Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING

Preliminary
Water Quality Management Plan
(PWQMP)

For:

Bridge Point Rancho Cucamonga – 2 Buildings
12434 4th Street
Rancho Cucamonga, CA 91730
WQMPXXXX-XXXXX

APN: 0229-283-50 & -51

Prepared for:
Bridge Development Partners, LLC
11100 Santa Monica Blvd., Suite 700
Los Angeles, CA 90025
Phone: (213) 805-6667
Contact: Brendan Kotler

Prepared by:
Thienes Engineering, Inc.
14349 Firestone Boulevard
La Mirada, CA 90638
Phone: (714) 521-4811
Contact: Luis Prado (luisp@thieneseng.com)
Job No. 3819

Approval Date: _____
Implementation Date: _____

1st Submittal: April 21, 2020
2nd Submittal: January 8, 2021
3rd Submittal: _____

Project Owner's Certification

This Water Quality Management Plan (WQMP) has been prepared for ***Bridge Development Partners, LLC*** by ***Thienes Engineering, Inc***. The WQMP is intended to comply with the requirements of the ***City of Rancho Cucamonga*** and the NPDES Areawide Stormwater Program requiring the preparation of a WQMP.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the San Bernardino County's Municipal Storm Water Management Program and the intent of the NPDES Permit for San Bernardino County and the incorporated cities of San Bernardino County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors in interest and the city/county shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity.

"I certify under a penalty of law that the provisions (implementation, operation, maintenance, and fund) of the WQMP have been accepted and that the plan will be transferred to future successors."

Project Data			
Permit/Application Number(s):	DRC-2020-00213	**Grading Permit Number(s):**	PGRXXXX-XXXXX
Tract/Parcel Map Number(s):		**Building Permit Number(s):**	PGRXXXX-XXXXX
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN: 0229-283-50 & -51

Owner's Signature		
Owner Name: Bridge Development Partners, LLC		
Name/Title	Brian Wilson, Principal	
Company	Bridge Development Partners, LLC	
Address	11100 Santa Monica Blvd., Suite 700, Los Angeles, CA 90025	
Email	bwilson@bridgedev.com	
Telephone #	(213) 805-6667	
Signature	**Date**	

Preparer's Certification

Project Data			
Permit/Application Number(s):	DRC-2020-00213	**Grading Permit Number(s):**	PGRXXXX-XXXXX
Tract/Parcel Map Number(s):		**Building Permit Number(s):**	PGRXXXX-XXXXX
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN: 0229-283-50 & -51

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan were prepared under my oversight and meet the requirements of Regional Water Quality Control Board Order No. R8-2010-0036."

Engineer: Reinhard Stenzel	
Title	Director of Engineering
Company	Thienes Engineering, Inc.
Address	14349 Firestone Boulevard, La Mirada, CA 90638
Email	reinhard@thieneseng.com
Telephone #	(714) 521-4811
Signature	
Date	1/8/2021

PE Stamp Below

Contents

Forms

Attachments

Section 1 Discretionary Permit(s)

Form 1-1 Project Information					
Project Name	Bridge Point Rancho Cucamonga				
Project Owner Contact Name:	Brendan Kotler				
Mailing Address:	11100 Santa Monica Blvd., Suite 700 Los Angeles, CA 90025	**E-mail Address:**	bkotler@bridgedev.com	**Telephone:**	(213) 805-6667
Permit/Application Number(s):	DRC-2020-00213 PGRXXXX-XXXXX WQMPXXXX-XXXXX		**Tract/Parcel Map Number(s):**		
Additional Information/ Comments:	n/a				
Description of Project:	Project gross area is approximately 91.40 acres and the project net area is approximately 85.05 acres. However, the total water quality treatment area encompasses approximately 90.23 acres. This includes 83.35 acres (from net area) of onsite/private improvements, approximately 6.70 acres of offsite improvements (Street "A"), and an additional 0.18 acres of minor driveway/street improvements along 4th and 6th Street. Proposed improvements to the site includes two warehouse type buildings and dedication of "A" Street. There are truck yards located on the westerly and easterly sides of Building 1 and on the northerly and southerly sides of Building 2. Vehicle parking is located along all sides of Building 1; and the northerly, easterly, and southerly sides of Building 2. The remainder of this site is reserved for landscaping. Proposed conditions generally maintain existing drainage patterns. Runoff from the northerly half of Building 2 and the northerly truck yard is collected in grate inlets located in the truck yard area. A proposed storm drain system conveys runoff westerly around the proposed building and then continues southerly along the westerly property line. Additional catch basins intercept flows from the north westerly vehicle parking and westerly drive aisle. Runoff from the southerly half of Building 2 and southerly truck yard is collected in grate inlets located in the truck yard area. A separate proposed storm drain system then conveys runoff westerly, joining with the previously mentioned storm drain system from the northerly truck yard of Building 2. Flows will continue southerly, through the westerly truck yard of Building 1, and connect to the storm drain system from Building 1 before discharging into the existing storm drain in 4th Street. Runoff from the vehicle parking located north of Building 1, the westerly half of Building 1 and westerly truck yard is collected in a series of catch basins. A proposed storm drain conveys flow southerly to where runoff from the southwest vehicle parking is added. Runoff from the vehicle parking along the east side of the Building 2, the easterly half of Building 1, easterly truck yard and southerly vehicle parking is collected in a series of catch basins. A proposed storm drain conveys flows southerly through the easterly truck yard of Building 1 and then westerly through the southerly vehicle parking before connecting with the storm drain system from the westerly portion of Building 1. Approximately 1.30 acres from the southerly landscaped area fronting 4th Street and northerly landscaped area fronting 6th Street will sheet flow offsite. These areas are considered self-treating; it will not be routed to the underground retention system for treatment. Lastly, the project site will utilize the maximum extent practicable (MEP) principle in order to treat disturbed Public Right-of-Way (ROW) impervious areas onsite. This area is approximately 0.18 acres and is included along with the onsite design capture volume (DCV).				

	Roof and surface runoff will sheet flow into inlets where stormwater will be intercepted into the underground retention systems for water quality treatment. These systems will utilize infiltration as their primary form of treatment. These systems store stormwater runoff until it gradually exfiltrates into the underlying soil. Pollutant removal occurs through the infiltration of runoff and the adsorption of pollutants into the soil. This practice has high pollutant removal efficiency and can also help recharge groundwater, thus helping to maintain low flows in stream systems.
Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.	Pending

Section 2 Project Description

2.1 Project Information

This section of the WQMP should provide the information listed below. The information provided for Conceptual/ Preliminary WQMP should give sufficient detail to identify the major proposed site design and LID BMPs and other anticipated water quality features that impact site planning. Final Project WQMP must specifically identify all BMP incorporated into the final site design and provide other detailed information as described herein.

The purpose of this information is to help determine the applicable development category, pollutants of concern, watershed description, and long term maintenance responsibilities for the project, and any applicable water quality credits. This information will be used in conjunction with the information in Section 3, Site Description, to establish the performance criteria and to select the LID BMP or other BMP for the project or other alternative programs that the project will participate in, which are described in Section 4.

Form 2.1-1 Description of Proposed Project

[1] Development Category (Select all that apply):

☒ Significant re-development involving the addition or replacement of 5,000 ft² or more of impervious surface on an already developed site	☐ New development involving the creation of 10,000 ft² or more of impervious surface collectively over entire site	☐ Automotive repair shops with standard industrial classification (SIC) codes 5013, 5014, 5541, 7532- 7534, 7536-7539	☐ Restaurants (with SIC code 5812) where the land area of development is 5,000 ft² or more
☐ Hillside developments of 5,000 ft² or more which are located on areas with known erosive soil conditions or where the natural slope is 25 percent or more	☐ Developments of 2,500 ft² of impervious surface or more adjacent to (within 200 ft) or discharging directly into environmentally sensitive areas or waterbodies listed on the CWA Section 303(d) list of impaired waters.	☒ Parking lots of 5,000 ft² or more exposed to storm water	☐ Retail gasoline outlets that are either 5,000 ft² or more, or have a projected average daily traffic of 100 or more vehicles per day

☐ Non-Priority / Non-Category Project

May require source control LID BMPs and other LIP requirements. Please consult with local jurisdiction on specific requirements.

[2] Project Area (ft²):	3,930,419 sq-ft 90.23 acres*	**[3] Number of Dwelling Units:**	n/a	**[4] SIC Code:**	4225

[5] Is Project going to be phased? ☒Yes ☐No

If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.

[6] Does Project include roads? ☐Yes ☒No

If yes, ensure that applicable requirements for transportation projects are addressed (see Appendix A of TGD for WQMP)

* This includes approximately 6.70 acres of offsite improvements (Street "A"), and an additional 0.18 acres of minor driveway/street improvements along 4th and 6th Street.

Description for 4225: General Warehousing and Storage

Division E: Transportation, Communications, Electric, Gas, And Sanitary Services | Major Group 42: Motor Freight Transportation And Warehousing

Industry Group 422: Public Warehousing And Storage

4225 General Warehousing and Storage
Establishments primarily engaged in the warehousing and storage of a general line of goods. The warehousing of goods at foreign trade zones is classified in Industry 4226. Field warehousing is classified in Services, Industry 7389.

- General warehousing and storage
- Miniwarehouse warehousing
- Warehousing, self-storage

SIC Search | Division Structure | Major Group Structure

UNITED STATES
DEPARTMENT OF LABOR

Occupational Safety and Health Administration
200 Constitution Ave NW
Washington, DC 20210
800-321-6742 (OSHA)
TTY
www.OSHA.gov

2.2 Property Ownership/Management

Describe the ownership/management of all portions of the project and site. State whether any infrastructure will transfer to public agencies (City, County, Caltrans, etc.) after project completion. State if a homeowners or property owners association will be formed and be responsible for the long-term maintenance of project stormwater facilities. Describe any lot-level stormwater features that will be the responsibility of individual property owners.

Form 2.2-1 Property Ownership/Management
Describe property ownership/management responsible for long-term maintenance of WQMP stormwater facilities:
Bridge Development Partners, LLC 11100 Santa Monica Blvd., Suite 700 Los Angeles, CA 90025 Phone: (213) 805-6667 Contact: Brendan Kotler No infrastructure will be transferred to a public agency after project completion. A property owner's association (POA) will be formed for long-term maintenance of project stormwater facilities.

2.3 Potential Stormwater Pollutants

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-3 in the TGD for WQMP).

Form 2.3-1 Pollutants of Concern

Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	Including petroleum hydrocarbons. Bacterial indicators are routinely detected in pavement runoff.
Nutrients - Phosphorous	E ☒	N ☐	Expected pollutant if landscaping exists on-site.
Nutrients - Nitrogen	E ☒	N ☐	Expected pollutant if landscaping exists on-site.
Noxious Aquatic Plants	E ☒	N ☐	Expected pollutant if landscaping exists on-site.
Sediment / TSS / pH	E ☒	N ☐	Expected pollutant if landscaping exists on-site.
Metals	E ☒	N ☐	Expected pollutant if parking lots exist on-site.
Oil and Grease	E ☒	N ☐	Expected pollutant if parking lots exist on-site.
Trash & Debris	E ☒	N ☐	Expected pollutant if landscaping and parking lots exists on-site.
Pesticides / Herbicides	E ☒	N ☐	Expected pollutant if landscaping exists on-site.
Organic Compounds	E ☒	N ☐	Expected pollutant if landscaping exists on-site. Including solvents. Bacterial indicators are routinely detected in pavement runoff.
Oxygen Demanding Compounds	E ☒	N ☐	Expected pollutant if landscaping exists on-site.
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	

The expected POCs for the project site are ***Pathogens, Nutrients, and Metals***.

2.4 Water Quality Credits

A water quality credit program is applicable for certain types of development projects if it is not feasible to meet the requirements for on-site LID. Proponents for eligible projects, as described below, can apply for water quality credits that would reduce project obligations for selecting and sizing other treatment BMP or participating in other alternative compliance programs. Refer to Section 6.2 in the TGD for WQMP to determine if water quality credits are applicable for the project.

Form 2.4-1 Water Quality Credits

[1] **Project Types that Qualify for Water Quality Credits:** *Select all that apply*			
☐ Redevelopment projects that reduce the overall impervious footprint of the project site. [Credit = % impervious reduced]	Higher density development projects ☐ Vertical density [20%] ☐ 7 units/ acre [5%]	☐ Mixed use development, (combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that demonstrate environmental benefits not realized through single use projects) [20%]	☐ Brownfield redevelopment (redevelop real property complicated by presence or potential of hazardous contaminants) [25%]
☐ Redevelopment projects in established historic district, historic preservation area, or similar significant core city center areas [10%]	☐ Transit-oriented developments (mixed use residential or commercial area designed to maximize access to public transportation) [20%]	☐ In-fill projects (conversion of empty lots & other underused spaces < 5 acres, substantially surrounded by urban land uses, into more beneficially used spaces, such as residential or commercial areas) [10%]	☐ Live-Work developments (variety of developments designed to support residential and vocational needs) [20%]
[2] **Total Credit %:** n/a *(Total all credit percentages up to a maximum allowable credit of 50 percent)*			
Description of Water Quality Credit Eligibility (if applicable)	n/a		

The proposed project will ***not*** utilize any water quality credits.

Section 3 Site and Watershed Description

Describe the project site conditions that will facilitate the selection of BMP through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (and sub-watershed DMAs) is conveyed to the site outlet(s). Refer to Section 3.2 in the TGD for WQMP. Complete form 3.2 for each DA on the project site.

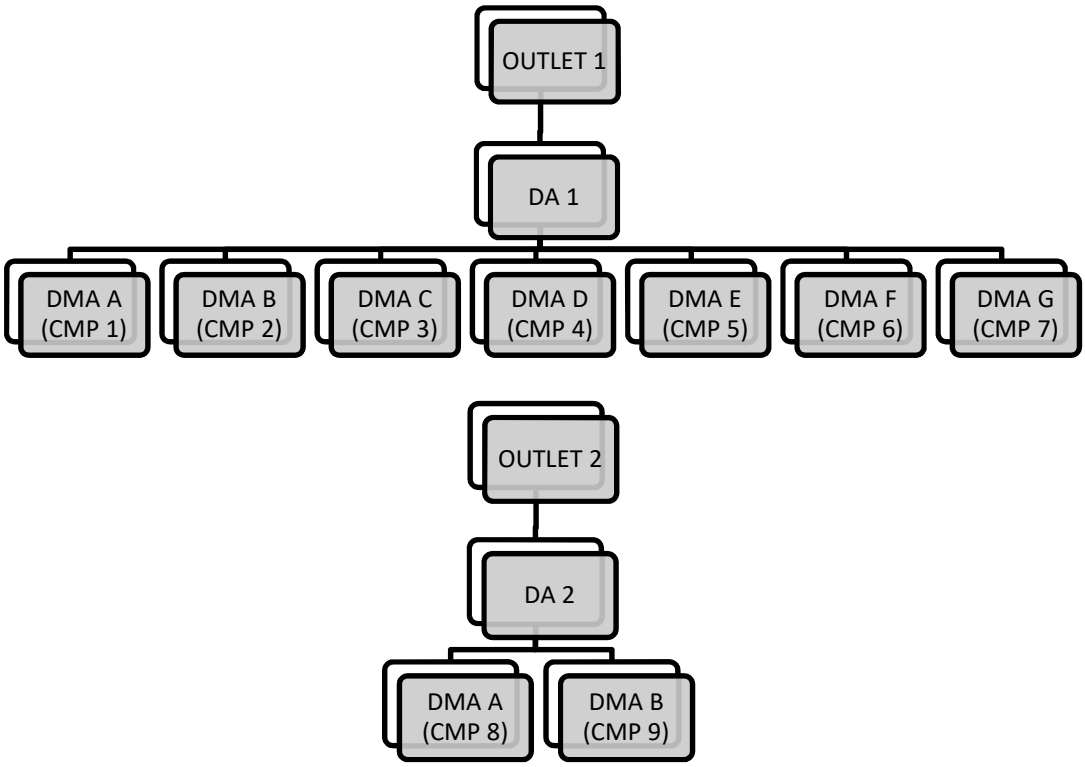
Form 3-1 Site Location and Hydrologic Features

Site coordinates *Take GPS measurement at approximate center of site*	**Latitude:** 34.081402	**Longitude:** -117.53386	**Thomas Bros Map page:** Page 603

[1] San Bernardino County climatic region: ☒Valley ☐Mountain ☐Desert

[2] Does the site have more than one drainage area (DA): ☐Yes ☒No

If no, proceed to Form 3-2. If yes, then use this form to show a conceptual schematic describing DMAs and hydrologic feature connecting DMAs to the site outlet(s). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached.



Conveyance	*Briefly describe on-site drainage features to convey runoff that is not retained within a DMA*
DA 1 DMA A flows to Outlet 1	Prior to runoff discharging to the existing public storm drain in 4th Street, the low flows from DA 1 DMA A will be directed to a set of underground retention system for infiltration (CMP 1). DMA A includes ROW improvements from "A" Street.
DA 1 DMA B flows to Outlet 1	Prior to runoff discharging to the existing public storm drain in 4th Street, the low flows from DA 1 DMA B will be directed to a set of underground retention system for infiltration (CMP 2).
DA 1 DMA C flows to Outlet 1	Prior to runoff discharging to the existing public storm drain in 4th Street, the low flows from DA 1 DMA C will be directed to a set of underground retention system for infiltration (CMP 3).

DA 1 DMA D flows to Outlet 1	Prior to runoff discharging to the existing public storm drain in 4th Street, the low flows from DA 1 DMA D will be directed to a set of underground retention system for infiltration (CMP 4).
DA 1 DMA E flows to Outlet 1	Prior to runoff discharging to the existing public storm drain in 4th Street, the low flows from DA 1 DMA E will be directed to a set of underground retention system for infiltration (CMP 5).
DA 1 DMA F flows to Outlet 1	Prior to runoff discharging to the existing public storm drain in 4th Street, the low flows from DA 1 DMA F will be directed to a set of underground retention system for infiltration (CMP 6).
DA 1 DMA G flows to Outlet 1	Prior to runoff discharging to the existing public storm drain in 4th Street, the low flows from DA 1 DMA G will be directed to a set of underground retention system for infiltration (CMP 7).
DA 2 DMA A flows to Outlet 2	Prior to runoff discharging to the existing public storm drain in 4th Street, the low flows from DA 2 DMA A will be directed to a set of underground retention system for infiltration (CMP 8).
DA 2 DMA B flows to Outlet 2	Prior to runoff discharging to the existing public storm drain in 4th Street, the low flows from DA 2 DMA B will be directed to a set of underground retention system for infiltration (CMP 9). DMA B includes ROW improvements from 4th Street and 6th Street.

Form 3-2 Existing Hydrologic Characteristics for Drainage Area (DA)

For each drainage area's sub-watershed DMA, provide the following characteristics	DMA A Hydrology Nodes (100-150)	DMA B Hydrology Nodes (160-161)	DMA C Hydrology Nodes (170-171)	DMA D Hydrology Nodes (180-181)
[1] **DMA drainage area (ft^2)**	*3,709,134 (85.00 ac)	*1,637,856 (0.80 ac)	*104,544 (2.40 ac)	*34,848 (1.85 ac)
[2] **Existing site impervious area (ft^2)**	2,681,118	19,690	0	67,518
[3] **Antecedent moisture condition** *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	AMC II	AMC II	AMC II	AMC II
[4] **Hydrologic soil group** *Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP*	HSG A	HSG A	HSG A	HSG A
[5] **Longest flowpath length (ft)**	3,234	380	193	270
[6] **Longest flowpath slope (ft/ft)**	0.014	0.013	0.024	0.020
[7] **Current land cover type(s)** *Select from Fig C-3 of Hydrology Manual*	Barren Commercial	Barren Commercial	Barren Commercial	Barren Commercial
[8] **Pre-developed pervious area condition:** *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% See Attachment A for photos of site to support rating*	Poor and Paved	Poor and Paved	Poor and Paved	Poor and Paved

*Does not include 0.18 acres of minor driveway/street improvements along 4th and 6th Street. This does include approximately 6.70 acres that will be dedicated as "A" Street. Hydrology map available in Attachment C.

Form 3-3 Watershed Description

Receiving Waters *Refer to Watershed Mapping Tool - http://sbcounty.permitrack.com/WAP See 'Drainage Facilities" link at this website*	Day Creek Cucamonga Creek, Reach 1 Mill Creek (Prado Area) Chino Creek, Reach 1A Santa Ana River, Reach 3 Prado Dam Santa Ana River, Reach 2 Santa Ana River, Reach 1 Pacific Ocean
Applicable TMDLs *Refer to Local Implementation Plan*	Day Creek: None Cucamonga Creek, Reach 1: High Coliform Count Mill Creek (Prado Area): Pathogens Chino Creek, Reach 1A: Pathogens Santa Ana River, Reach 3: Pathogens and Nitrate Prado Dam: Pathogens Santa Ana River, Reach 2: None Santa Ana River, Reach 1: None Pacific Ocean: None
303(d) listed impairments *Refer to Local Implementation Plan and Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP and State Water Resources Control Board website – http://www.waterboards.ca.gov/santaana/water_iss ues/programs/tmdl/index.shtml*	Day Creek: None Cucamonga Creek, Reach 1: Cadmium, Copper, Lead, and Zinc Mill Creek (Prado Area): Indicator Bacteria, Nutrients and Total Suspended Solids (TSS) Chino Creek, Reach 1A: Indicator Bacteria, and Nutrients Santa Ana River, Reach 3: Copper, Indicator Bacteria and Lead Prado Dam: pH Santa Ana River, Reach 2: None Santa Ana River, Reach 1: None Pacific Ocean: None
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP*	n/a
Unlined Downstream Water Bodies *Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP*	Santa Ana River
Hydrologic Conditions of Concern	☐ Yes *Complete Hydrologic Conditions of Concern (HCOC) Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-10 in submittal* ☒ No
Watershed–based BMP included in a RWQCB approved WAP	☐ Yes *Attach verification of regional BMP evaluation criteria in WAP* • *More Effective than On-site LID* • *Remaining Capacity for Project DCV* • *Upstream of any Water of the US* • *Operational at Project Completion* • *Long-Term Maintenance Plan* ☒ No

Section 4 Best Management Practices (BMP)

4.1 Source Control BMP

4.1.1 Pollution Prevention

Non-structural and structural source control BMP are required to be incorporated into all new development and significant redevelopment projects. Form 4.1-1 and 4.1-2 are used to describe specific source control BMPs used in the WQMP or to explain why a certain BMP is not applicable. Table 7-3 of the TGD for WQMP provides a list of applicable source control BMP for projects with specific types of potential pollutant sources or activities. The source control BMP in this table must be implemented for projects with these specific types of potential pollutant sources or activities.

The preparers of this WQMP have reviewed the source control BMP requirements for new development and significant redevelopment projects. The preparers have also reviewed the specific BMP required for project as specified in Forms 4.1-1 and 4.1-2. All applicable non-structural and structural source control BMP shall be implemented in the project.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs	☒	☐	Property owner will familiarize him/herself with the educational materials in Attachment "E" and the contents of the WQMP.
N2	Activity Restrictions	☒	☐	The owner shall develop ongoing activity restrictions that include those that have the potential to create adverse impacts on water quality. Activities include, but are not limited to: handling and disposal of contaminants, fertilizer and pesticide application restrictions, litter control and pick-up, and vehicle or equipment repair as well as any other activities that may potentially contribute to water pollution. Refer to Attachment J.
N3	Landscape Management BMPs	☒	☐	Irrigation must be consistent with City's Water Conservation Ordinance. Fertilizer and pesticide usage will be consistent with County Management Guidelines for Use of Fertilizers and Pesticides.
N4	BMP Maintenance	☒	☐	BMP maintenance, implementation schedules, and responsible parties are included with each specific BMP narrative.
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	No hazardous materials anticipated outdoors. WQMP to be amended if hazardous materials become applicable.
N6	Local Water Quality Ordinances	☒	☐	Owner/tenant will comply with Local Water Ordinances.
N7	Spill Contingency Plan	☒	☐	Owner/tenant will have a spill contingency plan, a separate document, based on specific site needs.
N8	Underground Storage Tank Compliance	☐	☒	No USTs onsite.
N9	Hazardous Materials Disclosure Compliance	☐	☒	No hazardous materials anticipated outdoors. WQMP to be amended if hazardous materials become applicable.
N10	Uniform Fire Code Implementation	☒	☐	If applicable, owner will comply with Article 80 of the California Fire Code enforced by the fire protection agency. The facility operators will be educated annually regarding requirements for handling, storage and proper disposal of hazardous substances.
N11	Litter/Debris Control Program	☒	☐	Contract with their landscape maintenance firm to provide this service during regularly schedule maintenance. They are required to implement trash management and litter control procedures in the common areas aimed at reducing pollution of drainage water.
N12	Employee Training	☒	☐	The owner will ensure that tenants are also familiar with onsite BMPs and necessary maintenance required of the tenants. Owner will check with City and County at least once a year to obtain new or updated educational materials and provide these materials to tenants. Employees shall be trained to clean up spills and participate in ongoing maintenance. The WQMP requires annual employee training and new hires within 2 months.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N13	Housekeeping of Loading Docks	☒	☐	Keep all fluids indoors. Clean up spills immediately and keep spills from entering storm drain system. No direct discharges into the storm drain system. Area shall be inspected weekly for proper containment and practices with spills cleaned up immediately and disposed of properly.
N14	Catch Basin Inspection Program	☒	☐	Monthly inspection by property owner's designee. Inspection consists of immediate repair of any deterioration of the structures and maintenance of drain inserts before and after major rain events. Drain insert maintenance shall be per manufacturer's guidelines.
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	All landscape maintenance contractors will be required to sweep up all landscape cuttings, mowings and fertilizer materials off paved areas weekly and dispose of properly. Parking areas and drive ways will be swept monthly by sweeping contractor.
N16	Other Non-structural Measures for Public Agency Projects	☐	☒	Not a public agency project.
N17	Comply with all other applicable NDPES permits	☒	☐	Will comply with Construction General Permit and Industrial General Permit (may apply for No Exposure Certification/NEC).

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
S1	Provide storm drain system stenciling and signage (CASQA New Development BMP Handbook SD-13)	☒	☐	"No Dumping – Drains to Waterway" stencils will be applied. Legibility of stencil will be maintained on a yearly basis.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☐	☒	No outdoor material storage areas onsite.
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	Paved with an impervious surface, designed not to allow run-on from adjoining areas, designed to divert drainage from adjoining roofs and pavements diverted around the area, screened or walled to prevent off-site transport of trash. A trash enclosure detail is provided within the Site and Drainage Map.
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)	☒	☐	Irrigation systems shall include reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines. Timers will be used to avoid over watering and watering cycles and duration shall be adjusted seasonally by the landscape maintenance contractor. The landscaping areas will be grouped with plants that have similar water requirements. Native or drought tolerant species shall also be used where appropriate to reduce excess irrigation runoff and promote surface filtration.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☐	☒	Stormwater runoff from all impervious areas will drain into the proposed infiltration facilities for treatment.
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☐	☒	No channels to protect.
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☐	☒	No applicable.
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	No maintenance bays onsite.
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	No vehicle wash areas onsite.
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	No outdoor processing areas onsite.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	No equipment wash areas onsite.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☐	☒	No fueling areas onsite.
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	No hillsides onsite.
S14	Wash water control for food preparation areas	☐	☒	No food preparation onsite.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	No community cars wash racks onsite.

4.1.2 Preventive LID Site Design Practices

Site design practices associated with new LID requirements in the MS4 Permit should be considered in the earliest phases of a project. Preventative site design practices can result in smaller DCV for LID BMP and hydromodification control BMP by reducing runoff generation. Describe site design and drainage plan including:

- A narrative of site design practices utilized or rationale for not using practices
- A narrative of how site plan incorporates preventive site design practices
- Include an attached Site Plan layout which shows how preventative site design practices are included in WQMP

Refer to Section 5.2 of the TGD for WQMP for more details.

Form 4.1-3 Preventive LID Site Design Practices Checklist

Site Design Practices *If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets.*
Minimize impervious areas: ☐ Yes ☒ No Explanation: The project will utilize belowground infiltration facilities to collect runoff from impervious areas. Roads and sidewalk widths are reduced to the City standards.
Maximize natural infiltration capacity: ☒ Yes ☐ No Explanation: The infiltration facilities are positioned in downstream and highly permeable areas that will maximize the amount of stormwater collected for treatment.
Preserve existing drainage patterns and time of concentration: ☒ Yes ☐ No Explanation: Post-development drainage patterns will mimic pre-development conditions. Stormwater will be retained in infiltration facilities and mimic the time of concentration compared to existing condition.
Disconnect impervious areas: ☒ Yes ☐ No Explanation: The infiltration facilities are permeable areas that will disconnect impervious areas before discharging offsite. Roof downspouts are designed to drain into BMPs that are permeable.
Protect existing vegetation and sensitive areas: ☐ Yes ☒ No Explanation: Not applicable, there is no existing vegetation onsite (see Attachment A for recent site photos). The site is being developed into a light industrial facility. There are no sensitive areas to protect. Landscape will be provided throughout the site.
Re-vegetate disturbed areas: ☐ Yes ☒ No Explanation: Not applicable, development consists of three light-industrial warehouses. Most of the disturbed areas will be paved; however, all disturbed areas will be collected by the infiltration facilities for treatment. Landscape will be provided throughout the site.
Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: ☒ Yes ☐ No Explanation: Heavy construction vehicles will be prohibited from performing unnecessary soil compaction at the locations of the infiltration facilities.
Utilize vegetated drainage swales in place of underground piping or imperviously lined swales: ☐ Yes ☒ No Explanation: Underground piping and imperviously lined swales are located at truck loading areas that could not be substituted with vegetated swales. All Imperviously lined swales will be taken to the infiltration facilities for treatment.
Stake off areas that will be used for landscaping to minimize compaction during construction : ☒ Yes ☐ No Explanation: Landscaped areas (not located in the compacted building zone area) will be staked to minimize unnecessary compaction during construction. Material storage areas and stockpiles will be located on areas being developed into a parking lot. Access routes for heavy equipment will be located around infiltration locations.

4.2 Project Performance Criteria

The purpose of this section of the Project WQMP is to establish targets for post development hydrology based on performance criteria specified in the MS4 Permit. These targets include runoff volume for water quality control (referred to as LID design capture volume), and runoff volume, time of concentration, and peak runoff for protection of any downstream waterbody segments with a HCOC. ***If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.***

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), the San Bernardino County Stormwater Program requires use of the P6 method (MS4 Permit Section XI.D.6a.ii) – Form 4.2-1
- For HCOC pre- and post-development hydrologic calculation, the San Bernardino County Stormwater Program requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 mi2), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for HCOC performance criteria.

Refer to Section 4 in the TGD for WQMP for detailed guidance and instructions.

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)

[1] **Project area (ft²):** 592,416 (DMA A – 13.60 ac)	[2] **Imperviousness after applying preventative site design practices (Imp%):** 95%	[3] **Runoff Coefficient (R_c):** 0.807 $R_C = 0.858(Imp\%)^3 - 0.78(Imp\%)^2 + 0.774(Imp\%) + 0.04$
[4] **Determine 1-hour rainfall depth for a 2-year return period $P_{2yr-1hr}$ (in):** 0.528 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
[5] **Compute P6, Mean 6-hr Precipitation (inches):** 0.782 *P6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*		
[6] **Drawdown Rate** *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
[7] **Compute design capture volume, DCV (ft³):** 61,140 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		
[1] **Project area (ft²):** 309,919 (DMA A Offsite Imp – 7.10 ac)	[2] **Imperviousness after applying preventative site design practices (Imp%):** 95%	[3] **Runoff Coefficient (R_c):** 0.807 $R_C = 0.858(Imp\%)^3 - 0.78(Imp\%)^2 + 0.774(Imp\%) + 0.04$
[4] **Determine 1-hour rainfall depth for a 2-year return period $P_{2yr-1hr}$ (in):** 0.528 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		

[5] Compute P6, Mean 6-hr Precipitation (inches): 0.782

*P6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1*

(Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)

[6] Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*	24-hrs ☐ 48-hrs ☒

[7] Compute design capture volume, DCV (ft^3): 31,919

*DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)*

Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2

[1] Project area (ft^2): 461,736 (DMA B – 10.60 ac)	**[2] Imperviousness after applying preventative site design practices (Imp%):** 95%	**[3] Runoff Coefficient (R_c):** 0.807 $R_C = 0.858(Imp\%)^3 - 0.78(Imp\%)^2 + 0.774(Imp\%) + 0.04$

[4] Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.528
http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

[5] Compute P6, Mean 6-hr Precipitation (inches): 0.782

*P6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1*

(Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)

[6] Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*	24-hrs ☐ 48-hrs ☒

[7] Compute design capture volume, DCV (ft^3): 47,654

*DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)*

Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2

[1] Project area (ft^2): 87,120 (DMA C – 2.00 ac)	**[2] Imperviousness after applying preventative site design practices (Imp%):** 95%	**[3] Runoff Coefficient (R_c):** 0.807 $R_C = 0.858(Imp\%)^3 - 0.78(Imp\%)^2 + 0.774(Imp\%) + 0.04$

[4] Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.528
http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

[5] Compute P6, Mean 6-hr Precipitation (inches): 0.782

*P6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1*

(Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)

[6] Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*	24-hrs ☐ 48-hrs ☒

[7] Compute design capture volume, DCV (ft^3): 8,991

*DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)*

Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2

[1] Project area (ft^2): 483,516 (DMA D – 11.10 ac)	**[2] Imperviousness after applying preventative site design practices (Imp%):** 95%	**[3] Runoff Coefficient (R_c):** 0.807 $R_C = 0.858(Imp\%)^3 - 0.78(Imp\%)^2 + 0.774(Imp\%) + 0.04$

[4] Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.528
http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

[5] Compute P6, Mean 6-hr Precipitation (inches): 0.782

*P6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1*

(Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)

[6] **Drawdown Rate** *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
[7] **Compute design capture volume, DCV (ft³):** 49,901 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		
[1] **Project area (ft²):** 625,086 (DMA E – 14.35 ac)	[2] **Imperviousness after applying preventative site design practices (Imp%):** 95%	[3] **Runoff Coefficient (R_c):** 0.807 *$R_C = 0.858(Imp\%)^3 - 0.78(Imp\%)^2 + 0.774(Imp\%) + 0.04$*
[4] **Determine 1-hour rainfall depth for a 2-year return period $P_{2yr-1hr}$ (in):** 0.528 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
[5] **Compute P6, Mean 6-hr Precipitation (inches):** 0.782 *P6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1* *(Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*		
[6] **Drawdown Rate** *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
[7] **Compute design capture volume, DCV (ft³):** 64,512 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		
[1] **Project area (ft²):** 50,094 (DMA F – 1.15 ac)	[2] **Imperviousness after applying preventative site design practices (Imp%):** 95%	[3] **Runoff Coefficient (R_c):** 0.807 *$R_C = 0.858(Imp\%)^3 - 0.78(Imp\%)^2 + 0.774(Imp\%) + 0.04$*
[4] **Determine 1-hour rainfall depth for a 2-year return period $P_{2yr-1hr}$ (in):** 0.528 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
[5] **Compute P6, Mean 6-hr Precipitation (inches):** 0.782 *P6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1* *(Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*		
[6] **Drawdown Rate** *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
[7] **Compute design capture volume, DCV (ft³):** 5,170 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		
[1] **Project area (ft²):** 93,654 (DMA G – 2.15 ac)	[2] **Imperviousness after applying preventative site design practices (Imp%):** 95%	[3] **Runoff Coefficient (R_c):** 0.807 *$R_C = 0.858(Imp\%)^3 - 0.78(Imp\%)^2 + 0.774(Imp\%) + 0.04$*
[4] **Determine 1-hour rainfall depth for a 2-year return period $P_{2yr-1hr}$ (in):** 0.528 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
[5] **Compute P6, Mean 6-hr Precipitation (inches):** 0.782 *P6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1* *(Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*		

[6] Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*	24-hrs ☐ 48-hrs ☒
[7] Compute design capture volume, DCV (ft^3): 9,666 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*	

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 2)

[1] **Project area (ft²):** 644,688 (DMA A – 14.80 ac)	[2] **Imperviousness after applying preventative site design practices (Imp%):** 95%	[3] **Runoff Coefficient (R_c):** 0.807 $R_C = 0.858(Imp\%)^3 - 0.78(Imp\%)^2 + 0.774(Imp\%) + 0.04$

[4] **Determine 1-hour rainfall depth for a 2-year return period $P_{2yr-1hr}$ (in):** 0.528
http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

[5] **Compute P6, Mean 6-hr Precipitation (inches):** 0.782

*P6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1*

(Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)

[6] **Drawdown Rate** *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*	24-hrs ☐ 48-hrs ☒

[7] **Compute design capture volume, DCV (ft³):** 66,535

*DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)*

Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2

[1] **Project area (ft²):** 518,364 (DMA B – 11.90 ac)	[2] **Imperviousness after applying preventative site design practices (Imp%):** 95%	[3] **Runoff Coefficient (R_c):** 0.807 $R_C = 0.858(Imp\%)^3 - 0.78(Imp\%)^2 + 0.774(Imp\%) + 0.04$

[4] **Determine 1-hour rainfall depth for a 2-year return period $P_{2yr-1hr}$ (in):** 0.528
http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

[5] **Compute P6, Mean 6-hr Precipitation (inches):** 0.782

*P6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1*

(Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)

[6] **Drawdown Rate** *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*	24-hrs ☐ 48-hrs ☒

[7] **Compute design capture volume, DCV (ft³):** 53,498

*DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)*

Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2

[1] **Project area (ft²):** 7,841 (DMA B Offsite Imp – 0.18 ac)	[2] **Imperviousness after applying preventative site design practices (Imp%):** 100%	[3] **Runoff Coefficient (R_c):** 0.892 $R_C = 0.858(Imp\%)^3 - 0.78(Imp\%)^2 + 0.774(Imp\%) + 0.04$

[4] **Determine 1-hour rainfall depth for a 2-year return period $P_{2yr-1hr}$ (in):** 0.528
http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

[5] **Compute P6, Mean 6-hr Precipitation (inches):** 0.782

*P6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1*

(Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)

[6] **Drawdown Rate** *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*	24-hrs ☐ 48-hrs ☒

[7] **Compute design capture volume, DCV (ft³):** 894

*DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)*

Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2

Form 4.2-2 Summary of HCOC Assessment

Does project have the potential to cause or contribute to an HCOC in a downstream channel: ☐ Yes ☒ No

Go to: http://sbcounty.permitrack.com/WAP/

If "Yes", then complete HCOC assessment of site hydrology for 2yr storm event using Forms 4.2-3 through 4.2-5 and insert results below (Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual)

If "No," then proceed to Section 4.3 Project Conformance Analysis

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	[1] n/a *Form 4.2-3 Item 12*	[2] n/a *Form 4.2-4 Item 13*	[3] n/a *Form 4.2-5 Item 10*
Post-developed	[4] n/a *Form 4.2-3 Item 13*	[5] n/a *Form 4.2-4 Item 14*	[6] n/a *Form 4.2-5 Item 14*
Difference	[7] n/a *Item 4 – Item 1*	[8] n/a *Item 5 – Item 2*	[9] n/a *Item 6 – Item 3*
Difference (as % of pre-developed)	[10] n/a *Item 7 / Item 1*	[11] n/a *Item 8 / Item 2*	[12] n/a *Item 9 / Item 3*

Form 4.2-3 HCOC Assessment for Runoff Volume (DA 1)

Weighted Curve Number Determination for: Pre-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1a Land Cover type	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2a Hydrologic Soil Group (HSG)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3a DMA Area, ft^2 *sum of areas of DMA should equal area of DA*	0	0	0	0	0	0	0	0
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	0	0	0	0	0	0	0	0
Weighted Curve Number Determination for: Post-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1b Land Cover type	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2b Hydrologic Soil Group (HSG)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3b DMA Area, ft^2 *sum of areas of DMA should equal area of DA*	0	0	0	0	0	0	0	0
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	0	0	0	0	0	0	0	0

5 Pre-Developed area-weighted CN: 0	**7** Pre-developed soil storage capacity, S (in): 0 *S = (1000 / Item 5) - 10*	**9** Initial abstraction, I_a (in): 0 *I_a = 0.2 * Item 7*
6 Post-Developed area-weighted CN: 0	**8** Post-developed soil storage capacity, S (in): 0 *S = (1000 / Item 6) - 10*	**10** Initial abstraction, I_a (in): 0 *I_a = 0.2 * Item 8*

11 Precipitation for 2 yr, 24 hr storm (in): 0
Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

12 Pre-developed Volume (ft^3): 0
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)*

13 Post-developed Volume (ft^3): 0
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)*

14 Volume Reduction needed to meet HCOC Requirement, (ft^3): 0
*V_{HCOC} = (Item 13 * 0.95) – Item 12*

Form 4.2-4 HCOC Assessment for Time of Concentration (DA 1)

Compute time of concentration for pre and post developed conditions for each DA

(For projects using the Hydrology Manual complete the form below)

Variables	Pre-developed DA1 *Use additional forms if there are more than 4 DMA*				Post-developed DA1 *Use additional forms if there are more than 4 DMA*			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
1 Length of flowpath (ft) *Use Form 3-2 Item 5 for pre-developed condition*	0	0	0	0	0	0	0	0
2 Change in elevation (ft)	0	0	0	0	0	0	0	0
3 Slope (ft/ft) *S_o = Item 2 / Item 1*	0	0	0	0	0	0	0	0
4 Land cover	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
5 Initial DMA Time of Concentration (min) *Appendix C-1 of the TGD for WQMP*	0	0	0	0	0	0	0	0
6 Length of conveyance from DMA outlet to project site outlet (ft) *May be zero if DMA outlet is at project site outlet*	0	0	0	0	0	0	0	0
7 Cross-sectional area of channel (ft^2)	0	0	0	0	0	0	0	0
8 Wetted perimeter of channel (ft)	0	0	0	0	0	0	0	0
9 Manning's roughness of channel (n)	0	0	0	0	0	0	0	0
10 Channel flow velocity (ft/sec) *V_{fps} = (1.49 / Item 9) * (Item 7/Item 8)^0.67 * (Item 3)^0.5*	0	0	0	0	0	0	0	0
11 Travel time to outlet (min) *T_t = Item 6 / (Item 10 * 60)*	0	0	0	0	0	0	0	0
12 Total time of concentration (min) *T_c = Item 5 + Item 11*	0	0	0	0	0	0	0	0
13 Pre-developed time of concentration (min): 0 *Minimum of Item 12 pre-developed DMA*								
14 Post-developed time of concentration (min): 0 *Minimum of Item 12 post-developed DMA*								
15 Additional time of concentration needed to meet HCOC requirement (min): 0 *$T_{C\text{-}HCOC}$ = (Item 13 * 0.95) – Item 14*								

Form 4.2-5 HCOC Assessment for Peak Runoff (DA 1)

Compute peak runoff for pre- and post-developed conditions

Variables		Pre-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*			Post-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*		
		DMA A	DMA B	DMA C	DMA A	DMA B	DMA C
1 Rainfall Intensity for storm duration equal to time of concentration *I_{peak} = 10^(LOG Form 4.2-1 Item 4 - 0.6 LOG Form 4.2-4 Item 5 /60)*		0	0	0	0	0	0
2 Drainage Area of each DMA (Acres) *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*		0	0	0	0	0	0
3 Ratio of pervious area to total area *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*		0	0	0	0	0	0
4 Pervious area infiltration rate (in/hr) *Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP*		0	0	0	0	0	0
5 Maximum loss rate (in/hr) *F_m = Item 3 * Item 4* *Use area-weighted F_m from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*		0	0	0	0	0	0
6 Peak Flow from DMA (cfs) *Q_p =Item 2 * 0.9 * (Item 1 - Item 5)*		0	0	0	0	0	0
7 Time of concentration adjustment factor for other DMA to site discharge point *Form 4.2-4 Item 12 DMA / Other DMA upstream of site discharge point (If ratio is greater than 1.0, then use maximum value of 1.0)*	DMA A	*n/a*			*n/a*		
	DMA B		*n/a*			*n/a*	
	DMA C			*n/a*			*n/a*

8 Pre-developed Q_p at T_c for DMA A: 0 *Q_p = Item 6_{DMAA} + [Item 6_{DMAB} * (Item 1_{DMAA} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAA/2}$] + [Item 6_{DMAC} * (Item 1_{DMAA} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAA/3}$]*	**9** Pre-developed Q_p at T_c for DMA B: 0 *Q_p = Item 6_{DMAB} + [Item 6_{DMAA} * (Item 1_{DMAB} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAB/1}$] + [Item 6_{DMAC} * (Item 1_{DMAB} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAB/3}$]*	**10** Pre-developed Q_p at T_c for DMA C: 0 *Q_p = Item 6_{DMAC} + [Item 6_{DMAA} * (Item 1_{DMAC} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAC/1}$] + [Item 6_{DMAB} * (Item 1_{DMAC} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAC/2}$]*
10 Peak runoff from pre-developed condition confluence analysis (cfs): 0 *Maximum of Item 8, 9, and 10 (including additional forms as needed)*		
11 Post-developed Q_p at T_c for DMA A: 0 *Same as Item 8 for post-developed values*	**12** Post-developed Q_p at T_c for DMA B: 0 *Same as Item 9 for post-developed values*	**13** Post-developed Q_p at T_c for DMA C: 0 *Same as Item 10 for post-developed values*
14 Peak runoff from post-developed condition confluence analysis (cfs): 0 *Maximum of Item 11, 12, and 13 (including additional forms as needed)*		
15 Peak runoff reduction needed to meet HCOC Requirement (cfs): 0 *$Q_{p\text{-}HCOC}$ = (Item 14 * 0.95) – Item 10*		

4.3 Project Conformance Analysis

Complete the following forms for each project site DA to document that the proposed LID BMPs conform to the project DCV developed to meet performance criteria specified in the MS4 Permit (WQMP Template Section 4.2). For the LID DCV, the forms are ordered according to hierarchy of BMP selection as required by the MS4 Permit (see Section 5.3.1 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design and Hydrologic Source Controls (Form 4.3-2)
- Retention and Infiltration (Form 4.3-3)
- Harvested and Use (Form 4.3-4) or
- Biotreatment (Form 4.3-5).

At the end of each form, additional fields facilitate the determination of the extent of mitigation provided by the specific BMP category, allowing for use of the next category of BMP in the hierarchy, if necessary.

The first step in the analysis, using Section 5.3.2.1 of the TGD for WQMP, is to complete Forms 4.3-1 and 4.3-3) to determine if retention and infiltration BMPs are infeasible for the project. For each feasibility criterion in Form 4.3-1, if the answer is "Yes," provide all study findings that includes relevant calculations, maps, data sources, etc. used to make the determination of infeasibility.

Next, complete Forms 4.3-2 and 4.3-4 to determine the feasibility of applicable HSC and harvest and use BMPs, and, if their implementation is feasible, the extent of mitigation of the DCV.

If no site constraints exist that would limit the type of BMP to be implemented in a DA, evaluate the use of combinations of LID BMPs, including all applicable HSC BMPs to maximize on-site retention of the DCV. If no combination of BMP can mitigate the entire DCV, implement the single BMP type, or combination of BMP types, that maximizes on-site retention of the DCV within the minimum effective area.

If the combination of LID HSC, retention and infiltration, and harvest and use BMPs are unable to mitigate the entire DCV, then biotreatment BMPs may be implemented by the project proponent. If biotreatment BMPs are used, then they must be sized to provide sufficient capacity for effective treatment of the remainder of the volume-based performance criteria that cannot be achieved with LID BMPs (TGD for WQMP Section 5.4.4.2). Under no circumstances shall any portion of the DCV be released from the site without effective mitigation and/or treatment.

Form 4.3-1 Infiltration BMP Feasibility (DA 1)

Feasibility Criterion – Complete evaluation for each DA on the Project Site	
1 Would infiltration BMP pose significant risk for groundwater related concerns? *Refer to Section 5.3.2.1 of the TGD for WQMP*	☐ Yes ☒ No
If Yes, Provide basis: (attach)	
2 Would installation of infiltration BMP significantly increase the risk of geotechnical hazards (Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert): • The location is less than 50 feet away from slopes steeper than 15 percent • The location is less than eight feet from building foundations or an alternative setback. • A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.	☐ Yes ☒ No
If Yes, Provide basis: (attach)	
3 Would infiltration of runoff on a Project site violate downstream water rights?	☐ Yes ☒ No
If Yes, Provide basis: (attach)	
4 Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils?	☐ Yes ☒ No
If Yes, Provide basis: (attach)	
5 Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)?	☐ Yes ☒ No
If Yes, Provide basis: (attach)	
6 Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? *See Section 3.5 of the TGD for WQMP and WAP*	☐ Yes ☒ No
If Yes, Provide basis: (attach)	
7 Any answer from Item 1 through Item 3 is "Yes": *If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Harvest and Use BMP. If no, then proceed to Item 8 below.*	☐ Yes ☒ No
8 Any answer from Item 4 through Item 6 is "Yes": *If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Hydrologic Source Control BMP.* *If no, then proceed to Item 9, below.*	☐ Yes ☒ No
9 All answers to Item 1 through Item 6 are "No": *Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.* *Proceed to Form 4.3-2, Hydrologic Source Control BMP.*	☒ Yes ☐ No

Form 4.3-2 Infiltration BMP Feasibility (DA 2)

Feasibility Criterion – Complete evaluation for each DA on the Project Site	
1 Would infiltration BMP pose significant risk for groundwater related concerns? *Refer to Section 5.3.2.1 of the TGD for WQMP*	☐ Yes ☒ No
If Yes, Provide basis: (attach)	
2 Would installation of infiltration BMP significantly increase the risk of geotechnical hazards (Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert): • The location is less than 50 feet away from slopes steeper than 15 percent • The location is less than eight feet from building foundations or an alternative setback. • A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.	☐ Yes ☒ No
If Yes, Provide basis: (attach)	
3 Would infiltration of runoff on a Project site violate downstream water rights?	☐ Yes ☒ No
If Yes, Provide basis: (attach)	
4 Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils?	☐ Yes ☒ No
If Yes, Provide basis: (attach)	
5 Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)?	☐ Yes ☒ No
If Yes, Provide basis: (attach)	
6 Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? *See Section 3.5 of the TGD for WQMP and WAP*	☐ Yes ☒ No
If Yes, Provide basis: (attach)	
7 Any answer from Item 1 through Item 3 is "Yes": *If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Harvest and Use BMP. If no, then proceed to Item 8 below.*	☐ Yes ☒ No
8 Any answer from Item 4 through Item 6 is "Yes": *If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Hydrologic Source Control BMP.* *If no, then proceed to Item 9, below.*	☐ Yes ☒ No
9 All answers to Item 1 through Item 6 are "No": *Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.* *Proceed to Form 4.3-2, Hydrologic Source Control BMP.*	☒ Yes ☐ No

4.3.1 Site Design Hydrologic Source Control BMP

Section XI.E. of the Permit emphasizes the use of LID preventative measures; and the use of LID HSC BMPs reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable HSC shall be provided except where they are mutually exclusive with each other, or with other BMPs. Mutual exclusivity may result from overlapping BMP footprints such that either would be potentially feasible by itself, but both could not be implemented. Please note that while there are no numeric standards regarding the use of HSC, if a project cannot feasibly meet BMP sizing requirements or cannot fully address HCOCs, feasibility of all applicable HSC must be part of demonstrating that the BMP system has been designed to retain the maximum feasible portion of the DCV. Complete Form 4.3-2 to identify and calculate estimated retention volume from implementing site design HSC BMP. Refer to Section 5.4.1 in the TGD for more detailed guidance.

Form 4.3-3 Site Design Hydrologic Source Control BMPs (DA)

1 Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: ☐ Yes ☒ No *If yes, complete Items 2-5; If no, proceed to Item 6*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Total impervious area draining to pervious area (ft²)	0	0	0
3 Ratio of pervious area receiving runoff to impervious area	0	0	0
4 Retention volume achieved from impervious area dispersion (ft³) *V = Item2 * Item 3 * (0.5/12), assuming retention of 0.5 inches of runoff*	0	0	0
5 Sum of retention volume achieved from impervious area dispersion (ft³): 0 $V_{retention}$ *=Sum of Item 4 for all BMPs*			
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): ☐ Yes ☒ No *If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
7 Ponding surface area (ft²)	0	0	0
8 Ponding depth (ft)	0	0	0
9 Surface area of amended soil/gravel (ft²)	0	0	0
10 Average depth of amended soil/gravel (ft)	0	0	0
11 Average porosity of amended soil/gravel	0	0	0
12 Retention volume achieved from on-lot infiltration (ft³) $V_{retention}$ *= (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)*	0	0	0
13 Runoff volume retention from on-lot infiltration (ft³): 0 $V_{retention}$ *=Sum of Item 12 for all BMPs*			
14 Implementation of evapotranspiration BMP (green, brown, or blue roofs): ☐ Yes ☒ No *If yes, complete Items 15-20. If no, proceed to Item 21*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
15 Rooftop area planned for ET BMP (ft²)	0	0	0
16 Average wet season ET demand (in/day) *Use local values, typical ~ 0.1*	0	0	0

Form 4.3-3 Site Design Hydrologic Source Control BMPs (DA)			
17 **Daily ET demand (ft^3/day)** *Item 15 * (Item 16 / 12)*	0	0	0
18 **Drawdown time (hrs)** *Copy Item 6 in Form 4.2-1*	0	0	0
19 **Retention Volume (ft^3)** *$V_{retention}$ = Item 17 * (Item 18 / 24)*	0	0	0
20 **Runoff volume retention from evapotranspiration BMPs (ft^3):** 0 *$V_{retention}$ =Sum of Item 19 for all BMPs*			
21 **Implementation of Street Trees:** ☐ Yes ☒ No *If yes, complete Items 22-25. If no, proceed to Item 26*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
22 **Number of Street Trees**	0	0	0
23 **Average canopy cover over impervious area (ft^2)**	0	0	0
24 **Runoff volume retention from street trees (ft^3)** *$V_{retention}$ = Item 22 * Item 23 * (0.05/12) assume runoff retention of 0.05 inches*	0	0	0
25 **Runoff volume retention from street tree BMPs (ft^3):** 0 *$V_{retention}$ = Sum of Item 24 for all BMPs*			
26 **Implementation of residential rain barrel/cisterns:** ☐ Yes ☒ No *If yes, complete Items 27-29; If no, proceed to Item 30*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
27 **Number of rain barrels/cisterns**	0	0	0
28 **Runoff volume retention from rain barrels/cisterns (ft^3)** *$V_{retention}$ = Item 27 * 3*	0	0	0
29 **Runoff volume retention from residential rain barrels/Cisterns (ft^3):** 0 *$V_{retention}$ =Sum of Item 28 for all BMPs*			
30 **Total Retention Volume from Site Design Hydrologic Source Control BMPs:** 0 *Sum of Items 5, 13, 20, 25 and 29*			

4.3.2 Infiltration BMPs

Use Form 4.3-3 to compute on-site retention of runoff from proposed retention and infiltration BMPs. Volume retention estimates are sensitive to the percolation rate used, which determines the amount of runoff that can be infiltrated within the specified drawdown time. The infiltration safety factor reduces field measured percolation to account for potential inaccuracy associated with field measurements, declining BMP performance over time, and compaction during construction. Appendix D of the TGD for WQMP provides guidance on estimating an appropriate safety factor to use in Form 4.3-3.

If site constraints limit the use of BMPs to a single type and implementation of retention and infiltration BMPs mitigate no more than 40% of the DCV, then they are considered infeasible and the Project Proponent may evaluate the effectiveness of BMPs lower in the LID hierarchy of use (Section 5.5.1 of the TGD for WQMP)

If implementation of infiltrations BMPs is feasible as determined using Form 4.3-1, then LID infiltration BMPs shall be implemented to the MEP (section 4.1 of the TGD for WQMP).

Form 4.3-4 Infiltration LID BMP – including underground BMPs (DA 1)

1 Remaining LID DCV not met by site design HSC BMP (ft³): 278,953
V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30

BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA 1 DMA A & OFFSITE IMP CMP 1	DA 1 DMA B CMP 2	DA 1 DMA C CMP 3
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods*	7.70	2.60	2.60
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	2.50	2.50	2.50
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	3.08	1.04	1.04
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48	48	48
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	4.10' 49.20"	4.10' 49.20"	4.10' 49.20"
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	4.10' 49.20"	4.10' 49.20"	4.10' 49.20"
8 Infiltrating surface area, SA_{BMP} (ft²) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	30,147	15,485	2,943
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	n/a	n/a	n/a
10 Amended soil porosity	n/a	n/a	n/a
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	1.0' 12"	1.0' 12"	1.0' 12"
12 Gravel porosity	0.40	0.40	0.40
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	3	3	3
14 Above Ground Retention Volume (ft³) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	n/a	n/a	n/a
15 Underground Retention Volume (ft³) *Volume determined using manufacturer's specifications and calculations*	93,260	47,873	9,068

16 Total Retention Volume from LID Infiltration BMPs: SEE LAST FORM 4.3-3
(Sum of Items 14 and 15 for all infiltration BMP included in plan)

17 Fraction of DCV achieved with infiltration BMP: SEE LAST FORM 4.3-3
Retention% = Item 16 / Form 4.2-1 Item 7

18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs?
☐ Yes ☐ No SEE LAST FORM 4.3-3
If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.

Form 4.3-3 Infiltration LID BMP – including underground BMPs (DA 1)

1 Remaining LID DCV not met by site design HSC BMP (ft³): 278,953
V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30

BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA 1 DMA D CMP 4	DA 1 DMA E CMP 5	DA 1 DMA F CMP 6	DA 1 DMA G CMP 7
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods*	2.60	2.60	2.60	2.60
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	2.50	2.50	2.50	2.50
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	1.04	1.04	1.04	1.04
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48	48	48	48
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	4.10' 49.20"	4.10' 49.20"	4.10' 49.20"	4.10' 49.20"
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	4.10' 49.20"	4.10' 49.20"	4.10' 49.20"	4.10' 49.20"
8 Infiltrating surface area, SA_{BMP} (ft²) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	16,203	20,935	1,704	3,160
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	n/a	n/a	n/a	n/a
10 Amended soil porosity	n/a	n/a	n/a	n/a
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	1.0' 12"	1.0' 12"	1.0' 12"	1.0' 12"
12 Gravel porosity	0.40	0.40	0.40	0.40
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	3	3	3	3
14 Above Ground Retention Volume (ft³) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	n/a	n/a	n/a	n/a
15 Underground Retention Volume (ft³) *Volume determined using manufacturer's specifications and calculations*	50,095	64,731	5,238	9,726

16 Total Retention Volume from LID Infiltration BMPs: 279,991
(Sum of Items 14 and 15 for all infiltration BMP included in plan)

17 Fraction of DCV achieved with infiltration BMP: 100%
Retention% = Item 16 / Form 4.2-1 Item 7

18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs?
☒ Yes ☐ No
If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.

Form 4.3-3 Infiltration LID BMP – including underground BMPs (DA 2)

1 Remaining LID DCV not met by site design HSC BMP (ft^3): 120,927 *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30*			
BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA 2 DMA A CMP 8	DA 2 DMA B & OFFSITE IMP CMP 9	n/a
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods*	4.10	2.60	n/a
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	2.50	2.50	n/a
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	1.64	1.04	n/a
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48	48	n/a
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	4.10’ 49.20”	4.10’ 49.20”	n/a
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	4.10’ 49.20”	4.10’ 49.20”	n/a
8 Infiltrating surface area, SA_{BMP} (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	21,569	17,645	n/a
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	n/a	n/a	n/a
10 Amended soil porosity	n/a	n/a	n/a
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	1.0’ 12”	1.0’ 12”	n/a
12 Gravel porosity	0.40	0.40	n/a
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	3	3	n/a
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	n/a	n/a	n/a
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer’s specifications and calculations*	66,691	54,575	n/a
16 Total Retention Volume from LID Infiltration BMPs: 121,266 *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*			
17 Fraction of DCV achieved with infiltration BMP: 100% *Retention% = Item 16 / Form 4.2-1 Item 7*			
18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? ☒ Yes ☐ No *If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.*			

4.3.3 Harvest and Use BMP

Harvest and use BMP may be considered if the full LID DCV cannot be met by maximizing infiltration BMPs. Use Form 4.3-4 to compute on-site retention of runoff from proposed harvest and use BMPs.

Volume retention estimates for harvest and use BMPs are sensitive to the on-site demand for captured stormwater. Since irrigation water demand is low in the wet season, when most rainfall events occur in San Bernardino County, the volume of water that can be used within a specified drawdown period is relatively low. The bottom portion of Form 4.3-4 facilitates the necessary computations to show infeasibility if a minimum incremental benefit of 40 percent of the LID DCV would not be achievable with MEP implementation of on-site harvest and use of stormwater (Section 5.5.4 of the TGD for WQMP).

Form 4.3-4 Harvest and Use BMPs (DA 1)

1 Remaining LID DCV not met by site design HSC or infiltration BMP (ft^3): 0 *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16*			
BMP Type(s) *Compute runoff volume retention from proposed harvest and use BMP (Select BMPs from Table 5-4 of the TGD for WQMP) - Use additional forms for more BMPs*	DA DMA BMP Type *(Use additional forms for more BMPs)*	DA DMA BMP Type *(Use additional forms for more BMPs)*	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Describe cistern or runoff detention facility	n/a	n/a	n/a
3 Storage volume for proposed detention type (ft^3) *Volume of cistern*	0	0	0
4 Landscaped area planned for use of harvested stormwater (ft^2)	0	0	0
5 Average wet season daily irrigation demand (in/day) Use local values, typical ~ 0.1 in/day	0	0	0
6 Daily water demand (ft^3/day) *Item 4 * (Item 5 / 12)*	0	0	0
7 Drawdown time (hrs) *Copy Item 6 from Form 4.2-1*	0	0	0
8 Retention Volume (ft^3) *$V_{retention}$ = Minimum of (Item 3) or (Item 6 * (Item 7 / 24))*	0	0	0
9 Total Retention Volume (ft^3) from Harvest and Use BMP: 0 *Sum of Item 8 for all harvest and use BMP included in plan*			
10 Is the full DCV retained with a combination of LID HSC, retention and infiltration, and harvest & use BMPs? ☐ Yes ☒ No *If yes, demonstrate conformance using Form 4.3-10. If no, then re-evaluate combinations of all LID BMP and optimize their implementation such that the maximum portion of the DCV is retained on-site (using a single BMP type or combination of BMP types). If the full DCV cannot be mitigated after this optimization process, proceed to Section 4.3.4.*			

4.3.4 Biotreatment BMP

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration, and harvest and use BMPs. A key consideration when using biotreatment BMP is the effectiveness of the proposed BMP in addressing the pollutants of concern for the project (see Table 5-5 of the TGD for WQMP).

Use Form 4.3-5 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV. Biotreatment computations are included as follows:

- Use Form 4.3-6 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-7 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-8 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

Form 4.3-5 Selection and Evaluation of Biotreatment BMP (DA 1)

<table>
<tr><td colspan="2">1 Remaining LID DCV not met by site design HSC, infiltration, or harvest and use BMP for potential biotreatment (ft³): 0
Form 4.2-1 Item 7 – Form 4.3-2 Item 30 – Form 4.3-3 Item 16- Form 4.3-4 Item 9</td><td colspan="2">List pollutants of concern
Copy from Form 2.3-1
none</td></tr>
<tr><td rowspan="2">2 Biotreatment BMP Selected
(Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)</td><td>Volume-based biotreatment
Use Forms 4.3-6 and 4.3-7 to compute treated volume</td><td>Flow-based biotreatment
Use Form 4.3-8 to compute treated volume</td></tr>
<tr><td>☐ Bioretention with underdrain
☐ Planter box with underdrain
☐ Constructed wetlands
☐ Wet extended detention
☐ Dry extended detention</td><td>☐ Vegetated swale
☐ Vegetated filter strip
☐ Proprietary biotreatment</td></tr>
<tr><td>3 Volume biotreated in volume based biotreatment BMP (ft³): 0
Form 4.3-6 Item 15 + Form 4.3-7 Item 13</td><td>4 Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft³): 0
Item 1 – Item 3</td><td>5 Remaining fraction of LID DCV for sizing flow based biotreatment BMP: 0%
Item 4 / Item 1</td></tr>
<tr><td colspan="3">6 Flow-based biotreatment BMP capacity provided (cfs): 0
Use Figure 5-2 of the TGD for WQMP to determine flow capacity required to provide biotreatment of remaining percentage of unmet LID DCV (Item 5), for the project's precipitation zone (Form 3-1 Item 1)</td></tr>
<tr><td colspan="3">7 Metrics for MEP determination:
Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the TGD for WQMP for the proposed category of development: ☐
If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.</td></tr>
</table>

Form 4.3-6 Volume Based Biotreatment (DA 1)
Bioretention and Planter Boxes with Underdrains

Biotreatment BMP Type *(Bioretention w/underdrain, planter box w/underdrain, other comparable BMP)*	DA DMA BMP Type *(Use additional forms for more BMPs)*	DA DMA BMP Type *(Use additional forms for more BMPs)*	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*	n/a	n/a	n/a
2 Amended soil infiltration rate *Typical ~ 5.0*	0	0	0
3 Amended soil infiltration safety factor *Typical ~ 2.0*	0	0	0
4 Amended soil design percolation rate (in/hr) P_{design} *= Item 2 / Item 3*	0	0	0
5 Ponded water drawdown time (hr) *Copy Item 6 from Form 4.2-1*	0	0	0
6 Maximum ponding depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*	0	0	0
7 Ponding Depth (ft) d_{BMP} *= Minimum of (1/12 * Item 4 * Item 5) or Item 6*	0	0	0
8 Amended soil surface area (ft^2)	0	0	0
9 Amended soil depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*	0	0	0
10 Amended soil porosity, *n*	0	0	0
11 Gravel depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*	0	0	0
12 Gravel porosity, *n*	0	0	0
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	0	0	0
14 Biotreated Volume (ft^3) $V_{biotreated}$ *= Item 8 * [(Item 7/2) + (Item 9 * Item 10) +(Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	0	0	0
15 Total biotreated volume from bioretention and/or planter box with underdrains BMP: 0 *Sum of Item 14 for all volume-based BMPs included in this form*			

Form 4.3-7 Volume Based Biotreatment (DA 1)
Constructed Wetlands and Extended Detention

Biotreatment BMP Type *Constructed wetlands, extended wet detention, extended dry detention, or other comparable proprietary BMP. If BMP includes multiple modules (e.g. forebay and main basin), provide separate estimates for storage and pollutants treated in each module.*	DA DMA BMP Type *(Use additional forms for more BMPs)*		DA DMA BMP Type *(Use additional forms for more BMPs)*	
	Forebay	Basin	Forebay	Basin
1 Pollutants addressed with BMP forebay and basin *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*	n/a	n/a	n/a	n/a
2 Bottom width (ft)	0	0	0	0
3 Bottom length (ft)	0	0	0	0
4 Bottom area (ft^2) *A_{bottom} = Item 2 * Item 3*	0	0	0	0
5 Side slope (ft/ft)	0	0	0	0
6 Depth of storage (ft)	0	0	0	0
7 Water surface area (ft^2) $A_{surface}$ *=(Item 2 + (2 * Item 5 * Item 6)) * (Item 3 + (2 * Item 5 * Item 6))*	0	0	0	0
8 Storage volume (ft^3) *For BMP with a forebay, ensure fraction of total storage is within ranges specified in BMP specific fact sheets, see Table 5-6 of the TGD for WQMP for reference to BMP design details* V *=Item 6 / 3 * [Item 4 + Item 7 + (Item 4 * Item 7)^0.5]*	0	0	0	0
9 Drawdown Time (hrs) *Copy Item 6 from Form 2.1*	0		0	
10 Outflow rate (cfs) *Q_{BMP} = (Item $8_{forebay}$ + Item 8_{basin}) / (Item 9 * 3600)*	0		0	
11 Duration of design storm event (hrs)	0		0	
12 Biotreated Volume (ft^3) *$V_{biotreated}$ = (Item $8_{forebay}$ + Item 8_{basin}) +(Item 10 * Item 11 * 3600)*	0		0	
13 Total biotreated volume from constructed wetlands, extended dry detention, or extended wet detention: 0 *(Sum of Item 12 for all BMP included in plan)*				

Form 4.3-8 Flow Based Biotreatment (DA 1)			
Biotreatment BMP Type *Vegetated swale, vegetated filter strip, or other comparable proprietary BMP*	DA DMA BMP Type *(Use additional forms for more BMPs)*	DA DMA BMP Type *(Use additional forms for more BMPs)*	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in TGD Table 5-5*	n/a	n/a	n/a
2 Flow depth for water quality treatment (ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*	0	0	0
3 Bed slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*	0	0	0
4 Manning's roughness coefficient	0	0	0
5 Bottom width (ft) *b_w = (Form 4.3-5 Item 6 * Item 4) / (1.49 * Item 2^1.67 * Item 3^0.5)*	0	0	0
6 Side Slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*	0	0	0
7 Cross sectional area (ft^2) *A = (Item 5 * Item 2) + (Item 6 * Item 2^2)*	0	0	0
8 Wa**ter quality flow velocity (ft/sec)** *V = Form 4.3-5 Item 6 / Item 7*	0	0	0
9 Hydraulic residence time (min) *Pollutant specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*	0	0	0
10 Len**gth of flow based BMP (ft)** *L = Item 8 * Item 9 * 60*	0	0	0
11 Water surface area at water quality flow depth (ft^2) *SA_{top} = (Item 5 + (2 * Item 2 * Item 6)) * Item 10*	0	0	0

4.3.5 Conformance Summary

Complete Form 4.3-9 to demonstrate how on-site LID DCV is met with proposed site design hydrologic source control, infiltration, harvest and use, and/or biotreatment BMP. The bottom line of the form is used to describe the basis for infeasibility determination for on-site LID BMP to achieve full LID DCV, and provides methods for computing remaining volume to be addressed in an alternative compliance plan. If the project has more than one outlet, then complete additional versions of this form for each outlet.

Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA 1)

1 Total LID DCV for the Project DA-1 (ft^3): 278,953

Copy Item 7 in Form 4.2-1

2 On-site retention with site design hydrologic source control LID BMP (ft^3): 0

Copy Item 30 in Form 4.3-2

3 On-site retention with LID infiltration BMP (ft^3): 279,991

Copy Item 16 in Form 4.3-3

4 On-site retention with LID harvest and use BMP (ft^3): 0

Copy Item 9 in Form 4.3-4

5 On-site biotreatment with volume based biotreatment BMP (ft^3): 0

Copy Item 3 in Form 4.3-5

6 Flow capacity provided by flow based biotreatment BMP (cfs): 0

Copy Item 6 in Form 4.3-5

7 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use BMP: ☒ Yes ☐ No
  If yes, sum of Items 2, 3, and 4 is greater than Item 1
- Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: ☐ Yes ☒ No
  If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized
- On-site retention and infiltration is determined to be infeasible and biotreatment BMP provide biotreatment for all pollutants of concern for full LID DCV: ☐ Yes ☒ No
  If yes, Form 4.3-1 Items 7 and 8 were both checked yes

8 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:

- Combination of HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐
  Checked yes for Form 4.3-5 Item 7, Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, V_{alt} *= (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐
  Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed

Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA 2)

1 Total LID DCV for the Project DA-1 (ft^3): 120,927

Copy Item 7 in Form 4.2-1

2 On-site retention with site design hydrologic source control LID BMP (ft^3): 0

Copy Item 30 in Form 4.3-2

3 On-site retention with LID infiltration BMP (ft^3): 121,266

Copy Item 16 in Form 4.3-3

4 On-site retention with LID harvest and use BMP (ft^3): 0

Copy Item 9 in Form 4.3-4

5 On-site biotreatment with volume based biotreatment BMP (ft^3): 0

Copy Item 3 in Form 4.3-5

6 Flow capacity provided by flow based biotreatment BMP (cfs): 0

Copy Item 6 in Form 4.3-5

7 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use BMP: ☒ Yes ☐ No
  If yes, sum of Items 2, 3, and 4 is greater than Item 1
- Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: ☐ Yes ☒ No
  If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized
- On-site retention and infiltration is determined to be infeasible and biotreatment BMP provide biotreatment for all pollutants of concern for full LID DCV: ☐ Yes ☒ No
  If yes, Form 4.3-1 Items 7 and 8 were both checked yes

8 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:

- Combination of HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐
  Checked yes for Form 4.3-5 Item 7, Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, V_{alt} *= (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐
  Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed

4.3.6 Hydromodification Control BMP

Use Form 4.3-10 to compute the remaining runoff volume retention, after LID BMP are implemented, needed to address HCOC, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential HCOC. Describe hydromodification control BMP that address HCOC, which may include off-site BMP and/or in-stream controls. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-10 Hydromodification Control BMPs (DA 1)

1 Volume reduction needed for HCOC performance criteria (ft^3): 0 *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	**2 On-site retention with site design hydrologic source control, infiltration, and harvest and use LID BMP (ft^3):** 0 *Sum of Form 4.3-9 Items 2, 3, and 4 Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving HCOC volume reduction*
3 Remaining volume for HCOC volume capture (ft^3): 0 *Item 1 – Item 2*	**4 Volume capture provided by incorporating additional on-site or off-site retention BMPs (ft^3):** 0 *Existing downstream BMP may be used to demonstrate additional volume capture (if so, attach to this WQMP a hydrologic analysis showing how the additional volume would be retained during a 2-yr storm event for the regional watershed)*

5 If Item 4 is less than Item 3, incorporate in-stream controls on downstream waterbody segment to prevent impacts due to hydromodification ☐
Attach in-stream control BMP selection and evaluation to this WQMP

6 Is Form 4.2-2 Item 11 less than or equal to 5%: ☐ Yes ☐ No

If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site or off-site retention BMP ☐
  BMP upstream of a waterbody segment with a potential HCOC may be used to demonstrate increased time of concentration through hydrograph attenuation (if so, show that the hydraulic residence time provided in BMP for a 2-year storm event is equal or greater than the addition time of concentration requirement in Form 4.2-4 Item 15)
- Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities ☐
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

7 Form 4.2-2 Item 12 less than or equal to 5%: ☐ Yes ☐ No

If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site or off-site retention BMPs ☐
  BMPs upstream of a waterbody segment with a potential HCOC may be used to demonstrate additional peak runoff reduction through hydrograph attenuation (if so, attach to this WQMP, a hydrograph analysis showing how the peak runoff would be reduced during a 2-yr storm event)
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

4.4 Alternative Compliance Plan (if applicable)

Describe an alternative compliance plan (if applicable) for projects not fully able to infiltrate, harvest and use, or biotreat the DCV via on-site LID practices. A project proponent must develop an alternative compliance plan to address the remainder of the LID DCV. Depending on project type some projects may qualify for water quality credits that can be applied to reduce the DCV that must be treated prior to development of an alternative compliance plan (see Form 2.4-1, Water Quality Credits). Form 4.3-9 Item 8 includes instructions on how to apply water quality credits when computing the DCV that must be met through alternative compliance. Alternative compliance plans may include one or more of the following elements:

- On-site structural treatment control BMP - All treatment control BMP should be located as close to possible to the pollutant sources and should not be located within receiving waters;
- Off-site structural treatment control BMP - Pollutant removal should occur prior to discharge of runoff to receiving waters;
- Urban runoff fund or In-lieu program, if available

Depending upon the proposed alternative compliance plan, approval by the executive officer may or may not be required (see Section 6 of the TGD for WQMP).

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

All BMP included as part of the project WQMP are required to be maintained through regular scheduled inspection and maintenance (refer to Section 8, Post Construction BMP Requirements, in the TGD for WQMP). Fully complete Form 5-1 summarizing all BMP included in the WQMP. Attach additional forms as needed. The WQMP shall also include a detailed Operation and Maintenance Plan for all BMP and may require a Maintenance Agreement (consult the jurisdiction's LIP). If a Maintenance Agreement is required, it must also be attached to the WQMP.

Form 5-1 BMP Inspection and Maintenance

BMP	Responsible Party(ies)	Inspection/Maintenance Activities Required	Minimum Frequency of Activities
CONTECH CMP Underground Infiltration System	Owner	Contech recommends ongoing quarterly inspections of the accumulated sediment. All systems shall be designed with an access/inspection manhole situated at or near the inlet and the outlet orifice. Maintaining the system should be scheduled during dry weather.	Inspections shall be done quarterly. Maintenance shall be scheduled when accumulated sediment or trash is clogging the discharge orifice.
Drain Inserts	Owner	Visually inspect for defects and illegal dumping. Notify proper authorities if illegal dumping has occurred. Using an industrial vacuum, the collected materials shall be removed from the filter basket and disposed of properly. Inspect biosorb hydrocarbon boom and replace as necessary.	Four times per year or following any rain event that would potentially accumulate a large amount of debris in the system. Replace boom twice per year, at a minimum.
Storm Drain Stenciled Message	Owner	Visually inspect for legibility and replace or repaint as necessary.	Annually
N1: Education of Property Owners, Tenants and Occupants on Stormwater BMPs	Owner	Property owner will familiarize him/herself with the educational materials in Attachment "E" and the contents of the WQMP.	Annually (January) for all employees and within 2 months for new hires.
N2: Activity Restrictions	Owner	Activities are restricted to only those for which a BMP has been implemented. The owner shall develop ongoing activity restrictions that include those that have the potential to create adverse impacts on water quality. Activities include, but are not limited to: handling and disposal of contaminants, fertilizer and pesticide application restrictions, litter control and pick-up, and vehicle or equipment repair as well as any other activities that may potentially contribute to water pollution.	Ongoing
N3: Landscape Management BMPs	Owner	Irrigation must be consistent with City's Water Conservation Ordinance. Fertilizer and pesticide usage will be consistent with County Management Guidelines for Use of Fertilizers and Pesticides.	Ongoing

Form 5-1 BMP Inspection and Maintenance

N4: BMP Maintenance	Owner	BMP maintenance, implementation schedules, and responsible parties are included with each specific BMP narrative.	As described in each BMP listed within this form.
N7: Spill Contingency Plan	Owner	Owner/tenant will have a spill contingency plan, a separate document, based on specific site needs.	Ongoing
N10: Uniform Fire Code Implementation	Owner	If applicable, owner will comply with Article 80 of the Uniform Fire Code enforced by the fire protection agency. The facility operators will be educated annually regarding requirements for handling, storage and proper disposal of hazardous substances.	Ongoing
N11: Litter/Debris Control Program	Owner	Contract with their landscape maintenance firm to provide this service during regularly schedule maintenance. They are required to implement trash management and litter control procedures in the common areas aimed at reducing pollution of drainage water.	Weekly
N12: Employee Training	Owner	The owner will ensure that tenants are also familiar with onsite BMPs and necessary maintenance required of the tenants. Owner will check with City and County at least once a year to obtain new or updated educational materials and provide these materials to tenants. Employees shall be trained to clean up spills and participate in ongoing maintenance. The WQMP requires annual employee training and new hires within 2 months.	Annually (January) for all employees and within 2 months for new hires.
N13: Housekeeping of Loading Docks	Owner	Keep all fluids indoors. Clean up spills immediately and keep spills from entering storm drain system. No direct discharges into the storm drain system. Area shall be inspected weekly for proper containment and practices with spills cleaned up immediately and disposed of properly.	Ongoing
N14: Catch Basin Inspection Program	Owner	Monthly inspection by property owner's designee. Inspection consists of immediate repair of any deterioration of the structures and maintenance of drain inserts before and after major rain events. Drain insert maintenance shall be per manufacturer's guidelines.	Monthly inspection and maintain as necessary.
N15: Vacuum Sweeping of Private Streets and Parking Lots	Owner	All landscape maintenance contractors will be required to sweep up all landscape cuttings, mowings and fertilizer materials off paved areas weekly and dispose of properly. Parking areas and drive ways will be swept monthly by sweeping contractor.	Monthly
N17: Comply with all other applicable NPDES permits	Owner	Will comply with Construction General Permit and Industrial General Permit (may apply for No Exposure Certification/NEC).	Ongoing
S1: Provide storm drain system stenciling and signage (CASQA New Development BMP Handbook SD-13)	Owner	"No Dumping – Drains to River" stencils will be applied. Legibility of stencil will be maintained on a yearly basis.	Annually (January)

Form 5-1 BMP Inspection and Maintenance			
S3: Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	Owner	Paved with an impervious surface, designed not to allow run-on from adjoining areas, designed to divert drainage from adjoining roofs and pavements diverted around the area, screened or walled to prevent off-site transport of trash. Detail to be provided once available.	Ongoing
S4: Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)	Owner	Irrigation systems shall include reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines. Timers will be used to avoid over watering and watering cycles and duration shall be adjusted seasonally by the landscape maintenance contractor. The landscaping areas will be grouped with plants that have similar water requirements. Native or drought tolerant species shall also be used where appropriate to reduce excess irrigation runoff and promote surface filtration.	Adjust watering cycles and duration seasonally / quarterly (Oct, Jan, Apr, and Jul).

Section 6 WQMP Attachments

6.1 Site Plan and Drainage Plan

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural Source Control BMP locations
- Site Design Hydrologic Source Control BMP locations
- LID BMP details
- Drainage delineations and flow information
- Drainage connections

See Attachment C for Site and Drainage Plan.

6.2 Electronic Data Submittal

Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (consult the LIP), this section will describe the contents (e.g., layering, nomenclature, geo-referencing, etc.) of these documents so that they may be interpreted efficiently and accurately.

6.3 Post Construction

Attach all O&M Plans and Memorandum of Agreement for BMP to the WQMP (Attachment D).

6.4 Other Supporting Documentation

- BMP Educational Materials (Attachment E)
- Soil/Infiltration Report (Attachment F)
- BMP Maintenance Material (Attachment G)
- Conditions of Approval (Attachment H)
- Class V Injection Well Registration (Attachment I)
- Activity Restrictions (Attachment J)

Attachment A
Existing Condition Site Photos

Attachment B
BMP Design Calculations & Supporting Documentation

General Information
Homepage
Progress Reports
FAQ
Glossary

Precipitation Frequency
Data Server
GIS Grids
Maps
Time Series
Temporals
Documents

Probable Maximum Precipitation
Documents

Miscellaneous
Publications
Storm Analysis
Record Precipitation

Contact Us
Inquiries

NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: CA

Data description

Data type: Precipitation depth **Units:** English **Time series type:** Partial duration

Select location

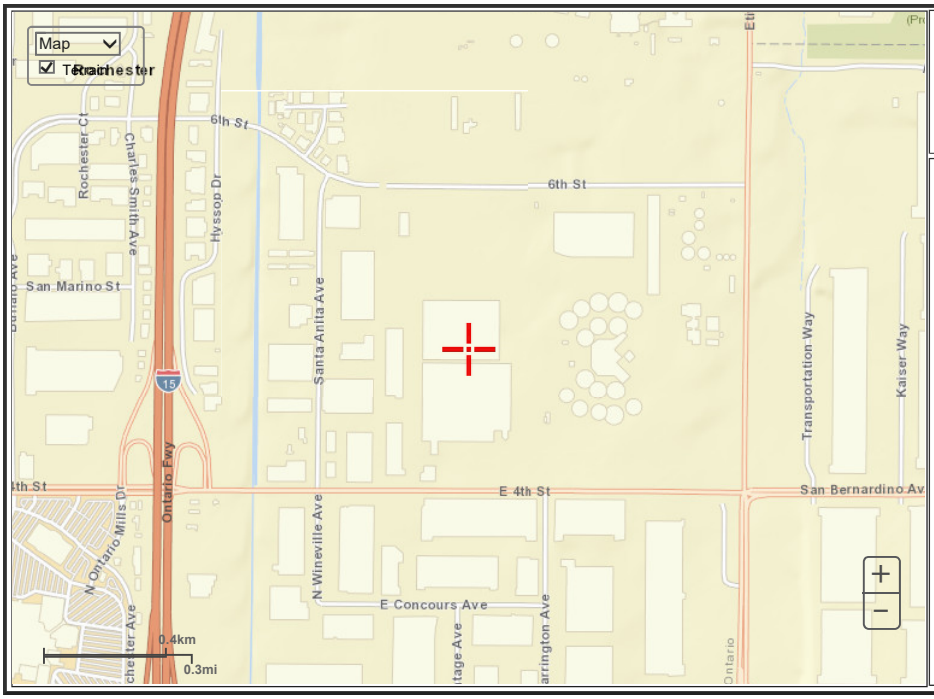
1) Manually:

a) By location (decimal degrees, use "-" for S and W): Latitude: 34.081402 Longitude: -117.53386 Submit

b) By station (list of CA stations): Select station

c) By address Search

2) Use map (if ESRI interactive map is not loading, try adding the host: **https://js.arcgis.com/** to the firewall, or contact us at hdsc.questions@noaa.gov):



a) Select location
Move crosshair or double click

b) Click on station icon
Show stations on map

Location information:
Name: Ontario, California, USA*
Latitude: 34.0814°
Longitude: -117.5339°
Elevation: 1066.37 ft **

* Source: ESRI Maps
** Source: USGS

POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 6, Version 2

PF tabular PF graphical Supplementary information Print page

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years) 1	2	5	10	25	50	100	200	500	1000
5-min	**0.106** (0.089-0.129)	**0.140** (0.117-0.170)	**0.186** (0.154-0.226)	**0.224** (0.184-0.274)	**0.276** (0.219-0.351)	**0.317** (0.247-0.412)	**0.360** (0.273-0.480)	**0.406** (0.299-0.556)	**0.469** (0.331-0.671)	**0.519** (0.354-0.771)
10-min	**0.153** (0.127-0.185)	**0.201** (0.168-0.244)	**0.266** (0.221-0.324)	**0.320** (0.264-0.393)	**0.396** (0.314-0.503)	**0.455** (0.354-0.591)	**0.516** (0.392-0.688)	**0.581** (0.428-0.797)	**0.672** (0.474-0.962)	**0.745** (0.507-1.10)
15-min	**0.185** (0.154-0.224)	**0.243** (0.203-0.295)	**0.322** (0.267-0.392)	**0.387** (0.319-0.476)	**0.478** (0.380-0.608)	**0.550** (0.428-0.714)	**0.625** (0.474-0.832)	**0.703** (0.518-0.964)	**0.813** (0.574-1.16)	**0.900** (0.613-1.34)
30-min	**0.273** (0.228-0.331)	**0.361** (0.300-0.438)	**0.477** (0.396-0.581)	**0.574** (0.473-0.705)	**0.709** (0.564-0.901)	**0.815** (0.634-1.06)	**0.925** (0.702-1.23)	**1.04** (0.768-1.43)	**1.20** (0.850-1.72)	**1.33** (0.909-1.98)
60-min	**0.401** (0.334-0.486)	**0.528** (0.440-0.641)	**0.699** (0.580-0.851)	**0.841** (0.692-1.03)	**1.04** (0.825-1.32)	**1.19** (0.929-1.55)	**1.36** (1.03-1.81)	**1.53** (1.12-2.09)	**1.76** (1.25-2.53)	**1.95** (1.33-2.90)
2-hr	**0.610** (0.508-0.739)	**0.788** (0.656-0.956)	**1.02** (0.850-1.25)	**1.22** (1.00-1.50)	**1.49** (1.18-1.89)	**1.70** (1.32-2.21)	**1.92** (1.46-2.55)	**2.15** (1.58-2.94)	**2.47** (1.74-3.53)	**2.72** (1.85-4.03)
3-hr	**0.777** (0.648-0.942)	**0.997** (0.830-1.21)	**1.29** (1.07-1.57)	**1.53** (1.25-1.87)	**1.85** (1.47-2.35)	**2.11** (1.64-2.74)	**2.37** (1.80-3.15)	**2.64** (1.95-3.62)	**3.02** (2.13-4.32)	**3.32** (2.26-4.92)
6-hr	**1.12** (0.930-1.35)	**1.43** (1.19-1.73)	**1.83** (1.52-2.23)	**2.16** (1.78-2.65)	**2.61** (2.07-3.31)	**2.95** (2.29-3.83)	**3.29** (2.50-4.38)	**3.64** (2.69-5.00)	**4.12** (2.91-5.90)	**4.50** (3.06-6.67)
12-hr	**1.48**	**1.92**	**2.47**	**2.91**	**3.49**	**3.92**	**4.34**	**4.77**	**5.33**	**5.76**

	(1.23-1.79)	(1.60-2.33)	(2.05-3.01)	(2.40-3.57)	(2.77-4.43)	(3.05-5.09)	(3.30-5.79)	(3.52-6.54)	(3.76-7.63)	(3.92-8.54)
24-hr	**1.98** (1.75-2.28)	**2.62** (2.32-3.03)	**3.43** (3.02-3.96)	**4.05** (3.54-4.72)	**4.86** (4.11-5.85)	**5.45** (4.52-6.70)	**6.02** (4.88-7.59)	**6.59** (5.19-8.54)	**7.33** (5.54-9.88)	**7.87** (5.76-11.0)
2-day	**2.43** (2.15-2.80)	**3.30** (2.92-3.81)	**4.40** (3.88-5.10)	**5.28** (4.62-6.16)	**6.44** (5.45-7.76)	**7.30** (6.05-8.98)	**8.15** (6.60-10.3)	**9.01** (7.10-11.7)	**10.1** (7.68-13.7)	**11.0** (8.05-15.4)
3-day	**2.66** (2.35-3.06)	**3.66** (3.24-4.22)	**4.96** (4.38-5.74)	**6.02** (5.26-7.02)	**7.44** (6.30-8.96)	**8.52** (7.07-10.5)	**9.62** (7.79-12.1)	**10.7** (8.46-13.9)	**12.2** (9.26-16.5)	**13.4** (9.81-18.7)
4-day	**2.91** (2.57-3.35)	**4.04** (3.57-4.66)	**5.53** (4.87-6.39)	**6.74** (5.90-7.86)	**8.39** (7.11-10.1)	**9.67** (8.02-11.9)	**11.0** (8.89-13.8)	**12.3** (9.70-15.9)	**14.1** (10.7-19.1)	**15.6** (11.4-21.7)
7-day	**3.41** (3.01-3.92)	**4.77** (4.22-5.50)	**6.57** (5.80-7.61)	**8.06** (7.05-9.40)	**10.1** (8.56-12.2)	**11.7** (9.71-14.4)	**13.3** (10.8-16.8)	**15.1** (11.9-19.5)	**17.4** (13.2-23.5)	**19.3** (14.1-26.9)
10-day	**3.69** (3.27-4.25)	**5.19** (4.59-5.99)	**7.19** (6.34-8.32)	**8.85** (7.74-10.3)	**11.1** (9.44-13.4)	**12.9** (10.7-15.9)	**14.8** (12.0-18.6)	**16.7** (13.2-21.7)	**19.4** (14.7-26.2)	**21.6** (15.8-30.1)
20-day	**4.28** (3.79-4.93)	**6.12** (5.41-7.06)	**8.60** (7.58-9.95)	**10.7** (9.35-12.5)	**13.6** (11.5-16.4)	**15.9** (13.2-19.6)	**18.4** (14.9-23.1)	**20.9** (16.5-27.1)	**24.5** (18.6-33.1)	**27.4** (20.0-38.2)
30-day	**5.04** (4.47-5.81)	**7.25** (6.41-8.37)	**10.3** (9.05-11.9)	**12.8** (11.2-14.9)	**16.4** (13.9-19.8)	**19.3** (16.0-23.7)	**22.3** (18.1-28.1)	**25.6** (20.2-33.1)	**30.2** (22.8-40.7)	**33.9** (24.8-47.3)
45-day	**5.98** (5.29-6.89)	**8.58** (7.59-9.91)	**12.2** (10.7-14.1)	**15.2** (13.3-17.8)	**19.6** (16.6-23.6)	**23.1** (19.2-28.5)	**26.9** (21.8-33.9)	**30.9** (24.4-40.0)	**36.7** (27.7-49.4)	**41.3** (30.2-57.7)
60-day	**6.95** (6.15-8.01)	**9.90** (8.76-11.4)	**14.0** (12.4-16.2)	**17.5** (15.3-20.4)	**22.6** (19.1-27.2)	**26.7** (22.1-32.8)	**31.1** (25.2-39.2)	**35.8** (28.2-46.4)	**42.6** (32.3-57.5)	**48.2** (35.3-67.3)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Estimates from the table in CSV format: Precipitation frequency estimates Submit

Main Link Categories:
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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
Office of Water Prediction (OWP)
1325 East West Highway
Silver Spring, MD 20910
Page Author: HDSC webmaster
Page last modified: April 21, 2017

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Worksheet H: Factor of Safety and Design Infiltration Rate Worksheet
Applicable to: DA 1 DMA A

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	1	0.25
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.00
B	Design	Tributary area size	0.25	3	0.75
		Level of pretreatment/ expected sediment loads	0.25	3	0.75
		Redundancy	0.25	3	0.75
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			2.50

Combined Safety Factor, $S_{TOT} = S_A \times S_B$	2.50
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)	7.7
Design Infiltration Rate, in/hr, $K_{DESIGN} = K_M / S_{TOT}$	3.08

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

An infiltration test was conducted at the project site to support a minimum measured infiltration result of 7.7 in/hr. The design infiltration rate is 3.08 in/hr after applying the appropriate safety factor. This design rate is suitable for infiltration facilities.

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

Worksheet H: Factor of Safety and Design Infiltration RateWorksheet
Applicable to: DA 1 DMAs B, C, D, E, F & G

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	1	0.25
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.00
B	Design	Tributary area size	0.25	3	0.75
		Level of pretreatment/ expected sediment loads	0.25	3	0.75
		Redundancy	0.25	3	0.75
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			2.50

Combined Safety Factor, $S_{TOT} = S_A \times S_B$	2.50
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)	2.60
Design Infiltration Rate, in/hr, $K_{DESIGN} = K_M / S_{TOT}$	1.04

Supporting Data

Briefly describe infiltration test and provide reference to testforms:

An infiltration test was conducted at the project site to support a minimum measured infiltration result of 2.6 in/hr. The design infiltration rate is 1.04 in/hr after applying the appropriate safety factor. This design rate is suitable for infiltration facilities.

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

Worksheet H: Factor of Safety and Design Infiltration Rate Worksheet
Applicable to: DA 2 DMA A

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	1	0.25
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.00
B	Design	Tributary area size	0.25	3	0.75
		Level of pretreatment/ expected sediment loads	0.25	3	0.75
		Redundancy	0.25	3	0.75
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			2.50

Combined Safety Factor, $S_{TOT} = S_A \times S_B$	2.50
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)	4.10
Design Infiltration Rate, in/hr, $K_{DESIGN} = K_M / S_{TOT}$	1.64

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

An infiltration test was conducted at the project site to support a minimum measured infiltration result of 4.10 in/hr. The design infiltration rate is 1.64 in/hr after applying the appropriate safety factor. This design rate is suitable for infiltration facilities.

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

Worksheet H: Factor of Safety and Design Infiltration Rate Worksheet
Applicable to: DA 2 DMA B

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	1	0.25
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.00
B	Design	Tributary area size	0.25	3	0.75
		Level of pretreatment/ expected sediment loads	0.25	3	0.75
		Redundancy	0.25	3	0.75
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			2.50

Combined Safety Factor, $S_{TOT} = S_A \times S_B$	2.50
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)	2.60
Design Infiltration Rate, in/hr, $K_{DESIGN} = K_M / S_{TOT}$	1.04

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

An infiltration test was conducted at the project site to support a minimum measured infiltration result of 2.6 in/hr. The design infiltration rate is 1.04 in/hr after applying the appropriate safety factor. This design rate is suitable for infiltration facilities.

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

VOLUME-BASED BMP DESIGN

$C_{BMP} = 0.858(imp)^3 - 0.78(imp)^2 + 0.774(imp) + 0.04$
P6 = (0.528)(1.4807) = 0.782 inches
P0 = (1.963)(C_{BMP})(0.782)
DCV = (P0 * Area) / 12

DA 1 DMA A – CMP-1

Region		Valley	
Drainage Area (acres)		13.60	acres
Drainage Area (sq-ft)		592,416	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.807	
1-hr 2-yr from NOAA		0.528	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.782	
Drawdown Rate (a)		1.963	
DCV		61,140	cu-ft
DCV		1.404	acre-ft

DA 1 DMA A – STREET "A" – CMP-1

Region		Valley	
Drainage Area (acres)		7.10	acres
Drainage Area (sq-ft)		309,276	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.807	
1-hr 2-yr from NOAA		0.528	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.782	
Drawdown Rate (a)		1.963	
DCV		31,919	cu-ft
DCV		0.733	acre-ft

Total DCV = 61,140 cu-ft + 31,919 cu-ft = 93,059 cu-ft

Design infiltration rate = 3.08 in/hr
d_{max} = 147.84 inches = Design infiltration rate x 48 hours = 3.08 in/hr x 48 hrs
d_{BMP} = 49.20 inches = [(6 inches + 12 inches) x 0.40] + 42 inches
$d_{max} > d_{BMP}$

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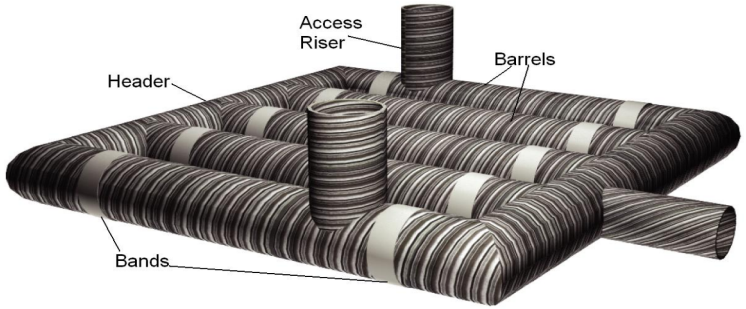


Project Summary

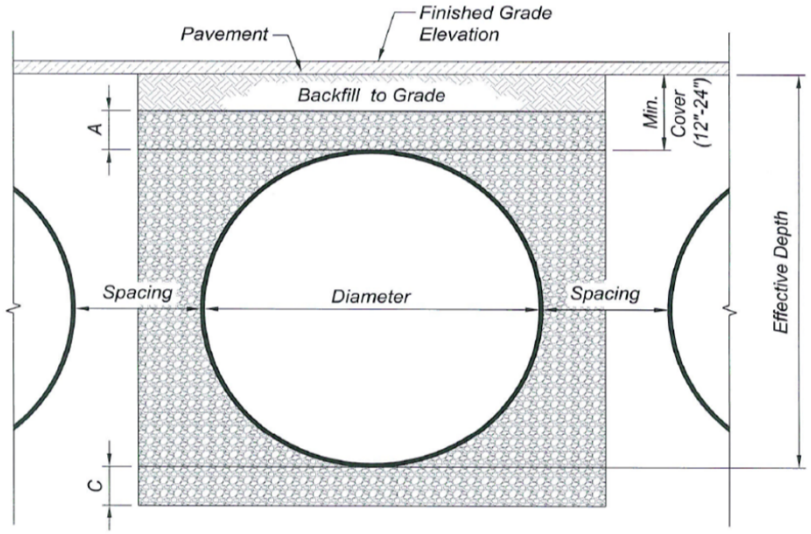
Date:	1/8/2021
Project Name:	Bridge Point Rancho (DA 1 DMA A)
City / County:	Rancho Cucamonga
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	93,059
Limiting Width (ft):	55.00
Invert Depth Below Asphalt (ft):	5.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	42
Number Of Headers:	1
Spacing between Barrels (ft):	1.75
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	12
Stone Porosity (0 to 40%):	40

9.62 ft^2 Pipe Area



System Sizing

Pipe Storage:	54,944	cf	
Porous Stone Storage:	38,316	cf	
Total Storage Provided:	93,260	cf	100.2% Of Required Storage
Number of Barrels:	10	barrels	
Length per Barrel:	566.0	ft	
Length Per Header:	50.8	ft	
Rectangular Footprint (W x L):	52.75 ft x 571.5 ft		

CONTECH Materials

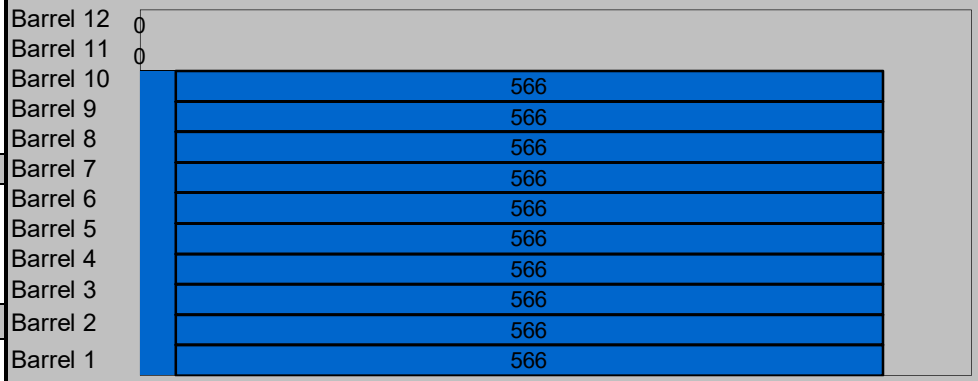
Total CMP Footage:	5,711	ft
Approximate Total Pieces:	243	pcs
Approximate Coupling Bands:	242	bands
Approximate Truckloads:	31	trucks

Construction Quantities**

Total Excavation:	5583	cy
Porous Stone Backfill For Storage:	3548	cy stone
Backfill to Grade Excluding Stone:	0	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



DA 1 DMA B – CMP-2

Region		Valley	
Drainage Area (acres)		10.60	acres
Drainage Area (sq-ft)		461,736	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.807	
1-hr 2-yr from NOAA		0.528	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.782	
Drawdown Rate (a)		1.963	
DCV		47,654	cu-ft
DCV		1.094	acre-ft

Design infiltration rate = 1.04 in/hr

d_{max} = 49.92 inches = Design infiltration rate x 48 hours = 1.04 in/hr x 48 hrs

d_{BMP} = 49.20 inches = [(6 inches + 12 inches) x 0.40] + 42 inches

$d_{max} > d_{BMP}$

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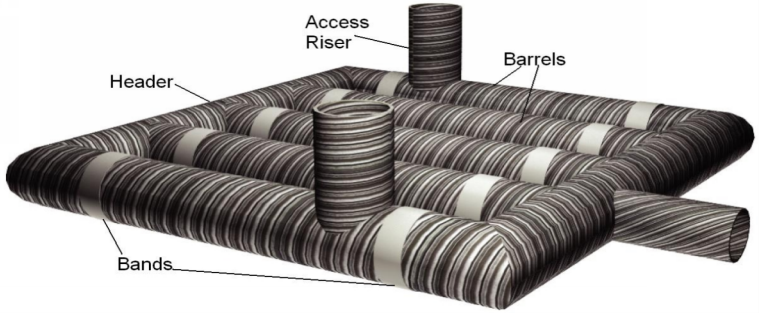


Project Summary

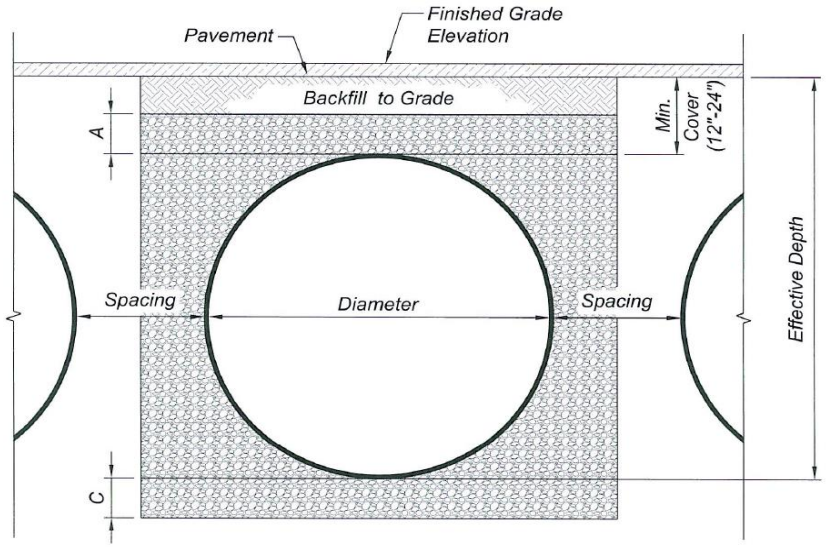
Date:	1/8/2021
Project Name:	Bridge Point Rancho (DA 1 DMA B)
City / County:	Rancho Cucamonga
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	47,654
Limiting Width (ft):	45.00
Invert Depth Below Asphalt (ft):	5.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	42
Number Of Headers:	1
Spacing between Barrels (ft):	1.75
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	12
Stone Porosity (0 to 40%):	40

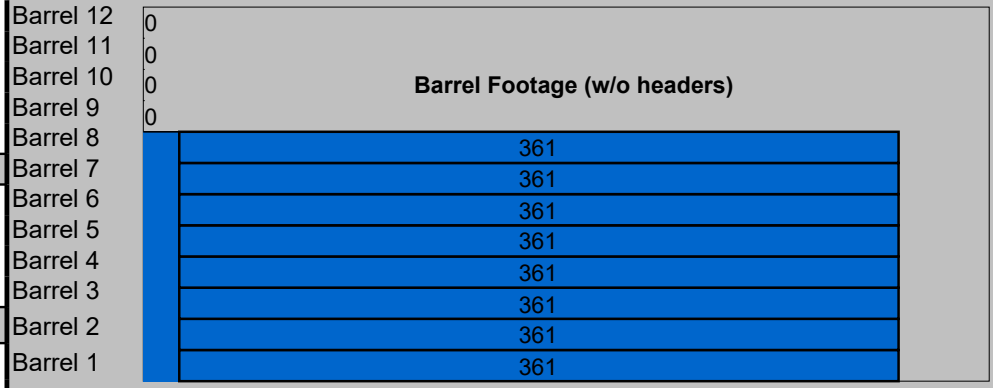
9.62 ft^2 Pipe Area



System Sizing

Pipe Storage:	28,173	cf	
Porous Stone Storage:	19,700	cf	
Total Storage Provided:	47,873	cf	100.5% Of Required Storage
Number of Barrels:	8	barrels	
Length per Barrel:	361.0	ft	
Length Per Header:	40.3	ft	
Rectangular Footprint (W x L):	42.25 ft x 366.5 ft		

System Layout



CONTECH Materials

Total CMP Footage:	2,928	ft
Approximate Total Pieces:	130	pcs
Approximate Coupling Bands:	129	bands
Approximate Truckloads:	17	trucks

Construction Quantities**

Total Excavation:	2868	cy
Porous Stone Backfill For Storage:	1824	cy stone
Backfill to Grade Excluding Stone:	0	cy fill

***Construction quantities are approximate and should be verified upon final design*

DA 1 DMA C – CMP-3

Region		Valley	
Drainage Area (acres)		2.00	acres
Drainage Area (sq-ft)		87,120	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.807	
1-hr 2-yr from NOAA		0.528	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.782	
Drawdown Rate (a)		1.963	
DCV		8,991	cu-ft
DCV		0.206	acre-ft

Design infiltration rate = 1.04 in/hr

d_{max} = 49.92 inches = Design infiltration rate x 48 hours = 1.04 in/hr x 48 hrs

d_{BMP} = 49.20 inches = [(6 inches + 12 inches) x 0.40] + 42 inches

$d_{max} > d_{BMP}$

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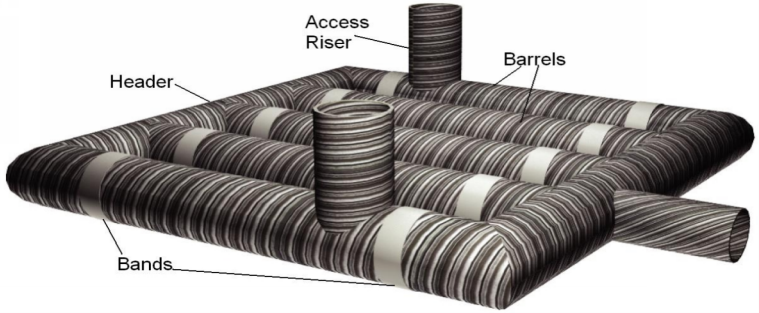


Project Summary

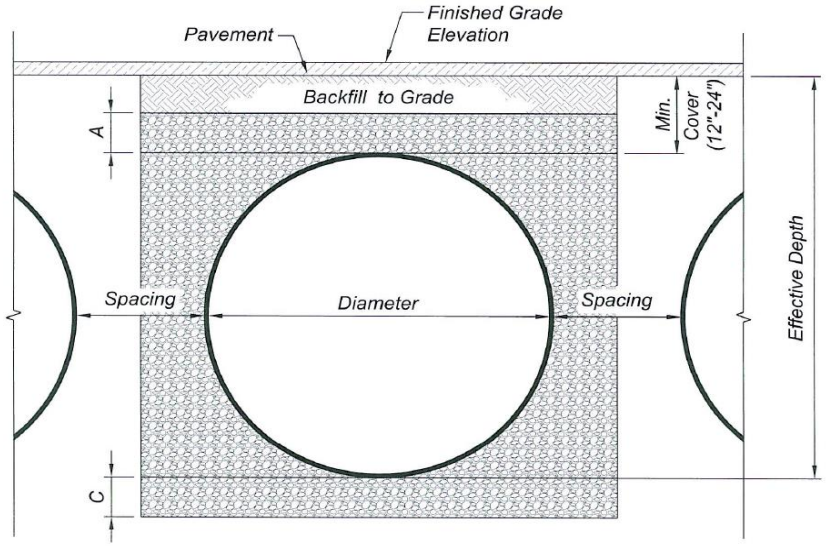
Date:	1/8/2021
Project Name:	Bridge Point Rancho (DA 1 DMA C)
City / County:	Rancho Cucamonga
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	8,991
Limiting Width (ft):	25.00
Invert Depth Below Asphalt (ft):	5.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	42
Number Of Headers:	1
Spacing between Barrels (ft):	1.75
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	12
Stone Porosity (0 to 40%):	40

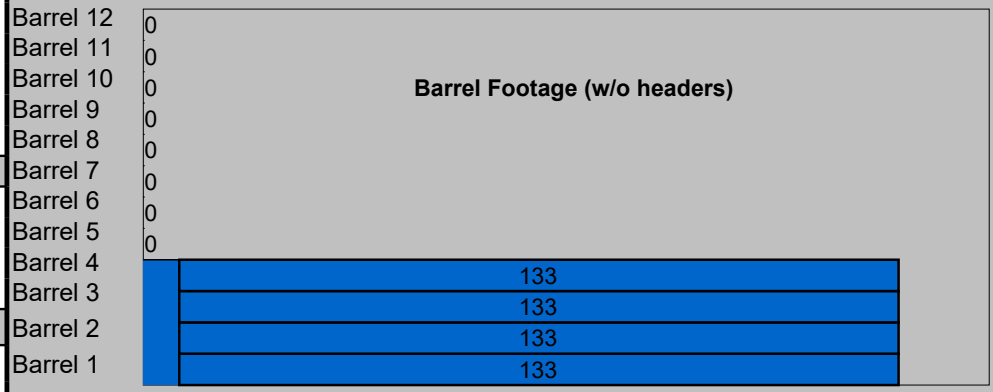
9.62 ft^2 Pipe Area



System Sizing

Pipe Storage:	5,304	cf	
Porous Stone Storage:	3,765	cf	
Total Storage Provided:	9,068	cf	100.9% Of Required Storage
Number of Barrels:	4	barrels	
Length per Barrel:	133.0	ft	
Length Per Header:	19.3	ft	
Rectangular Footprint (W x L):	21.25 ft x 138.5	ft	

System Layout



CONTECH Materials

Total CMP Footage:	551	ft
Approximate Total Pieces:	25	pcs
Approximate Coupling Bands:	24	bands
Approximate Truckloads:	4	trucks

Construction Quantities**

Total Excavation:	546	cy
Porous Stone Backfill For Storage:	349	cy stone
Backfill to Grade Excluding Stone:	1	cy fill

***Construction quantities are approximate and should be verified upon final design*

DA 1 DMA D – CMP-4

Region		Valley	
Drainage Area (acres)		11.10	acres
Drainage Area (sq-ft)		483,516	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.807	
1-hr 2-yr from NOAA		0.528	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.782	
Drawdown Rate (a)		1.963	
DCV		49,901	cu-ft
DCV		1.146	acre-ft

Design infiltration rate = 1.04 in/hr

d_{max} = 49.92 inches = Design infiltration rate x 48 hours = 1.04 in/hr x 48 hrs

d_{BMP} = 49.20 inches = [(6 inches + 12 inches) x 0.40] + 42 inches

$d_{max} > d_{BMP}$

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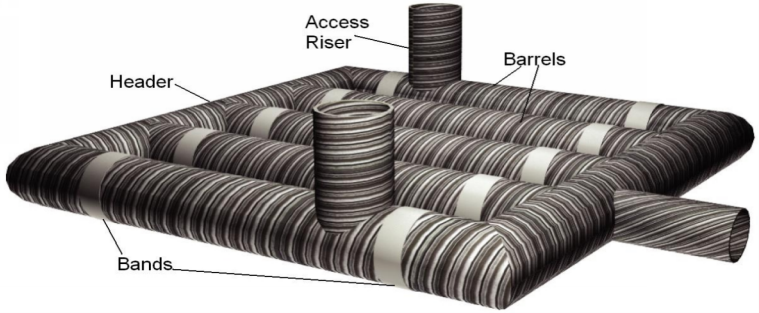


Project Summary

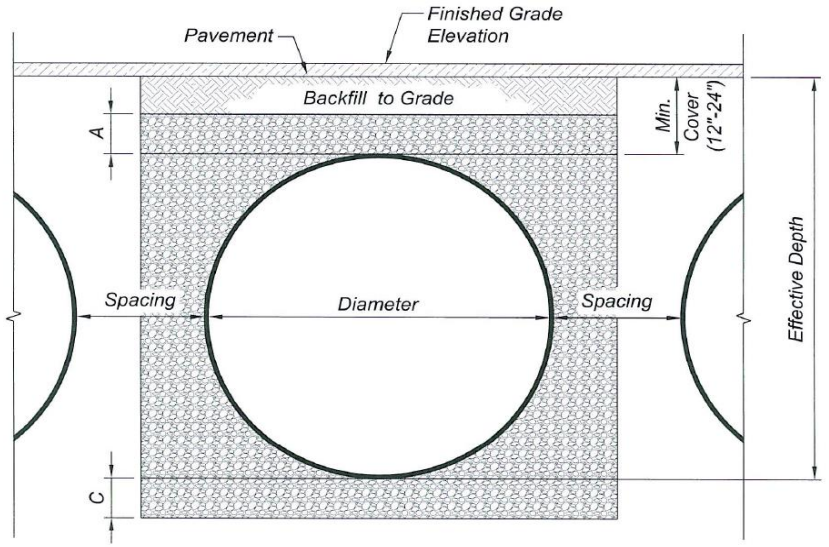
Date:	1/8/2021
Project Name:	Bridge Point Rancho (DA 1 DMA D)
City / County:	Rancho Cucamonga
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	49,901
Limiting Width (ft):	45.00
Invert Depth Below Asphalt (ft):	5.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	42
Number Of Headers:	1
Spacing between Barrels (ft):	1.75
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	12
Stone Porosity (0 to 40%):	40

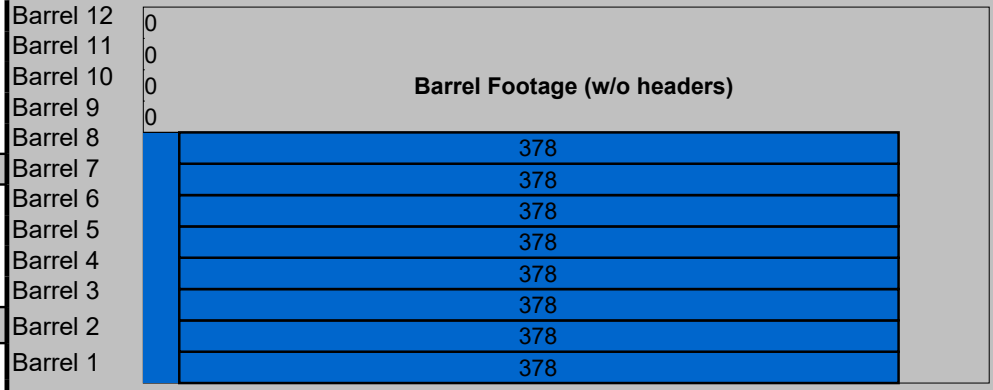
9.62 ft^2 Pipe Area



System Sizing

Pipe Storage:	29,482	cf	
Porous Stone Storage:	20,613	cf	
Total Storage Provided:	50,095	cf	100.4% Of Required Storage
Number of Barrels:	8	barrels	
Length per Barrel:	378.0	ft	
Length Per Header:	40.3	ft	
Rectangular Footprint (W x L):	42.25 ft x 383.5	ft	

System Layout



CONTECH Materials

Total CMP Footage:	3,064	ft
Approximate Total Pieces:	130	pcs
Approximate Coupling Bands:	129	bands
Approximate Truckloads:	17	trucks

Construction Quantities**

Total Excavation:	3001	cy
Porous Stone Backfill For Storage:	1909	cy stone
Backfill to Grade Excluding Stone:	0	cy fill

***Construction quantities are approximate and should be verified upon final design*

DA 1 DMA E – CMP-5

Region		Valley	
Drainage Area (acres)		14.35	acres
Drainage Area (sq-ft)		625,086	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.807	
1-hr 2-yr from NOAA		0.528	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.782	
Drawdown Rate (a)		1.963	
DCV		64,512	cu-ft
DCV		1.481	acre-ft

Design infiltration rate = 1.04 in/hr

d_{max} = 49.92 inches = Design infiltration rate x 48 hours = 1.04 in/hr x 48 hrs

d_{BMP} = 49.20 inches = [(6 inches + 12 inches) x 0.40] + 42 inches

$d_{max} > d_{BMP}$

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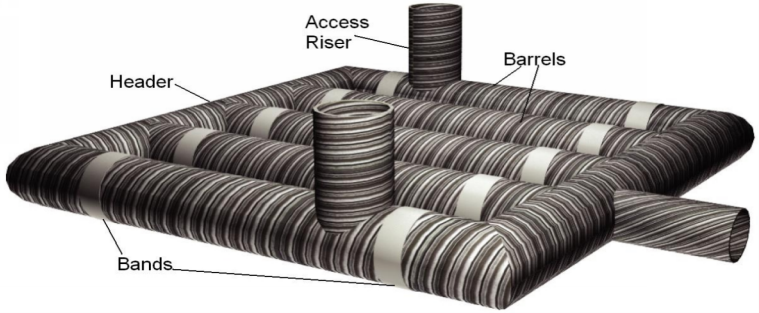


Project Summary

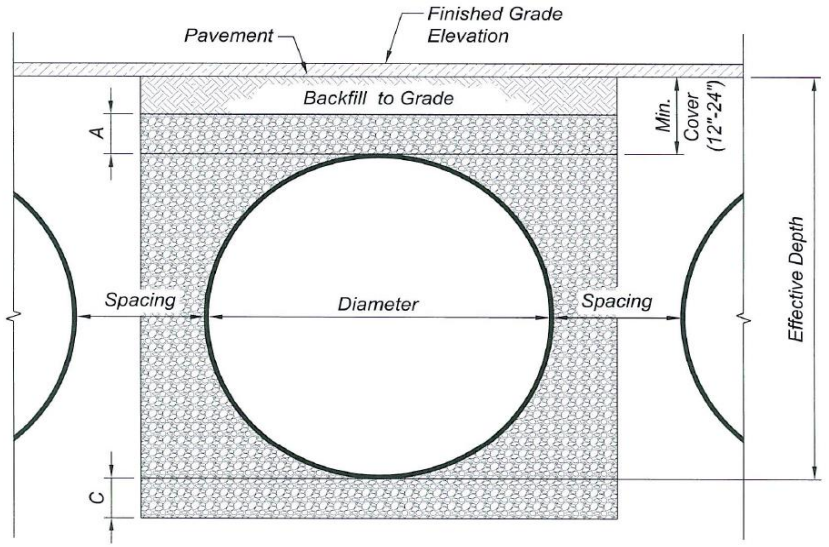
Date:	1/8/2021
Project Name:	Bridge Point Rancho (DA 1 DMA E)
City / County:	Rancho Cucamonga
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	64,512
Limiting Width (ft):	45.00
Invert Depth Below Asphalt (ft):	5.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	42
Number Of Headers:	1
Spacing between Barrels (ft):	1.75
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	12
Stone Porosity (0 to 40%):	40

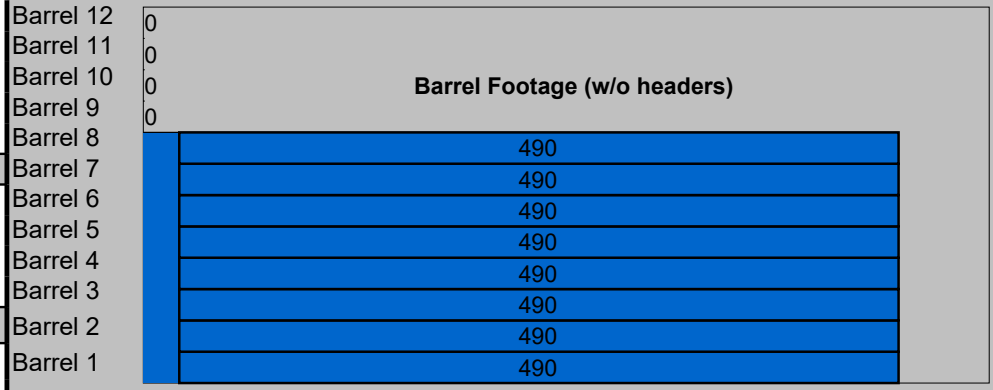
9.62 ft^2 Pipe Area



System Sizing

Pipe Storage:	38,102	cf	
Porous Stone Storage:	26,629	cf	
Total Storage Provided:	64,731	cf	100.3% Of Required Storage
Number of Barrels:	8	barrels	
Length per Barrel:	490.0	ft	
Length Per Header:	40.3	ft	
Rectangular Footprint (W x L):	42.25 ft x 495.5 ft		

System Layout



CONTECH Materials

Total CMP Footage:	3,960	ft
Approximate Total Pieces:	170	pcs
Approximate Coupling Bands:	169	bands
Approximate Truckloads:	22	trucks

Construction Quantities**

Total Excavation:	3877	cy
Porous Stone Backfill For Storage:	2466	cy stone
Backfill to Grade Excluding Stone:	0	cy fill

***Construction quantities are approximate and should be verified upon final design*

DA 1 DMA F – CMP-6

Region		Valley	
Drainage Area (acres)		1.15	acres
Drainage Area (sq-ft)		50,094	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.807	
1-hr 2-yr from NOAA		0.528	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.782	
Drawdown Rate (a)		1.963	
DCV		5,170	cu-ft
DCV		0.119	acre-ft

Design infiltration rate = 1.04 in/hr

d_{max} = 49.92 inches = Design infiltration rate x 48 hours = 1.04 in/hr x 48 hrs

d_{BMP} = 49.20 inches = [(6 inches + 12 inches) x 0.40] + 42 inches

$d_{max} > d_{BMP}$

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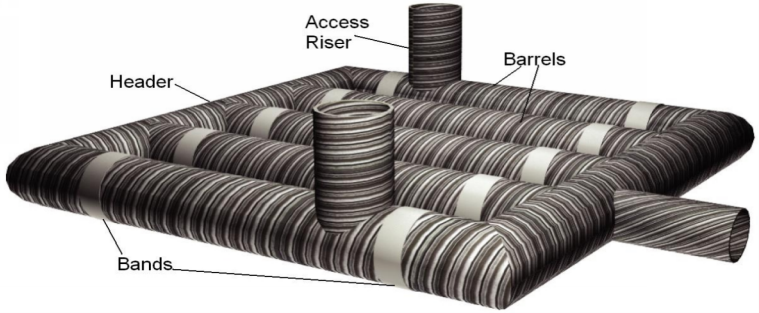


Project Summary

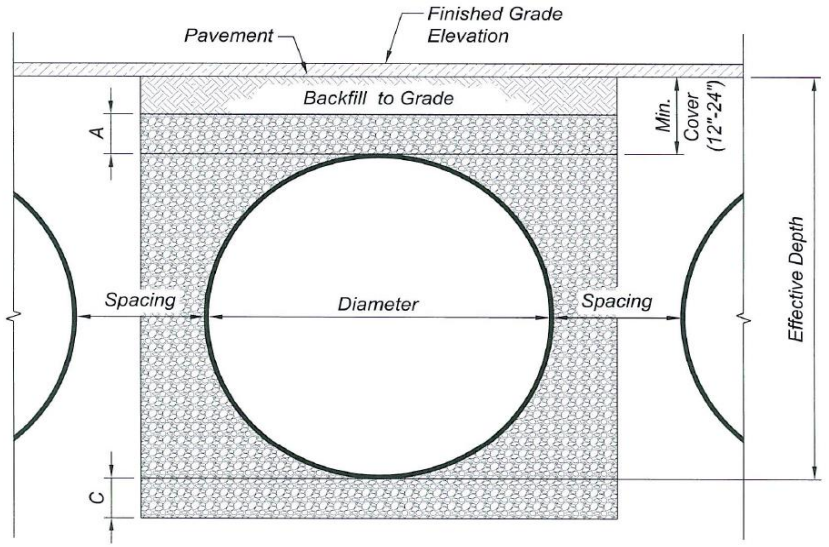
Date:	1/8/2021
Project Name:	Bridge Point Rancho (DA 1 DMA F)
City / County:	Rancho Cucamonga
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	5,170
Limiting Width (ft):	20.00
Invert Depth Below Asphalt (ft):	5.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	42
Number Of Headers:	1
Spacing between Barrels (ft):	1.75
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	12
Stone Porosity (0 to 40%):	40

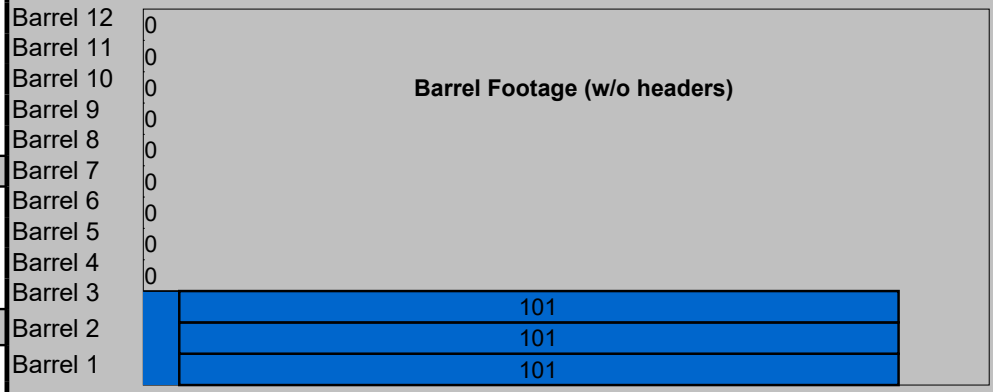
9.62 ft^2 Pipe Area



System Sizing

Pipe Storage:	3,050	cf	
Porous Stone Storage:	2,188	cf	
Total Storage Provided:	5,238	cf	101.3% Of Required Storage
Number of Barrels:	3	barrels	
Length per Barrel:	101.0	ft	
Length Per Header:	14.0	ft	
Rectangular Footprint (W x L):	16. ft x 106.5 ft		

System Layout



CONTECH Materials

Total CMP Footage:	317	ft
Approximate Total Pieces:	16	pcs
Approximate Coupling Bands:	15	bands
Approximate Truckloads:	2	trucks

Construction Quantities**

Total Excavation:	316	cy
Porous Stone Backfill For Storage:	203	cy stone
Backfill to Grade Excluding Stone:	0	cy fill

***Construction quantities are approximate and should be verified upon final design*

DA 1 DMA G – CMP-7

Region		Valley	
Drainage Area (acres)		2.15	acres
Drainage Area (sq-ft)		93,654	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.807	
1-hr 2-yr from NOAA		0.528	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.782	
Drawdown Rate (a)		1.963	
DCV		9,666	cu-ft
DCV		0.222	acre-ft

Design infiltration rate = 1.04 in/hr

d_{max} = 49.92 inches = Design infiltration rate x 48 hours = 1.04 in/hr x 48 hrs

d_{BMP} = 49.20 inches = [(6 inches + 12 inches) x 0.40] + 42 inches

$d_{max} > d_{BMP}$

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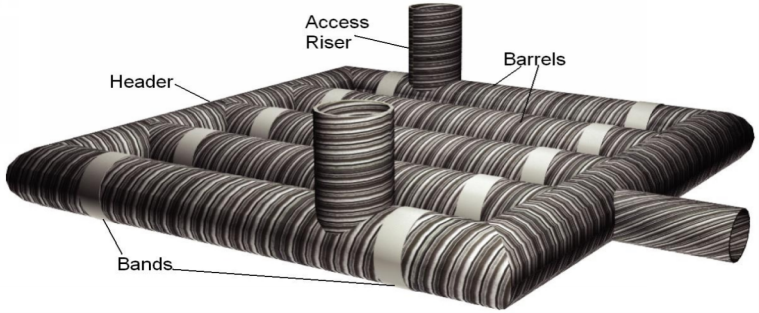


Project Summary

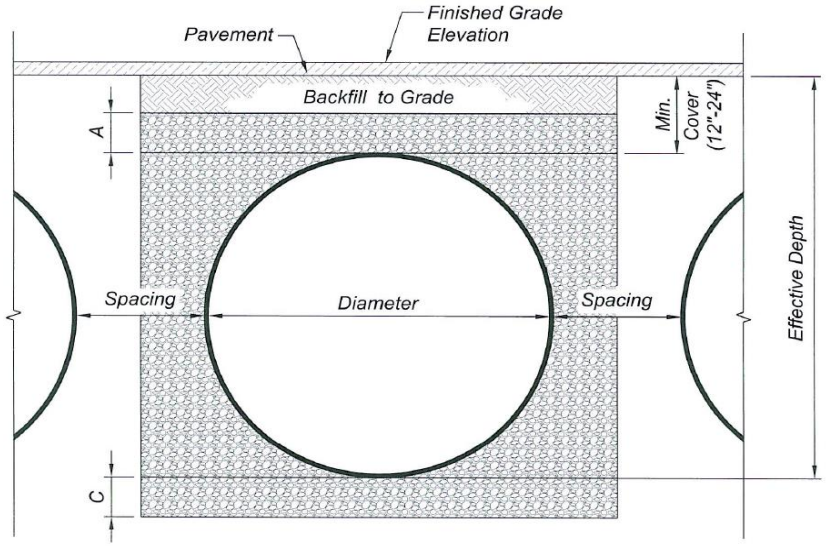
Date:	1/8/2021
Project Name:	Bridge Point Rancho (DA 1 DMA G)
City / County:	Rancho Cucamonga
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	9,666
Limiting Width (ft):	20.00
Invert Depth Below Asphalt (ft):	5.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	42
Number Of Headers:	1
Spacing between Barrels (ft):	1.75
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	12
Stone Porosity (0 to 40%):	40

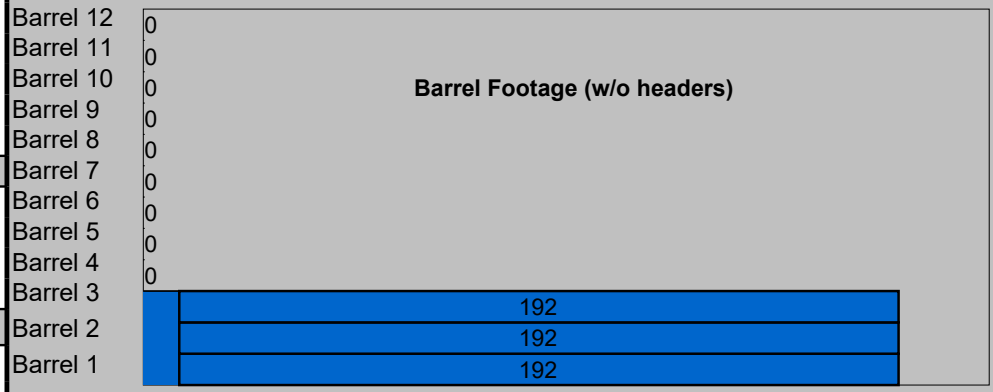
9.62 ft^2 Pipe Area



System Sizing

Pipe Storage:	5,676	cf	
Porous Stone Storage:	4,049	cf	
Total Storage Provided:	9,726	cf	100.6% Of Required Storage
Number of Barrels:	3	barrels	
Length per Barrel:	192.0	ft	
Length Per Header:	14.0	ft	
Rectangular Footprint (W x L):	16. ft x 197.5 ft		

System Layout



CONTECH Materials

Total CMP Footage:	590	ft
Approximate Total Pieces:	25	pcs
Approximate Coupling Bands:	24	bands
Approximate Truckloads:	4	trucks

Construction Quantities**

Total Excavation:	586	cy
Porous Stone Backfill For Storage:	375	cy stone
Backfill to Grade Excluding Stone:	1	cy fill

***Construction quantities are approximate and should be verified upon final design*

DA 2 DMA A – CMP-8

Region		Valley	
Drainage Area (acres)		14.80	acres
Drainage Area (sq-ft)		644,688	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.807	
1-hr 2-yr from NOAA		0.528	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.782	
Drawdown Rate (a)		1.963	
DCV		66,535	cu-ft
DCV		1.527	acre-ft

Design infiltration rate = 1.04 in/hr

d_{max} = 49.92 inches = Design infiltration rate x 48 hours = 1.04 in/hr x 48 hrs

d_{BMP} = 49.20 inches = [(6 inches + 12 inches) x 0.40] + 42 inches

$d_{max} > d_{BMP}$

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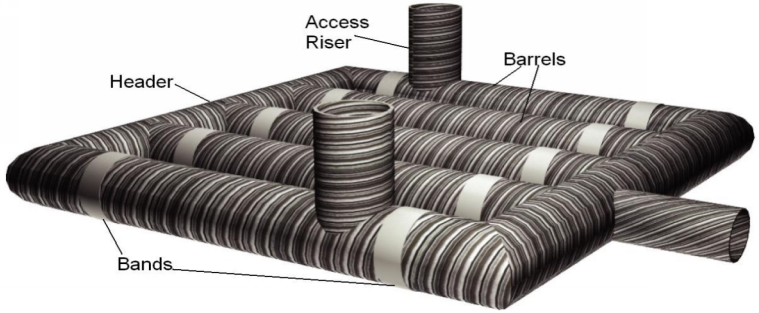


Project Summary

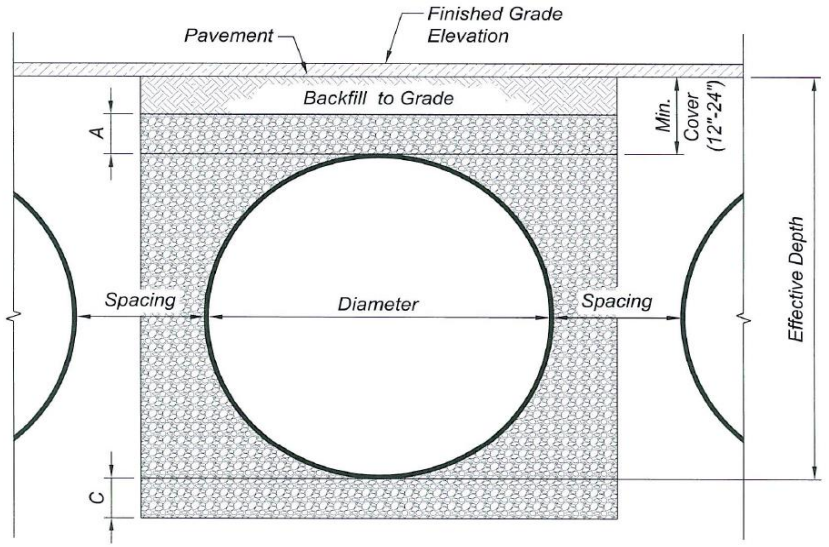
Date:	1/8/2021
Project Name:	Bridge Point Rancho (DA 2 DMA A)
City / County:	Rancho Cucamonga
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	66,535
Limiting Width (ft):	45.00
Invert Depth Below Asphalt (ft):	5.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	42
Number Of Headers:	1
Spacing between Barrels (ft):	1.75
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	12
Stone Porosity (0 to 40%):	40

9.62 ft^2 Pipe Area



System Sizing

Pipe Storage:	39,257	cf	
Porous Stone Storage:	27,435	cf	
Total Storage Provided:	66,691	cf	100.2% Of Required Storage
Number of Barrels:	8	barrels	
Length per Barrel:	505.0	ft	
Length Per Header:	40.3	ft	
Rectangular Footprint (W x L):	42.25 ft x 510.5 ft		

CONTECH Materials

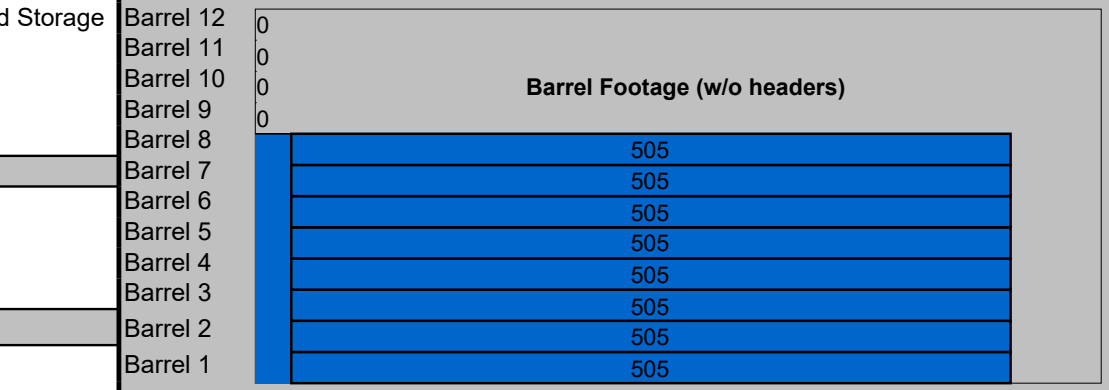
Total CMP Footage:	4,080	ft
Approximate Total Pieces:	178	pcs
Approximate Coupling Bands:	177	bands
Approximate Truckloads:	23	trucks

Construction Quantities**

Total Excavation:	3995	cy
Porous Stone Backfill For Storage:	2540	cy stone
Backfill to Grade Excluding Stone:	1	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



DA 2 DMA B – CMP-9

Region		Valley	
Drainage Area (acres)		11.90	acres
Drainage Area (sq-ft)		518,364	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.807	
1-hr 2-yr from NOAA		0.528	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.782	
Drawdown Rate (a)		1.963	
DCV		53,498	cu-ft
DCV		1.228	acre-ft

DA 2 DMA B (OFFSITE STREET IMPROVEMENTS) – CMP-9

Region		Valley	
Drainage Area (acres)		0.18	acres
Drainage Area (sq-ft)		7,841	sq-ft
Impervious Coeff	i =	1	< 1.0
Runoff Coeff	**C =**	0.892	
1-hr 2-yr from NOAA		0.528	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.782	
Drawdown Rate (a)		1.963	
DCV		894	cu-ft
DCV		0.021	acre-ft

53,498 CF + 894 CF = 54,392 CF

Design infiltration rate = 1.64 in/hr
d_{max} = 78.72 inches = Design infiltration rate x 48 hours = 1.64 in/hr x 48 hrs
d_{BMP} = 49.20 inches = [(6 inches + 12 inches) x 0.40] + 42 inches
$d_{max} > d_{BMP}$

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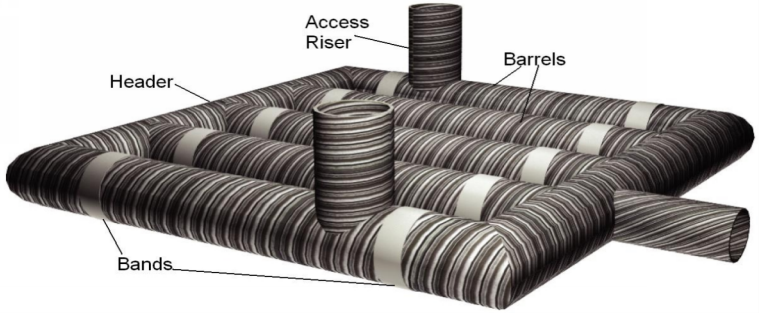


Project Summary

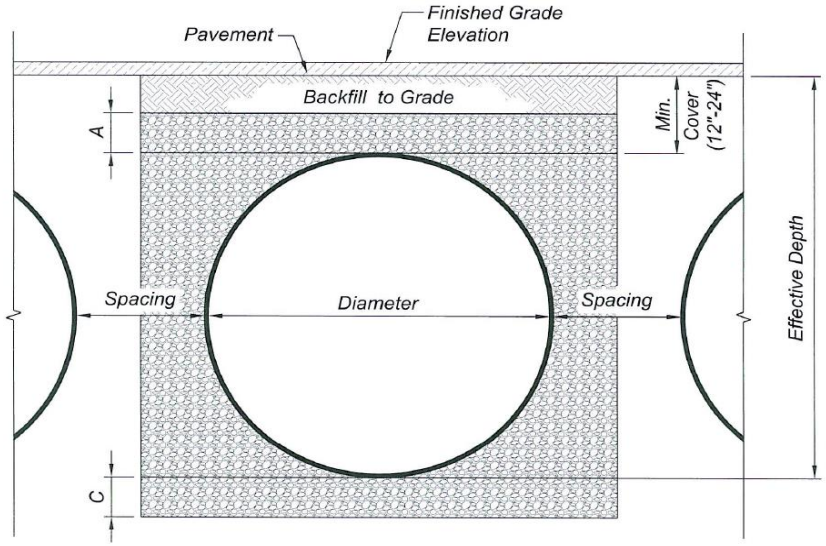
Date:	1/8/2021
Project Name:	Bridge Point Rancho (DA 2 DMA B)
City / County:	Rancho Cucamonga
State:	California
Designed By:	Luis Prado
Company:	Thienes Engineering
Telephone:	(714) 521-4811

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	54,392
Limiting Width (ft):	55.00
Invert Depth Below Asphalt (ft):	5.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	42
Number Of Headers:	1
Spacing between Barrels (ft):	1.75
Stone Width Around Perimeter of System (ft):	1
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	12
Stone Porosity (0 to 40%):	40

9.62 ft^2 Pipe Area



System Sizing

Pipe Storage:	32,142	cf	
Porous Stone Storage:	22,433	cf	
Total Storage Provided:	54,575	cf	100.3% Of Required Storage
Number of Barrels:	10	barrels	
Length per Barrel:	329.0	ft	
Length Per Header:	50.8	ft	
Rectangular Footprint (W x L):	52.75 ft x 334.5 ft		

System Layout

	Barrel Footage (w/o headers)
Barrel 12	0
Barrel 11	0
Barrel 10	329
Barrel 9	329
Barrel 8	329
Barrel 7	329
Barrel 6	329
Barrel 5	329
Barrel 4	329
Barrel 3	329
Barrel 2	329
Barrel 1	329

CONTECH Materials

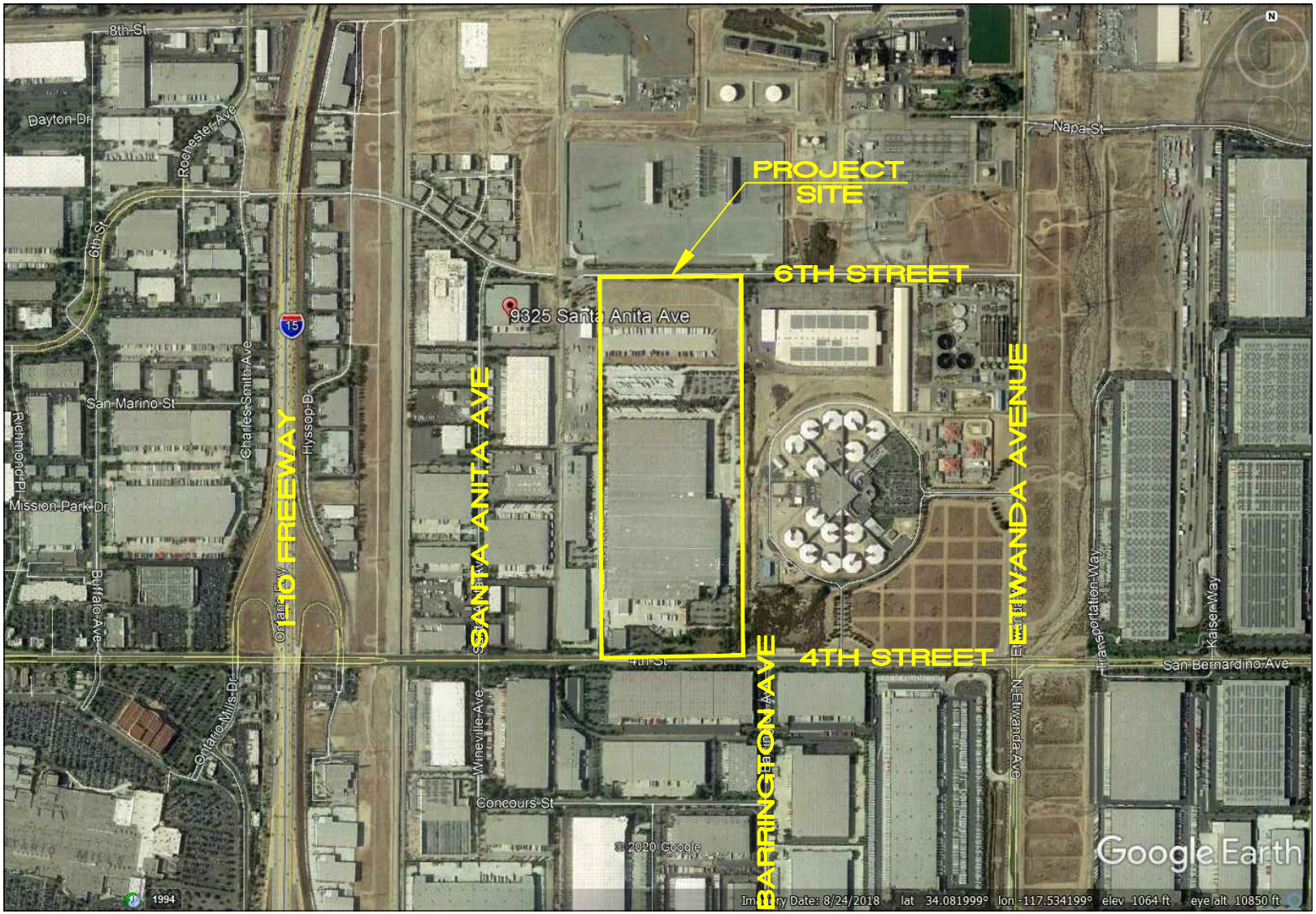
Total CMP Footage:	3,341	ft
Approximate Total Pieces:	143	pcs
Approximate Coupling Bands:	142	bands
Approximate Truckloads:	18	trucks

Construction Quantities**

Total Excavation:	3268	cy
Porous Stone Backfill For Storage:	2077	cy stone
Backfill to Grade Excluding Stone:	0	cy fill

***Construction quantities are approximate and should be verified upon final design*

Attachment C
Site and Drainage Plan



Last Update: 3/31/20
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Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

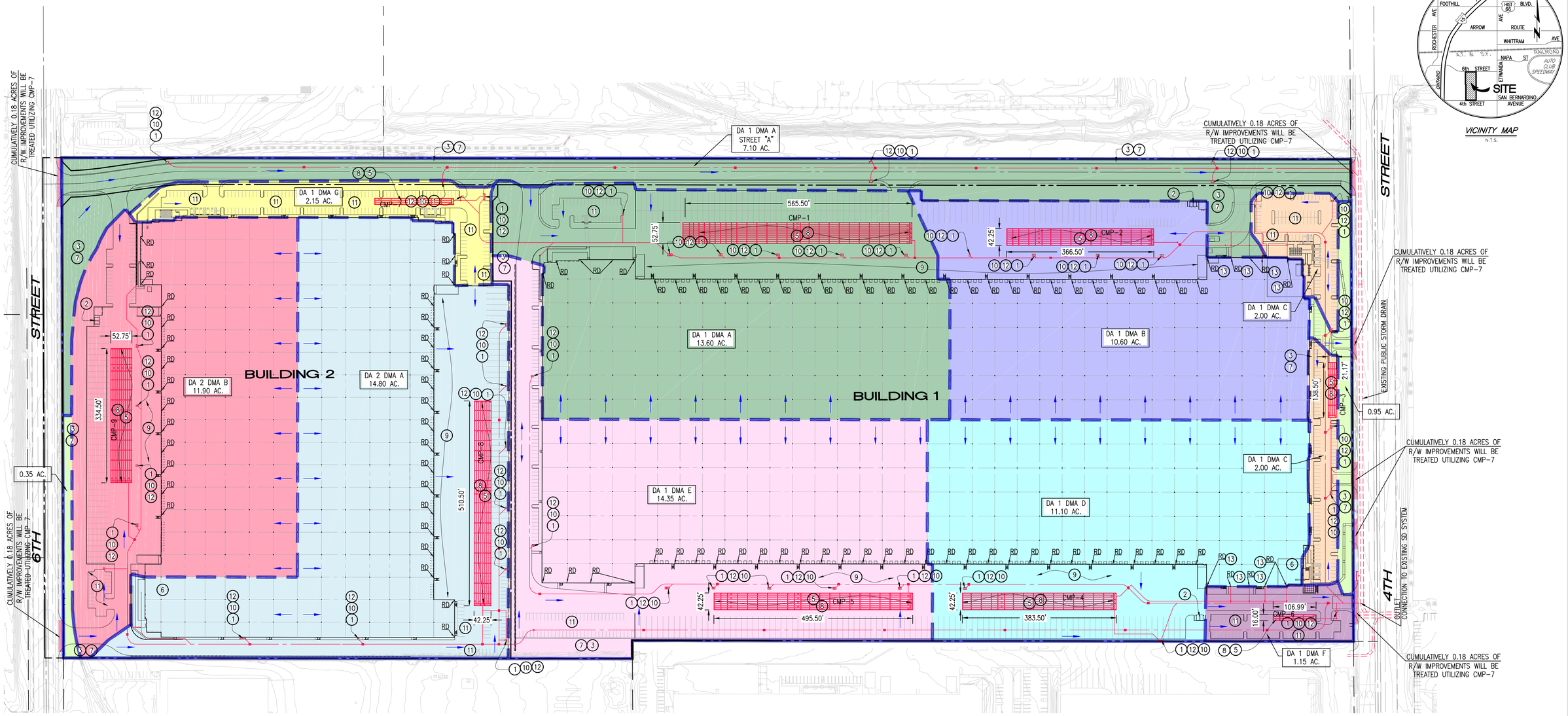
VICINITY MAP

FOR

12434 4TH STREET
RANCHO CUCAMONGA, CA

N

NTS



VICINITY MAP
N.T.S.

LEGEND

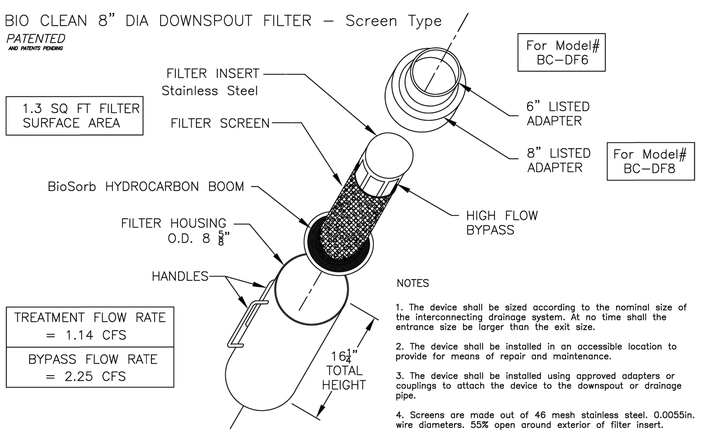
1. S1–STORM DRAIN SYSTEM SIGNS "NO DUMPING – DRAINS TO WATERWAY"
2. S3–TRASH ENCLOSURE
3. S4–EFFICIENT IRRIGATION
4. NOT USED
5. CONTECH 42–INCH PERFORATED CMP
6. N1–EDUCATIONAL MATERIALS
7. N3–LANDSCAPE MANAGEMENT BMPS
8. N4–BMP MAINTENANCE
9. N13–HOUSEKEEPING OF LOADING DOCKS
10. N14–CATCH BASIN INSPECTION
11. N15–SWEEPING OF PARKING LOTS
12. DRAIN INSERT(S)
13. ROOF DRAIN INSERTS

NOTES:

RD ROOF DRAIN
CMP CORRUGATED METAL PIPE
BOUNDARY
DRAINAGE AREAS
FLOW DIRECTION
INFILTRATION FACILITY LOCATION

BIO CLEAN 8" DIA DOWNSPOUT FILTER – Screen Type

PATENTED AND PATENTS PENDING



NOTES

1. The device shall be sized according to the nominal size of the interconnecting drainage system. At no time shall the entrance size be larger than the exit size.
2. The device shall be installed in an accessible location to provide for means of repair and maintenance.
3. The device shall be installed using approved adapters or couplings to attach the device to the downspout or drainage pipe.
4. Screens are made out of 46 mesh stainless steel. 0.0055in. wire diameters. 55% open around exterior of filter insert.

Bio Clean
A Forterra Company

BIO CLEAN ENVIRONMENTAL PO BOX 869, OCEANSIDE, CA P 760.433.7640 F 760.433.3179		PROJECT:	
8" DOWNSPOUT FILTER SCREEN TYPE MODEL NO. BC–DF6, BC–DF8		DRAWING #:	
		FILE NAME:	
DATE: 8/30/2012	SCALE: NTS	REVISIONS: LM	DATE: 8/30/2012
DRAFTER: T.H.H.	UNITS =INCHES	REVISIONS:	DATE:

ROOF DRAIN FILTER INSERT

PROJECT AREA:	90.05 AC	
	90.05 AC (DISTURBED AREA)	67.38 AC (EXISTING IMPERVIOUS)
	5.91 AC (PROPOSED LANDSCAPE)	84.14 AC (PROPOSED IMPERVIOUS)
	88.85 AC (NET)	91.39 AC (GROSS)

1. **WQMP BMP As-Built Certificate**

I hereby certify that the necessary water quality management plan best management practice devices have been constructed under my supervision and are functional to the best of my knowledge as of the date below.

Signature _____ Date _____

Wet Seal

INSTALL ONE 4" ALUMINUM STORM DRAIN PLACARD, PAINTED BLUE WITH A 1/4" SQUARE MOUNTING HOLE (NO DUMPING DRAINS TO WATERWAY) FISH WITH WAVE (PROVIDED BY ENGINEERING SERVICES DEPARTMENT) ON CENTER OF CATCH BASIN BETWEEN SCORING LINE AND CURB LINE. STORM DRAIN PLACARD MUST BE INSTALLED WITH "NO DUMPING DRAINS TO WATERWAY" READING TOWARD THE STREET. MUST INSTALL PLACARD WITH A 1/4"x1" HAMMER SET RIVET (PROVIDED BY ENGINEERING SERVICES DEPARTMENT) AND MASONRY ADHESIVE.

BMP COORDINATES

BMP	LATITUDE	LONGITUDE
CMP–1	34.081115	–117.532382
CMP–2	34.079254	–117.532451
CMP–3	34.077507	–117.534163
CMP–4	34.079528	–117.535462
CMP–5	34.081155	–117.535438
CMP–6	34.083376	–117.534640
CMP–7	34.085838	–117.533804
CMP–8	34.083762	–117.532116
CMP–9	34.077738	–117.535677

AREA SUMMARY:

GROSS AREA:	3,981,084 SQ. FT. 91.39 ACRES
TOTAL NET (PARCELS 1 & 2)	3,704,522 SQ. FT. (NET) 85.044 ACRES (NET)

0 50 100 200 300

SCALE:1"=100'

Last Update: 1/21/21
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CITY OF RANCHO CUCAMONGA
PUBLIC WORKS DEPARTMENT

PRELIMINARY SITE AND DRAINAGE MAP

BRIDGE POINT RANCHO CUCAMONGA
12434 4TH STREET

JN 3819

CITY OF RANCHO CUCAMONGA BENCHMARK NO. "10016"
FD. 2" BRASS DISK STAMPED "SBCS BM NO. 700–25 1968" IN SOUTH END OF THE WEST CONCRETE BRIDGE ABUTMENT OF A STEEL GIRDER BRIDGE ACROSS THE ETIWANDA FLOOD CONTROL CHANNEL 0.2 MILES EAST OF FREEWAY NO. 15, 8 FT. SOUTH OF SOUTH RAIL.

ELEVATION = 1128.056 FEET (1987 ADJUSTMENT) (NAVD '29)

PREPARED FOR:
BRIDGE POINT RANCHO CUCAMONGA, LLC
11100 SANTA MONICA BLVD., SUITE 700
LOS ANGELES, CA 90025
PHONE: (213) 805–6667

PREPARED BY:
Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521–4811 FAX(714)521–4173

REGISTERED PROFESSIONAL ENGINEER REINHARD STEINER No. 50434 Exp. 12–31–22 CIVIL STATE OF CALIFORNIA

Designed by		
Date		
Checked by		
Date		
Designed by		
Date		
Checked by		
Date		

Sheet 18 of 20 Sheets

PLOT DATE: 01/21/2021

Last Update: 01/20/2021
D:\3800–3899\3819\3819CGP–18–BMPSITEMAP– PRELIMINARY SITE AND DRAINAGE MAP.dwg

Form 5-1 BMP Inspection and Maintenance			
BMP	Responsible Party(ies)	Inspection/Maintenance Activities Required	Minimum Frequency of Activities
CONTECH CMP Underground Infiltration System	Owner	Contech recommends ongoing quarterly inspections of the accumulated sediment. All systems shall be designed with an access/inspection manhole situated at or near the inlet and the outlet orifice. Maintaining the system should be scheduled during dry weather.	Inspections shall be done quarterly. Maintenance shall be scheduled when accumulated sediment or trash is clogging the discharge orifice.
Drain Inserts	Owner	Visually inspect for defects and illegal dumping. Notify proper authorities if illegal dumping has occurred. Using an industrial vacuum, the collected materials shall be removed from the filter basket and disposed of properly. Inspect biosorb hydrocarbon boom and replace as necessary.	Four times per year or following any rain event that would potentially accumulate a large amount of debris in the system. Replace boom twice per year, at a minimum.
Storm Drain Stenciled Message	Owner	Visually inspect for legibility and replace or repaint as necessary.	Annually
N1: Education of Property Owners, Tenants and Occupants on Stormwater BMPs	Owner	Property owner will familiarize him/herself with the educational materials in Attachment "E" and the contents of the WQMP.	Annually (January) for all employees and within 2 months for new hires.
N2: Activity Restrictions	Owner	The owner shall develop ongoing activity restrictions that include those that have the potential to create adverse impacts on water quality. Activities include, but are not limited to: handling and disposal of contaminants, fertilizer and pesticide application restrictions, litter control and pick-up, and vehicle or equipment repair as well as any other activities that may potentially contribute to water pollution.	Ongoing
N3: Landscape Management BMPs	Owner	Irrigation must be consistent with City's Water Conservation Ordinance. Fertilizer and pesticide usage will be consistent with County Management Guidelines for Use of Fertilizers and Pesticides.	Ongoing
N4: BMP Maintenance	Owner	BMP maintenance, implementation schedules, and responsible parties are included with each specific BMP narrative.	As described in each BMP listed within this form.
N7: Spill Contingency Plan	Owner	Owner/tenant will have a spill contingency plan, a separate document, based on specific site needs.	Ongoing

Form 5-1 BMP Inspection and Maintenance			
BMP	Responsible Party(ies)	Inspection/Maintenance Activities Required	Minimum Frequency of Activities
N10: Uniform Fire Code Implementation	Owner	If applicable, owner will comply with Article 80 of the Uniform Fire Code enforced by the fire protection agency. The facility operators will be educated annually regarding requirements for handling, storage and proper disposal of hazardous substances.	Ongoing
N11: Litter/Debris Control Program	Owner	Contract with their landscape maintenance firm to provide this service during regularly schedule maintenance. They are required to implement trash management and litter control procedures in the common areas aimed at reducing pollution of drainage water.	Weekly
N12: Employee Training	Owner	The owner will ensure that tenants are also familiar with onsite BMPs and necessary maintenance required of the tenants. Owner will check with City and County at least once a year to obtain new or updated educational materials and provide these materials to tenants. Employees shall be trained to clean up spills and participate in ongoing maintenance. The WQMP requires annual employee training and new hires within 2 months.	Annually (January) for all employees and within 2 months for new hires.
N13: Housekeeping of Loading Docks	Owner	Keep all fluids indoors. Clean up spills immediately and keep spills from entering storm drain system. No direct discharges into the storm drain system. Area shall be inspected weekly for proper containment and practices with spills cleaned up immediately and disposed of properly.	Ongoing
N14: Catch Basin Inspection Program	Owner	Monthly inspection by property owner's designee. Inspection consists of immediate repair of any deterioration of the structures and maintenance of drain inserts before and after major rain events. Drain insert maintenance shall be per manufacturer's guidelines.	Monthly inspection and maintain as necessary.

Form 5-1 BMP Inspection and Maintenance			
BMP	Responsible Party(ies)	Inspection/Maintenance Activities Required	Minimum Frequency of Activities
N15: Vacuum Sweeping of Private Streets and Parking Lots	Owner	All landscape maintenance contractors will be required to sweep up all landscape cuttings, mowings and fertilizer materials off paved areas weekly and dispose of properly. Parking areas and drive ways will be swept monthly by sweeping contractor.	Monthly
N17: Comply with all other applicable NPDES permits	Owner	Will comply with Construction General Permit and Industrial General Permit (may apply for No Exposure Certification/NEC).	Ongoing
S1: Provide storm drain system stenciling and signage (CASQA New Development BMP Handbook SD-13)	Owner	"No Dumping – Drains to River" stencils will be applied. Legibility of stencil will be maintained on a yearly basis.	Annually (January)
S3: Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	Owner	Paved with an impervious surface, designed not to allow run-on from adjoining areas, designed to divert drainage from adjoining roofs and pavements diverted around the area, screened or walled to prevent off-site transport of trash. Detail to be provided once available.	Ongoing
S4: Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)	Owner	Irrigation systems shall include reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines. Timers will be used to avoid over watering and watering cycles and duration shall be adjusted seasonally by the landscape maintenance contractor. The landscaping areas will be grouped with plants that have similar water requirements. Native or drought tolerant species shall also be used where appropriate to reduce excess irrigation runoff and promote surface filtration.	Adjust watering cycles and duration seasonally / quarterly (Oct, Jan, Apr, and Jul).

DYODS™
Design Your Own Detention System

CONTECH CMP DETENTION SYSTEMS

CONTECH STORMWATER SOLUTIONS INC.

For design assistance, drawings, and pricing send completed worksheet to:
dyods@contech-cpi.com

Project Summary

Date:	8/12/2020	
Project Name:	Bridge Point Rancho (DA 1 DMA A)	
City / County:	Rancho Cucamonga	
State:	California	
Designed By:	Luis Prado	
Company:	Thienes Engineering	**Enter Information in Blue Cells**
Telephone:	(714) 521-4811	

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	87,215	
Limiting Width (ft):	55.00	
Invert Depth Below Asphalt (ft):	5.00	
Solid or Perforated Pipe:	Perforated	
Shape Or Diameter (in):	42	9.62 ft² Pipe Area
Number Of Headers:	1	
Spacing between Barrels (ft):	1.75	
Stone Width Around Perimeter of System (ft):	1	
Depth A: Porous Stone Above Pipe (in):	6	
Depth C: Porous Stone Below Pipe (in):	12	
Stone Porosity (0 to 40%):	40	

System Sizing

Pipe Storage:	51,480	cf	
Porous Stone Storage:	35,903	cf	
Total Storage Provided:	87,383	cf	100.2% Of Required Storage
Number of Barrels:	10	barrels	
Length per Barrel:	530.0	ft	
Length Per Header:	50.8	ft	
Rectangular Footprint (W x L):	52.75 ft x 535.5	ft	

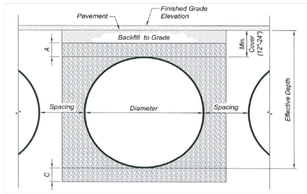
CONTECH Materials

Total CMP Footage:	5,351	ft
Approximate Total Pieces:	233	pcs
Approximate Coupling Bands:	232	bands
Approximate Truckloads:	30	trucks

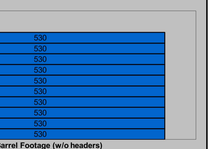
Construction Quantities**

Total Excavation:	5232	cy
Porous Stone Backfill For Storage:	3324	cy stone
Backfill to Grade Excluding Stone:	1	cy fill

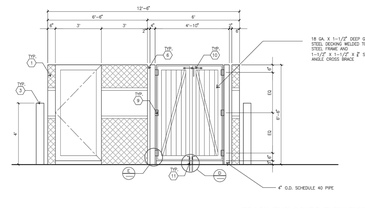
***Construction quantities are approximate and should be verified upon final design*



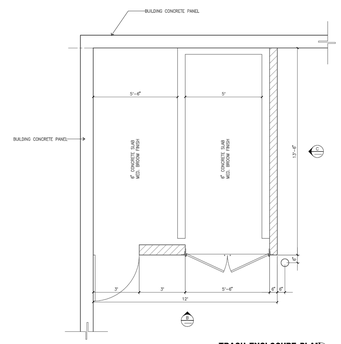
System Layout



CMP DETAIL (TYP.)



TRASH ENCLOSURE ELEVATION (B) SCALE: 1/2" = 1'-0"

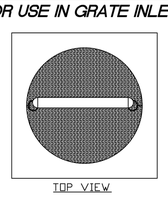


TRASH ENCLOSURE PLAN (A) SCALE: 1/2" = 1'-0"

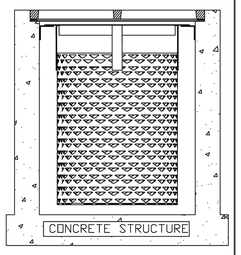
TRASH ENCLOSURE DETAIL

BIO CLEAN FULL CAPTURE FILTER

FOR USE IN GRATE INLETS

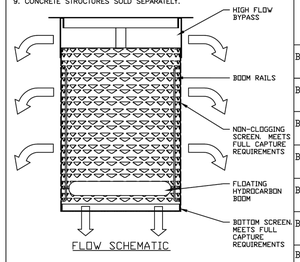


TOP VIEW



NOTES:

1. ALL HARDWARE, FLANGE, FRAME, SCREENS SHALL BE STAINLESS STEEL
2. HYDROCARBON BOOM SHALL BE 2" DIAMETER AND CONNECTED, MECHANICALLY TO THE FILTER FRAME WITH RAILS ALLOWING IT TO FLOAT ON THE WATER SURFACE REGARDLESS OF HEIGHT
3. SEE PERFORMANCE REPORTS IN MANUFACTURES SPECIFICATIONS
4. OTHER STANDARD AND CUSTOM MODEL SIZES AVAILABLE – CONTACT BIO CLEAN FOR MORE INFORMATION.
5. ASSESS ACTIVE WORK AREA
6. CONSIDERS A SAFETY FACTOR OF 2.0.
7. CONSIDERS A LOCAL DEPRESSION PONDING DEPTH OF 6 INCHES.
8. STORAGE CAPACITY BASED ON THE BASKET HALF FULL.
9. CONCRETE STRUCTURES SOLD SEPARATELY.



FLOW SCHEMATIC

MODEL #	TREATMENT FLOW (CFS)	BYPASS FLOW (CFS)	SOLIDS STORAGE CAPACITY (CF)
BIO-GRATE-FULL 12-12-12	1.55	1.55	0.27
BIO-GRATE-FULL 18-18-18	4.32	3.68	1.05
BIO-GRATE-FULL 24-24-24	7.67	4.83	2.41
BIO-GRATE-FULL 30-30-24	12.97	6.21	3.98
BIO-GRATE-FULL 25-38-24	13.53	6.59	4.16
BIO-GRATE-FULL 36-36-24	19.64	7.60	5.94
BIO-GRATE-FULL 48-48-18	25.59	10.13	7.92

DRAWING: BIO CLEAN GRATE INLET FILTER DETAILS		MEETS FULL CAPTURE REQUIREMENTS	
TYPICAL MODEL DETAIL			
WARRANTY: 8 YEAR MANUFACTURERS		PROJECT:	
BIO CLEAN ENVIRONMENTAL SERVICES, INC. 398 VIA EL CENTRO, OCEANSIDE CA 92058 PHONE: 760-433-7640 FAX: 760-433-3176		REVISIONS:	DATE:
DATE: 10/12/17	SCALE: SF = 15	REVISIONS:	DATE:
DRAFTER: M.C.P.	UNITS = INCHES	REVISIONS:	DATE:

Bio Clean
A Forterra Company

PAGE 1

BIO CLEAN FULL CAPTURE FILTER WITH TROUGH SYSTEM

FOR USE IN CURB INLETS

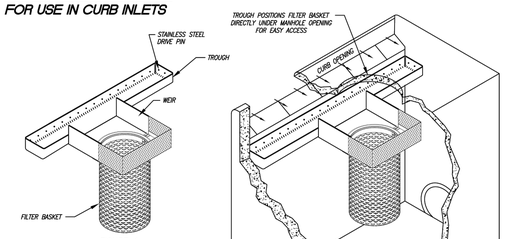


FIGURE 1: DETAIL OF PARTS

FIGURE 2: DETAIL OF CONFIGURATION

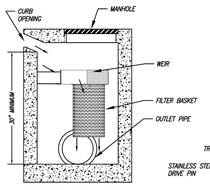


FIGURE 4: DETAIL OF PROFILE

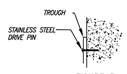


FIGURE 3: DETAIL OF MOUNTING

MODEL NUMBER	TREATMENT FLOW (cfs)*	SOLIDS STORAGE CAPACITY (cu ft)
BIO-CURB-FULL-24	2.85	1.40
BIO-CURB-FULL-18	2.85	1.05
BIO-CURB-FULL-12	2.85	0.70

*SEE PAGE 2 FOR EXPLANATION OF FLOW RATES

NOTES:

1. TROUGH SYSTEM PROVIDES FOR ENTIRE COVERAGE OF INLET OPENING SO TO DIVERT ALL FLOW TO FILTER.
2. TROUGH SYSTEM MANUFACTURED FROM MARINE GRADE FIBERGLASS, GEL COATED FOR UV PROTECTION.
3. SYSTEM ATTACHED TO THE CATCH BASIN WITH NON-CORROSIVE HARDWARE.
4. FILTER MANUFACTURED OF 100% STAINLESS STEEL.
5. FILTER MADE OF NON-CLOGGIN SCREEN WITH 4.7 MM OPENINGS AND MEETS FULL CAPTURE REQUIREMENTS.
6. FILTER CAN BE FITTED WITH HYDROCARBON ABSORBENT BOOM
7. FILTER IS LOCATED DIRECTLY UNDER THE MANHOLE FOR EASY REMOVAL AND MAINTENANCE.
8. LENGTH OF TROUGH CAN VARY FROM 2' TO 30'
9. OTHER STANDARD AND CUSTOM MODEL SIZES AVAILABLE – CONTACT BIO CLEAN FOR MORE INFORMATION.
10. CONSIDERS A SAFETY FACTOR OF 2.0
11. BYPASS IS FACILITATED VIA OVERFLOW OF THE TROUGH SYSTEM AND IS EQUAL TO THE CAPACITY OF THE CURB OPENING
12. STORAGE CAPACITY BASED ON THE BASKET HALF FULL.
13. ADDITIONAL TREATMENT AND STORAGE CAPACITY CAN BE ACHIEVED BY UTILIZING MULTIPLE FILTER BASKETS.

TREATMENT FLOW RATE: 2.85 cfs		MEETS FULL CAPTURE REQUIREMENTS	
		MODEL #: BIO-CURB-FULL	
WARRANTY: 8 YEAR MANUFACTURERS		PROJECT:	
BIO CLEAN ENVIRONMENTAL SERVICES, INC. 398 VIA EL CENTRO, OCEANSIDE CA 92058 PHONE: 760-433-7640 FAX: 760-433-3176		REVISIONS:	DATE:
DATE: 10/12/2017	SCALE: NTS	REVISIONS:	DATE:
DRAFTER: M.C.P.	UNITS = INCHES	REVISIONS:	DATE:

Bio Clean
A Forterra Company

PAGE 1

DRAIN INSERTS

Vicky Li

From:
Sent:
To:
Cc:
Subject: USEPA Region 9 iWells notification regarding:

Thank you for using the online injection well registration form. Below is a copy of data received. Please reply if the data was received or transcribed in error.
This notice authorizes only the planned discharges listed. Please update this registration when these wells are active to receive our authorization to inject uncontaminated water only.
Any change of use or ownership of the wells, or any new injection, requires notification to EPA. For more information, please see also the regulations beginning at 40 CFR 144.

-Facility

Rancho Cucamonga, CA 91730

GIS:
Local Identifier:
UIC File ID:
Tribal Land: No
Ownership: Private - Business or other for-profits

-Contacts
---Contact Type: PRIMARY OWNER

---Contact Type: Consultant
Vicky Li
Thienes Engineering, Inc.
vicky@thieneseng.com

-Comments
Stormwater infiltration galleries are authorized by rule 40 CFR 144. Infiltration galleries are considered Class V wells and pose a low threat to underground sources of drinking waters (USDWs).

-Well Summary

INJECTION WELL EPA REGISTRATION CONFIRMATION

Last Update:1/8/21
D:\3800-3899\3819\3819CGP-19-BMPSITEMAP- PRELIMINARY SITE AND DRAINAGE MAP.dwg

CITY OF RANCHO CUCAMONGA
PUBLIC WORKS DEPARTMENT

PRELIMINARY SITE AND DRAINAGE MAP DETAILS

BRIDGE POINT RANCHO CUCAMONGA 12434 4TH STREET

JN 3819

CITY OF RANCHO CUCAMONGA BENCHMARK NO. "10016"
FD. 2" BRASS DISK STAMPED "SBCS BM NO. 700-25 1968" IN SOUTH END OF THE WEST CONCRETE BRIDGE ABUTMENT OF A STEEL GIRDER BRIDGE ACROSS THE ETIWANDA FLOOD CONTROL CHANNEL 0.2 MILES EAST OF FREEWAY NO. 15, 8 FT. SOUTH OF SOUTH RAIL.

ELEVATION = 1128.056 FEET (1987 ADJUSTMENT) (NAVD '29)

PREPARED FOR:
BRIDGE POINT RANCHO CUCAMONGA, LLC
11100 SANTA MONICA BLVD., SUITE 700
LOS ANGELES, CA 90025
PHONE: (213) 805-6667

PREPARED BY:
Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

REGISTERED PROFESSIONAL ENGINEER — RICHARD STEWART — No. 36931 — Exp. 12-31-22 — CIVIL — STATE OF CALIFORNIA

Designed by		
Date		
Checked by		
Date		
Designed by		
Date		
Checked by		
Date		

Sheet 19 of 20 Sheets

PLOT DATE: 01/08/2021

Last Update: 01/08/2021
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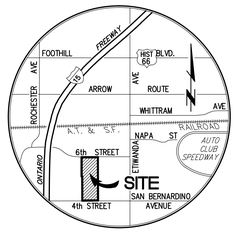
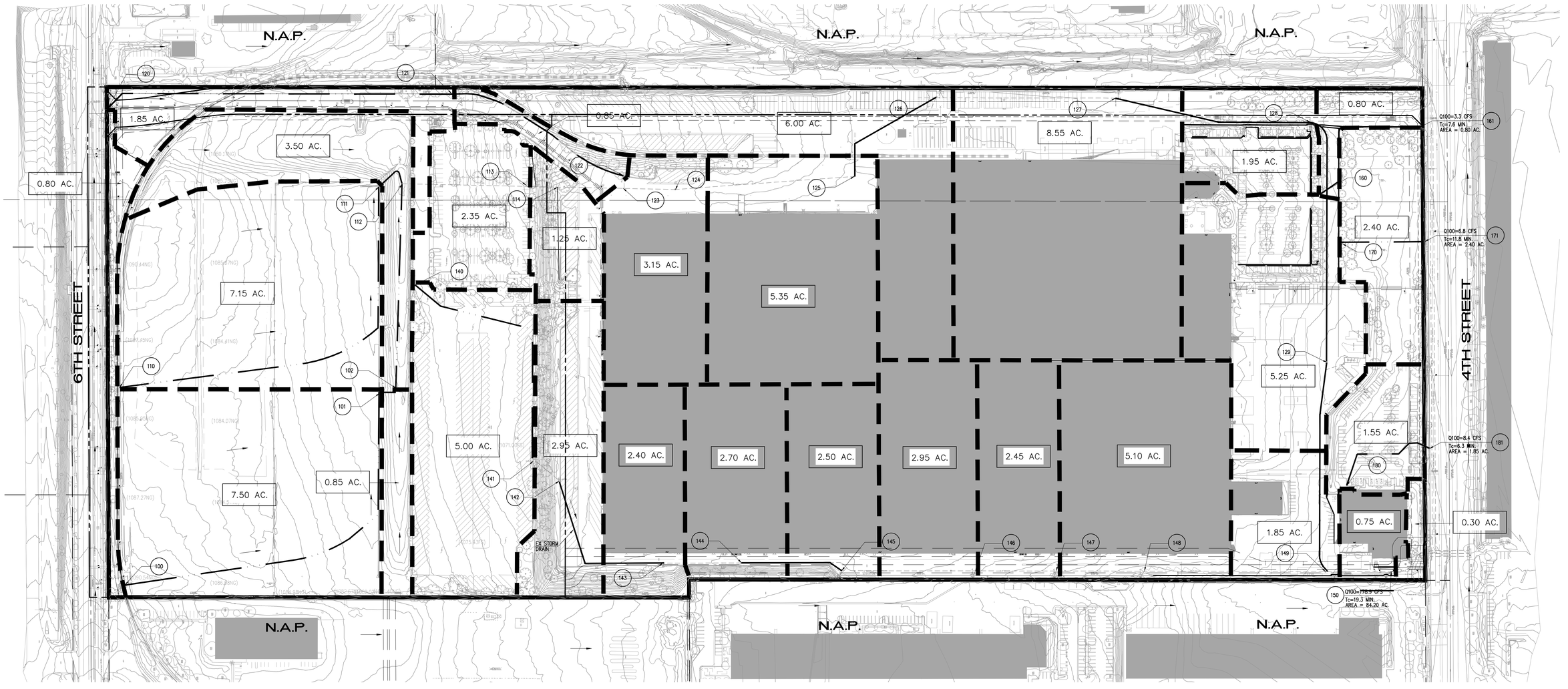


VICINITY MAP
N.T.S.



LEGEND

- PROJECT BOUNDARY
- SUBAREA BOUNDARY
- FLOW LINE
- 9.10 AC. — SUBAREA AREA
- 100 — NODE NUMBER
- FLOW DIRECTION

0 50 100 200 300

SCALE: 1"=100'

CITY OF RANCHO CUCAMONGA

PUBLIC WORKS DEPARTMENT

EXISTING CONDITION HYDROLOGY MAP

BRIDGE POINT RANCO CUCAMONGA 4TH STREET

PREPARED FOR:

BRIDGE DEVELOPMENT PARTNERS, LLC
11100 SANTA MONICA BLVD., SUITE 700
LOS ANGELES, CA 90025
(213)-805-6667 PHONE
(310)-853-8423 FAX

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH:(714)521-4811 FAX(714)521-4173

Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____

Approved by _____ Date _____

Public Works Director _____ R.C.E. XXXXX

Sheet 1 of 1 Sheets

Last Update:12/14/20
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Attachment D
Memorandum of Agreement of Storm Water Quality Management Plan

RECORDING REQUESTED BY
City of Rancho Cucamonga
AND WHEN RECORDED MAIL DOCUMENT TO:

NAME City of Rancho Cucamonga
Engineering Services Dept.
STREET ADDRESS 10500 Civic Center Drive
CITY, STATE & ZIP CODE Rancho Cucamonga, CA 91730

SPACE ABOVE FOR RECORDER'S USE ONLY

MEMORANDUM OF AGREEMENT OF STORM WATER QUALITY MANAGEMENT PLAN

THIS COVER SHEET ADDED TO PROVIDE ADEQUATE SPACE FOR RECORDING INFORMATION

File: TEI 3819

Prepared by: Thienes Engineering, Inc.

Checked by: RS/LP/VL

Assessor's Parcel Number: 0229-283-50 & -51

MEMORANDUM OF AGREEMENT OF STORM WATER QUALITY MANAGEMENT PLAN

The undersigned hereby enters into this Memorandum of Storm Water Quality Management Plan (the "Memorandum") on this _____ day of MONTH, 2021 with reference to the following:

A. The undersigned is the owner of certain real property located in the City of Rancho Cucamonga, County of San Bernardino, State of California legally described below and hereto referred to as "Exhibit A" (the "Real Property") and "Exhibit B" (Vicinity Map). Each exhibit is attached hereto and incorporated herein by this reference and also in the Water Quality Management Plan document, on file with the owner or its successors or assigns, and the City and hereinafter is referred to as "WQMP".

B. The undersigned is seeking certain permits and approvals from the City of Rancho Cucamonga ("City") for the development of the Real Property as follows: Precise Grading and Building Permit (the "Approvals").

C. In consideration of the City granting the Approvals, I the undersigned, agree to and accept the terms and conditions of the Storm Water Quality Management Plan (the "Plan") approved by the City's Engineering Services Department on MM/DD/2020, and bind the Real Property with the provisions of the Plan, which is on file with the City of Rancho Cucamonga's Engineering Services Department, File No. DRC2020-00202, PGRXXXX-XXXXX, WQMPXXXX-XXXXX.

D. In consideration of the City granting the Approvals, the undersigned has agreed to and accepts the terms and conditions of the Plan as it relates to the Real Property and agrees that the Real Property shall be bound by and subject to the Plan.

E. The owner has chosen to install structures as required by Best Management Practices (BMPs) and to implement non-structural BMPs as described in Exhibit "C" (List of BMP Maintenance Items) and depicted in Exhibit "D" (BMP Site Map). The purpose of the WQMP is to minimize pollutants in urban runoff and to minimize other adverse impacts of urban runoff;

F. Said WQMP has been certified by the Owner and reviewed and approved by the City;

G. Said BMPs, with installation and/or implementation on private property and draining only private property, are part of a private facility with all implementation, maintenance or replacement, therefore, the sole responsibility of the Owner in accordance with the terms of this Agreement;

NOW, THEREFORE, it is hereby agreed by the undersigned as follows:

1. Owner hereby provides the City of Rancho Cucamonga's designee complete inspection access, of any duration, to the areas in which BMPs are applied and their immediate vicinity at any time, upon reasonable notice, or in the event of emergency, as determined by the City's Engineer, no advance notice, for the purpose of inspection, sampling, testing of device(s), and in case of emergency, to undertake all necessary repairs or other preventative measures at owner's expense as provided in paragraph 3 below. City shall make every effort at all times to minimize or avoid interference with Owner's use of the property.

2. The undersigned hereby agrees to the terms and conditions of the Plan, the provisions of which are incorporated by reference as though set out herein in full, and agrees that the Real Property shall be bound by and subject to the terms and conditions of the Plan, subject to minor modifications incorporated during construction, as approved by the City of Rancho Cucamonga Engineering Services Director.

3. The undersigned agrees to conduct the necessary routine maintenance of any structural devices designed into or installed as part of the storm water drainage system on the Real Property to reduce

pollutants in storm water runoff to the maximum extent practicable or to reestablish infiltration through the lifetime of the development which is the subject of Approvals.

4. The undersigned agrees to hold the City, its officials, officers, employees, volunteers, and agents free and harmless from any and all claims, demands, causes of action, costs, expenses, liability, loss, damage, or injury, in law or equity, to property or persons, arising from the imposition of the Plan by the City.

5. The agreements contained herein and the terms and conditions of the Plan are covenants intended to run with the land and shall burden the Real Property and shall be binding upon future owners of all or any portion of the Real Property. Upon a transfer of the Real Property, the transferor (including the undersigned) shall be relieved of any obligations under this Memorandum or the Plan arising from and after the effective date of the transfer.

6. The provisions of this Memorandum are intended to constitute equitable servitudes which shall encumber the Real Property and be binding upon future owners of the Real Property or any portion thereof.

7. The provisions of the Memorandum may be enforced by the City, which, among other remedies, shall have the remedy of injunctive relief and other equitable remedies.

8. This Memorandum shall not be amended, modified or terminated without the prior written consent of the City, which consent to be effective shall be contained in a document executed by the City and recorded against the Real Property.

Owner Name: Bridge Development Partners, LLC

Authorized Signature _____

Print Name: Brian Wilson

Title: Principal

Date: _____

Project Description: Construction of an industrial development consisting of two (2) industrial logistics buildings on 4th Street on approximately 90.05 acres of land.

ALL CAPACITY ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF _____

COUNTY OF _____

On _____ (Date) before me, _____ (Name and title of the officer) ,

personally appeared _____ (Name of person signing)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

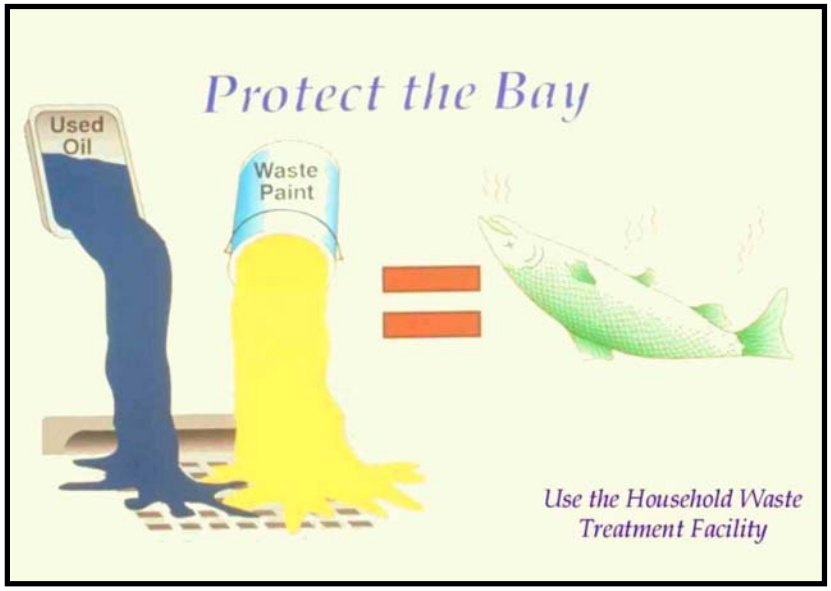
WITNESS my hand and official seal.

_____
Signature of officer

(Seal)

Attachment E
Educational Materials

Non-Stormwater Discharges SC-10



Art Credit: Margie Winter

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	
Nutrients	✓
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	✓
Organics	✓

Description

Non-stormwater discharges are those flows that do not consist entirely of stormwater. Some non-stormwater discharges do not include pollutants and may be discharged to the storm drain. These include uncontaminated groundwater and natural springs. There are also some non-stormwater discharges that typically do not contain pollutants and may be discharged to the storm drain with conditions. These include car washing, air conditioner condensate, etc. However there are certain non-stormwater discharges that pose environmental concern. These discharges may originate from illegal dumping or from internal floor drains, appliances, industrial processes, sinks, and toilets that are connected to the nearby storm drainage system. These discharges (which may include: process waste waters, cooling waters, wash waters, and sanitary wastewater) can carry substances such as paint, oil, fuel and other automotive fluids, chemicals and other pollutants into storm drains. They can generally be detected through a combination of detection and elimination. The ultimate goal is to effectively eliminate non-stormwater discharges to the stormwater drainage system through implementation of measures to detect, correct, and enforce against illicit connections and illegal discharges of pollutants on streets and into the storm drain system and creeks.

Approach

Initially the industry must make an assessment of non-stormwater discharges to determine which types must be eliminated or addressed through BMPs. The focus of the following approach is in the elimination of non-stormwater discharges.

CASQA California Stormwater Quality Association

Pollution Prevention

- Ensure that used oil, used antifreeze, and hazardous chemical recycling programs are being implemented. Encourage litter control.

Suggested Protocols

Recommended Complaint Investigation Equipment

- Field Screening Analysis
  - pH paper or meter
  - Commercial stormwater pollutant screening kit that can detect for reactive phosphorus, nitrate nitrogen, ammonium nitrogen, specific conductance, and turbidity
  - Sample jars
  - Sample collection pole
  - A tool to remove access hole covers
- Laboratory Analysis
  - Sample cooler
  - Ice
  - Sample jars and labels
  - Chain of custody forms
- Documentation
  - Camera
  - Notebook
  - Pens
  - Notice of Violation forms
  - Educational materials

General

- Develop clear protocols and lines of communication for effectively prohibiting non-stormwater discharges, especially those that are not classified as hazardous. These are often not responded to as effectively as they need to be.
- Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as “Dump No Waste Drains to Stream” stenciled or demarcated next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.

- See SC44 Stormwater Drainage System Maintenance for additional information.

Illicit Connections

- Locate discharges from the industrial storm drainage system to the municipal storm drain system through review of "as-built" piping schematics.
- Isolate problem areas and plug illicit discharge points.
- Locate and evaluate all discharges to the industrial storm drain system.

Visual Inspection and Inventory

- Inventory and inspect each discharge point during dry weather.
- Keep in mind that drainage from a storm event can continue for a day or two following the end of a storm and groundwater may infiltrate the underground stormwater collection system. Also, non-stormwater discharges are often intermittent and may require periodic inspections.

Review Infield Piping

- A review of the "as-built" piping schematic is a way to determine if there are any connections to the stormwater collection system.
- Inspect the path of floor drains in older buildings.

Smoke Testing

- Smoke testing of wastewater and stormwater collection systems is used to detect connections between the two systems.
- During dry weather the stormwater collection system is filled with smoke and then traced to sources. The appearance of smoke at the base of a toilet indicates that there may be a connection between the sanitary and the stormwater system.

Dye Testing

- A dye test can be performed by simply releasing a dye into either your sanitary or process wastewater system and examining the discharge points from the stormwater collection system for discoloration.

TV Inspection of Drainage System

- TV Cameras can be employed to visually identify illicit connections to the industrial storm drainage system.

Illegal Dumping

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste.

- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.
- Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.
- For larger spills, a private spill cleanup company or Hazmat team may be necessary.

Once a site has been cleaned:

- Post "No Dumping" signs with a phone number for reporting dumping and disposal.
- Landscaping and beautification efforts of hot spots may also discourage future dumping, as well as provide open space and increase property values.
- Lighting or barriers may also be needed to discourage future dumping.
- See fact sheet SC11 Spill Prevention, Control, and Cleanup.

Inspection

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- Conduct field investigations of the industrial storm drain system for potential sources of non-stormwater discharges.
- Pro-actively conduct investigations of high priority areas. Based on historical data, prioritize specific geographic areas and/or incident type for pro-active investigations.

Reporting

- A database is useful for defining and tracking the magnitude and location of the problem.
- Report prohibited non-stormwater discharges observed during the course of normal daily activities so they can be investigated, contained, and cleaned up or eliminated.
- Document that non-stormwater discharges have been eliminated by recording tests performed, methods used, dates of testing, and any on-site drainage points observed.
- Document and report annually the results of the program.
- Maintain documentation of illicit connection and illegal dumping incidents, including significant conditionally exempt discharges that are not properly managed.

Training

- Training of technical staff in identifying and documenting illegal dumping incidents is required.
- Consider posting the quick reference table near storm drains to reinforce training.
- Train employees to identify non-stormwater discharges and report discharges to the appropriate departments.

- Educate employees about spill prevention and cleanup.
- Well-trained employees can reduce human errors that lead to accidental releases or spills. The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur. Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.
- Determine and implement appropriate outreach efforts to reduce non-permissible non-stormwater discharges.
- Conduct spill response drills annually (if no events occurred to evaluate your plan) in cooperation with other industries.
- When a responsible party is identified, educate the party on the impacts of his or her actions.

Spill Response and Prevention

- See SC11 Spill Prevention Control and Cleanup.

Other Considerations

- Many facilities do not have accurate, up-to-date schematic drawings.

Requirements

Costs (including capital and operation & maintenance)

- The primary cost is for staff time and depends on how aggressively a program is implemented.
- Cost for containment and disposal is borne by the discharger.
- Illicit connections can be difficult to locate especially if there is groundwater infiltration.
- Indoor floor drains may require re-plumbing if cross-connections to storm drains are detected.

Maintenance (including administrative and staffing)

- Illegal dumping and illicit connection violations requires technical staff to detect and investigate them.

Supplemental Information

Further Detail of the BMP

Illegal Dumping

- Substances illegally dumped on streets and into the storm drain systems and creeks include paints, used oil and other automotive fluids, construction debris, chemicals, fresh concrete, leaves, grass clippings, and pet wastes. All of these wastes cause stormwater and receiving water quality problems as well as clog the storm drain system itself.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots

- Types and quantities (in some cases) of wastes
- Patterns in time of occurrence (time of day/night, month, or year)
- Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
- Responsible parties

One of the keys to success of reducing or eliminating illegal dumping is increasing the number of people at the facility who are aware of the problem and who have the tools to at least identify the incident, if not correct it. Therefore, train field staff to recognize and report the incidents.

What constitutes a "non-stormwater" discharge?

- Non-stormwater discharges to the stormwater collection system may include any water used directly in the manufacturing process (process wastewater), air conditioning condensate and coolant, non-contact cooling water, cooling equipment condensate, outdoor secondary containment water, vehicle and equipment wash water, sink and drinking fountain wastewater, sanitary wastes, or other wastewaters.

Permit Requirements

- Facilities subject to stormwater permit requirements must include a certification that the stormwater collection system has been tested or evaluated for the presence of non-stormwater discharges. The State's General Industrial Stormwater Permit requires that non-stormwater discharges be eliminated prior to implementation of the facility's SWPPP.

Performance Evaluation

- Review annually internal investigation results; assess whether goals were met and what changes or improvements are necessary.
- Obtain feedback from personnel assigned to respond to, or inspect for, illicit connections and illegal dumping incidents.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Spill Prevention, Control & Cleanup SC-11

Photo Credit: Geoff Brosseau

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Description

Many activities that occur at an industrial or commercial site have the potential to cause accidental or illegal spills. Preparation for accidental or illegal spills, with proper training and reporting systems implemented, can minimize the discharge of pollutants to the environment.

Spills and leaks are one of the largest contributors of stormwater pollutants. Spill prevention and control plans are applicable to any site at which hazardous materials are stored or used. An effective plan should have spill prevention and response procedures that identify potential spill areas, specify material handling procedures, describe spill response procedures, and provide spill clean-up equipment. The plan should take steps to identify and characterize potential spills, eliminate and reduce spill potential, respond to spills when they occur in an effort to prevent pollutants from entering the stormwater drainage system, and train personnel to prevent and control future spills.

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Approach

Pollution Prevention

- Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.

- Develop a Spill Prevention Control and Countermeasure (SPCC) Plan. The plan should include:

- Description of the facility, owner and address, activities and chemicals present
- Facility map
- Notification and evacuation procedures
- Cleanup instructions
- Identification of responsible departments
- Identify key spill response personnel

- Recycle, reclaim, or reuse materials whenever possible. This will reduce the amount of process materials that are brought into the facility.

Suggested Protocols (including equipment needs)

Spill Prevention

- Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.

- If consistent illegal dumping is observed at the facility:
  - Post "No Dumping" signs with a phone number for reporting illegal dumping and disposal. Signs should also indicate fines and penalties applicable for illegal dumping.
  - Landscaping and beautification efforts may also discourage illegal dumping.
  - Bright lighting and/or entrance barriers may also be needed to discourage illegal dumping.

- Store and contain liquid materials in such a manner that if the tank is ruptured, the contents will not discharge, flow, or be washed into the storm drainage system, surface waters, or groundwater.

- If the liquid is oil, gas, or other material that separates from and floats on water, install a spill control device (such as a tee section) in the catch basins that collects runoff from the storage tank area.

- Routine maintenance:
  - Place drip pans or absorbent materials beneath all mounted taps, and at all potential drip and spill locations during filling and unloading of tanks. Any collected liquids or soiled absorbent materials must be reused/recycled or properly disposed.
  - Store and maintain appropriate spill cleanup materials in a location known to all near the tank storage area; and ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.
  - Sweep and clean the storage area monthly if it is paved, *do not hose down the area to a storm drain.*

  - Check tanks (and any containment sumps) daily for leaks and spills. Replace tanks that are leaking, corroded, or otherwise deteriorating with tanks in good condition. Collect all spilled liquids and properly dispose of them.

- Label all containers according to their contents (e.g., solvent, gasoline).
- Label hazardous substances regarding the potential hazard (corrosive, radioactive, flammable, explosive, poisonous).
- Prominently display required labels on transported hazardous and toxic materials (per US DOT regulations).
- Identify key spill response personnel.

Spill Control and Cleanup Activities

- Follow the Spill Prevention Control and Countermeasure Plan.
- Clean up leaks and spills immediately.
- Place a stockpile of spill cleanup materials where it will be readily accessible (e.g., near storage and maintenance areas).
- On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste. Physical methods for the cleanup of dry chemicals include the use of brooms, shovels, sweepers, or plows.
- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.
- Chemical cleanups of material can be achieved with the use of adsorbents, gels, and foams. Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.
- For larger spills, a private spill cleanup company or Hazmat team may be necessary.

Reporting

- Report spills that pose an immediate threat to human health or the environment to the Regional Water Quality Control Board.
- Federal regulations require that any oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hour).
- Report spills to local agencies, such as the fire department; they can assist in cleanup.
- Establish a system for tracking incidents. The system should be designed to identify the following:

  - Types and quantities (in some cases) of wastes

  - Patterns in time of occurrence (time of day/night, month, or year)

- Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)

- Responsible parties

Training

- Educate employees about spill prevention and cleanup.

- Well-trained employees can reduce human errors that lead to accidental releases or spills:

  - The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur.

  - Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.

- Employees should be educated about aboveground storage tank requirements. Employees responsible for aboveground storage tanks and liquid transfers should be thoroughly familiar with the Spill Prevention Control and Countermeasure Plan and the plan should be readily available.

- Train employees to recognize and report illegal dumping incidents.

Other Considerations (Limitations and Regulations)

- State regulations exist for facilities with a storage capacity of 10,000 gallons or more of petroleum to prepare a Spill Prevention Control and Countermeasure (SPCC) Plan (Health & Safety Code Chapter 6.67).

- State regulations also exist for storage of hazardous materials (Health & Safety Code Chapter 6.95), including the preparation of area and business plans for emergency response to the releases or threatened releases.

- Consider requiring smaller secondary containment areas (less than 200 sq. ft.) to be connected to the sanitary sewer, prohibiting any hard connections to the storm drain.

Requirements

Costs (including capital and operation & maintenance)

- Will vary depending on the size of the facility and the necessary controls.

- Prevention of leaks and spills is inexpensive. Treatment and/or disposal of contaminated soil or water can be quite expensive.

Maintenance (including administrative and staffing)

- This BMP has no major administrative or staffing requirements. However, extra time is needed to properly handle and dispose of spills, which results in increased labor costs.

Supplemental Information

Further Detail of the BMP

Reporting

Record keeping and internal reporting represent good operating practices because they can increase the efficiency of the facility and the effectiveness of BMPs. A good record keeping system helps the facility minimize incident recurrence, correctly respond with appropriate cleanup activities, and comply with legal requirements. A record keeping and reporting system should be set up for documenting spills, leaks, and other discharges, including discharges of hazardous substances in reportable quantities. Incident records describe the quality and quantity of non-stormwater discharges to the storm sewer. These records should contain the following information:

- Date and time of the incident
- Weather conditions
- Duration of the spill/leak/discharge
- Cause of the spill/leak/discharge
- Response procedures implemented
- Persons notified
- Environmental problems associated with the spill/leak/discharge

Separate record keeping systems should be established to document housekeeping and preventive maintenance inspections, and training activities. All housekeeping and preventive maintenance inspections should be documented. Inspection documentation should contain the following information:

- The date and time the inspection was performed
- Name of the inspector
- Items inspected
- Problems noted
- Corrective action required
- Date corrective action was taken

Other means to document and record inspection results are field notes, timed and dated photographs, videotapes, and drawings and maps.

Aboveground Tank Leak and Spill Control

Accidental releases of materials from aboveground liquid storage tanks present the potential for contaminating stormwater with many different pollutants. Materials spilled, leaked, or lost from

tanks may accumulate in soils or on impervious surfaces and be carried away by stormwater runoff.

The most common causes of unintentional releases are:

- Installation problems
- Failure of piping systems (pipes, pumps, flanges, couplings, hoses, and valves)
- External corrosion and structural failure
- Spills and overfills due to operator error
- Leaks during pumping of liquids or gases from truck or rail car to a storage tank or vice versa

Storage of reactive, ignitable, or flammable liquids should comply with the Uniform Fire Code and the National Electric Code. Practices listed below should be employed to enhance the code requirements:

- Tanks should be placed in a designated area.
- Tanks located in areas where firearms are discharged should be encapsulated in concrete or the equivalent.
- Designated areas should be impervious and paved with Portland cement concrete, free of cracks and gaps, in order to contain leaks and spills.
- Liquid materials should be stored in UL approved double walled tanks or surrounded by a curb or dike to provide the volume to contain 10 percent of the volume of all of the containers or 110 percent of the volume of the largest container, whichever is greater. The area inside the curb should slope to a drain.
- For used oil or dangerous waste, a dead-end sump should be installed in the drain.
- All other liquids should be drained to the sanitary sewer if available. The drain must have a positive control such as a lock, valve, or plug to prevent release of contaminated liquids.
- Accumulated stormwater in petroleum storage areas should be passed through an oil/water separator.

Maintenance is critical to preventing leaks and spills. Conduct routine inspections and:

- Check for external corrosion and structural failure.
- Check for spills and overfills due to operator error.
- Check for failure of piping system (pipes, pumps, flanger, coupling, hoses, and valves).
- Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.

- Visually inspect new tank or container installation for loose fittings, poor welding, and improper or poorly fitted gaskets.
- Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.
- Frequently relocate accumulated stormwater during the wet season.
- Periodically conduct integrity testing by a qualified professional.

Vehicle Leak and Spill Control

Major spills on roadways and other public areas are generally handled by highly trained Hazmat teams from local fire departments or environmental health departments. The measures listed below pertain to leaks and smaller spills at vehicle maintenance shops.

In addition to implementing the spill prevention, control, and clean up practices above, use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- Perform all vehicle fluid removal or changing inside or under cover to prevent the run-on of stormwater and the runoff of spills.
- Regularly inspect vehicles and equipment for leaks, and repair immediately.
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Immediately drain all fluids from wrecked vehicles.
- Store wrecked vehicles or damaged equipment under cover.
- Place drip pans or absorbent materials under heavy equipment when not in use.
- Use adsorbent materials on small spills rather than hosing down the spill.
- Remove the adsorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
- Oil filters disposed of in trashcans or dumpsters can leak oil and contaminate stormwater. Place the oil filter in a funnel over a waste oil recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask your oil supplier or recycler about recycling oil filters.

- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- Design the fueling area to prevent the run-on of stormwater and the runoff of spills:
  - Cover fueling area if possible.
  - Use a perimeter drain or slope pavement inward with drainage to a sump.
  - Pave fueling area with concrete rather than asphalt.
- If dead-end sump is not used to collect spills, install an oil/water separator.
- Install vapor recovery nozzles to help control drips as well as air pollution.
- Discourage "topping-off' of fuel tanks.
- Use secondary containment when transferring fuel from the tank truck to the fuel tank.
- Use adsorbent materials on small spills and general cleaning rather than hosing down the area. Remove the adsorbent materials promptly.
- Carry out all Federal and State requirements regarding underground storage tanks, or install above ground tanks.
- Do not use mobile fueling of mobile industrial equipment around the facility; rather, transport the equipment to designated fueling areas.
- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Train employees in proper fueling and cleanup procedures.

Industrial Spill Prevention Response

For the purposes of developing a spill prevention and response program to meet the stormwater regulations, facility managers should use information provided in this fact sheet and the spill prevention/response portions of the fact sheets in this handbook, for specific activities. The program should:

- Integrate with existing emergency response/hazardous materials programs (e.g., Fire Department)
- Develop procedures to prevent/mitigate spills to storm drain systems
- Identify responsible departments
- Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures
- Address spills at municipal facilities, as well as public areas

- Provide training concerning spill prevention, response and cleanup to all appropriate personnel

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Stormwater Managers Resource Center http://www.stormwatercenter.net/

Outdoor Loading/Unloading SC-30

Photo Credit: Geoff Brosseau

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Description

The loading/unloading of materials usually takes place outside on docks or terminals; therefore, materials spilled, leaked, or lost during loading/unloading may collect in the soil or on other surfaces and have the potential to be carried away by stormwater runoff or when the area is cleaned. Additionally, rainfall may wash pollutants from machinery used to unload or move materials. Implementation of the following protocols will prevent or reduce the discharge of pollutants to stormwater from outdoor loading/unloading of materials.

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Keep accurate maintenance logs to evaluate materials removed and improvements made.
- Park tank trucks or delivery vehicles in designated areas so that spills or leaks can be contained.
- Limit exposure of material to rainfall whenever possible.
- Prevent stormwater run-on.
- Check equipment regularly for leaks.

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Suggested Protocols

Loading and Unloading – General Guidelines

- Develop an operations plan that describes procedures for loading and/or unloading.
- Conduct loading and unloading in dry weather if possible.
- Cover designated loading/unloading areas to reduce exposure of materials to rain.
- Consider placing a seal or door skirt between delivery vehicles and building to prevent exposure to rain.
- Design loading/unloading area to prevent stormwater run-on, which would include grading or berming the area, and position roof downspouts so they direct stormwater away from the loading/unloading areas.
- Have employees load and unload all materials and equipment in covered areas such as building overhangs at loading docks if feasible.
- Load/unload only at designated loading areas.
- Use drip pans underneath hose and pipe connections and other leak-prone spots during liquid transfer operations, and when making and breaking connections. Several drip pans should be stored in a covered location near the liquid transfer area so that they are always available, yet protected from precipitation when not in use. Drip pans can be made specifically for railroad tracks. Drip pans must be cleaned periodically, and drip collected materials must be disposed of properly.
- Pave loading areas with concrete instead of asphalt.
- Avoid placing storm drains in the area.
- Grade and/or berm the loading/unloading area to a drain that is connected to a deadend.

Inspection

- Check loading and unloading equipment regularly for leaks, including valves, pumps, flanges and connections.
- Look for dust or fumes during loading or unloading operations.

Training

- Train employees (e.g., fork lift operators) and contractors on proper spill containment and cleanup.
- Have employees trained in spill containment and cleanup present during loading/unloading.
- Train employees in proper handling techniques during liquid transfers to avoid spills.
- Make sure forklift operators are properly trained on loading and unloading procedures.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Contain leaks during transfer.
- Store and maintain appropriate spill cleanup materials in a location that is readily accessible and known to all and ensure that employees are familiar with the site's spill control plan and proper spill cleanup procedures.
- Have an emergency spill cleanup plan readily available.
- Use drip pans or comparable devices when transferring oils, solvents, and paints.

Other Considerations (Limitations and Regulations)

- Space and time limitations may preclude all transfers from being performed indoors or under cover.
- It may not be possible to conduct transfers only during dry weather.

Requirements

Costs

Costs should be low except when covering a large loading/unloading area.

Maintenance

- Conduct regular inspections and make repairs as necessary. The frequency of repairs will depend on the age of the facility.
- Check loading and unloading equipment regularly for leaks.
- Conduct regular broom dry-sweeping of area.

Supplemental Information

Further Detail of the BMP

Special Circumstances for Indoor Loading/Unloading of Materials

Loading or unloading of liquids should occur in the manufacturing building so that any spills that are not completely retained can be discharged to the sanitary sewer, treatment plant, or treated in a manner consistent with local sewer authorities and permit requirements.

- For loading and unloading tank trucks to above and below ground storage tanks, the following procedures should be used:
  - The area where the transfer takes place should be paved. If the liquid is reactive with the asphalt, Portland cement should be used to pave the area.
  - The transfer area should be designed to prevent run-on of stormwater from adjacent areas. Sloping the pad and using a curb, like a speed bump, around the uphill side of the transfer area should reduce run-on.

- The transfer area should be designed to prevent runoff of spilled liquids from the area. Sloping the area to a drain should prevent runoff. The drain should be connected to a dead-end sump or to the sanitary sewer. A positive control valve should be installed on the drain.

- For transfer from rail cars to storage tanks that must occur outside, use the following procedures:

  - Drip pans should be placed at locations where spillage may occur, such as hose connections, hose reels, and filler nozzles. Use drip pans when making and breaking connections.

  - Drip pan systems should be installed between the rails to collect spillage from tank cars.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Outdoor Equipment Operations SC-32

Description

Outside process equipment operations and maintenance can contaminate stormwater runoff. Activities, such as grinding, painting, coating, sanding, degreasing or parts cleaning, landfills and waste piles, solid waste treatment and disposal, are examples of process operations that can lead to contamination of stormwater runoff. Source controls for outdoor process equipment operations and maintenance include reducing the amount of waste created, enclosing or covering all or some of the equipment, installing secondary containment, and training employees.

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Approach

Pollution Prevention

- Perform the activity during dry periods.
- Use non-toxic chemicals for maintenance and minimize or eliminate the use of solvents.

Targeted Constituents

Sediment	✓
Nutrients	
Trash	
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Suggested Protocols

- Consider enclosing the activity in a building and connecting the floor drains to the sanitary sewer.
- Cover the work area with a permanent roof if possible.
- Minimize contact of stormwater with outside process equipment operations through berming and drainage routing (run-on prevention). If possible, connect process equipment area to public sewer or facility wastewater treatment system. Some municipalities require that secondary containment areas be connected to the sanitary sewer, prohibiting any hard connections to the storm drain.
- Dry clean the work area regularly.

Training

- Train employees to perform the activity during dry periods only or substituting benign materials for more toxic ones.
- Train employee and contractors in proper techniques for spill containment and cleanup. Employees should have the tools and knowledge to immediately begin cleaning up a spill should one occur.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.

- Have employees trained in emergency spill cleanup procedures present when dangerous waste, liquid chemicals, or other wastes are delivered.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Prevent operator errors by using engineering safe guards and thus reducing accidental releases of pollutant.
- Inspect storage areas regularly for leaks or spills. Also check for structural failure, spills and overfills due to operator error, and/or failure of piping system.

Other Considerations

- Providing cover may be expensive.
- Space limitations may preclude enclosing some equipment.
- Storage sheds often must meet building and fire code requirements.

Requirements

Costs

Costs vary depending on the complexity of the operation and the amount of control necessary for stormwater pollution control.

Maintenance

- Conduct routine preventive maintenance, including checking process equipment for leaks.
- Clean the storm drain system regularly.

Supplemental Information

Further Detail of the BMP

Hydraulic/Treatment Modifications

If stormwater becomes polluted, it should be captured and treated. If you do not have your own process wastewater treatment system, consider discharging to the public sewer system. Use of the public sewer might be allowed under the following conditions:

- If the activity area is very small (less than a few hundred square feet), the local sewer authority may be willing to allow the area to remain uncovered with the drain connected to the public sewer.
- It may be possible under unusual circumstances to connect a much larger area to the public sewer, as long as the rate of stormwater discharges does not exceed the capacity of the wastewater treatment plant. The stormwater could be stored during the storm and then transferred to the public sewer when the normal flow is low, such as at night.

Industries that generate large volumes of process wastewater typically have their own treatment system and corresponding permit. These industries have the discretion to use their wastewater treatment system to treat stormwater within the constraints of their permit requirements for process treatment. It may also be possible for the industry to discharge the stormwater directly to an effluent outfall without treatment as long as the total loading of the discharged process

water and stormwater does not exceed the loading had a stormwater treatment device been used. This could be achieved by reducing the loading from the process wastewater treatment system. Check with your Regional Water Quality Control Board or local sewering agency, as this option would be subject to permit constraints and potentially regular monitoring.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Stormwater Managers Resource Center http://www.stormwatercenter.net

Waste Handling & Disposal SC-34

Photo Credit: Geoff Brosseau

Description

Improper storage and handling of solid wastes can allow toxic compounds, oils and greases, heavy metals, nutrients, suspended solids, and other pollutants to enter stormwater runoff. The discharge of pollutants to stormwater from waste handling and disposal can be prevented and reduced by tracking waste generation, storage, and disposal; reducing waste generation and disposal through source reduction, reuse, and recycling; and preventing run-on and runoff.

Approach

Pollution Prevention

- Accomplish reduction in the amount of waste generated using the following source controls:
  - Production planning and sequencing
  - Process or equipment modification
  - Raw material substitution or elimination
  - Loss prevention and housekeeping
  - Waste segregation and separation
  - Close loop recycling
- Establish a material tracking system to increase awareness about material usage. This may reduce spills and minimize contamination, thus reducing the amount of waste produced.
- Recycle materials whenever possible.

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	✓
Organics	✓

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Suggested Protocols

General

- Cover storage containers with leak proof lids or some other means. If waste is not in containers, cover all waste piles (plastic tarps are acceptable coverage) and prevent stormwater run-on and runoff with a berm. The waste containers or piles must be covered except when in use.
- Use drip pans or absorbent materials whenever grease containers are emptied by vacuum trucks or other means. Grease cannot be left on the ground. Collected grease must be properly disposed of as garbage.
- Check storage containers weekly for leaks and to ensure that lids are on tightly. Replace any that are leaking, corroded, or otherwise deteriorating.
- Sweep and clean the storage area regularly. If it is paved, do not hose down the area to a storm drain.
- Dispose of rinse and wash water from cleaning waste containers into a sanitary sewer if allowed by the local sewer authority. Do not discharge wash water to the street or storm drain.
- Transfer waste from damaged containers into safe containers.
- Take special care when loading or unloading wastes to minimize losses. Loading systems can be used to minimize spills and fugitive emission losses such as dust or mist. Vacuum transfer systems can minimize waste loss.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide a sufficient number of litter receptacles for the facility.
- Clean out and cover litter receptacles frequently to prevent spillage.

Waste Collection

- Keep waste collection areas clean.
- Inspect solid waste containers for structural damage regularly. Repair or replace damaged containers as necessary.
- Secure solid waste containers; containers must be closed tightly when not in use.
- Do not fill waste containers with washout water or any other liquid.
- Ensure that only appropriate solid wastes are added to the solid waste container. Certain wastes such as hazardous wastes, appliances, fluorescent lamps, pesticides, etc., may not be disposed of in solid waste containers (see chemical/ hazardous waste collection section below).

- Do not mix wastes; this can cause chemical reactions, make recycling impossible, and complicate disposal.

Good Housekeeping

- Use all of the product before disposing of the container.
- Keep the waste management area clean at all times by sweeping and cleaning up spills immediately.
- Use dry methods when possible (e.g., sweeping, use of absorbents) when cleaning around restaurant/food handling dumpster areas. If water must be used after sweeping/using absorbents, collect water and discharge through grease interceptor to the sewer.

Chemical/Hazardous Wastes

- Select designated hazardous waste collection areas on-site.
- Store hazardous materials and wastes in covered containers and protect them from vandalism.
- Place hazardous waste containers in secondary containment.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Stencil or demarcate storm drains on the facility's property with prohibitive message regarding waste disposal.

Run-on/Runoff Prevention

- Prevent stormwater run-on from entering the waste management area by enclosing the area or building a berm around the area.
- Prevent waste materials from directly contacting rain.
- Cover waste piles with temporary covering material such as reinforced tarpaulin, polyethylene, polyurethane, polypropyleneor hypalon.
- Cover the area with a permanent roof if feasible.
- Cover dumpsters to prevent rain from washing waste out of holes or cracks in the bottom of the dumpster.
- Move the activity indoor after ensuring all safety concerns such as fire hazard and ventilation are addressed.

Inspection

- Inspect and replace faulty pumps or hoses regularly to minimize the potential of releases and spills.
- Check waste management areas for leaking containers or spills.

- Repair leaking equipment including valves, lines, seals, or pumps promptly.

Training

- Train staff in pollution prevention measures and proper disposal methods.
- Train employees and contractors in proper spill containment and cleanup. The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur.
- Train employees and subcontractors in proper hazardous waste management.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Have an emergency plan, equipment and trained personnel ready at all times to deal immediately with major spills
- Collect all spilled liquids and properly dispose of them.
- Store and maintain appropriate spill cleanup materials in a location known to all near the designated wash area.
- Ensure that vehicles transporting waste have spill prevention equipment that can prevent spills during transport. Spill prevention equipment includes:
  - Vehicles equipped with baffles for liquid waste
  - Trucks with sealed gates and spill guards for solid waste

Other Considerations (Limitations and Regulations)

Hazardous waste cannot be reused or recycled; it must be disposed of by a licensed hazardous waste hauler.

Requirements

Costs

Capital and O&M costs for these programs will vary substantially depending on the size of the facility and the types of waste handled. Costs should be low if there is an inventory program in place.

Maintenance

- None except for maintaining equipment for material tracking program.

Supplemental Information

Further Detail of the BMP

Land Treatment System

Minimize runoff of polluted stormwater from land application by:

- Choosing a site where slopes are under 6%, the soil is permeable, there is a low water table, it is located away from wetlands or marshes, and there is a closed drainage system

- Avoiding application of waste to the site when it is raining or when the ground is saturated with water
- Growing vegetation on land disposal areas to stabilize soils and reduce the volume of surface water runoff from the site
- Maintaining adequate barriers between the land application site and the receiving waters (planted strips are particularly good)
- Using erosion control techniques such as mulching and matting, filter fences, straw bales, diversion terracing, and sediment basins
- Performing routine maintenance to ensure the erosion control or site stabilization measures are working

Examples

The port of Long Beach has a state-of-the-art database for identifying potential pollutant sources, documenting facility management practices, and tracking pollutants.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

Solid Waste Container Best Management Practices – Fact Sheet On-Line Resources – Environmental Health and Safety. Harvard University. 2002.

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Safer Alternative Products SC-35

Description

Promote the use of less harmful products and products that contain little or no TMDL pollutants. Alternatives exist for most product classes including chemical fertilizers, pesticides, cleaning solutions, janitorial chemicals, automotive and paint products, and consumables (batteries, fluorescent lamps).

Approach

Pattern a new program after the many established programs around the state and country. Integrate this best management practice as much as possible with existing programs at your facility.

Develop a comprehensive program based on:

- The "Precautionary Principle," which is an alternative to the "Risk Assessment" model that says it's acceptable to use a potentially harmful product until physical evidence of its harmful effects are established and deemed too costly from an environmental or public health perspective. For instance, a risk assessment approach might say it's acceptable to use a pesticide until there is direct proof of an environmental impact. The Precautionary Principle approach is used to evaluate whether a given product is safe, whether it is really necessary, and whether alternative products would perform just as well.
- Environmentally Preferable Purchasing Program to minimize the purchase of products containing hazardous ingredients used in the facility's custodial services, fleet maintenance, and facility maintenance in favor of using alternate products that pose less risk to employees and to the environment.
- Integrated Pest Management (IPM) or Less-Toxic Pesticide Program, which uses a pest management approach that minimizes the use of toxic chemicals and gets rid of pests by methods that pose a lower risk to employees, the public, and the environment.
- Energy Efficiency Program including no-cost and low-cost energy conservation and efficiency actions that can reduce both energy consumption and electricity bills, along with long-term energy efficiency investments.

Consider the following mechanisms for developing and implementing a comprehensive program:

- Policies

Objectives

- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	
Nutrients	✓
Trash	
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

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- Procedures
  - Standard operating procedures (SOPs)
  - Purchasing guidelines and procedures
  - Bid packages (services and supplies)
- Materials
  - Preferred or approved product and supplier lists
  - Product and supplier evaluation criteria
  - Training sessions and manuals
  - Fact sheets for employees

Implement this BMP in conjunction with the Vehicle and Equipment Management fact sheets (SC20 – SC22) and SC41, Building and Grounds Maintenance.

Training

- Employees who handle potentially harmful materials in the use of safer alternatives.
- Purchasing departments should be encouraged to procure less hazardous materials and products that contain little or no harmful substances or TMDL pollutants.

Regulations

This BMP has no regulatory requirements. Existing regulations already encourage facilities to reduce the use of hazardous materials through incentives such as reduced:

- Specialized equipment storage and handling requirements,
- Storm water runoff sampling requirements,
- Training and licensing requirements, and
- Record keeping and reporting requirements.

Equipment

- There are no major equipment requirements to this BMP.

Limitations

- Alternative products may not be available, suitable, or effective in every case.

Requirements

Cost Considerations

- The primary cost is for staff time to: 1) develop new policies and procedures and 2) educate purchasing departments and employees who handle potentially harmful materials about the availability, procurement, and use of safer alternatives.

- Some alternative products may be slightly more expensive than conventional products.

Supplemental Information

Employees and contractors / service providers can both be educated about safer alternatives by using information developed by a number of organizations including the references and resources listed below.

The following discussion provides some general information on safer alternatives. More specific information on particular hazardous materials and the available alternatives may be found in the references and resources listed below.

- Automotive products – Less toxic alternatives are not available for many automotive products, especially engine fluids. But there are alternatives to grease lubricants, car polishes, degreasers, and windshield washer solution. Rerefined motor oil is also available.
- Vehicle/Trailer lubrication – Fifth wheel bearings on trucks require routine lubrication. Adhesive lubricants are available to replace typical chassis grease.
- Cleaners – Vegetables-based or citrus-based soaps are available to replace petroleum-based soaps/detergents.
- Paint products – Water-based paints, wood preservatives, stains, and finishes are available.
- Pesticides – Specific alternative products or methods exist to control most insects, fungi, and weeds.
- Chemical Fertilizers – Compost and soil amendments are natural alternatives.
- Consumables – Manufacturers have either reduced or are in the process of reducing the amount of heavy metals in consumables such as batteries and fluorescent lamps. All fluorescent lamps contain mercury, however low-mercury containing lamps are now available from most hardware and lighting stores. Fluorescent lamps are also more energy efficient than the average incandescent lamp.
- Janitorial chemicals – Even biodegradable soap can harm fish and wildlife before it biodegrades. Biodegradable does not mean non-toxic. Safer products and procedures are available for floor stripping and cleaning, as well as carpet, glass, metal, and restroom cleaning and disinfecting.

Examples

There are a number of business and trade associations, and communities with effective programs. Some of the more prominent are listed below in the references and resources section.

References and Resources

Note: Many of these references provide alternative products for materials that typically are used inside and disposed to the sanitary sewer as well as alternatives to products that usually end up in the storm drain.

General Sustainable Practices and Pollution Prevention Including Pollutant-Specific Information

California Department of Toxic Substances Control (www.dtsc.ca.gov)

California Integrated Waste Management Board (www.ciwmb.ca.gov)

City of Santa Monica (www.santa-monica.org/environment)

City of Palo Alto (www.city.palo-alto.ca.us/cleanbay)

City and County of San Francisco, Department of the Environment (www.ci.sf.ca.us/sfenvironment)

Earth 911 (www.earth911.org/master.asp)

Environmental Finance Center Region IX (www.greenstart.org/efc9)

Flex Your Power (www.flexyourpower.ca.gov)

GreenBiz.com (www.greenbiz.com)

Green Business Program (www.abag.org/bayarea/enviro/gbus/gb.html)

Pacific Industrial and Business Association (www.piba.org)

Sacramento Clean Water Business Partners (www.sacstormwater.org)

USEPA BMP fact sheet – Alternative products (http://cfpub.epa.gov/npdes/stormwater/menuofbmps/poll_2.cfm)

USEPA Region IX Pollution Prevention Program (www.epa.gov/region09/p2)

Western Regional Pollution Prevention Network (www.westp2net.org)

Metals (mercury, copper)

National Electrical Manufacturers Association - Environment, Health and Safety (www.nema.org)

Sustainable Conservation (www.suscon.org)

- Auto Recycling Project
- Brake Pad Partnership

Pesticides and Chemical Fertilizers

Bio-Integral Resource Center (www.birc.org)

California Department of Pesticide Regulation (www.cdpr.ca.gov)

University of California Statewide IPM Program (www.ipm.ucdavis.edu/default.html)

Dioxins

Bay Area Dioxins Project (http://dioxin.abag.ca.gov/)

Building & Grounds Maintenance SC-41

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	
Organics	

Description

Stormwater runoff from building and grounds maintenance activities can be contaminated with toxic hydrocarbons in solvents, fertilizers and pesticides, suspended solids, heavy metals, abnormal pH, and oils and greases. Utilizing the protocols in this fact sheet will prevent or reduce the discharge of pollutants to stormwater from building and grounds maintenance activities by washing and cleaning up with as little water as possible, following good landscape management practices, preventing and cleaning up spills immediately, keeping debris from entering the storm drains, and maintaining the stormwater collection system.

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Encourage proper lawn management and landscaping, including use of native vegetation.

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- Encourage use of Integrated Pest Management techniques for pest control.
- Encourage proper onsite recycling of yard trimmings.
- Recycle residual paints, solvents, lumber, and other material as much as possible.

Suggested Protocols

Pressure Washing of Buildings, Rooftops, and Other Large Objects

- In situations where soaps or detergents are used and the surrounding area is paved, pressure washers must use a water collection device that enables collection of wash water and associated solids. A sump pump, wet vacuum or similarly effective device must be used to collect the runoff and loose materials. The collected runoff and solids must be disposed of properly.
- If soaps or detergents are not used, and the surrounding area is paved, wash runoff does not have to be collected but must be screened. Pressure washers must use filter fabric or some other type of screen on the ground and/or in the catch basin to trap the particles in wash water runoff.
- If you are pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement.

Landscaping Activities

- Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures on exposed soils.

Building Repair, Remodeling, and Construction

- Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.
- Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.
- Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.
- Clean paintbrushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.
- Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a catch basin. This is particularly necessary on rainy days. The containment device(s) must be in place at the beginning of the work day, and accumulated dirty runoff and solids must be collected and disposed of before removing the containment device(s) at the end of the work day.

- If you need to de-water an excavation site, you may need to filter the water before discharging to a catch basin or off-site. If directed off-site, you should direct the water through hay bales and filter fabric or use other sediment filters or traps.
- Store toxic material under cover during precipitation events and when not in use. A cover would include tarps or other temporary cover material.

Mowing, Trimming, and Planting

- Dispose of leaves, sticks, or other collected vegetation as garbage, by composting or at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures when soils are exposed.
- Place temporarily stockpiled material away from watercourses and drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Consider an alternative approach when bailing out muddy water: do not put it in the storm drain; pour over landscaped areas.
- Use hand weeding where practical.

Fertilizer and Pesticide Management

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.
- Use less toxic pesticides that will do the job when applicable. Avoid use of copper-based pesticides if possible.
- Do not use pesticides if rain is expected.
- Do not mix or prepare pesticides for application near storm drains.
- Use the minimum amount needed for the job.
- Calibrate fertilizer distributors to avoid excessive application.
- Employ techniques to minimize off-target application (e.g., spray drift) of pesticides, including consideration of alternative application techniques.
- Apply pesticides only when wind speeds are low.
- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
- Irrigate slowly to prevent runoff and then only as much as is needed.
- Clean pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Dispose of empty pesticide containers according to the instructions on the container label.

- Use up the pesticides. Rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering and repair leaks in the irrigation system as soon as they are observed.

Training

- Educate and train employees on pesticide use and in pesticide application techniques to prevent pollution.
- Train employees and contractors in proper techniques for spill containment and cleanup.
- Be sure the frequency of training takes into account the complexity of the operations and the nature of the staff.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials, such as brooms, dustpans, and vacuum sweepers (if desired) near the storage area where it will be readily accessible.
- Have employees trained in spill containment and cleanup present during the loading/unloading of dangerous wastes, liquid chemicals, or other materials.
- Familiarize employees with the Spill Prevention Control and Countermeasure Plan.
- Clean up spills immediately.

Other Considerations

Alternative pest/weed controls may not be available, suitable, or effective in many cases.

Requirements

Costs

- Cost will vary depending on the type and size of facility.
- Overall costs should be low in comparison to other BMPs.

Maintenance

Sweep paved areas regularly to collect loose particles. Wipe up spills with rags and other absorbent material immediately, do not hose down the area to a storm drain.

Supplemental Information

Further Detail of the BMP

Fire Sprinkler Line Flushing

Building fire sprinkler line flushing may be a source of non-stormwater runoff pollution. The water entering the system is usually potable water, though in some areas it may be non-potable reclaimed wastewater. There are subsequent factors that may drastically reduce the quality of the water in such systems. Black iron pipe is usually used since it is cheaper than potable piping, but it is subject to rusting and results in lower quality water. Initially, the black iron pipe has an oil coating to protect it from rusting between manufacture and installation; this will contaminate the water from the first flush but not from subsequent flushes. Nitrates, poly-phosphates and other corrosion inhibitors, as well as fire suppressants and antifreeze may be added to the sprinkler water system. Water generally remains in the sprinkler system a long time (typically a year) and between flushes may accumulate iron, manganese, lead, copper, nickel, and zinc. The water generally becomes anoxic and contains living and dead bacteria and breakdown products from chlorination. This may result in a significant BOD problem and the water often smells. Consequently dispose fire sprinkler line flush water into the sanitary sewer. Do not allow discharge to storm drain or infiltration due to potential high levels of pollutants in fire sprinkler line water.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Mobile Cleaners Pilot Program: Final Report. 1997. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Building Repair and Construction SC-42

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Recycle

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Description

Modifications are common particularly at large industrial sites. The activity may vary from minor and normal building repair to major remodeling, or the construction of new facilities. These activities can generate pollutants including solvents, paints, paint and varnish removers, finishing residues, spent thinners, soap cleaners, kerosene, asphalt and concrete materials, adhesive residues, and old asbestos installation. Protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants to stormwater from building repair, remodeling, and construction by using soil erosion controls, enclosing or covering building material storage areas, using good housekeeping practices, using safer alternative products, and training employees.

Approach

Pollution Prevention

- Recycle residual paints, solvents, lumber, and other materials to the maximum extent practical.
- Buy recycled products to the maximum extent practical.
- Inform on-site contractors of company policy on these matters and include appropriate provisions in their contract to ensure certain proper housekeeping and disposal practices are implemented.

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- Make sure that nearby storm drains are well marked to minimize the chance of inadvertent disposal of residual paints and other liquids.

Suggested Protocols

Repair & Remodeling

- Follow BMPs identified in Construction BMP Handbook.
- Maintain good housekeeping practices while work is underway.
- Keep the work site clean and orderly. Remove debris in a timely fashion. Sweep the area.
- Cover materials of particular concern that must be left outside, particularly during the rainy season.
- Do not dump waste liquids down the storm drain.
- Dispose of wash water, sweepings, and sediments properly.
- Store materials properly that are normally used in repair and remodeling such as paints and solvents.
- Sweep out the gutter or wash the gutter and trap the particles at the outlet of the downspout if when repairing roofs, small particles have accumulated in the gutter. A sock or geofabric placed over the outlet may effectively trap the materials. If the downspout is tight lined, place a temporary plug at the first convenient point in the storm drain and pump out the water with a vactor truck, and clean the catch basin sump where you placed the plug.
- Properly store and dispose waste materials generated from construction activities. See Construction BMP Handbook.
- Clean the storm drain system in the immediate vicinity of the construction activity after it is completed.

Painting

- Enclose painting operations consistent with local air quality regulations and OSHA.
- Local air pollution regulations may, in many areas of the state, specify painting procedures which if properly carried out are usually sufficient to protect water quality.
- Develop paint handling procedures for proper use, storage, and disposal of paints.
- Transport paint and materials to and from job sites in containers with secure lids and tied down to the transport vehicle.
- Test and inspect spray equipment prior to starting to paint. Tighten all hoses and connections and do not overfill paint containers.
- Mix paint indoors before using so that any spill will not be exposed to rain. Do so even during dry weather because cleanup of a spill will never be 100% effective.
- Transfer and load paint and hot thermoplastic away from storm drain inlets.

- Do not transfer or load paint near storm drain inlets.
- Plug nearby storm drain inlets prior to starting painting and remove plugs when job is complete when there is significant risk of a spill reaching storm drains.
- Cover nearby storm drain inlets prior to starting work if sand blasting is used to remove paint.
- Use a ground cloth to collect the chips if painting requires scraping or sand blasting of the existing surface. Dispose the residue properly.
- Cover or enclose painting operations properly to avoid drift.
- Clean the application equipment in a sink that is connected to the sanitary sewer if using water based paints.
- Capture all cleanup-water and dispose of properly.
- Dispose of paints containing lead or tributyl tin and considered a hazardous waste properly.
- Store leftover paints if they are to be kept for the next job properly, or dispose properly.
- Recycle paint when possible. Dispose of paint at an appropriate household hazardous waste facility.

Training

Proper education of off-site contractors is often overlooked. The conscientious efforts of well trained employees can be lost by unknowing off-site contractors, so make sure they are well informed about what they are expected to do.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Clean up spills immediately.
- Excavate and remove the contaminated (stained) soil if a spill occurs on dirt.

Limitations

- This BMP is for minor construction only. The State's General Construction Activity Stormwater Permit has more requirements for larger projects. The companion "Construction Best Management Practice Handbook" contains specific guidance and best management practices for larger-scale projects.
- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Be certain that actions to help stormwater quality are consistent with Cal- and Fed-OSHA and air quality regulations.

SC-42 Building Repair and Construction

Requirements

Costs

These BMPs are generally low to modest in cost.

Maintenance

N/A

Supplemental Information

Further Detail of the BMP

Soil/Erosion Control

If the work involves exposing large areas of soil, employ the appropriate soil erosion and control techniques. See the Construction Best Management Practice Handbook. If old buildings are being torn down and not replaced in the near future, stabilize the site using measures described in SC-40 Contaminated or Erodible Areas.

If a building is to be placed over an open area with a storm drainage system, make sure the storm inlets within the building are covered or removed, or the storm line is connected to the sanitary sewer. If because of the remodeling a new drainage system is to be installed or the existing system is to be modified, consider installing catch basins as they serve as effective "in-line" treatment devices. See Treatment Control Fact Sheet TC-20 Wet Pond/Basin in Section 5 of the New Development and Redevelopment Handbook regarding design criteria. Include in the catch basin a "turn-down" elbow or similar device to trap floatables.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Parking/Storage Area Maintenance SC-43

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Description

Parking lots and storage areas can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through stormwater runoff or non-stormwater discharges. The protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants from parking/storage areas and include using good housekeeping practices, following appropriate cleaning BMPs, and training employees.

Approach

The goal of this program is to ensure stormwater pollution prevention practices are considered when conducting activities on or around parking areas and storage areas to reduce potential for pollutant discharge to receiving waters. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Encourage alternative designs and maintenance strategies for impervious parking lots. (See New Development and Redevelopment BMP Handbook)
- Keep accurate maintenance logs to evaluate BMP implementation.

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SC-43 Parking/Storage Area Maintenance

Suggested Protocols

General

- Keep the parking and storage areas clean and orderly. Remove debris in a timely fashion.
- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and/or infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low quantities.
- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.
- Discharge soapy water remaining in mop or wash buckets to the sanitary sewer through a sink, toilet, clean-out, or wash area with drain.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide an adequate number of litter receptacles.
- Clean out and cover litter receptacles frequently to prevent spillage.
- Provide trash receptacles in parking lots to discourage litter.
- Routinely sweep, shovel, and dispose of litter in the trash.

Surface Cleaning

- Use dry cleaning methods (e.g., sweeping, vacuuming) to prevent the discharge of pollutants into the stormwater conveyance system if possible.
- Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.
- Sweep all parking lots at least once before the onset of the wet season.
- Follow the procedures below if water is used to clean surfaces:
  - Block the storm drain or contain runoff.
  - Collect and pump wash water to the sanitary sewer or discharge to a pervious surface. Do not allow wash water to enter storm drains.
  - Dispose of parking lot sweeping debris and dirt at a landfill.
- Follow the procedures below when cleaning heavy oily deposits:
  - Clean oily spots with absorbent materials.
  - Use a screen or filter fabric over inlet, then wash surfaces.

- Do not allow discharges to the storm drain.
- Vacuum/pump discharges to a tank or discharge to sanitary sewer.
- Appropriately dispose of spilled materials and absorbents.

Surface Repair

- Preheat, transfer or load hot bituminous material away from storm drain inlets.
- Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff.
- Cover and seal nearby storm drain inlets where applicable (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal.
- Use only as much water as necessary for dust control, to avoid runoff.
- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

Inspection

- Have designated personnel conduct inspections of parking facilities and stormwater conveyance systems associated with parking facilities on a regular basis.
- Inspect cleaning equipment/sweepers for leaks on a regular basis.

Training

- Provide regular training to field employees and/or contractors regarding cleaning of paved areas and proper operation of equipment.
- Train employees and contractors in proper techniques for spill containment and cleanup.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials where it will be readily accessible or at a central location.
- Clean up fluid spills immediately with absorbent rags or material.
- Dispose of spilled material and absorbents properly.

Other Considerations

Limitations related to sweeping activities at large parking facilities may include high equipment costs, the need for sweeper operator training, and the inability of current sweeper technology to remove oil and grease.

SC-43 Parking/Storage Area Maintenance

Requirements

Costs

Cleaning/sweeping costs can be quite large. Construction and maintenance of stormwater structural controls can be quite expensive as well.

Maintenance

- Sweep parking lot regularly to minimize cleaning with water.
- Clean out oil/water/sand separators regularly, especially after heavy storms.
- Clean parking facilities regularly to prevent accumulated wastes and pollutants from being discharged into conveyance systems during rainy conditions.

Supplemental Information

Further Detail of the BMP

Surface Repair

Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff. Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal. Only use only as much water as is necessary for dust control to avoid runoff.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Drainage System Maintenance SC-44

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff and stormwater that may contain certain pollutants. The protocols in this fact sheet are intended to reduce pollutants reaching receiving waters through proper conveyance system operation and maintenance.

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	
Bacteria	✓
Oil and Grease	
Organics	

Approach

Pollution Prevention

Maintain catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis to remove pollutants, reduce high pollutant concentrations during the first flush of storms, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

Suggested Protocols

Catch Basins/Inlet Structures

- Staff should regularly inspect facilities to ensure compliance with the following:
  - Immediate repair of any deterioration threatening structural integrity.
  - Cleaning before the sump is 40% full. Catch basins should be cleaned as frequently as needed to meet this standard.
  - Stenciling of catch basins and inlets (see SC34 Waste Handling and Disposal).

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- Clean catch basins, storm drain inlets, and other conveyance structures before the wet season to remove sediments and debris accumulated during the summer.
- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Clean and repair as needed.
- Keep accurate logs of the number of catch basins cleaned.
- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.
- Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed. Do not dewater near a storm drain or stream.

Storm Drain Conveyance System

- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.
- Collect and pump flushed effluent to the sanitary sewer for treatment whenever possible.

Pump Stations

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.
- Do not allow discharge to reach the storm drain system when cleaning a storm drain pump station or other facility.
- Conduct routine maintenance at each pump station.
- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.

Open Channel

- Modify storm channel characteristics to improve channel hydraulics, increase pollutant removals, and enhance channel/creek aesthetic and habitat value.
- Conduct channel modification/improvement in accordance with existing laws. Any person, government agency, or public utility proposing an activity that will change the natural (emphasis added) state of any river, stream, or lake in California, must enter into a Steam or Lake Alteration Agreement with the Department of Fish and Game. The developer-applicant should also contact local governments (city, county, special districts), other state agencies (SWRCB, RWQCB, Department of Forestry, Department of Water Resources), and Federal Corps of Engineers and USFWS.

Illicit Connections and Discharges

- Look for evidence of illegal discharges or illicit connections during routine maintenance of conveyance system and drainage structures:
  - Is there evidence of spills such as paints, discoloring, etc?

- Are there any odors associated with the drainage system?
- Record locations of apparent illegal discharges/illicit connections?
- Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of upgradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
- Eliminate the discharge once the origin of flow is established.

- Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Illegal Dumping

- Inspect and clean up hot spots and other storm drainage areas regularly where illegal dumping and disposal occurs.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots
  - Types and quantities (in some cases) of wastes
  - Patterns in time of occurrence (time of day/night, month, or year)
  - Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
  - Responsible parties
- Post "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Training

- Train crews in proper maintenance activities, including record keeping and disposal.
- Allow only properly trained individuals to handle hazardous materials/wastes.
- Have staff involved in detection and removal of illicit connections trained in the following:
  - OSHA-required Health and Safety Training (29 CFR 1910.120) plus annual refresher training (as needed).

- OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and Federal OSHA 29 CFR 1910.146).

- Procedural training (field screening, sampling, smoke/dye testing, TV inspection).

Spill Response and Prevention

- Investigate all reports of spills, leaks, and/or illegal dumping promptly.
- Clean up all spills and leaks using "dry" methods (with absorbent materials and/or rags) or dig up, remove, and properly dispose of contaminated soil.
- Refer to fact sheet SC-11 Spill Prevention, Control, and Cleanup.

Other Considerations (Limitations and Regulations)

- Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.
- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, liquid/sediment disposal, and prohibition against disposal of flushed effluent to sanitary sewer in some areas.
- Regulations may include adoption of substantial penalties for illegal dumping and disposal.
- Local municipal codes may include sections prohibiting discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.

Requirements

Costs

- An aggressive catch basin cleaning program could require a significant capital and O&M budget.
- The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal. The primary cost is for staff time. Cost depends on how aggressively a program is implemented. Other cost considerations for an illegal dumping program include:

  - Purchase and installation of signs.

  - Rental of vehicle(s) to haul illegally-disposed items and material to landfills.

  - Rental of heavy equipment to remove larger items (e.g., car bodies) from channels.

  - Purchase of landfill space to dispose of illegally-dumped items and material.

- Methods used for illicit connection detection (smoke testing, dye testing, visual inspection, and flow monitoring) can be costly and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary.

Maintenance

- Two-person teams may be required to clean catch basins with vactor trucks.
- Teams of at least two people plus administrative personnel are required to identify illicit discharges, depending on the complexity of the storm sewer system.
- Arrangements must be made for proper disposal of collected wastes.
- Technical staff are required to detect and investigate illegal dumping violations.

Supplemental Information

Further Detail of the BMP

Storm Drain Flushing

Flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in storm drainage systems. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as an open channel, another point where flushing will be initiated, or the sanitary sewer and the treatment facilities, thus preventing resuspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. Deposits can hinder the designed conveyance capacity of the storm drain system and potentially cause backwater conditions in severe cases of clogging.

Storm drain flushing usually takes place along segments of pipe with grades that are too flat to maintain adequate velocity to keep particles in suspension. An upstream manhole is selected to place an inflatable device that temporarily plugs the pipe. Further upstream, water is pumped into the line to create a flushing wave. When the upstream reach of pipe is sufficiently full to cause a flushing wave, the inflated device is rapidly deflated with the assistance of a vacuum pump, thereby releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce impacts of stormwater pollution, a second inflatable device placed well downstream may be used to recollect the water after the force of the flushing wave has dissipated. A pump may then be used to transfer the water and accumulated material to the sanitary sewer for treatment. In some cases, an interceptor structure may be more practical or required to recollect the flushed waters.

It has been found that cleansing efficiency of periodic flush waves is dependent upon flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter, and population density. As a rule of thumb, the length of line to be flushed should not exceed 700 feet. At this maximum recommended length, the percent removal efficiency ranges between 65-75% for organics and 55-65% for dry weather grit/inorganic material. The percent removal efficiency drops rapidly beyond that. Water is commonly supplied by a water truck, but fire hydrants can also supply water. To make the best use of water, it is recommended that reclaimed water be used or that fire hydrant line flushing coincide with storm sewer flushing.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

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King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

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The Storm Water Managers Resource Center http://www.stormwatercenter.net

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http://www.epa.gov/npdes/menuofbmps/poll_16.htm

Landscape Maintenance SC-73

Objectives

- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	
Oxygen Demanding	☑

Description

Landscape maintenance activities include vegetation removal; herbicide and insecticide application; fertilizer application; watering; and other gardening and lawn care practices. Vegetation control typically involves a combination of chemical (herbicide) application and mechanical methods. All of these maintenance practices have the potential to contribute pollutants to the storm drain system. The major objectives of this BMP are to minimize the discharge of pesticides, herbicides and fertilizers to the storm drain system and receiving waters; prevent the disposal of landscape waste into the storm drain system by collecting and properly disposing of clippings and cuttings, and educating employees and the public.

Approach

Pollution Prevention

- Implement an integrated pest management (IPM) program. IPM is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools.
- Choose low water using flowers, trees, shrubs, and groundcover.
- Consider alternative landscaping techniques such as naturescaping and xeriscaping.
- Conduct appropriate maintenance (i.e. properly timed fertilizing, weeding, pest control, and pruning) to help preserve the landscapes water efficiency.

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- Consider grass cycling (grass cycling is the natural recycling of grass by leaving the clippings on the lawn when mowing. Grass clippings decompose quickly and release valuable nutrients back into the lawn).

Suggested Protocols

Mowing, Trimming, and Weeding

- Whenever possible use mechanical methods of vegetation removal (e.g mowing with tractor-type or push mowers, hand cutting with gas or electric powered weed trimmers) rather than applying herbicides. Use hand weeding where practical.
- Avoid loosening the soil when conducting mechanical or manual weed control, this could lead to erosion. Use mulch or other erosion control measures when soils are exposed.
- Performing mowing at optimal times. Mowing should not be performed if significant rain events are predicted.
- Mulching mowers may be recommended for certain flat areas. Other techniques may be employed to minimize mowing such as selective vegetative planting using low maintenance grasses and shrubs.
- Collect lawn and garden clippings, pruning waste, tree trimmings, and weeds. Chip if necessary, and compost or dispose of at a landfill (see waste management section of this fact sheet).
- Place temporarily stockpiled material away from watercourses, and berm or cover stockpiles to prevent material releases to storm drains.

Planting

- Determine existing native vegetation features (location, species, size, function, importance) and consider the feasibility of protecting them. Consider elements such as their effect on drainage and erosion, hardiness, maintenance requirements, and possible conflicts between preserving vegetation and the resulting maintenance needs.
- Retain and/or plant selected native vegetation whose features are determined to be beneficial, where feasible. Native vegetation usually requires less maintenance (e.g., irrigation, fertilizer) than planting new vegetation.
- Consider using low water use groundcovers when planting or replanting.

Waste Management

- Compost leaves, sticks, or other collected vegetation or dispose of at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Place temporarily stockpiled material away from watercourses and storm drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Reduce the use of high nitrogen fertilizers that produce excess growth requiring more frequent mowing or trimming.

- Avoid landscape wastes in and around storm drain inlets by either using bagging equipment or by manually picking up the material.

Irrigation

- Where practical, use automatic timers to minimize runoff.
- Use popup sprinkler heads in areas with a lot of activity or where there is a chance the pipes may be broken. Consider the use of mechanisms that reduce water flow to sprinkler heads if broken.
- Ensure that there is no runoff from the landscaped area(s) if re-claimed water is used for irrigation.
- If bailing of muddy water is required (e.g. when repairing a water line leak), do not put it in the storm drain; pour over landscaped areas.
- Irrigate slowly or pulse irrigate to prevent runoff and then only irrigate as much as is needed.
- Apply water at rates that do not exceed the infiltration rate of the soil.

Fertilizer and Pesticide Management

- Utilize a comprehensive management system that incorporates integrated pest management (IPM) techniques. There are many methods and types of IPM, including the following:
  - Mulching can be used to prevent weeds where turf is absent, fencing installed to keep rodents out, and netting used to keep birds and insects away from leaves and fruit.
  - Visible insects can be removed by hand (with gloves or tweezers) and placed in soapy water or vegetable oil. Alternatively, insects can be sprayed off the plant with water or in some cases vacuumed off of larger plants.
  - Store-bought traps, such as species-specific, pheromone-based traps or colored sticky cards, can be used.
  - Slugs can be trapped in small cups filled with beer that are set in the ground so the slugs can get in easily.
  - In cases where microscopic parasites, such as bacteria and fungi, are causing damage to plants, the affected plant material can be removed and disposed of (pruning equipment should be disinfected with bleach to prevent spreading the disease organism).
  - Small mammals and birds can be excluded using fences, netting, tree trunk guards.
  - Beneficial organisms, such as bats, birds, green lacewings, ladybugs, praying mantis, ground beetles, parasitic nematodes, trichogramma wasps, seed head weevils, and spiders that prey on detrimental pest species can be promoted.
- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.

- Use pesticides only if there is an actual pest problem (not on a regular preventative schedule).
- Do not use pesticides if rain is expected. Apply pesticides only when wind speeds are low (less than 5 mph).
- Do not mix or prepare pesticides for application near storm drains.
- Prepare the minimum amount of pesticide needed for the job and use the lowest rate that will effectively control the pest.
- Employ techniques to minimize off-target application (e.g. spray drift) of pesticides, including consideration of alternative application techniques.
- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
- Calibrate fertilizer and pesticide application equipment to avoid excessive application.
- Periodically test soils for determining proper fertilizer use.
- Sweep pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Purchase only the amount of pesticide that you can reasonably use in a given time period (month or year depending on the product).
- Triple rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Dispose of empty pesticide containers according to the instructions on the container label.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering, and repair leaks in the irrigation system as soon as they are observed.
- Inspect pesticide/fertilizer equipment and transportation vehicles daily.

Training

- Educate and train employees on use of pesticides and in pesticide application techniques to prevent pollution. Pesticide application must be under the supervision of a California qualified pesticide applicator.
- Train/encourage municipal maintenance crews to use IPM techniques for managing public green areas.
- Annually train employees within departments responsible for pesticide application on the appropriate portions of the agency's IPM Policy, SOPs, and BMPs, and the latest IPM techniques.

- Employees who are not authorized and trained to apply pesticides should be periodically (at least annually) informed that they cannot use over-the-counter pesticides in or around the workplace.
- Use a training log or similar method to document training.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup
- Have spill cleanup materials readily available and in a know in location
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- The Federal Pesticide, Fungicide, and Rodenticide Act and California Title 3, Division 6, Pesticides and Pest Control Operations place strict controls over pesticide application and handling and specify training, annual refresher, and testing requirements. The regulations generally cover: a list of approved pesticides and selected uses, updated regularly; general application information; equipment use and maintenance procedures; and record keeping. The California Department of Pesticide Regulations and the County Agricultural Commission coordinate and maintain the licensing and certification programs. All public agency employees who apply pesticides and herbicides in "agricultural use" areas such as parks, golf courses, rights-of-way and recreation areas should be properly certified in accordance with state regulations. Contracts for landscape maintenance should include similar requirements.
- All employees who handle pesticides should be familiar with the most recent material safety data sheet (MSDS) files.
- Municipalities do not have the authority to regulate the use of pesticides by school districts, however the California Healthy Schools Act of 2000 (AB 2260) has imposed requirements on California school districts regarding pesticide use in schools. Posting of notification prior to the application of pesticides is now required, and IPM is stated as the preferred approach to pest management in schools.

Requirements

Costs

Additional training of municipal employees will be required to address IPM techniques and BMPs. IPM methods will likely increase labor cost for pest control which may be offset by lower chemical costs.

Maintenance

Not applicable

Supplemental Information

Further Detail of the BMP

Waste Management

Composting is one of the better disposal alternatives if locally available. Most municipalities either have or are planning yard waste composting facilities as a means of reducing the amount of waste going to the landfill. Lawn clippings from municipal maintenance programs as well as private sources would probably be compatible with most composting facilities

Contractors and Other Pesticide Users

Municipal agencies should develop and implement a process to ensure that any contractor employed to conduct pest control and pesticide application on municipal property engages in pest control methods consistent with the IPM Policy adopted by the agency. Specifically, municipalities should require contractors to follow the agency's IPM policy, SOPs, and BMPs; provide evidence to the agency of having received training on current IPM techniques when feasible; provide documentation of pesticide use on agency property to the agency in a timely manner.

References and Resources

King County Stormwater Pollution Control Manual. Best Management Practices for Businesses. 1995. King County Surface Water Management. July. On-line: http://dnr.metrokc.gov/wlr/dss/spcm.htm

Los Angeles County Stormwater Quality Model Programs. Public Agency Activities http://ladpw.org/wmd/npdes/model_links.cfm

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July. 1998.

Orange County Stormwater Program http://www.ocwatersheds.com/StormWater/swp_introduction.asp

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Landscaping and Lawn Care. Office of Water. Office of Wastewater Management. On-line: http://www.epa.gov/npdes/menuofbmps/poll_8.htm

Efficient Irrigation SD-12

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

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- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Storm Drain Signage SD-13

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ☑ Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include “NO DUMPING

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– DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.

- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Maintenance Bays & Docks SD-31

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ☑ Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Description

Several measures can be taken to prevent operations at maintenance bays and loading docks from contributing a variety of toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to the stormwater conveyance system.

Approach

In designs for maintenance bays and loading docks, containment is encouraged. Preventative measures include overflow containment structures and dead-end sumps. However, in the case of loading docks from grocery stores and warehouse/distribution centers, engineered infiltration systems may be considered.

Suitable Applications

Appropriate applications include commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for vehicle maintenance and repair are governed by Building and Fire Codes, and by current local agency ordinances, and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code requirements.

Designing New Installations

Designs of maintenance bays should consider the following:

- Repair/maintenance bays and vehicle parts with fluids should be indoors; or designed to preclude urban run-on and runoff.
- Repair/maintenance floor areas should be paved with Portland cement concrete (or equivalent smooth impervious surface).

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- Repair/maintenance bays should be designed to capture all wash water leaks and spills. Provide impermeable berms, drop inlets, trench catch basins, or overflow containment structures around repair bays to prevent spilled materials and wash-down waters form entering the storm drain system. Connect drains to a sump for collection and disposal. Direct connection of the repair/maintenance bays to the storm drain system is prohibited. If required by local jurisdiction, obtain an Industrial Waste Discharge Permit.

- Other features may be comparable and equally effective.

The following designs of loading/unloading dock areas should be considered:

- Loading dock areas should be covered, or drainage should be designed to preclude urban run-on and runoff.

- Direct connections into storm drains from depressed loading docks (truck wells) are prohibited.

- Below-grade loading docks from grocery stores and warehouse/distribution centers of fresh food items should drain through water quality inlets, or to an engineered infiltration system, or an equally effective alternative. Pre-treatment may also be required.

- Other features may be comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permit.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Trash Storage Areas SD-32

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.
- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

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- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

Other Resources

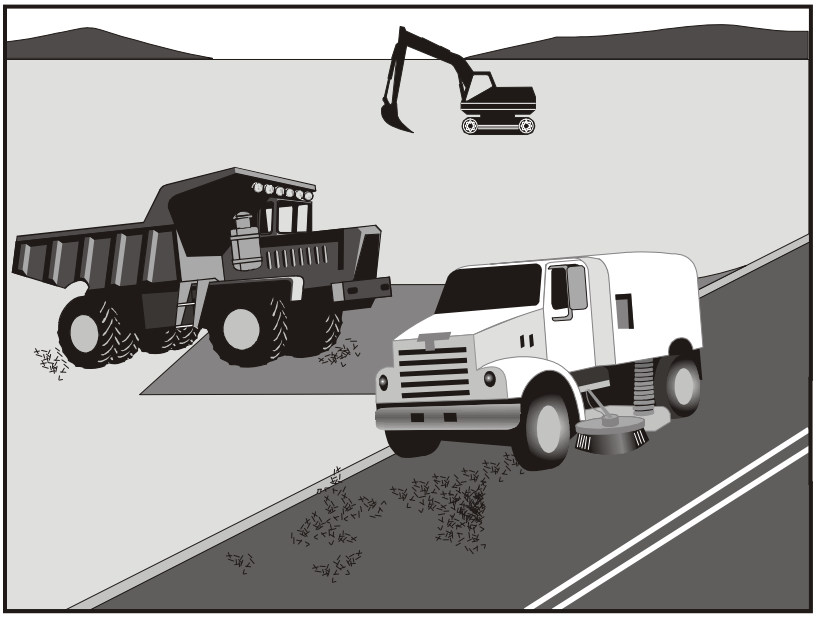
A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Street Sweeping and Vacuuming SE-7



Categories		
EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.
- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.

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- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd^3 hopper) to $88/hour (9 yd^3 hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

Attachment F
Infiltration Report

September 27, 2019

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Bridge Development Partners
1600 E. Franklin Avenue, Suite D
El Segundo, California 90245

Attention: Mr. Brendan Kotler
Vice President, Development

Project No.: **19G188-2**

Subject: **Results of Infiltration Testing**
Proposed Warehouse Development
4th Street, West of Barrington Avenue
Rancho Cucamonga, California

Reference: Geotechnical Investigation, Proposed Warehouse Development, 4th Street, West of Barrington Avenue, Rancho Cucamonga, California, prepared for Bridge Development Partners, by Southern California Geotechnical, Inc. (SCG), SCG Project No. 19G188-1, dated September 27, 2019.

Gentlemen:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 19P322, dated August 13, 2019. The scope of services included site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the onsite soils. The infiltration testing was performed in general accordance with ASTM Test Method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

Site and Project Description

The subject site is located on the north side of 4th Street, 180± feet west of the intersection of 4th Street and Barrington Avenue in Rancho Cucamonga, California. The site is bounded to the north by 6th Street, to the west by existing commercial/industrial buildings, to the south by 4th Street, and to the east by an existing commercial/industrial building and the West Valley Detention Center. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 of this report.

The site presently consists of a Big Lots warehouse and distribution facility made up of two (2) rectangular-shaped parcels, which total 90.13 acres in size. The southern parcel is developed with a commercial/industrial building, 1,380,000± ft² in size, located in the northwestern region of the parcel. The building is of concrete tilt-up construction, supported on a conventional shallow

foundation with concrete slab-on-grade floors. The building possesses dock-high doors along the eastern and northern building walls, and is surrounded by concrete pavements in the loading dock and drive lane areas. A smaller building, 26,800± ft² in size, is located in the southwestern corner of the parcel. The smaller building appears to also be of concrete tilt-up construction, supported on a conventional shallow foundation with a concrete slab-on-grade floor. Two (2) asphaltic concrete parking lots are located in the southeastern and southwestern areas of the parcel. The pavements in the southern parcel are generally in fair to poor condition with moderate cracking throughout. Areas of turf grass and landscape planters containing large-sized trees are also located in the southern area of the southern parcel.

The northern parcel is vacant of any structures. The northern area of this parcel is presently being utilized as a grape vineyard. The ground surface cover consists of exposed soil with rows of grape vines. The central and southwestern portions of the northern parcel are presently being utilized as trailer parking lots. The ground surface cover in the central trailer lot consists of crushed aggregate base (CAB) and the southwestern lot is developed with concrete pavements. An asphaltic concrete parking lot is located in the southeastern area of the parcel. The pavements in the northern parcel are generally in fair condition with moderate cracking throughout.

Detailed topographic information was not available at the time of this report. However, based on topographic information obtained from Google Earth, the site topography ranges from 1090± feet mean sea level (msl) in the northwestern area of the site to 1048± feet msl in the southeastern area of the site. The site topography in the southern parcel generally slopes downward to the south at a gradient of less than 1± percent, and to the south at a gradient of 2± percent in the northern parcel.

Proposed Development

Based on the most recent site plan provided to our office by the client, the site will be developed with one new warehouse, 1,430,660± ft^2 in size to be constructed on the southern parcel. Dock-high doors will be constructed along the east and west sides of the warehouse. The building will be surrounded by asphaltic concrete pavements for parking and drive lanes, and Portland cement concrete pavements for the loading dock areas. Several landscape planters and concrete flatwork will be included throughout the site. The existing buildings will need to be demolished to facilitate the new construction.

We understand that the proposed development will include on-site infiltration to dispose of storm water. Based on an infiltration test exhibit provided to our office, the proposed infiltration systems will consist of a total of four (4) below-grade chamber systems located in the northern area of the northern parcel and in the northern, eastern, and western areas of the southern parcel. The bottoms of the chamber systems will each extend to a depth of 12± feet below the existing site grades. It should be noted that due to the presence of the existing development, the infiltration testing was only completed for three (3) of the four (4) proposed below-grade chamber systems.

Concurrent Study

SCG recently conducted a geotechnical investigation at the subject site, referenced above. As part of this study, twenty (20) borings were advanced to depths of 15 to 25± feet below existing site grades. Asphaltic concrete pavements were present at the ground surface at three (3) of the

boring locations, which consist of 3 to 5± inches of asphaltic concrete with 0 to 18± inches of underlying aggregate base. Portland cement concrete was encountered at the ground surface at eleven (11) of boring locations, consisting of 5½ to 12± inches of Portland cement concrete. Artificial fill soils were encountered beneath the pavements at most of the boring locations and at the ground surface at two (2) of the boring locations. The fill soils extend to depths of 1½ to 5½± feet and generally consist of medium dense to dense silty fine sands and fine sands with variable amounts of medium to coarse sand, fine to coarse gravel, and occasional calcareous veining. Native alluvial soils were encountered at the ground surface of four (4) of the boring locations and beneath the pavements and fill soils at all of the other boring locations. The alluvium extends to at least the maximum depth explored of 25± feet. The alluvial soils generally consist of loose to very dense fine sands with variable amounts of medium to coarse sands and gravel, and loose to very dense silty fine to coarse sands with variable amounts of clay, gravel, and occasional calcareous veining. Occasional loose to medium dense fine sandy silt layers with trace amounts of iron oxide staining and calcareous veining, were encountered within the upper 2½ to 8± feet and between 12 to 20± feet below the ground surface. One of the borings encountered a clayey silt layer from 17 to 19½± feet.

Groundwater

Groundwater was not encountered at any of the borings. Based on the lack of any water within the borings and the moisture contents of the recovered soil samples, the static groundwater table is considered to have existed at a depth in excess of 25± feet below existing site grades at the time of the subsurface investigation. As part of our research, we reviewed readily available groundwater data in order to determine regional groundwater depths. Recent water level data was obtained from the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. The nearest monitoring well on record is located approximately 8,484 feet south of the site. Water level readings within this monitoring well indicate a groundwater level of 283± feet (March 2019) below the ground surface.

Subsurface Exploration

Scope of Exploration

The subsurface exploration for the infiltration testing consisted of four (4) backhoe-excavated trenches, extending to depths of 8 to 11½± feet below existing site grades. The trenches were logged during the excavation by a member of our staff. The approximate locations of the infiltration trenches (identified as I-1 through I-4) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Geotechnical Conditions

Artificial fill soils were encountered at the ground surface at Infiltration Trench Nos. I-2 and I-4, extending 1½ to 2± feet below the existing site grades. The fill soils generally consist of loose to medium dense fine to medium sands and silty fine to medium sands with little coarse sand and trace to little fine gravel. The fill soils possess a disturbed and mottled appearance, paper fragments within Trench No. I-4, and both of the trenches exposed ¾-inch diameter, intact PVC pipes ½ to 1± foot below the ground surface, resulting in their classification as artificial fill.

Native alluvium was encountered below the artificial fill soils and at the ground surface the Infiltration Trench Nos. I-1 and I-3. The alluvial soils generally consist of very loose to dense silty fine sands to fine sandy silts, silty fine to medium sands, fine sands, and fine to coarse sands with varying fine to coarse gravel and silt content, extending to the maximum depth explored of 11½± feet below the existing site grades. The Trench Logs, which illustrate the conditions encountered at the infiltration test locations, are included with this report.

Infiltration Testing

We understand that the results of the testing will be used to prepare a preliminary design for the storm water infiltration systems that will be used at the subject site. As previously mentioned, the infiltration testing was performed in general accordance with ASTM Test Method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

Two stainless steel infiltration rings were used for the infiltration testing. The outer infiltration ring is 2 feet in diameter and 20 inches in height. The inner infiltration ring is 1 foot in diameter and 20 inches in height. At the test locations, the outer ring was driven 3± inches into the soil at the base of each trench. The inner ring was centered inside the outer ring and subsequently driven 3± inches into the soil at the base of the trench. The rings were driven into the soil using a ten-pound sledge hammer. The soil surrounding the wall of the infiltration rings was only slightly disturbed during the driving process.

Infiltration Testing Procedure

Infiltration testing was performed at all four (4) of the trench locations. The infiltration testing consisted of filling the inner ring and the annular space (the space between the inner and outer rings) with water, approximately 3 to 4 inches above the soil. To prevent the flow of water from one ring to the other, the water level in both the inner ring and the annular space between the rings was maintained using constant-head float valves. The volume of water that was added to maintain a constant head in the inner ring and the annular space during each time interval was determined and recorded. A cap was placed over the rings to minimize the evaporation of water during the tests.

The schedule for readings was determined based on the observed soil type at the base of each backhoe-excavated trench. Based on the existing soils at each infiltration test location, the volumetric measurements were made at increments ranging from 2 to 5 minutes. The water volume measurements are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on these spreadsheets.

The infiltration rates for the infiltration tests are calculated in centimeters per hour and then converted to inches per hour. The rates are summarized below:

Infiltration Test No.	Depth (feet)	Soil Description	Infiltration Rate (inches/hour)
I-1	11½	Silty fine to medium Sand	2.6
I-2	10½	Silty fine to medium Sand, trace coarse Sand	4.3
I-3	8	Silty fine to medium Sand	4.1
I-4	9	Silty fine to medium Sand	7.7

Laboratory Testing

Moisture Content

The moisture contents for selected soil samples within the trenches were determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Trench Logs.

Grain Size Analysis

The grain size distribution of selected soils collected from the base of each infiltration test trench has been determined using a range of wire mesh screens. These tests were performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of the grainsize analysis are presented on Plates C-1 through C-4 of this report.

Design Recommendations

Four (4) infiltration tests were performed at the subject site. As noted above, the calculated infiltration rates at the infiltration test locations range from 2.6 to 7.7 inches per hour due to the varying relative densities and the silt content of the soil exposed at the bottom of each infiltration trench. Based on the results of Infiltration Test No. I-1, we recommend a design infiltration rate of 2.6 inches per hour be used for the design of the proposed below-grade chamber system located in the northern area the northern parcel. Based on the results of Infiltration Test Nos. I-2 and I-3, we recommend an infiltration rate of 4.1 inches per hour be used for the design of the proposed chamber system located in the northern area of the southern parcel. Based on the results of Infiltration Test No. I-4, we recommend an infiltration rate of 7.7 inches per hour be used for the design of the proposed chamber system located in the eastern area of the southern parcel.

We recommend that a representative from the geotechnical engineer be on-site during the construction of the proposed infiltration systems to identify the soil classification at the base of each chamber system. It should be confirmed that the soils at the base of the proposed infiltration

systems correspond with those presented in this report to ensure that the performance of the systems will be consistent with the rates reported herein.

The design of the proposed storm water infiltration systems should be performed by the project civil engineer, in accordance with the City of Rancho Cucamonga and/or County of San Bernardino guidelines. However, it is recommended that the system be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the systems. The presence of such materials would decrease the effective infiltration rates. **It is recommended that the project civil engineer apply an appropriate factor of safety. The infiltration rates recommended above are based on the assumption that only clean water will be introduced to the subsurface profile. Any fines, debris, or organic materials could significantly impact the infiltration rates.** It should be noted that the recommended infiltration rates are based on infiltration testing at four (4) discrete locations and the overall infiltration rates of the storm water infiltration systems could vary considerably.

Construction Considerations

The infiltration rates presented in this report are specific to the tested locations and tested depths. Infiltration rates can be significantly reduced if the soils are exposed to excessive disturbance or compaction during construction. Therefore, the subgrade soils within proposed infiltration system areas should not be overexcavated, undercut or compacted in any significant manner. **It is recommended that a note to this effect be added to the project plans and/or specifications.**

Infiltration versus Permeability

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. The infiltration rates presented herein were determined in accordance with the ASTM Test Method D-3385-03 standard and are considered valid for the time and place of the actual test. Changes in soil moisture content will affect these infiltration rates. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

Location of Infiltration Systems

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration areas could potentially be damaged due to saturation of subgrade soils. **The proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls.** Even with this provision of locating the infiltration systems at least 25 feet from the building, it is

possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration systems.

General Comments

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rates contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur. The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between trench locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Scott McCann
Staff Scientist

Robert G. Trazo, GE 2655
Principal Engineer

Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Trench Logs (4 pages)
Infiltration Test Results Spreadsheets (4 pages)
Grain Size Distribution Graphs (4 pages)

SOURCE: SAN BERNARDINO COUNTY
THOMAS GUIDE, 2013

SITE LOCATION MAP

PROPOSED WAREHOUSE DEVELOPMENT

RANCHO CUCAMONGA, CALIFORNIA

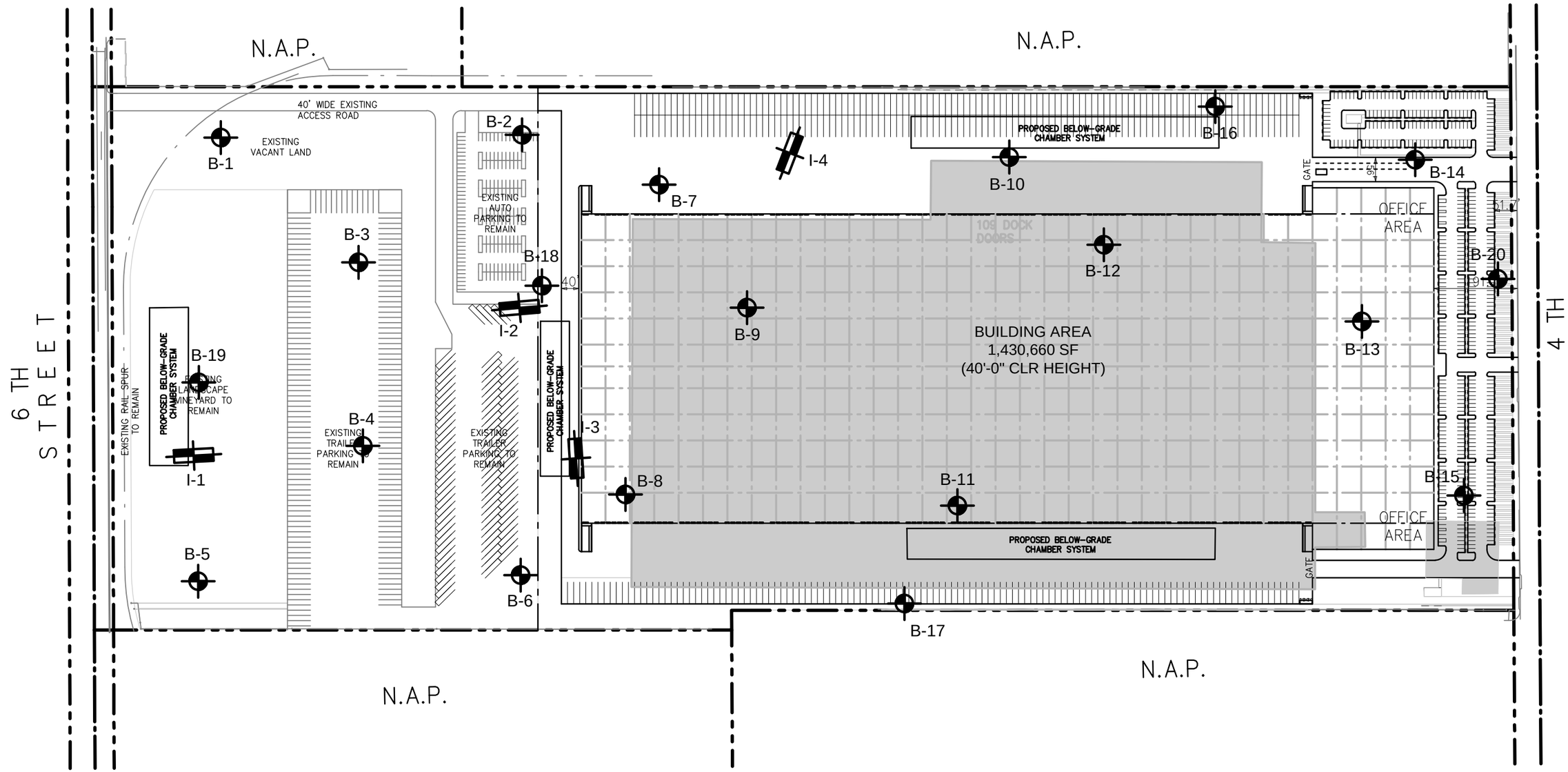
SCALE: 1" = 2400'

DRAWN: JH
CHKD: RGT

SCG PROJECT
19G188-2

PLATE 1

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



GEOTECHNICAL LEGEND

- APPROXIMATE INFILTRATION TEST LOCATION
- APPROXIMATE BORING LOCATION FROM CONCURRENT STUDY (SCG PROJECT NO. 19G188-1)
- EXISTING BUILDINGS TO BE DEMOLISHED

NORTH
SoCalGeo

NOTE: SITE PLAN PREPARED BY RGA.

INFILTRATION TEST LOCATION PLAN
PROPOSED WAREHOUSE DEVELOPMENT
RANCHO CUCAMONGA, CALIFORNIA

SCALE: 1" = 240'	
DRAWN: SAM CHKD: RGT	
SCG PROJECT 19G188-2	
PLATE 2	

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO.
I-1

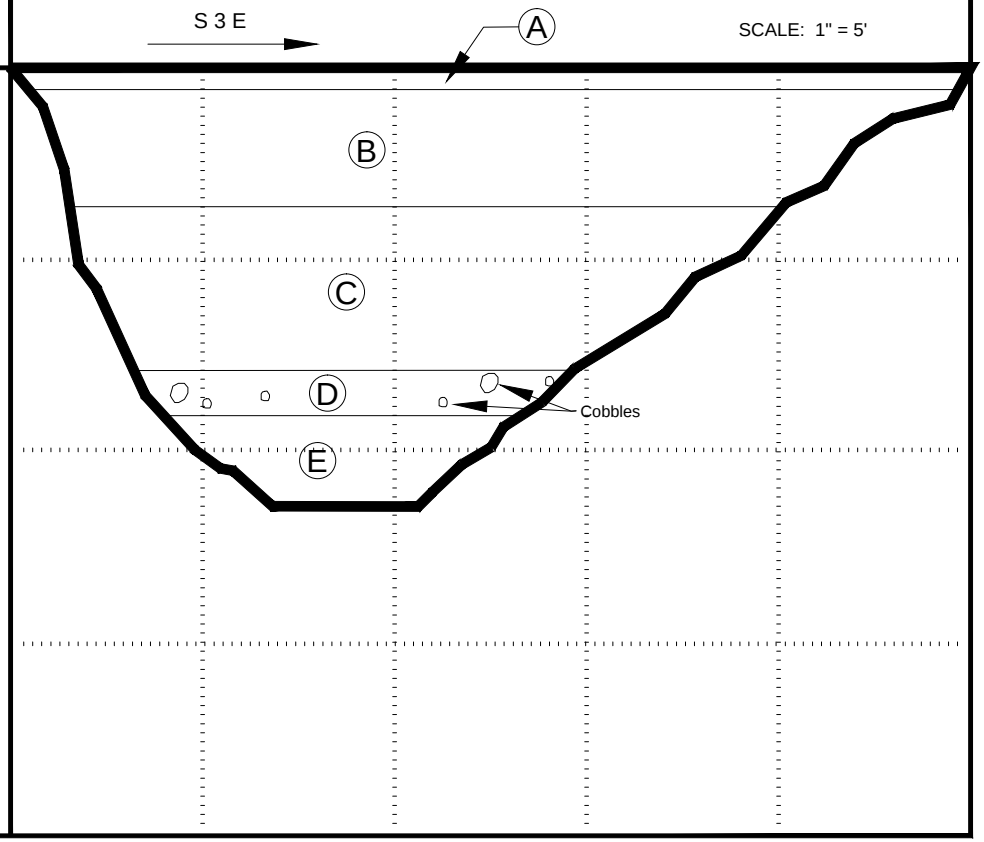
JOB NO.: 19G188-2
PROJECT: Proposed Warehouse Development
LOCATION: Rancho Cucamonga, CA
DATE: 9-9-2019

EQUIPMENT USED: Backhoe
LOGGED BY: Scott McCann
ORIENTATION: S 3 E
ELEVATION:

WATER DEPTH: Dry
SEEPAGE DEPTH: Dry
READINGS TAKEN: At Completion

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		5	A: ALLUVIUM: Light Gray Brown fine Sand, little Silt, little medium to coarse Sand, little fine Gravel, trace fine root fibers, very loose - dry B: ALLUVIUM: Gray Brown fine Sand, little medium Sand, little Silt, trace coarse Sand, trace roots, loose to medium dense - damp
5	b		8	C: ALLUVIUM: Light Brown to Brown Silty fine Sand, trace to little medium Sand, trace coarse Sand, trace fine Gravel, trace calcareous veining, medium dense - damp to moist
	b		2	D: ALLUVIUM: Light Gray fine to coarse Sand, little fine Gravel, trace coarse Gravel, occasional Cobbles, medium dense to dense - dry to damp E: ALLUVIUM: Light Gray Brown to Brown Silty fine to medium Sand, medium dense - moist
10	b		10	
				Trench Terminated @ 11.5 feet
15				

GRAPHIC REPRESENTATION



KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER
(RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-1

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. I-2

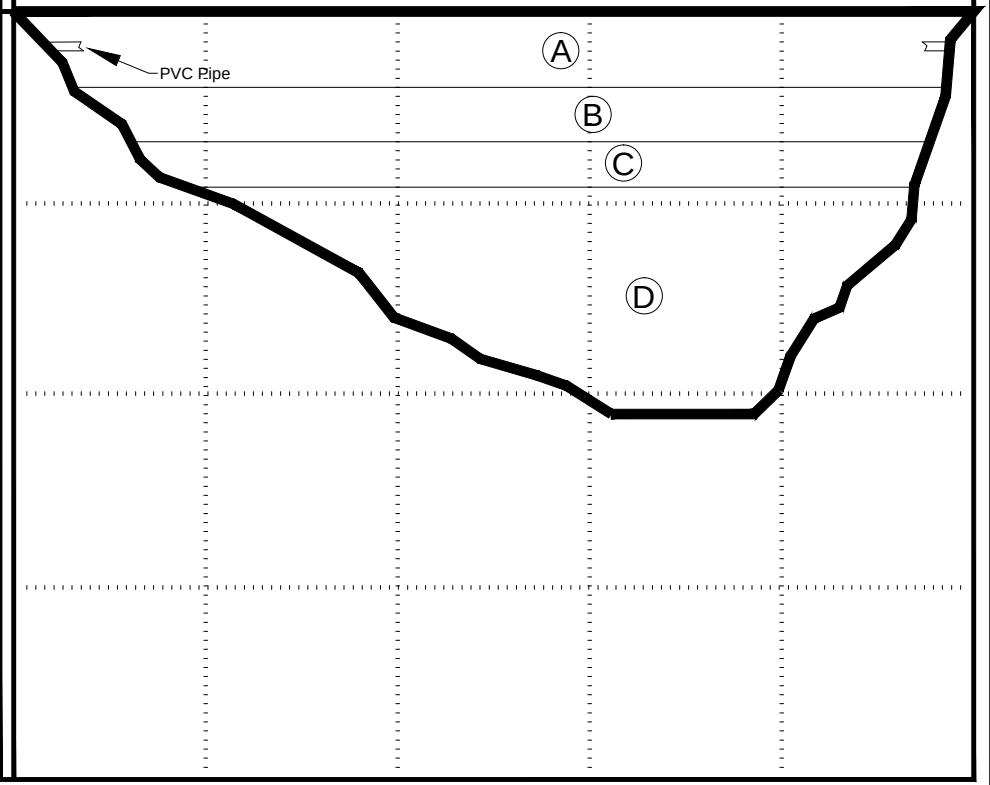
JOB NO.: 19G188-2
PROJECT: Proposed Warehouse Development
LOCATION: Rancho Cucamonga, CA
DATE: 9-9-2019

EQUIPMENT USED: Backhoe
LOGGED BY: Scott McCann
ORIENTATION: N 5 W
ELEVATION:

WATER DEPTH: Dry
SEEPAGE DEPTH: Dry
READINGS TAKEN: At Completion

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		1	A: FILL: Light Gray Brown fine to medium Sand, little coarse Sand, trace fine Gravel, trace Silt, 3/4" diameter intact PVC pipe, trace fine root fibers, trace roots, loose to medium dense - dry
	b		1	B: ALLUVIUM: Light Gray fine to coarse Sand, little fine Gravel, trace coarse Gravel, trace roots, medium dense to dense - dry
	b		5	C: ALLUVIUM: Gray Brown Silty fine Sand, trace medium Sand, trace fine root fibers, medium dense - damp
5				D: ALLUVIUM: Light Gray Brown Silty fine to medium Sand, trace coarse Sand, medium dense - damp
10	b		3	
				Trench Terminated @ 10.5 feet
15				

GRAPHIC REPRESENTATION



KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER (RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-2

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. I-3

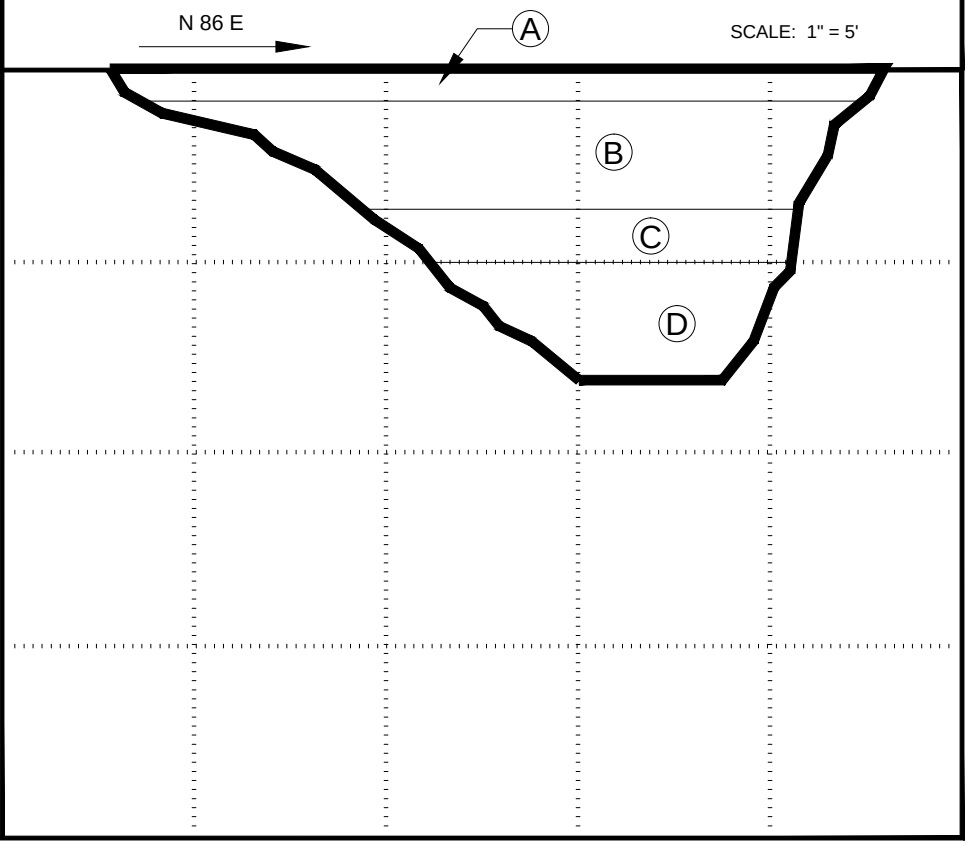
JOB NO.: 19G188-2
PROJECT: Proposed Warehouse Development
LOCATION: Rancho Cucamonga, CA
DATE: 9-10-2019

EQUIPMENT USED: Backhoe
LOGGED BY: Scott McCann
ORIENTATION: N 86 E
ELEVATION:

WATER DEPTH: Dry
SEEPAGE DEPTH: Dry
READINGS TAKEN: At Completion

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
5	b		4	A: ALLUVIUM: Light Brown fine to medium Sand, little coarse Sand, little Silt, trace fine Gravel, trace fine root fibers, trace to abundant roots, loose to medium dense - dry to damp
	b		7	B: ALLUVIUM: Light Brown to Brown fine Sand, little medium Sand, trace coarse Sand, trace Silt, trace fine root fibers and roots, medium dense - damp
				C: ALLUVIUM: Light Brown Silty fine Sand to fine Sandy Silt, trace to little medium Sand, trace calcareous veining, dense - damp
				D: ALLUVIUM: Light Gray Brown Silty fine to medium Sand, medium dense - damp
	b		4	
10				Trench Terminated @ 8 feet
15				

GRAPHIC REPRESENTATION



KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER (RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-3

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH NO. I-4

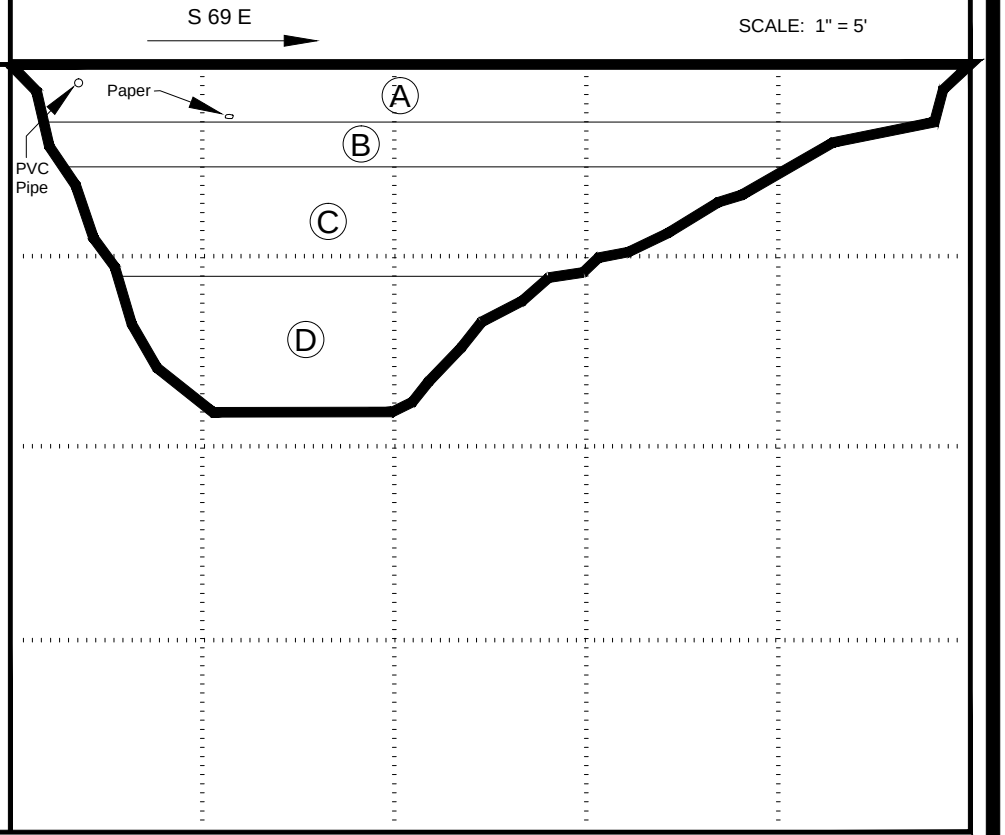
JOB NO.: 19G188-2
PROJECT: Proposed Warehouse Development
LOCATION: Rancho Cucamonga, CA
DATE: 9-10-2019

EQUIPMENT USED: Backhoe
LOGGED BY: Scott McCann
ORIENTATION: S 69 E
ELEVATION:

WATER DEPTH: Dry
SEEPAGE DEPTH: Dry
READINGS TAKEN: At Completion

DEPTH	SAMPLE	DRY DENSITY (PCF)	MOISTURE (%)	EARTH MATERIALS DESCRIPTION
	b		5	A: FILL: Light Gray Brown to Brown Silty fine to medium Sand, little coarse Sand, trace to little fine Gravel, trace paper fragments, 3/4" diameter intact PVC pipe, mottled, medium dense - damp
	b		5	B: ALLUVIUM: Light Brown Silty fine Sand, little medium Sand, trace coarse Sand, trace calcareous veining, medium dense to dense - damp
	b		6	C: ALLUVIUM: Brown fine to medium Sand, trace to little coarse Sand, little Silt, abundant calcareous veining, slightly cemented, dense - damp
5				
	b		5	D: ALLUVIUM: Light Gray Brown Silty fine to medium Sand, loose to medium dense - damp
10				Trench Terminated @ 9 feet
15				

GRAPHIC REPRESENTATION



KEY TO SAMPLE TYPES:
B - BULK SAMPLE (DISTURBED)
R - RING SAMPLE 2-1/2" DIAMETER (RELATIVELY UNDISTURBED)

TRENCH LOG

PLATE B-4

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse Development
Project Location	Rancho Cucamonga, CA
Project Number	19G188-2
Engineer	Scott McCann

Infiltration Test No: I-1

Constants

	Diameter (ft)	Area (ft^2)	Area (cm^2)
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval **Elapsed** (min)	Flow Readings: Inner Ring (ml)	Flow Readings: Ring Flow (cm^3)	Flow Readings: Annular Ring (ml)	Flow Readings: Space Flow (cm^3)	Infiltration Rates: Inner Ring* (cm/hr)	Infiltration Rates: Annular Space* (cm/hr)	Infiltration Rates: Inner Ring* (in/hr)	Infiltration Rates: Annular Space* (in/hr)
1	Initial	9:30 AM	5	200	700	700	2450	11.51	13.43	4.53	5.29
	Final	9:35 AM	**5**	900		3150					
2	Initial	9:36 AM	5	100	525	400	2100	8.63	11.51	3.40	4.53
	Final	9:41 AM	**11**	625		2500					
3	Initial	9:42 AM	5	650	450	2600	1500	7.40	8.22	2.91	3.24
	Final	9:47 AM	**17**	1100		4100					
4	Initial	9:48 AM	5	100	450	500	1600	7.40	8.77	2.91	3.45
	Final	9:53 AM	**23**	550		2100					
5	Initial	9:54 AM	5	550	425	2100	1550	6.99	8.50	2.75	3.35
	Final	9:59 AM	**29**	975		3650					
6	Initial	10:00 AM	5	850	400	700	1600	6.58	8.77	2.59	3.45
	Final	10:05 AM	**35**	1250		2300					
7	Initial	10:06 AM	5	1350	400	5200	1700	6.58	9.32	2.59	3.67
	Final	10:11 AM	**41**	1750		6900					

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse Development
Project Location	Rancho Cucamonga, CA
Project Number	19G188-2
Engineer	Scott McCann

Infiltration Test No: I-2

Constants

	Diameter (ft)	Area (ft^2)	Area (cm^2)
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval **Elapsed** (min)	Flow Readings: Inner Ring (ml)	Flow Readings: Ring Flow (cm^3)	Flow Readings: Annular Ring (ml)	Flow Readings: Space Flow (cm^3)	Infiltration Rates: Inner Ring* (cm/hr)	Infiltration Rates: Annular Space* (cm/hr)	Infiltration Rates: Inner Ring* (in/hr)	Infiltration Rates: Annular Space* (in/hr)
1	Initial	12:45 PM	2	300	500	200	2000	20.56	27.41	8.09	10.79
	Final	12:47 PM	**2**	800		2200					
2	Initial	12:49 PM	2	800	450	2200	1400	18.50	19.19	7.28	7.55
	Final	12:51 PM	**6**	1250		3600					
3	Initial	12:53 PM	2	1250	450	3600	1700	18.50	23.30	7.28	9.17
	Final	12:55 PM	**10**	1700		5300					
4	Initial	12:57 PM	3	50	600	400	2750	16.45	25.13	6.48	9.89
	Final	1:00 PM	**15**	650		3150					
5	Initial	1:02 PM	3	650	500	3200	2200	13.71	20.10	5.40	7.91
	Final	1:05 PM	**20**	1150		5400					
6	Initial	1:06 PM	3	1150	425	5500	2000	11.65	18.27	4.59	7.19
	Final	1:09 PM	**24**	1575		7500					
7	Initial	1:10 PM	3	1575	400	7600	1900	10.96	17.36	4.32	6.83
	Final	1:13 PM	**28**	1975		9500					

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse Development
Project Location	Rancho Cucamonga, CA
Project Number	19G188-2
Engineer	Scott McCann

Infiltration Test No: I-3

Constants

	Diameter (ft)	Area (ft^2)	Area (cm^2)
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval **Elapsed** (min)	Flow Readings: Inner Ring (ml)	Flow Readings: Ring Flow (cm^3)	Flow Readings: Annular Ring (ml)	Flow Readings: Space Flow (cm^3)	Infiltration Rates: Inner Ring* (cm/hr)	Infiltration Rates: Annular Space* (cm/hr)	Infiltration Rates: Inner Ring* (in/hr)	Infiltration Rates: Annular Space* (in/hr)
1	Initial	10:30 AM	5	200	1125	850	4650	18.50	25.49	7.28	10.04
	Final	10:35 AM	**5**	1325		5500					
2	Initial	10:36 AM	5	50	750	400	4200	12.33	23.03	4.86	9.07
	Final	10:41 AM	**11**	800		4600					
3	Initial	10:42 AM	5	0	650	100	4000	10.69	21.93	4.21	8.63
	Final	10:47 AM	**17**	650		4100					
4	Initial	10:48 AM	5	650	675	2900	4000	11.10	21.93	4.37	8.63
	Final	10:53 AM	**23**	1325		6900					
5	Initial	10:54 AM	5	100	675	200	3950	11.10	21.65	4.37	8.53
	Final	10:59 AM	**29**	775		4150					
6	Initial	11:00 AM	5	775	625	5250	3800	10.28	20.83	4.05	8.20
	Final	11:05 AM	**35**	1400		9050					
7	Initial	11:06 AM	5	400	625	1100	3750	10.28	20.56	4.05	8.09
	Final	11:11 AM	**41**	1025		4850					

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse Development
Project Location	Rancho Cucamonga, CA
Project Number	19G188-2
Engineer	Scott McCann

Infiltration Test No: I-4

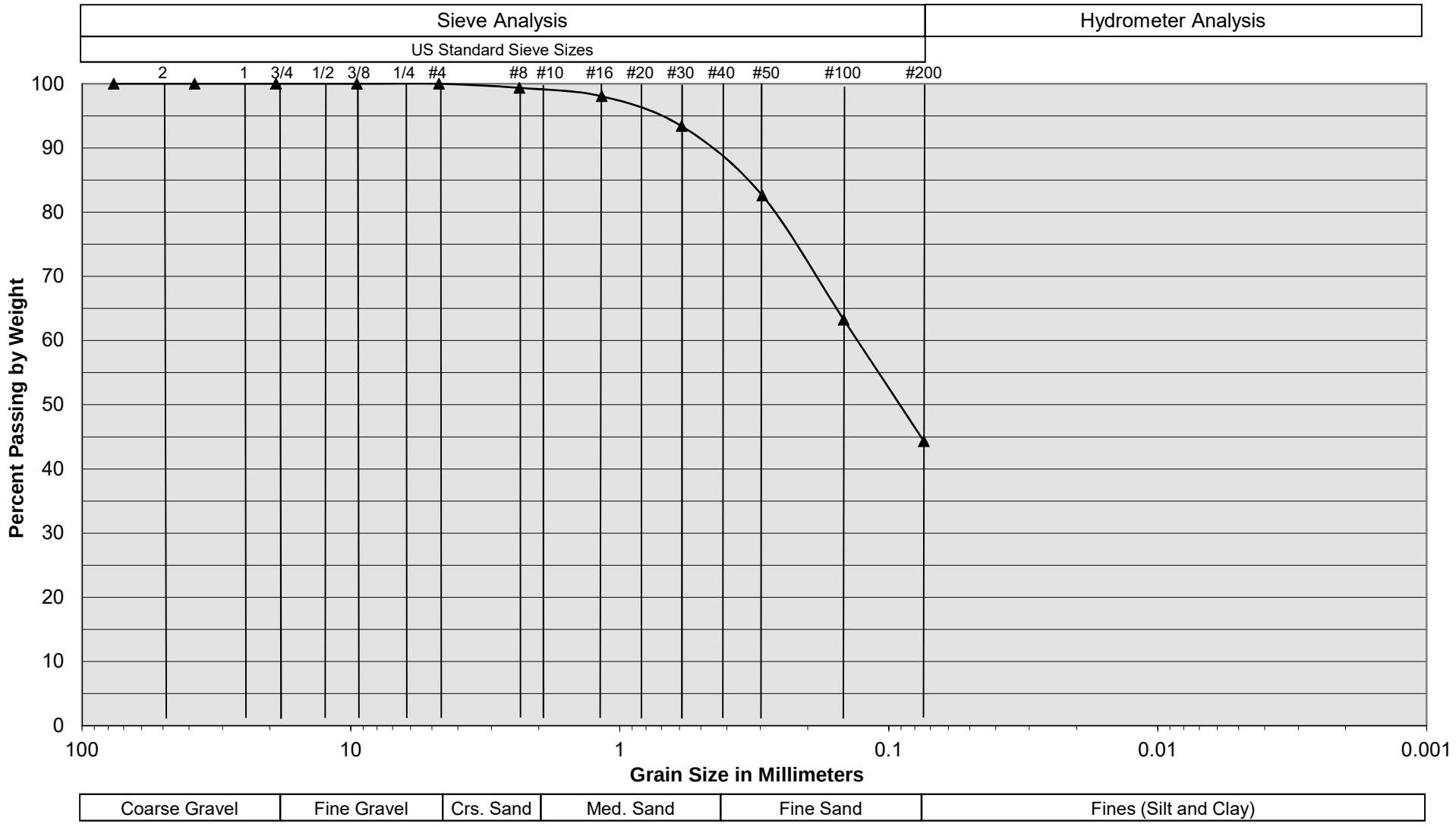
Constants

	Diameter (ft)	Area (ft^2)	Area (cm^2)
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval **Elapsed** (min)	Flow Readings: Inner Ring (ml)	Flow Readings: Ring Flow (cm^3)	Flow Readings: Annular Ring (ml)	Flow Readings: Space Flow (cm^3)	Infiltration Rates: Inner Ring* (cm/hr)	Infiltration Rates: Annular Space* (cm/hr)	Infiltration Rates: Inner Ring* (in/hr)	Infiltration Rates: Annular Space* (in/hr)
1	Initial	8:00 AM	2	150	1050	550	3600	43.17	49.34	17.00	19.43
	Final	8:02 AM	**2**	1200		4150					
2	Initial	8:03 AM	2	200	900	600	3500	37.00	47.97	14.57	18.89
	Final	8:05 AM	**5**	1100		4100					
3	Initial	8:06 AM	2	200	800	900	3100	32.89	42.49	12.95	16.73
	Final	8:08 AM	**8**	1000		4000					
4	Initial	8:09 AM	2	100	725	400	2950	29.81	40.43	11.74	15.92
	Final	8:11 AM	**11**	825		3350					
5	Initial	8:12 AM	2	150	600	500	2900	24.67	39.75	9.71	15.65
	Final	8:14 AM	**14**	750		3400					
6	Initial	8:15 AM	2	250	550	1200	2600	22.61	35.63	8.90	14.03
	Final	8:17 AM	**17**	800		3800					
7	Initial	8:18 AM	2	100	525	850	2500	21.59	34.26	8.50	13.49
	Final	8:20 AM	**20**	625		3350					
8	Initial	8:21 AM	2	200	525	1500	2400	21.59	32.89	8.50	12.95
	Final	8:23 AM	**23**	725		3900					
9	Initial	8:24 AM	2	800	500	2350	2350	20.56	32.21	8.09	12.68
	Final	8:26 AM	**26**	1300		4700					
10	Initial	8:27 AM	2	1350	475	4950	2300	19.53	31.52	7.69	12.41
	Final	8:29 AM	**29**	1825		7250					

Grain Size Distribution

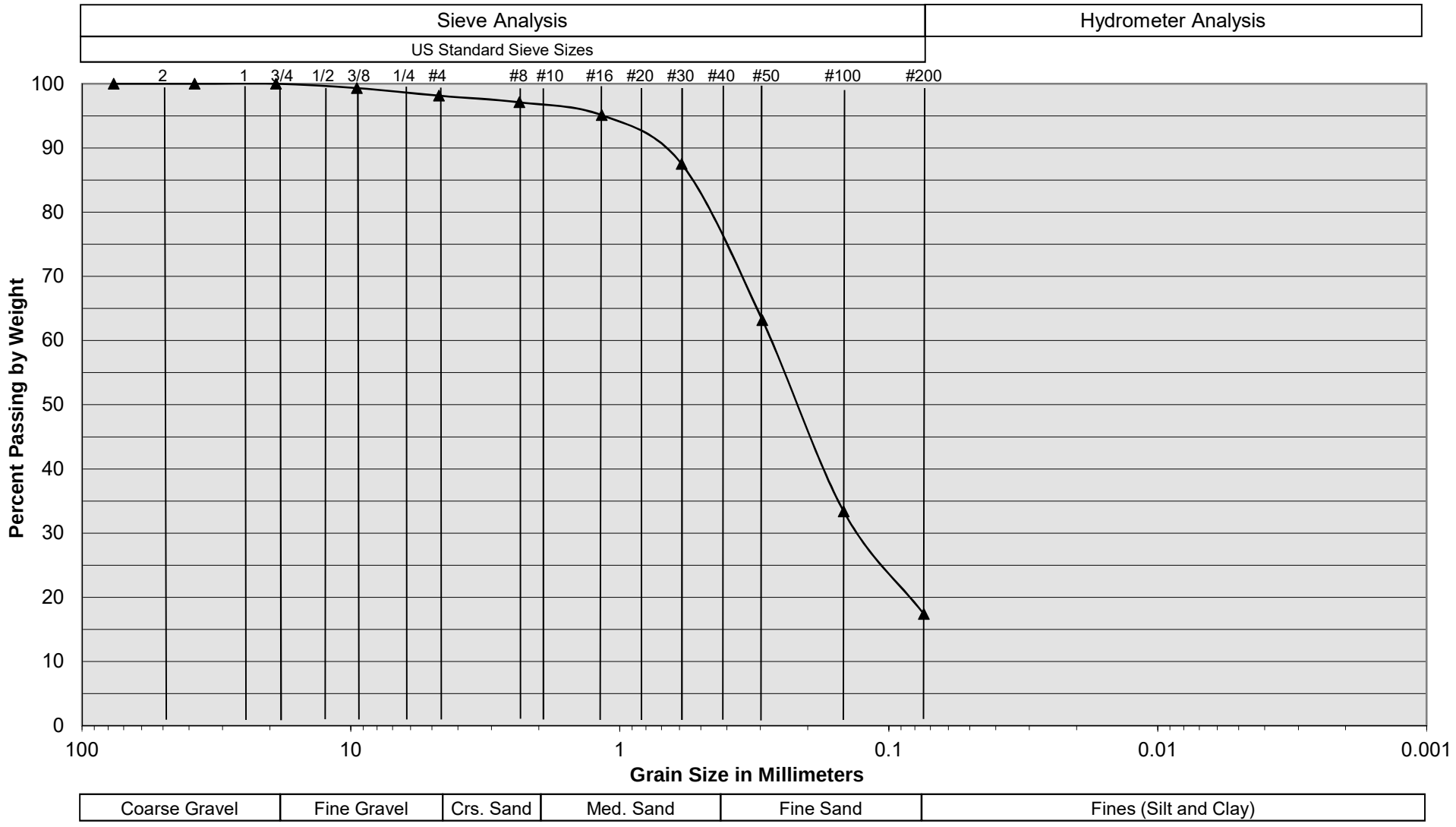


Sample Description	I-1 @ 11½ feet
Soil Classification	Light Gray Brown to Brown Silty fine to medium Sand

Proposed Warehouse Development
Rancho Cucamonga, CA
Project No. 19G188-2
PLATE C-1

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

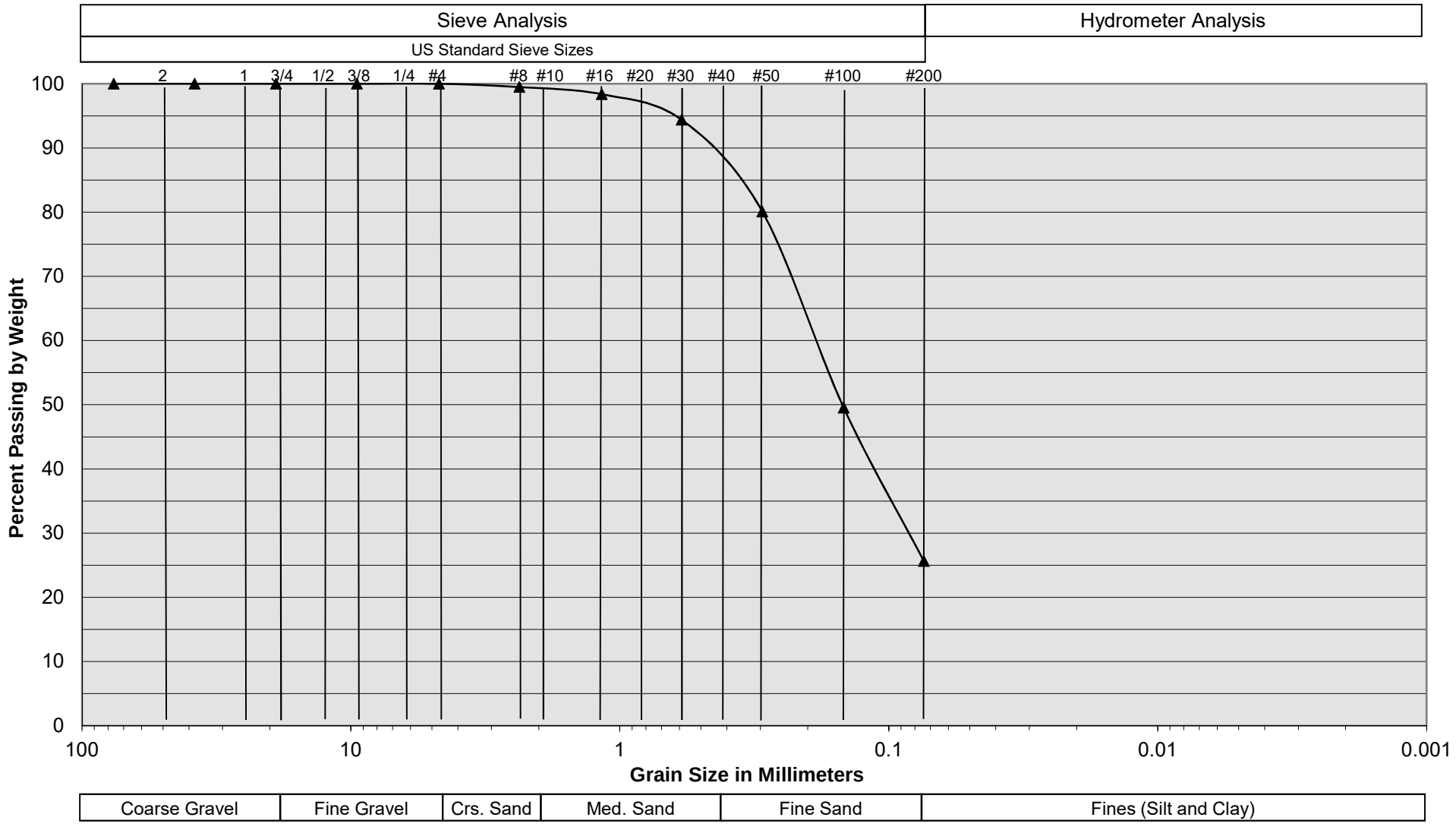


Sample Description	I-2 @ 10½ feet
Soil Classification	Light Gray Brown Silty fine to medium Sand, trace coarse Sand

Proposed Warehouse Development
Rancho Cucamonga, CA
Project No. 19G188-2
PLATE C-2

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution



Sample Description	I-3 @ 8 feet
Soil Classification	Light Gray Brown Silty fine to medium Sand

Proposed Warehouse Development
Rancho Cucamonga, CA
Project No. 19G188-2
PLATE C-3

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
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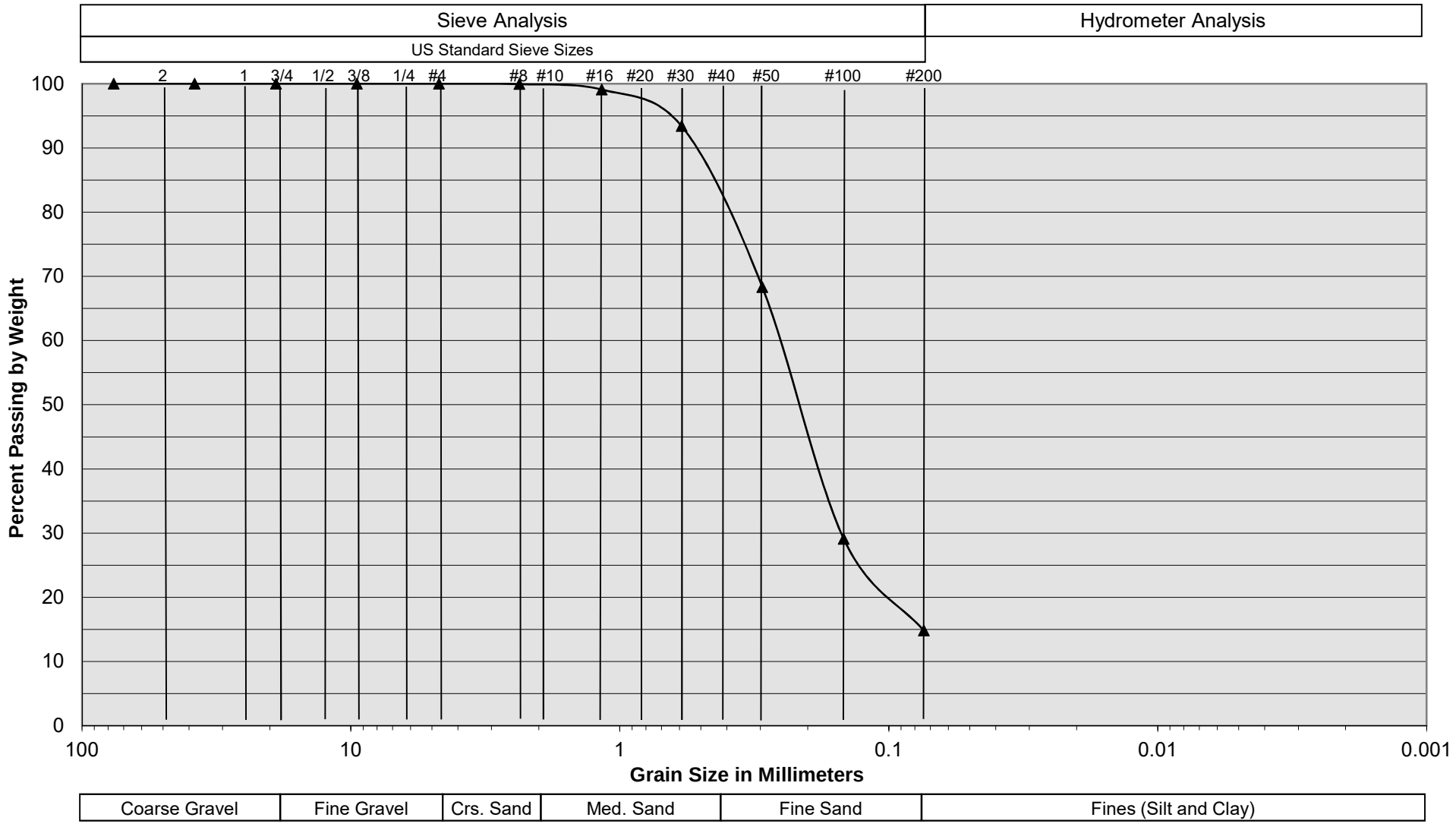
Grain Size Distribution



Sample Description	I-4 @ 9 feet
Soil Classification	Light Gray Brown Silty fine to medium Sand

Proposed Warehouse Development
Rancho Cucamonga, CA
Project No. 19G188-2
PLATE C-4

SoCalGeo
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A California Corporation

Attachment G
BMP Maintenance Material

Maintenance and Inspection Proposal

Date _____ Project Name _____

Project Address _____ **Rancho Cucamonga, CA 91730**

Contact _____ Phone ( ) Email _____

Contract Term **Annual Maintenance (2x / year)** * Subject to Automatic Renewal

Following, please find details of Bio Clean's Maintenance Program and a Proposal to service the Stormwater Systems located at the above referenced project. Bio Clean's recommended cleaning is quarterly for filter inserts (or 2x/yr optional), or per local agency or city requirements. Hydrodynamic separators and LID units should be cleaned one time per year and inspected six months after the cleaning to ensure proper functioning, or per local agency or city requirements. The Maintenance Program incorporates a tracking number used to identify each unit and preserve its history.

Quantity	Description of Service	Size	Cost Per Unit	Services Per Year	Total
X	Pipe Jetting - StormTech MC3500 chambers	XX	$XX	X	$XX
X	Curb Type Filter Cleaning & Debris Disposal	BC-CURB-30	$XX	X	$XX
X	Grate Type Filter Cleaning & Debris Disposal	BC-GRATE-MLS 25-38-24	$XX	X	$XX
X	Downspout Filter Cleaning	BC-DS-8	$XX	X	$XX
10%	Vehicle Maintenance / Fuel Surcharge				$XX
		Cost			**XX**

Notes: Non-Prevailing wage rates. Site inspection of BMP's not performed, list prices are subject to change. 2x/year service is for curb/grate filter inserts only. Pipe jetting cost is hourly, list price is for one full day (8 hours). Price is subject to change if pipes are compacted with debris upon site inspection.

Program Details

Filter Insert Details:
- Visual inspection of catch basin and filter insert for illicit discharge or structural deterioration. Filter insert condition will be noted.
- Clean filter insert. Remove trash, foliage and sediment. Power wash and inspect filter for minor damages.
- Evaluate Hydrocarbon Booms. Booms will be changed out a minimum of one time per year, if needed, unless noted. Replacement will be noted.
- Transport and dispose collected pollutants, liquids and hydrocarbon booms to approved facility in accordance with local and state requirements.
- A written report identifying collected pollutants, weights, and boom/media condition will be submitted to customer, city or municipality after each service.

Hydrodynamic Separator/ LID Unit Details:
- Visual inspection of system for illicit discharge or structural deterioration.
- Clean system according to manufacture's specifications; using a vactor truck or as specified.
- Record pollutants (sediment, trash, foliage) along with approximate weights or yards, and amount of water collected.
- Evaluate condition of the system media (cartridge system, mulch, etc.) per manufacture's specification.
- Transport and dispose collected pollutants and liquids to approved facility in accordance with local and state requirements.
- A written report identifying collected pollutants, weights/yards, and media condition will be submitted to customer, city or municipality after each service.

Confined Space Details:
Bio Clean's maintenance technicians are trained and certified in Air Monitoring and Confined Space Entry. In the event that entry is required, Confined Space Entry will be conducted in accordance with CAL OSHA and FED OSHA requirements. Our technicians are certified in Traffic Control and HAZWOPER.

Invoice will be billed after each service. Terms are Net 30 Days. Prices quoted are for a yearly contract, or longer, as specified above. Proposal pricing is good for 90 days from above date. See Service Agreement for additional Service Details, Payment & Terms.

Regards,

Paul Krajewski
Maintenance Services Director
Bio Clean A Forterra Company

Bridge Development Partners, LLC
11100 Santa Monica Boulevard, Suite 700
Los Angeles, CA 90025

January XX, 2021

Mr. Matthew Addington
Associate Engineer
City of Rancho Cucamonga
10500 Civic Center Drive
Rancho Cucamonga, CA 91730
matthew.addington@cityofrc.us

Subject: **WQMP for Bridge Point Rancho Cucamonga – 4th Street**
Letter of Intent to Enter into a Contract to Maintain Structural Stormwater Treatment Devices and Filters

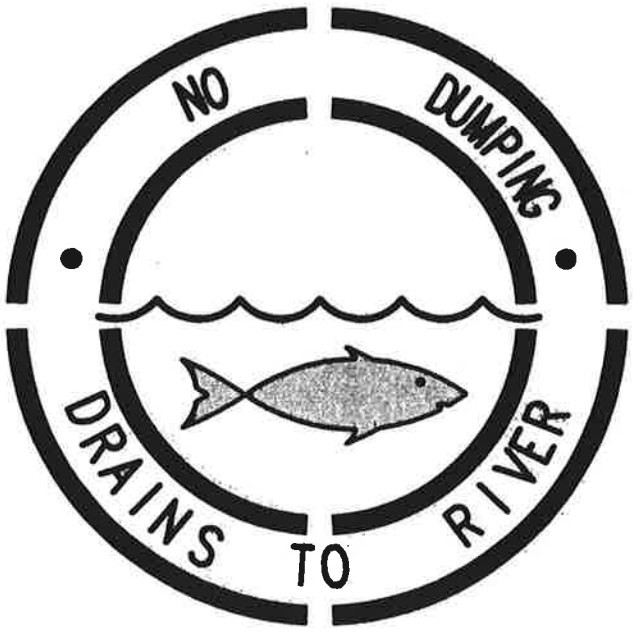
Dear Mr. Addington,

This letter shall serve to substantiate an intent to enter into a contract for the maintenance of the structural stormwater treatment devices and filters prior to issuance of a certificate of occupancy.

If you have any questions, please contact our Executive Vice President, Development, Brenden Kotler at (213) 267-0668 or bkotler@bridgedev.com.

Respectfully,
Bridge Development Partners, LLC

Brendan Kotler
Executive Vice President, Development



SAMPLE STENCIL TO BE USED NEAR GRATE AND CURB OPENING INLETS

SYMBOL TO BE 24" IN DIAMETER

Thienes Engineering
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

SAMPLE CATCH BASIN STENCIL
PER BMP SD-13

Drain Inlet Insert MP-52

General Description

Drain inlet inserts, also known as catch basin, drop inlet or curb inlet inserts, are used to remove pollutants at the point of entry to the storm drain system. There are a multitude of inserts of various shapes and configurations including baffles, baskets, boxes, fabrics, sorbent media, screens, and skimmers. The effectiveness of drain inlet inserts depends on their design, application, loading, and frequency of maintenance to remove accumulated sediment, trash, and debris.

Inspection / Maintenance Considerations

Routine inspection and maintenance is necessary to maintain functionality of drain inlet inserts and to prevent re-suspension and discharge of accumulated pollutants. Maintenance activities vary depending on the type of drain inlet insert being implemented; refer to the manufacturer's recommendations for more information.

Advanced BMPs Covered

Maintenance Concerns

- *Sediment, Trash, and Debris Accumulations*
- *Pollutant Re-suspension and Discharge*

Targeted Constituents*

Sediment	✓
Nutrients	✓
Trash	✓
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

**Removal Effectiveness varies for different manufacturer designs. See New Development and Redevelopment Handbook-Section 5 for more information.*

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION®

Inspection Activities	Suggested Frequency
☐ Verify that stormwater enters the unit and does not leak around the perimeter.	After construction.
☐ Inspect for sediment, trash, and debris buildup and proper functioning.	At the beginning of the wet season and after significant storms
Maintenance Activities	**Suggested Frequency**
☐ Remove accumulated sediment, trash, and debris. ☐ Replace sorbent media.	At the beginning of the wet season and as necessary

References

California Department of Transportation. *Treatment BMP Technology Report (CTSW-RT-09-239.06),* April, 2010. http://www.dot.ca.gov/hq/env/stormwater/pdf/CTSW-RT-09-239-06.pdf.

California Stormwater Quality Association. *Stormwater Best Management Practice Handbook, New Development and Redevelopment,* 2003. https://www.casqa.org/resources/bmp-handbooks/new-development-redevelopment-bmp-handbook.

Orange County Stormwater Program. Technical Guidance Document BMP Fact Sheets. http://media.ocgov.com/gov/pw/watersheds/documents/wqmp/tgd/technical_guidance_document_bmp_fact_sheets.asp.

San Francisco Public Utilities Commission, et al. San Francisco Stormwater Design Guidelines. Appendix A, Stormwater BMP Fact Sheets, June, 2010. http://www.sfwater.org/modules/showdocument.aspx?documentid=2778.

Tahoe Regional Planning Agency. Best Management Practices Handbook, 2012. http://www.tahoebmp.org/Documents/2012%20BMP%20Handbook.pdf.

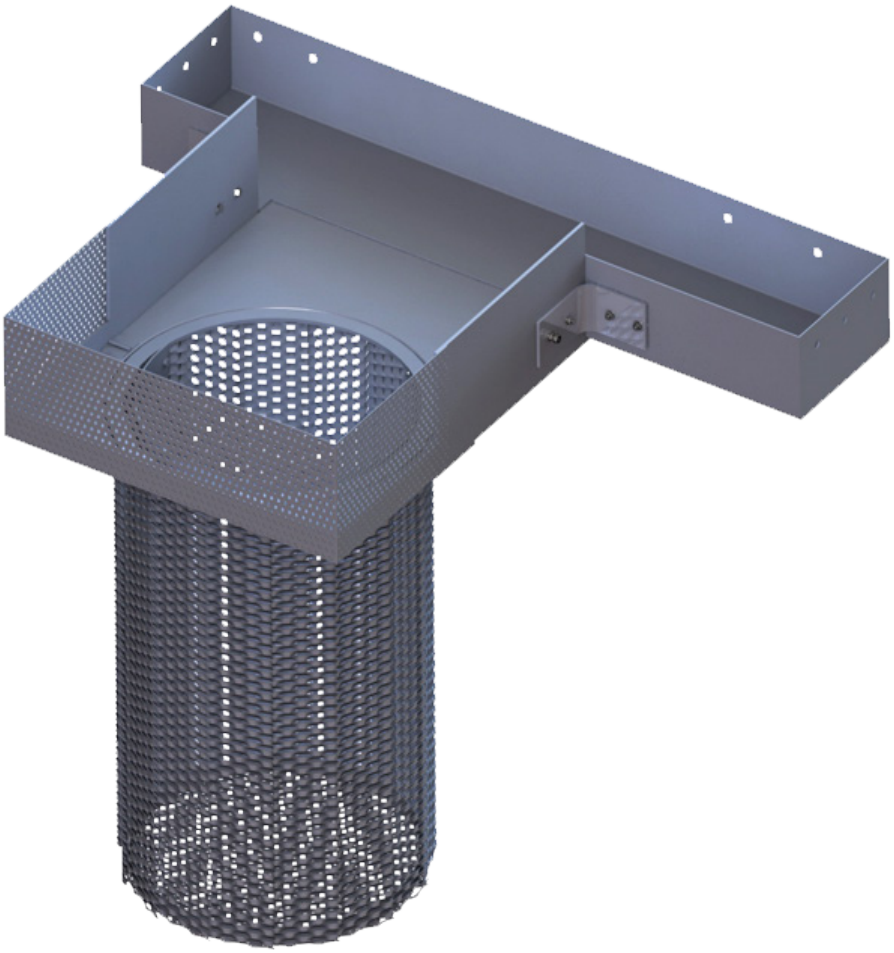
U.S. Environmental Protection Agency, Post-Construction Stormwater Management in New Development and Redevelopment. BMP Fact Sheets. Available at: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=min_measure&min_measure_id=5.

Ventura Countywide Stormwater Quality Management Program. *Technical Guidance Manual for Stormwater Quality Control Measures,* May, 2010. http://www.vcstormwater.org/documents/workproducts/technicalguidancemanual/2010revisions/Ventura%20Technical%20Guidance%20Document_5-6-10.pdf.

Curb Inlet Filter

Bio Clean
A Forterra Company

OPERATION & MAINTENANCE



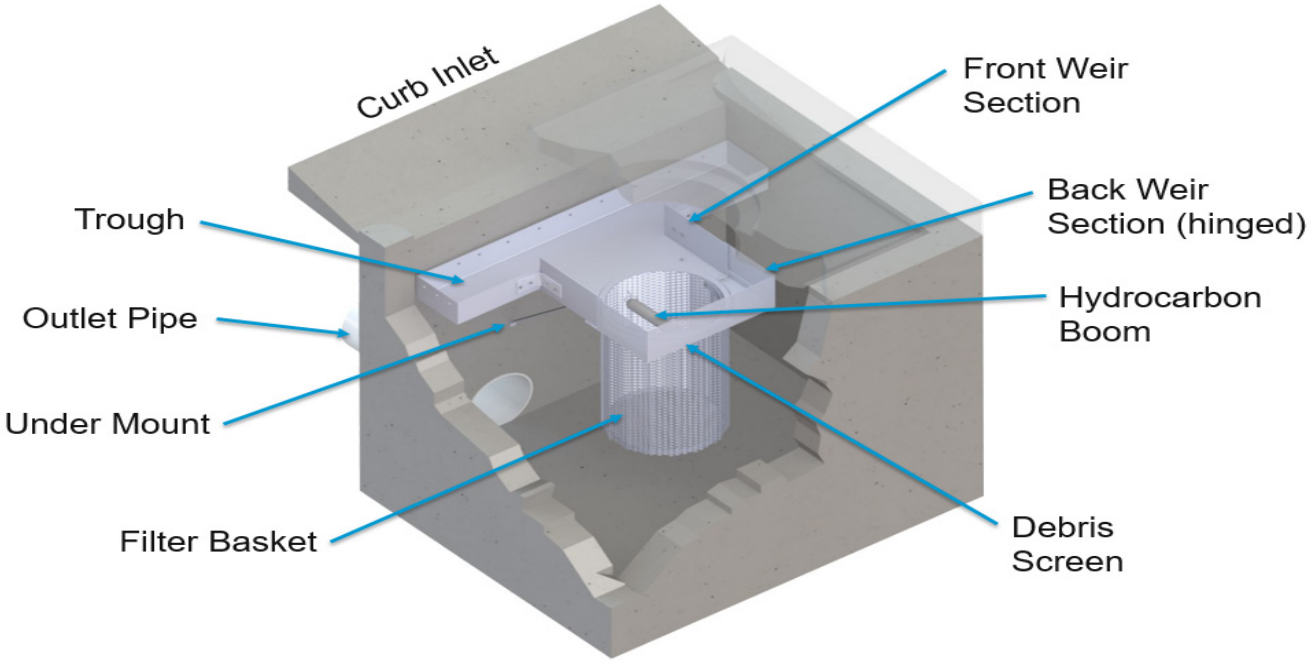
Bio Clean Environmental Services, Inc.
398 Via El Centro
Oceanside, CA 92058

www.BioCleanEnvironmental.com
p: 760.433.7640
f: 760.433.3176

OPERATION & MAINTENANCE

The Bio Clean Curb Inlet Filter is a stormwater device designed to remove high levels of trash, debris, sediments and hydrocarbons. The filter is available in several configurations including trash full capture, multi-level screening, Kraken membrane filter and media filter variations. This manual covers maintenance procedures of the trash full capture and multi-level screening configurations. A supplemental manual is available for the Kraken and media filter variations. The innovative trough & weir system is mounted along the curb face and directs incoming stormwater toward the filter basket which is positioned "directly" under the manhole access opening regardless of its location in the catch basin. This innovative design allows the filter to be cleaned from finish surface without access into the catch basin, therefore drastically reducing maintenance time and eliminating confined space entry. The filter has a lifting handle allowing for the filter to be removed easily through the manhole. The weir also folds up to allow for unimpeded access into the basin for routine maintenance or pipe jetting.

As with all stormwater BMPs, inspection and maintenance on the Curb Inlet Filter is necessary. Stormwater regulations require BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess site-specific loading conditions. This is recommended because pollutant loading can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding of roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years. Without appropriate maintenance a BMP can exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.



System Diagram:

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the Curb Inlet Filter:

- Bio Clean Environmental Inspection Form (contained within this manual).
- Manhole hook or appropriate tools to remove access hatches and covers.
- Appropriate traffic control signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections or maintenance of the system.

Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the Curb Inlet Fitler are quick and easy. As mentioned above the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long-term inspection and maintenance interval requirements.

The Curb Inlet Filter can be inspected though visual observation without entry into the catch basin. All necessary pre-inspection steps must be carried out before inspection occurs, such as safety measures to protect the inspector and nearby pedestrians from any dangers associated with an open access hatch or manhole. Once the manhole has been safely opened the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the inside of the catch basin through the manhole. If minimal light is available and vision into the unit is impaired utilize a flashlight to see inside the catch basin.
- Look for any out of the ordinary obstructions in the catch basin, trough, weir, filter basket, basin floor our outlet pipe. Write down any observations on the inspection form.
- Through observation and/or digital photographs estimate the amount of trash, foliage and sediment accumulated inside the filter basket. Record this information on the inspection form.
- Observe the condition and color of the hydrocarbon boom. Record this information on the inspection form.

- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components.
- Obstructions in the trough, weir, filter basket or catch basin.
- Excessive accumulation of trash, foliage and sediment in the filter basket and/or trough and weir sections. Maintenance is required when the basket is greater than half-full.
- The following chart shows the 50% and 100% storage capacity of each filter height:

Model	Filter Basket Diameter (in)	Filter Basket Height (in)	50% Storage Capacity (cu ft)	100% Storage Capacity (cu ft)
BC-CURB-30	18	30	2.21	4.42
BC-CURB-24	18	24	1.77	3.53
BC-CURB-18	18	18	1.33	2.65
BC-CURB-12	18	12	0.88	1.77

Maintenance Equipment

It is recommended that a vacuum truck be utilized to minimize the time required to maintain the Curb Inlet Filter though it can easily cleaned by hand:

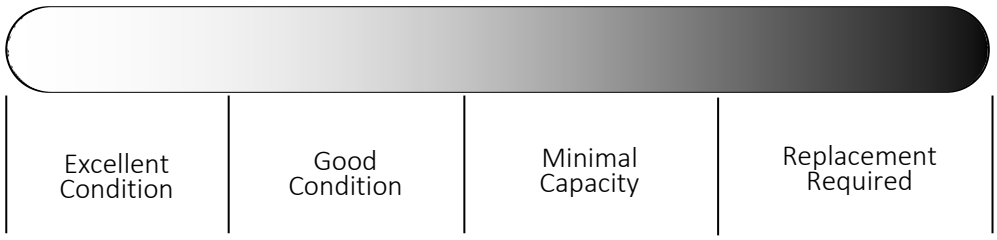
- Bio Clean Environmental Maintenance Form (contained in O&M Manual).
- Manhole hook or appropriate tools to access hatches and covers.
- Appropriate safety signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine maintenance of the system. Small or large vacuum truck (with pressure washer attachment preferred).

Maintenance Procedures

It is recommended that maintenance occurs at least two days after the most recent rain event to allow debris and sediments to dry out. Maintaining the system while flows are still entering it will increase the time and complexity required for maintenance. Cleaning of the Curb Inlet Filter can be performed from finish surface without entry into catch basin utilizing a vacuum truck. Some unique

and custom configurations may create conditions which would require entry for some or all of the maintenance procedures. Once all safety measures have been set up cleaning of the Curb Inlet Filter can proceed as followed:

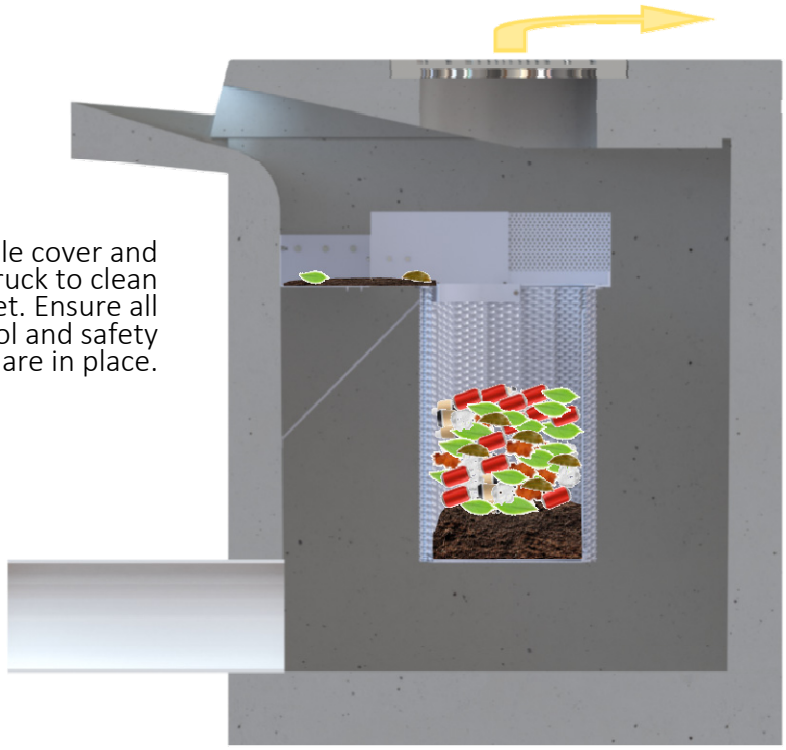
- Remove all manhole cover or access hatches (traffic control and safety measures to be completed prior).
- Using an extension on a vacuum truck position the hose over the opened manhole or hatch opening. Insert the vacuum hose down into the filter basket and suck out trash, foliage and sediment. A pressure wash is recommended and will assist in spraying of any debris stuck on the side or bottom of the filter basket. If the filter basket is full, trash, sediment, and debris will accumulate inside the trough and weir sections of the system. Once the filter basket is clean power wash the weir and trough pushing these debris into the filter basket (leave the hose in the filter basket during this process so entering debris will be sucked out). Power wash off the trough, weir, debris screen, and filter basket sides and bottom.
- Next remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required install and fasten on a new hydrocarbon boom. Booms can be ordered directly from the manufacturer.
- Follow is a replacement indication color chart for the hydrocarbon booms:



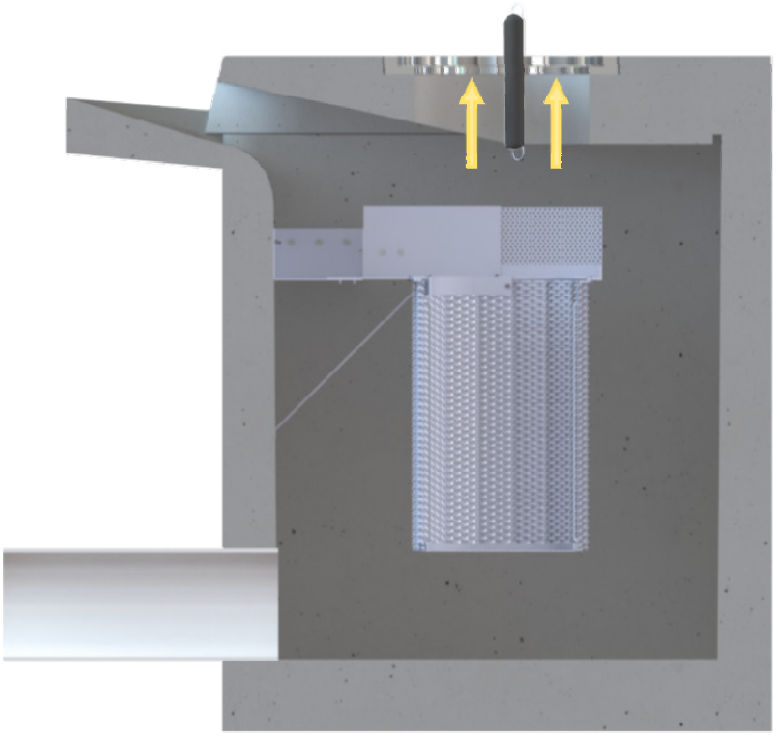
- The last step is to close up and replace the manhole or hatch and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.
- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.
- In the case of damaged components, replacement parts can be ordered from the manufacturer. Hydrocarbon booms can also be ordered directly from the manufacturer as previously noted.

Maintenance Sequence

Remove manhole cover and set up vacuum truck to clean the filter basket. Ensure all traffic control and safety measures are in place.

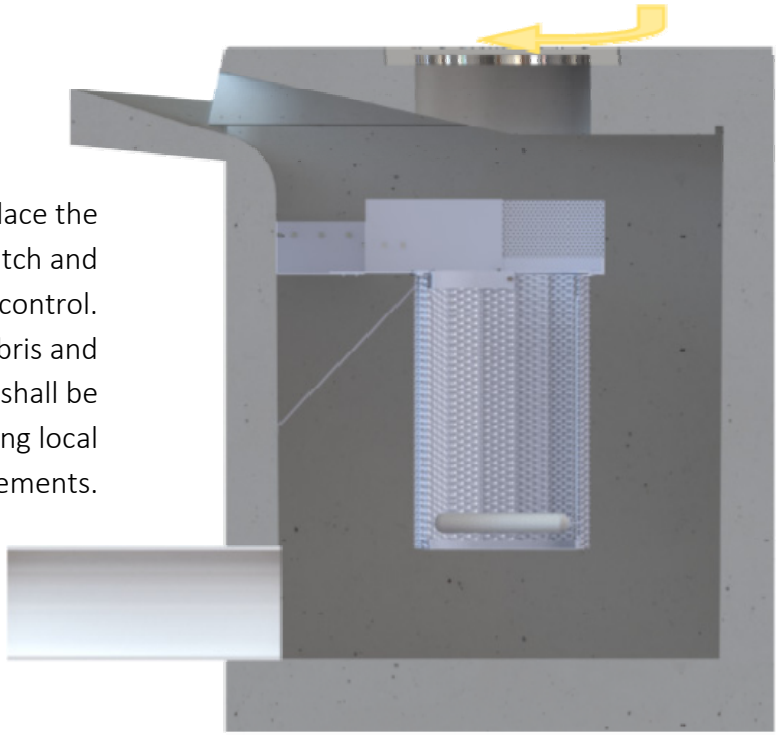


Insert the vacuum hose down into the filter basket and suck out debris. Use a pressure washer to assist in vacuum removal. Pressure wash off the weir and trough and vacuum out any remaining debris.



Remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required install and fasten on a new hydrocarbon boom.

Close up and replace the manhole or hatch and remove all traffic control. All removed debris and pollutants shall be disposed of following local and state requirements.



For Maintenance Services or Information Please Contact Us At:
760-433-7640
Or Email: info@biocleanenvironmental.com

Bio Clean
A Forterra Company

Inspection and Maintenance Report
Catch Basin Only

Project Name _____

Project Address _____ (city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ollow Up ☐omplaint ☐torm Storm Event in Last 72-hours? ☐ ☐s

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Catch Basin Size	Evidence of Illicit Discharge?	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Signs of Structural Damage?	Functioning Properly or Maintenance Needed?
1	Lat: Long:							
2	Lat: Long:							
3	Lat: Long:							
4	Lat: Long:							
5	Lat: Long:							
6	Lat: Long:							
7	Lat: Long:							
8	Lat: Long:							
10	Lat: Long:							
11	Lat: Long:							
12	Lat: Long:							

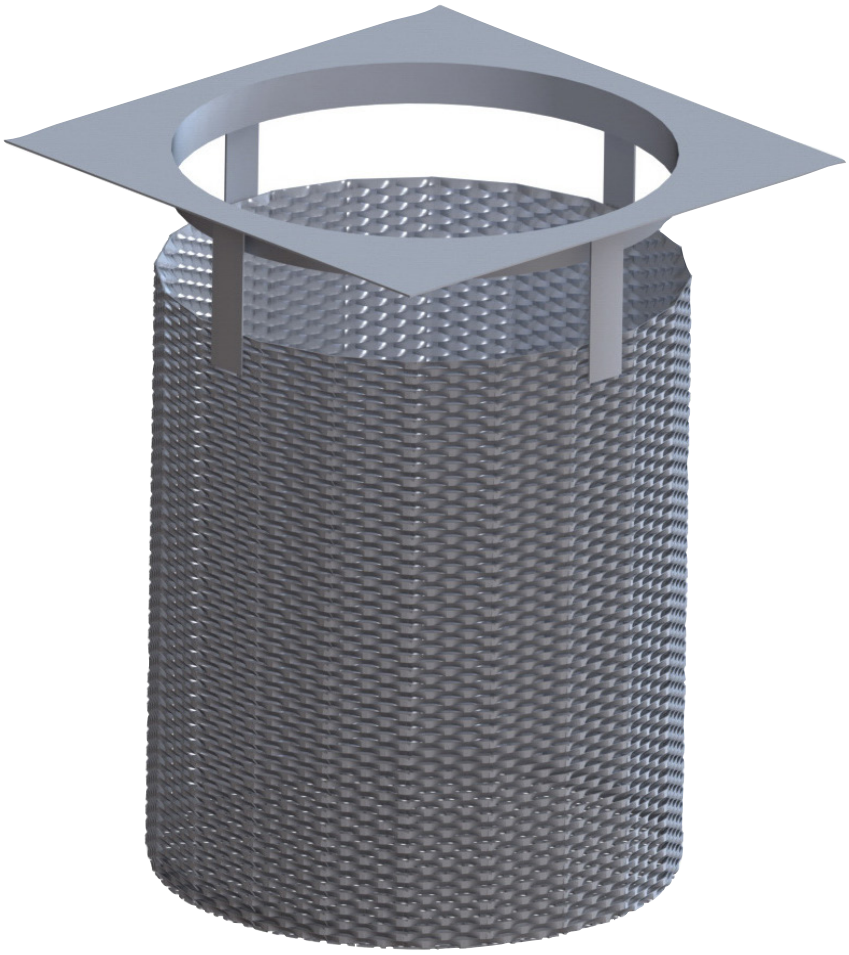
Comments:

398 Via El Centro, Oceanside, CA 92058 P. 760.433.7640 F. 760.433.3176

Grate Inlet Filter

Bio Clean
A Forterra Company

OPERATION & MAINTENANCE



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Oceanside, CA 92058

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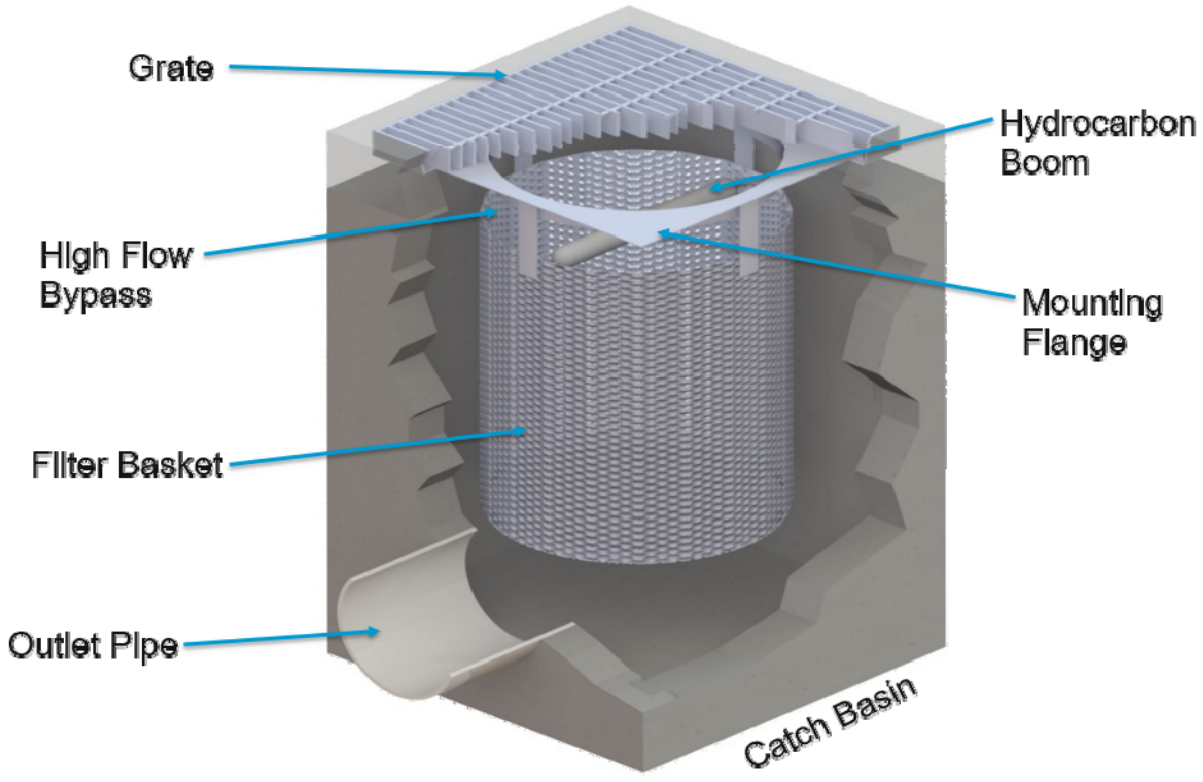
OPERATION & MAINTENANCE

The Bio Clean Grate Inlet Filter is a stormwater device designed to remove high levels of trash, debris, sediments and hydrocarbons. The filter is available in several configurations including trash full capture, multi-level screening, Kraken membrane filter and media filter variations. This manual covers maintenance procedures of the trash full capture and multi-level screening configurations. A supplemental manual is available for the Kraken and media filter variations. This filter is made of 100% stainless steel and is available and various sizes and depths allowing it to fit in any grated catch basin inlet. The filters heavy duty construction allows for cleaning with any vacuum truck. The filet can also easily be cleaned by hand.

As with all stormwater BMPs, inspection and maintenance on the Grate Inlet Filter is necessary. Stormwater regulations require BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess site-specific loading conditions. This is recommended because pollutant loading can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding of roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years. Without appropriate maintenance a BMP can exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.



System Diagram:

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the Grate Inlet Filter:

- Bio Clean Environmental Inspection Form (contained within this manual).
- Manhole hook or appropriate tools to remove access hatches and covers.
- Appropriate traffic control signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections or maintenance of the system.

Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the Grate Inlet Filter are quick and easy. As mentioned above the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long-term inspection and maintenance interval requirements.

The Grate Inlet Filter can be inspected though visual observation. All necessary pre-inspection steps must be carried out before inspection occurs, such as safety measures to protect the inspector and nearby pedestrians from any dangers associated with an open grated inlet. Once the grate has been safely removed the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the filter with the grate removed.
- Look for any out of the ordinary obstructions on the grate or in the filter and its bypass. Write down any observations on the inspection form.
- Through observation and/or digital photographs estimate the amount of trash, foliage and sediment accumulated inside the filter basket. Record this information on the inspection form.
- Observe the condition and color of the hydrocarbon boom. Record this information on the inspection form.
- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components.
- Obstructions in the filter basket and its bypass.
- Excessive accumulation of trash, foliage and sediment in the filter basket. Maintenance is required when the basket is greater than half-full.
- The following chart shows the 50% and 100% storage capacity of each filter height:

Model	Filter Basket Diameter (in)	Filter Basket Height (in)	50% Storage Capacity (cu ft)	100% Storage Capacity (cu ft)
BC-GRATE-12-12-12	10.00	12.00	0.27	0.55
BC-GRATE-18-18-18	16.00	18.00	1.05	2.09
BC-GRATE-24-24-24	21.00	24.00	2.41	4.81
BC-GRATE-30-30-24	27.00	24.00	3.98	7.95
BC-GRATE-36-36-24	33.00	24.00	5.94	11.88
BC-GRATE-48-48-18	44.00	18.00	7.92	15.84

Maintenance Equipment

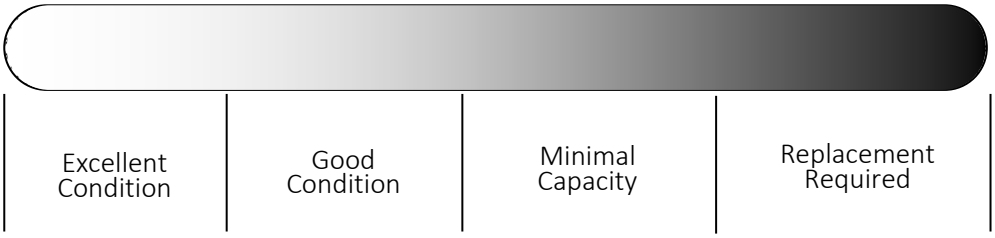
It is recommended that a vacuum truck be utilized to minimize the time required to maintain the Curb Inlet Filter, though it can easily cleaned by hand:

- Bio Clean Environmental Maintenance Form (contained in O&M Manual).
- Manhole hook or appropriate tools to remove the grate.
- Appropriate safety signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine maintenance of the system. Small or large vacuum truck (with pressure washer attachment preferred).

Maintenance Procedures

It is recommended that maintenance occurs at least two days after the most recent rain event to allow debris and sediments to dry out. Maintaining the system while flows are still entering it will increase the time and complexity required for maintenance. Cleaning of the Grate Inlet Filter can be performed utilizing a vacuum truck. Once all safety measures have been set up cleaning of the Grate Inlet Filter can proceed as followed:

- Remove grate (traffic control and safety measures to be completed prior).
- Using an extension on a vacuum truck position the hose over the opened catch basin. Insert the vacuum hose down into the filter basket and suck out trash, foliage and sediment. A pressure wash is recommended and will assist in spraying of any debris stuck on the side or bottom of the filter basket. Power wash off the filter basket sides and bottom.
- Next remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required install and fasten on a new hydrocarbon boom. Booms can be ordered directly from the manufacturer.
- Follow is a replacement indication color chart for the hydrocarbon booms:



- The last step is to replace the grate and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.
- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.
- In the case of damaged components, replacement parts can be ordered from the manufacturer. Hydrocarbon booms can also be ordered directly from the manufacturer as previously noted.

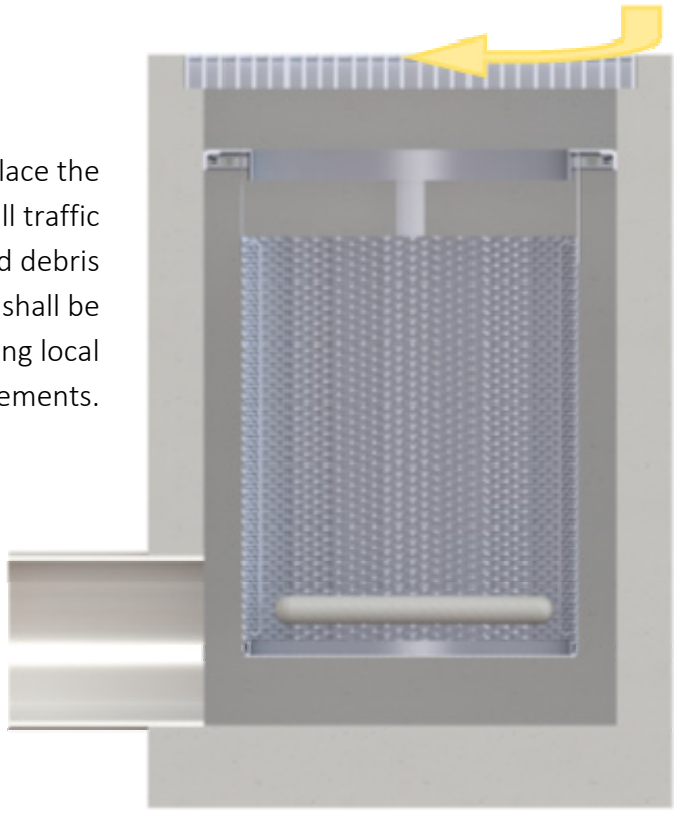
Maintenance Sequence

Remove grate and set up vacuum truck to clean the filter basket.

Insert the vacuum hose down into the filter basket and suck out debris. Use a pressure washer to assist in vacuum removal. Pressure wash off screens.

Remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required install and fasten on a new hydrocarbon boom.

Close up and replace the grate and remove all traffic control. All removed debris and pollutants shall be disposed of following local and state requirements.



For Maintenance Services or Information Please Contact Us At:
760-433-7640
Or Email:
info@biocleanenvironmental.com

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Inspection and Maintenance Report
Catch Basin Only

Project Name _____

Project Address _____ (city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ollow Up ☐omplaint ☐torm Storm Event in Last 72-hours? ☐ ☐s

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Catch Basin Size	Evidence of Illicit Discharge?	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Signs of Structural Damage?	Functioning Properly or Maintenance Needed?
1	Lat: Long:							
2	Lat: Long:							
3	Lat: Long:							
4	Lat: Long:							
5	Lat: Long:							
6	Lat: Long:							
7	Lat: Long:							
8	Lat: Long:							
10	Lat: Long:							
11	Lat: Long:							
12	Lat: Long:							

Comments:

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Infiltration Basin TC-11

General Description

An infiltration basin is a shallow impoundment that is designed to infiltrate stormwater. Infiltration basins store stormwater runoff until it gradually exfiltrates into the underlying soil. Pollutant removal occurs through the infiltration of runoff and the adsorption of pollutants into the soil and vegetation. Additional benefits include:

- Reduced runoff volume and attenuation of peak flows, and
- Facilitated groundwater recharge thus helping to maintain low flows in stream systems.

Inspection/Maintenance Considerations

The use and regular maintenance of pretreatment BMPs will significantly minimize maintenance requirements for the basin. Installing vegetated swales or a sediment forebay upstream from the infiltration basin can provide effective pretreatment and reduce maintenance.

Spill response procedures and controls should be implemented to prevent spills from reaching the infiltration system. This BMP may require groundwater monitoring, and basins cannot be put into operation until the upstream tributary area is stabilized.

Advanced BMPs Covered

Maintenance Concerns

- *Vector Control*
- *Clogged soil or outlet structures*
- *Vegetation/Landscape Maintenance*
- *Groundwater contamination*
- *Accumulation of metals*
- *Aesthetics*

Targeted Constituents

Sediment	■
Nutrients	■
Trash	■
Metals	■
Bacteria	■
Oil and Grease	■
Organics	■

Legend (Removal Effectiveness)

● Low ▲ Medium ■ High

✱ Requires Pretreatment

Note: The removal effectiveness ratings shown in the table are for properly designed, sited, and maintained BMPs; some configurations will have variations in pollutant effectiveness.

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Inspection Activities	Suggested Frequency
☐ Observe drain time for a storm after completion or modification of the facility to confirm that the desired drain time has been obtained. ☐ Newly established vegetation should be inspected several times to determine if any landscape maintenance (reseeding, irrigation, etc.) is necessary. ☐ Inspect for upslope or adjacent contributing sediment sources and ensure that pretreatment systems are in place.	Post construction and semi-annually (beginning and end of rainy season)
☐ Inspect for the following issues: differential accumulation of sediment, signs of wetness or damage to structures, erosion of the basin floor, dead or dying grass on the bottom, condition of riprap, drain time, signs of petroleum hydrocarbon contamination, standing water, trash and debris, sediment accumulation, slope stability, pretreatment device condition	Semi-annually and after extreme events
Maintenance Activities	**Suggested Frequency**
☐ Factors responsible for clogging should be repaired immediately.	Immediately
☐ Remove invasive weeds once monthly during the first two growing seasons.	Monthly during growing season
☐ Stabilize eroded banks with erosion control mat or mulch and revegetate. ☐ Repair undercut and eroded areas at inflow and outflow structures. ☐ Maintain access to the basin for regular maintenance activities. ☐ Mow as appropriate for vegetative cover species. ☐ Monitor health of vegetation and replace as necessary. ☐ Control mosquitoes as necessary. ☐ Remove litter and debris from infiltration basin area as required. ☐ Trim vegetation to prevent establishment of woody vegetation that decreases storage volume.	Standard maintenance (as needed)
☐ Mow and remove grass clippings, litter, and debris. ☐ Replant eroded or barren spots to prevent erosion and accumulation of sediment.	Semi-annual
☐ Scrape bottom and remove sediment when accumulated sediment reduces original infiltration rate by 25-50%. Restore original cross-section and infiltration rate. Properly dispose of sediment. ☐ Seed or sod to restore ground cover. ☐ Disc or otherwise aerate bottom. ☐ Dethatch basin bottom.	3-5 year maintenance

If there are actual signs of clogging or significant loss of infiltrative capacity the following maintenance activities should be considered:

- ☐ Mechanically de-thatching and/or aerating the top soils along the sides and bottom of the basin.
- ☐ Tilling or dicing to scarify the bottom of the basin

These activities should be on an "as-needed" rather than on a routine basis. Always remove deposited sediments before scarification, and use a hand-guided rotary tiller, if possible, or a disc harrow pulled by a light tractor.

Clogged infiltration basins with surface standing water can become a breeding area for mosquitoes and midges. Maintenance efforts associated with infiltration basins should include frequent inspections to ensure that water infiltrates into the subsurface completely (recommended infiltration rate of 96 hours or less) and that vegetation is carefully managed to prevent creating mosquito and other vector habitats.

Additional Information

In most cases, surface sediment removed from an infiltration basin during periodic maintenance to restore capacity does not contain toxic materials (e/g metals, oil and grease, or organics) at levels posing a hazardous concern. Studies to date indicate that pond sediments are generally below toxicity limits and can be safely landfilled or disposed onsite. Onsite sediment disposal is always preferable (if local authorities permit) as long as the sediments are deposited away from the perimeter to prevent their reentry into the basin. Sediments should be tested for toxic materials in compliance with current landfill requirements and disposed of properly.

Maintenance activities should use lightweight equipment (e.g. bobcat), which will not compact the underlying soil to remove the top layer of sediment. The remaining soil should be tilled and revegetated as soon as possible.

Sediment removal within the basin should be performed when the sediment is dry enough so that it is cracked and readily separates from the basin floor. This minimizes intermixing of the finer sediment with underlying coarser material on the basin floor.

Special maintenance considerations are required maintain infiltration basins effectiveness in cold climates. Treating runoff containing salt-based deicers in an infiltration basin may reduce soil fertility cause vegetation to fail. Incorporating mulch into the soil can help to mitigate this problem. Infiltration basins should not be used to store snow plowed from highways or parking lots. The sand in this snow can clog the basin. In addition, the chlorides and other pollutants can contaminate the groundwater.

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CONTECH®
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Contech® CMP Detention & Infiltration Maintenance Guide

CONTECH®
CMP DETENTION SYSTEMS

Maintenance

Underground storm water detention and retention systems should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size or configuration of the system.

Inspection

Inspection is the key to effective maintenance and is easily performed. CONTECH recommends ongoing quarterly inspections of the accumulated sediment. Sediment deposition and transport may vary from year to year and quarterly inspections will help insure that systems are cleaned out at the appropriate time. Inspections should be performed more often in the winter months in climates where sanding operations may lead to rapid accumulations, or in equipment washdown areas. It is very useful to keep a record of each inspection. A sample inspection log is included for your use.

Systems should be cleaned when inspection reveals that accumulated sediment or trash is clogging the discharge orifice. CONTECH suggests that all systems be designed with an access/inspection manhole situated at or near the inlet and the outlet orifice. Should it be necessary to get inside the system to perform maintenance activities, all appropriate precautions regarding confined space entry and OSHA regulations should be followed.

Cleaning

Maintaining an underground detention or retention system is easiest when there is no flow entering the system. For this reason, it is a good idea to schedule the cleanout during dry weather.

Accumulated sediment and trash can typically be evacuated through the manhole over the outlet orifice. If maintenance is not performed as recommended, sediment and trash may accumulate in front of the outlet orifice. Manhole covers should be securely seated following cleaning activities.

Inspection & Maintenance Log Sample Template

_____" Diameter System			Location: Anywhere, USA		
Date	**Depth of Sediment**	**Accumulated Trash**	**Maintenance Performed**	**Maintenance Personnel**	**Comments**
12/01/10	2"	None	Removed Sediment	B. Johnson	Installed
03/01/11	1"	Some	Removed Sediment and Trash	B. Johnson	Swept parking lot
06/01/11	0"	None	None		
09/01/11	0"	Heavy	Removed Trash	S. Riley	
12/01/11	1"	None	Removed Sediment	S. Riley	
04/01/12	0"	None	None	S. Riley	
04/15/01	2	Some	Removed Sediment and Trash	ACE Environmental Services	

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Support

Drawings and specifications are available at www.ContechES.com.

Site-specific support is available from our engineers.

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Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, earth stabilization and wastewater treament products. For information, visit www.ContechES.com or call 800.338.1122.

Attachment H
Conditions of Approval

Attachment I
Class V Injection Well Registration

Attachment J
Activity Restrictions

Activity Restrictions

It is the responsibility of the owner to prohibit:

- Vehicle washing, maintenance or repair outside of designated areas
- Hosing down paved areas
- Disposal of animal waste not in appropriate locations
- Use of chemicals, pesticides, toxins, etc. on paved or landscape areas
- Dumping of any waste into drainage facilities
- Blowing or sweeping of debris (leaf litter, grass clippings, litter, etc.) into drainage facilities.
- Discharge of fertilizer or pesticides to drainage facilities
- Keeping dumpsters lids open
- Washing kitchen wastes or kitchen equipment to storm water drainage features
- The owner will inform employees, contractors, etc. that spills are to be swept or vacuumed
- Connections of pool/spa drains to streets or storm drains.
- Discharges of paint or masonry wastes to streets or storm drains