crushed aggregate	Type C (slow infiltration)	Flat - slope (less ...
15131	Drains to LID	BMP 2	C03-C: SDGE Switch Yard Landscaping, Drainages, Slopes	0.35	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)
16132	Drains to LID	BMP 2	C03-D: SDGE Switch Yard Building	0.03	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
16185	Drains to LID	BMP 3	C04: Landscaping, Drainages	0.25	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
16186	Drains to LID	BMP 6	C05-A: NE Plant Pavement	0.23	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Flat - slope (less ...
16187	Drains to LID	BMP 6	C05-B: NE Plant Gravel	0.42	Pervious (Pre)	Crushed aggregate	Type C (slow infiltration)	Flat - slope (less ...
16188	Drains to LID	BMP 6	C05-C: NE Plant Landscaping	0.13	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
16189	Drains to LID	BMP 6	C05-D: NE Plant Misc Structures	0.25	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
16313	Self-Retaining	BMP 6	C05-E: NE Plant Containment Structures	0.09	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
16314	Drains to LID	BMP 6	C06-A: NW Plant Pavement	0.26	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Flat - slope (less ...
16347	Drains to LID	BMP 6	C06-B: NW Plant Gravel	0.48	Pervious (Pre)	Crushed aggregate	Type C (slow infiltration)	Flat - slope (less ...
16348	Drains to LID	BMP 6	C06-C: NW Plant Landscaping	0.11	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
16349	Drains to LID	BMP 6	C06-D: NW Plant Misc Structures	0.21	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
16350	Self-Retaining	BMP 6	C06-E: NW Plant Containment Structures	0.21	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
16473	Drains to LID	BMP 3	C07-A: Plant Switch Yard Pavement	0.01	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Flat - slope (less ...
16474	Drains to LID	BMP 3	C07-B: Plant Switch Yard Gravel	0.29	Pervious (Pre)	Crushed aggregate	Type C (slow infiltration)	Flat - slope (less ...
16475	Drains to LID	BMP 3	C07-C: Plant Switch Yard Building	0.00	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
16476	Drains to LID	BMP 6	C08-A: Landscaping, Retaining Walls, Slopes, Pond, Access	0.52	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)
19908	Drains to LID	BMP 4	C08-B: Landscaping, Drainages, Slopes, Access	0.22	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)
19909	Drains to LID	BMP 5	C09: Plant Main Buildings	0.68	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
19910	Drains to LID	BMP 5	C10: Landscaping, Retaining Walls, Slopes	0.22	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)
19911	Drains to LID	BMP 5	C11: Landscaping, Retaining Walls, Slopes	0.65	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)

LID Facility Summary

BMP ID	Type	Description	Plan Area (sqft)	Volume 1(cft)	Volume 2(cft)	Orifice Flow (cfs)	Orifice Size (inch)
BMP 1	Flow-Through Planter	C02	164	137	98	0.005	0.4
BMP 2	Bioretention	C03	2091	1743	1255	0.021	0.7
BMP 3	Bioretention	C04 and C07	362	301	217	0.008	0.4
BMP 4	Flow-Through Planter	C08-B	134	111	80	0.004	0.3
BMP 5	Flow-Through Planter	C09, C10 and C11	5410	4508	3246	0.028	0.9
BMP 6	Bioretention	C05, C06 and C08-A	6126	5104	3675	0.041	1.00

Project Summary

Project Name	Quail Brush Generation Project
Project Applicant	Quail Brush Genco, LLC
Jurisdiction	City of San Diego
Parcel (APN)	
Hydrologic Unit	San Diego

Compliance Basin Summary

Basin Name:	South Watershed - South Plant, Access Road, Slopes, Walls, Pond
Receiving Water:	South Culvert
Rainfall Basin	Oceanside
Mean Annual Precipitation (inches)	13.3
Project Basin Area (acres):	3.38
Watershed Area (acres):	0.00
SCCWRP Lateral Channel Susceptiblity (H, M, L):	
SCCWRP Vertifical Channel Susceptiblity (H, M, L):	
Overall Channel Susceptibility (H, M, L):	HIGH
Lower Flow Threshold (% of 2-Year Flow):	0.1

Drainage Management Area Summary

ID	Type	BMP ID	Description	Area (ac)	Pre-Project Cover	Post Surface Type	Drainage Soil	Slope
15018	Drains to LID	BMP 1	S02: Landscaping, Retaining Walls, Slope	0.33	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)
15019	Drains to Pond	BMP 2	S03-A: Access Road Pavement	0.26	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Flat - slope (less ...
15020	Drains to Pond	BMP 2	S03-B: Landscaping, Retaining Walls, Drainages, Slopes	0.26	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
15021	Drains to LID	BMP 3	S04-A: Plant Pavement	0.46	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Flat - slope (less ...
15056	Drains to LID	BMP 3	S04-B: Plant Gravel	0.24	Pervious (Pre)	Crushed aggregate	Type C (slow infiltration)	Flat - slope (less ...
15057	Drains to LID	BMP 3	S04-C: Plant Landscaping	0.16	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
15058	Drains to LID	BMP 3	S04-D: Plant Misc Structures	0.16	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
15059	Drains to LID	BMP 3	S05: Landscaping, Retaining Walls	0.2	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
15060	Drains to Pond	BMP 5	S06-A: Access Road Pavement	0.19	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Moderate (5 - 10%)
19854	Drains to Pond	BMP 5	S06-B: Landscaping, Retaining Walls, Drainages, Slopes	0.21	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Moderate (5 - 10%)
19855	Drains to Pond	BMP 5	S07-A: Access Road Pavement	0.19	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Moderate (5 - 10%)
19856	Drains to Pond	BMP 5	S07-B: Landscaping, Retaining Walls, Drainages, Slopes, Pond	0.56	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Moderate (5 - 10%)
19857	Drains to LID	BMP 4	S08-A: Access Road Pavement	0.07	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Moderate (5 - 10%)
19858	Drains to LID	BMP 4	S08-B: Landscaping, Retaining Walls, Drainages, Slopes	0.09	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Moderate (5 - 10%)

Pond Facility Summary

Scenario	Description	Bottom Area (sqft)	Top Area (sqft)	Depth (ft)	Volume (cft)	Low Orifice (in)	Low Invert (ft)	High Orifice (in)	High Invert (ft)	Weir Length (ft)	Weir Invert (ft)	Facility Soil	Drawdown (hrs)
Design A	South Combined Pond	1906	2669	2	4576.5	1.00	0.05	8.00	1.25	10.00	2.00	C	33.00

Project Summary

Project Name	Quail Brush Generation Project
Project Applicant	Quail Brush Genco, LLC
Jurisdiction	City of San Diego
Parcel (APN)	
Hydrologic Unit	San Diego

Compliance Basin Summary

Basin Name:	South Watershed - South Plant, Access Road, Slopes, Walls, Pond
Receiving Water:	South Culvert
Rainfall Basin	Oceanside
Mean Annual Precipitation (inches)	13.3
Project Basin Area (acres):	3.38
Watershed Area (acres):	0.00
SCCWRP Lateral Channel Susceptiblity (H, M, L):	
SCCWRP Vertifical Channel Susceptiblity (H, M, L):	
Overall Channel Susceptibility (H, M, L):	HIGH
Lower Flow Threshold (% of 2-Year Flow):	0.1

Drainage Management Area Summary

ID	Type	BMP ID	Description	Area (ac)	Pre-Project Cover	Post Surface Type	Drainage Soil	Slope
15018	Drains to Pond	BMP 5	S02: Landscaping, Retaining Walls, Slope	0.33	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)
15019	Drains to Pond	BMP 5	S03-A: Access Road Pavement	0.26	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Flat - slope (less ...
15020	Drains to Pond	BMP 5	S03-B: Landscaping, Retaining Walls, Drainages, Slopes	0.26	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
15021	Drains to Pond	BMP 5	S04-A: Plant Pavement	0.46	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Flat - slope (less ...
15056	Drains to Pond	BMP 5	S04-B: Plant Gravel	0.24	Pervious (Pre)	Crushed aggregate	Type C (slow infiltration)	Flat - slope (less ...
15057	Drains to Pond	BMP 5	S04-C: Plant Landscaping	0.16	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
15058	Drains to Pond	BMP 5	S04-D: Plant Misc Structures	0.16	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
15059	Drains to Pond	BMP 5	S05: Landscaping, Retaining Walls	0.2	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
15060	Drains to Pond	BMP 5	S06-A: Access Road Pavement	0.19	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Moderate (5 - 10%)
19854	Drains to Pond	BMP 5	S06-B: Landscaping, Retaining Walls, Drainages, Slopes	0.21	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Moderate (5 - 10%)
19855	Drains to Pond	BMP 5	S07-A: Access Road Pavement	0.19	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Moderate (5 - 10%)
19856	Drains to Pond	BMP 5	S07-B: Landscaping, Retaining Walls, Drainages, Slopes, Pond	0.56	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Moderate (5 - 10%)
19857	Drains to LID	BMP 4	S08-A: Access Road Pavement	0.07	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Moderate (5 - 10%)
19858	Drains to LID	BMP 4	S08-B: Landscaping, Retaining Walls, Drainages, Slopes	0.09	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Moderate (5 - 10%)

Pond Facility Summary

Scenario	Description	Bottom Area (sqft)	Top Area (sqft)	Depth (ft)	Volume (cft)	Low Orifice (in)	Low Invert (ft)	High Orifice (in)	High Invert (ft)	Weir Length (ft)	Weir Invert (ft)	Facility Soil	Drawdown (hrs)
Design A	South Combined Pond	5245	6468	2	11713.6	1.5	0.05	9.00	1.25	10.00	2.00	C	39.00

Project Summary

Project Name	Quail Brush Generation Project
Project Applicant	Quail Brush Genco, LLC
Jurisdiction	City of San Diego
Parcel (APN)	
Hydrologic Unit	San Diego

Compliance Basin Summary

Basin Name:	Central Watershed - North Plant, Plant & SGDE Switch Yards, Slopes, Walls, Pond
Receiving Water:	Central Culvert
Rainfall Basin	Oceanside
Mean Annual Precipitation (inches)	13.3
Project Basin Area (acres):	6.83
Watershed Area (acres):	0.00
SCCWRP Lateral Channel Susceptiblity (H, M, L):	
SCCWRP Vertifical Channel Susceptiblity (H, M, L):	
Overall Channel Susceptibility (H, M, L):	HIGH
Lower Flow Threshold (% of 2-Year Flow):	0.1

Drainage Management Area Summary

ID	Type	BMP ID	Description	Area (ac)	Pre-Project Cover	Post Surface Type	Drainage Soil	Slope
15128	Drains to LID	BMP 1	C02: Landscaping, Retaining Walls, Slopes	0.27	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)
15129	Drains to LID	BMP 2	C03-A: SDGE Switch Yard Pavement	0.25	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Flat - slope (less ...
15130	Drains to LID	BMP 2	C03-B: SDGE Switch Yard Gravel	0.7	Pervious (Pre)	Crushed aggregate	Type C (slow infiltration)	Flat - slope (less ...
15131	Drains to LID	BMP 2	C03-C: SDGE Switch Yard Landscaping, Drainages, Slopes	0.35	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)
16132	Drains to LID	BMP 2	C03-D: SDGE Switch Yard Building	0.03	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
16185	Drains to LID	BMP 3	C04: Landscaping, Drainages	0.25	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
16186	Drains to Pond	BMP 6	C05-A: NE Plant Pavement	0.23	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Flat - slope (less ...
16187	Drains to Pond	BMP 6	C05-B: NE Plant Gravel	0.42	Pervious (Pre)	Crushed aggregate	Type C (slow infiltration)	Flat - slope (less ...
16188	Drains to Pond	BMP 6	C05-C: NE Plant Landscaping	0.13	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
16189	Drains to Pond	BMP 6	C05-D: NE Plant Misc Structures	0.25	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
16313	Self-Retaining	BMP 6	C05-E: NE Plant Containment Structures	0.09	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
16314	Drains to Pond	BMP 6	C06-A: NW Plant Pavement	0.26	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Flat - slope (less ...
16347	Drains to Pond	BMP 6	C06-B: NW Plant Gravel	0.48	Pervious (Pre)	Crushed aggregate	Type C (slow infiltration)	Flat - slope (less ...
16348	Drains to Pond	BMP 6	C06-C: NW Plant Landscaping	0.11	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
16349	Drains to Pond	BMP 6	C06-D: NW Plant Misc Structures	0.21	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
16350	Self-Retaining	BMP 6	C06-E: NW Plant Containment Structures	0.21	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
16473	Drains to Pond	BMP 3	C07-A: Plant Switch Yard Pavement	0.01	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Flat - slope (less ...
16474	Drains to Pond	BMP 3	C07-B: Plant Switch Yard Gravel	0.29	Pervious (Pre)	Crushed aggregate	Type C (slow infiltration)	Flat - slope (less ...
16475	Drains to Pond	BMP 3	C07-C: Plant Switch Yard Building	0.00	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
16476	Drains to Pond	BMP 6	C08-A: Landscaping, Retaining Walls, Slopes, Pond, Access	0.52	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)
19908	Drains to LID	BMP 4	C08-B: Landscaping, Drainages, Slopes, Access	0.22	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)
19909	Drains to LID	BMP 5	C09: Plant Main Buildings	0.68	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
19910	Drains to LID	BMP 5	C10: Landscaping, Retaining Walls, Slopes	0.22	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)
19911	Drains to LID	BMP 5	C11: Landscaping, Retaining Walls, Slopes	0.65	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)

Pond Facility Summary

Scenario	Description	Bottom Area (sqft)	Top Area (sqft)	Depth (ft)	Volume (cft)	Low Orifice (in)	Low Invert (ft)	High Orifice (in)	High Invert (ft)	Weir Length (ft)	Weir Invert (ft)	Facility Soil	Drawdown (hrs)
Design A	Central Combined Pond	6912	8675	2	19484.8	1.2	0.05	12.00	1.65	10.00	2.5	C	83.00

Project Summary

Project Name	Quail Brush Generation Project
Project Applicant	Quail Brush Genco, LLC
Jurisdiction	City of San Diego
Parcel (APN)	
Hydrologic Unit	San Diego

Compliance Basin Summary

Basin Name:	Central Watershed - North Plant, Plant & SGDE Switch Yards, Slopes, Walls, Pond
Receiving Water:	Central Culvert
Rainfall Basin	Oceanside
Mean Annual Precipitation (inches)	13.3
Project Basin Area (acres):	6.83
Watershed Area (acres):	0.00
SCCWRP Lateral Channel Susceptiblity (H, M, L):	
SCCWRP Vertifical Channel Susceptiblity (H, M, L):	
Overall Channel Susceptibility (H, M, L):	HIGH
Lower Flow Threshold (% of 2-Year Flow):	0.1

Drainage Management Area Summary

ID	Type	BMP ID	Description	Area (ac)	Pre-Project Cover	Post Surface Type	Drainage Soil	Slope
15128	Drains to LID	BMP 1	C02: Landscaping, Retaining Walls, Slopes	0.27	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)
15129	Drains to LID	BMP 2	C03-A: SDGE Switch Yard Pavement	0.25	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Flat - slope (less ...
15130	Drains to LID	BMP 2	C03-B: SDGE Switch Yard Gravel	0.7	Pervious (Pre)	Crushed aggregate	Type C (slow infiltration)	Flat - slope (less ...
15131	Drains to LID	BMP 2	C03-C: SDGE Switch Yard Landscaping, Drainages, Slopes	0.35	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)
16132	Drains to LID	BMP 2	C03-D: SDGE Switch Yard Building	0.03	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
16185	Drains to LID	BMP 3	C04: Landscaping, Drainages	0.25	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
16186	Drains to Pond	BMP 6	C05-A: NE Plant Pavement	0.23	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Flat - slope (less ...
16187	Drains to Pond	BMP 6	C05-B: NE Plant Gravel	0.42	Pervious (Pre)	Crushed aggregate	Type C (slow infiltration)	Flat - slope (less ...
16188	Drains to Pond	BMP 6	C05-C: NE Plant Landscaping	0.13	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
16189	Drains to Pond	BMP 6	C05-D: NE Plant Misc Structures	0.25	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
16313	Self-Retaining	BMP 6	C05-E: NE Plant Containment Structures	0.09	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
16314	Drains to Pond	BMP 6	C06-A: NW Plant Pavement	0.26	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Flat - slope (less ...
16347	Drains to Pond	BMP 6	C06-B: NW Plant Gravel	0.48	Pervious (Pre)	Crushed aggregate	Type C (slow infiltration)	Flat - slope (less ...
16348	Drains to Pond	BMP 6	C06-C: NW Plant Landscaping	0.11	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
16349	Drains to Pond	BMP 6	C06-D: NW Plant Misc Structures	0.21	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
16350	Self-Retaining	BMP 6	C06-E: NW Plant Containment Structures	0.21	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
16473	Drains to LID	BMP 3	C07-A: Plant Switch Yard Pavement	0.01	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Flat - slope (less ...
16474	Drains to LID	BMP 3	C07-B: Plant Switch Yard Gravel	0.29	Pervious (Pre)	Crushed aggregate	Type C (slow infiltration)	Flat - slope (less ...
16475	Drains to LID	BMP 3	C07-C: Plant Switch Yard Building	0.00	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
16476	Drains to Pond	BMP 6	C08-A: Landscaping, Retaining Walls, Slopes, Pond, Access	0.52	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)
19908	Drains to LID	BMP 4	C08-B: Landscaping, Drainages, Slopes, Access	0.22	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)
19909	Drains to LID	BMP 5	C09: Plant Main Buildings	0.68	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
19910	Drains to LID	BMP 5	C10: Landscaping, Retaining Walls, Slopes	0.22	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)
19911	Drains to LID	BMP 5	C11: Landscaping, Retaining Walls, Slopes	0.65	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)

Pond Facility Summary

Scenario	Description	Bottom Area (sqft)	Top Area (sqft)	Depth (ft)	Volume (cft)	Low Orifice (in)	Low Invert (ft)	High Orifice (in)	High Invert (ft)	Weir Length (ft)	Weir Invert (ft)	Facility Soil	Drawdown (hrs)
Design A	Central Combined Pond	5312	6870	2	15228.4	1.1	0.05	16.00	1.65	10.00	2.5	C	82.00

Project Summary

Project Name	Quail Brush Generation Project
Project Applicant	Quail Brush Genco, LLC
Jurisdiction	City of San Diego
Parcel (APN)	
Hydrologic Unit	San Diego

Compliance Basin Summary

Basin Name:	South Watershed - South Plant, Access Road, Slopes, Walls, Pond
Receiving Water:	South Culvert
Rainfall Basin	Oceanside
Mean Annual Precipitation (inches)	13.3
Project Basin Area (acres):	3.38
Watershed Area (acres):	0.00
SCCWRP Lateral Channel Susceptiblity (H, M, L):	
SCCWRP Vertifical Channel Susceptiblity (H, M, L):	
Overall Channel Susceptibility (H, M, L):	HIGH
Lower Flow Threshold (% of 2-Year Flow):	0.1

Drainage Management Area Summary

ID	Type	BMP ID	Description	Area (ac)	Pre-Project Cover	Post Surface Type	Drainage Soil	Slope
15018	Drains to LID	BMP 1	S02: Landscaping, Retaining Walls, Slope	0.33	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)
15019	Drains to LID	BMP 2	S03-A: Access Road Pavement	0.26	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Flat - slope (less ...
15020	Drains to LID	BMP 2	S03-B: Landscaping, Retaining Walls, Drainages, Slopes	0.26	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
15021	Drains to LID	BMP 3	S04-A: Plant Pavement	0.46	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Flat - slope (less ...
15056	Drains to LID	BMP 3	S04-B: Plant Gravel	0.24	Pervious (Pre)	Crushed aggregate	Type C (slow infiltration)	Flat - slope (less ...
15057	Drains to LID	BMP 3	S04-C: Plant Landscaping	0.16	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
15058	Drains to LID	BMP 3	S04-D: Plant Misc Structures	0.16	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
15059	Drains to LID	BMP 3	S05: Landscaping, Retaining Walls	0.2	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
15060	Drains to Pond	BMP 5	S06-A: Access Road Pavement	0.19	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Moderate (5 - 10%)
19854	Drains to Pond	BMP 5	S06-B: Landscaping, Retaining Walls, Drainages, Slopes	0.21	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Moderate (5 - 10%)
19855	Drains to Pond	BMP 5	S07-A: Access Road Pavement	0.19	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Moderate (5 - 10%)
19856	Drains to Pond	BMP 5	S07-B: Landscaping, Retaining Walls, Drainages, Slopes, Pond	0.56	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Moderate (5 - 10%)
19857	Drains to LID	BMP 4	S08-A: Access Road Pavement	0.07	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Moderate (5 - 10%)
19858	Drains to LID	BMP 4	S08-B: Landscaping, Retaining Walls, Drainages, Slopes	0.09	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Moderate (5 - 10%)

LID Facility Summary

BMP ID	Type	Description	Plan Area (sqft)	Volume 1(cft)	Volume 2(cft)	Orifice Flow (cfs)	Orifice Size (inch)
BMP 1	Flow-Through Planter	S02	201	167	120	0.007	0.4
BMP 2	Bioretention	S03	1619	1349	971	0.007	0.4
BMP 3	Bioretention	S04 and S05	3850	3208	2310	0.017	0.7
BMP 4	Bioretention	S08	447	372	268	0.003	0.2
BMP 5	Bioretention	S02 through S07	8115	6761	4869	0.053	1.00

Project Summary

Project Name	Quail Brush Generation Project
Project Applicant	Quail Brush Genco, LLC
Jurisdiction	City of San Diego
Parcel (APN)	
Hydrologic Unit	San Diego

Compliance Basin Summary

Basin Name:	South Watershed - South Plant, Access Road, Slopes, Walls, Pond
Receiving Water:	South Culvert
Rainfall Basin	Oceanside
Mean Annual Precipitation (inches)	13.3
Project Basin Area (acres):	3.38
Watershed Area (acres):	0.00
SCCWRP Lateral Channel Susceptiblity (H, M, L):	
SCCWRP Vertifical Channel Susceptiblity (H, M, L):	
Overall Channel Susceptibility (H, M, L):	HIGH
Lower Flow Threshold (% of 2-Year Flow):	0.1

Drainage Management Area Summary

ID	Type	BMP ID	Description	Area (ac)	Pre-Project Cover	Post Surface Type	Drainage Soil	Slope
15018	Drains to LID	BMP 5	S02: Landscaping, Retaining Walls, Slope	0.33	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Steep (greater 10%)
15019	Drains to LID	BMP 5	S03-A: Access Road Pavement	0.26	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Flat - slope (less ...
15020	Drains to LID	BMP 5	S03-B: Landscaping, Retaining Walls, Drainages, Slopes	0.26	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
15021	Drains to LID	BMP 5	S04-A: Plant Pavement	0.46	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Flat - slope (less ...
15056	Drains to LID	BMP 5	S04-B: Plant Gravel	0.24	Pervious (Pre)	Crushed aggregate	Type C (slow infiltration)	Flat - slope (less ...
15057	Drains to LID	BMP 5	S04-C: Plant Landscaping	0.16	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
15058	Drains to LID	BMP 5	S04-D: Plant Misc Structures	0.16	Pervious (Pre)	Roofs	Type C (slow infiltration)	Flat - slope (less ...
15059	Drains to LID	BMP 5	S05: Landscaping, Retaining Walls	0.2	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Flat - slope (less ...
15060	Drains to LID	BMP 5	S06-A: Access Road Pavement	0.19	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Moderate (5 - 10%)
19854	Drains to LID	BMP 5	S06-B: Landscaping, Retaining Walls, Drainages, Slopes	0.21	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Moderate (5 - 10%)
19855	Drains to LID	BMP 5	S07-A: Access Road Pavement	0.19	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Moderate (5 - 10%)
19856	Drains to LID	BMP 5	S07-B: Landscaping, Retaining Walls, Drainages, Slopes, Pond	0.56	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Moderate (5 - 10%)
19857	Drains to LID	BMP 4	S08-A: Access Road Pavement	0.07	Pervious (Pre)	Concrete or asphalt	Type C (slow infiltration)	Moderate (5 - 10%)
19858	Drains to LID	BMP 4	S08-B: Landscaping, Retaining Walls, Drainages, Slopes	0.09	Pervious (Pre)	Landscaping	Type C (slow infiltration)	Moderate (5 - 10%)

LID Facility Summary

BMP ID	Type	Description	Plan Area (sqft)	Volume 1(cft)	Volume 2(cft)	Orifice Flow (cfs)	Orifice Size (inch)
BMP 1	Flow-Through Planter	S02	201	167	120	0.007	0.4
BMP 2	Bioretention	S03	1619	1349	971	0.007	0.4
BMP 3	Bioretention	S04 and S05	3850	3208	2310	0.017	0.7
BMP 4	Bioretention	S08	447	372	268	0.003	0.2
BMP 5	Bioretention	S02 through S07	8115	6761	4869	0.053	1.00

APPENDIX C
Typical Details of Treatment Control BMPs

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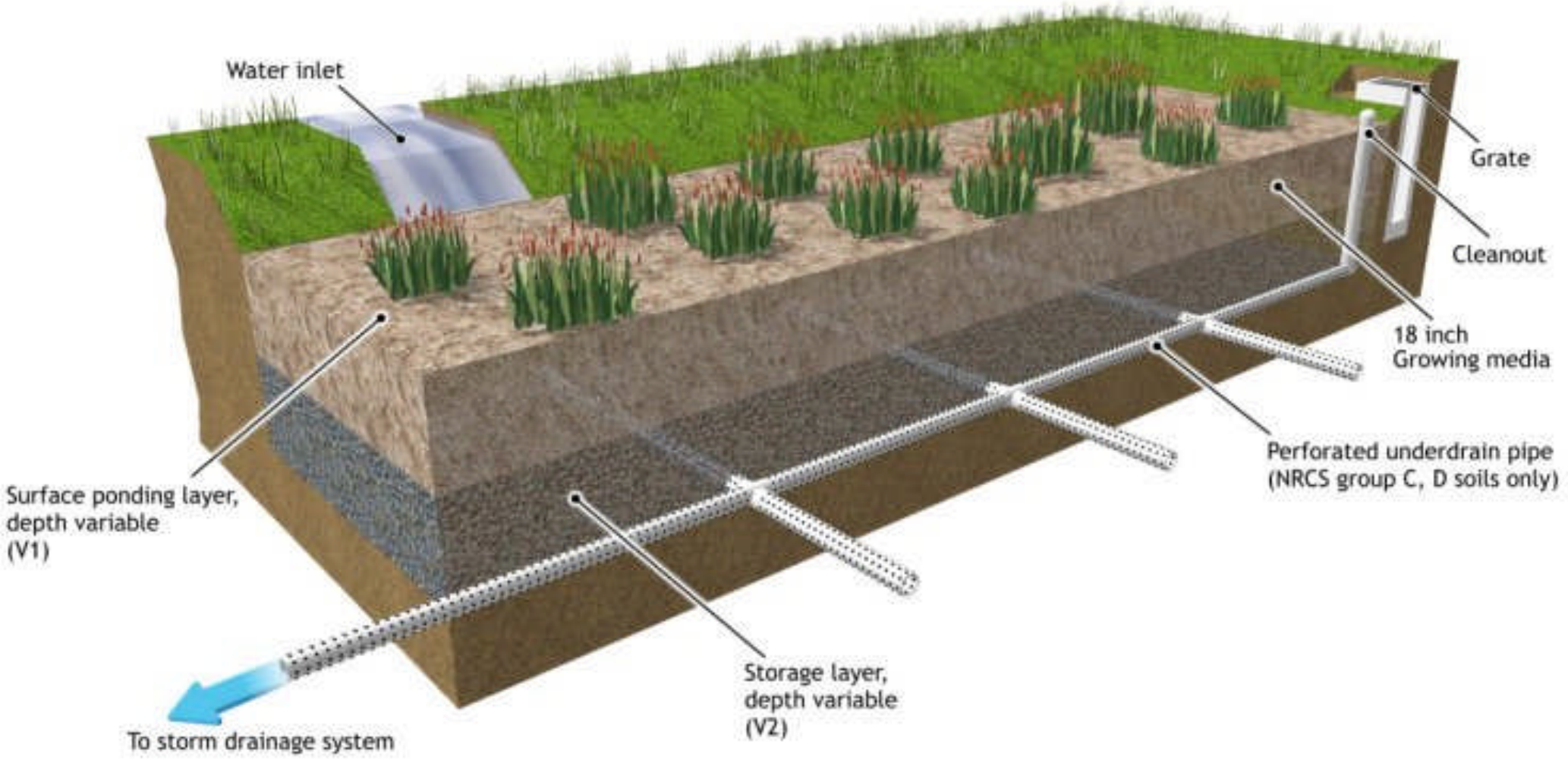
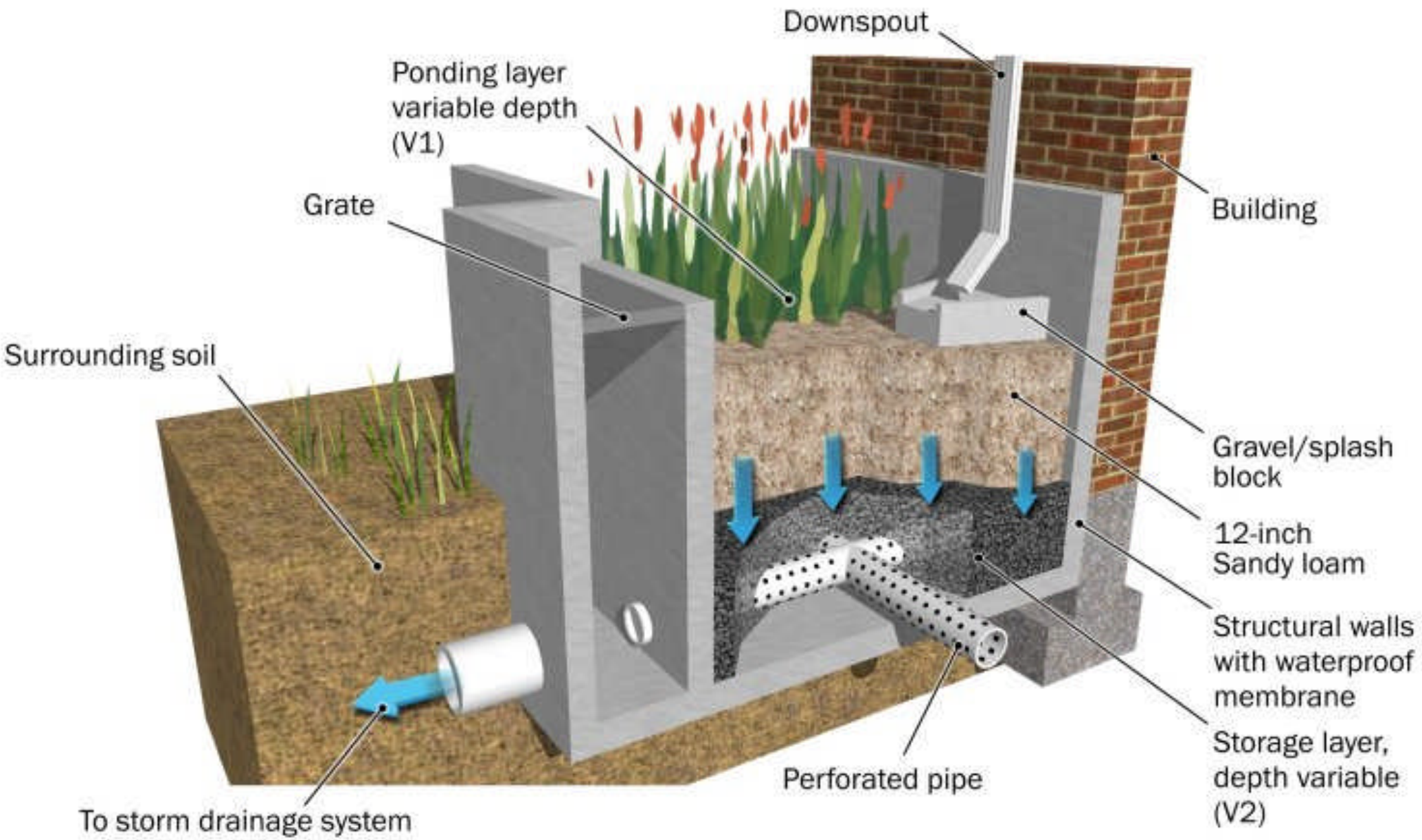
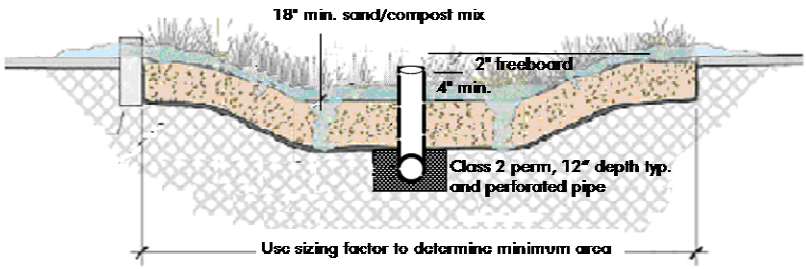


BIORETENTION AREA/BASIN EXAMPLE



FLOW-THROUGH PLANTER EXAMPLE

Bioretention Facilities



Bioretention facility configured for treatment-only requirements. Bioretention facilities can rectangular, linear, or nearly any shape.

Best Uses

- Commercial areas
- Residential subdivisions
- Industrial developments
- Roadways
- Parking lots
- Fit in setbacks, medians, and other landscaped areas

Advantages

- Can be any shape
- Low maintenance
- Can be landscaped

Limitations

- Require 4% of tributary impervious square footage
- Typically requires 3-4 feet of head
- Irrigation typically required

Bioretention detains runoff in a surface reservoir, filters it through plant roots and a biologically active soil mix, and then infiltrates it into the ground. Where native soils are less permeable, an underdrain conveys treated runoff to storm drain or surface drainage.

Bioretention facilities can be configured in nearly any shape. When configured as linear **swales**, they can convey high flows while percolating and treating lower flows.

Bioretention facilities can be configured as in-ground or above-ground planter boxes, with the bottom open to allow infiltration to native soils underneath. If infiltration cannot be allowed, use the sizing factors and criteria for the Flow-Through Planter.

► CRITERIA

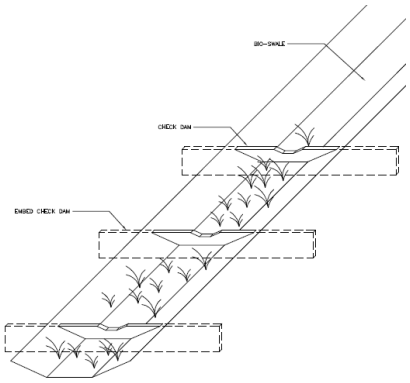
For development projects subject only to runoff treatment requirements, the following criteria apply:

Parameter	Criterion
Soil mix depth	18 inches minimum
Soil mix minimum percolation rate	5 inches per hour minimum sustained (10 inches per hour initial rate recommended)
Soil mix surface area	0.04 times tributary impervious area (or equivalent)

Parameter	Criterion
Surface reservoir depth	6 inches minimum; may be sloped to 4 inches where adjoining walkways.
Underdrain	Required in Group "C" and "D" soils. Perforated pipe embedded in gravel ("Class 2 permeable" recommended), connected to storm drain or other accepted discharge point.

► DETAILS

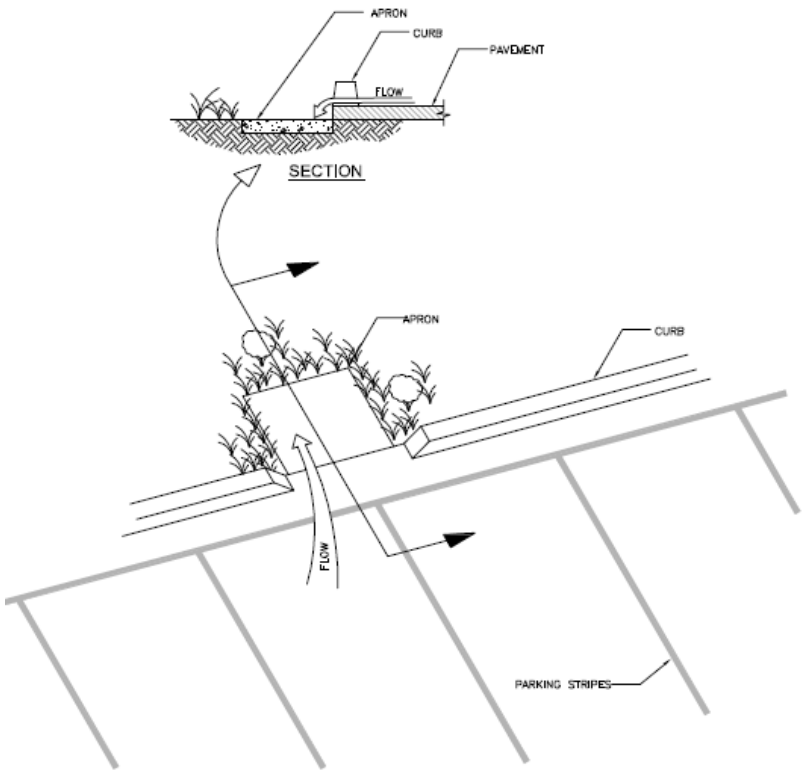
Plan. On the surface, a bioretention facility should be one level, shallow basin—or a series of basins. As runoff enters each basin, it should flood and fill throughout before runoff overflows to the outlet or to the next downstream basin. This will help prevent movement of surface mulch and soil mix.



Use check dams for linear bioretention facilities (swales) on a slope.

In a linear swale, check dams should be placed so that the lip of each dam is at least as high as the toe of the next upstream dam. A similar principle applies to bioretention facilities built as terraced roadway shoulders.

Inlets. Paved areas draining to the facility should be graded, and inlets should be placed, so that runoff remains as sheet flow or as dispersed as possible. Curb cuts should be wide (12" is recommended) to avoid clogging with leaves or debris. Allow for a minimum reveal of 4"-6" between the inlet and soil mix elevations to ensure turf or mulch buildup does not block the inlet. In addition, place an apron of stone or concrete, a foot square or larger, inside each inlet to prevent vegetation from growing up and blocking the inlet.



Recommended design details for bioretention facility inlets (see text).

Where runoff is collected in pipes or gutters and conveyed to the facility, protect the landscaping from high-velocity flows with energy-dissipating rocks. In larger installations, provide cobble-lined channels to better distribute flows throughout the facility.

Upturned pipe outlets can be used to dissipate energy when runoff is piped from roofs and upgradient paved areas.

Soil mix. The required soil mix is similar to a loamy sand. It must maintain a minimum percolation rate of 5" per hour throughout the life of the facility, and it must be suitable for maintaining plant life. Typically, on-site soils will not be suitable due to clay content.

Storage and drainage layer. "Class 2 permeable," Caltrans specification 68-1.025, is recommended. Open-graded crushed rock, washed, may be used, but requires 4"-6" washed pea gravel be substituted at the top of the crushed rock gravel layers. **Do not use filter fabric** to separate the soil mix from the gravel drainage layer or the gravel drainage layer from the native soil.

Underdrains. No underdrain is required where native soils beneath the facility are Hydrologic Soil Group A or B. For treatment-only facilities where native soils are Group C or D, a perforated pipe must be bedded in the gravel layer and must terminate at a storm drain or other approved discharge point.

Outlets. In treatment-only facilities, outlets must be set high enough to ensure the surface reservoir fills and the entire surface area of soil mix is flooded before the outlet elevation is reached. In swales, this can be achieved with appropriately placed check dams.

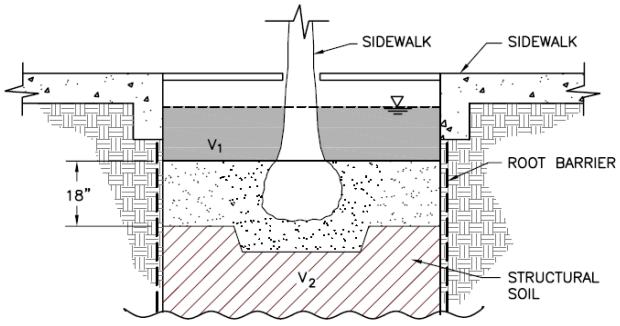
The outlet should be designed to exclude floating mulch and debris.

Vaults, utility boxes and light standards. It is best to locate utilities outside the bioretention facility—in adjacent walkways or in a separate area set aside for this purpose. If utility structures are to be placed within the facility, the locations should be anticipated and adjustments made to ensure the minimum bioretention surface area and volumes are achieved. Leaving the final locations to each individual utility can produce a haphazard, unaesthetic appearance and make the bioretention facility more difficult to maintain.

Emergency overflow. The site grading plan should anticipate extreme events and potential clogging of the overflow and route emergency overflows safely.

Trees. Bioretention areas can accommodate small or large trees. There is no need to subtract the area taken up by roots from the effective area of the facility. Extensive tree roots maintain soil permeability and help retain runoff. Normal maintenance of a bioretention facility should not affect tree lifespan.

The bioretention facility can be integrated with a tree pit of the required depth and filled with structural soil. If a root barrier is used, it can be located to allow tree roots to spread throughout the bioretention facility while protecting adjacent pavement. Locations and planting elevations should be selected to avoid blocking the facility's inlets and outlets.



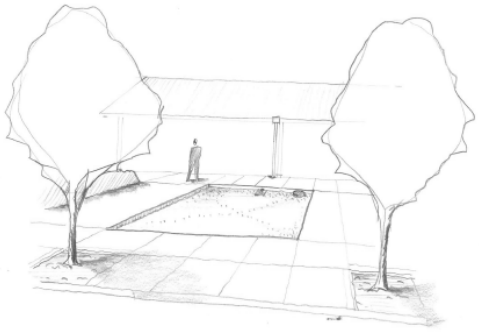
Bioretention facility configured as a tree well.
The root barrier is optional.

► APPLICATIONS

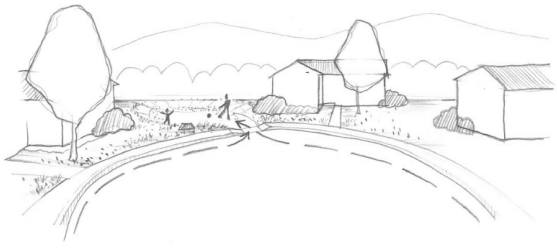
Multi-purpose landscaped areas. Bioretention facilities are easily adapted to serve multiple purposes. The loamy sand soil mix will support turf or a plant palette suitable to the location and a well-drained soil.

Example landscape treatments:

- Lawn with sloped transition to adjacent landscaping.
- Swale in setback area
- Swale in parking median
- Lawn with hardscaped edge treatment
- Decorative garden with formal or informal plantings
- Traffic island with low-maintenance landscaping
- Raised planter with seating
- Bioretention on a terraced slope



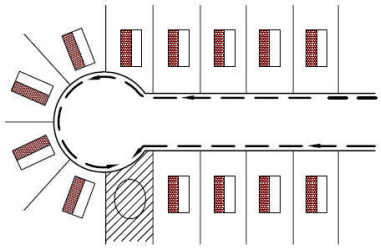
Bioretention facility configured as a recessed decorative lawn with hardscaped edge.



Bioretention facility configured and planted as a lawn/ play area.

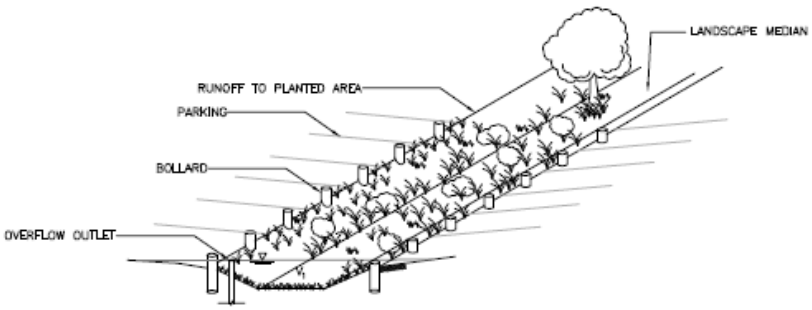
Residential subdivisions. Some subdivisions are designed to drain roofs and driveways to the streets (in the conventional manner) and then drain the streets to bioretention areas, with one bioretention area for each 1 to 6 lots, depending on subdivision layout and topography.

If allowed by the local jurisdiction, bioretention areas can be placed on a separate, dedicated parcel with joint ownership.



Bioretention facility receiving drainage
from individual lots and the street in
a residential subdivision.

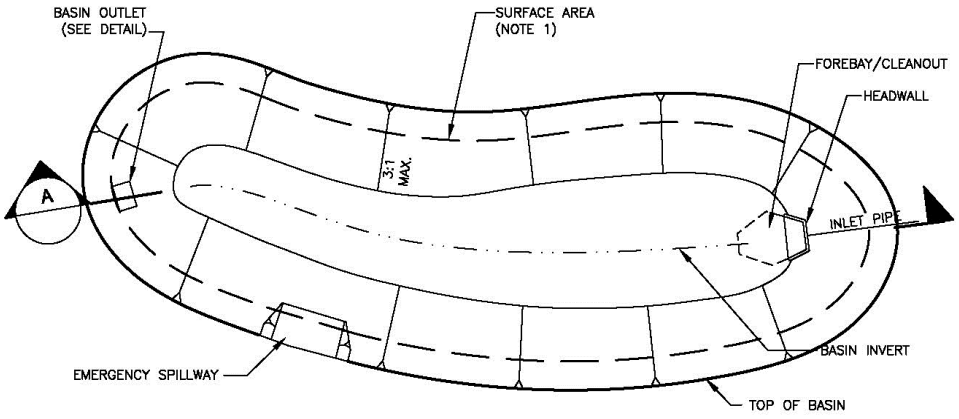
Sloped sites. Bioretention facilities must be constructed as a basin, or series of basins, with the circumference of each basin set level. It may be necessary to add curbs or low retaining walls.



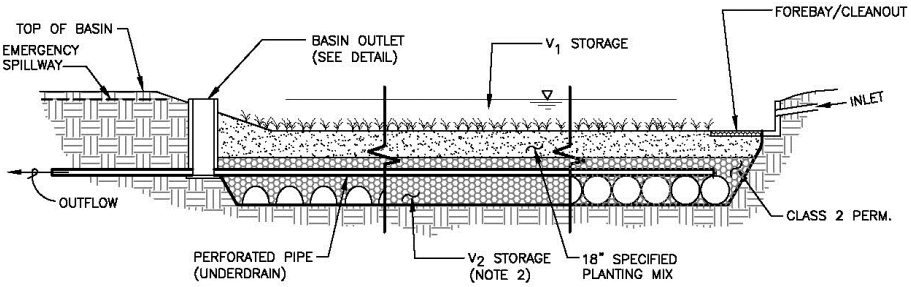
Bioretention facility configured as a parking median.
Note use of bollards in place of curbs, eliminating the need for curb cuts.

Design Checklist for Bioretention

- ❒ Volume or depth of surface reservoir meets or exceeds minimum.
- ❒ 18" depth "loamy sand" soil mix with minimum long-term percolation rate of 5"/hour.
- ❒ Area of soil mix meets or exceeds minimum.
- ❒ Perforated pipe underdrain bedded in "Class 2 perm" with connection and sufficient head to storm drain or discharge point (except in "A" or "B" soils).
- ❒ No filter fabric.
- ❒ Underdrain has a clean-out port consisting of a vertical, rigid, non-perforated PVC pipe, with a minimum diameter of 6 inches and a watertight cap.
- ❒ Location and footprint of facility are shown on site plan and landscaping plan.
- ❒ Bioretention area is designed as a basin (level edges) or a series of basins, and grading plan is consistent with these elevations. If facility is designed as a swale, check dams are set so the lip of each dam is at least as high as the toe of the next upstream dam.
- ❒ Inlets are 12" wide, have 4"-6" reveal and an apron or other provision to prevent blockage when vegetation grows in, and energy dissipation as needed.
- ❒ Overflow connected to a downstream storm drain or approved discharge point.
- ❒ Emergency spillage will be safely conveyed overland.
- ❒ Plantings are suitable to the climate and a well-drained soil.
- ❒ Irrigation system with connection to water supply.
- ❒ Vaults, utility boxes, and light standards are located outside the minimum soil mix surface area.
- ❒ When excavating, avoid smearing of the soils on bottom and side slopes. Minimize compaction of native soils and "rip" soils if clayey and/or compacted. Protect the area from construction site runoff.



PLAN VIEW
NOT TO SCALE



A SECTION
NOT TO SCALE

NOTE

1. SURFACE AREA LIMIT DETERMINED BY EXTENT OF SPECIFIED PLANTING MIX, WHICH IS GOVERNED BY THE OUTLET SPILL ELEVATION. FOR REQUIRED SURFACE AREA REFER TO THE FACTORS AND EQUATIONS IN THE STORMWATER C.3 GUIDEBOOK.
2. V_2 STORAGE ACCOMPLISHED WITH INFILTRATION ARCHES, PERFORATED PIPES, CLASS 2 PERM OR OTHER AT THE DESIGNERS DISCRETION.

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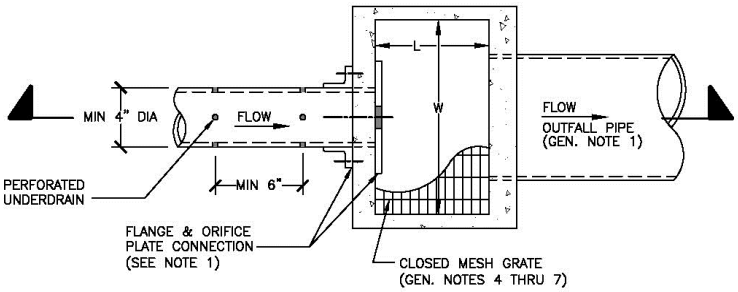
Bioretention Facility



PLAN
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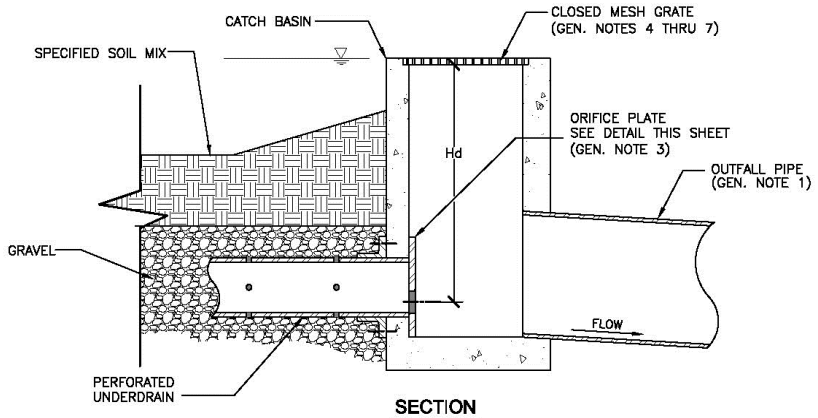
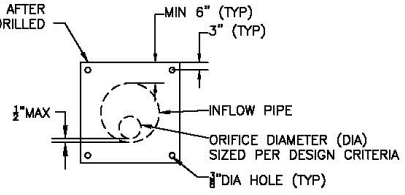


SECTION
N.T.S.

ORIFICE PLATE: MIN SQUARE DIMENSIONS 1.0 FT GREATER THAN PIPE DIA. HOT-DIP GALVANIZED PLATE AFTER HOLES HAVE BEEN DRILLED



FLOW CONTROL ORIFICE PLATE

NOTE

1. ORIFICE PLATE & FLANGE CONNECTION TO CONCRETE SHALL BE FITTED WITH 30 DUROMETER NEOPRENE RING.

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Bioretention Facility Outlet Detail - A

Flow-through Planter

Portland 2004 Stormwater Manual

Best Uses

- Management of roof runoff
- Next to buildings
- Dense urban areas
- Where infiltration is not desired

Advantages

- Can be used next to structures
- Versatile
- Can be any shape
- Low maintenance

Limitations

- Can be used for flow-control only on sites with "C" and "D" soils
- Requires underdrain
- Requires 3-4 feet of head

Flow-through planters treat and detain runoff without allowing seepage into the underlying soil. They can be used next to buildings and on slopes where stability might be affected by adding soil moisture.

Flow-through planters typically receive runoff via downspouts leading from the roofs of adjacent buildings. However, they can also be set in-ground and receive sheet flow from adjacent paved areas.

Pollutants are removed as runoff passes through the soil layer and is collected in an underlying layer of gravel or drain rock. A perforated-pipe underdrain is typically connected to a storm drain or other discharge point. An overflow inlet conveys flows which exceed the capacity of the planter.

► CRITERIA

Treatment only. For development projects subject only to runoff treatment requirements, the following criteria apply:

Parameter	Criterion
Soil mix depth	18 inches minimum
Soil mix minimum percolation rate	5 inches per hour minimum sustained (10 inches per hour initial rate recommended)
Soil mix surface area	0.04 times tributary impervious area (or equivalent)

Parameter	Criterion
Surface reservoir depth	6" minimum; may be sloped to 4" where adjoining walkways.
Underdrain	Typically used. Perforated pipe embedded in gravel ("Class 2 permeable" recommended), connected to storm drain or other accepted discharge point.

► DETAILS

Configuration. The planter must be level. To avoid standing water in the subsurface layer, set the perforated pipe underdrain and orifice as nearly flush with the planter bottom as possible.

Inlets. Protect plantings from high-velocity flows by adding rocks or other energy-dissipating structures at downspouts and other inlets.

Soil mix. The required soil mix is similar to a loamy sand. It must maintain a minimum percolation rate of 5" per hour throughout the life of the facility, and it must be suitable for maintaining plant life. Typically, on-site soils will not be suitable due to clay content.

Gravel storage and drainage layer. "Class 2 permeable," Caltrans specification 68-1.025, is recommended. Open-graded crushed rock, washed, may be used, but requires 4"-6" of washed pea gravel be substituted at the top of the crushed rock layer. **Do not use filter fabric** to separate the soil mix from the gravel drainage layer.

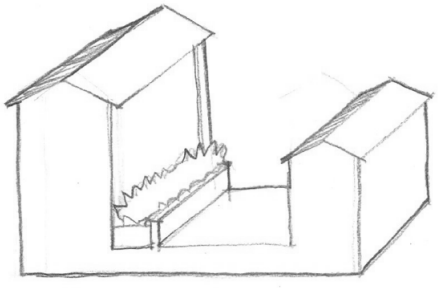
Emergency overflow. The planter design and installation should anticipate extreme events and potential clogging of the overflow and route emergency overflows safely.

► APPLICATIONS

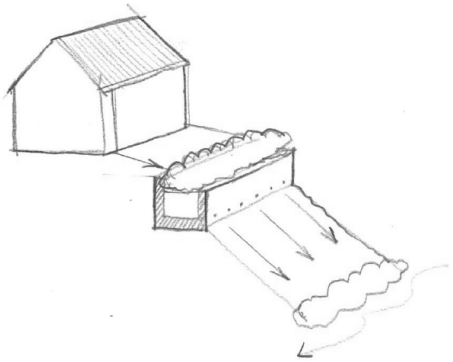
Adjacent to buildings. Flow-through planters may be located adjacent to buildings, where the planter vegetation can soften the visual effect of the building wall. A setback with a raised planter box may be appropriate even in some neo-traditional pedestrian-oriented urban streetscapes.

At plaza level. Flow-through planters have been successfully incorporated into podium-style developments, with the planters placed on the plaza level and receiving runoff from the tower roofs above. Runoff from the plaza level is typically managed separately by additional flow-through planters or bioretention facilities located at street level.

Steep slopes. Flow-through planters provide a means to detain and treat runoff on slopes that cannot accept infiltration from a bioretention facility. The planter can be built into the slope similar to a retaining wall. The design should consider the need to access the planter for periodic maintenance. Flows from the planter underdrain and overflow must be directed in accordance with local requirements. It is sometimes possible to disperse these flows to the downgradient hillside.



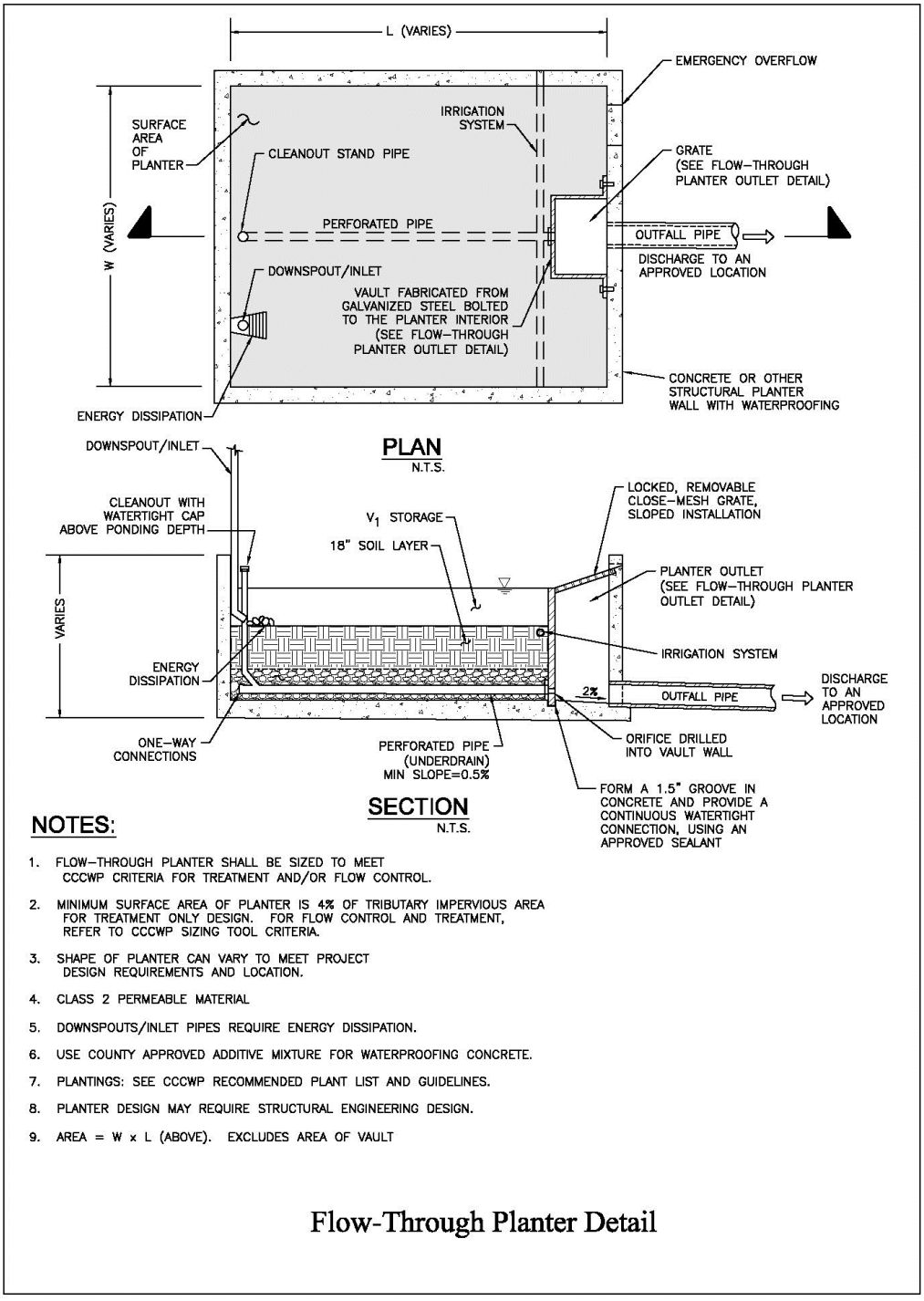
Flow-through planter on the plaza level of a podium-style development.



Flow-through planter built into a hillside. Flows from the underdrain and overflow must be directed in accordance with local requirements.

Design Checklist for Flow-through Planter

- ❒ Reservoir depth is 4-6" minimum.
- ❒ 18" depth "loamy sand" soil mix with minimum long-term infiltration rate of 5"/hour.
- ❒ Area of soil mix meets or exceeds minimum.
- ❒ "Class 2 perm" drainage layer.
- ❒ No filter fabric.
- ❒ Perforated pipe underdrain with outlet located flush or nearly flush with planter bottom. Connection with sufficient head to storm drain or discharge point.
- ❒ Underdrain has a clean-out port consisting of a vertical, rigid, non-perforated PVC pipe, with a minimum diameter of 6 inches and a watertight cap.
- ❒ Overflow connected to a downstream storm drain or approved discharge point.
- ❒ Location and footprint of facility are shown on site plan and landscaping plan.
- ❒ Planter is set level.
- ❒ Emergency spillage will be safely conveyed overland.
- ❒ Plantings are suitable to the climate and a well-drained soil.
- ❒ Irrigation system with connection to water supply.



NOTES:

1. FLOW-THROUGH PLANTER SHALL BE SIZED TO MEET CCCWP CRITERIA FOR TREATMENT AND/OR FLOW CONTROL.
2. MINIMUM SURFACE AREA OF PLANTER IS 4% OF TRIBUTARY IMPERVIOUS AREA FOR TREATMENT ONLY DESIGN. FOR FLOW CONTROL AND TREATMENT, REFER TO CCCWP SIZING TOOL CRITERIA.
3. SHAPE OF PLANTER CAN VARY TO MEET PROJECT DESIGN REQUIREMENTS AND LOCATION.
4. CLASS 2 PERMEABLE MATERIAL
5. DOWNSPOUTS/INLET PIPES REQUIRE ENERGY DISSIPATION.
6. USE COUNTY APPROVED ADDITIVE MIXTURE FOR WATERPROOFING CONCRETE.
7. PLANTINGS: SEE CCCWP RECOMMENDED PLANT LIST AND GUIDELINES.
8. PLANTER DESIGN MAY REQUIRE STRUCTURAL ENGINEERING DESIGN.
9. AREA = W x L (ABOVE). EXCLUDES AREA OF VAULT

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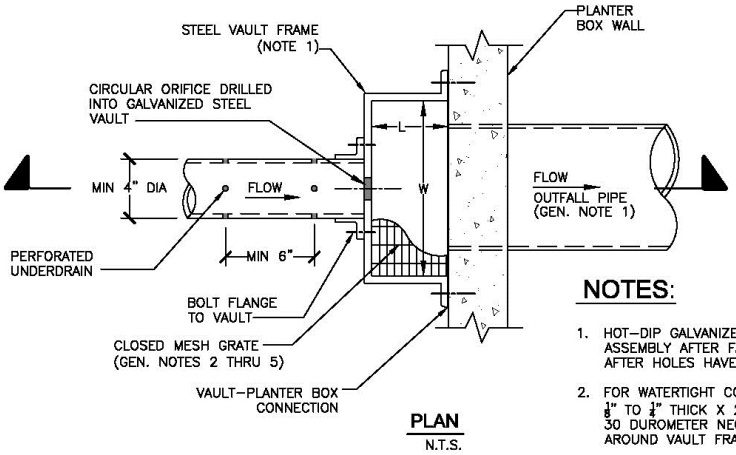
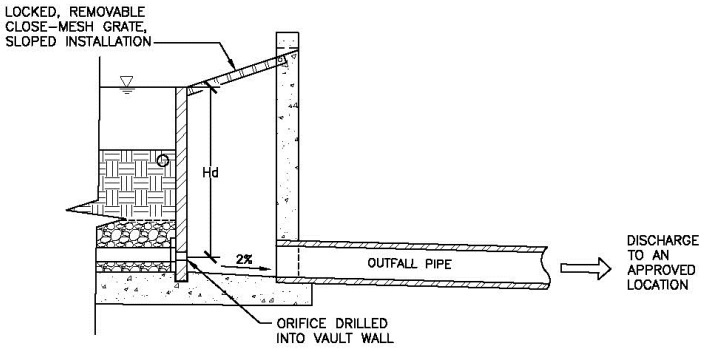
Flow-Through Planter Detail



PLAN
N.T.S.

NOTES:

1. HOT-DIP GALVANIZE ENTIRE FRAME ASSEMBLY AFTER FABRICATION AND AFTER HOLES HAVE BEEN DRILLED.
2. FOR WATERTIGHT CONNECTION, INSTALL $\frac{1}{8}$" TO $\frac{1}{4}$" THICK X 2" WIDE CONTINUOUS 30 DUROMETER NEOPRENE GASKET, ALL AROUND VAULT FRAME.



SECTION
N.T.S.

GENERAL OUTLET DETAIL NOTES:

1. OUTFALL PIPE SHALL BE SIZED TO CONVEY DESIGN STORM PER CCCWP DESIGN CRITERIA.
2. GRATE SHALL BE MOUNTED USING STAINLESS STEEL HARDWARE AND PROVIDED WITH HINGED AND LOCKABLE OR BOLTABLE ACCESS PANELS.
3. GRATE SHALL BE STAINLESS STEEL, ALUMINUM OR STEEL. STEEL GRATES SHALL BE HOT DIP GALVANIZED AND MAY BE HOT POWDER PAINTED AFTER GALVANIZING.
4. GRATE SHALL BE DESIGNED SUCH THAT THE DIAGONAL DIMENSION OF EACH OPENING IS SMALLER THAN THE DIAMETER OF THE OUTLET PIPE.
5. STRUCTURAL DESIGN OF GRATE SHALL BE BASED ON FULL HYDROSTATIC HEAD WITH ZERO HEAD DOWNSTREAM OF GRATE.

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Flow-Through Planter Outlet Detail

Infiltration Facilities and Infiltration Basins

Best Uses

- Alternative to bioretention in areas with permeable soils

Advantages

- Compact footprint
- Can be installed in paved areas

Limitations

- Can be used only on sites with "A" and "B" soils
- Requires minimum of 10' from bottom of facility to seasonal high groundwater
- Not suitable for drainage from some industrial areas or arterial roads
- Must be maintained to prevent clogging.

The typical infiltration trenches is a prefabricated structure, such as an open-bottomed vault or box, placed in an excavation or boring. The vault may be empty, which provides maximum space efficiency, or may be filled in rock.

An infiltration basin has the same functional components—a volume to store runoff and sufficient area to infiltrate that volume into the native soil—but is open rather than covered.

► CRITERIA

Infiltration facilities and infiltration basins must be designed with the minimum volume calculated by Equation 4-8 using a unit volume based on the County of San Diego's 85th Percentile Isopluvial Map.

Consult with the local jurisdiction engineer regarding the need to verify soil permeability and other site conditions are suitable for infiltration facilities and infiltration basins. Some proposed criteria are on Page 5-12 of Caltrans' 2004 *BMP Retrofit Pilot Study Final Report* (CTSW-RT-01-050).

The infiltration rate and infiltrative area must be sufficient to drain a full facility within 72 hours.

► DETAILS

Infiltration facilities should be sited to allow for the potential future need for removal and replacement.

In locations where native soils are coarser than a medium sand, the area directly beneath the facility should be over-excavated by two feet and backfilled with sand as a groundwater protection measure.

Design Checklist for Infiltration Trenches

- ❒ Volume and infiltrative area meet or exceed minimum.
- ❒ Overflow connected to a downstream storm drain or approved discharge point.
- ❒ Emergency spillage will be safely conveyed overland.
- ❒ Depth from bottom of the facility to seasonally high groundwater elevation is ≥10'.
- ❒ Areas tributary to the facility do not include automotive repair shops; car washes; fleet storage areas (Bus, truck, etc.); nurseries, or other uses that may present an exceptional threat to groundwater quality.
- ❒ Underlying soils are in Hydrologic Soil Group A or B. Infiltration rate is sufficient to ensure a full basin will drain completely within 72 hours. Soil infiltration rate has been confirmed.
- ❒ Set back from structures 10' or as recommended by structural or geotechnical engineer

Cistern with Bioretention Facility

A cistern in series with a bioretention facility can meet treatment requirements where space is limited. In this configuration, the cistern is equipped with a flow-control orifice and the bioretention facility is sized to treat a trickle outflow from the cistern.

Best Uses

- In series with a bioretention facility to meet treatment requirement in limited space.
- Management of roof runoff
- Dense urban areas

Advantages

- Storage volume can be in any configuration

Limitations

- Somewhat complex to design, build, and operate
- Requires head for both cistern and bioretention facility

► CRITERIA

Cistern. The cistern must detain the volume calculated by Equation 4-8 and must include an orifice or other device designed for a 24-hour drawdown time.

Bioretention facility. See the design sheet for bioretention facilities. The area of the bioretention facility must be sized to treat the maximum discharge flow, assuming a percolation rate of 5" per hour through the engineered soil.

Use with sand filter. A cistern in series with a sand filter can meet treatment requirements. See the discussion of treatment facility selection in Chapter 2 and the design guidance for sand filters in Chapter 4.

► DETAILS

Flow-control orifice. The cistern must be equipped with an orifice plate or other device to limit flow to the bioretention area.

Preventing mosquito harborage. Cisterns should be designed to drain completely, leaving no standing water. Drains should be located flush with the bottom of the cistern. Alternatively—or in addition—all entry and exit points, should be provided with traps or sealed or screened to prevent mosquito entry. Note mosquitoes can enter through openings 1/16" or larger and will fly for many feet through pipes as small as ¼".

Exclude debris. Provide leaf guards and/or screens to prevent debris from accumulating in the cistern.

Ensure access for maintenance. Design the cistern to allow for cleanout. Avoid creating the need for maintenance workers to enter a confined space. Ensure the outlet orifice can be easily accessed for cleaning and maintenance.

► APPLICATIONS

Shallow ponding on a flat roof. The "cistern" storage volume can be designed in any configuration, including simply storing rainfall on the roof where it falls and draining it away slowly. See the County of San Diego's 85th percentile isopluvial diagrams for required average depths.

Cistern attached to a building and draining to a planter. This arrangement allows a planter box to be constructed with a smaller area.

Vault with pumped discharge to bioretention facility. In this arrangement, runoff from a parking lot and/or building roofs can be captured and detained underground and then pumped to a bioretention facility on the surface. Alternatively, treatment can be accomplished with a sand filter. See the discussion of selection of stormwater treatment facilities in Chapter 2.

Water harvesting or graywater reuse. It may be possible to create a site-specific design that uses cisterns to achieve stormwater flow control, stormwater treatment, and rainwater reuse for irrigation or indoor uses (**water harvesting**). Facilities must meet criteria for capturing and treating the volume specified by Equation 4-8. This volume must be allowed to empty within 24 hours so runoff from additional storms, which may follow, is also captured and treated. Additional volume may be required if the system also stores runoff for longer periods for reuse. Indoor uses of non-potable water may be restricted or prohibited. Check with municipal staff.

Design Checklist for Cistern

- ❒ Volume meets or exceeds minimum.
- ❒ Outlet with orifice or other flow-control device restricts flow and is designed to provide a 24-hour drawdown time.
- ❒ Outlet is piped to a bioretention facility designed to treat the maximum discharge from the cistern orifice.
- ❒ Cistern is designed to drain completely and/or sealed to prevent mosquito harborage.
- ❒ Design provides for exclusion of debris and accessibility for maintenance.

- ❒ Overflow connected to a downstream storm drain or approved discharge point.
- ❒ Emergency spillage will be safely conveyed overland.