Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING

PROJECT SPECIFIC PRELIMINARY WATER QUALITY MANAGEMENT PLAN (P-WQMP)

FOR:
TEMESCAL VALLEY COMMERCE CENTER
TEMESCAL CANYON ROAD AND DAWSON CANYON ROAD
COUNTY OF RIVERSIDE, CALIFORNIA 92883
APNs: 283-160-043 AND 283-190-28

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JOB NO. 3905

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FOR

"TEMESCAL VALLEY COMMERCE CENTER"

PREPARED BY LUIS PRADO
UNDER THE SUPERVISION OF:

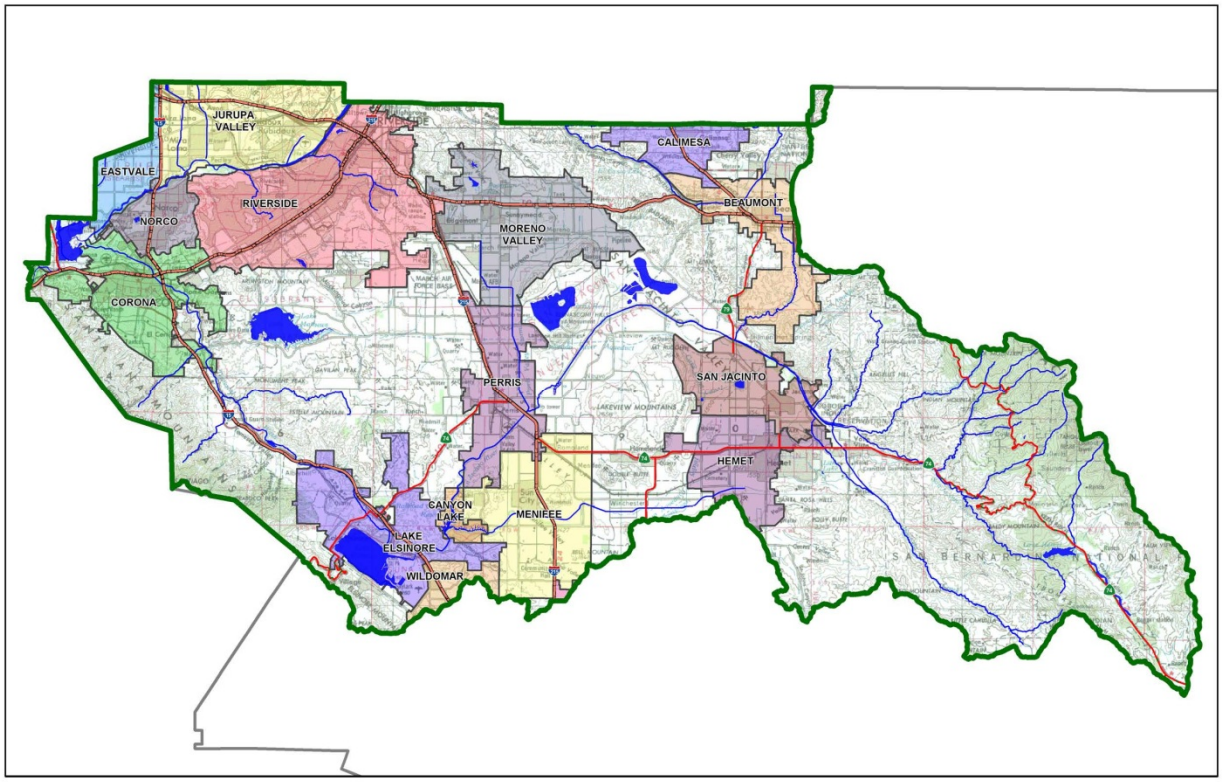
1/13/2021

REINHARD STENZEL DATE
R.C.E. 56155
EXP. 12/31/22

Project Specific Water Quality Management Plan

*A Template for Projects located within the **Santa Ana Watershed** Region of Riverside County*

Project Title: Temescal Valley Commerce Center
Development No: A.P.N. 283-160-043 and 283-190-28
Design Review/Case No: CUP200044



☒ **Preliminary**
☐ **Final**

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Prepared for Compliance with
Regional Board Order No. **R8-2010-0033**

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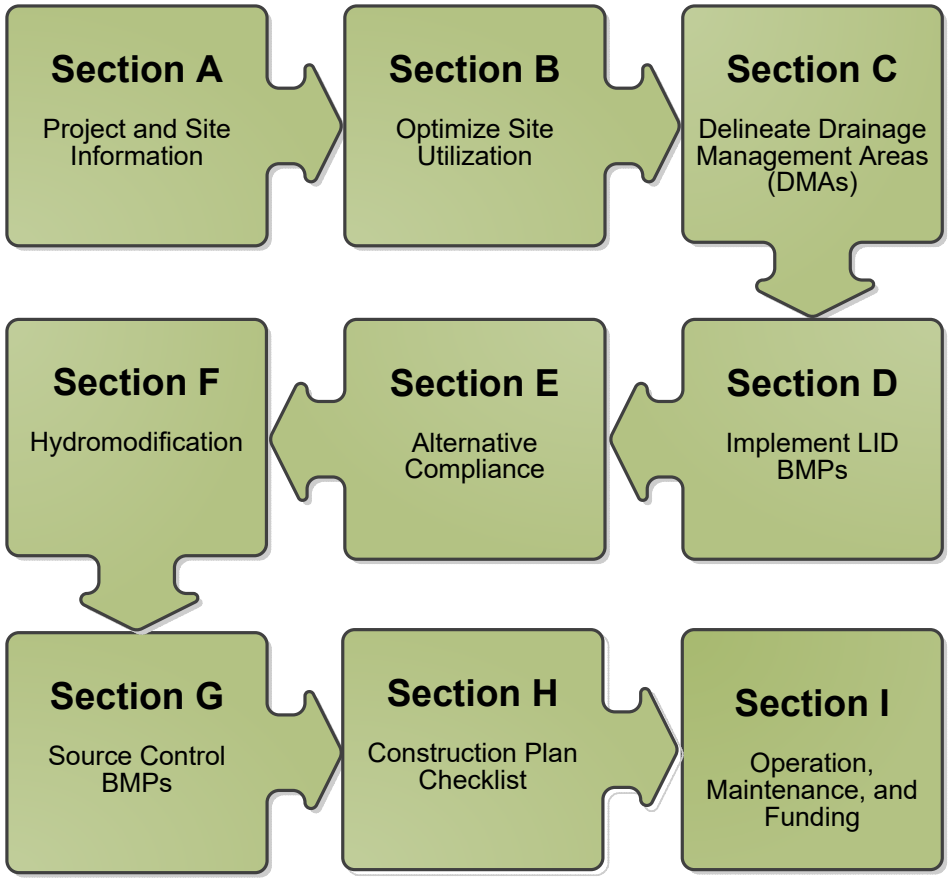
A Brief Introduction

This Project-Specific WQMP Template for the **Santa Ana Region** has been prepared to help guide you in documenting compliance for your project. Because this document has been designed to specifically document compliance, you will need to utilize the WQMP Guidance Document as your "how-to" manual to help guide you through this process. Both the Template and Guidance Document go hand-in-hand, and will help facilitate a well prepared Project-Specific WQMP. Below is a flowchart for the layout of this Template that will provide the steps required to document compliance.



OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for **Dawson Canyon LLC** by **Thienes Engineering, Inc.** for the **Temescal Valley Commerce Center** project.

This WQMP is intended to comply with the requirements of **County of Riverside** for **Ordinance No. 754** which includes the requirement for the preparation and implementation of a Project-Specific WQMP.

The undersigned, while owning the property/project described in the preceding paragraph, shall be responsible for the implementation and funding of this WQMP and will ensure that this WQMP is amended as appropriate to reflect up-to-date conditions on the site. In addition, the property owner accepts responsibility for interim operation and maintenance of Stormwater BMPs until such time as this responsibility is formally transferred to a subsequent owner. This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party (or parties) having responsibility for implementing portions of this WQMP. At least one copy of this WQMP will be maintained at the project site or project office in perpetuity. The undersigned is authorized to certify and to approve implementation of this WQMP. The undersigned is aware that implementation of this WQMP is enforceable under **County of Riverside** Ordinance **No. 754**.

"I, the undersigned, certify under penalty of law that the provisions of this WQMP have been reviewed and accepted and that the WQMP will be transferred to future successors in interest."

Owner's Signature	Date
Matt Englhard	
Owner's Printed Name	Owner's Title/Position

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan meet the requirements of Regional Water Quality Control Board Order No. **R8-2010-0033** and any subsequent amendments thereto."

Preparer's Signature	Date
Reinhard Stenzel	Director of Engineering
Preparer's Printed Name	Preparer's Title/Position

Preparer's Licensure:

Table of Contents

Section A: Project and Site Information 6

A.1 Maps and Site Plans 7
A.2 Identify Receiving Waters 7
A.3 Additional Permits/Approvals required for the Project: 8

Section B: Optimize Site Utilization (LID Principles) 9

Section C: Delineate Drainage Management Areas (DMAs) 11

Section D: Implement LID BMPs 13

D.1 Infiltration Applicability 13
D.2 Harvest and Use Assessment 14
D.3 Bioretention and Biotreatment Assessment 17
D.4 Feasibility Assessment Summaries 17
D.5 LID BMP Sizing 18

Section E: Alternative Compliance (LID Waiver Program) 21

E.1 Identify Pollutants of Concern 21
E.2 Stormwater Credits 22
E.3 Sizing Criteria 23
E.4 Treatment Control BMP Selection 23

Section F: Hydromodification 24

F.1 Hydrologic Conditions of Concern (HCOC) Analysis 24
F.2 HCOC Mitigation 25

Section G: Source Control BMPs 26

Section H: Construction Plan Checklist 28

Section I: Operation, Maintenance and Funding 29

List of Tables

Table A.1 Identification of Receiving Waters 7
Table A.2 Other Applicable Permits 8
Table C.1 DMA Classifications 11
Table C.2 Type 'A', Self-Treating Areas 11
Table C.3 Type 'B', Self-Retaining Areas 11
Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas 12
Table C.5 Type 'D', Areas Draining to BMPs 12
Table D.1 Infiltration Feasibility 13
Table D.2 LID Prioritization Summary Matrix 17
Table D.3 DCV Calculations for LID BMPs (DMA A) 18
Table D.3 DCV Calculations for LID BMPs (DMA B) 18
Table D.3 DCV Calculations for LID BMPs (DMA C) 19
Table D.3 DCV Calculations for LID BMPs (DMA D) 19
Table D.3 DCV Calculations for LID BMPs (DMA E) 19
Table D.3 DCV Calculations for LID BMPs (DMA G) 20
Table D.3 DCV Calculations for LID BMPs (DMA H) 20
Table D.3 DCV Calculations for LID BMPs (DMA I) 20
Table E.1 Potential Pollutants by Land Use Type 22
Table E.2 Water Quality Credits 22
Table E.3 Treatment Control BMP Sizing 23
Table E.4 Treatment Control BMP Selection 23
Table F.1 Hydrologic Conditions of Concern Summary 24
Table G.1 Permanent and Operational Source Control Measures 26
Table H.1 Construction Plan Cross-reference 28

List of Appendices

Appendix 1: Maps and Site Plans 30
Appendix 2: Construction Plans 31
Appendix 3: Soils Information 32
Appendix 4: Historical Site Conditions 33
Appendix 5: LID Infeasibility 34
Appendix 6: BMP Design Details 35
Appendix 7: Hydromodification 36
Appendix 8: Source Control 37
Appendix 9: O&M 38
Appendix 10: Educational Materials 39

Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Light Industrial Warehouse
Planning Area:	Light Industrial/Business Park
Community Name:	N/A
Development Name:	Temescal Valley Commerce Center
PROJECT LOCATION	
Latitude & Longitude (GIS): 33.781405, -117.484502	
Project Watershed and Sub-Watershed: Santa Ana River & San Jacinto	
APN(s): 283-160-043 and 283-190-28	
Map Book and Page No.: Assessor's Map BK283 Pages 16 and 19	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Light Industrial
Proposed or Potential SIC Code(s)	4225
Area of Existing Impervious Project Footprint (SF)	0
Total Area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	1,710,166 (39.26 acres) total project including onsite and offsite areas 1,431,643 (32.87 acres) impervious
Does the project consist of offsite road improvements?	☐ Y ☒ N
Does the project propose to construct unpaved roads?	☐ Y ☒ N
Is the project part of a larger common plan of development (phased project)?	☐ Y ☒ N
EXISTING SITE CHARACTERISTICS	
Total area of existing Impervious Surfaces within the project limits (SF)	0
Is the project located within any MSHCP Criteria Cell?	☐ Y ☒ N
If so, identify the Cell number:	N/A
Are there any natural hydrologic features on the project site?	☐ Y ☒ N
Is a Geotechnical Report attached?	☒ Y ☐ N
If no Geotech. Report, list the NRCS soils type(s) present on the site (A, B, C and/or D)	Soil/Infiltration Report Available
What is the Water Quality Design Storm Depth for the project?	0.85

Project Description:

The overall project encompasses approximately 39.26 acres of improvements, which includes 34.85 acres of onsite work, and 4.41 acres of offsite work. Proposed improvements include a 183,456 square foot building and vehicle parking located adjacent to all sides of the building. A truck dock and trailer parking will be on the south side of the building. The east and west portions of the building will be loading areas. Landscape will be throughout the site and along the perimeter. Per the soils engineer, infiltration is feasible therefore underground infiltration chambers will be proposed to retain the runoff produced by the 85th percentile storm rainfall depth. Mitigation for the street widening improvements on the surrounding streets will be provided onsite via underground infiltration chambers. Additional storage in the underground chambers will be provided to mitigate the hydrologic conditions of concern (HCOC).

Existing Site:

The project site is currently unpaved and barren. The site generally surface drains to the north and appears to pond stormwater prior to discharging into the Temescal Wash.

Stormwater is currently draining onto the site from offsite portions of the previous larger development and the bordering hillside to the southeast. Run-on surface drains to the north, down the vegetated slopes, and enters the

site through the compacted surface of the neighboring southerly property. A gutter is proposed along the southerly property line to intercept and convey offsite run-on northeast, to the Temescal Wash.

Hydrology:

Runoff from the northeasterly drive aisle and auto parking areas will surface drain to catch basins located in northeasterly parking lot. An onsite storm drain system, Line "B", will convey stormwater northwest toward the easterly loading area.

Drainage from the southerly drive aisle entrance and auto parking areas along the southeast property line will surface drain northeasterly to a catch basin in the easterly parking lot. An onsite storm drain system, Line "A", will convey runoff to the northwest, collect runoff from the abutting drive aisle, and continue toward the easterly loading area.

Stormwater from the easterly auto parking and loading area will collect in catch basins east of the proposed building. Line "A" will convey stormwater to the north, confluence with Line "B", turn west around the building, and continue toward the southeast portion of the Temescal Canyon Road and Dawson Canyon Road intersection.

The westerly and southwesterly vehicle parking, southerly truck yard, and westerly loading area will surface drain to catch basins located in the parking lot, truck yard, and westerly loading area. The southerly storm drain system, Line "C" will convey runoff to the north and confluence with Line "A".

Runoff north of the building will surface drain to catch basins in the northerly auto parking and laterals will convey the stormwater to Line "A". Line "A" will ultimately discharge into a proposed storm drain system in Temescal Canyon Road.

Lastly, approximately 1.30 acres, comprised of self-treating areas and some driveways, along Dawson Canyon Road and Park Canyon Road will sheet flow offsite without first being routed to the onsite BMPs.

A.1 Maps and Site Plans

When completing your Project-Specific WQMP, include a map of the local vicinity and existing site. In addition, include all grading, drainage, landscape/plant palette and other pertinent construction plans in Appendix 2. At a **minimum**, your WQMP Site Plan should include the following:

- Drainage Management Areas
- Proposed Structural BMPs
- Drainage Path
- Drainage Infrastructure, Inlets, Overflows
- Source Control BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces
- Standard Labeling

Use your discretion on whether or not you may need to create multiple sheets or can appropriately accommodate these features on one or two sheets. Keep in mind that the Co-Permittee plan reviewer must be able to easily analyze your project utilizing this template and its associated site plans and maps.

A.2 Identify Receiving Waters

Using Table A.1 below, list in order of upstream to downstream, and the receiving waters that the project site is tributary to. Continue to fill each row with the Receiving Water's 303(d) listed impairments (if any), designated beneficial uses, and proximity, if any, to a RARE beneficial use. Include a map of the receiving waters in Appendix 1.

Table A.1 Identification of Receiving Waters

Receiving Waters	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Temescal Creek, Reach 2	None	AGR, IND, GWR, REC1, REC2, WARM, WILD	Not classified as a RARE waterbody.

Receiving Waters	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Temescal Creek, Reach 1	pH	REC1, REC2, WARM, WILD	Not classified as a RARE waterbody.
Santa Ana River, Reach 3	Nitrate, Pathogens, Copper, and Lead	AGR, GWR, REC1, REC2, WARM, WILD, RARE	46 miles
The Prado Basin Management Zone	None	REC1, REC2, WARM, WILD, RARE	46 miles
Santa Ana River, Reach 2	Indicator Bacteria	AGR, GWR, REC1, REC2, WARM, WILD, RARE	51 miles
Santa Ana River, Reach 1	None	REC1, REC2, WARM, WILD	Not classified as a RARE waterbody.
Tidal Prism of Santa Ana River and Newport Slough	Enterococcus, Fecal Coliform, Total Coliform	REC1, REC2, COMM, WILD, RARE, MAR	77 miles
Pacific Ocean Near shore Zone	None	IND, NAV, REC1, REC2, COMM, WILD, RARE, SPWN, MAR, SHEL	77 miles

A.3 Additional Permits/Approvals required for the Project:

Table A.2 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	☐ Y	☒ N
State Water Resources Control Board, Clean Water Act (CWA) Section 401 Water Quality Cert.	☐ Y	☒ N
US Army Corps of Engineers, CWA Section 404 Permit	☐ Y	☒ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☐ Y	☒ N
Statewide Construction General Permit Coverage	☒ Y	☐ N
Statewide Industrial General Permit Coverage	☒ Y	☐ N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☐ Y	☒ N
Other *(please list in the space below as required)* County of Riverside Grading Permit	☒ Y	☐ N
Other *(please list in the space below as required)* County of Riverside Building Permit	☒ Y	☐ N

If yes is answered to any of the questions above, the Co-Permittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

Section B: Optimize Site Utilization (LID Principles)

Review of the information collected in Section 'A' will aid in identifying the principal constraints on site design and selection of LID BMPs as well as opportunities to reduce imperviousness and incorporate LID Principles into the site and landscape design. For example, **constraints** might include impermeable soils, high groundwater, groundwater pollution or contaminated soils, steep slopes, geotechnical instability, high-intensity land use, heavy pedestrian or vehicular traffic, utility locations or safety concerns. **Opportunities** might include existing natural areas, low areas, oddly configured or otherwise unbuildable parcels, easements and landscape amenities including open space and buffers (which can double as locations for bioretention BMPs), and differences in elevation (which can provide hydraulic head). Prepare a brief narrative for each of the site optimization strategies described below. This narrative will help you as you proceed with your LID design and explain your design decisions to others.

The 2010 Santa Ana MS4 Permit further requires that LID Retention BMPs (Infiltration Only or Harvest and Use) be used unless it can be shown that those BMPs are infeasible. Therefore, it is important that your narrative identify and justify if there are any constraints that would prevent the use of those categories of LID BMPs. Similarly, you should also note opportunities that exist which will be utilized during project design. Upon completion of identifying Constraints and Opportunities, include these on your WQMP Site plan in Appendix 1.

Site Optimization

The following questions are based upon Section 3.2 of the WQMP Guidance Document. Review of the WQMP Guidance Document will help you determine how best to optimize your site and subsequently identify opportunities and/or constraints, and document compliance.

Did you identify and preserve existing drainage patterns? If so, how? If not, why?

- *There are no creeks, wetlands, or riparian habitats nearby.*
- *Existing drainage patterns generally flow northerly before discharging into the Temescal Wash. Proposed condition drainage patterns mimic pre-development conditions. The proposed onsite storm drain will discharge into the proposed public storm drain in Temescal Canyon Road before discharging to the Temescal Wash.*

Did you identify and protect existing vegetation? If so, how? If not, why?

- *Not applicable, there are no sensitive areas.*
- *No applicable, there are no existing trees or vegetation to preserve.*

Did you identify and preserve natural infiltration capacity? If so, how? If not, why?

- *Infiltration capacity has been identified through infiltration tests within the project (see Appendix 3 for infiltration results).*

Did you identify and minimize impervious area? If so, how? If not, why?

- *Impervious area on the site has been minimized to City standards.*
- *Due to the nature of the project site (large trucks), substitution of pavement for landscaping is not feasible. The project does not propose overflow parking where substitution of pavement for landscaping would be optimal. Landscaping has been provided wherever applicable and to the maximum extent practicable.*

- *The entire Design Capture Volume (DCV) is handled by the proposed underground infiltration chambers.*

Did you identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?

- *Roof runoff is directed to the underground infiltration chambers for treatment.*
- *The site is not on a hillside.*

Section C: Delineate Drainage Management Areas (DMAs)

Utilizing the procedure in Section 3.3 of the WQMP Guidance Document which discusses the methods of delineating and mapping your project site into individual DMAs, complete Table C.1 below to appropriately categorize the types of classification (e.g., Type A, Type B, etc.) per DMA for your project site. Upon completion of this table, this information will then be used to populate and tabulate the corresponding tables for their respective DMA classifications.

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)[1]	Area (Sq. Ft.)	Area (Acres)	DMA Type
A-1	Concrete or Asphalt	156,555	3.59	Type D
A-2	Ornamental Landscaping	43,821	1.01	Type D
B-1	Concrete or Asphalt	156,486	3.59	Type D
B-2	Ornamental Landscaping	26,466	0.61	Type D
C-1	Roofs/Conc/Asphalt	403,150	9.26	Type D
C-2	Ornamental Landscaping	45,518	1.04	Type D
D-1	Roofs/Conc/Asphalt	412,905	9.48	Type D
D-2	Ornamental Landscaping	46,653	1.07	Type D
E-1	Concrete or Asphalt	150,181	3.45	Type D
E-2	Ornamental Landscaping	19,703	0.45	Type D
F	Ornamental Landscaping	56,628	1.30	Type A
G-1	Concrete or Asphalt	39,858	0.92	Type D
G-2	Ornamental Landscaping	21,997	0.50	Type D
H-1	Concrete or Asphalt	74,227	1.70	Type D
H-2	Ornamental Landscaping	12,893	0.30	Type D
I-1	Concrete or Asphalt	38,280	0.88	Type D
I-2	Ornamental Landscaping	4,844	0.11	Type D

[1]*Reference Table 2-1 in the WQMP Guidance Document to populate this column.*

Table C.2 Type 'A', Self-Treating Areas

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
DMA F	56,628	Drought Tolerant	Timed Sprinklers

Table C.3 Type 'B', Self-Retaining Areas

Self-Retaining Area				**Type 'C' DMAs that are draining to the Self-Retaining Area**		
DMA Type/ID	**Post-Project Surface Type**	**Area (square feet)**	**Storm Depth (inches)**	**DMA Type/ID**	**[C] from Table C.4**	***Required Retention Depth (inches)***
		[A]	[B]		[C]	[D] = [B] + ([B]*[C]/[A])

Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas

DMA					Receiving Self-Retaining DMA		
DMA Type/ID	Area (square feet) [A]	Post-Project Surface Type	Impervious Fraction [B]	Product [C] = [A] x [B]	DMA Type/ID	Area (square feet) [D]	Ratio [C] / [D]

Table C.5 Type 'D', Areas Draining to BMPs

DMA Name or ID	BMP Name or ID
A-1	Underground Infiltration System (STC "A")
A-2	Underground Infiltration System (STC "A")
B-1	Underground Infiltration System (STC "B")
B-2	Underground Infiltration System (STC "B")
C-1	Underground Infiltration System (STC "C")
C-2	Underground Infiltration System (STC "C")
D-1	Underground Infiltration System (STC "D")
D-2	Underground Infiltration System (STC "D")
E-1	Underground Infiltration System (STC "E")
E-2	Underground Infiltration System (STC "E")
G-1	Underground Infiltration System (STC "G")
G-2	Underground Infiltration System (STC "G")
H-1	Underground Infiltration System (STC "H")
H-2	Underground Infiltration System (STC "H")
I-1	Underground Infiltration System (STC "I")
I-2	Underground Infiltration System (STC "I")

Note: More than one drainage management area can drain to a single LID BMP, however, one drainage management area may not drain to more than one BMP.

Section D: Implement LID BMPs

D.1 Infiltration Applicability

Is there an approved downstream 'Highest and Best Use' for stormwater runoff (see discussion in Chapter 2.4.4 of the WQMP Guidance Document for further details)? ☐ Y ☒ N

If yes has been checked, Infiltration BMPs shall not be used for the site. If no, continue working through this section to implement your LID BMPs. It is recommended that you contact your Co-Permittee to verify whether or not your project discharges to an approved downstream 'Highest and Best Use' feature.

Geotechnical Report

A Geotechnical Report or Phase I Environmental Site Assessment may be required by the Copermittee to confirm present and past site characteristics that may affect the use of Infiltration BMPs. In addition, the Co-Permittee, at their discretion, may not require a geotechnical report for small projects as described in Chapter 2 of the WQMP Guidance Document. If a geotechnical report has been prepared, include it in Appendix 3. In addition, if a Phase I Environmental Site Assessment has been prepared, include it in Appendix 4.

Is this project classified as a small project consistent with the requirements of Chapter 2 of the WQMP Guidance Document? ☐ Y ☒ N

Infiltration Feasibility

Table D.1 below is meant to provide a simple means of assessing which DMAs on your site support Infiltration BMPs and is discussed in the WQMP Guidance Document in Chapter 2.4.5. Check the appropriate box for each question and then list affected DMAs as applicable. If additional space is needed, add a row below the corresponding answer.

Table D.1 Infiltration Feasibility

Does the project site…	YES	NO
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		X
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet of a water supply well?		X
If Yes, list affected DMAs:		
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?		X
If Yes, list affected DMAs:		
…have measured in-situ infiltration rates of less than 1.6 inches / hour?		X
If Yes, list affected DMAs:		
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?		X
If Yes, list affected DMAs:		
…geotechnical report identify other site-specific factors that would preclude effective and safe infiltration?		X
Describe here:		

If you answered "Yes" to any of the questions above for any DMA, Infiltration BMPs should not be used for those DMAs and you should proceed to the assessment for Harvest and Use below.

D.2 Harvest and Use Assessment

Please check what applies*:*

☐ Reclaimed water will be used for the non-potable water demands for the project.

☐ Downstream water rights may be impacted by Harvest and Use as approved by the Regional Board (verify with the Copermittee).

☒ The Design Capture Volume will be addressed using Infiltration Only BMPs. In such a case, Harvest and Use BMPs are still encouraged, but it would not be required if the Design Capture Volume will be infiltrated or evapotranspired.

If any of the above boxes have been checked, Harvest and Use BMPs need not be assessed for the site. If neither of the above criteria applies, follow the steps below to assess the feasibility of irrigation use, toilet use and other non-potable uses (e.g., industrial use).

Irrigation Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for Irrigation Use BMPs on your site:

Step 1: Identify the total area of irrigated landscape on the site, and the type of landscaping used.

Total Area of Irrigated Landscape: N/A

Type of Landscaping (Conservation Design or Active Turf): N/A

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for irrigation use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: N/A

Step 3: Cross reference the Design Storm depth for the project site (see Exhibit A of the WQMP Guidance Document) with the left column of Table 2-3 in Chapter 2 to determine the minimum area of Effective Irrigated Area per Tributary Impervious Area (EIATIA).

Enter your EIATIA factor: N/A

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum irrigated area that would be required.

Minimum required irrigated area: N/A

Step 5: Determine if harvesting stormwater runoff for irrigation use is feasible for the project by comparing the total area of irrigated landscape (Step 1) to the minimum required irrigated area (Step 4).

Minimum required irrigated area (Step 4)	Available Irrigated Landscape (Step 1)
N/A	N/A

Toilet Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for toilet flushing uses on your site:

Step 1: Identify the projected total number of daily toilet users during the wet season, and account for any periodic shut downs or other lapses in occupancy:

Projected Number of Daily Toilet Users: N/A

Project Type: N/A

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for toilet use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: N/A

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-2 in Chapter 2 to determine the minimum number or toilet users per tributary impervious acre (TUTIA).

Enter your TUTIA factor: N/A

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of toilet users that would be required.

Minimum number of toilet users: N/A

Step 5: Determine if harvesting stormwater runoff for toilet flushing use is feasible for the project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required Toilet Users (Step 4)	**Projected number of toilet users (Step 1)**
N/A	N/A

Other Non-Potable Use Feasibility

Are there other non-potable uses for stormwater runoff on the site (e.g. industrial use)? See Chapter 2 of the Guidance for further information. If yes, describe below. If no, write N/A.

N/A

Step 1: Identify the projected average daily non-potable demand, in gallons per day, during the wet season and accounting for any periodic shut downs or other lapses in occupancy or operation.

Average Daily Demand: N/A

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for the identified non-potable use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: N/A

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-3 in Chapter 2 to determine the minimum demand for non-potable uses per tributary impervious acre.

Enter the factor from Table 2-3: N/A

Step 4: Multiply the unit value obtained from Step 4 by the total of impervious areas from Step 3 to develop the minimum number of gallons per day of non-potable use that would be required.

Minimum required use: N/A

Step 5: Determine if harvesting stormwater runoff for other non-potable use is feasible for the project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required non-potable use (Step 4)	**Projected average daily use (Step 1)**
N/A	N/A

If Irrigation, Toilet and Other Use feasibility anticipated demands are less than the applicable minimum values, Harvest and Use BMPs are not required and you should proceed to utilize LID Bioretention and Biotreatment, unless a site-specific analysis has been completed that demonstrates technical infeasibility as noted in D.3 below.

D.3 Bioretention and Biotreatment Assessment

Other LID Bioretention and Biotreatment BMPs as described in Chapter 2.4.7 of the WQMP Guidance Document are feasible on nearly all development sites with sufficient advance planning.

Select one of the following:

☐ LID Bioretention/Biotreatment BMPs will be used for some or all DMAs of the project as noted below in Section D.4 (note the requirements of Section 3.4.2 in the WQMP Guidance Document).

☐ A site-specific analysis demonstrating the technical infeasibility of all LID BMPs has been performed and is included in Appendix 5. If you plan to submit an analysis demonstrating the technical infeasibility of LID BMPs, request a pre-submittal meeting with the Copermittee to discuss this option. Proceed to Section E to document your alternative compliance measures.

☒ Not applicable

D.4 Feasibility Assessment Summaries

From the Infiltration, Harvest and Use, Bioretention and Biotreatment Sections above, complete Table D.2 below to summarize which LID BMPs are technically feasible, and which are not, based upon the established hierarchy.

Table D.2 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy				Alternative Compliance	Site Design (Type A, B, C)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment		
A-1	☒	☐	☐	☐	☐	☐
A-2	☒	☐	☐	☐	☐	☐
B-1	☒	☐	☐	☐	☐	☐
B-2	☒	☐	☐	☐	☐	☐
C-1	☒	☐	☐	☐	☐	☐
C-2	☒	☐	☐	☐	☐	☐
D-1	☒	☐	☐	☐	☐	☐
D-2	☒	☐	☐	☐	☐	☐
E-1	☒	☐	☐	☐	☐	☐
E-2	☒	☐	☐	☐	☐	☐
G-1	☒	☐	☐	☐	☐	☐
G-2	☒	☐	☐	☐	☐	☐
H-1	☒	☐	☐	☐	☐	☐
H-2	☒	☐	☐	☐	☐	☐
I-1	☒	☐	☐	☐	☐	☐
I-2	☒	☐	☐	☐	☐	☐

For those DMAs where LID BMPs are not feasible, provide a brief narrative below summarizing why they are not feasible, include your technical infeasibility criteria in Appendix 5, and proceed to Section E below to document Alternative Compliance measures for those DMAs. Recall that each proposed DMA must pass through the LID BMP hierarchy before alternative compliance measures may be considered.

D.5 LID BMP Sizing

Each LID BMP must be designed to ensure that the Design Capture Volume will be addressed by the selected BMPs. First, calculate the Design Capture Volume for each LID BMP using the V_{BMP} worksheet in Appendix F of the LID BMP Design Handbook. Second, design the LID BMP to meet the required V_{BMP} using a method approved by the Copermittee. Utilize the worksheets found in the LID BMP Design Handbook or consult with your Copermittee to assist you in correctly sizing your LID BMPs. Complete Table D.3 below to document the Design Capture Volume and the Proposed Volume for each LID BMP. Provide the completed design procedure sheets for each LID BMP in Appendix 6. You may add additional rows to the table below as needed.

Table D.3 DCV Calculations for LID BMPs (DMA A)

DMA A - Underground Infiltration System (STC "A")								
DMA Type/ID	**DMA Area (square feet)**	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f**	**DMA Runoff Factor**	**DMA Areas x Runoff Factor**	***Design Storm Depth (in)***	***Design Capture Volume, V_{BMP} (cubic feet)***	***Proposed Volume on Plans (cubic feet)***
	[A]		[B]	[C]	[A] x [C]			
A-1	156,555	Concrete or Asphalt	*1.00*	*0.89*	*139,647.1*	*0.85*	*9891.7*	*10,235.0*
A-2	43,821	Ornamental Landscaping	*0.10*	*0.11*	*4,840.4*	*0.85*	*342.9*	
	200,376				*144,488*	0.85	10,234.6	10,235

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.4 DCV Calculations for LID BMPs (DMA B)

DMA B - Underground Infiltration System (STC "B")								
DMA Type/ID	**DMA Area (square feet)**	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f**	**DMA Runoff Factor**	**DMA Areas x Runoff Factor**	***Design Storm Depth (in)***	***Design Capture Volume, V_{BMP} (cubic feet)***	***Proposed Volume on Plans (cubic feet)***
	[A]		[B]	[C]	[A] x [C]			
B-1	156,486	Concrete or Asphalt	*1.00*	*0.89*	*139,585.5*	*0.85*	*9887.3*	*10,095.0*
B-2	26,466	Ornamental Landscaping	*0.10*	*0.11*	*2,923.4*	*0.85*	*207.1*	
	182,952				*142,509*	0.85	10,094.4	10,095

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.5 DCV Calculations for LID BMPs (DMA C)

DMA C - Underground Infiltration System (STC "C")								
DMA Type/ID	**DMA Area (square feet)**	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f**	**DMA Runoff Factor**	**DMA Areas x Runoff Factor**	***Design Storm Depth (in)***	***Design Capture Volume, V_{BMP} (cubic feet)***	***Proposed Volume on Plans (cubic feet)***
	[A]		[B]	[C]	[A] x [C]			
C-1	403,150	Roofs/Conc/Asphalt	*1.00*	*0.89*	*359,609.8*	*0.85*	*25472.4*	*25,829.0*
C-2	45,518	Ornamental Landscaping	*0.10*	*0.11*	*5,027.8*	*0.85*	*356.1*	
	448,668				*364,638*	0.85	25,828.5	25,829

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.6 DCV Calculations for LID BMPs (DMA D)

DMA D - Underground Infiltration System (STC "D")								
DMA Type/ID	**DMA Area (square feet)**	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f**	**DMA Runoff Factor**	**DMA Areas x Runoff Factor**	***Design Storm Depth (in)***	***Design Capture Volume, V_{BMP} (cubic feet)***	***Proposed Volume on Plans (cubic feet)***
	[A]		[B]	[C]	[A] x [C]			
D-1	412,905	Roofs/Conc/Asphalt	*1.00*	*0.89*	*368,311.3*	*0.85*	*26088.7*	*26,454.0*
D-2	46,653	Ornamental Landscaping	*0.10*	*0.11*	*5,153.2*	*0.85*	*365*	
	459,558				*373,465*	0.85	26,453.7	26,454

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.7 DCV Calculations for LID BMPs (DMA E)

DMA E - Underground Infiltration System (STC "E")								
DMA Type/ID	**DMA Area (square feet)**	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f**	**DMA Runoff Factor**	**DMA Areas x Runoff Factor**	***Design Storm Depth (in)***	***Design Capture Volume, V_{BMP} (cubic feet)***	***Proposed Volume on Plans (cubic feet)***
	[A]		[B]	[C]	[A] x [C]			
E-1	150,181	Concrete or Asphalt	*1.00*	*0.89*	*133,961.5*	*0.85*	*9488.9*	*9,644.0*
E-2	19,703	Ornamental Landscaping	*0.10*	*0.11*	*2,176.4*	*0.85*	*154.2*	
	169,884				*136,138*	0.85	9,643.1	9,644

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.8 DCV Calculations for LID BMPs (DMA G)

DMA G - Underground Infiltration System (STC "G")								
DMA Type/ID	**DMA Area (square feet)**	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f**	**DMA Runoff Factor**	**DMA Areas x Runoff Factor**	***Design Storm Depth (in)***	***Design Capture Volume, V_{BMP} (cubic feet)***	***Proposed Volume on Plans (cubic feet)***
	[A]		[B]	[C]	[A] x [C]			
G-1	39,858	Concrete or Asphalt	*1.00*	*0.89*	*35,553.5*	*0.85*	*2518.4*	*2,691.0*
G-2	21,997	Ornamental Landscaping	*0.10*	*0.11*	*2,429.7*	*0.85*	*172.1*	
	61,855				*37,983*	0.85	2,690.5	2,691

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.9 DCV Calculations for LID BMPs (DMA H)

DMA H - Underground Infiltration System (STC "H")								
DMA Type/ID	**DMA Area (square feet)**	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f**	**DMA Runoff Factor**	**DMA Areas x Runoff Factor**	***Design Storm Depth (in)***	***Design Capture Volume, V_{BMP} (cubic feet)***	***Proposed Volume on Plans (cubic feet)***
	[A]		[B]	[C]	[A] x [C]			
H-1	74,227	Concrete or Asphalt	*1.00*	*0.89*	*66,210.5*	*0.85*	*4689.9*	*4,791.0*
H-2	12,893	Ornamental Landscaping	*0.10*	*0.11*	*1,424.1*	*0.85*	*100.9*	
	87,120				*67,635*	0.85	4,790.8	4,791

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.10 DCV Calculations for LID BMPs (DMA I)

DMA I - Underground Infiltration System (STC "I")								
DMA Type/ID	**DMA Area (square feet)**	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f**	**DMA Runoff Factor**	**DMA Areas x Runoff Factor**	***Design Storm Depth (in)***	***Design Capture Volume, V_{BMP} (cubic feet)***	***Proposed Volume on Plans (cubic feet)***
	[A]		[B]	[C]	[A] x [C]			
I-1	38,280	Concrete or Asphalt	*1.00*	*0.89*	*34,146.1*	*0.85*	*2418.7*	*2,457.0*
I-2	4,844	Ornamental Landscaping	*0.10*	*0.11*	*535.1*	*0.85*	*37.9*	
	43,124				*34,681*	0.85	2,456.6	2,457

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Section E: Alternative Compliance (LID Waiver Program)

LID BMPs are expected to be feasible on virtually all projects. Where LID BMPs have been demonstrated to be infeasible as documented in Section D, other Treatment Control BMPs must be used (subject to LID waiver approval by the Copermittee). Check one of the following Boxes:

☒ LID Principles and LID BMPs have been incorporated into the site design to fully address all Drainage Management Areas. No alternative compliance measures are required for this project and thus this Section is not required to be completed.

- *Or* -

☐ The following Drainage Management Areas are unable to be addressed using LID BMPs. A site-specific analysis demonstrating technical infeasibility of LID BMPs has been approved by the Co-Permittee and included in Appendix 5. Additionally, no downstream regional and/or sub-regional LID BMPs exist or are available for use by the project. The following alternative compliance measures on the following pages are being implemented to ensure that any pollutant loads expected to be discharged by not incorporating LID BMPs, are fully mitigated.

E.1 Identify Pollutants of Concern

Utilizing Table A.1 from Section A above which noted your project's receiving waters and their associated EPA approved 303(d) listed impairments, cross reference this information with that of your selected Priority Development Project Category in Table E.1 below. If the identified General Pollutant Categories are the same as those listed for your receiving waters, then these will be your Pollutants of Concern and the appropriate box or boxes will be checked on the last row. The purpose of this is to document compliance and to help you appropriately plan for mitigating your Pollutants of Concern in lieu of implementing LID BMPs.

Table E.1 Potential Pollutants by Land Use Type

Priority Development Project Categories and/or Project Features (check those that apply)	General Pollutant Categories							
	Bacterial Indicators	Metals	Nutrients	Pesticides	Toxic Organic Compounds	Sediments	Trash & Debris	Oil & Grease
☐ Detached Residential Development	P	N	P	P	N	P	P	P
☐ Attached Residential Development	P	N	P	P	N	P	P	P(2)
☒ Commercial/Industrial Development	P(3)	P	P(1)	P(1)	P(5)	P(1)	P	P
☐ Automotive Repair Shops	N	P	N	N	P(4, 5)	N	P	P
☐ Restaurants (>5,000 ft^2)	P	N	N	N	N	N	P	P
☐ Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P
☒ Parking Lots (>5,000 ft^2)	P(6)	P	P(1)	P(1)	P(4)	P(1)	P	P
☐ Retail Gasoline Outlets	N	P	N	N	P	N	P	P
Project Priority Pollutant(s) of Concern	☒	☒	☐	☐	☒	☐	☒	☐

P = Potential

N = Not Potential

(1) A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected

(2) A potential Pollutant if the project includes uncovered parking areas; otherwise not expected

(3) A potential Pollutant is land use involving animal waste

(4) Specifically petroleum hydrocarbons

(5) Specifically solvents

(6) Bacterial indicators are routinely detected in pavement runoff

E.2 Stormwater Credits

Projects that cannot implement LID BMPs but nevertheless implement smart growth principles are potentially eligible for Stormwater Credits. Utilize Table 3-8 within the WQMP Guidance Document to identify your Project Category and its associated Water Quality Credit. If not applicable, write N/A.

Table E.2 Water Quality Credits

Qualifying Project Categories	Credit Percentage[2]
N/A	
Total Credit Percentage[1]	

[1]Cannot Exceed 50%

[2]Obtain corresponding data from Table 3-8 in the WQMP Guidance Document

E.3 Sizing Criteria

After you appropriately considered Stormwater Credits for your project, utilize Table E.3 below to appropriately size them to the DCV, or Design Flow Rate, as applicable. Please reference Chapter 3.5.2 of the WQMP Guidance Document for further information.

Table E.3 Treatment Control BMP Sizing

DMA Type/ ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imp Fraction, I_f	DMA Runoff Factor	DMA Area x Runoff Factor				
	[A]		[B]	[C]	[A] x [C]				
N/A	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*Design Storm Depth (in)*	*Minimum Design Capture Volume (cubic feet)*	*Total Storm Water Credit % Reduction*	*Proposed Volume or Flow on Plans (cubic feet or cfs)*

[B], [C] is obtained as described in Section 2.3.1 from the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is for Flow-Based Treatment Control BMPs [G] = 43,560, for Volume-Based Control Treatment BMPs, [G] = 12
[H] is from the Total Credit Percentage as Calculated from Table E.2 above
[I] as obtained from a design procedure sheet from the BMP manufacturer and should be included in Appendix 6

E.4 Treatment Control BMP Selection

Treatment Control BMPs typically provide proprietary treatment mechanisms to treat potential pollutants in runoff, but do not sustain significant biological processes. Treatment Control BMPs must have a removal efficiency of a medium or high effectiveness as quantified below:

- **High**: equal to or greater than 80% removal efficiency
- **Medium**: between 40% and 80% removal efficiency

Such removal efficiency documentation (e.g., studies, reports, etc.) as further discussed in Chapter 3.5.2 of the WQMP Guidance Document, must be included in Appendix 6. In addition, ensure that proposed Treatment Control BMPs are properly identified on the WQMP Site Plan in Appendix 1.

Table E.4 Treatment Control BMP Selection

Selected Treatment Control BMP Name or ID[1]	Priority Pollutant(s) of Concern to Mitigate[2]	Removal Efficiency Percentage[3]
N/A		
N/A		

[1] *Treatment Control BMPs must not be constructed within Receiving Waters. In addition, a proposed Treatment Control BMP may be listed more than once if they possess more than one qualifying pollutant removal efficiency.*
[2] *Cross Reference Table E.1 above to populate this column.*
[3] *As documented in a Co-Permittee Approved Study and provided in Appendix 6.*

Section F: Hydromodification

F.1 Hydrologic Conditions of Concern (HCOC) Analysis

Once you have determined that the LID design is adequate to address water quality requirements, you will need to assess if the proposed LID Design may still create a HCOC. Review Chapters 2 and 3 (including Figure 3-7) of the WQMP Guidance Document to determine if your project must mitigate for Hydromodification impacts. If your project meets one of the following criteria which will be indicated by the check boxes below, you do not need to address Hydromodification at this time. However, if the project does not qualify for Exemptions 1, 2 or 3, then additional measures must be added to the design to comply with HCOC criteria. This is discussed in further detail below in Section F.2.

HCOC EXEMPTION 1: The Priority Development Project disturbs less than one acre. The Copermittee has the discretion to require a Project-Specific WQMP to address HCOCs on projects less than one acre on a case by case basis. The disturbed area calculation should include all disturbances associated with larger common plans of development.

Does the project qualify for this HCOC Exemption? ☐Y ☒N

If Yes, HCOC criteria do not apply.

HCOC EXEMPTION 2: The volume and time of concentration[1] of storm water runoff for the post-development condition is not significantly different from the pre-development condition for a 2-year return frequency storm (a difference of 5% or less is considered insignificant) using one of the following methods to calculate:

- Riverside County Hydrology Manual
- Technical Release 55 (TR-55): Urban Hydrology for Small Watersheds (NRCS 1986), or derivatives thereof, such as the Santa Barbara Urban Hydrograph Method
- Other methods acceptable to the Co-Permittee

Does the project qualify for this HCOC Exemption? ☒Y ☐ N

If yes, report results in Table F.1 below and provide your substantiated hydrologic analysis in Appendix 7.

Table F.1 Hydrologic Conditions of Concern Summary

	2 year – 24 hour		
	Pre-condition	**Post-condition**	**% Difference**
Time of Concentration (min)	7.64	4.60	60%
Volume (cubic-feet)	25,046	205,380	820%

[1] Time of concentration is defined as the time after the beginning of the rainfall when all portions of the drainage basin are contributing to flow at the outlet.

To meet HCOC requirements, the mitigation volume must be achieved by using LID and hydromodification mitigation BMPs. The mitigation volume required is approximately 170,065 cu-ft ([205,380 cu-ft x 0.95] – 25,046 cu-ft). In addition to the 82,255 cu-ft already being provided to meet LID requirements, the underground chambers will also store an additional 87,810 cu-ft. As a result, HCOCs will be addressed by the proposed underground chambers. Since the mitigation volume has been met, it is physically impossible for the project to avoid increasing the time of concentration and reducing peak runoff by more than five percent of pre-development conditions.

HCOC EXEMPTION 3: All downstream conveyance channels to an adequate sump (for example, Prado Dam, Lake Elsinore, Canyon Lake, Santa Ana River, or other lake, reservoir or naturally erosion resistant feature) that will receive runoff from the project are engineered and regularly maintained to ensure design flow capacity; no sensitive stream habitat areas will be adversely affected; or are not identified on the Co-Permittees Hydromodification Sensitivity Maps.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, HCOC criteria do not apply and note below which adequate sump applies to this HCOC qualifier:

F.2 HCOC Mitigation

If none of the above HCOC Exemption Criteria are applicable, HCOC criteria is considered mitigated if they meet one of the following conditions:

a. Additional LID BMPS are implemented onsite or offsite to mitigate potential erosion or habitat impacts as a result of HCOCs. This can be conducted by an evaluation of site-specific conditions utilizing accepted professional methodologies published by entities such as the California Stormwater Quality Association (CASQA), the Southern California Coastal Water Research Project (SCCRWP), or other Co-Permittee approved methodologies for site-specific HCOC analysis.

b. The project is developed consistent with an approved Watershed Action Plan that addresses HCOC in Receiving Waters.

c. Mimicking the pre-development hydrograph with the post-development hydrograph, for a 2-year return frequency storm. Generally, the hydrologic conditions of concern are not significant, if the post-development hydrograph is no more than 10% greater than pre-development hydrograph. In cases where excess volume cannot be infiltrated or captured and reused, discharge from the site must be limited to a flow rate no greater than 110% of the pre-development 2-year peak flow.

Section G: Source Control BMPs

Source control BMPs include permanent, structural features that may be required in your project plans — such as roofs over and berms around trash and recycling areas — and Operational BMPs, such as regular sweeping and "housekeeping", that must be implemented by the site's occupant or user. The MEP standard typically requires both types of BMPs. In general, Operational BMPs cannot be substituted for a feasible and effective permanent BMP. Using the Pollutant Sources/Source Control Checklist in Appendix 8, review the following procedure to specify Source Control BMPs for your site:

1. ***Identify Pollutant Sources*:** Review Column 1 in the Pollutant Sources/Source Control Checklist. Check off the potential sources of Pollutants that apply to your site.

2. ***Note Locations on Project-Specific WQMP Exhibit*:** Note the corresponding requirements listed in Column 2 of the Pollutant Sources/Source Control Checklist. Show the location of each Pollutant source and each permanent Source Control BMP in your Project-Specific WQMP Exhibit located in Appendix 1.

3. ***Prepare a Table and Narrative*:** Check off the corresponding requirements listed in Column 3 in the Pollutant Sources/Source Control Checklist. In the left column of Table G.1 below, list each potential source of runoff Pollutants on your site (from those that you checked in the Pollutant Sources/Source Control Checklist). In the middle column, list the corresponding permanent, Structural Source Control BMPs (from Columns 2 and 3 of the Pollutant Sources/Source Control Checklist) used to prevent Pollutants from entering runoff. **Add additional narrative** in this column that explains any special features, materials or methods of construction that will be used to implement these permanent, Structural Source Control BMPs.

4. ***Identify Operational Source Control BMPs:*** To complete your table, refer once again to the Pollutant Sources/Source Control Checklist. List in the right column of your table the Operational BMPs that should be implemented as long as the anticipated activities continue at the site. Copermittee stormwater ordinances require that applicable Source Control BMPs be implemented; the same BMPs may also be required as a condition of a use permit or other revocable Discretionary Approval for use of the site.

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
A. On-site storm drain inlets	• Mark all inlets with the words "Only Rain Down the Storm Drain" or similar.	• Maintain and periodically repaint or replace inlet markings annually. • Provide stormwater pollution prevention information to new site owners, lessees, or operators upon occupancy and annually thereafter. • See CASQA fact sheet SC-44 for "Drainage System Maintenance," included in Appendix of this document. • Include the following lease agreements: "Tenant shall not allow anyone to discharge anything to storm drain or to store or deposit materials so as to create a potential discharge to storm drains."

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
B. Interior floor drains and elevator shaft sump pumps	• Interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	• Inspect and maintain drains semi-annually to prevent blockages and overflow.
D2. Landscape / Outdoor Pesticide Use	• Landscape plans will minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. • Pest-resistant plans will be used adjacent to hardscape. • The landscape plans will consider plants appropriate to the site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	• Maintain landscaping only using minimum pesticides, when needed. • See Appendix 10 for "Landscape and Gardening" brochure by RCFlood. • Provide Integrated Pest Management (IPM) information to new owners, lessees and operators upon occupancy and annually thereafter. IPM is an effective and environmentally sensitive approach to pest management.
G. Refuse Areas	• Site refuse will be handled by contractor on a weekly basis. • Signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	• A minimum of two receptacles will be provided and located indoors. Receptacles are to be inspected daily and repairs or replacements to leaky receptacles will be completed immediately. Receptacles are to remain covered when not in use. Dumping of liquid or hazardous wastes is prohibited. A "no hazardous materials" sign will be posted. Spills will be cleaned immediately upon discovery. Spill control materials will be available onsite. See Appendix 10 for CASQA fact sheet SC-34 for "Waste Handling and Disposal."
H. Industrial processes	• All process activities to be performed indoors. No processes to drain to exterior or to storm drain system.	• See Appendix 10 for CASQA fact sheet SC-10 for "Non-Stormwater Discharges"
M. Loading Docks	• Spills will be cleaned up immediately and disposed of properly.	• Move loaded and unloaded items indoors as soon as possible. • See Appendix 10 for CASQA fact sheet SC-30 for "Outdoor Loading and Unloading"
P. Plazas, sidewalks, and parking lots		• Sweep plazas, sidewalks, and parking lots monthly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.

Section H: Construction Plan Checklist

Populate Table H.1 below to assist the plan checker in an expeditious review of your project. The first two columns will contain information that was prepared in previous steps, while the last column will be populated with the corresponding plan sheets. This table is to be completed with the submittal of your final Project-Specific WQMP.

Table H.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)	Latitude	Longitude
A	On-site storm drain inlets	Conceptual Grading Plans	---	---
B	Interior floor drains and elevator shaft sump pumps	N/A	---	---
D2	Landscape / Outdoor Pesticide Use	On-site Landscape Improvement Plans	---	---
G	Refuse Areas	Conceptual Grading Plans	---	---
H	Industrial processes	Conceptual Grading Plans (indoors, if any)	---	---
M	Loading Docks	Conceptual Grading Plans	---	---
P	Plazas, sidewalks, and parking lots	Conceptual Grading Plans	---	---
STC "A"	Underground Infiltration System	Conceptual Grading Plans	33.780316	-117.485067
STC "B"	Underground Infiltration System	Conceptual Grading Plans	33.782186	-117.484095
STC "C"	Underground Infiltration System	Conceptual Grading Plans	33.782909	-117.485679
STC "D"	Underground Infiltration System	Conceptual Grading Plans	33.782105	-117.487088
STC "E"	Underground Infiltration System	Conceptual Grading Plans	33.782937	-117.488080
STC "G"	Underground Infiltration System	Conceptual Grading Plans	33.783567	-117.486753
STC "H"	Underground Infiltration System	Conceptual Grading Plans	33.782749	-117.488094
STC "I"	Underground Infiltration System	Conceptual Grading Plans	33.779600	-117.485216

Note that the updated table — or Construction Plan WQMP Checklist — is **only a reference tool** to facilitate an easy comparison of the construction plans to your Project-Specific WQMP. Co-Permittee staff can advise you regarding the process required to propose changes to the approved Project-Specific WQMP.

Section I: Operation, Maintenance and Funding

The Copermittee will periodically verify that Stormwater BMPs on your site are maintained and continue to operate as designed. To make this possible, your Copermittee will require that you include in Appendix 9 of this Project-Specific WQMP:

1. A means to finance and implement facility maintenance in perpetuity, including replacement cost.
2. Acceptance of responsibility for maintenance from the time the BMPs are constructed until responsibility for operation and maintenance is legally transferred. A warranty covering a period following construction may also be required.
3. An outline of general maintenance requirements for the Stormwater BMPs you have selected.
4. Figures delineating and designating pervious and impervious areas, location, and type of Stormwater BMP, and tables of pervious and impervious areas served by each facility. Geo-locating the BMPs using a coordinate system of latitude and longitude is recommended to help facilitate a future statewide database system.
5. A separate list and location of self-retaining areas or areas addressed by LID Principles that do not require specialized O&M or inspections but will require typical landscape maintenance as noted in Chapter 5, pages 85-86, in the WQMP Guidance. Include a brief description of typical landscape maintenance for these areas.

Your local Co-Permittee will also require that you prepare and submit a detailed Stormwater BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the Stormwater BMPs built on your site. An agreement assigning responsibility for maintenance and providing for inspections and certification may also be required.

Details of these requirements and instructions for preparing a Stormwater BMP Operation and Maintenance Plan are in Chapter 5 of the WQMP Guidance Document.

Maintenance Mechanism: County of Riverside:

Covenant and Agreement

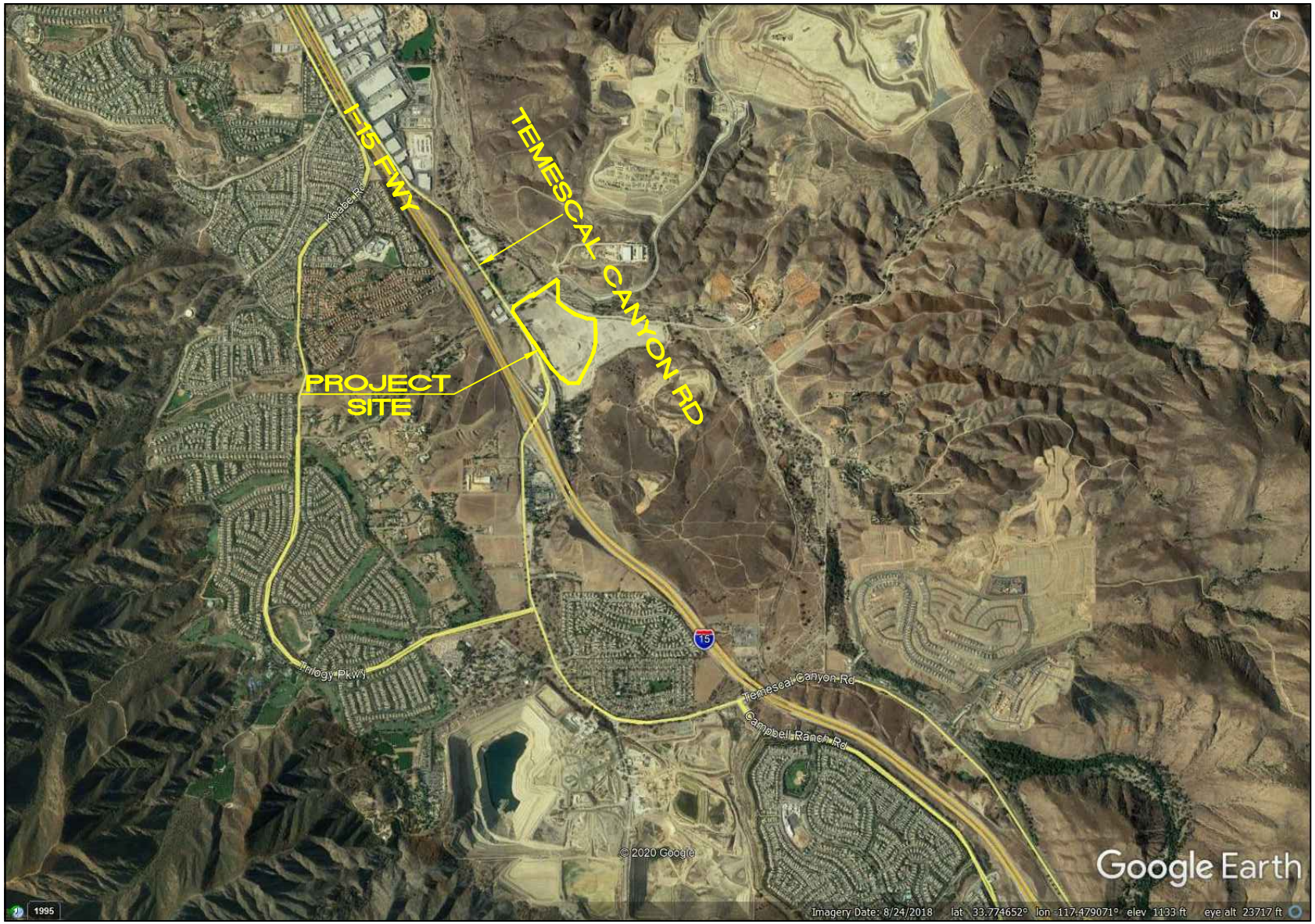
Will the proposed BMPs be maintained by a Home Owners' Association (HOA) or Property Owners Association (POA)?

☐ Y ☒ N

Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map



Last Update: 11/1/20
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VICINITY MAP

FOR

TEMESCAL VALLEY COMMERCE CENTER

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

Last Update:11/1/20
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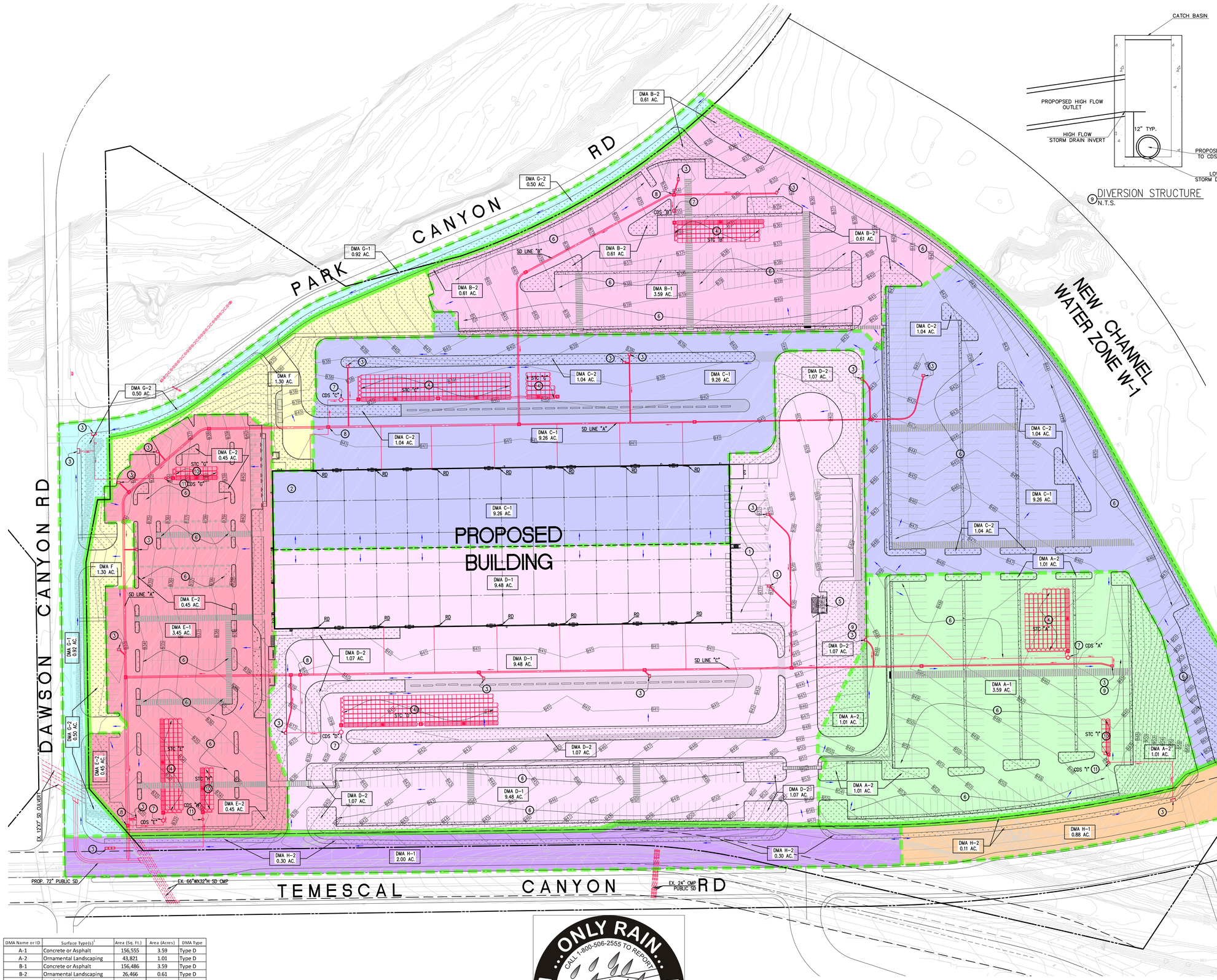
FLOW

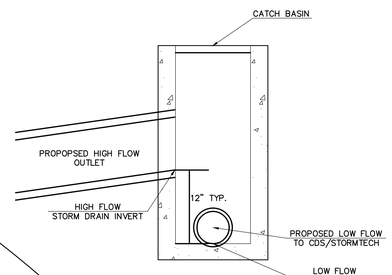
RECEIVING WATERS MAP

FOR

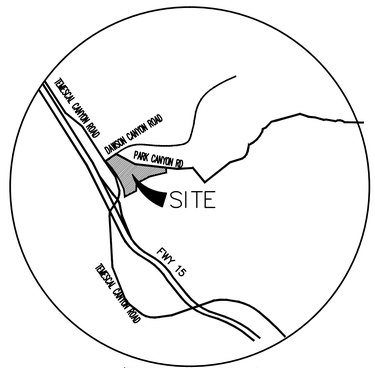
TEMESCAL VALLEY COMMERCE CENTER

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





9 DIVERSION STRUCTURE
N.T.S.



(T4S, R6W, SECTION 35 & 35)

VICINITY MAP
N.T.S.

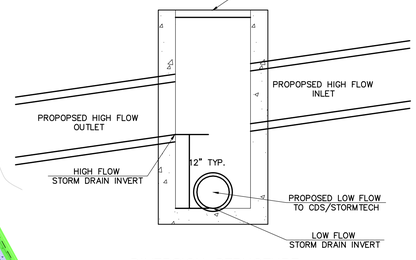
LEGEND

1. LOADING/UNLOADING TRUCK DOCKS
2. EDUCATIONAL MATERIAL/OFFICE
3. STORM DRAIN STENCIL
4. UNDERGROUND INFILTRATION CHAMBERS
5. TRASH ENCLOSURE
6. PARKING LOT MAINTENANCE (SWEEPING)
7. CDS UNIT
8. DIVERSION STRUCTURE – MANHOLE
9. DIVERSION STRUCTURE – CATCH BASIN
10. OFFSITE – UNDERGROUND INFILTRATION CHAMBERS
11. OFFSITE – CDS UNIT

NOTE:

- BOUNDARY
- SUBAREAS (TRIBUTARY TO STC)
- FLOW LINE
- SD FLOW LINE
- LANDSCAPE/EFFICIENT IRRIGATION

RD ROOF DRAIN
STC STORMTECH CHAMBERS



8 DIVERSION STRUCTURE
N.T.S.

0 30 60 120 180
SCALE: 1"=60'

DMA Name or ID	Surface Type(s)[1]	Area (Sq. Ft.)	Area (Acres)	DMA Type
A-1	Concrete or Asphalt	156,555	3.59	Type D
A-2	Ornamental Landscaping	43,821	1.01	Type D
B-1	Concrete or Asphalt	156,486	3.59	Type D
B-2	Ornamental Landscaping	26,466	0.61	Type D
C-1	Roofs/Conc/Asphalt	403,150	9.26	Type D
C-2	Ornamental Landscaping	45,518	1.04	Type D
D-1	Roofs/Conc/Asphalt	412,905	9.48	Type D
D-2	Ornamental Landscaping	46,653	1.07	Type D
E-1	Concrete or Asphalt	150,181	3.45	Type D
E-2	Ornamental Landscaping	19,703	0.45	Type D
F	Ornamental Landscaping	63,162	1.30	Type A
G-1	Concrete or Asphalt	39,858	0.92	Type D
G-2	Ornamental Landscaping	21,997	0.50	Type D
H-1	Concrete or Asphalt	74,227	1.70	Type D
H-2	Ornamental Landscaping	12,893	0.30	Type D
I-1	Concrete or Asphalt	38,280	0.88	Type D
I-2	Ornamental Landscaping	4,844	0.11	Type D

SAMPLE STORM DRAIN STENCIL

Last Update:1/13/21
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COUNTY OF RIVERSIDE
PUBLIC WORKS DEPARTMENT

WQMP SITE MAP

TEMESCAL VALLEY COMMERCE CENTER

TEMESCAL CANYON ROAD AND DAWSON CANYON ROAD

PREPARED FOR:
DAWSON CANYON LLC
11777 SAN VICENTE BLVD, STE 780
LOS ANGELES, CA 90049
PHONE: (949) 296-7006

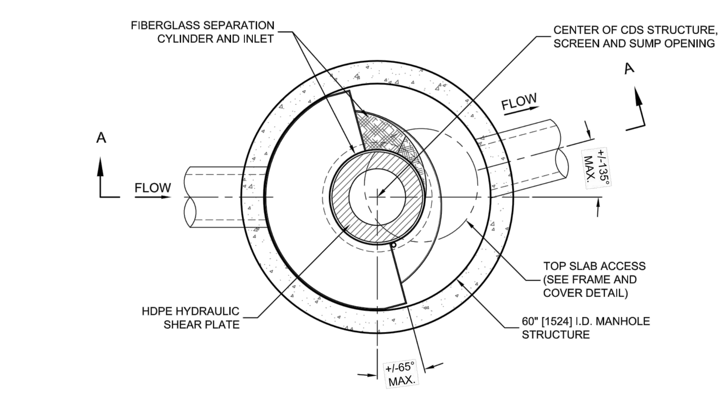
PREPARED BY:
Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

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

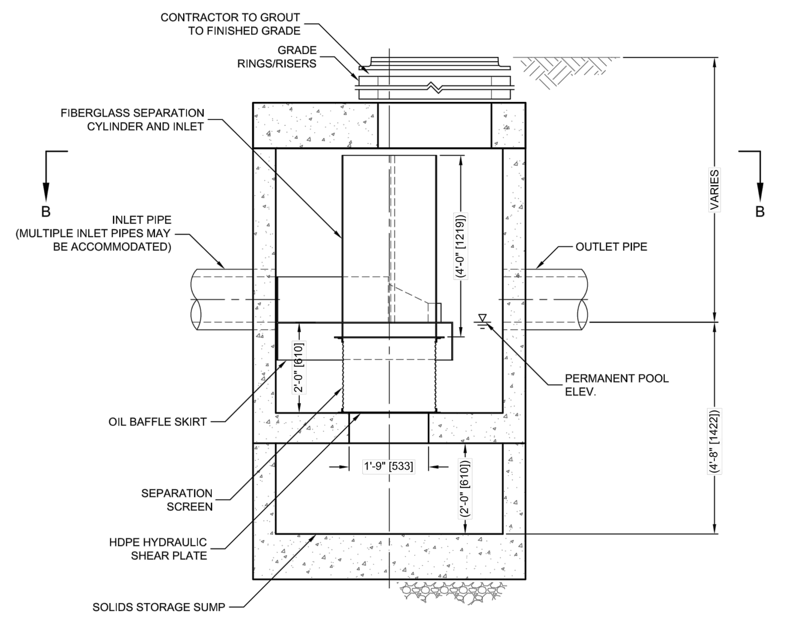
Approved by _____ Date _____
Public Works Director _____ R.C.E. _____

Sheet 1 of 2 Sheets

2712/ 1 OF 2 SHEETS



PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.

CDS

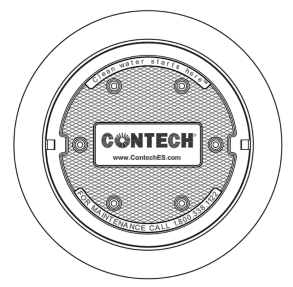
I:\STORMWATER\COMMOPS\22 CDS\40 STANDARD DRAWINGS\INLINE (CDS-C)\DWG\CDS2015-5-C-DTL.DWG 5/13/2014 5:54 PM

CDS2015-5-C DESIGN NOTES

CDS2015-5-C RATED TREATMENT CAPACITY IS 0.7 CFS [19.8 L/s], OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 10.0 CFS [396 L/s]. IF THE SITE CONDITIONS EXCEED 14.0 [396 L/s] CFS, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS2015-5-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*
NOTES/SPECIAL REQUIREMENTS:			

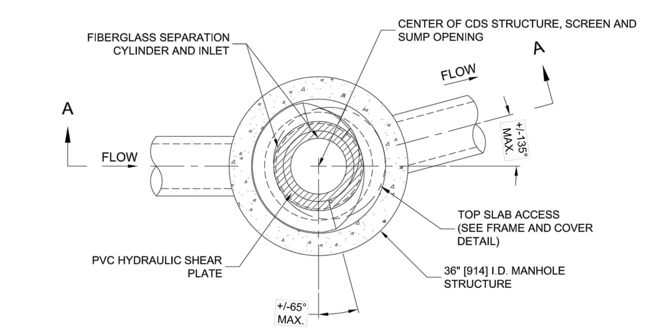
* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

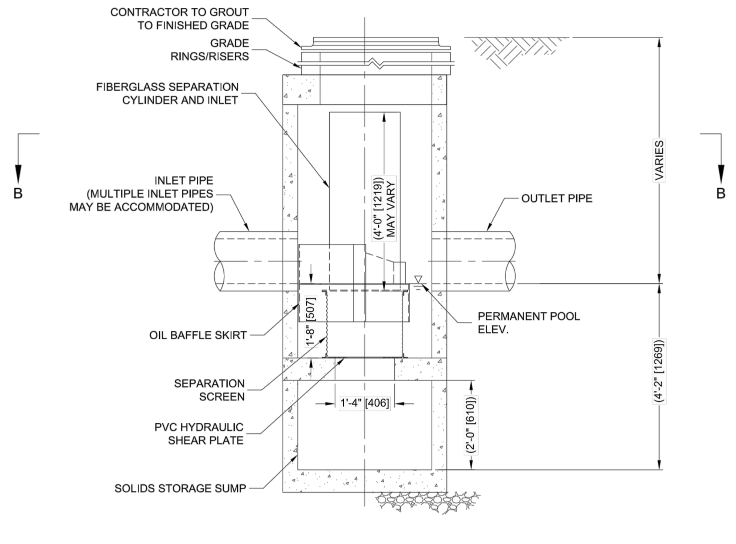
INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS2015-5-C
INLINE CDS
STANDARD DETAIL



PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.

CDS

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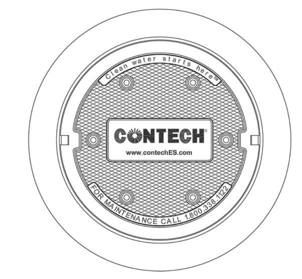
CDS1515-3-C DESIGN NOTES

CDS1515-3-C RATED TREATMENT CAPACITY IS 0.50 [14.16 L/s] CFS, OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 6.0 [170 L/s] CFS. IF THE SITE CONDITIONS EXCEED 6.0 [170 L/s] CFS, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS1515-3-C CONFIGURATION IS SHOWN.



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*
NOTES/SPECIAL REQUIREMENTS:			

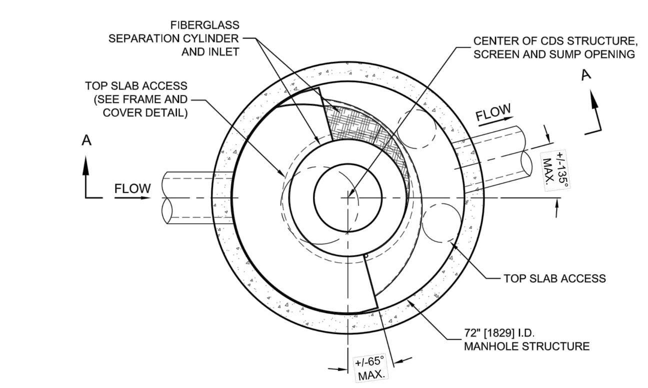
* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO..
5. IF REQUIRED, PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.
6. CDS STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

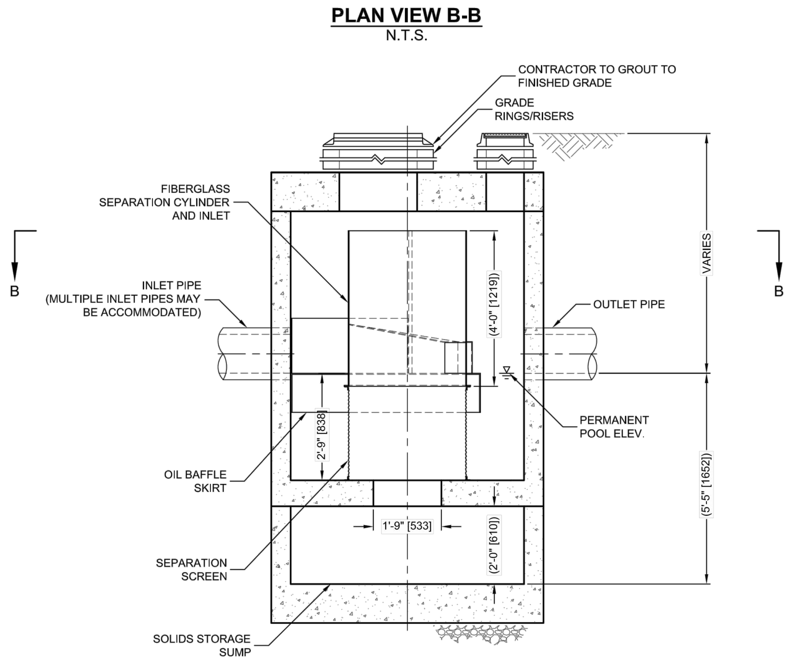
INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS1515-3-C
ONLINE CDS
STANDARD DETAIL



PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.

CDS

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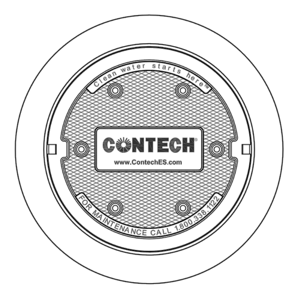
CDS3020-6-C DESIGN NOTES

CDS3020-6-C RATED TREATMENT CAPACITY IS 2.0 CFS [56.6 L/s], OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 20.0 CFS [566 L/s]. IF THE SITE CONDITIONS EXCEED 20.0 CFS [566 L/s], AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS3020-6-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*
NOTES/SPECIAL REQUIREMENTS:			

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
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4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
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C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS3020-6-C
INLINE CDS
STANDARD DETAIL

StormTech ADS

STORMTECH MC-3500 CHAMBER

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

STORMTECH MC-3500 CHAMBER
(not to scale)

Nominal Chamber Specifications

Size (L x W x H)
90" x 77" x 45"
2,286 mm x 1,956 mm x 1,143 mm

Chamber Storage
109.9 ft³ (3.11 m³)

Min. Installed Storage*
175.0 ft³ (4.96 m³)

Weight
134 lbs (60.8 kg)

Shipping
15 chambers/pallet
7 end caps/pallet
7 pallets/truck

*Assumes a minimum of 12" (300 mm) of stone above, 9" (230 mm) of stone below chambers, 6" (150 mm) of stone between chambers/end caps and 40% stone porosity.

STORMTECH MC-3500 END CAP
(not to scale)

Nominal End Cap Specifications

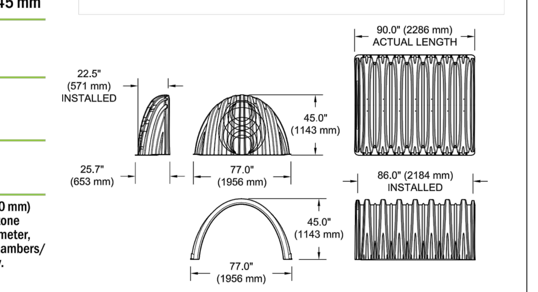
Size (L x W x H)
26.5" x 71" x 45.1"
673 mm x 1,803 mm x 1,145 mm

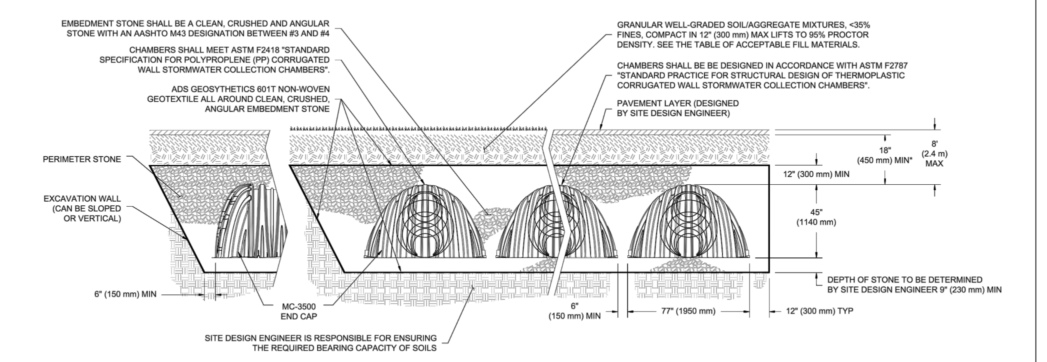
End Cap Storage
14.9 ft³ (0.42 m³)

Min. Installed Storage*
45.1ft³ (1.28 m³)

Weight
49 lbs (22.2 kg)

*Assumes a minimum of 12" (300 mm) of stone above, 9" (230 mm) of stone below, 6" (150 mm) of stone perimeter, 6" (150 mm) of stone between chambers/end caps and 40% stone porosity.





*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

StormTech ADS

MC-3500 CHAMBER SPECIFICATION

STORAGE VOLUME PER CHAMBER FT³ (M³)

	Bare Chamber Storage ft³ (m³)	Chamber and Stone Foundation Depth in. (mm)			
		9" (230 mm)	12" (300 mm)	15" (375 mm)	18" (450 mm)
MC-3500 Chamber	109.9 (3.11)	175.0 (4.96)	179.9 (5.09)	184.9 (5.24)	189.9 (5.38)
MC-3500 End Cap	14.9 (.42)	45.1 (1.28)	46.6 (1.32)	48.3 (1.37)	49.9 (1.41)

Note: Assumes 6" (150 mm) row spacing, 40% stone porosity, 12" (300 mm) stone above and includes the bare chamber/end cap volume.

AMOUNT OF STONE PER CHAMBER

ENGLISH TONS (yds³)	Stone Foundation Depth			
	9"	12"	15"	18"
MC-3500 Chamber	8.5 (6.0)	9.1 (6.5)	9.7 (6.9)	10.4 (7.4)
MC-3500 End Cap	3.9 (2.8)	4.1 (2.9)	4.3 (3.1)	4.5 (3.2)
METRIC KILOGRAMS (m³)	230 mm	300 mm	375 mm	450 mm
MC-3500 Chamber	7711 (4.6)	8255 (5.0)	8800 (5.3)	9435 (5.7)
MC-3500 End Cap	3538 (2.1)	3719 (2.2)	3901 (2.4)	4082 (2.5)

Note: Assumes 12" (300 mm) of stone above and 6" (150 mm) row spacing and 6" (150 mm) of perimeter stone in front of end caps.

VOLUME EXCAVATION PER CHAMBER YD³ (M³)

	Stone Foundation Depth			
	9" (230 mm)	12" (300 mm)	15" (375mm)	18" (450 mm)
MC-3500 Chamber	11.9 (9.1)	12.4 (9.5)	12.8(9.8)	13.3 (10.2)
MC-3500 End Cap	4.0 (3.1)	4.1 (3.2)	4.3 (3.3)	4.4 (3.4)

Note: Assumes 6" (150 mm) of separation between chamber rows and 24" (600 mm) of cover. The volume of excavation will vary as depth of cover increases.

ADS DESIGN TOOL 2.0

Working on a project?
Visit us at www.stormtech.com
and utilize the StormTech Design Tool

For more information on the StormTech MC-3500 Chamber and other ADS products, please contact our Customer Service Representatives at 1-800-821-6710

THE MOST ADVANCED NAME IN WATER MANAGEMENT SOLUTIONS®

Advanced Drainage Systems, Inc.
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COUNTY OF RIVERSIDE
PUBLIC WORKS DEPARTMENT

WQMP SITE MAP

TEMESCAL VALLEY COMMERCE CENTER

TEMESCAL CANYON ROAD AND DAWNSON CANYON ROAD

PREPARED FOR:
DAWSON CANYON LLC
11777 SAN VICENTE BLVD, STE 780
LOS ANGELES, CA 90049
PHONE: (949) 296-7006

PREPARED BY:
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 ____

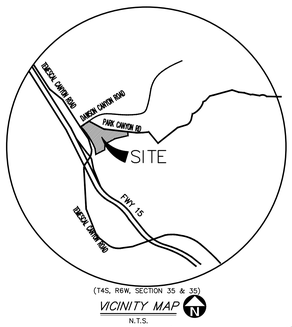
Public Works Director R.C.E. ____

Sheet 2 of 2 Sheets

3905/ 2 OF 2 SHEETS

Appendix 2: Construction Plans

Grading and Drainage Plans



(T4S, R6W, SECTION 35 & 35)

VICINITY MAP

N.T.S.

		PRELIMINARY - EARTHWORK BALANCE CALCULATIONS	1/5/2021	
PROJECT:		TEMESCAL VALLEY COMMERCE CENTER		
JOB#		3905b		
			QUANTITY	UNITS
	K.	SITE AREA:	1,517,630	SF
	L.	SUBSIDENCE FACTOR:	0.150	
	M.	SHRINKAGE FACTOR:	10.0	%
	N.	SITE STRIPPING FACTOR:	0.1	
	O.	OVEREXCAVATION:	16,987	CY
	A.	CALCULATED CUT:	125,000	CY
		ADDITION SLAB CUT:	566	CY
		FOOTING AND UTILITY SPOILS	2,422	CY
		RECYCLE MATERIAL	-	CY
		UGS-WQMP	14,940	CY
		TOTAL CUT: (A+B)	**142,928**	CY
	D.	CALCULATED FILL:	115,000	CY
	E.	LIGHT PAVING FILL:	-	CY
	F.	SUBSIDENCE: (LxK)/27=	8,431	CY
	G.	SHRINKAGE: (M/100)C=	14,293	CY
	H.	SITE STRIPPING	3,506	CY
	I.	OVEREXCAVATION SHRINKAGE	1,699	CY
	J.	**TOTAL FILL: (D+E+F+G+H)=**	**142,928**	CY
	K.	**TOTAL (IMPORT) OR EXPORT:**	**(0)**	CY
		SITE ADJUSTMENT	(0.00)	

PARK CANYON RD

DAWSON CANYON RD

TEMESCAL CANYON

PROP. CHANNEL

PROPOSED BUILDING
941.49 FF
940.91 PAD

SEE SHEET 04

PREPARED FOR:

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COUNTY OF RIVERSIDE
PUBLIC WORKS DEPARTMENT

CONCEPTUAL GRADING PLAN
TEMESCAL VALLEY COMMERCE CENTER
PLANNING CASE NO. PAR19-00052

CUP200044 | Sheet 1 of 4 Sheets | 3905b

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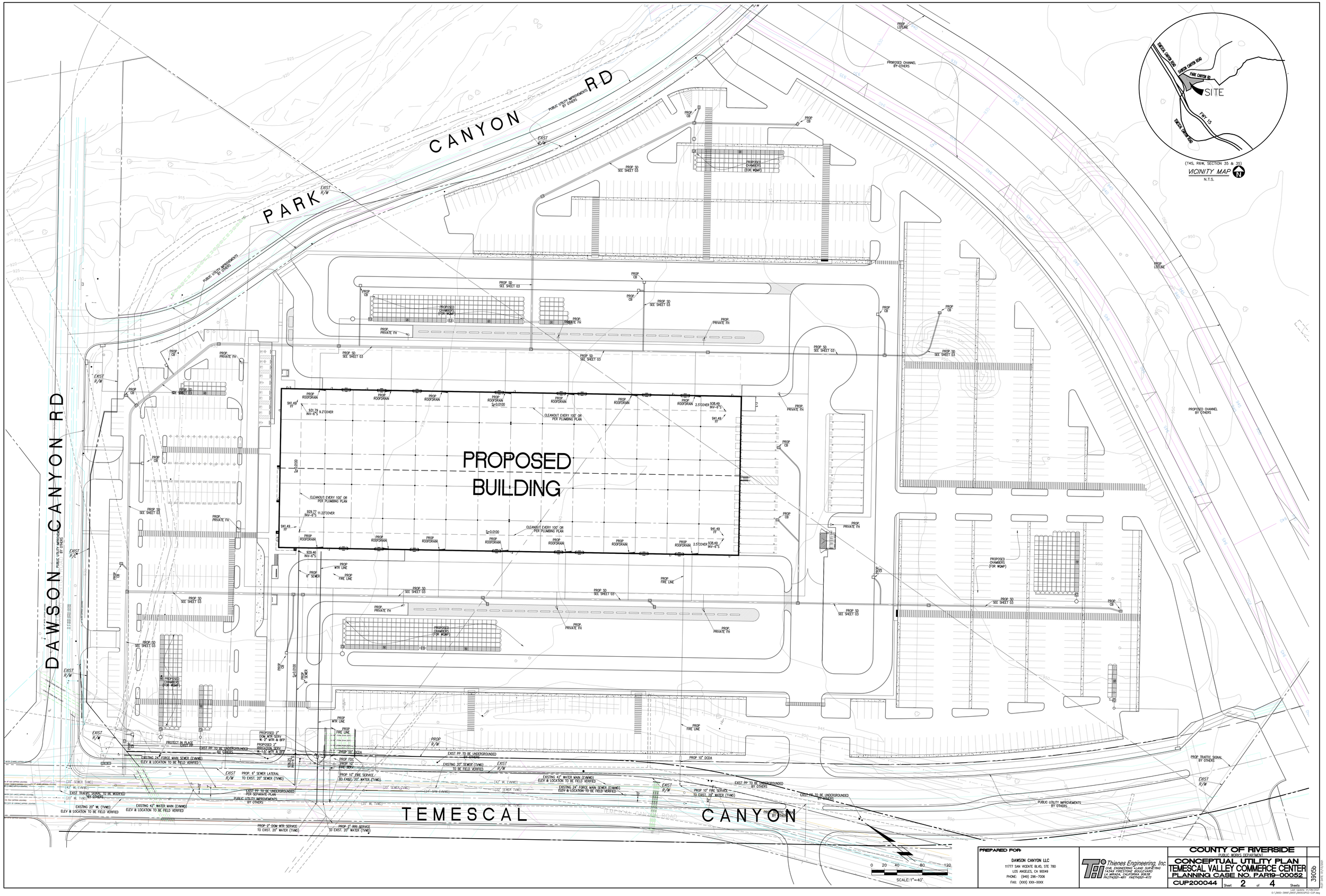

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COUNTY OF RIVERSIDE
PUBLIC WORKS DEPARTMENT

CONCEPTUAL UTILITY PLAN
TEMESCAL VALLEY COMMERCE CENTER
PLANNING CASE NO. PAR19-00052

CUP200044 Sheet 2 of 4 Sheets

3905b

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PARK CANYON RD

DAWSON CANYON RD

TEMESCAL CANYON RD

NEW CHANNEL WATER ZONE W-1

PROPOSED BUILDING

FLOODWAY AREA ZONE AE

100.00' PROPOSED CHANNEL BY OTHERS

CURB OPENING CATCH BASIN PER SPPWC 300-3

GRATING CATCH BASIN PER SPPWC 305-3

MANHOLE PER SPPWC 321-2

MANHOLE PER SPPWC 320-2

MANHOLE PER SPPWC 322-2

MANHOLE PER SPPWC 321-1

S.D. PIPE 18" H.D.P.E.

S.D. PIPE 24" H.D.P.E.

S.D. PIPE 30" H.D.P.E.

S.D. PIPE 36" H.D.P.E.

S.D. PIPE 12" H.D.P.E.

S.D. PIPE 60" H.D.P.E.

S.D. PIPE 72" H.D.P.E.

S.D. PIPE 12" R.C.P.

HYDRODYNAMIC SEPARATOR CDS3020-6 (1.7 CFS MIN.)

HYDRODYNAMIC SEPARATOR CDS2015-5 (0.60 CFS MIN.)

HYDRODYNAMIC SEPARATOR CDS1515-3 (0.20 CFS MIN.)

UNDERGROUND INFILTRATION SYSTEM 229 STORMTECH MC-3500 CHAMBERS 36-INCH STONE FOUNDATION WQ VOL = 39,809 CF MIN. HCOC VOL = 26,580 CF MIN.

UNDERGROUND INFILTRATION SYSTEM 92 STORMTECH MC-3500 CHAMBERS 36-INCH STONE FOUNDATION WQ VOL = 10,094 CF MIN. HCOC VOL = 11,196 CF MIN.

UNDERGROUND INFILTRATION SYSTEM 14 STORMTECH MC-3500 CHAMBERS 9-INCH STONE FOUNDATION WQ VOL = 2,691 CF MIN.

UNDERGROUND INFILTRATION SYSTEM 234 STORMTECH MC-3500 CHAMBERS 36-INCH STONE FOUNDATION WQ VOL = 24,454 CF MIN. HCOC VOL = 27,024 CF MIN.

UNDERGROUND INFILTRATION SYSTEM 27 STORMTECH MC-3500 CHAMBERS 9-INCH STONE FOUNDATION WQ VOL = 4,749 CF MIN.

UNDERGROUND INFILTRATION SYSTEM 14 STORMTECH MC-3500 CHAMBERS 9-INCH STONE FOUNDATION WQ VOL = 2,457 CF MIN.

SECTION LINE

50.00' SCE ESMT

4.00' SCE ESMT

20.00' SCE ESMT

REMOVE AND CAP EXISTING STORM DRAIN CULVERTS

EXISTING STORM DRAIN 2-5.5'W x 3.5'H C.M.P. CULVERTS PER PLAN 924-M LINE 'D'

EXISTING STORM DRAIN 2-6'W x 4'H R.C.B. CULVERTS PER PLAN 924-M

PROPOSED JUNCTION STRUCTURE PER SPPWC 333-2

PROPOSED TRANSITION STRUCTURE PER SPPWC 340-2

PROTECT EXISTING CATCH BASIN AND HEADWALL

MANHOLE PER SPPWC 320-2 W/ 30" BIOFLEX CHECKMATE VALVE

CATCH BASIN

(20" SEWER TYMO)

(42" W. EVMWD) 72" R.C.P.

(20" W. TYMO)

(24" GEM EVMWD)

(42" W. EVMWD)

(20" SEWER TYMO)

(20" W. TYMO)

0 20 40 80 120

SCALE:1"=40'

PREPARED FOR:

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COUNTY OF RIVERSIDE
PUBLIC WORKS DEPARTMENT

CONCEPTUAL STORM DRAIN PLAN
TEMESCAL VALLEY COMMERCE CENTER
PLANNING CASE NO. PAR19-00052

CUP200044 | Sheet 3 of 4 Sheets

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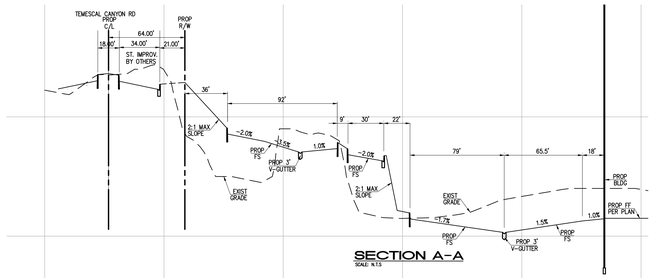

SECTION A-A
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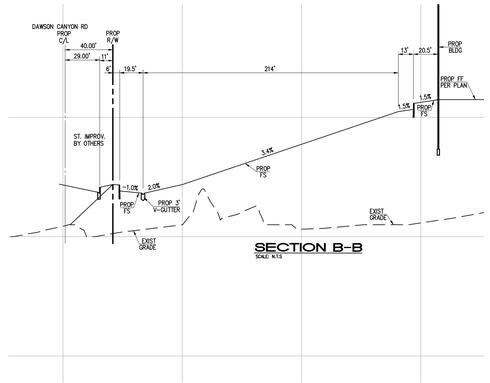

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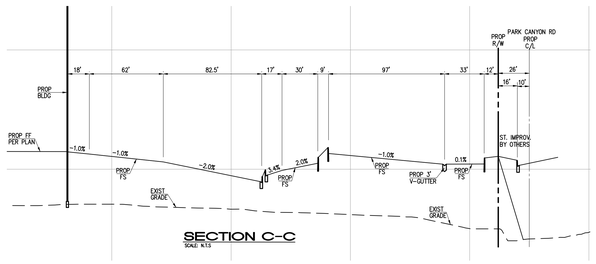

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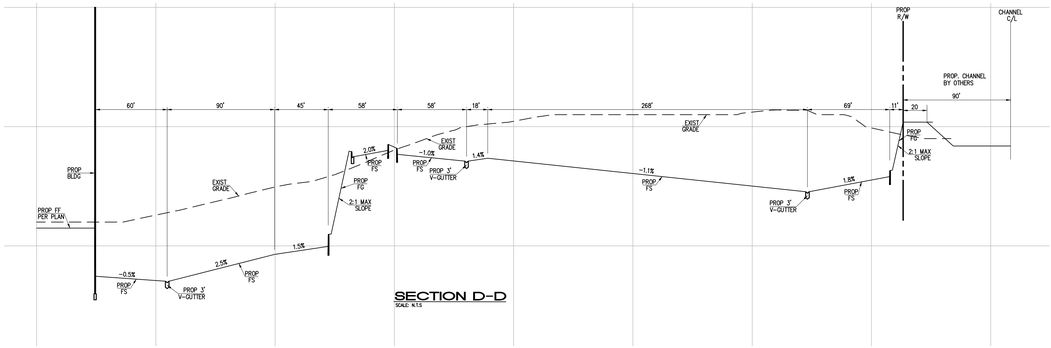

SECTION D-D
SCALE: N.T.S

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COUNTY OF RIVERSIDE
PUBLIC WORKS DEPARTMENT
SECTIONS
TEMESCAL VALLEY COMMERCE CENTER
PLANNING CASE NO. PAR19-00052
CUP200044 Sheet 4 of 4 Sheets

Last update: 01/08/2021
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Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS
10641 HUMBOLT STREET LOS ALAMITOS, CA 90720
(562)799-9469 FAX (562)799-9459

December 10, 2020 Project Number 21206-19

Proficiency Capital, LLC
5020 Campus Drive
Newport Beach, California 92660

Attn: Matt Englhard

RE: **Supplemental Infiltration Testing** - Proposed Warehouse Development - Located at the Corner of Temescal Canyon Road and Park Canyon Road, Corona, in the County of Riverside, California

Dear Mr. Englhard:
As requested, supplemental infiltration testing in addition to tests provided in our previous report titled *Geotechnical Investigation*, dated July 16, 2019 has been performed at the subject site. Test locations and depths as shown on the attached Figure 1 were provided by Thienes Engineering.

INFILTRATION TESTING

Ten test borings were excavated for testing in order to establish infiltration rate for the design of the systems in various areas of the site. Boring logs with descriptions of the subsurface soils encountered are provided in Appendix A. Groundwater in the vicinity is in excess of 50 feet below grade. Some minor seeping of perched water was found in our excavations T-19, T-20 and T-21 near the southwest corner of the site at 9 to 10 feet below grade, as described in our earlier report. (No infiltration is planned in the area of the perched water.)

The borings consisted of 6-inch diameter test holes. A 3-inch diameter perforated PVC casing with solid end cap was installed in the borings and then surrounded with gravel materials to prevent caving. The boreholes were filled with water for pre-soaking purposes. Based upon the rapid initial fall of water in nine of the ten test holes during the pre-soak period, testing was conducted at 10-minute maximum intervals for six additional readings.

Test hole B-5 experienced slower fall during the presoak period; thus, the boring was pre-saturated overnight and testing was completed the next day at 30-minute intervals for twelve additional readings. The measurements were obtained by using an electronic tape measure with 1/16-inch divisions and timed with a stopwatch.

Discussion of Results

Based upon the results of our testing, the underlying soils exhibit generally uniform infiltration rates. The infiltration field data and test calculations are attached in Appendix B. The following table provides our test results:

Test No.	Depth (feet bgs)	Soil Type*	Field Infiltration rate
B-1	7.0	silty SAND	8.70 in/hr
B-2	11.0	sandy SILT	2.06 in/hr
B-3	15.0	slightly silty SAND	7.94 in/hr
B-4	15.0	slightly silty SAND	5.80 in/hr
B-5	16.0	silty SAND	1.65 in/hr
B-6	16.0	silty SAND	4.84 in/hr
B-7	15.0	silty SAND	5.15 in/hr
B-8	15.0	slightly silty SAND	42.86 in/hr
B-9	16.0	slightly silty SAND	42.86 in/hr
B-10	16.0	slightly silty SAND	128.57 in/hr

* All borings encountered varying amount of gravel and cobbles.

The design infiltration rates should utilize a safety factor of 3.0, and as described below.

a) The reduction factor - $R_f = CF_t$ and Rf = 3.50 to 5.83 for the field infiltration test.

b) CF_v = 1.0 based on silt and sand soils encountered in the test borings at 7 to 16 feet.

c) CF_s = 2.0 for long-term siltation, plugging and maintenance. The sand and clay soils are likely to have some plugging and regular maintenance of storm water discharge devices is required.

Existing groundwater is located deeper than 50 feet below existing grade and will not affect the system in the upper 20 feet. The potential of settlement of proposed or existing structures located at least 10 feet from any infiltration system is low. In addition, the potential for hydro-consolidation and the susceptibility for any ground settlements are considered low. All systems shall meet the California Regional Water Quality Control Board (CRWQCB) requirements. The use of an on-site disposal system appears to be geotechnically feasible for future development provided the infiltration rates as given are used in the design.

CLOSURE

The recommendations and conclusions contained in this report are based upon the soil conditions uncovered in our test excavations. No warranty of the soil condition between our excavations is implied. NorCal Engineering should be notified for possible further recommendations if unexpected to unfavorable conditions are encountered during construction phase. It is the responsibility of the owner to ensure that all information within this report is submitted to the Architect and appropriate Engineers for the project.

This firm should have the opportunity to review the final plans (72 hours for review required) to verify that all our recommendations are incorporated. This report and all conclusions are subject to the review of the controlling authorities for the project.

A preconstruction conference should be held between the developer, general contractor, grading contractor, city inspector, architect, and soil engineer to clarify any questions relating to the grading operations and subsequent construction. Our representative should be present during the grading operations and construction phase to certify that such recommendations are complied within the field.

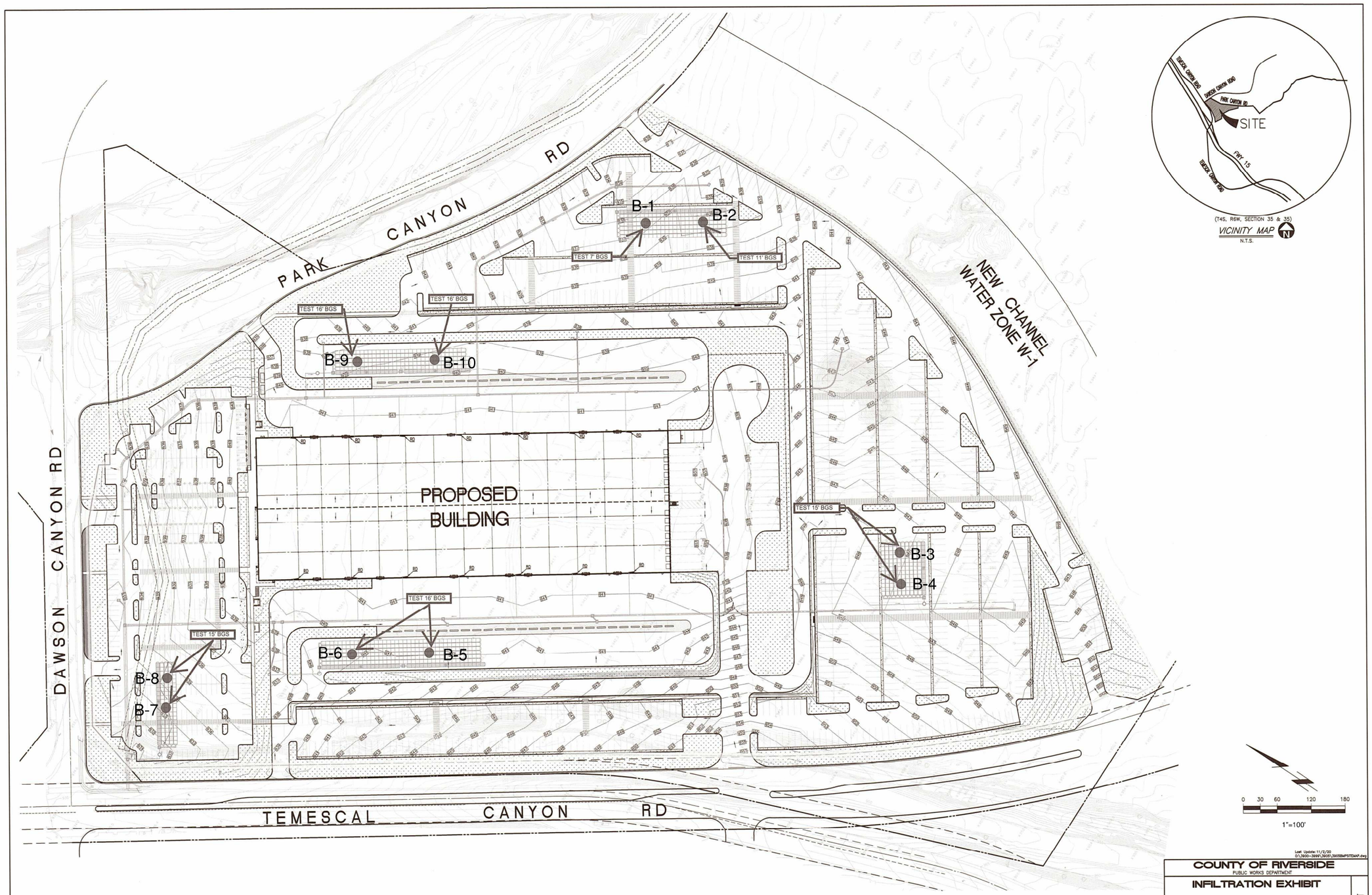
The described testing has been conducted in a manner consistent with the level of care and skill exercised by members of our profession currently practicing under similar conditions in the Southern California area. No other warranty, expressed or implied is made.

We appreciate this opportunity to be of service to you. If you have any further questions, please do not hesitate to contact the undersigned.

Respectfully submitted,
NORCAL ENGINEERING

Keith D. Tucker
Project Engineer
R.G.E. 841

Mark A. Burkholder
Project Manager



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COUNTY OF RIVERSIDE
PUBLIC WORKS DEPARTMENT

INFILTRATION EXHIBIT

TEMESCAL VALLEY COMMERCE CENTER

TEMESCAL CANYON ROAD AND DAWNSON CANYON ROAD

NorCal Engineering
SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT 21206-20 | DATE 12/2020

LOCATIONS OF INFILTRATION TESTS

FIGURE 1

PREPARED FOR:
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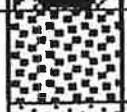
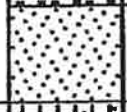
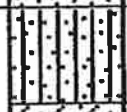
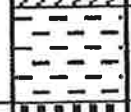
Designed by ____ Date ____
Checked by ____ Date ____
Designed by ____ Date ____
Checked by ____ Date ____

Approved by ____ Date ____
Public Works Director ____ R.C.E. ____

Sheet 1 of 1 Sheets

3905/ 1 OF 1 SHEET

APPENDIX A

MAJOR DIVISION			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL, SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVEL-LY SANDS, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINE (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

UNIFIED SOIL CLASSIFICATION SYSTEM

KEY:

- ■ Indicates 2.5-inch Inside Diameter. Ring Sample.
- ⊠ Indicates 2-inch OD Split Spoon Sample (SPT).
- ⧅ Indicates Shelby Tube Sample.
- ◫ Indicates No Recovery.
- ◧ Indicates SPT with 140# Hammer 30 in. Drop.
- ⊠ Indicates Bulk Sample.
- ◩ Indicates Small Bag Sample.
- ◨ Indicates Non-Standard
- ⧓ Indicates Core Run.

COMPONENT PROPORTIONS

DESCRIPTIVE TERMS	RANGE OF PROPORTION
Trace	1 - 5%
Few	5 - 10%
Little	10 - 20%
Some	20 - 35%
And	35 - 50%

COMPONENT DEFINITIONS

COMPONENT	SIZE RANGE
Boulders	Larger than 12 in
Cobbles	3 in to 12 in
Gravel	3 in to No 4 (4.5mm)
Coarse gravel	3 in to 3/4 in
Fine gravel	3/4 in to No 4 (4.5mm)
Sand	No. 4 (4.5mm) to No. 200 (0.074mm)
Coarse sand	No. 4 (4.5 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and Clay	Smaller than No. 200 (0.074 mm)

MOISTURE CONTENT

DRY	Absence of moisture, dusty, dry to the touch.
DAMP	Some perceptible moisture; below optimum
MOIST	No visible water; near optimum moisture content
WET	Visible free water, usually soil is below water table.

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N -VALUE

COHESIONLESS SOILS		COHESIVE SOILS		
Density	N (blows/ft)	Consistency	N (blows/ft)	Approximate Undrained Shear Strength (psf)
Very Loose	0 to 4	Very Soft	0 to 2	< 250
Loose	4 to 10	Soft	2 to 4	250 - 500
Medium Dense	10 to 30	Medium Stiff	4 to 8	500 - 1000
Dense	30 to 50	Stiff	8 to 15	1000 - 2000
Very Dense	over 50	Very Stiff	15 to 30	2000 - 4000
		Hard	over 30	> 4000

Proficiency Capital, LLC
21206-19

Log of Boring B-1

Boring Location: Temescal Cnyn and Park Cnyn, Corona

Date of Drilling: 11/30/2020 | **Groundwater Depth:** None Encountered

Drilling Method: Drill Rig

Hammer Weight: 140 lbs | **Drop:** 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel and small cobbles Brown, medium dense, dry					
		NATURAL SOILS Silty SAND with gravel and small cobbles Brown, medium dense, damp					
5		GWT not encountered					
		Boring completed at depth of 7'					
10							
15							
20							
25							
30							
35							

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NorCal Engineering

Proficiency Capital, LLC
21206-19

Log of Boring B-2

Boring Location: Temescal Cnyn and Park Cnyn, Corona

Date of Drilling: 11/30/2020 | **Groundwater Depth:** None Encountered

Drilling Method: Drill Rig

Hammer Weight: 140 lbs | **Drop:** 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel Brown, medium dense, dry					
		NATURAL SOILS Sandy SILT with gravel and occasional small cobbles Brown, medium stiff, damp					
5		GWT not encountered					
10		Boring completed at depth of 11'					
15							
20							
25							
30							
35							

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Proficiency Capital, LLC
21206-19

Log of Boring B-3

Boring Location: Temescal Cnyn and Park Cnyn, Corona

Date of Drilling: 11/30/2020 | **Groundwater Depth:** None Encountered

Drilling Method: Drill Rig

Hammer Weight: 140 lbs | **Drop:** 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel, small cobbles and occasional concrete pieces Brown, medium dense, dry					
5		NATURAL SOILS Sandy SILT with occasional gravel Brown, medium stiff, moist					
10		Slightly silty SAND with gravel and occasional cobbles Brown, very dense, damp					
15		Boring completed at depth of 15'					
20							
25							
30							
35							

GWT not encountered

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Proficiency Capital, LLC 21206-19	Log of Boring B-4

Boring Location: Temescal Cnyn and Park Cnyn, Corona

Date of Drilling: 11/30/2020 | **Groundwater Depth:** None Encountered

Drilling Method: Drill Rig

Hammer Weight: 140 lbs | **Drop:** 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel,cobbles and concrete pieces Brown, medium dense, dry					
		NATURAL SOILS Sandy SILT with gravel and occasional small cobbles Brown, medium stiff, damp to moist					
5		GWT not encountered					
10		Slightly silty SAND with occasional gravel and cobbles Brown, very dense, damp					
15		Boring completed at depth of 15'					
20							
25							
30							
35							

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NorCal Engineering

Proficiency Capital, LLC
21206-19

Log of Boring B-5

Boring Location: Temescal Cnyn and Park Cnyn, Corona

Date of Drilling: 11/30/2020 | **Groundwater Depth:** None Encountered

Drilling Method: Drill Rig

Hammer Weight: 140 lbs | **Drop:** 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel and small cobbles Brown, medium dense, dry					
		GWT not encountered					
		NATURAL SOILS Silty SAND with gravel and small cobbles Brown, medium dense, damp					
5							
10							
15							
		Boring completed at depth of 16'					
20							
25							
30							
35							

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Proficiency Capital, LLC
21206-19

Log of Boring B-6

Boring Location: Temescal Cnyn and Park Cnyn, Corona

Date of Drilling: 11/30/2020 | **Groundwater Depth:** None Encountered

Drilling Method: Drill Rig

Hammer Weight: 140 lbs | **Drop:** 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel and small cobbles Brown, medium dense, damp					
		NATURAL SOILS Silty SAND with gravel and small cobbles Brown, medium dense, damp					
5		GWT not encountered					
10							
15		Boring completed at depth of 16'					
20							
25							
30							
35							

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Proficiency Capital, LLC 21206-19	Log of Boring B-7

Boring Location: Temescal Cnyn and Park Cnyn, Corona	
Date of Drilling: 12/1/2020	Groundwater Depth: None Encountered
Drilling Method: Drill Rig	
Hammer Weight: 140 lbs	Drop: 30"
Surface Elevation: Not Measured	

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel and small cobbles Brown, loose, dry					
		GWT not encountered					
		NATURAL SOILS Silty SAND with gravel and small cobbles Brown, medium dense, damp					
5							
10							
15		Boring completed at depth of 15'					
20							
25							
30							
35							

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Proficiency Capital, LLC
21206-19

Log of Boring B-8

Boring Location: Temescal Cnyn and Park Cnyn, Corona

Date of Drilling: 12/1/2020 | **Groundwater Depth:** None Encountered

Drilling Method: Drill Rig

Hammer Weight: 140 lbs | **Drop:** 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel and small cobbles Brown, loose, dry					
		NATURAL SOILS Silty SAND with gravel and small cobbles Brown, medium dense, damp					
5		GWT not encountered					
10		Slightly silty SAND with gravel and small cobbles Brown, medium dense, damp					
15		Boring completed at depth of 15'					
20							
25							
30							
35							

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Proficiency Capital, LLC
21206-19

Log of Boring B-9

Boring Location: Temescal Cnyn and Park Cnyn, Corona

Date of Drilling: 12/1/2020 | **Groundwater Depth:** None Encountered

Drilling Method: Drill Rig

Hammer Weight: 140 lbs | **Drop:** 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel and small cobbles Brown, loose, dry					
		NATURAL SOILS Silty SAND with gravel and occasional small cobbles Brown, medium dense, damp					
5		GWT not encountered					
10		Slightly silty SAND with gravel and small cobbles Brown, medium dense, damp					
15		Boring completed at depth of 16'					
20							
25							
30							
35							

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Proficiency Capital, LLC
21206-19

Log of Boring B-10

Boring Location: Temescal Cnyn and Park Cnyn, Corona

Date of Drilling: 12/1/2020 | **Groundwater Depth:** None Encountered

Drilling Method: Drill Rig

Hammer Weight: 140 lbs | **Drop:** 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel and small cobbles Brown, dense, moist					
5		NATURAL SOILS Silty SAND with gravel and occasional small cobbles Brown, medium dense, moist					
10		Slightly silty SAND with gravel and occasional small cobbles Brown, medium dense, damp					
15		Boring completed at depth of 16'					
20							
25							
30							
35							

GWT not encountered

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\2120619-2.log Date: 12/10/2020

APPENDIX B

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

PERCOLATION TEST DATA

Client: Dawson Canyon, LLC	**Date:** 11/30/2020
Project No.: 21206-19	**Tested By:** J.S.
Test Hole: B-1	**USCS Soil Classification:**
Depth of Test Hole: 7'	**Sides (if rectangular):**
Diameter of Test Hole: 6"	**Length:**
Sandy Soil Criteria Test*:	**Width:**

TRIAL NO.	START TIME	STOP TIME	TIME INTERVAL (MIN)	INITIAL DEPTH TO WATER (IN)	FINAL DEPTH TO WATER (IN)	CHANGE IN WATER LEVEL (IN)	GREATER THAN OR EQUAL TO 6"
1	9:04	9:20	16	68.0	84.0	16.0	
2	9:20	9:45	25	69.0	83.0	14.0	

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30-minute intervals) with a precision of at least 0.25".

TRIAL NO	START TIME	STOP TIME	ΔT TIME INTERVAL (MIN)	Do INITIAL DEPTH TO WATER (IN)	Df FINAL DEPTH TO WATER (IN)	ΔD CHANGE IN WATER LEVEL (IN)	PERCOLATION RATE (MIN/IN)
1	9:45	9:55	10	69.0	77.0	8.0	
2	9:55	10:05	10	69.0	77.0	8.0	
3	10:05	10:15	10	69.0	76.5	7.5	
4	10:15	10:25	10	69.0	76.5	7.5	
5	10:25	10:35	10	69.0	76.5	7.5	
6	10:35	10:45	10	69.0	76.0	7.0	
7							
8							
9							
10							
11							
12							
13							
14							
15							

COMMENTS:

NORCAL ENGINEERING
SOILS AND GEOTECHNICAL CONSULTANTS

PERCOLATION TEST DATA

Client: Dawson Canyon, LLC	**Date:** 11/30/2020
Project No.: 21206-19	**Tested By:** J.S.
Test Hole: B-2	**USCS Soil Classification:**
Depth of Test Hole: 11'	**Sides (if rectangular):**
Diameter of Test Hole: 6"	**Length:**
Sandy Soil Criteria Test*:	**Width:**

TRIAL NO.	START TIME	STOP TIME	TIME INTERVAL (MIN)	INITIAL DEPTH TO WATER (IN)	FINAL DEPTH TO WATER (IN)	CHANGE IN WATER LEVEL (IN)	GREATER THAN OR EQUAL TO 6"
1	9:49	10:14	25	116.5	123.5	7.0	
2	10:14	10:39	25	113.0	121.0	8.0	

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30-minute intervals) with a precision of at least 0.25".

TRIAL NO	START TIME	STOP TIME	ΔT TIME INTERVAL (MIN)	Do INITIAL DEPTH TO WATER (IN)	Df FINAL DEPTH TO WATER (IN)	ΔD CHANGE IN WATER LEVEL (IN)	PERCOLATION RATE (MIN/IN)
1	10:39	10:49	10	114.0	116.5	2.5	
2	10:49	10:59	10	116.5	118.5	2.0	
3	10:59	11:09	10	115.0	117.0	2.0	
4	11:09	11:19	10	117.0	118.5	1.5	
5	11:19	11:29	10	117.0	118.5	1.5	
6	11:29	11:39	10	116.5	118.5	2.0	
7							
8							
9							
10							
11							
12							
13							
14							
15							
COMMENTS:							

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

PERCOLATION TEST DATA

Client: Dawson Canyon, LLC	**Date:** 11/30/2020
Project No.: 21206-19	**Tested By:** D.L.
Test Hole: B-3	**USCS Soil Classification:**
Depth of Test Hole: 15'	**Sides (if rectangular):**
Diameter of Test Hole: 6"	**Length:**
Sandy Soil Criteria Test*:	**Width:**

TRIAL NO.	START TIME	STOP TIME	TIME INTERVAL (MIN)	INITIAL DEPTH TO WATER (IN)	FINAL DEPTH TO WATER (IN)	CHANGE IN WATER LEVEL (IN)	GREATER THAN OR EQUAL TO 6"
1	11:39	12:04	25	162.0	173.0	11.0	
2	12:04	12:29	25	165.0	177.0	12.0	

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30-minute intervals) with a precision of at least 0.25".

TRIAL NO	START TIME	STOP TIME	ΔT TIME INTERVAL (MIN)	Do INITIAL DEPTH TO WATER (IN)	Df FINAL DEPTH TO WATER (IN)	ΔD CHANGE IN WATER LEVEL (IN)	PERCOLATION RATE (MIN/IN)
1	12:29	12:39	10	165.0	171.5	6.5	
2	12:39	12:49	10	165.0	171.5	6.5	
3	12:49	12:59	10	165.0	171.5	6.5	
4	12:59	1:09	10	165.0	171.0	6.0	
5	1:09	1:19	10	165.0	171.0	6.0	
6	1:19	1:29	10	165.0	171.5	6.5	
7							
8							
9							
10							
11							
12							
13							
14							
15							
COMMENTS:							

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

PERCOLATION TEST DATA

Client: Dawson Canyon, LLC	**Date:** 11/30/2020
Project No.: 21206-19	**Tested By:** J.S.
Test Hole: B-4	**USCS Soil Classification:**
Depth of Test Hole: 15'	**Sides (if rectangular):**
Diameter of Test Hole: 6"	**Length:**
Sandy Soil Criteria Test*:	**Width:**

TRIAL NO.	START TIME	STOP TIME	TIME INTERVAL (MIN)	INITIAL DEPTH TO WATER (IN)	FINAL DEPTH TO WATER (IN)	CHANGE IN WATER LEVEL (IN)	GREATER THAN OR EQUAL TO 6"
1	11:41	12:06	25	162.0	173.5	11.5	
2	12:06	12:31	25	163.0	174.0	11.0	

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30-minute intervals) with a precision of at least 0.25".

TRIAL NO	START TIME	STOP TIME	ΔT TIME INTERVAL (MIN)	Do INITIAL DEPTH TO WATER (IN)	Df FINAL DEPTH TO WATER (IN)	ΔD CHANGE IN WATER LEVEL (IN)	PERCOLATION RATE (MIN/IN)
1	12:31	12:41	10	165.0	171.0	6.0	
2	12:41	1:41	10	165.0	171.0	6.0	
3	1:41	1:01	10	163.0	169.0	96.0	
4	1:01	1:11	10	163.0	168.5	5.5	
5	1:11	1:21	10	165.0	171.0	6.0	
6	1:21	1:31	10	165.0	170.0	5.0	
7							
8							
9							
10							
11							
12							
13							
14							
15							

COMMENTS:

NORCAL ENGINEERING
SOILS AND GEOTECHNICAL CONSULTANTS

PERCOLATION TEST DATA

Client: Dawson Canyon, LLC	**Date:** 11/30/2020
Project No.: 21206-19	**Tested By:** D.L..
Test Hole: B-5	**USCS Soil Classification:**
Depth of Test Hole: 16'	**Sides (if rectangular):**
Diameter of Test Hole: 6"	**Length:**
Sandy Soil Criteria Test*:	**Width:**

TRIAL NO.	START TIME	STOP TIME	TIME INTERVAL (MIN)	INITIAL DEPTH TO WATER (IN)	FINAL DEPTH TO WATER (IN)	CHANGE IN WATER LEVEL (IN)	GREATER THAN OR EQUAL TO 6"
1	12:29	12:54	25	177.0	183.5	6.5	
2	12:54	1:19	25	175.0	180.0	5.0	

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30-minute intervals) with a precision of at least 0.25".

TRIAL NO	START TIME	STOP TIME	ΔT TIME INTERVAL (MIN)	Do INITIAL DEPTH TO WATER (IN)	Df FINAL DEPTH TO WATER (IN)	ΔD CHANGE IN WATER LEVEL (IN)	PERCOLATION RATE (MIN/IN)
1	7:15	7:45	30	177.0	182.5	5.5	
2	7:45	8:15	30	176.0	181.0	5.0	
3	8:15	8:45	30	176.0	181.0	5.0	
4	8:45	9:15	30	176.0	181.5	5.5	
5	9:15	9:45	30	176.0	181.0	5.0	
6	9:45	10:15	30	176.0	181.5	5.5	
7	10:15	10:45	30	176.0	181.0	5.0	
8	10:45	11:15	30	176.0	181.0	5.0	
9	11:15	11:45	30	176.0	181.0	5.0	
10	11:45	12:15	30	176.0	181.5	5.5	
11	12:15	12:45	30	175.0	180.0	5.0	
12	12:45	1:15	30	176.0	181.0	5.0	
13							
14							
15							
COMMENTS:							

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

PERCOLATION TEST DATA

Client: Dawson Canyon, LLC	**Date**: 11/30/2020
Project No.: 21206-19	**Tested By**: J.S.
Test Hole: B-6	**USCS Soil Classification**:
Depth of Test Hole: 16'	**Sides (if rectangular)**:
Diameter of Test Hole: 6"	**Length**:
Sandy Soil Criteria Test*:	**Width**:

TRIAL NO.	START TIME	STOP TIME	TIME INTERVAL (MIN)	INITIAL DEPTH TO WATER (IN)	FINAL DEPTH TO WATER (IN)	CHANGE IN WATER LEVEL (IN)	GREATER THAN OR EQUAL TO 6"
1	12:40	1:05	25	177.0	189.0	12.0	
2	1:05	1:30	25	177.0	187.0	10.0	

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30-minute intervals) with a precision of at least 0.25".

TRIAL NO	START TIME	STOP TIME	ΔT TIME INTERVAL (MIN)	Do INITIAL DEPTH TO WATER (IN)	Df FINAL DEPTH TO WATER (IN)	ΔD CHANGE IN WATER LEVEL (IN)	PERCOLATION RATE (MIN/IN)
1	1:30	1:40	10	176.0	182.0	6.0	
2	1:40	1:50	10	176.0	182.0	6.0	
3	1:50	2:00	10	176.0	181.5	5.5	
4	2:00	2:10	10	176.0	181.0	5.0	
5	2:10	2:20	10	176.0	181.0	5.0	
6	2:20	2:30	10	176.0	180.5	4.5	
7							
8							
9							
10							
11							
12							
13							
14							
15							

COMMENTS:

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

PERCOLATION TEST DATA

Client: Dawson Canyon, LLC	**Date:** 12/1/2020
Project No.: 21206-19	**Tested By:** D.R.
Test Hole: B-7	**USCS Soil Classification:**
Depth of Test Hole: 15'	**Sides (if rectangular):**
Diameter of Test Hole: 6"	**Length:**
Sandy Soil Criteria Test*:	**Width:**

TRIAL NO.	START TIME	STOP TIME	TIME INTERVAL (MIN)	INITIAL DEPTH TO WATER (IN)	FINAL DEPTH TO WATER (IN)	CHANGE IN WATER LEVEL (IN)	GREATER THAN OR EQUAL TO 6"
1	7:07	7:23	16	165.0	180.0	15.0	
2	7:23	7:48	25	163.0	174.0	11.0	

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30-minute intervals) with a precision of at least 0.25".

TRIAL NO	START TIME	STOP TIME	ΔT TIME INTERVAL (MIN)	Do INITIAL DEPTH TO WATER (IN)	Df FINAL DEPTH TO WATER (IN)	ΔD CHANGE IN WATER LEVEL (IN)	PERCOLATION RATE (MIN/IN)
1	7:48	7:58	10	163.0	169.0	6.0	
2	7:58	8:08	10	165.0	175.5	5.5	
3	8:08	8:18	10	165.0	175.5	5.5	
4	8:18	8:28	10	164.5	169.5	5.0	
5	8:28	8:38	10	165.0	170.0	5.0	
6	8:38	8:48	10	163.0	108.0	5.0	
7							
8							
9							
10							
11							
12							
13							
14							
15							
COMMENTS:							

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

PERCOLATION TEST DATA

Client: Dawson Canyon, LLC	**Date**: 12/1/2020
Project No.: 21206-19	**Tested By**: J.S.
Test Hole: B-8	**USCS Soil Classification**:
Depth of Test Hole: 15'	**Sides (if rectangular)**:
Diameter of Test Hole: 6"	**Length**:
Sandy Soil Criteria Test*:	**Width**:

TRIAL NO.	START TIME	STOP TIME	TIME INTERVAL (MIN)	INITIAL DEPTH TO WATER (IN)	FINAL DEPTH TO WATER (IN)	CHANGE IN WATER LEVEL (IN)	GREATER THAN OR EQUAL TO 6"
1	7:31	8:35	4	165.0	180.0	15.0	
2	8:35	8:40	5	165.0	180.0	15.0	

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30-minute intervals) with a precision of at least 0.25".

TRIAL NO	START TIME	STOP TIME	ΔT TIME INTERVAL (MIN)	Do INITIAL DEPTH TO WATER (IN)	Df FINAL DEPTH TO WATER (IN)	ΔD CHANGE IN WATER LEVEL (IN)	PERCOLATION RATE (MIN/IN)
1	8:40	8:44	4	165.0	180.0	15.0	
2	8:44	8:48	4	165.0	180.0	15.0	
3	8:48	8:52	4	165.0	180.0	15.0	
4	8:52	8:57	5	165.0	180.0	15.0	
5	8:57	9:02	5	165.0	180.0	15.0	
6	9:02	9:07	5	165.0	180.0	15.0	
7	9:07	9:12	5	165.0	180.0	15.0	
8	9:12	9:22	5	165.0	180.0	15.0	
9	9:22	9:27	5	165.0	180.0	15.0	
10	9:27	9:33	6	165.0	180.0	15.0	
11	9:33	9:39	6	165.0	180.0	15.0	
12	9:39	9:45	6	165.0	180.0	15.0	
13							
14							
15							
COMMENTS:							

NORCAL ENGINEERING
SOILS AND GEOTECHNICAL CONSULTANTS

PERCOLATION TEST DATA

Client: Dawson Canyon, LLC	**Date:** 12/1/2020
Project No.: 21206-19	**Tested By:** J.S.
Test Hole: B-9	**USCS Soil Classification:**
Depth of Test Hole: 16'	**Sides (if rectangular):**
Diameter of Test Hole: 6"	**Length:**
Sandy Soil Criteria Test*:	**Width:**

TRIAL NO.	START TIME	STOP TIME	TIME INTERVAL (MIN)	INITIAL DEPTH TO WATER (IN)	FINAL DEPTH TO WATER (IN)	CHANGE IN WATER LEVEL (IN)	GREATER THAN OR EQUAL TO 6"
1	10:05	10:10	5	176.0	192.0	16.0	
2	10:10	10:15	5	176.5	192.0	15.5	

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30-minute intervals) with a precision of at least 0.25".

TRIAL NO	START TIME	STOP TIME	ΔT TIME INTERVAL (MIN)	Do INITIAL DEPTH TO WATER (IN)	Df FINAL DEPTH TO WATER (IN)	ΔD CHANGE IN WATER LEVEL (IN)	PERCOLATION RATE (MIN/IN)
1	10:15	10:20	5	177.0	192.0	15.0	
2	10:20	10:25	5	177.0	192.0	15.0	
3	10:25	10:30	5	177.0	192.0	15.0	
4	10:30	10:35	5	177.0	192.0	15.0	
5	10:35	10:40	5	177.0	192.0	15.0	
6	10:40	10:45	5	177.0	192.0	15.0	
7	10:45	10:50	5	177.0	192.0	15.0	
8	10:50	10:56	6	177.0	192.0	15.0	
9	10:56	11:02	6	177.0	192.0	15.0	
10	11:02	11:08	6	177.0	192.0	15.0	
11	11:08	11:14	6	177.0	192.0	15.0	
12	11:14	11:20	6	177.0	192.0	15.0	
13							
14							
15							
COMMENTS:							

NORCAL ENGINEERING
SOILS AND GEOTECHNICAL CONSULTANTS

PERCOLATION TEST DATA

Client: Dawson Canyon, LLC	**Date:** 12/1/2020
Project No.: 21206-19	**Tested By:** J.S.
Test Hole: B-10	**USCS Soil Classification:**
Depth of Test Hole: 16'	**Sides (if rectangular):**
Diameter of Test Hole: 6"	**Length:**
Sandy Soil Criteria Test*:	**Width:**

TRIAL NO.	START TIME	STOP TIME	TIME INTERVAL (MIN)	INITIAL DEPTH TO WATER (IN)	FINAL DEPTH TO WATER (IN)	CHANGE IN WATER LEVEL (IN)	GREATER THAN OR EQUAL TO 6"
1	1:22	1:24	2	176.5	192.0	15.5	
2	1:24	1:26	2	176.0	192.0	16.0	

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30-minute intervals) with a precision of at least 0.25".

TRIAL NO	START TIME	STOP TIME	ΔT TIME INTERVAL (MIN)	Do INITIAL DEPTH TO WATER (IN)	Df FINAL DEPTH TO WATER (IN)	ΔD CHANGE IN WATER LEVEL (IN)	PERCOLATION RATE (MIN/IN)
1	1:26	1:28	2	176.0	192.0	16.0	
2	1:28	1:30	2	176.0	192.0	16.0	
3	1:30	1:32	2	177.0	192.0	15.0	
4	1:32	1:34	2	177.0	192.0	15.0	
5	1:34	1:36	2	177.0	192.0	15.0	
6	1:36	1:38	2	177.0	192.0	15.0	
7	1:38	1:40	2	176.5	192.0	15.5	
8	1:40	1:42	2	177.0	192.0	15.0	
9	1:42	1:44	2	177.0	192.0	15.0	
10	1:44	1:46	2	176.5	192.0	15.5	
11	1:46	1:48	2	177.0	192.0	15.0	
12	1:48	1:50	2	177.0	192.0	15.0	
13	1:50	1:52	2	177.0	192.0	15.0	
14	1:52	1:54	2	177.0	192.0	15.0	
15	1:54	1:56	2	177.0	192.0	15.0	
COMMENTS:							

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PERCOLATION TEST DATA

Client: Dawson Canyon, LLC	**Date:** 12/1/2020
Project No.: 21206-19	**Tested By:** D.L.
Test Hole: B-10	**USCS Soil Classification:**
Depth of Test Hole: 16'	**Sides (if rectangular):**
Diameter of Test Hole: 6"	**Length:**
Sandy Soil Criteria Test*:	**Width:**

TRIAL NO.	START TIME	STOP TIME	TIME INTERVAL (MIN)	INITIAL DEPTH TO WATER (IN)	FINAL DEPTH TO WATER (IN)	CHANGE IN WATER LEVEL (IN)	GREATER THAN OR EQUAL TO 6"
1							
2							

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30-minute intervals) with a precision of at least 0.25".

TRIAL NO	START TIME	STOP TIME	ΔT TIME INTERVAL (MIN)	Do INITIAL DEPTH TO WATER (IN)	Df FINAL DEPTH TO WATER (IN)	ΔD CHANGE IN WATER LEVEL (IN)	PERCOLATION RATE (MIN/IN)
1	1:56	1:58	2	177.0	192.0	15.0	
2	1:58	2:00	2	177.0	192.0	15.0	
3	2:00	2:02	2	177.0	192.0	15.0	
4	2:02	2:04	2	177.0	192.0	15.0	
5	2:04	2:06	2	177.0	192.0	15.0	
6	2:06	2:08	2	176.5	192.0	15.5	
7	2:08	2:10	2	177.0	192.0	15.0	
8	2:10	2:12	2	177.0	192.0	15.0	
9	2:12	2:14	2	177.0	192.0	15.0	
10	2:14	2:16	2	177.0	192.0	15.0	
11	2:16	2:18	2	177.0	192.0	15.0	
12	2:18	2:20	2	177.0	192.0	15.0	
13	2:20	2:22	2	177.0	192.0	15.0	
14	2:22	2:24	2	177.0	192.0	15.0	
15	2:24	2:26	2	177.0	192.0	15.0	
COMMENTS:							

SOIL INFILTRATION RATE CALCS ⇒ Auger Boring

Location:	B-1	B-2	B-3
• Depth =	7 ft.	11 ft.	15'
• Hole Dia. =	6 in.	6 in.	6 in.
• Drop = Δd	7.0 in.	2.0 in.	6.5 in.
• Time = Δt Interval	10 min.	10 min.	10 min.
• Preadjusted Perc. Rate	42 in/hr.	12 in/hr.	39 in/hr.
• Initial Water Depth = d_i	15.0 in.	15.5 in.	15.0 in.
• Reduction Factor = R_f	4.83	5.83	4.91
• INFILTRATION RATE	8.70 in/hr	2.06 in/hr	7.94 in/hr

$$\text{Infiltration Rate} = \frac{\text{Pre-adjusted Perc. Rate}}{\text{Reduction Factor}}$$

$$\text{Reduction Factor} = R_f = \left[\frac{2 \cdot d_i - \Delta d}{\text{Dia.}}\right] + 1$$

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SOIL INFILTRATION RATE CALCULATIONS

DATE

SOIL INFILTRATION RATE CALCS ⇒ Auger Boring

Location:	B-4	B-5	B-6
• Depth =	15 ft.	16 ft.	16 ft.
• Hole Dia. =	6 in.	6 in.	6 in.
• Drop = Δd	5.0 in.	4.5 in.	4.5 in.
• Time = Δt Interval	10 min.	30 min.	10 min.
• Preadjusted Perc. Rate	30 in/hr.	9 in/hr	27 in/hr.
• Initial Water Depth = d_i	15.0 in.	16.0 in	16.0 in.
• Reduction Factor = R_f	5.17	5.50	5.58
• INFILTRATION RATE	5.80 in/hr	1.65 in/hr	4.84 in/hr.

$$\text{Infiltration Rate} = \frac{\text{Preadjusted Perc. Rate}}{\text{Reduction Factor}}$$

$$\text{Reduction Factor} = R_f = \left[\frac{2 \cdot d_i - \Delta d}{\text{Dia.}}\right] + 1$$

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DATE

SOIL INFILTRATION RATE CALCULATIONS

SOIL INFILTRATION RATE CALCS ⇒ Auger Boring

Location:	B-7	B-8	B-9
• Depth =	15 ft.	15 ft.	16 ft.
• Hole Dia. =	6 in.	6 in.	6 in.
• Drop = Δd	5.0 in.	15.0 in.	15.0 in.
• Time = Δt Interval	10 min.	6 min.	6 min
• Preadjusted Perc. Rate	30 in/hr	150 in/hr	150 in/hr
• Initial Water Depth = d_i	17.0 in.	15.0 in.	15.0 in
• Reduction Factor = R_f	5.83	3.50	3.50
• INFILTRATION RATE	5.15 in/hr	42.86 in/hr	42.86 in/hr.

$$\text{Infiltration Rate} = \frac{\text{Pre adjusted Perc. Rate}}{\text{Reduction Factor}}$$

$$\text{Reduction Factor} = R_f = \left[\frac{2 \cdot d_i - \Delta d}{\text{Dia.}}\right] + 1$$

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SOIL INFILTRATION RATE CALCULATIONS

DATE

SOIL INFILTRATION RATE CALCS ⇒ Auger Boring

Location:	B-10
• Depth =	16 ft.
• Hole Dia. =	6 in.
• Drop = Δd	15.0 in.
• Time = Δt Interval	2 min.
• Preadjusted Perc. Rate	450 in/hr.
• Initial Water Depth = d_i	15 in.
• Reduction Factor = R_f	3.50
• INFILTRATION RATE	128.57 in/hr.

$$\text{Infiltration Rate} = \frac{\text{Preadjusted Perc. Rate}}{\text{Reduction Factor}}$$

$$\text{Reduction Factor} = R_f = \left[\frac{2 \cdot d_i - \Delta d}{\text{Dia.}}\right] + 1$$

NorCal Engineering
SOILS AND GEOTECHNICAL CONSULTANTS

DATE

SOIL INFILTRATION RATE CALCULATIONS

GEOTECHNICAL INVESTIGATION

Proposed Warehouse Development
Temescal Canyon Road and Park Canyon Road, Corona
County of Riverside, California

Proficiency Capital, LLC
5020 Campus Drive
Newport Beach, California 92660

Project Number 21206-19
July 16, 2019

NorCal Engineering

NorCal Engineering
SOILS AND GEOTECHNICAL CONSULTANTS
10641 HUMBOLT STREET LOS ALAMITOS, CA 90720
(562)799-9469 FAX (562)799-9459

July 16, 2019 Project Number 21206-19

Proficiency Capital, LLC
5020 Campus Drive
Newport Beach, California 92660

Attn: Matt Englhard

RE: **GEOTECHNICAL INVESTIGATION** - Proposed Warehouse Development - Located at the Corner of Temescal Canyon Road and Park Canyon Road, Corona, in the County of Riverside, California

Dear Mr. Englhard:
Pursuant to your request, this firm has performed this Geotechnical Investigation for the above referenced project. The purpose of this investigation is to evaluate the geotechnical conditions of subject property and to provide recommendations for the proposed development. This geotechnical engineering report presents the findings of our study along with conclusions and recommendations for development.

1.0 STRUCTURAL CONSIDERATIONS

1.1 Proposed Development

It is currently proposed to develop the 71-acre site with concrete tilt-up warehouse buildings along with associated pavement and landscape areas. Grading for the development will include minor cut and fill procedures. Final building plans shall be reviewed by this firm prior to submittal for city approval to determine the need for any additional study and revised recommendations pertinent to the proposed development, if necessary.

2.0 SITE DESCRIPTION

The subject site is located at the corner of Temescal Canyon Road and Park Canyon Road in the Corona area of the County of Riverside. The parcel is relatively level with variable drainage patterns across the property. Some stockpiles of gravel base material are located in the central area of the site.

3.0 GEOLOGIC SETTING

The property is located in the Peninsular Ranges geomorphic province of California. The Peninsular Ranges province extends from the Los Angeles Basin southeast to Baja California and from the Pacific Ocean eastward to the Coachella Valley and Colorado Desert. The province consists of numerous northwest to southeast-trending mountain ranges and valleys that are geologically controlled by several major active faults. The subject site is located within and near the southwestern edge part of the Perris block, a generally stable area situated roughly midway between two of these major faults; the Chino /Elsinore and San Jacinto fault zones. More specifically, the property is situated on the ancient flood plain of the Temescal Wash drainage.

The USGS Open File Reports for the Lake Mathews 7.5' Quadrangle assigns the soil materials underlying the site as early Pleistocene to Holocene alluvial deposits. These sediments are, in turn, underlain by Cretaceous volcanic rocks and older metamorphic rocks. Relatively minor amounts of Paleocene sediments are mapped south of the site. The alluvium is described in general as unconsolidated to mostly well-dissected and well-indurated silt, sand and gravel deposits. Figure 1, Regional Geologic Map, shows the distribution of the alluvial sediments and bedrock in the vicinity of the property.

3.1 Faulting

The property is not located in an Alquist-Priolo (AP) earthquake fault zone. Several stereo pair aerial photographs, from the years 1948 to 2014, available online at HistoricAerials.com, were reviewed to evaluate for any lineaments or fault-related geomorphic features within, adjacent or trending towards the property. No indications of natural lineaments or other fault-related features indicative of Holocene or older faulting were noted. No indications of faulting were noted during our reconnaissance at and in the vicinity of the site. No faults are shown trending towards or through the site on the referenced geologic maps. Based on our evaluation, we conclude that there are no active or potentially active faults trending towards or through the property, and additional fault investigations are not necessary. The potential for surface fault rupture to occur at the site is considered low. The site is situated roughly 3,500 feet northeast of the active Elsinore fault zone. As is the case with most of southern California, the property is expected to experience strong ground shaking during the lifetime of the project.

3.2 Subsidence

According to the Riverside County Hazards report (Earth Consultants International, 2001), subsidence in Riverside County has been linked to significant fluctuations in groundwater levels within deep alluvial basins, and generally, the subsidence occurs throughout the valley region. Three areas have been identified with documented subsidence; the Elsinore Trough, the San Jacinto Valley, and the southern Coachella Valley. The property is not situated within any of the three areas of Riverside County associated with documented subsidence. The potential for subsidence to impact the site is considered low.

4.0 SEISMICITY DESIGN

The proposed development lies outside of any Alquist Priolo Special Studies Zone and the potential for damage due to direct fault rupture is considered unlikely.

The following seismic design parameters (printout attached Appendix A) are provided and are in accordance with the 2016 California Building Code (CBC) as determined using the ASCE 7 Hazard Tool (https://asce7hazardtool.online/) for the referenced project.

Seismic Design Parameters

Site Location – Region 1	Latitude	33.781°
	Longitude	-117.484°
Seismic Use Group		II
Site Class		D
Risk Category		I/II/III
Maximum Spectral Response Acceleration	S_S	2.291g
	S_1	0.901g
Adjusted Maximum Acceleration	S_{MS}	2.291g
	S_{M1}	1.352g
Design Spectral Response Acceleration Parameters	S_{DS}	1.527g
	S_{D1}	0.901g

The Elsinore Fault (Glen Ivy) is capable of producing a Magnitude 6.8 earthquake. Ground shaking originating from earthquakes along other active faults in the region is expected to induce lower horizontal accelerations due to smaller anticipated earthquakes and/or greater distances to other faults.

5.0 LIQUEFACTION EVALUATION

The site is expected to experience ground shaking and earthquake activity that is typical of the Southern California area. It is during severe ground shaking that loose, granular soils below groundwater can liquify. Based upon information in the Riverside County *Generalized Liquefaction Map*, dated December 13, 2013, the subject site is situated in an area of generalized low/very low liquefaction potential.

The design of the proposed development in conformance with the latest Building Code provisions for earthquake design is expected to provide mitigation of ground shaking hazards typical to this region.

6.0 FIELD INVESTIGATION

6.1 Site Exploration

The investigation consisted of the placement of thirty-five (35) subsurface excavations by backhoe. Explorations extended to a maximum depth of 20.5 feet below current ground elevations. The explorations were placed at accessible locations throughout the site.

The explorations were visually classified and logged by a field engineer with locations of the subsurface excavations are shown on the attached Figure 2. Detailed descriptions of the subsurface conditions are listed on the logs in Appendix B. It should be noted that the transition from one soil type to another as shown on the excavation logs is approximate and may in fact be a gradual transition. The soils encountered are described as follows:

Fill Soils– Fill soils generally classifying as silty SAND to sandy SILT with some gravel, cobbles, concrete pieces and other minor debris were encountered in the explorations to depths ranging from 1.5 to 12 feet. These soils were noted to be variable in density and damp to moist.

Native Soils – Native soils classifying as slightly silty to silty SAND and sandy SILT with gravel and occasional cobbles were encountered beneath the upper fill soils. Cobble content increased with depth in some of the excavations and some boulders were also encountered with depth in T-19, T-21 and T-22. These soils were noted to be medium dense/stiff to dense/stiff and damp. Some lenses of silts and clays were noted in some of the excavations as well. It also appears bedrock may be located at approximately 10 feet below grade in the southern portion of the site. Backhoe pits met refusal at this depth in the area and this is the area where some perched water was found at the contact (see Section 6.2 below).

6.2 Groundwater

Groundwater in the vicinity is in excess of 50 feet below grade. Some minor seeping of perched water was found in our excavations T-19, T-20 and T-21 at 9 to 10 feet below grade.

7.0 LABORATORY TESTS

Relatively undisturbed samples of the subsurface soils were obtained to perform laboratory testing and analysis for direct shear, consolidation tests, and to determine in-place moisture/densities. These relatively undisturbed ring samples were obtained by driving a thin-walled steel sampler lined with one-inch long brass rings with an inside diameter of 2.42 inches into the undisturbed soils.

Bulk bag samples were obtained in the upper soils for expansion index tests, Atterberg limits tests, corrosion tests, resistance value and maximum density tests. Wall loadings on the order of 4,000 lbs./lin.ft. and maximum compression loads on the order of 100 kips were utilized for testing and design purposes. All test results are included in Appendix C, unless otherwise noted.

7.1 **Field moisture content** (ASTM:D 2216-10) and the dry density of the ring samples were determined in the laboratory. This data is listed on the logs of explorations.

7.2 **Maximum density tests** (ASTM: D-1557-12) were performed on typical samples of the upper soils. Results of these tests are shown on Table I.

7.3 **Expansion index tests** (ASTM: D-4829-11) were performed on remolded samples of the upper soils to determine the expansive characteristics and to provide any necessary recommendations for reinforcement of the slabs-on-grade and the foundations. Results of these tests are provided on Table II and are discussed later in this report.

7.4 **Atterberg Limits** (ASTM: D 4318-10) consisting of liquid limit, plastic limit and plasticity index were performed on representative soil samples. Results are shown on Table III.

7.5 **Direct shear tests** (ASTM: D-3080-11) were performed on undisturbed and/or remolded samples of the subsurface soils. These tests were performed to determine parameters for the calculation of the allowable soil bearing capacity. The test is performed under saturated conditions at loads of 1,000 lbs./sq.ft., 2,000 lbs./sq.ft., and 3,000 lbs./sq.ft. with results shown on Plates A-D.

7.6 **Consolidation tests** (ASTM: D-2435-11) were performed on undisturbed samples to determine the differential and total settlement which may be anticipated based upon the proposed loads. Water was added to the samples at a surcharge of one KSF and the settlement curves are plotted on Plates E-H.

7.7 **Soluble sulfate, pH, Resistivity and Chloride tests** to determine potential corrosive effects of soils on concrete and metal structures were performed in the laboratory. Test results are given in Tables III – VI and are discussed later in this report.

7.8 **Resistance 'R' Value tests** (CA 301) were conducted on a representative soil sample to determine preliminary pavement section design for the proposed pavement areas. Test results are provided in Table VIII and recommended pavement sections are provided later within the text of this report.

8.0 CONCLUSIONS AND RECOMMENDATIONS

Based upon our evaluations, the proposed development is acceptable from a geotechnical engineering standpoint. By following the recommendations and guidelines set forth in our report, the structures and grading will be safe from excessive settlements under the anticipated design loadings and conditions. The proposed grading and development shall meet all requirements of the County Building Ordinance and will not impose any adverse effect on existing adjacent land or structures.

The following recommendations are based upon soil conditions encountered in our field investigation; these near-surface soil conditions could vary across the site. Variations in the soil conditions may not become evident until the commencement of grading operations for the proposed development and revised recommendations from the soils engineer may be necessary based upon the conditions encountered.

8.1 Site Grading Recommendations

It is recommended that site inspections be performed by a representative of this firm during all grading and construction of the development to verify the findings and recommendations documented in this report. Any unusual conditions which may be encountered in the course of the project development may require the need for additional study and revised recommendations.

Any vegetation and organic laden soils shall be removed and hauled from proposed grading areas prior to and during the grading operations if encountered. Existing vegetation shall not be mixed or disced into the soils. Any removed soils may be reutilized as compacted fill once any deleterious material or oversized materials (in excess of eight inches) is removed. Grading operations shall be performed in accordance with the attached *Specifications for Placement of Compacted Fill*.

8.1.1 **Removal and Recompaction Recommendations**

The upper existing fill soils (2 to 12 feet) shall be removed to competent native materials, the exposed surface scarified to a depth of 8 inches, brought to within 2% of optimum moisture content and compacted to a minimum of 90% of the laboratory standard (ASTM: D-1557-12) prior to placement of any additional compacted fill soils and pavement. *The upper 12 inches of soils beneath building pad and concrete paving shall be compacted to a minimum of 95%.* Grading shall extend a minimum of 5 horizontal feet outside the edges of foundations or equidistant to the depth of fill placed, whichever is greater. Care should be taken to provide or maintain adequate lateral support for all adjacent improvements and structures at all times during the grading operations and construction phase.

Adequate drainage away from the structures, pavement and slopes should be provided at all times per the current building code.

It is likely that isolated areas of undiscovered fill not described in this report or materials disturbed during demolition operations will be encountered on site; if found, these areas should be treated as discussed earlier. A diligent search shall also be conducted during grading operations in an effort to uncover any underground structures, irrigation or utility lines. If encountered, these structures and lines shall be either removed or properly abandoned prior to the proposed construction. Abandonment procedures will be provided once underground structures are encountered.

If placement of slabs-on-grade and pavement is not performed immediately upon completion of grading operations, additional testing and grading of the areas may be necessary prior to continuation of construction operations. Likewise, if adverse weather conditions occur which may damage the subgrade soils, additional assessment by the soils engineer as to the suitability of the supporting soils may be needed.

8.1.2 **Fill Blanket Recommendations**

Due to the potential for differential settlement of structures supported on both compacted fill and native soils, it is recommended that all building foundations be underlain by a uniform compacted fill blanket at least 2 feet in thickness. The fill blanket shall extend a minimum of 5 horizontal feet outside the edges of foundations or equidistant to the depth of fill placed, whichever is greater.

Building floor slabs should also be underlain by a minimum of 2 feet of compacted fill soils.

8.1.3 **Shrinkage and Subsidence**

Results of our in-place density tests reveal that the soil shrinkage will be on the order of 10 to 15% due to excavation and recompaction, based upon the assumption that the fill is compacted to 92% of the maximum dry density per ASTM standards. Subsidence should be 0.15 feet due to earthwork operations. The volume change does not include any allowance for vegetation or organic stripping, removal of subsurface improvements or topographic approximations.

Although these values are only approximate, they represent our best estimate of shrinkage values which will likely occur during grading. If more accurate shrinkage and subsidence factors are needed, it is recommended that field testing using the actual equipment and grading techniques should be conducted.

8.2 **Temporary Excavations and Shoring Design**

Temporary unsurcharged excavations less than 4 feet in height may be excavated at vertical inclinations. Unsurcharged excavations over 4 feet and not in excess of 10 feet in height in the existing site materials may be trimmed at a 1 to 1 (horizontal to vertical) gradient for the entire height of the cut. In areas where soils with little or no binder are encountered, where adverse geological conditions are exposed, or where excavations are adjacent to existing structures, shoring, slot-cutting, or flatter excavations may be required.

The temporary cut slope gradients given above do not preclude local raveling and sloughing. All excavations shall be made in accordance with the requirements of the soils engineer, CAL-OSHA and other public agencies having jurisdiction.

Temporary shoring design may utilize an active earth pressure of 25 pcf without any surcharge due to adjacent traffic, equipment or structures. The passive fluid pressures of 250 pcf may be doubled to 500 pcf for temporary design.

8.3 Foundation Design

All foundations may be designed utilizing the following allowable soil bearing capacities for an embedded depth of 18 inches into approved compacted fill materials with the corresponding widths. Footings shall not traverse from compacted fill to native soils due to the potential for differential settlement of structures.

Allowable Soil Bearing Capacity (psf)

Width (ft)	Continuous Foundation	Isolated Foundation
1.5	2000	2500
2.0	2100	2600
4.0	2500	2900
6.0	2900	3400

The bearing value may be increased by 500 psf for each additional foot of depth in excess of the 18-inch minimum depth, up to a maximum of 4500 psf. Property line screen wall foundations where proper overexcavation and recompaction is not possible due to property line restrictions may be designed using a reduced allowable soil bearing capacity of 1,500 psf for foundations a minimum of 18 inches in depth *and* at least 8 inches into the underlying medium dense native soils. A one-third increase may be used when considering short term loading from wind and seismic forces.

Continuous foundations shall be reinforced with a minimum of 2-#4 steel bars top and 2 bottom. Spread foundations may be reinforced at the discretion of the structural engineer. Additional reinforcement may be necessary due to soil expansion or proposed loadings and shall be further evaluated by the project engineers and/or architect. A representative of this firm shall observe foundation excavations prior placement of steel reinforcement and concrete.

8.4 Settlement Analysis

Resultant pressure curves for the consolidation tests are shown on Plates E-H. Computations utilizing these curves and the recommended allowable soil bearing capacities reveal that the foundations will experience normal settlements on the order of ¾ inch and differential settlements of less than ¼ inch.

8.5 Lateral Resistance

The following values may be utilized in resisting lateral loads imposed on the structure. Requirements of the California Building Code should be adhered to when the coefficient of friction and passive pressures are combined.

Coefficient of Friction - 0.40
Equivalent Passive Fluid Pressure = 250 lbs./cu.ft.
Maximum Passive Pressure = 2,500 lbs./cu.ft.

The passive pressure recommendations are valid only for approved compacted fill soils or competent native ground.

8.6 **Retaining Wall Design Parameters**

Active earth pressures against retaining walls will be equal to the pressures developed by the following fluid densities. These values are for **granular backfill material** placed behind the walls at various ground slopes above the walls.

Surface Slope of Retained Materials (Horizontal to Vertical)	Equivalent Fluid Density (lb./cu.ft.)
Level	30
5 to 1	35
4 to 1	38
3 to 1	40
2 to 1	45

Any applicable short-term construction surcharges and seismic forces should be added to the above lateral pressure values. All walls shall be waterproofed as needed and protected from hydrostatic pressure by a reliable permanent subdrain system.

During a local Magnitude 6.8 earthquake along the Elsinore fault zone, additional lateral pressures will occur along the back of walls retaining 6 feet or more of soil. The seismic-induced lateral soil pressure may be computed using a triangular pressure distribution with the maximum value at the top of the wall. The maximum lateral pressure of (20 pcf) H where H is the height of the retained soils above the wall footing should be used in final design of retaining walls.

Sliding resistance values and passive fluid pressure values given in our previous report may be increased by 1/3 during short-term wind and seismic loading conditions.

8.7 **Floor Slab Design**

Concrete floor slabs-on-grade shall be a minimum of 4 and 6 inches in thickness in office and warehouse areas, respectively, and may be placed upon fill soils compacted to a minimum of *95%* relative compaction. Soils should be brought to near-optimum moisture levels prior to placement of concrete, as verified by the soil engineer. Slabs-on-grade shall be reinforced with a minimum of #3 steel bars placed at 18 inches on-center, both directions, positioned mid-height in the slab. Slabs 7 inches in thickness may delete the reinforcement requirement. Additional reinforcement requirements and an increase in thickness of the slabs-on-grade may be necessary based upon soils expansion potential at the conclusion of grading and proposed loading conditions in the structures and should be evaluated further by the project engineers and/or architect.

A vapor retarder should be utilized in areas which would be sensitive to the infiltration of moisture. This retarder shall meet requirements of ASTM E 96, *Water Vapor Transmission of Materials* and ASTM E 1745, *Standard Specification for Water Vapor Retarders used in Contact with Soil or Granular Fill Under Concrete Slabs.* The vapor retarder shall be installed in accordance with procedures stated in ASTM E 1643, *Standard practice for Installation of Water Vapor Retarders used in Contact with Earth or Granular Fill Under Concrete Slabs*.

The moisture retarder may be placed upon 4 inches of sand or gravel. The surface upon which the retarder is placed shall be smooth and free of rocks, gravel or other protrusions which may damage the retarder. Use of sand above the retarder is under the purview of the structural engineer; if sand is used over the retarder, it should be placed in a dry condition.

All concrete slab areas to receive floor coverings should be moisture tested to meet all manufacturer requirements prior to placement.

8.8 **Expansive Soil**

The upper soils at the site are very low (Expansion Index = 0-20) to low (21-50) in expansion potential. Sites with expansive soils (Expansion Index >20) require special attention during project design and maintenance. The attached *Expansive Soil Guidelines* should be reviewed by the engineers, architects, owner, maintenance personnel and other interested parties and considered during the design of the project and future property maintenance.

8.9 **Utility Trench and Excavation Backfill**

Trenches from installation of utility lines and other excavations may be backfilled with on-site soils or approved imported soils compacted to a minimum of 90% relative compaction. All utility lines shall be properly bedded and shaded with clean sand having a sand equivalency rating of 30 or more. This material shall be thoroughly water jetted around the pipe structure prior to placement of compacted backfill soils.

8.10 **Corrosion Design Criteria**

Representative samples of the surficial soils revealed negligible sulfate concentrations and no special concrete design recommendations are deemed necessary at this time. It is recommended that additional sulfate tests be performed at the completion of rough grading to assure that the as graded conditions are consistent with the recommendations stated in this design. Sulfate test results may be found on the attached Table IV.

Tests were also conducted on a random representative sample of soils to determine the potential corrosive effects on buried metallic structures. Tests for pH, resistivity and chloride are included on Tables V – VII. Soil pH indicates a slightly acidic condition. Resistivity is representative of corrosive soils and metallic structures should be protected as necessary. Chloride content measured 351 ppm.

A corrosion engineer may be consulted regarding protection of buried metallic piping.

8.11 **Preliminary Pavement Design**

The table below provides a preliminary pavement design based upon a tested R-Value of 16 for the proposed pavement areas. Final pavement design should be based on R-Value testing of the subgrade soils near the conclusion of rough grading to assure that the as-graded conditions are consistent with those used in this preliminary design.

On-Site Flexible (Asphaltic) Pavement Section Design

Type of Traffic	Traffic Index	Inches Asphalt	Inches Base
Auto Parking/Circulation	5.0	3.5	7.0
Truck	7.0	5.0	12.5

Subgrade soils to receive base material shall be compacted to a minimum of 90% relative compaction; base material shall be compacted to at least 95%. Any concrete slab-on-grade in pavement areas may be placed on subgrade soils compacted to at least 95% relative compaction and shall be a minimum of 6 inches in thickness and reinforced with a minimum of #3 steel bars placed at 18 inches on-center, both directions, positioned mid-height in the slab. Slabs 7 inches in thickness may delete the reinforcement requirement.

An increase in slab thickness and placement of steel reinforcement due to loading conditions and soil expansion may be necessary and should be reviewed by the structural engineer.

The above recommendations are based upon estimated traffic loadings. Client should submit anticipated traffic loadings for the pavement areas to the soils engineer, when available, so that pavement sections may be reviewed to determine adequacy to support the proposed loadings.

9.0 INFILTRATION TESTING

Five test locations were excavated to determine the infiltration rate of the proposed infiltration/bio-retention systems. The test locations were excavated by backhoe to depths ranging from 5 to 10 feet below existing ground surface (bgs). Excavations were trimmed at 1:1 (horizontal to vertical) inclinations in order to provide safe entry into the excavations.

The infiltration test consisted of the double ring infiltration test per ASTM Method D 3385. The double ring infiltrometer method consists of driving two open cylinders, one inside the other, into the ground, partially filling the ring with water, and then maintaining the liquid at a constant level. The volume of liquid added to the inner ring, to maintain the liquid level constant is the measure of the volume of liquid that infiltrates into the soil.

The volume infiltrated during timed intervals is converted to an incremental infiltration velocity, usually expressed in centimeters per hour or inches per hour and plotted verses elapsed time. The maximum-steady state or average incremental infiltration velocity, depending on the purpose/application of the test is equivalent to the infiltration rate.

Water levels were maintained at a constant level in both the inner ring and annular space between rings throughout the test, to prevent flow of water from one ring to the other.

The volume of liquid used during each measured time interval was converted into an incremental infiltration velocity of both the inner ring in the annular space using the following equations:

For the inner ring calculated as follows:

$Vir=\Delta Vir/(Air\Delta t)$

where:

Vir = inner ring incremental infiltration velocity, cm/hr

ΔVir = volume of water used during time interval to maintain constant head in the inner ring, cm^3

Air = internal area of the inner ting, cm^2

Δt = time interval, hr

An average of the final readings obtained was used for design purposes in each of the basins. The testing data sheets are attached in Appendix D and summarized in the *Discussion of Results* section below.

The use of on-site disposal system by means of retention/infiltration basins or chambers appears to be geotechnically feasible for future development in all areas except test T-3 where very low infiltration rates were encountered. The field infiltration rates given below may be utilized in the final basin design with a safety factor of 2.0 or greater.

Test No.	Depth (feet bgs)	Soil Type	Infiltration Rate (cm/hr)	(in/hr)
T-3	5.0	sandy Silt	0.5	0.2
T-12	7.0	silty Sand	181.5	72.6
T-15	5.0	silty Sand	44.2	17.7
T-29	6.0	sandy Silt	8.1	3.2
T-33	10.0	sandy Silt	5.9	2.4

It is our opinion that the site is generally suitable for stormwater infiltration without increasing the potential of settlement of proposed and existing structures or adversely affecting retaining/basement walls located either on or adjacent to the subject site. In addition, the potential for hydro-consolidation and the susceptibility for any ground settlements are considered low. All systems shall meet the California Regional Water Quality Control Board (CRWQCB) requirements.

10.0 CLOSURE

The recommendations and conclusions contained in this report are based upon the soil conditions uncovered in our test excavations. No warranty of the soil condition between our excavations is implied. NorCal Engineering should be notified for possible further recommendations if unexpected to unfavorable conditions are encountered during construction phase. It is the responsibility of the owner to ensure that all information within this report is submitted to the Architect and appropriate Engineers for the project.

This firm should have the opportunity to review the final plans (72 hours for review required) to verify that all our recommendations are incorporated. This report and all conclusions are subject to the review of the controlling authorities for the project.

A preconstruction conference should be held between the developer, general contractor, grading contractor, city inspector, architect, and soil engineer to clarify any questions relating to the grading operations and subsequent construction. Our representative should be present during the grading operations and construction phase to certify that such recommendations are complied within the field.

This geotechnical investigation has been conducted in a manner consistent with the level of care and skill exercised by members of our profession currently practicing under similar conditions in the Southern California area. No other warranty, expressed or implied is made.

We appreciate this opportunity to be of service to you. If you have any further questions, please do not hesitate to contact the undersigned.

Respectfully submitted,
NORCAL ENGINEERING

Keith D. Tucker
Project Engineer
R.G.E. 841

Mark A. Burkholder
Project Manager

Andrew Stone
Project Geologist
C.E.G. 1648

SPECIFICATIONS FOR PLACEMENT OF COMPACTED FILL

Excavation
Any existing low-density soils and/or saturated soils shall be removed to competent natural soil under the inspection of the Soils Engineering Firm. After the exposed surface has been cleansed of debris and/or vegetation, it shall be scarified until it is uniform in consistency, brought to the proper moisture content and compacted to a minimum of 90% relative compaction (in accordance with ASTM: D-1557-12).

In any area where a transition between fill and native soil or between bedrock and soil are encountered, additional excavation beneath foundations and slabs will be necessary in order to provide uniform support and avoid differential settlement of the structure. Verification of elevations during grading operations will be the responsibility of the owner or his designated representative.

Material For Fill
The on-site soils or approved import soils may be utilized for the compacted fill provided they are free of any deleterious materials and shall not contain any rocks, brick, asphaltic concrete, concrete or other hard materials greater than eight inches in maximum dimensions. Any import soil must be approved by the Soils Engineering firm a minimum of 72 hours prior to importation of site.

Placement of Compacted Fill Soils
The approved fill soils shall be placed in layers not excess of six inches in thickness. Each lift shall be uniform in thickness and thoroughly blended. The fill soils shall be brought to within 2% of the optimum moisture content, unless otherwise specified by the Soils Engineering firm. Each lift shall be compacted to a minimum of 90% relative compaction (in accordance with ASTM: D-1557-12) and approved prior to the placement of the next layer of soil. Compaction tests shall be obtained at the discretion of the Soils Engineering firm but to a minimum of one test for every 500 cubic yards placed and/or for every 2 feet of compacted fill placed.

The minimum relative compaction shall be obtained in accordance with accepted methods in the construction industry. The final grade of the structural areas shall be in a dense and smooth condition prior to placement of slabs-on-grade or pavement areas. No fill soils shall be placed, spread or compacted during unfavorable weather conditions. When the grading is interrupted by heavy rains, compaction operations shall not be resumed until approved by the Soils Engineering firm.

Grading Observations

The controlling governmental agencies should be notified prior to commencement of any grading operations. This firm recommends that the grading operations be conducted under the observation of a Soils Engineering firm as deemed necessary. A 24-hour notice must be provided to this firm prior to the time of our initial inspection.

Observation shall include the clearing and grubbing operations to assure that all unsuitable materials have been properly removed; approve the exposed subgrade in areas to receive fill and in areas where excavation has resulted in the desired finished grade and designate areas of overexcavation; and perform field compaction tests to determine relative compaction achieved during fill placement. In addition, all foundation excavations shall be observed by the Soils Engineering firm to confirm that appropriate bearing materials are present at the design grades and recommend any modifications to construct footings.

EXPANSIVE SOIL GUIDELINES

The following expansive soil guidelines are provided for your project. The intent of these guidelines is to inform you, the client, of the importance of proper design and maintenance of projects supported on expansive soils. ***You, as the owner or other interested party, should be warned that you have a duty to provide the information contained in the soil report including these guidelines to your design engineers, architects, landscapers and other design parties in order to enable them to provide a design that takes into consideration expansive soils.***

In addition, you should provide the soil report with these guidelines to any property manager, lessee, property purchaser or other interested party that will have or assume the responsibility of maintaining the development in the future.

Expansive soils are fine-grained silts and clays which are subject to swelling and contracting. The amount of this swelling and contracting is subject to the amount of fine-grained clay materials present in the soils and the amount of moisture either introduced or extracted from the soils. Expansive soils are divided into five categories ranging from "very low" to "very high". Expansion indices are assigned to each classification and are included in the laboratory testing section of this report. *If the expansion index of the soils on your site, as stated in this report, is 21 or higher, you have expansive soils.* The classifications of expansive soils are as follows:

Classification of Expansive Soil*

Expansion Index	Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
Above 130	Very High

*From Table 18A-I-B of California Building Code (1988)

When expansive soils are compacted during site grading operations, care is taken to place the materials at or slightly above optimum moisture levels and perform proper compaction operations. Any subsequent excessive wetting and/or drying of expansive soils will cause the soil materials to expand and/or contract. These actions are likely to cause distress of foundations, structures, slabs-on-grade, sidewalks and pavement over the life of the structure. ***It is therefore imperative that even after construction of improvements, the moisture contents are maintained at relatively constant levels, allowing neither excessive wetting or drying of soils.***

Evidence of excessive wetting of expansive soils may be seen in concrete slabs, both interior and exterior. Slabs may lift at construction joints producing a trip hazard or may crack from the pressure of soil expansion. Wet clays in foundation areas may result in lifting of the structure causing difficulty in the opening and closing of doors and windows, as well as cracking in exterior and interior wall surfaces. In extreme wetting of soils to depth, settlement of the structure may eventually result. Excessive wetting of soils in landscape areas adjacent to concrete or asphaltic pavement areas may also result in expansion of soils beneath pavement and resultant distress to the pavement surface.

Excessive drying of expansive soils is initially evidenced by cracking in the surface of the soils due to contraction. Settlement of structures and on-grade slabs may also eventually result along with problems in the operation of doors and windows.

Projects located in areas of expansive clay soils will be subject to more movement and "hairline" cracking of walls and slabs than similar projects situated on non-expansive sandy soils. There are, however, measures that developers and property owners may take to reduce the amount of movement over the life the development. The following guidelines are provided to assist you in both design and maintenance of projects on expansive soils:

- Drainage away from structures and pavement is essential to prevent excessive wetting of expansive soils. Grades of at least 3% should be designed and maintained to allow flow of irrigation and rain water to approved drainage devices or to the street. Any "ponding" of water adjacent to buildings, slabs and pavement after rains is evidence of poor drainage; the installation of drainage devices or regrading of the area may be required to assure proper drainage. Installation of rain gutters is also recommended to control the introduction of moisture next to buildings. Gutters should discharge into a drainage device or onto pavement which drains to roadways.

- Irrigation should be strictly controlled around building foundations, slabs and pavement and may need to be adjusted depending upon season. This control is essential to maintain a relatively uniform moisture content in the expansive soils and to prevent swelling and contracting. Over-watering adjacent to improvements may result in damage to those improvements. NorCal Engineering makes no specific recommendations regarding landscape irrigation schedules.

- Planting schemes for landscaping around structures and pavement should be analyzed carefully. Plants (including sod) requiring high amounts of water may result in excessive wetting of soils. Trees and large shrubs may actually extract moisture from the expansive soils, thus causing contraction of the fine-grained soils.

- Thickened edges on exterior slabs will assist in keeping excessive moisture from entering directly beneath the concrete. A six-inch thick or greater deepened edge on slabs may be considered. Underlying interior and exterior slabs with 6 to 12 inches or more of non-expansive soils and providing presaturation of the underlying clayey soils as recommended in the soil report will improve the overall performance of on-grade slabs.

- Increase the amount of steel reinforcing in concrete slabs, foundations and other structures to resist the forces of expansive soils. The precise amount of reinforcing should be determined by the appropriate design engineers and/or architects.

- Recommendations of the soil report should always be followed in the development of the project. Any recommendations regarding presaturation of the upper subgrade soils in slab areas should be performed in the field and verified by the Soil Engineer.

REFERENCES

1. California Building Code, 2016.

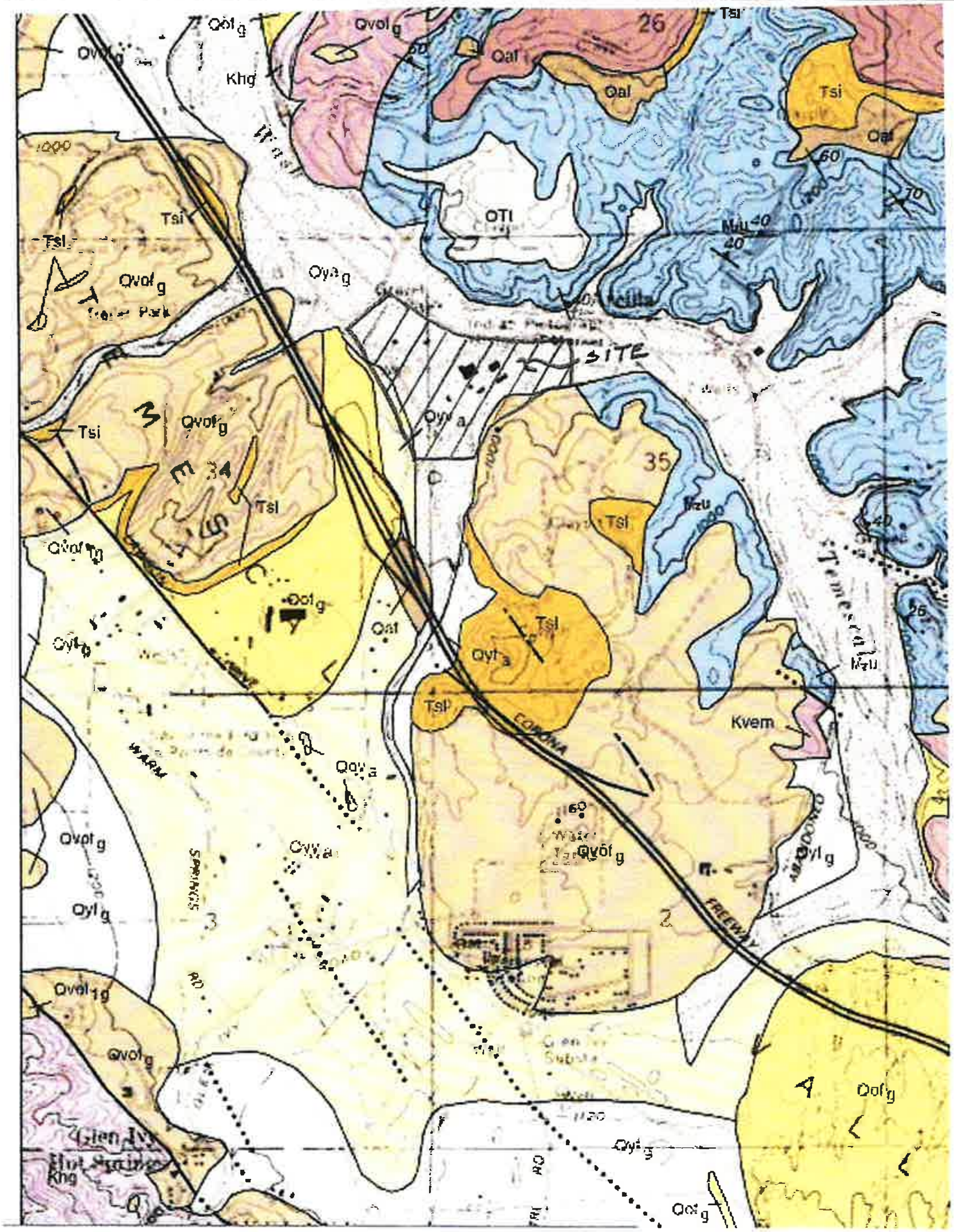
2. California Division of Mines and Geology, 1997, Guidelines for Evaluating and Mitigating Seismic Hazards in California: Special Publication 117.

3. International Conference of Building Officials, Uniform Building Code UBC, 2009.

4. ACI Building Code Requirements for Structural Concrete (ACI 318-05) and Commentary (ACI 318R-05), 2005.

5. Geologic Map of the Lake Mathews 7.5' Quadrangle, Riverside County, California, Morton, D.M. and Weber, F.H., 2001, published by the United States Geological Survey as Open File Report 01-479

6. *State of California, Special Studies Zones, Lake Mathews Quadrangle,* January 1, 1980, available through the California Geological Survey



LEGEND

Qya, Qyv, Qvof	ALLUVIUM
Tsi	Silverado Formation
Kvem	Volcanic Rock
MzU	Metamorphic Rock

N

0 2000'

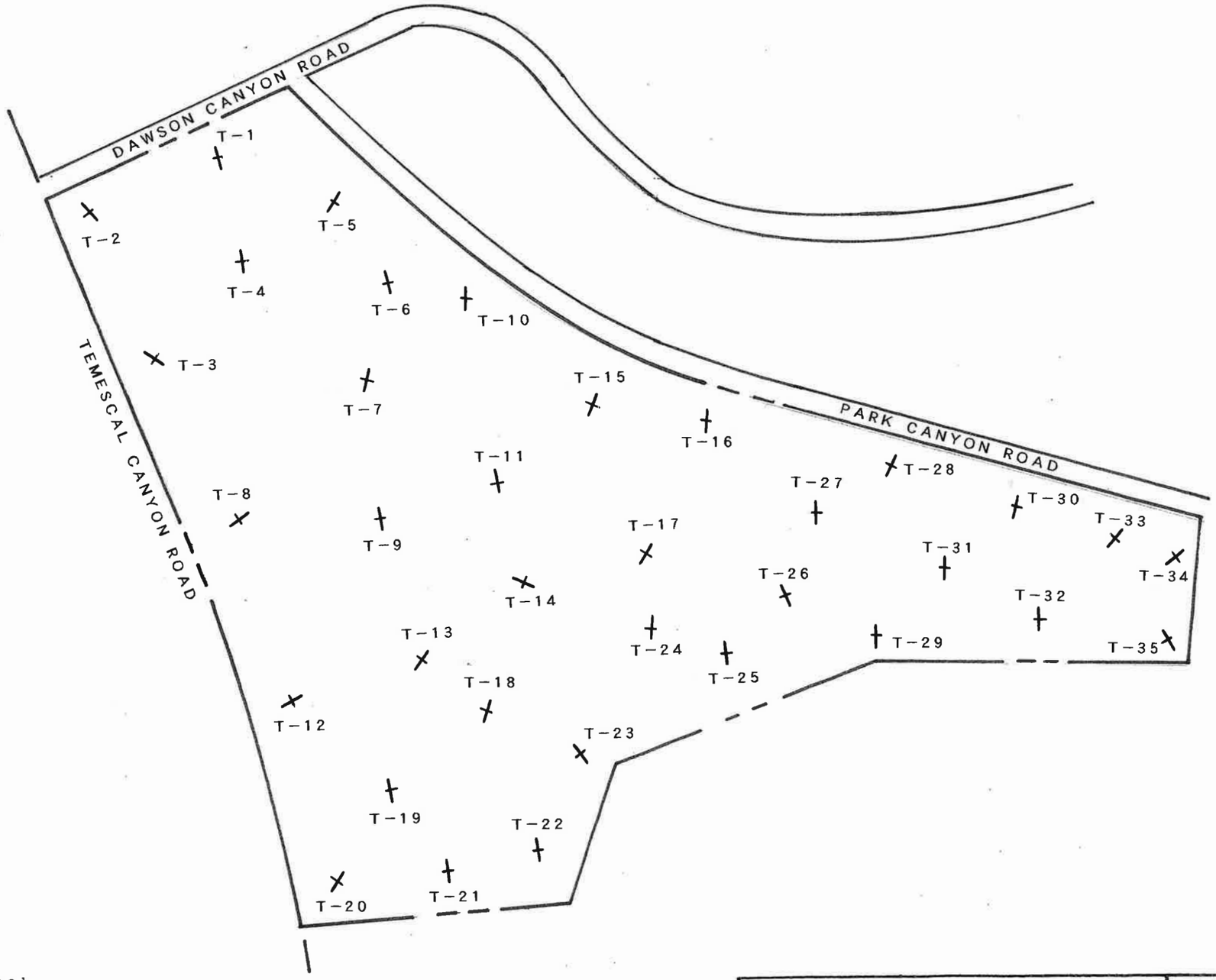
Portion of: *Geologic Map of the Lake Mathews 7.5' Quadrangle, Riverside County, California*, Morton, D.M. and Weber, F.H., 2001

NorCal Engineering
SOILS AND GEOTECHNICAL CONSULTANTS

GEOLOGIC MAP

PROJECT 21206-19 **DATE** 7/2019

FIG. 1



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0 300'

SCALE

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT 21206-19 | DATE 7/2019

APPROXIMATE LOCATIONS OF SOIL BORINGS

FIG. 2

APPENDICES

(In order of appearance)

Appendix A – Seismic Design

Appendix B –Logs of Test Explorations
***Logs of Test Excavations T-1 to T-35**

Appendix C - Laboratory Analysis
***Table I - Maximum Dry Density Tests**
***Table II - Expansion Index Tests**
***Table III - Atterberg Limits Tests**
***Table IV - Sulfate Tests**
***Table V - pH Tests**
***Table VI - Resistivity Tests**
***Table VII - Chloride Tests**
***Table VIII - Resistance 'R' Value Tests**

***Plates A-D - Direct Shear Tests**
***Plates E-H - Consolidation Tests**

Appendix D – Infiltration Test Data

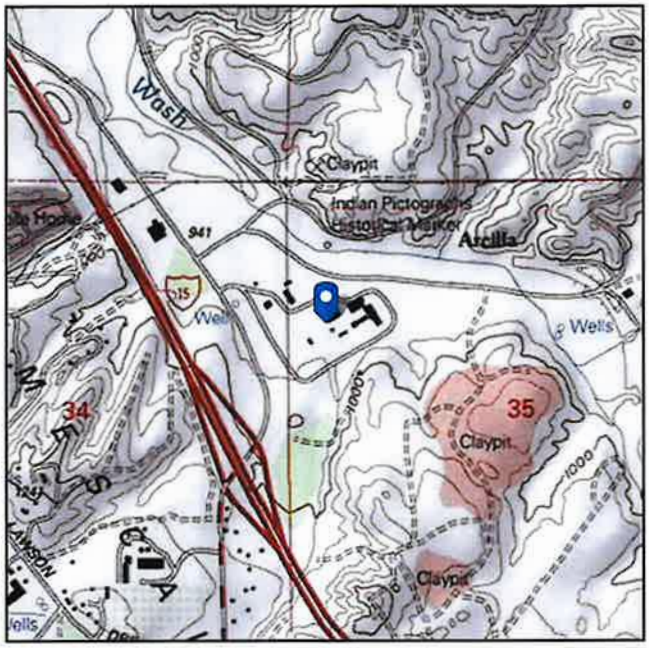
APPENDIX A

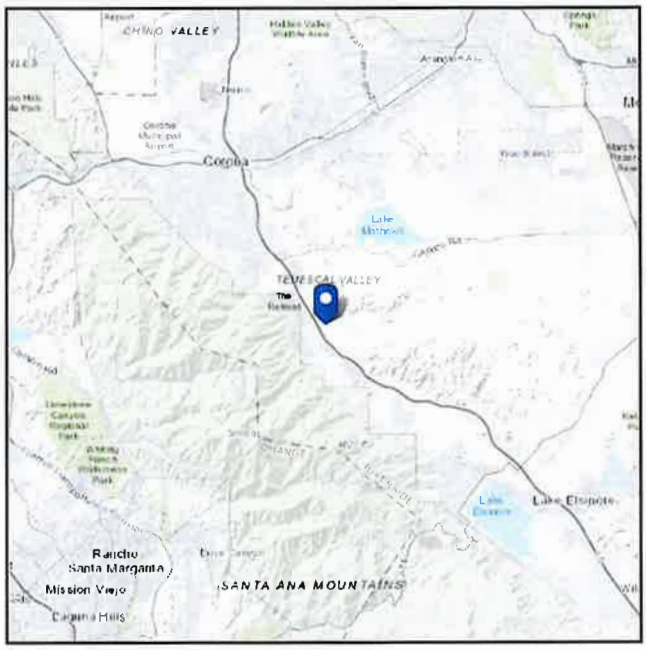
ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-10
Risk Category: III
Soil Class: D - Stiff Soil

Elevation: 954.27 ft (NAVD 88)
Latitude: 33.781
Longitude: -117.484





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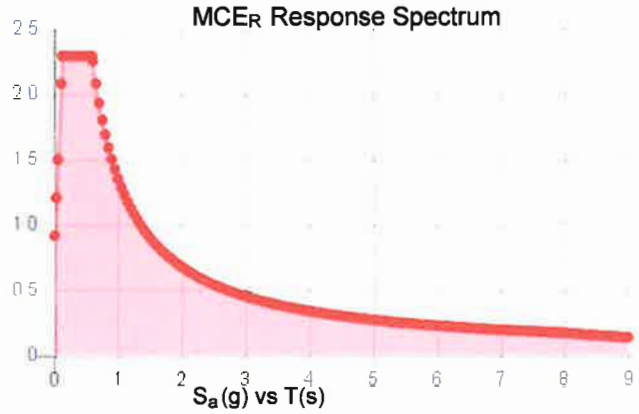
Seismic

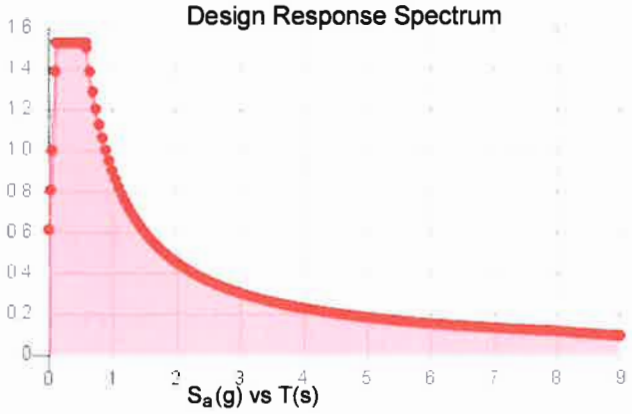
Site Soil Class: D - Stiff Soil

Results:

S_S :	2.291	S_{DS} :	1.527
S_1 :	0.901	S_{D1} :	0.901
F_a :	1	T_L :	8
F_v :	1.5	PGA :	0.88
S_{MS} :	2.291	PGA_M :	0.88
S_{M1} :	1.352	F_{PGA} :	1
		I_e :	1.25

Seismic Design Category E





Data Accessed: Sun Jul 14 2019

Date Source: USGS Seismic Design Maps based on ASCE/SEI 7-10, incorporating Supplement 1 and errata of March 31, 2013, and ASCE/SEI 7-10 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-10 Ch. 21 are available from USGS.

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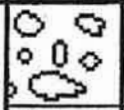
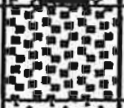
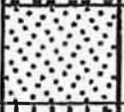
The ASCE 7 Hazard Tool is provided for your convenience, for informational purposes only, and is provided "as is" and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE 7 standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

ASCE does not intend, nor should anyone interpret, the results provided by this Tool to replace the sound judgment of a competent professional, having knowledge and experience in the appropriate field(s) of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the contents of this Tool or the ASCE 7 standard.

In using this Tool, you expressly assume all risks associated with your use. Under no circumstances shall ASCE or its officers, directors, employees, members, affiliates, or agents be liable to you or any other person for any direct, indirect, special, incidental, or consequential damages arising from or related to your use of, or reliance on, the Tool or any information obtained therein. To the fullest extent permitted by law, you agree to release and hold harmless ASCE from any and all liability of any nature arising out of or resulting from any use of data provided by the ASCE 7 Hazard Tool.

APPENDIX B

MAJOR DIVISION			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL, SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINE (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

UNIFIED SOIL CLASSIFICATION SYSTEM

NorCal Engineering

KEY:

- ■ Indicates 2.5-inch Inside Diameter. Ring Sample.
- ⊠ Indicates 2-inch OD Split Spoon Sample (SPT).
- ⧅ Indicates Shelby Tube Sample.
- ◫ Indicates No Recovery.
- ◧ Indicates SPT with 140# Hammer 30 in. Drop.
- ⊠ Indicates Bulk Sample.
- ◩ Indicates Small Bag Sample.
- ◨ Indicates Non-Standard
- ⧓ Indicates Core Run.

COMPONENT PROPORTIONS

DESCRIPTIVE TERMS	RANGE OF PROPORTION
Trace	1 - 5%
Few	5 - 10%
Little	10 - 20%
Some	20 - 35%
And	35 - 50%

COMPONENT DEFINITIONS

COMPONENT	SIZE RANGE
Boulders	Larger than 12 in
Cobbles	3 in to 12 in
Gravel	3 in to No 4 (4.5mm)
Coarse gravel	3 in to 3/4 in
Fine gravel	3/4 in to No 4 (4.5mm)
Sand	No. 4 (4.5mm) to No. 200 (0.074mm)
Coarse sand	No. 4 (4.5 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and Clay	Smaller than No. 200 (0.074 mm)

MOISTURE CONTENT

DRY	Absence of moisture, dusty, dry to the touch.
DAMP	Some perceptible moisture; below optimum
MOIST	No visible water; near optimum moisture content
WET	Visible free water, usually soil is below water table.

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N -VALUE

COHESIONLESS SOILS		COHESIVE SOILS		
Density	N (blows/ft)	Consistency	N (blows/ft)	Approximate Undrained Shear Strength (psf)
Very Loose	0 to 4	Very Soft	0 to 2	< 250
Loose	4 to 10	Soft	2 to 4	250 - 500
Medium Dense	10 to 30	Medium Stiff	4 to 8	500 - 1000
Dense	30 to 50	Stiff	8 to 15	1000 - 2000
Very Dense	over 50	Very Stiff	15 to 30	2000 - 4000
		Hard	over 30	> 4000

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21206-19

Log of Trench T-1

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/11/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty (fine grained) SAND with gravel, some cobbles and some concrete pieces Brown, loose to medium dense, dry to moist	■		10.2	113.2	
5		NATURAL SOILS Silty SAND with gravel and small cobbles Brown, medium dense, moist	☑		4.5		
		Slightly silty (medium to coarse grained) SAND with gravel and occasional cobbles Brown, medium dense, damp					
		Trench completed at depth of 6'					
10							
15							
20							
25							
30							
35							

GWT not encountered

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Log of Trench T-2

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/11/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0	FILL SOILS Slightly silty SAND with gravel and some small cobbles Light brown to brown, loose to medium dense, dry to damp					
5	NATURAL SOILS Slightly silty (medium to coarse grained) SAND with gravel, small cobbles Brown, dense, damp	■		3.2	124.0	
	Fine to coarse grained, Silty SAND with gravel Brown, dense, moist					
10	Clayey SAND with gravel Dark brown, dense, moist	■		10.0	124.0	
	Slightly silty (medium to coarse grained) SAND with gravel, small cobbles Light brown to brown, dense, damp Some lenses of clayey SAND noted					
15		■		3.0	118.0	
20		■		4.5	108.4	
	Trench completed at depth of 20.5'					
25						
30						
35						

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Log of Trench T-3

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/11/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel, small cobbles and some concrete pieces Brown, medium dense, damp					
		GWT not encountered					
		NATURAL SOILS Sandy SILT with gravel, small cobbles Brown, medium stiff, damp	☑		4.4		
5		Trench completed at depth of 5'					
10							
15							
20							
25							
30							
35							

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Log of Trench T-4

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/11/19 | Groundwater Depth: None Encountered

Drilling Method: Backhoe

Hammer Weight: | Drop:

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Gravelly Silty SAND Brown, medium dense, dry	■		3.3	113.9	
5		NATURAL SOILS Sandy SILT with occasional gravel Brown, medium stiff, damp	■		5.3	96.3	
		Slightly silty (fine to coarse grained) SAND with gravel and some small cobbles Brown, medium dense, damp					
10		Trench completed at depth of 10'					
15							
20							
25							
30							
35							

GWT not encountered

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Log of Trench T-5

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/11/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel and some cobbles Brown, medium dense, damp					
5		NATURAL SOILS Silty SAND with gravel and small cobbles Brown, medium dense, damp	■		7.7	110.4	
			■		8.1	116.6	
10		Trench completed at depth of 10'					
15							
20							
25							
30							
35							

GWT not encountered

Date: 7/16/2019 File: C:\Superlog4\PROJECT\21206-19.log SuperLog CivilTech Software, USA www.civiltech.com

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Log of Trench T-6

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/11/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel, some cobbles Brown, loose to medium dense, dry to damp					
5		GWT not encountered NATURAL SOILS Silty SAND with gravel and small cobbles Brown, dense, damp Trench completed at depth of 5'					
10							
15							
20							
25							
30							
35							

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Log of Trench T-7

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/11/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel, some cobbles Brown, loose to medium dense, damp	☑				
5		GWT not encountered NATURAL SOILS Silty SAND with gravel and small cobbles Brown, medium dense, damp					
10		Slightly silty (fine to coarse grained) SAND with gravel and occasional small cobbles Brown, medium dense, damp Trench completed at depth of 8'					
15							
20							
25							
30							
35							

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Log of Trench T-8

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/11/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel and occasional small cobbles Brown, dense, dry to damp					
5		NATURAL SOILS Slightly silty SAND with occasional small cobbles Brown, medium dense, moist	■		2.9	106.8	
		Silty SAND with occasional gravel and some cobbles Brown, medium dense, damp	■		5.4	107.2	
10		Trench completed at depth of 10'					
15							
20							
25							
30							
35							

GWT not encountered

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Log of Trench T-9

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/11/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel, some cobbles and occasional wood pieces Brown, dense, dry to moist	■		11.2	100.4	
		NATURAL SOILS Silty (fine grained) SAND to Sandy SILT with gravel and small cobbles Brown, medium dense/stiff, moist	■		10.7	96.1	
5		Trench completed at depth of 6'					
10							
15							
20							
25							
30							
35							

GWT not encountered

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Log of Trench T-10

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/11/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel, some cobbles Brown, medium dense, dry to damp					
5		NATURAL SOILS Silty SAND with gravel and small cobbles Brown, medium dense, moist	■		8.7	111.2	
		Slightly silty (medium to coarse grained) SAND with cobbles Brown, medium dense, damp	▽		3.9		
10		Trench completed at depth of 10'					
15							
20							
25							
30							
35							

GWT not encountered

Date: 7/16/2019 File: C:\Superlog4\PROJECT\21206-19.log SuperLog CivilTech Software, USA www.civiltech.com

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21206-19

Log of Trench T-11

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/12/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel, some cobbles Brown, medium dense, dry to damp					
5	GWT not encountered	NATURAL SOILS Slightly silty (medium to coarse grained) SAND with small cobbles Light brown to brown, medium dense, damp	☑		3.9		
10		Trench completed at depth of 10'					
15							
20							
25							
30							
35							

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Proficiency Capital, LLC 21206-19	Log of Trench T-12
Boring Location: Temescal Cnyn & Park Cnyn, Corona	
Date of Drilling: 6/11/19	Groundwater Depth: None Encountered
Drilling Method: Backhoe	
Hammer Weight:	Drop:
Surface Elevation: Not Measured	

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel and small cobbles Brown, medium dense, damp					
5	GWT not encountered	NATURAL SOILS Silty SAND with gravel and small cobbles Brown, medium dense, damp					
		Trench completed at depth of 7'	☒		7.3		
10							
15							
20							
25							
30							
35							

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Proficiency Capital, LLC 21206-19	Log of Trench T-13

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/12/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel, concrete pieces and wire Brown, loose to medium dense, dry to damp					
5		GWT not encountered NATURAL SOILS Slightly silty (medium to coarse grained) SAND with small cobbles Brown, medium dense, dry to damp	☑		2.3		
10		Trench completed at depth of 10'	☑		1.9		
15							
20							
25							
30							
35							

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Log of Trench T-14

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/11/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty (medium to coarse grained) SAND with gravel, some cobbles and some concrete pieces Brown, loose to medium dense, dry to moist					
		NATURAL SOILS Silty SAND with gravel and small cobbles Brown, medium dense, moist	■		2.8	110.1	
5		Slightly silty (medium to coarse grained) SAND with gravel and occasional cobbles Brown, medium dense, damp Increase in cobbles with depth	☑		2.4		
10			☑		2.4		
15			☑		4.3		
20		Trench completed at depth of 20.5'	☑		5.1		
25							
30							
35							

GWT not encountered

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Log of Trench T-15

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/11/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel, some cobbles Brown, medium dense, dry to damp					
5	GWT not encountered	NATURAL SOILS Silty SAND with gravel and small cobbles Brown, medium dense, dry Trench completed at depth of 5'	☑		1.6		
10							
15							
20							
25							
30							
35							

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Log of Trench T-16

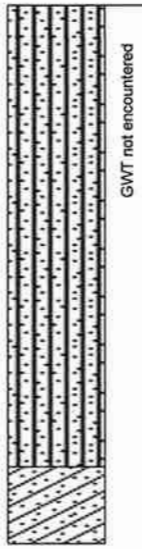
Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/12/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured



Depth (feet)	Lithology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel, rock, small cobbles and wood pieces Brown, medium dense, dry to moist with depth Very dense below 24"					
5							
			☑		13.4		
10			■		11.7	116.2	
		NATURAL SOILS Clayey SAND with occasional gravel and some small cobbles Brown, dense, moist					
15		Trench completed at depth of 14'					
20							
25							
30							
35							

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Log of Trench T-17

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/12/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Sandy CLAY with gravel and rock Brown, medium dense, moist	☑				
5		FILL SOILS Silty SAND with gravel and small cobbles Dark brown, medium dense, damp Some organic odor noted	☑		5.2		
10		NATURAL SOILS Slightly (medium to coarse grained) SAND with gravel, small cobbles Light brown, medium dense, damp Trench completed at depth of 12'	☑		2.6		
15							
20							
25							
30							
35							

GWT not encountered

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Log of Trench T-18

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/12/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Slightly silty SAND with gravel, small cobbles Brown, loose, dry					
		NATURAL SOILS Silty SAND with gravel and small cobbles Brown, medium dense, damp					
5							
10		Trench completed at depth of 10'	☑		7.7		
15							
20							
25							
30							
35							

GWT not encountered

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Log of Trench T-19

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/12/19 | **Groundwater Depth:** 9' (seeping)

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty (fine grained) SAND with gravel, some cobbles and some concrete pieces Brown, medium dense, dry to damp	■		13.8	119.1	
5		NATURAL SOILS Fine grained Sandy SILT with occasional gravel Brown, stiff, moist Slightly silty (medium to coarse grained) SAND with cobbles Brown, dense, damp					
10		Refusal at depth of 10' (possible bedrock)	☒		6.0		
15							
20							
25							
30							
35							

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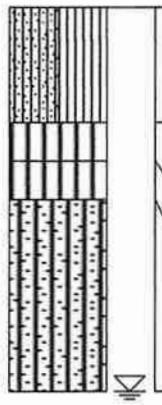
Proficiency Capital, LLC 21206-19	Log of Trench T-20

Boring Location: Temescal Cnyn & Park Cnyn, Corona	
Date of Drilling: 6/12/19	Groundwater Depth: 10' (seeping)
Drilling Method: Backhoe	
Hammer Weight:	Drop:
Surface Elevation: Not Measured	



Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND to Clayey sandy SILT with gravel and small concrete pieces Brown, medium stiff, damp					
		FILL SOILS Clayey SILT with occasional gravel Brown, stiff, moist	■		23.2	100.0	
5		Sandy SILT with Silty SAND Brown, medium stiff/dense, damp	■		15.7	110.3	
		Fine grained Silty SAND Brown, medium dense, moist Wet @ 6'					
10		Trench completed at depth of 10'					
15							
20							
25							
30							
35							

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Proficiency Capital, LLC 21206-19	Log of Trench T-21

Boring Location: Temescal Cnyn & Park Cnyn, Corona	
Date of Drilling: 6/11/19	Groundwater Depth: 10' (seeping)
Drilling Method: Backhoe	
Hammer Weight:	Drop:
Surface Elevation: Not Measured	

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel and rock Brown, medium dense, dry					
		NATURAL SOILS Silty SAND with gravel and cobbles Brown, very dense, damp					
5							
10		Refusal at depth of 10' due to boulders (possible bedrock)					
15							
20							
25							
30							
35							

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Proficiency Capital, LLC
21206-19

Log of Trench T-22

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/12/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel, some cobbles Brown, medium dense, dry to damp					
5		NATURAL SOILS Slightly silty (medium to coarse grained) SAND with small cobbles Brown, medium dense, damp					
10		Refusal at depth of 10' due to boulders (possible bedrock)					
15							
20							
25							
30							
35							

GWT not encountered

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21206-19

Log of Trench T-23

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/12/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel, occasional some cobbles and roots Brown, medium dense, dry to damp					
5		NATURAL SOILS Slightly silty (medium to coarse grained) SAND with occasional small cobbles Brown, medium dense, damp					
10		Silty SAND with gravel and occasional small cobbles Brown, dense, moist	■		7.6	122.7	
		Trench completed at depth of 10'					
15							
20							
25							
30							
35							

GWT not encountered

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21206-19

Log of Trench T-24

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/12/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty clayey SAND with gravel and occasional cobbles Brown, medium dense to dense, damp					
5		FILL SOILS Silty SAND with gravel, metal pieces and wood chips Dark brown, medium dense, moist	☑		10.3		
		NATURAL SOILS Silty SAND with occasional gravel and small cobbles Brown, medium dense, moist	■		10.2	99.0	
10		Trench completed at depth of 10'					
15							
20							
25							
30							
35							

GWT not encountered

Date: 7/16/2019 File: C:\Superlog4\PROJECT\21206-19.log SuperLog CivilTech Software, USA www.civiltech.com

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21206-19

Log of Trench T-25

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/12/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SANd with gravel and small cobbles Brown, dense, dry to damp Wood pieces @ 24"					
5		GWT not encountered					
		NATURAL SOILS Silty SAND with gravel and small cobbles Brown, medium dense, damp Trench completed at depth of 7'					
10							
15							
20							
25							
30							
35							

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Log of Trench T-26

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/12/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel, small cobbles and wood pieces Brown, medium dense, dry to damp					
5		GWT not encountered	☑		3.8		
		NATURAL SOILS Silty SAND with gravel and occasional cobbles Brown, medium dense, damp	■		4.0	94.9	
10							
		Slightly silty (medium to coarse grained SAND with gravel Light brown, medium dense, damp Occasional small cobbles below 15'					
15			☑		2.0		
20		Trench completed at depth of 20.5'	☑		2.1		
25							
30							
35							

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Log of Trench T-27

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/12/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel and occasional small cobbles Brown, medium dense, dry to damp					
5		GWT not encountered NATURAL SOILS Silty SAND with occasional gravel Brown, medium dense, damp	■		5.8	105.1	
		Trench completed at depth of 6'					
10							
15							
20							
25							
30							
35							

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Log of Trench T-28

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/12/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel and rock Brown, medium dense, dry to damp	☑		1.5		
5		NATURAL SOILS Slightly silty (medium to coarse grained) SAND with occasional cobbles Brown, medium dense, dry					
10		Sandy SILT with gravel, occasional cobbles Brown, medium stiff, damp	■		6.6	108.0	
15		Trench completed at depth of 12'					
20							
25							
30							
35							

GWT not encountered

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21206-19

Log of Trench T-29

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/11/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel and small cobbles Brown, medium dense, dry to damp					
5		GWT not encountered NATURAL SOILS Sandy SILT with gravel and small cobbles Brown, medium stiff, damp	☑		4.8		
10		Trench completed at depth of 6'					
15							
20							
25							
30							
35							

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Log of Trench T-30

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/12/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel and small cobbles Brown, medium dense, dry					
		GWT not encountered					
		NATURAL SOILS Slightly silty SAND with gravel and cobbles Light brown to brown, medium dense, damp					
5		Trench completed at depth of 5'					
10							
15							
20							
25							
30							
35							

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Log of Trench T-31

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/12/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel and rock Brown, medium dense, dry					
		NATURAL SOILS Silty SAND with gravel ans some small cobbles Brown, medium dense, damp					
5		Slightly silty (medium to coarse grained) SAND with gravel and occasional small cobbles Light brown to brown, medium dense, damp					
10		Trench completed at depth of 10'					
15							
20							
25							
30							
35							

GWT not encountered

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Log of Trench T-32

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/12/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel Brown, medium dense, dry					
5		NATURAL SOILS Slightly silty (medium to coarse grained) SAND with gravel and small cobbles Light brown to brown, medium dense, damp					
10		Silty SAND with occasional gravel and small cobbles Brown, medium dense, damp Trench completed at depth of 10'					
15							
20							
25							
30							
35							

GWT not encountered

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Log of Trench T-33

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/11/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Slightly silty SAND with gravel, small cobbles Brown, medium dense, dry to damp					
5		NATURAL SOILS Slightly silty (medium to coarse grained) SAND with gravel and occasional small cobbles Light brown, medium dense, damp Sandy SILT with occasional gravel Brown, medium stiff, damp to moist					
10		Trench completed at depth of 10'	☒		15.2		
15							
20							
25							
30							
35							

GWT not encountered

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Log of Trench T-34

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/12/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with gravel and rock Brown, medium dense, damp	■		1.4	109.3	
5		NATURAL SOILS Slightly silty (medium to coarse grained) SAND with gravel and occasional cobbles Light brown to brown, medium dense, dry	■		1.5	106.7	
10		Silty SAND with occasional gravel Brown, dense, moist	■		12.2	114.8	
		Trench completed at depth of 10.5'					
15							
20							
25							
30							
35							

GWT not encountered

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Log of Trench T-35

Boring Location: Temescal Cnyn & Park Cnyn, Corona

Date of Drilling: 6/12/19 | **Groundwater Depth:** None Encountered

Drilling Method: Backhoe

Hammer Weight: | **Drop:**

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Slightly silty SAND with gravel and small cobbles Brown, dense, moist					
		NATURAL SOILS Silty SAND with gravel and small cobbles Brown, dense, moist	☑		2.6		
5		Slightly silty (medium to coarse grained) SAND with gravel and occasional small cobbles Light brown to brown, medium dense, damp					
		Sandy SILT (fine grained) with occasional gravel Brown, medium stiff, moist	■		9.2	85.9	
10							
		Slightly silty (fine to coarse grained) SAND with gravel, occasional cobbles Brown, medium dense, damp	■		3.1	107.0	
15		Trench completed at depth of 15'					
20							
25							
30							
35							

GWT not encountered

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APPENDIX C

TABLE I
MAXIMUM DENSITY TESTS
(ASTM: D-1557-12)

Sample	Classification	Optimum Moisture	Maximum Dry Density (lbs./cu.ft.)
T-2 @ 1-2'	slightly silty SAND	12.0	129.0
T-9 @ 2-4'	sandy SILT	12.0	121.0
T-17 @ 1-2'	sandy CLAY	11.0	129.0

TABLE II
EXPANSION INDEX TESTS
(ASTM: D-4829-11)

Sample	Classification	Expansion Index
T-9 @ 2-4'	sandy SILT	14
T-17 @ 1-2'	sandy CLAY	22

TABLE III
ATTERBERG LIMITS
(ASTM: D-4318-10)

Sample	Liquid Limit	Plastic Limit	Plasticity Index
T-17 @ 1-2'	14	8	6

TABLE IV
SOLUBLE SULFATE TESTS
(CT 417)

Sample	Sulfate Concentration (%)
T-7 @ 2-3'	.0087

TABLE V
pH TESTS

Sample	pH
T-7 @ 2-3'	6.1

TABLE VI
RESISTIVITY TESTS
(CT 643)

Sample	Resistivity (ohm-cm)
T-7 @ 2-3'	1485

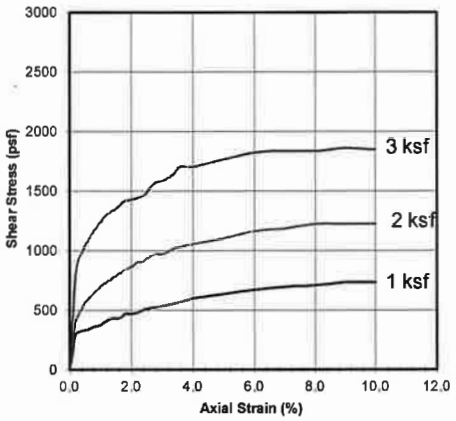
TABLE VII
CHLORIDE TESTS
(CT 422))

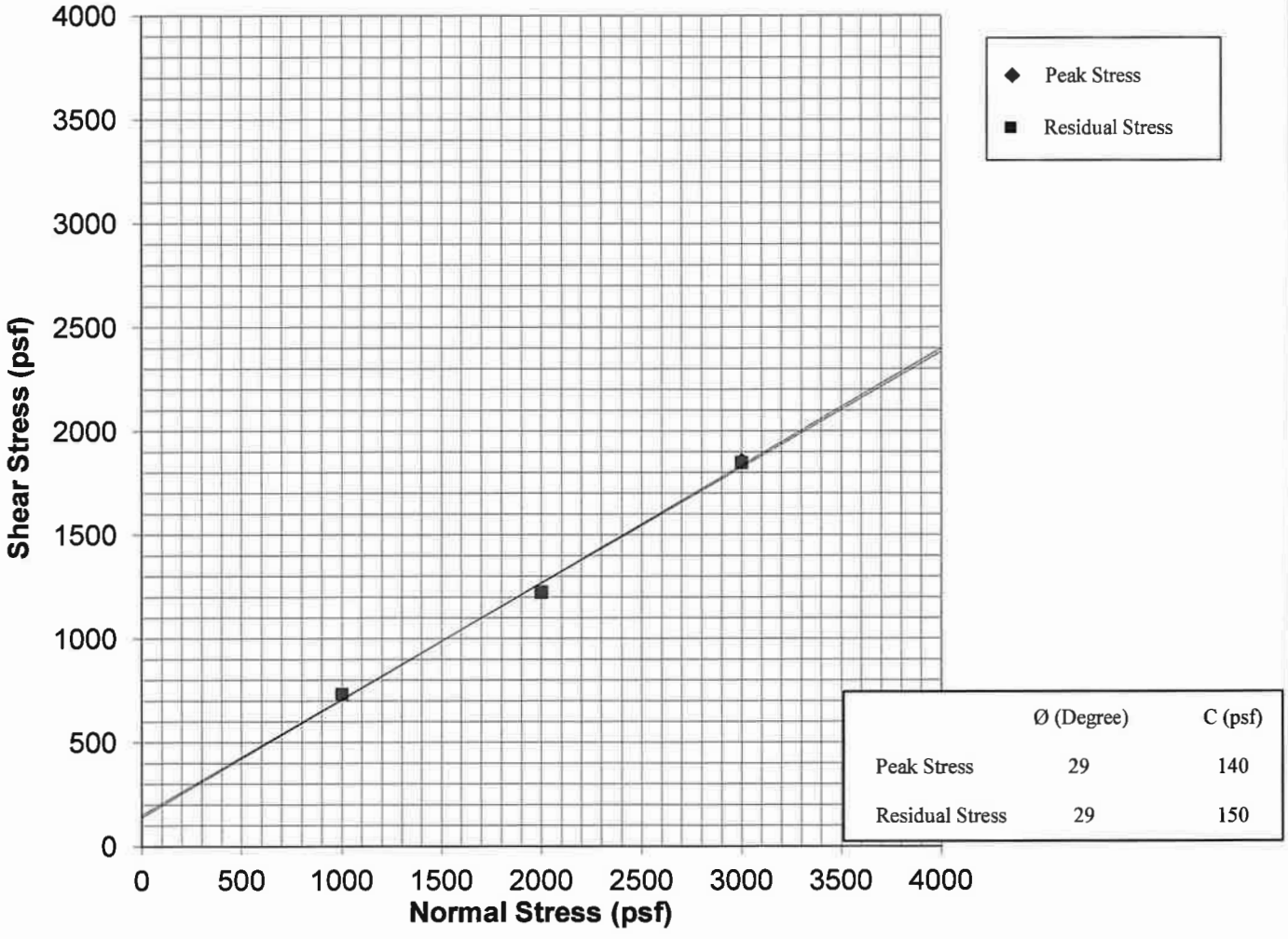
Sample	Concentration (ppm)
T-7 @ 2-3'	351

TABLE VIII
RESISTANCE 'R' VALUE TESTS
(CA 301))

Sample	'R' Value
T-19 @ 1-2'	16

Sample No.		T4@5'		
Sample Type:		Undisturbed/Saturated		
Soil Description:		Silty Sand w/ Some Small Gravel		
		1	2	3
Normal Stress	(psf)	1000	2000	3000
Peak Stress	(psf)	732	1224	1860
Displacement	(in.)	0.225	0.200	0.225
Residual Stress	(psf)	732	1224	1848
Displacement	(in.)	0.250	0.250	0.250
In Situ Dry Density	(pcf)	96.3	96.3	96.3
In Situ Water Content	(%)	5.3	5.3	5.3
Saturated Water Content	(%)	27.7	27.7	27.7
Strain Rate	(in/min)	0.020	0.020	0.020





	Ø (Degree)	C (psf)
Peak Stress	29	140
Residual Stress	29	150

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SOILS AND GEOTECHNICAL CONSULTANTS

Proficiency Capital, LLC

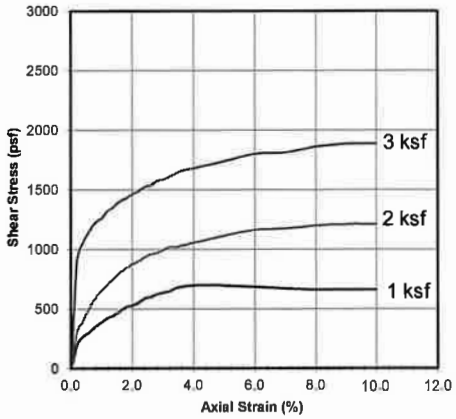
PROJECT NUMBER: 21206-19 DATE: 6/25/2019

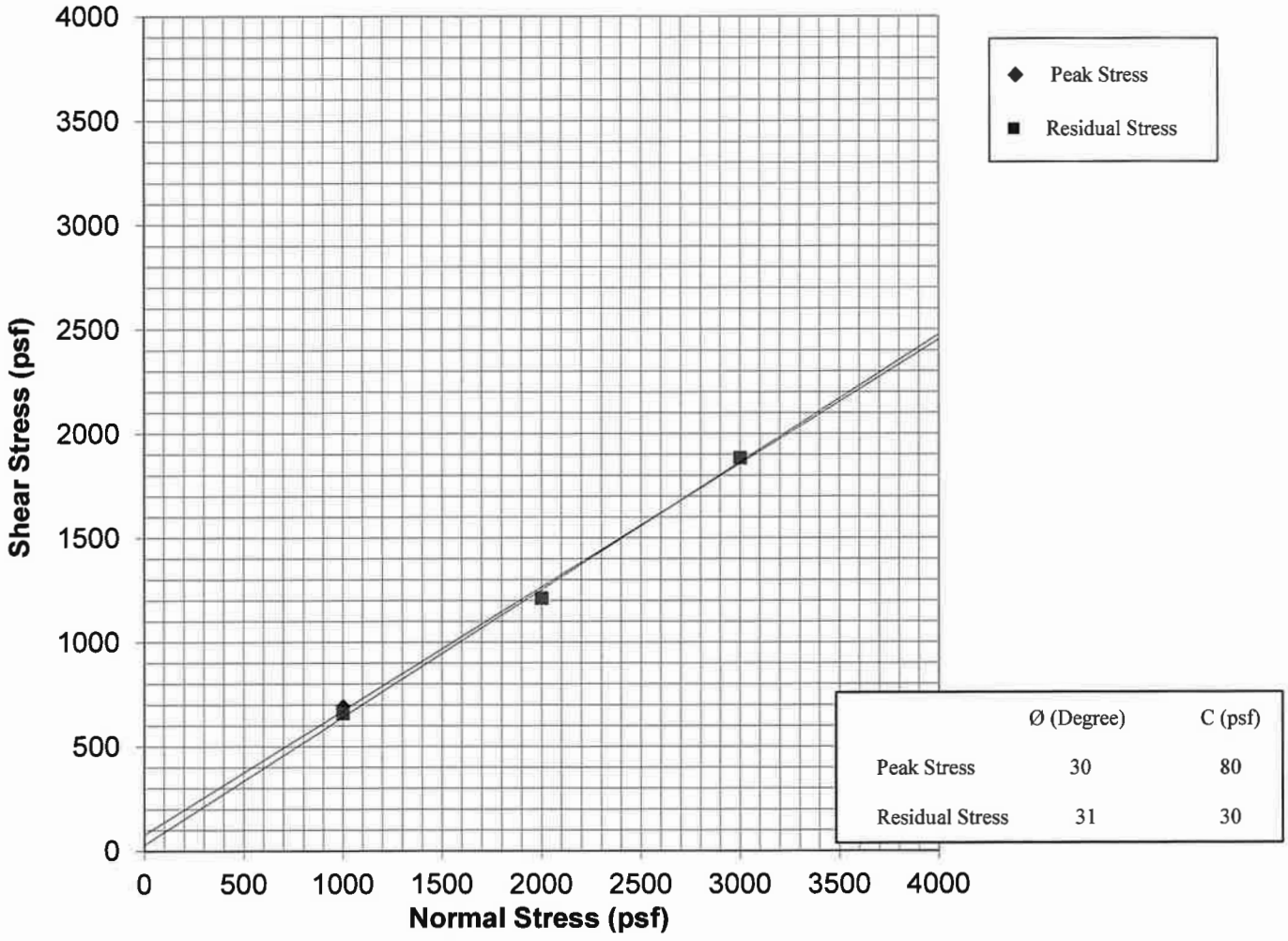
DIRECT SHEAR TEST

ASTM D3080

Plate A

Sample No.		T9@2'		
Sample Type:		Remolded/Saturated		
Soil Description:		Silty Clay w/ Some Sand		
		1	2	3
Normal Stress	(psf)	1000	2000	3000
Peak Stress	(psf)	696	1212	1884
Displacement	(in)	0.100	0.225	0.225
Residual Stress	(psf)	660	1212	1884
Displacement	(in.)	0.250	0.250	0.250
In Situ Dry Density	(pcf)	108.9	108.9	108.9
In Situ Water Content	(%)	12.0	12.0	12.0
Saturated Water Content	(%)	20.1	20.1	20.1
Strain Rate	(in/min)	0.020	0.020	0.020





	Ø (Degree)	C (psf)
Peak Stress	30	80
Residual Stress	31	30

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SOILS AND GEOTECHNICAL CONSULTANTS

Proficiency Capital, LLC

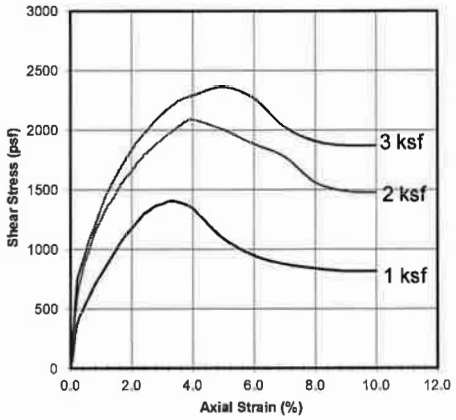
PROJECT NUMBER: 21206-19 DATE: 6/25/2019

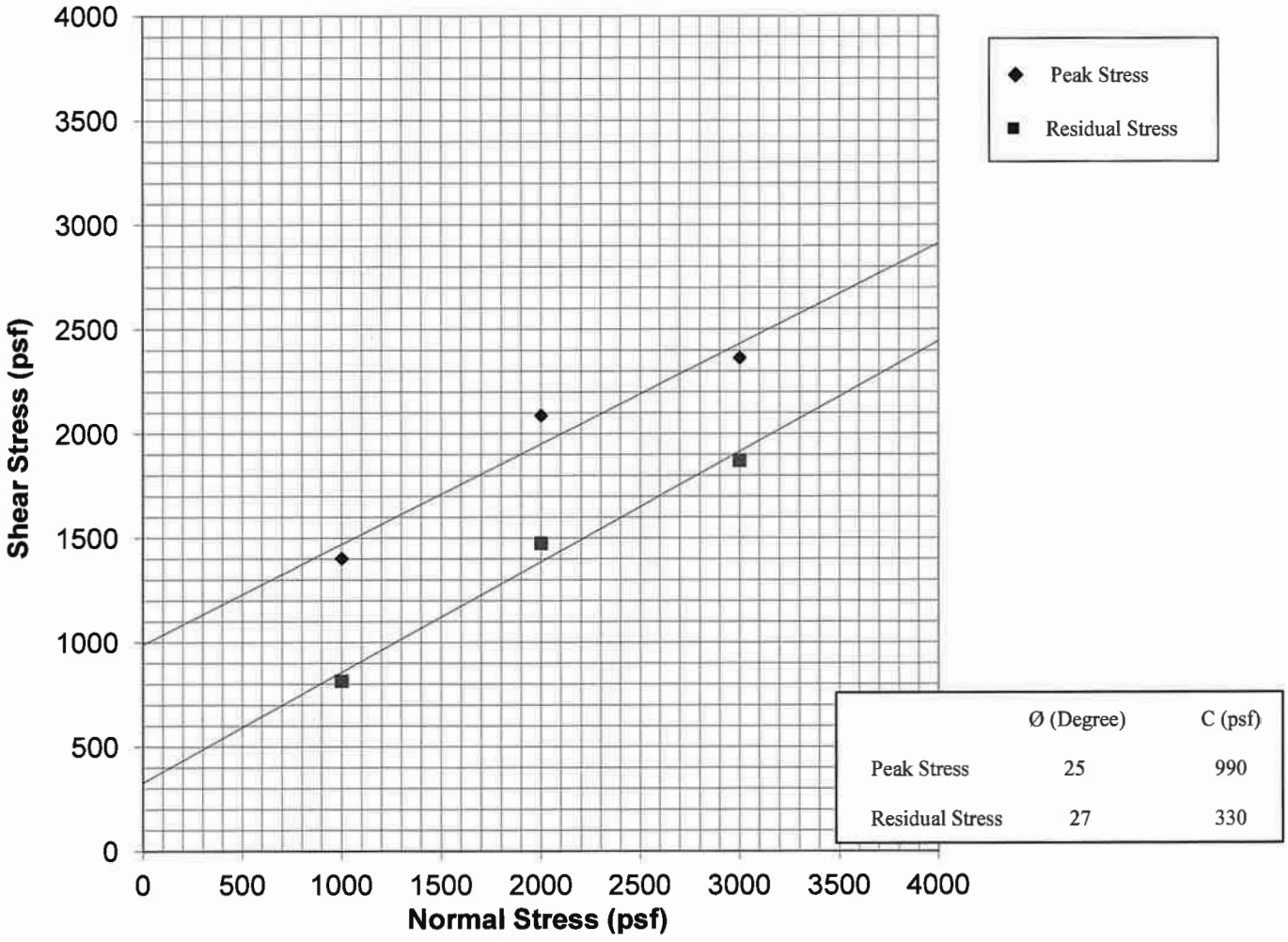
DIRECT SHEAR TEST

ASTM D3080

Plate B

Sample No.		T19@2'		
Sample Type:		Undisturbed/Saturated		
Soil Description:		Silty Clay w/ Some Fine Grained Sand		
		1	2	3
Normal Stress	(psf)	1000	2000	3000
Peak Stress	(psf)	1404	2088	2364
Displacement	(in)	0.080	0.100	0.125
Residual Stress	(psf)	816	1476	1872
Displacement	(in.)	0.250	0.250	0.250
In Situ Dry Density	(pcf)	119.1	119.1	119.1
In Situ Water Content	(%)	13.8	13.8	13.8
Saturated Water Content	(%)	15.2	15.2	15.2
Strain Rate	(in/min)	0.020	0.020	0.020





	Ø (Degree)	C (psf)
Peak Stress	25	990
Residual Stress	27	330

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SOILS AND GEOTECHNICAL CONSULTANTS

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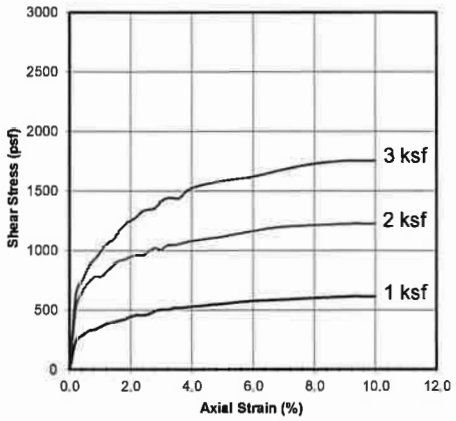
PROJECT NUMBER: 21206-19 DATE: 6/25/2019

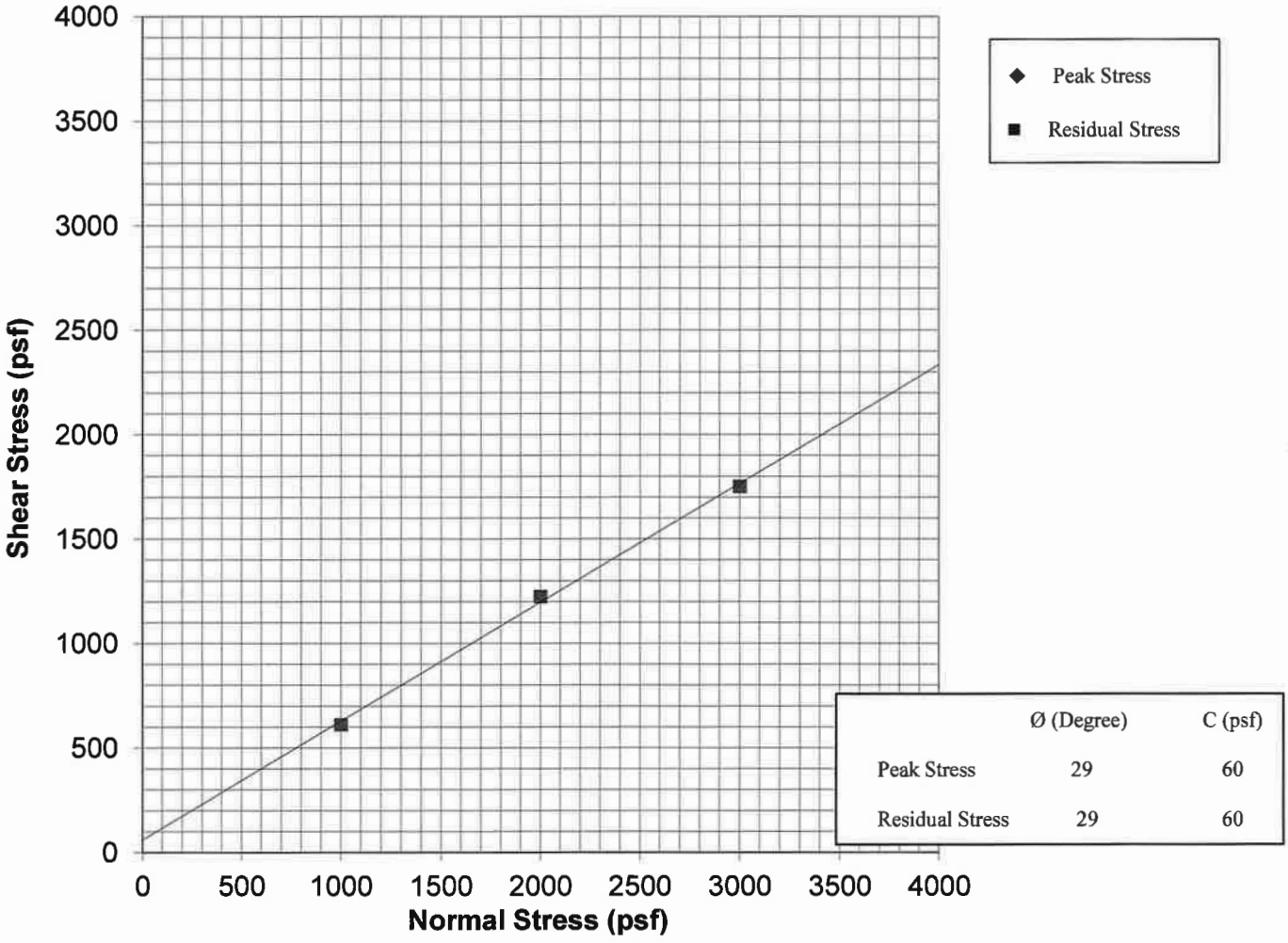
DIRECT SHEAR TEST

ASTM D3080

Plate C

Sample No.		T35@8'		
Sample Type:		Undisturbed/Saturated		
Soil Description:		Fine Grained Sand w/ Some Silt		
		1	2	3
Normal Stress	(psf)	1000	2000	3000
Peak Stress	(psf)	612	1224	1752
Displacement	(in)	0.225	0.225	0.225
Residual Stress	(psf)	612	1224	1752
Displacement	(in.)	0.250	0.250	0.250
In Situ Dry Density	(pcf)	85.9	85.9	85.9
In Situ Water Content	(%)	9.2	9.2	9.2
Saturated Water Content	(%)	35.5	35.5	35.5
Strain Rate	(in/min)	0.020	0.020	0.020





	Ø (Degree)	C (psf)
Peak Stress	29	60
Residual Stress	29	60

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SOILS AND GEOTECHNICAL CONSULTANTS

Proficiency Capital, LLC

PROJECT NUMBER: 21206-19 DATE: 6/25/2019

DIRECT SHEAR TEST

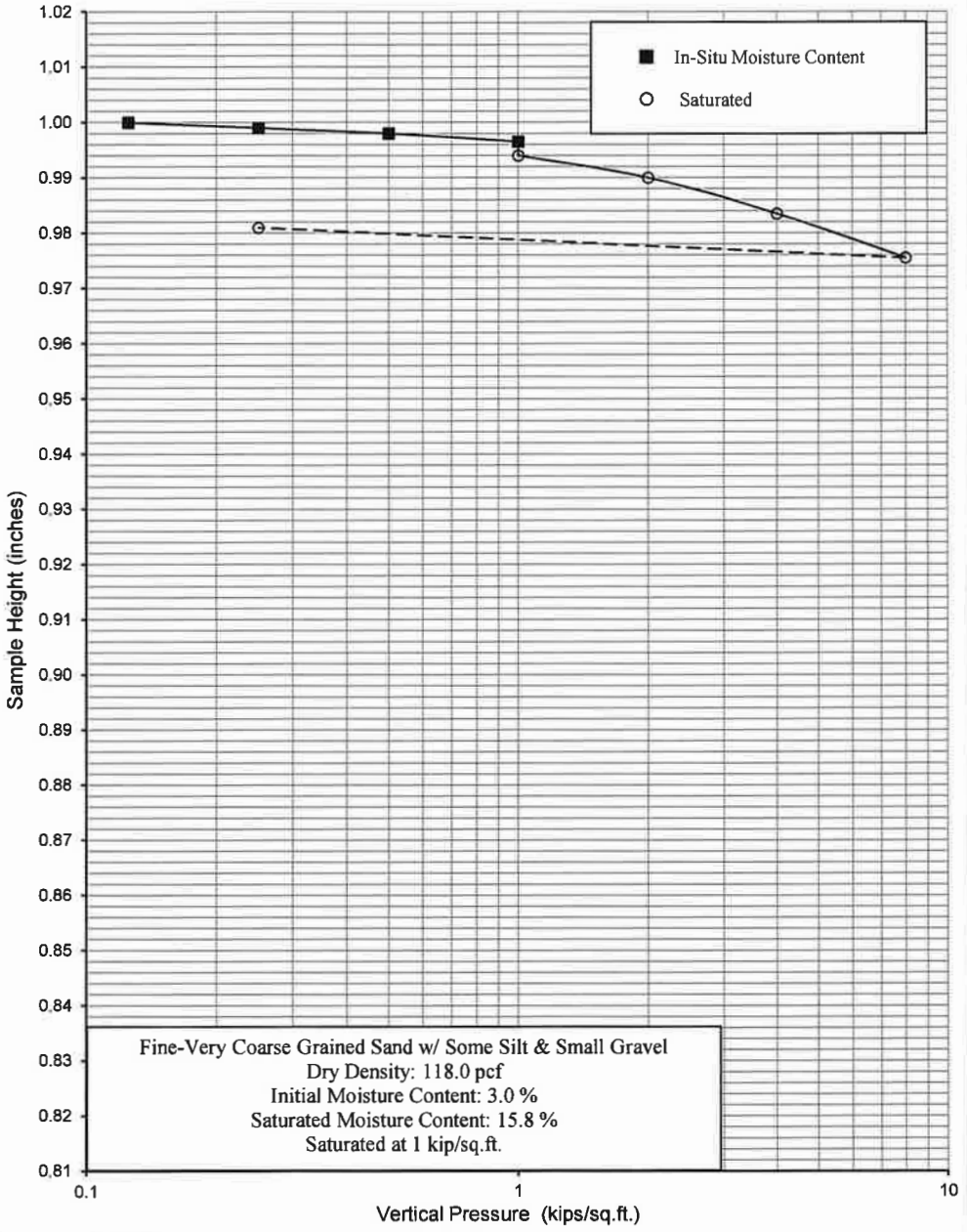
ASTM D3080

Plate D

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)	
0.125	1.0000	0.0	
0.25	0.9990	0.1	
0.5	0.9980	0.2	
1	0.9965	0.4	
1	0.9940	0.6	
2	0.9900	1.0	
4	0.9835	1.7	
8	0.9755	2.5	Saturated
0.25	0.9810	1.9	

Sample No.	T2	Depth	15'	Date	6/25/2019

Date Tested: 6/20/2019
Sample: T2
Depth: 15'



NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Proficiency Capital, LLC

PROJECT NUMBER: 21206-19 DATE: 6/25/2019

CONSOLIDATION TEST

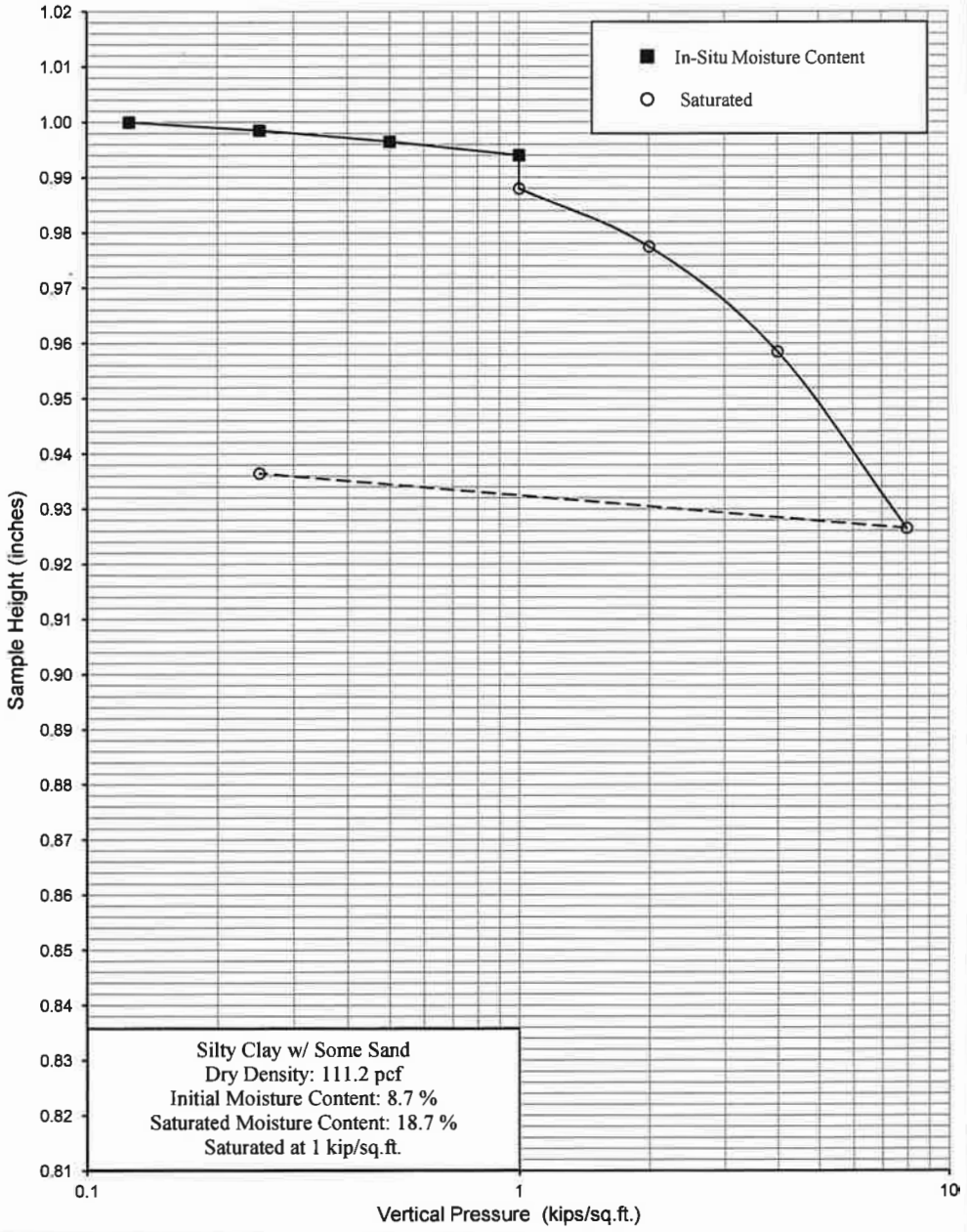
ASTM D2435

Plate E

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)	
0.125	1.0000	0.0	
0.25	0.9985	0.2	
0.5	0.9965	0.4	
1	0.9940	0.6	
1	0.9880	1.2	
2	0.9775	2.3	
4	0.9585	4.2	
8	0.9265	7.4	Saturated
0.25	0.9365	6.4	

Sample No.	T10	Depth	4'	Date	6/25/2019

Date Tested: 6/20/2019
Sample: T10
Depth: 4'



NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Proficiency Capital, LLC

PROJECT NUMBER: 21206-19 DATE: 6/25/2019

CONSOLIDATION TEST

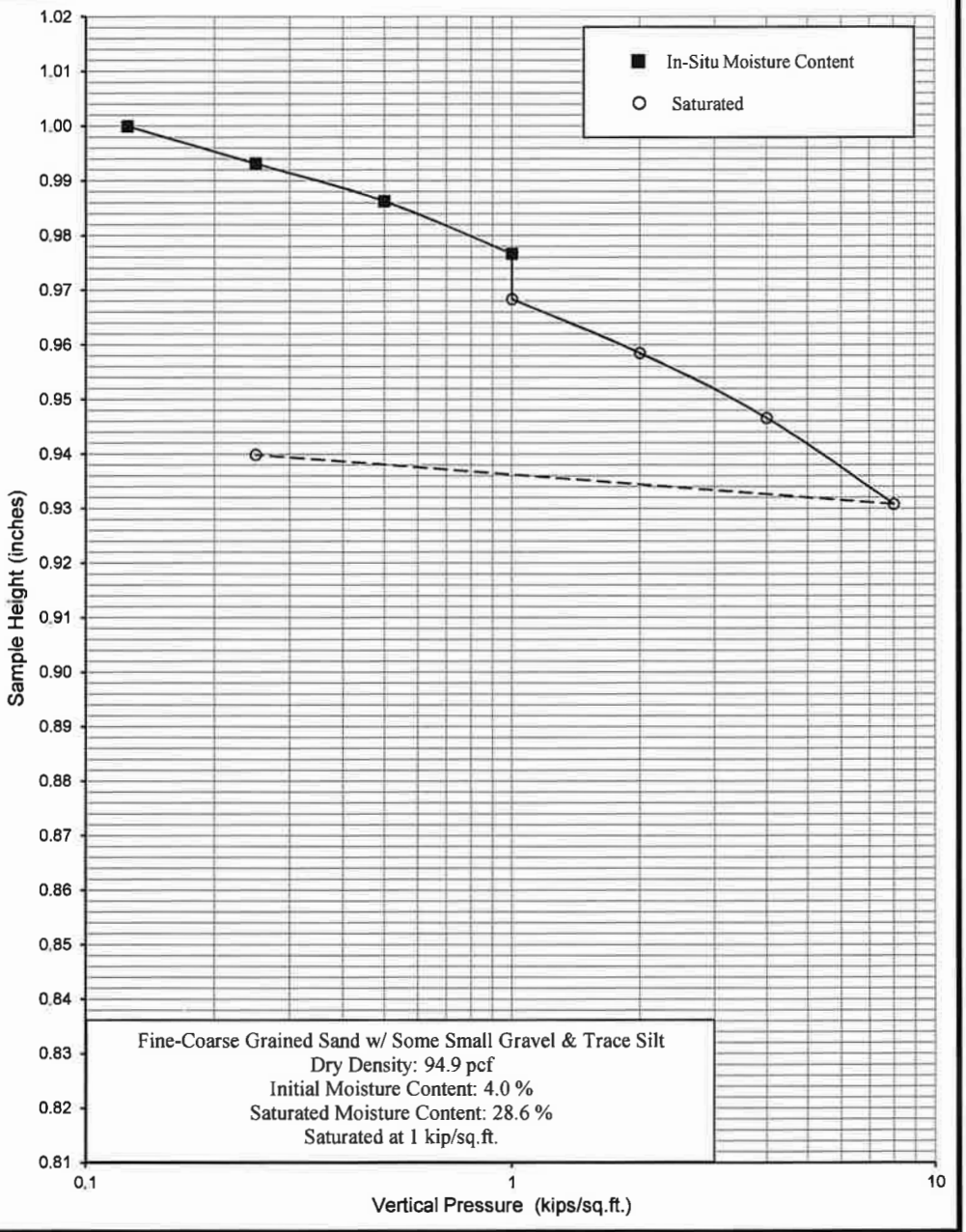
ASTM D2435

Plate F

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)	
0.125	1.0000	0.0	
0.25	0.9932	0.7	
0.5	0.9863	1.4	
1	0.9767	2.3	
1	0.9684	3.2	
2	0.9585	4.2	
4	0.9466	5.3	
8	0.9308	6.9	Saturated
0.25	0.9399	6.0	

Date Tested:	**6/20/2019**
Sample:	**T26**
Depth:	**10'**

Sample No.	T26	Depth	10'	Date	6/25/2019



NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Proficiency Capital, LLC

PROJECT NUMBER: 21206-19 DATE: 6/25/2019

CONSOLIDATION TEST

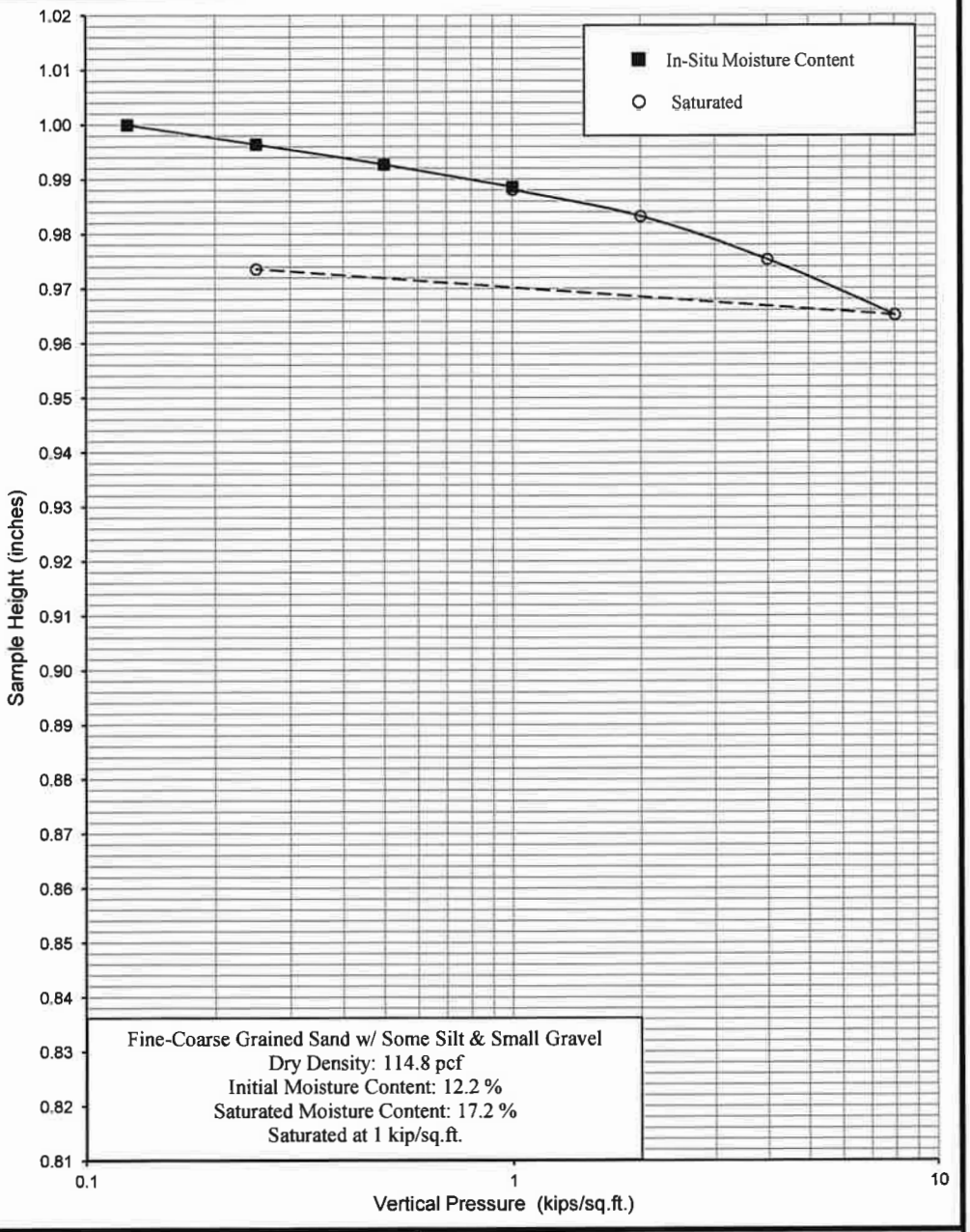
ASTM D2435

Plate G

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)	
0.125	1.0000	0.0	
0.25	0.9964	0.4	
0.5	0.9927	0.7	
1	0.9886	1.1	
1	0.9881	1.2	Saturated
2	0.9832	1.7	
4	0.9753	2.5	
8	0.9651	3.5	
0.25	0.9736	2.6	

Sample No.	T34	Depth	10'	Date	6/25/2019

Date Tested: 6/24/2019
Sample: T34
Depth: 10'



NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Proficiency Capital, LLC

PROJECT NUMBER: 21206-19 DATE: 6/25/2019

CONSOLIDATION TEST

ASTM D2435

Plate H

APPENDIX D

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

Project: Proficiency Capital, LLC
Project No.: 21206-19
Date: 6/11/19
Test No. T-3
Depth: 5'
Tested By: J.S. Jr.

TIME (hr/min)	CHANGE TIME (min)	CUMULATIVE TIME (min)	INNER RING READING (cm)	INNER RING CHANGE	INNER RING FLOW (cc)	OUTER RING READING (cm)	OUTER RING CHANGE	OUTER RING FLOW (cc)	INNER RING INF RATE (cm/hr)	OUTER RING INF RATE (cm/hr)	INNER RING INF RATE (ft/hr)
7:14			74.7			41.0					
7:29	15	15	75.0	0.3		41.3	0.3				
7:29			75.0			41.3					
7:44	15	30	75.0	0.0		41.3	0.0				
7:44			75.0			41.3					
7:59	15	45	75.2	0.2		41.4	0.1				
7:59			75.2			41.4					
8:14	15	60	75.2	0.0		41.5	0.1				
8:14			75.5			41.5					
8:29	15	75	75.5	0.3		41.8	0.3				
8:29			75.5			41.8					
8:44	15	90	75.5	0.0		41.8	0.0				
8:44			75.5			41.8					
8:59	15	105	75.7	0.2		42.0	0.2		0.8	0.8	
8:59			75.7			42.0					
9:14	15	120	75.7	0.0		42.0	0.0		0.0	0.0	
9:14			75.7			42.0					
9:29	15	135	75.9	0.2		42.1	0.1		0.8	0.4	
9:29			75.9			42.1					
9:44	15	150	76.0	0.1		42.1	0.0		0.4	0.0	
9:44			76.0			42.1					
9:59	15	165	76.0	0.0		42.1	0.0		0.0	0.0	
9:59			76.0			42.1					
10:14	15	180	76.2	0.2		42.2	0.1		0.8	0.4	

Average = 0.47 / 0.27 cm/hr

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

Project: Proficiency Capital, LLC
Project No.: 21206-19
Date: 6/11/19
Test No. T-12
Depth: 7'
Tested By: J.S. Jr.

TIME (hr/min)	CHANGE TIME (min)	CUMULATIVE TIME (min)	INNER RING READING (cm)	INNER RING CHANGE	INNER RING FLOW (cc)	OUTER RING READING (cm)	OUTER RING CHANGE	OUTER RING FLOW (cc)	INNER RING INF RATE (cm/hr)	OUTER RING INF RATE (cm/hr)	INNER RING INF RATE (ft/hr)
7:30			102.8			42.7					
7:31	1	1	106.5	3.7		45.8	3.1				
7:31			106.5			45.8					
7:32	1	2	109.3	2.8		48.6	2.8				
7:32			102.7			42.4					
7:33	1	3	106.2	3.5		46.0	3.6				
7:33			104.0			43.5					
7:35	2	5	110.1	6.1		49.3	5.8				
7:35			101.8			41.3					
7:37	2	7	107.9	6.1		47.5	6.0				
7:37			102.1			42.2					
7:39	2	9	108.2	6.1		48.1	5.9				
7:39			105.0			45.5					
7:41	2	11	111.0	6.0		51.2	5.7		180	171	
7:41			103.2			43.6					
7:43	2	13	107.4	6.2		49.8	6.2		186	186	
7:43			100.5			40.4					
7:45	2	15	106.4	5.9		46.0	5.6		177	168	
7:45			99.8			40.2					
7:47	2	17	105.9	6.1		46.0	5.8		183	174	
7:47			100.2			40.1					
7:49	2	19	106.4	6.2		45.9	5.8		186	174	
7:49			101.9			41.3					
7:51	2	21	107.8	5.9		46.8	5.5		177	165	

Average = 181.5 / 173 cm/hr

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

Project: Proficiency Capital, LLC
Project No.: 21206-19
Date: 6/11/19
Test No. T-15
Depth: 5'
Tested By: J.S. Jr.

TIME (hr/min)	CHANGE TIME (min)	CUMULATIVE TIME (min)	INNER RING READING (cm)	INNER RING CHANGE	INNER RING FLOW (cc)	OUTER RING READING (cm)	OUTER RING CHANGE	OUTER RING FLOW (cc)	INNER RING INF RATE (cm/hr)	OUTER RING INF RATE (cm/hr)	INNER RING INF RATE (ft/hr)
12:00			97.9			38.2					
12:05	5	5	103.0	5.1		43.4	5.2				
12:05			103.0			43.4					
12:10	5	10	106.7	3.7		47.9	4.5				
12:10			99.6			38.3					
12:15	5	15	102.6	3.0		42.5	4.2				
12:15			102.6			42.5					
12:20	5	20	106.1	3.5		47.2	4.7				
12:20			98.4			31.8					
12:25	5	25	101.6	3.2		41.9	4.1				
12:25			101.6			41.9					
12:30	5	30	105.0	3.4		46.1	4.2				
12:30			99.7			40.6					
12:35	5	35	103.3	3.6		45.1	4.5		43.2	54.0	
12:35			103.3			45.1					
12:40	5	40	107.0	3.7		49.3	4.2		44.4	50.4	
12:40			98.4			39.6					
12:45	5	45	101.9	3.5		43.6	4.0		42.0	48.0	
12:45			101.9			43.6					
12:50	5	50	105.7	3.8		47.7	4.1		45.6	49.2	
12:50			98.4			41.2					
12:55	5	55	102.2	3.8		45.4	4.2		45.6	50.4	
12:55			102.2			45.4					
1:00	5	60	105.9	3.7		49.6	4.2		44.4	50.4	

Average = 44.2 / 50.4 cm/hr

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

Project: Proficiency Capital, LLC
Project No.: 21206-19
Date: 6/11/19
Test No. T-29
Depth: 6'
Tested By: J.S. Jr.

TIME (hr/min)	CHANGE TIME (min)	CUMULATIVE TIME (min)	INNER RING READING (cm)	INNER RING CHANGE	INNER RING FLOW (cc)	OUTER RING READING (cm)	OUTER RING CHANGE	OUTER RING FLOW (cc)	INNER RING INF RATE (cm/hr)	OUTER RING INF RATE (cm/hr)	INNER RING INF RATE (ft/hr)
8:50			98.0			42.3					
9:05	15	15	104.4	6.4		47.1	4.8				
9:05			98.6			41.3					
9:20	15	30	101.8	3.2		44.3	3.0				
9:20			101.8			44.3					
9:35	15	45	104.2	2.4		46.7	2.4				
9:35			104.2			46.7					
9:50	15	60	106.1	1.9		48.8	2.1				
9:50			100.1			42.8					
10:05	15	75	102.3	2.2		45.1	2.3				
10:05			102.3			45.1					
10:20	15	90	104.6	2.3		47.3	2.2				
10:20			104.6			47.3					
10:35	15	105	106.7	2.1		49.3	2.0		8.4	8.0	
10:35			106.7			49.3					
10:50	15	120	106.7	2.0		51.3	2.0		8.0	8.0	
10:50			100.1			43.1					
11:05	15	135	102.4	2.3		45.5	2.4		9.2	9.6	
11:05			102.4			45.5					
11:20	15	150	104.3	1.9		47.6	2.1		7.6	8.4	
11:20			104.3			47.6					
11:35	15	165	106.3	2.0		49.7	2.1		8.0	8.4	
11:35			99.8			42.2					
11:50	15	180	101.6	1.8		44.2	2.0		7.2	8.0	

Average = 8.1 / 8.4 cm/hr

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

Project: Proficiency Capital, LLC
Project No.: 21206-19
Date: 6/11/19
Test No. T-33
Depth: 10'
Tested By: J.S. Jr.

TIME (hr/min)	CHANGE TIME (min)	CUMULATIVE TIME (min)	INNER RING READING (cm)	INNER RING CHANGE	INNER RING FLOW (cc)	OUTER RING READING (cm)	OUTER RING CHANGE	OUTER RING FLOW (cc)	INNER RING INF RATE (cm/hr)	OUTER RING INF RATE (cm/hr)	INNER RING INF RATE (ft/hr)
10:39			69.0			37.0					
10:54	15	15	72.3	3.3		40.9	3.9				
10:54			72.3			40.9					
11:09	15	30	74.8	2.5		43.0	2.1				
11:09			74.8			43.0					
11:24	15	45	76.7	1.9		45.0	2.0				
11:24			76.7			45.0					
11:39	15	60	78.3	1.6		47.1	2.1				
11:39			78.3			47.1					
11:54	15	75	79.8	1.5		48.9	1.8				
11:54			67.5			37.6					
12:09	15	90	69.3	1.8		39.7	2.1				
12:09			69.3			39.7					
12:24	15	105	70.9	1.6		41.8	2.1		6.4	8.4	
12:24			70.9			41.8					
12:39	15	120	72.5	1.6		43.8	2.0		6.4	8.0	
12:39			72.5			43.8					
12:54	15	135	74.0	1.5		45.6	1.8		6.0	7.2	
12:54			74.0			45.7					
1:09	15	150	75.5	1.5		47.4	1.8		6.0	7.2	
1:09			75.5			47.4					
1:24	15	165	76.9	1.4		49.1	1.7		5.6	6.8	
1:24			76.9			49.1					
1:39	15	180	78.2	1.3		50.9	1.8		5.2	7.2	

Average = 5.9 / 7.5 cm/hr

Appendix 4: Historical Site Conditions

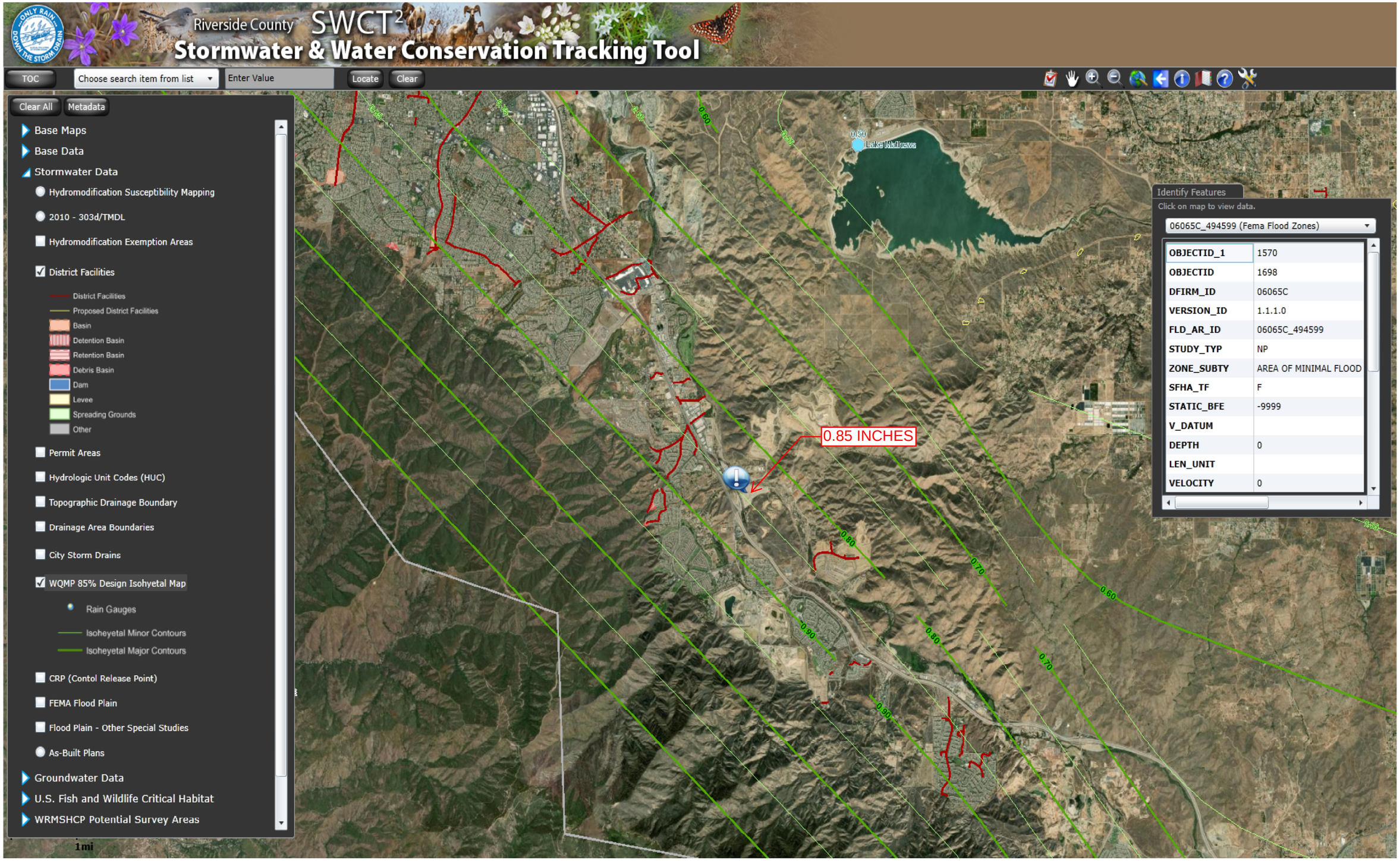
Phase I Environmental Site Assessment or Other Information on Past Site Use (NOT APPLICABLE)

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis (NOT APPLICABLE)

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation


Riverside County SWCT²
Stormwater & Water Conservation Tracking Tool
TOC
Choose search item from list
Enter Value
Locate
Clear
Clear All
Metadata
Base Maps
Base Data
Stormwater Data
Hydromodification Susceptibility Mapping
2010 - 303d/TMDL
Hydromodification Exemption Areas
District Facilities
District Facilities
Proposed District Facilities
Basin
Detention Basin
Retention Basin
Debris Basin
Dam
Levee
Spreading Grounds
Other
Permit Areas
Hydrologic Unit Codes (HUC)
Topographic Drainage Boundary
Drainage Area Boundaries
City Storm Drains
WQMP 85% Design Isohyetal Map
Rain Gauges
Isoheyetal Minor Contours
Isoheyetal Major Contours
CRP (Contol Release Point)
FEMA Flood Plain
Flood Plain - Other Special Studies
As-Built Plans
Groundwater Data
U.S. Fish and Wildlife Critical Habitat
WRMSHCP Potential Survey Areas
1mi
Lake Matthews
0.85 INCHES
Identify Features
Click on map to view data.
06065C_494599 (Fema Flood Zones)
OBJECTID_1 1570
OBJECTID 1698
DFIRM_ID 06065C
VERSION_ID 1.1.1.0
FLD_AR_ID 06065C_494599
STUDY_TYP NP
ZONE_SUBTY AREA OF MINIMAL FLOOD
SFHA_TF F
STATIC_BFE -9999
V_DATUM
DEPTH 0
LEN_UNIT
VELOCITY 0

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

(Note this worksheet shall ***only*** *be used in conjunction with BMP designs from the* ***LID BMP Design Handbook*** *)*

Company Name: Thienes Engineering, Inc.

Date: 1/12/2021

Designed by: Luis Prado

Case No:

Company Project Number/Name: Temescal Canyon Road (3905)

BMP Identification

BMP NAME / ID: CDS "A" (DMA A) - CDS2015-5-C

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
A-1	*156555*	*Concrete or Asphalt*	*1*	*0.89*	*139647.1*			
A-2	*43821*	*Ornamental Landscaping*	*0.1*	*0.11046*	*4840.4*			
	200376	***Total***			**144487.5**	**0.20**	***0.7***	***0.7***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Thienes Engineering, Inc.	Date	1/12/2021
Designed by	Luis Prado	Case No	
Company Project Number/Name	Temescal Canyon Road (3905)		

BMP Identification

BMP NAME / ID: CDS "B" (DMA B) - CDS2015-5-C

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
B-1	*156486*	*Concrete or Asphalt*	*1*	*0.89*	*139585.5*			
B-2	*26466*	*Ornamental Landscaping*	*0.1*	*0.11046*	*2923.4*			
	182952	***Total***			**142508.9**	**0.20**	***0.7***	***0.7***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Thienes Engineering, Inc. | Date: 1/12/2021

Designed by: Luis Prado | Case No:

Company Project Number/Name: Temescal Canyon Road (3905)

BMP Identification

BMP NAME / ID: CDS "C" (DMA C) - CDS3020-6-C

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
C-1	*403150*	*Roofs*	*1*	*0.89*	*359609.8*			
C-2	*45518*	*Ornamental Landscaping*	*0.1*	*0.110458*	*5027.8*			
	448668	***Total***			364637.6	0.20	*1.7*	*2*

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Thienes Engineering, Inc.	Date	1/12/2021
Designed by	Luis Prado	Case No	
Company Project Number/Name	Temescal Canyon Road (3905)		

BMP Identification

BMP NAME / ID: CDS "D" (DMA D) - CDS3020-6-C

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Rainfall Intensity (in/hr)	Design Flow Rate (cfs)	Proposed Flow Rate (cfs)
D-1	412905	Roofs	1	0.89	368311.3			
D-2	46653	Ornamental Landscaping	0.1	0.110458	5153.2			
	459558	Total			373464.5	0.20	1.7	2

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries | Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Thienes Engineering, Inc.
Date: 1/12/2021
Designed by: Luis Prado
Case No:
Company Project Number/Name: Temescal Canyon Road (3905)

BMP Identification

BMP NAME / ID: CDS "E" (DMA E) - CDS2015-5-C

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

	DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
DMAs	*E-1*	*150181*	*Concrete or Asphalt*	*1*	*0.89*	*133961.5*			
	E-2	*19703*	*Ornamental Landscaping*	*0.1*	*0.11046*	*2176.4*			
		169884	**Total**			**136137.9**	**0.20**	**0.6**	**0.7**

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Thienes Engineering, Inc.	Date	1/12/2021
Designed by	Luis Prado	Case No	
Company Project Number/Name	Temescal Canyon Road (3905)		

BMP Identification

BMP NAME / ID: CDS "G" (DMA G) - CDS1515-3-C

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
G-1	*39858.2*	*Concrete or Asphalt*	*1*	*0.89*	*35553.5*			
G-2	*21997*	*Ornamental Landscaping*	*0.1*	*0.11046*	*2429.7*			
	61855.2		***Total***		**37983.2**	**0.20**	***0.2***	***0.5***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Thienes Engineering, Inc. — Date: 1/12/2021

Designed by: Luis Prado — Case No:

Company Project Number/Name: Temescal Canyon Road (3905)

BMP Identification

BMP NAME / ID: CDS "H" (DMA H) - CDS1515-3-C

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity — I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
H-1	*74227*	*Concrete or Asphalt*	*1*	*0.89*	*66210.5*			
H-2	*12893*	*Ornamental Landscaping*	*0.1*	*0.11046*	*1424.1*			
	87120	***Total***			**67634.6**	**0.20**	**0.3**	**0.5**

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Thienes Engineering, Inc.	Date	1/12/2021
Designed by	Luis Prado	Case No	
Company Project Number/Name	Temescal Canyon Road (3905)		

BMP Identification

BMP NAME / ID: CDS "I" (DMA I) - CDS1515-3-C

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
I-1	*38280.4*	*Concrete or Asphalt*	*1*	*0.89*	*34146.1*			
I-2	*4844*	*Ornamental Landscaping*	*0.1*	*0.11046*	*535.1*			
	43124.4		***Total***		**34681.2**	**0.20**	***0.2***	***0.5***

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Thienes Engineering, Inc.

Date: 1/12/2021

Designed by: Luis Prado

Case No:

Company Project Number/Name: Temescal Canyon Road (3905)

BMP Identification

BMP NAME / ID: STC "A" / DMA A

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.85 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
A-1	*156555*	*Concrete or Asphalt*	*1*	*0.89*	*139647.1*			
A-2	*43821*	*Ornamental Landscaping*	*0.1*	*0.11*	*4840.4*			
	200376	**Total**			**144487.5**	**0.85**	**10234.5**	**10235**

Notes:

Tributary area = 4.60 acres

HCOC volume needed = 23,317 CF (Per Appendix 7)

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Subsurface Stormwater Management℠

MC-3500 Site Calculator

Project Information:

Project Name:	Temescal Canyon Road - JN3905 (DMA A)
Location:	Unincorporated Riverside County, CA
Date:	12-Jan
Engineer:	Thienes Engineering Inc.
StormTech RPM:	

System Requirements

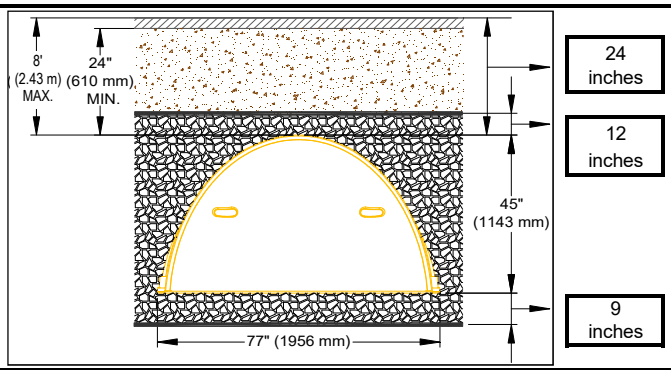
Units		Imperial	
Required Storage Volume		23317	CF
Stone Porosity (Industry Standard = 40%)		40	%
Stone Above Chambers	(12 inch min.)	12	inches
Stone Foundation Depth	(9 inch min.)	9	inches
Average Cover over Chambers	(24 inch min.)	24	inches
Bed size controlled by WIDTH or LENGTH?		WIDTH	
Limiting WIDTH or LENGTH dimension		80	feet
Storage Volume per Chamber		178.9	CF
Storage Volume per End Cap		46.9	CF

System Sizing

Number of Chambers Required	126	each
Number of End Caps Required	20	each
Bed Size (including perimeter stone)	6,936	square feet
Stone Required (including perimeter stone)	1239	tons
Volume of Excavation	1670	cubic yards
Non-woven Filter Fabric Required (20% Safety Factor)	2100	square yards
Length of Isolator Row	97.9	feet
Non-woven Isolator Row Fabric (20% Safety Factor)	170	square yards
Woven Isolator Row Fabric (20% Safety Factor)	215	square yards
Installed Storage Volume	23,479	cubic feet

Controlled by Width (Rows)

Maximum Width =		80	feet
6	rows of 13	chambers	
4	row of 12	chambers	
Maximum Length =		97.94	feet
Maximum Width =		72.92	feet



*This represents the estimated material and site work costs (US dollars) for the project. Materials excluded from this estimate are conveyance pipe, pavement design, etc. It is always advisable to seek detailed construction costs from local installers. Please contact STORMTECH at 888-892-2694 for additional cost information.

Project: **Temescal Canyon Road / DMA A**

Chamber Model -	MC-3500	
Units -	**Imperial**	Click Here for Metric
Number of Chambers -	126	
Number of End Caps -	20	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	0.00	ft
Amount of Stone Above Chambers -	12	in
Amount of Stone Below Chambers -	9	in

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☐ Include Perimeter Stone in Calculations

Height of System (inches)	Incremental Single Chamber (cubic feet)	Incremental Single End Cap (cubic feet)	Incremental Chambers (cubic feet)	Incremental End Cap (cubic feet)	Incremental Stone (cubic feet)	Incremental Ch, EC and Stone (cubic feet)	Cumulative System (cubic feet)	Elevation (feet)
66	0.00	0.00	0.00	0.00	226.94	226.94	23469.21	5.50
65	0.00	0.00	0.00	0.00	226.94	226.94	23242.28	5.42
64	0.00	0.00	0.00	0.00	226.94	226.94	23015.34	5.33
63	0.00	0.00	0.00	0.00	226.94	226.94	22788.41	5.25
62	0.00	0.00	0.00	0.00	226.94	226.94	22561.47	5.17
61	0.00	0.00	0.00	0.00	226.94	226.94	22334.54	5.08
60	0.00	0.00	0.00	0.00	226.94	226.94	22107.60	5.00
59	0.00	0.00	0.00	0.00	226.94	226.94	21880.67	4.92
58	0.00	0.00	0.00	0.00	226.94	226.94	21653.73	4.83
57	0.00	0.00	0.00	0.00	226.94	226.94	21426.80	4.75
56	0.00	0.00	0.00	0.00	226.94	226.94	21199.86	4.67
55	0.00	0.00	0.00	0.00	226.94	226.94	20972.92	4.58
54	0.06	0.00	7.32	0.00	224.01	231.33	20745.99	4.50
53	0.19	0.02	24.46	0.48	216.96	241.90	20514.66	4.42
52	0.29	0.04	37.04	0.75	211.82	249.61	20272.77	4.33
51	0.40	0.05	50.86	1.03	206.18	258.07	20023.16	4.25
50	0.69	0.07	86.58	1.35	191.76	279.70	19765.09	4.17
49	1.03	0.09	129.57	1.76	174.40	305.73	19485.39	4.08
48	1.25	0.11	157.44	2.14	163.10	322.69	19179.66	4.00
47	1.42	0.13	179.20	2.53	154.24	335.97	18856.97	3.92
46	1.57	0.14	198.21	2.89	146.49	347.60	18521.00	3.83
45	1.71	0.16	215.10	3.26	139.59	357.95	18173.40	3.75
44	1.83	0.18	230.39	3.63	133.33	367.35	17815.45	3.67
43	1.94	0.20	244.16	4.01	127.67	375.84	17448.10	3.58
42	2.04	0.22	257.14	4.37	122.33	383.84	17072.26	3.50
41	2.13	0.23	268.97	4.70	117.47	391.14	16688.42	3.42
40	2.22	0.25	280.25	5.01	112.83	398.09	16297.29	3.33
39	2.31	0.27	290.66	5.31	108.55	404.52	15899.19	3.25
38	2.38	0.28	300.48	5.60	104.50	410.58	15494.68	3.17
37	2.46	0.29	309.85	5.88	100.65	416.37	15084.09	3.08
36	2.53	0.31	318.55	6.16	97.05	421.76	14667.72	3.00
35	2.59	0.32	326.81	6.42	93.64	426.88	14245.96	2.92
34	2.66	0.33	334.66	6.69	90.39	431.75	13819.09	2.83
33	2.72	0.35	342.10	6.94	87.32	436.36	13387.34	2.75
32	2.77	0.36	349.18	7.20	84.38	440.76	12950.98	2.67
31	2.82	0.37	355.91	7.45	81.59	444.95	12510.21	2.58
30	2.88	0.38	362.31	7.69	78.94	448.93	12065.27	2.50
29	2.92	0.40	368.44	7.92	76.39	452.75	11616.34	2.42
28	2.97	0.41	374.21	8.15	73.99	456.35	11163.58	2.33
27	3.01	0.42	379.57	8.37	71.76	459.70	10707.234	2.25
26	**3.05**	**0.43**	**384.71**	**8.59**	**69.61**	**462.92**	**10247.53**	**2.17**
25	3.09	0.44	389.88	8.81	67.46	466.15	9784.62	2.08
24	3.13	0.45	394.45	9.02	65.55	469.02	9318.47	2.00
23	3.17	0.46	398.87	9.22	63.70	471.79	8849.45	1.92
22	3.20	0.47	403.13	9.41	61.92	474.46	8377.66	1.83
21	3.23	0.48	407.12	9.60	60.25	476.97	7903.20	1.75
20	3.26	0.49	410.94	9.78	58.65	479.37	7426.23	1.67
19	3.29	0.50	414.57	9.96	57.12	481.65	6946.86	1.58
18	3.32	0.51	418.06	10.13	55.66	483.85	6465.21	1.50
17	3.34	0.51	421.36	10.29	54.28	485.93	5981.36	1.42
16	3.37	0.52	424.45	10.44	52.98	487.87	5495.43	1.33
15	3.39	0.53	427.46	10.59	51.72	489.76	5007.56	1.25
14	3.41	0.54	430.23	10.73	50.55	491.51	4517.80	1.17
13	3.44	0.54	433.06	10.86	49.36	493.29	4026.29	1.08
12	3.46	0.55	435.67	10.99	48.27	494.93	3533.00	1.00
11	3.48	0.56	438.32	11.10	47.17	496.59	3038.07	0.92
10	3.51	0.59	441.64	11.90	45.52	499.06	2541.48	0.83
9	0.00	0.00	0.00	0.00	226.94	226.94	2042.42	0.75
8	0.00	0.00	0.00	0.00	226.94	226.94	1815.48	0.67
7	0.00	0.00	0.00	0.00	226.94	226.94	1588.55	0.58
6	0.00	0.00	0.00	0.00	226.94	226.94	1361.61	0.50
5	0.00	0.00	0.00	0.00	226.94	226.94	1134.68	0.42
4	0.00	0.00	0.00	0.00	226.94	226.94	907.74	0.33
3	0.00	0.00	0.00	0.00	226.94	226.94	680.81	0.25
2	0.00	0.00	0.00	0.00	226.94	226.94	453.87	0.17
1	0.00	0.00	0.00	0.00	226.94	226.94	226.94	0.08

Infiltration Basin - Design Procedure (Rev. 03-2012)	BMP ID: DMA A	Legend:	Required Entries / Calculated Cells
Company Name: Thienes Engineering			Date: 1/13/2021
Designed by: Luis Prado			County/City Case No.:

Design Volume

a) Tributary area (BMP subarea)	A_T =	4.6	acres
b) Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	10,235	ft^3

Maximum Depth

a) Infiltration rate	I =	5.8	in/hr
b) Factor of Safety (See Table 1, Appendix A: "Infiltration Testing" from this BMP Handbook)	FS =	3	
c) Calculate D_1 $D_1 = \frac{I\ (in/hr) \times 72\ hrs}{12\ (in/ft) \times FS}$	D_1 =	11.6	ft
d) Enter the depth of freeboard (at least 1 ft)		1	ft
e) Enter depth to historic high ground water (measured from **top** of basin)		50	ft
f) Enter depth to top of bedrock or impermeable layer (measured from **top** of basin)		50	ft
g) D_2 is the smaller of: Depth to groundwater - (10 ft + freeboard) and Depth to impermeable layer - (5 ft + freeboard)	D_2 =	39.0	ft
h) D_{MAX} is the smaller value of D_1 and D_2 but shall not exceed 5 feet	D_{MAX} =	11.6	ft

Basin Geometry

a) Basin side slopes (no steeper than 4:1)	z =	n/a	:1
b) Proposed basin depth (excluding freeboard)	d_B =	1.72	ft
c) Minimum bottom surface area of basin ($A_S = V_{BMP}/d_B$)	A_S =	5951	ft^2
d) Proposed Design Surface Area	A_D =	6936.0	ft^2

Forebay

a) Forebay volume (minimum 0.5% V_{BMP})	Volume =	51	ft^3
b) Forebay depth (height of berm/splashwall. 1 foot min.)	Depth =	n/a	ft
c) Forebay surface area (minimum)	Area =	#######	ft^2
d) Full height notch-type weir	Width (W) =	n/a	in

Notes: Effective ponding depth to achieve Vbmp = 20.6 inches = (9" x 0.4) + 17" chamber ponding

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Thienes Engineering, Inc. Date: 1/12/2021
Designed by: Luis Prado Case No:
Company Project Number/Name: Temescal Canyon Road (3905)

BMP Identification

BMP NAME / ID: STC "B" / DMA B

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth,
from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.85 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
B-1	*156486*	*Concrete or Asphalt*	*1*	*0.89*	*139585.5*			
B-2	*26466*	*Ornamental Landscaping*	*0.1*	*0.11*	*2923.4*			
	182952	***Total***			**142508.9**	**0.85**	**10094.4**	**10095**

Notes:
Tributary area = 4.20 acres
HCOC volume need = 21,290 CF (Per Appendix 7)

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MC-3500 Site Calculator

Project Information:

Project Name:	Temescal Canyon Road - JN3905 (DMA B)
Location:	Unincorporated Riverside County, CA
Date:	12-Jan
Engineer:	Thienes Engineering Inc.
StormTech RPM:	

System Requirements

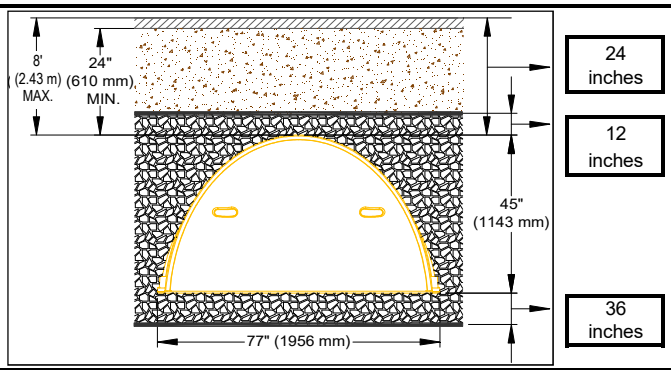
Units		Imperial	
Required Storage Volume		21290	CF
Stone Porosity (Industry Standard = 40%)		40	%
Stone Above Chambers	(12 inch min.)	12	inches
Stone Foundation Depth	(9 inch min.)	36	inches
Average Cover over Chambers	(24 inch min.)	24	inches
Bed size controlled by WIDTH or LENGTH?		WIDTH	
Limiting WIDTH or LENGTH dimension		40	feet
Storage Volume per Chamber		225.1	CF
Storage Volume per End Cap		62.3	CF

System Sizing

Number of Chambers Required	92	each
Number of End Caps Required	10	each
Bed Size (including perimeter stone)	5,073	square feet
Stone Required (including perimeter stone)	1510	tons
Volume of Excavation	1644	cubic yards
Non-woven Filter Fabric Required (20% Safety Factor)	1721	square yards
Length of Isolator Row	140.9	feet
Non-woven Isolator Row Fabric (20% Safety Factor)	244	square yards
Woven Isolator Row Fabric (20% Safety Factor)	310	square yards
Installed Storage Volume	21,332	cubic feet

Controlled by Width (Rows)

Maximum Width =		40	feet
2	rows of 19	chambers	
3	row of 18	chambers	
Maximum Length =		140.94	feet
Maximum Width =		37.09	feet



*This represents the estimated material and site work costs (US dollars) for the project. Materials excluded from this estimate are conveyance pipe, pavement design, etc. It is always advisable to seek detailed construction costs from local installers. Please contact STORMTECH at 888-892-2694 for additional cost information.

Project: **Temescal Canyon Road / DMA B**

Chamber Model -	MC-3500	
Units -	**Imperial**	Click Here for Metric
Number of Chambers -	92	
Number of End Caps -	10	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	0.00	ft
Amount of Stone Above Chambers -	12	in
Amount of Stone Below Chambers -	36	in

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☐ Include Perimeter Stone in Calculations

Height of System *(inches)*	Incremental Single Chamber *(cubic feet)*	Incremental Single End Cap *(cubic feet)*	Incremental Chambers *(cubic feet)*	Incremental End Cap *(cubic feet)*	Incremental Stone *(cubic feet)*	Incremental Ch, EC and Stone *(cubic feet)*	Cumulative System (cubic feet)	Elevation (feet)
93	0.00	0.00	0.00	0.00	163.11	163.11	21328.49	7.75
92	0.00	0.00	0.00	0.00	163.11	163.11	21165.38	7.67
91	0.00	0.00	0.00	0.00	163.11	163.11	21002.26	7.58
90	0.00	0.00	0.00	0.00	163.11	163.11	20839.15	7.50
89	0.00	0.00	0.00	0.00	163.11	163.11	20676.04	7.42
88	0.00	0.00	0.00	0.00	163.11	163.11	20512.92	7.33
87	0.00	0.00	0.00	0.00	163.11	163.11	20349.81	7.25
86	0.00	0.00	0.00	0.00	163.11	163.11	20186.69	7.17
85	0.00	0.00	0.00	0.00	163.11	163.11	20023.58	7.08
84	0.00	0.00	0.00	0.00	163.11	163.11	19860.46	7.00
83	0.00	0.00	0.00	0.00	163.11	163.11	19697.35	6.92
82	0.00	0.00	0.00	0.00	163.11	163.11	19534.23	6.83
81	0.06	0.00	5.34	0.00	160.98	166.32	19371.12	6.75
80	0.19	0.02	17.86	0.24	155.88	173.97	19204.80	6.67
79	0.29	0.04	27.04	0.38	152.15	179.57	19030.82	6.58
78	0.40	0.05	37.14	0.52	148.05	185.71	18851.26	6.50
77	0.69	0.07	63.22	0.68	137.56	201.45	18665.55	6.42
76	1.03	0.09	94.60	0.88	124.92	220.41	18464.10	6.33
75	1.25	0.11	114.96	1.07	116.70	232.73	18243.69	6.25
74	1.42	0.13	130.84	1.26	110.27	242.38	18010.96	6.17
73	1.57	0.14	144.73	1.44	104.65	250.82	17768.58	6.08
72	1.71	0.16	157.06	1.63	99.64	258.33	17517.76	6.00
71	1.83	0.18	168.22	1.82	95.10	265.14	17259.44	5.92
70	1.94	0.20	178.27	2.01	91.00	271.28	16994.30	5.83
69	2.04	0.22	187.76	2.18	87.14	277.08	16723.02	5.75
68	2.13	0.23	196.39	2.35	83.62	282.36	16445.94	5.67
67	2.22	0.25	204.63	2.51	80.26	287.39	16163.58	5.58
66	2.31	0.27	212.22	2.66	77.16	292.04	15876.18	5.50
65	2.38	0.28	219.40	2.80	74.24	296.43	15584.14	5.42
64	2.46	0.29	226.24	2.94	71.44	300.62	15287.71	5.33
63	2.53	0.31	232.59	3.08	68.85	304.52	14987.09	5.25
62	2.59	0.32	238.62	3.21	66.38	308.22	14682.57	5.17
61	2.66	0.33	244.36	3.34	64.03	311.74	14374.35	5.08
60	2.72	0.35	249.79	3.47	61.81	315.07	14062.62	5.00
59	2.77	0.36	254.96	3.60	59.69	318.25	13747.55	4.92
58	2.82	0.37	259.87	3.72	57.68	321.27	13429.30	4.83
57	2.88	0.38	264.54	3.84	55.76	324.15	13108.03	4.75
56	2.92	0.40	269.02	3.96	53.92	326.90	12783.88	4.67
55	2.97	0.41	273.23	4.08	52.19	329.50	12456.98	4.58
54	3.01	0.42	277.15	4.19	50.58	331.91	12127.479	4.50
53	3.05	0.43	280.90	4.30	49.04	334.23	11795.56	4.42
52	3.09	0.44	284.67	4.40	47.48	336.56	11461.33	4.33
51	3.13	0.45	288.01	4.51	46.11	338.63	11124.77	4.25
50	3.17	0.46	291.24	4.61	44.77	340.62	10786.14	4.17
49	3.20	0.47	294.35	4.71	43.49	342.55	10445.52	4.08
48	**3.23**	**0.48**	**297.26**	**4.80**	**42.29**	**344.35**	**10102.97**	**4.00**

47	3.26	0.49	300.05	4.89	41.14	346.08	9758.62	3.92
46	3.29	0.50	302.70	4.98	40.04	347.72	9412.54	3.83
45	3.32	0.51	305.25	5.06	38.99	349.30	9064.81	3.75
44	3.34	0.51	307.66	5.14	37.99	350.80	8715.51	3.67
43	3.37	0.52	309.91	5.22	37.06	352.20	8364.71	3.58
42	3.39	0.53	312.11	5.30	36.15	353.56	8012.52	3.50
41	3.41	0.54	314.14	5.37	35.31	354.82	7658.96	3.42
40	3.44	0.54	316.21	5.43	34.46	356.10	7304.14	3.33
39	3.46	0.55	318.11	5.49	33.67	357.28	6948.04	3.25
38	3.48	0.56	320.04	5.55	32.88	358.47	6590.77	3.17
37	3.51	0.59	322.47	5.95	31.75	360.17	6232.30	3.08
36	0.00	0.00	0.00	0.00	163.11	163.11	5872.13	3.00
35	0.00	0.00	0.00	0.00	163.11	163.11	5709.02	2.92
34	0.00	0.00	0.00	0.00	163.11	163.11	5545.90	2.83
33	0.00	0.00	0.00	0.00	163.11	163.11	5382.79	2.75
32	0.00	0.00	0.00	0.00	163.11	163.11	5219.67	2.67
31	0.00	0.00	0.00	0.00	163.11	163.11	5056.56	2.58
30	0.00	0.00	0.00	0.00	163.11	163.11	4893.44	2.50
29	0.00	0.00	0.00	0.00	163.11	163.11	4730.33	2.42
28	0.00	0.00	0.00	0.00	163.11	163.11	4567.21	2.33
27	0.00	0.00	0.00	0.00	163.11	163.11	4404.10	2.25
26	0.00	0.00	0.00	0.00	163.11	163.11	4240.98	2.17
25	0.00	0.00	0.00	0.00	163.11	163.11	4077.87	2.08
24	0.00	0.00	0.00	0.00	163.11	163.11	3914.75	2.00
23	0.00	0.00	0.00	0.00	163.11	163.11	3751.64	1.92
22	0.00	0.00	0.00	0.00	163.11	163.11	3588.52	1.83
21	0.00	0.00	0.00	0.00	163.11	163.11	3425.41	1.75
20	0.00	0.00	0.00	0.00	163.11	163.11	3262.30	1.67
19	0.00	0.00	0.00	0.00	163.11	163.11	3099.18	1.58
18	0.00	0.00	0.00	0.00	163.11	163.11	2936.07	1.50
17	0.00	0.00	0.00	0.00	163.11	163.11	2772.95	1.42
16	0.00	0.00	0.00	0.00	163.11	163.11	2609.84	1.33
15	0.00	0.00	0.00	0.00	163.11	163.11	2446.72	1.25
14	0.00	0.00	0.00	0.00	163.11	163.11	2283.61	1.17
13	0.00	0.00	0.00	0.00	163.11	163.11	2120.49	1.08
12	0.00	0.00	0.00	0.00	163.11	163.11	1957.38	1.00
11	0.00	0.00	0.00	0.00	163.11	163.11	1794.26	0.92
10	0.00	0.00	0.00	0.00	163.11	163.11	1631.15	0.83
9	0.00	0.00	0.00	0.00	163.11	163.11	1468.03	0.75
8	0.00	0.00	0.00	0.00	163.11	163.11	1304.92	0.67
7	0.00	0.00	0.00	0.00	163.11	163.11	1141.80	0.58
6	0.00	0.00	0.00	0.00	163.11	163.11	978.69	0.50
5	0.00	0.00	0.00	0.00	163.11	163.11	815.57	0.42
4	0.00	0.00	0.00	0.00	163.11	163.11	652.46	0.33
3	0.00	0.00	0.00	0.00	163.11	163.11	489.34	0.25
2	0.00	0.00	0.00	0.00	163.11	163.11	326.23	0.17
1	0.00	0.00	0.00	0.00	163.11	163.11	163.11	0.08

Infiltration Basin - Design Procedure (Rev. 03-2012)	BMP ID DMA B	Legend:	Required Entries / Calculated Cells

Company Name: Thienes Engineering — Date: 1/12/2021

Designed by: — County/City Case No.:

Design Volume

a) Tributary area (BMP subarea)	A_T =	4.2	acres
b) Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	10,094	ft^3

Maximum Depth

a) Infiltration rate	I =	7	in/hr
b) Factor of Safety (See Table 1, Appendix A: "Infiltration Testing" from this BMP Handbook)	FS =	3	
c) Calculate D_1 $D_1 = \frac{I\ (in/hr) \times 72\ hrs}{12\ (in/ft) \times FS}$	D_1 =	14.0	ft
d) Enter the depth of freeboard (at least 1 ft)		1	ft
e) Enter depth to historic high ground water (measured from **top** of basin)		50	ft
f) Enter depth to top of bedrock or impermeable layer (measured from **top** of basin)		50	ft
g) D_2 is the smaller of: Depth to groundwater - (10 ft + freeboard) and Depth to impermeable layer - (5 ft + freeboard)	D_2 =	39.0	ft
h) D_{MAX} is the smaller value of D_1 and D_2 but shall not exceed 5 feet	D_{MAX} =	14.0	ft

Basin Geometry

a) Basin side slopes (no steeper than 4:1)	z =	n/a	:1
b) Proposed basin depth (excluding freeboard)	d_B =	2.2	ft
c) Minimum bottom surface area of basin ($A_S = V_{BMP}/d_B$)	A_S =	4588	ft^2
d) Proposed Design Surface Area	A_D =	5073.0	ft^2

Forebay

a) Forebay volume (minimum 0.5% V_{BMP})	Volume =	50	ft^3
b) Forebay depth (height of berm/splashwall. 1 foot min.)	Depth =	n/a	ft
c) Forebay surface area (minimum)	Area =	#######	ft^2
d) Full height notch-type weir	Width (W) =	n/a	in

Notes: Effective ponding depth to achieve Vbmp = 26.4 inches = (36" x 0.4) + 12" chamber ponding

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Thienes Engineering, Inc.	Date	1/12/2021
Designed by	Luis Prado	Case No	
Company Project Number/Name	Temescal Canyon Road (3905)		

BMP Identification

BMP NAME / ID: STC "C" / DMA C

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.85 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
C-1	*403150*	*Roofs*	*1*	*0.89*	*359609.8*			
C-2	*45518*	*Ornamental Landscaping*	*0.1*	*0.11*	*5027.8*			
	448668		*Total*		*364637.6*	*0.85*	*25828.5*	*25829*

Notes:

Tributary area = 10.30 acres

HCOC volume needed = 52,211 CF (Per Appendix 7)

StormTech
Detention • Retention • Recharge
Subsurface Stormwater Management℠

MC-3500 Site Calculator

Project Information:

Project Name:	Temescal Canyon Road - JN3905 (DMA C)
Location:	Unincorporated Riverside County, CA
Date:	12-Jan
Engineer:	Thienes Engineering Inc.
StormTech RPM:	

System Requirements

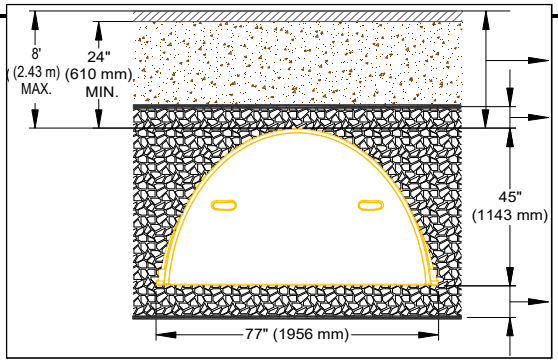
Units		Imperial	
Required Storage Volume		52211	CF
Stone Porosity (Industry Standard = 40%)		40	%
Stone Above Chambers	(12 inch min.)	12	inches
Stone Foundation Depth	(9 inch min.)	36	inches
Average Cover over Chambers	(24 inch min.)	24	inches
Bed size controlled by WIDTH or LENGTH?		WIDTH	
Limiting WIDTH or LENGTH dimension		50	feet
Storage Volume per Chamber		225.1	CF
Storage Volume per End Cap		62.3	CF

System Sizing

Number of Chambers Required	229	each
Number of End Caps Required	12	each
Bed Size (including perimeter stone)	12,323	square feet
Stone Required (including perimeter stone)	3646	tons
Volume of Excavation	3994	cubic yards
Non-woven Filter Fabric Required (20% Safety Factor)	3965	square yards
Length of Isolator Row	284.3	feet
Non-woven Isolator Row Fabric (20% Safety Factor)	493	square yards
Woven Isolator Row Fabric (20% Safety Factor)	625	square yards
Installed Storage Volume	52,296	cubic feet

Controlled by Width (Rows)

Maximum Width =			50	feet
1	row of	39	chambers	
5	row of	38	chambers	
Maximum Length =			284.28	feet
Maximum Width =			44.25	feet



*This represents the estimated material and site work costs (US dollars) for the project. Materials excluded from this estimate are conveyance pipe, pavement design, etc. It is always advisable to seek detailed construction costs from local installers. Please contact STORMTECH at 888-892-2694 for additional cost information.

Project: **Temescal Canyon Road / DMA C**

Chamber Model -	MC-3500	
Units -	**Imperial**	Click Here for Metric
Number of Chambers -	229	
Number of End Caps -	12	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	0.00	ft
Amount of Stone Above Chambers -	12	in
Amount of Stone Below Chambers -	36	in

Include Perimeter Stone in Calculations

Height of System *(inches)*	Incremental Single Chamber *(cubic feet)*	Incremental Single End Cap *(cubic feet)*	Incremental Chambers *(cubic feet)*	Incremental End Cap *(cubic feet)*	Incremental Stone *(cubic feet)*	Incremental Ch, EC and Stone *(cubic feet)*	Cumulative System (cubic feet)	Elevation (feet)
93	0.00	0.00	0.00	0.00	398.78	398.78	52300.70	7.75
92	0.00	0.00	0.00	0.00	398.78	398.78	51901.93	7.67
91	0.00	0.00	0.00	0.00	398.78	398.78	51503.15	7.58
90	0.00	0.00	0.00	0.00	398.78	398.78	51104.37	7.50
89	0.00	0.00	0.00	0.00	398.78	398.78	50705.60	7.42
88	0.00	0.00	0.00	0.00	398.78	398.78	50306.82	7.33
87	0.00	0.00	0.00	0.00	398.78	398.78	49908.04	7.25
86	0.00	0.00	0.00	0.00	398.78	398.78	49509.26	7.17
85	0.00	0.00	0.00	0.00	398.78	398.78	49110.49	7.08
84	0.00	0.00	0.00	0.00	398.78	398.78	48711.71	7.00
83	0.00	0.00	0.00	0.00	398.78	398.78	48312.93	6.92
82	0.00	0.00	0.00	0.00	398.78	398.78	47914.16	6.83
81	0.06	0.00	13.30	0.00	393.46	406.76	47515.38	6.75
80	0.19	0.02	44.45	0.29	380.88	425.62	47108.62	6.67
79	0.29	0.04	67.32	0.45	371.67	439.44	46683.00	6.58
78	0.40	0.05	92.44	0.62	361.56	454.61	46243.56	6.50
77	0.69	0.07	157.36	0.81	335.51	493.68	45788.95	6.42
76	1.03	0.09	235.48	1.06	304.16	540.70	45295.27	6.33
75	1.25	0.11	286.14	1.29	283.81	571.23	44754.57	6.25
74	1.42	0.13	325.69	1.52	267.89	595.10	44183.34	6.17
73	1.57	0.14	360.25	1.73	253.98	615.97	43588.24	6.08
72	1.71	0.16	390.94	1.95	241.62	634.51	42972.27	6.00
71	1.83	0.18	418.73	2.18	230.41	651.32	42337.76	5.92
70	1.94	0.20	443.75	2.41	220.32	666.47	41686.44	5.83
69	2.04	0.22	467.35	2.62	210.79	680.76	41019.97	5.75
68	2.13	0.23	488.84	2.82	202.11	693.78	40339.21	5.67
67	2.22	0.25	509.35	3.01	193.84	706.19	39645.43	5.58
66	2.31	0.27	528.26	3.19	186.20	717.64	38939.24	5.50
65	2.38	0.28	546.11	3.36	178.99	728.46	38221.60	5.42
64	2.46	0.29	563.13	3.53	172.11	738.77	37493.14	5.33
63	2.53	0.31	578.95	3.69	165.72	748.36	36754.37	5.25
62	2.59	0.32	593.97	3.85	159.65	757.47	36006.00	5.17
61	2.66	0.33	608.24	4.01	153.88	766.13	35248.53	5.08
60	2.72	0.35	621.76	4.16	148.41	774.33	34482.41	5.00
59	2.77	0.36	634.63	4.32	143.20	782.14	33708.08	4.92
58	2.82	0.37	646.85	4.47	138.25	789.56	32925.93	4.83
57	2.88	0.38	658.48	4.61	133.54	796.63	32136.37	4.75
56	2.92	0.40	669.63	4.75	129.03	803.41	31339.73	4.67
55	2.97	0.41	680.10	4.89	124.78	809.77	30536.33	4.58
54	3.01	0.42	689.85	5.02	120.83	815.70	29726.555	4.50
53	3.05	0.43	699.20	5.16	117.04	821.39	28910.85	4.42
52	3.09	0.44	708.59	5.28	113.23	827.10	28089.46	4.33
51	3.13	0.45	716.90	5.41	109.85	832.16	27262.36	4.25
50	**3.17**	**0.46**	**724.94**	**5.53**	**106.59**	**837.06**	**26430.20**	**4.17**
49	3.20	0.47	732.67	5.65	103.45	841.77	25593.14	4.08
48	3.23	0.48	739.93	5.76	100.50	846.19	24751.37	4.00

47	3.26	0.49	746.86	5.87	97.68	850.42	23905.18	3.92
46	3.29	0.50	753.47	5.98	95.00	854.44	23054.77	3.83
45	3.32	0.51	759.81	6.08	92.42	858.31	22200.32	3.75
44	3.34	0.51	765.80	6.17	89.99	861.96	21342.01	3.67
43	3.37	0.52	771.41	6.27	87.71	865.39	20480.05	3.58
42	3.39	0.53	776.88	6.35	85.48	868.72	19614.66	3.50
41	3.41	0.54	781.93	6.44	83.43	871.80	18745.94	3.42
40	3.44	0.54	787.08	6.52	81.34	874.93	17874.14	3.33
39	3.46	0.55	791.82	6.59	79.41	877.82	16999.21	3.25
38	3.48	0.56	796.62	6.66	77.46	880.75	16121.39	3.17
37	3.51	0.59	802.67	7.14	74.86	884.66	15240.64	3.08
36	0.00	0.00	0.00	0.00	398.78	398.78	14355.98	3.00
35	0.00	0.00	0.00	0.00	398.78	398.78	13957.20	2.92
34	0.00	0.00	0.00	0.00	398.78	398.78	13558.42	2.83
33	0.00	0.00	0.00	0.00	398.78	398.78	13159.65	2.75
32	0.00	0.00	0.00	0.00	398.78	398.78	12760.87	2.67
31	0.00	0.00	0.00	0.00	398.78	398.78	12362.09	2.58
30	0.00	0.00	0.00	0.00	398.78	398.78	11963.32	2.50
29	0.00	0.00	0.00	0.00	398.78	398.78	11564.54	2.42
28	0.00	0.00	0.00	0.00	398.78	398.78	11165.76	2.33
27	0.00	0.00	0.00	0.00	398.78	398.78	10766.98	2.25
26	0.00	0.00	0.00	0.00	398.78	398.78	10368.21	2.17
25	0.00	0.00	0.00	0.00	398.78	398.78	9969.43	2.08
24	0.00	0.00	0.00	0.00	398.78	398.78	9570.65	2.00
23	0.00	0.00	0.00	0.00	398.78	398.78	9171.88	1.92
22	0.00	0.00	0.00	0.00	398.78	398.78	8773.10	1.83
21	0.00	0.00	0.00	0.00	398.78	398.78	8374.32	1.75
20	0.00	0.00	0.00	0.00	398.78	398.78	7975.54	1.67
19	0.00	0.00	0.00	0.00	398.78	398.78	7576.77	1.58
18	0.00	0.00	0.00	0.00	398.78	398.78	7177.99	1.50
17	0.00	0.00	0.00	0.00	398.78	398.78	6779.21	1.42
16	0.00	0.00	0.00	0.00	398.78	398.78	6380.44	1.33
15	0.00	0.00	0.00	0.00	398.78	398.78	5981.66	1.25
14	0.00	0.00	0.00	0.00	398.78	398.78	5582.88	1.17
13	0.00	0.00	0.00	0.00	398.78	398.78	5184.10	1.08
12	0.00	0.00	0.00	0.00	398.78	398.78	4785.33	1.00
11	0.00	0.00	0.00	0.00	398.78	398.78	4386.55	0.92
10	0.00	0.00	0.00	0.00	398.78	398.78	3987.77	0.83
9	0.00	0.00	0.00	0.00	398.78	398.78	3588.99	0.75
8	0.00	0.00	0.00	0.00	398.78	398.78	3190.22	0.67
7	0.00	0.00	0.00	0.00	398.78	398.78	2791.44	0.58
6	0.00	0.00	0.00	0.00	398.78	398.78	2392.66	0.50
5	0.00	0.00	0.00	0.00	398.78	398.78	1993.89	0.42
4	0.00	0.00	0.00	0.00	398.78	398.78	1595.11	0.33
3	0.00	0.00	0.00	0.00	398.78	398.78	1196.33	0.25
2	0.00	0.00	0.00	0.00	398.78	398.78	797.55	0.17
1	0.00	0.00	0.00	0.00	398.78	398.78	398.78	0.08

Infiltration Basin - Design Procedure (Rev. 03-2012)	BMP ID DMA C	Legend:	Required Entries / Calculated Cells

Company Name: Thienes Engineering — Date: 1/12/2021

Designed by: — County/City Case No.:

Design Volume

a) Tributary area (BMP subarea)	A_T =	10.3	acres
b) Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	52,211	ft^3

Maximum Depth

a) Infiltration rate	I =	42.86	in/hr
b) Factor of Safety (See Table 1, Appendix A: "Infiltration Testing" from this BMP Handbook)	FS =	3	
c) Calculate D_1 $D_1 = \frac{I\ (in/hr) \times 72\ hrs}{12\ (in/ft) \times FS}$	D_1 =	85.7	ft
d) Enter the depth of freeboard (at least 1 ft)		1	ft
e) Enter depth to historic high ground water (measured from **top** of basin)		50	ft
f) Enter depth to top of bedrock or impermeable layer (measured from **top** of basin)		50	ft
g) D_2 is the smaller of: Depth to groundwater - (10 ft + freeboard) and Depth to impermeable layer - (5 ft + freeboard)	D_2 =	39.0	ft
h) D_{MAX} is the smaller value of D_1 and D_2 but shall not exceed 5 feet	D_{MAX} =	39.0	ft

Basin Geometry

a) Basin side slopes (no steeper than 4:1)	z =	n/a	:1
b) Proposed basin depth (excluding freeboard)	d_B =	2.37	ft
c) Minimum bottom surface area of basin ($A_S = V_{BMP}/d_B$)	A_S =	22030	ft^2
d) Proposed Design Surface Area — Minimum area must be provided	A_D =	12323.0	ft^2

Forebay

a) Forebay volume (minimum 0.5% V_{BMP})	Volume =	261	ft^3
b) Forebay depth (height of berm/splashwall. 1 foot min.)	Depth =	n/a	ft
c) Forebay surface area (minimum)	Area =	#######	ft^2
d) Full height notch-type weir	Width (W) =	n/a	in

Notes: Effective ponding depth to achieve Vbmp = 28.4 inches = (36" x 0.4) + 14" chamber ponding

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name Thienes Engineering, Inc. | Date 1/12/2021

Designed by Luis Prado | Case No

Company Project Number/Name Temescal Canyon Road (3905)

BMP Identification

BMP NAME / ID STC "D" / DMA D

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.85 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
D-1	*412905*	*Roofs*	*1*	*0.89*	*368311.3*			
D-2	*46653*	*Ornamental Landscaping*	*0.1*	*0.11*	*5153.2*			
	459558	***Total***			**373464.5**	**0.85**	**26453.7**	**26454**

Notes:

Tributary area = 10.55 acres

HCOC volume needed = 53,478 CF (Per Appendix 7)

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Detention • Retention • Recharge
Subsurface Stormwater Management℠

MC-3500 Site Calculator

Project Information:

Project Name:	Temescal Canyon Road - JN3905 (DMA D)
Location:	Unincorporated Riverside County, CA
Date:	12-Jan
Engineer:	Thienes Engineering Inc.
StormTech RPM:	

System Requirements

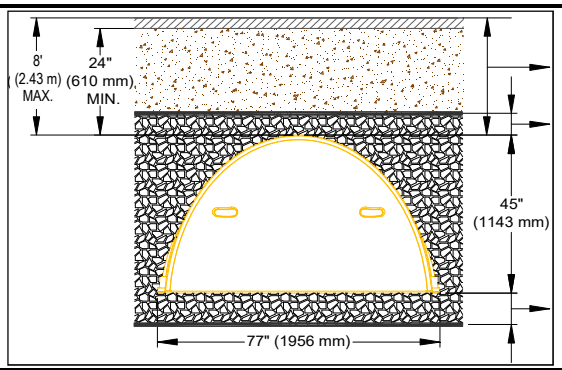
Units		Imperial	
Required Storage Volume		53478	CF
Stone Porosity (Industry Standard = 40%)		40	%
Stone Above Chambers	(12 inch min.)	12	inches
Stone Foundation Depth	(9 inch min.)	36	inches
Average Cover over Chambers	(24 inch min.)	24	inches
Bed size controlled by WIDTH or LENGTH?		WIDTH	
Limiting WIDTH or LENGTH dimension		55	feet
Storage Volume per Chamber		225.1	CF
Storage Volume per End Cap		62.3	CF

System Sizing

Number of Chambers Required	234	each
Number of End Caps Required	14	each
Bed Size (including perimeter stone)	12,569	square feet
Stone Required (including perimeter stone)	3714	tons
Volume of Excavation	4073	cubic yards
Non-woven Filter Fabric Required (20% Safety Factor)	3972	square yards
Length of Isolator Row	248.4	feet
Non-woven Isolator Row Fabric (20% Safety Factor)	431	square yards
Woven Isolator Row Fabric (20% Safety Factor)	547	square yards
Installed Storage Volume	53,546	cubic feet

Controlled by Width (Rows)

Maximum Width =		55	feet
3	rows of 34	chambers	
4	row of 33	chambers	
Maximum Length =		248.44	feet
Maximum Width =		51.42	feet



*This represents the estimated material and site work costs (US dollars) for the project. Materials excluded from this estimate are conveyance pipe, pavement design, etc. It is always advisable to seek detailed construction costs from local installers. Please contact STORMTECH at 888-892-2694 for additional cost information.

Project: **Temescal Canyon Road / DMA D**

Chamber Model -	MC-3500	
Units -	**Imperial**	Click Here for Metric
Number of Chambers -	234	
Number of End Caps -	14	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	0.00	ft
Amount of Stone Above Chambers -	12	in
Amount of Stone Below Chambers -	36	in

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☐ Include Perimeter Stone in Calculations

Height of System *(inches)*	Incremental Single Chamber *(cubic feet)*	Incremental Single End Cap *(cubic feet)*	Incremental Chambers *(cubic feet)*	Incremental End Cap *(cubic feet)*	Incremental Stone *(cubic feet)*	Incremental Ch, EC and Stone *(cubic feet)*	Cumulative System (cubic feet)	Elevation (feet)
93	0.00	0.00	0.00	0.00	408.46	408.46	53548.97	7.75
92	0.00	0.00	0.00	0.00	408.46	408.46	53140.51	7.67
91	0.00	0.00	0.00	0.00	408.46	408.46	52732.05	7.58
90	0.00	0.00	0.00	0.00	408.46	408.46	52323.59	7.50
89	0.00	0.00	0.00	0.00	408.46	408.46	51915.13	7.42
88	0.00	0.00	0.00	0.00	408.46	408.46	51506.67	7.33
87	0.00	0.00	0.00	0.00	408.46	408.46	51098.21	7.25
86	0.00	0.00	0.00	0.00	408.46	408.46	50689.75	7.17
85	0.00	0.00	0.00	0.00	408.46	408.46	50281.29	7.08
84	0.00	0.00	0.00	0.00	408.46	408.46	49872.84	7.00
83	0.00	0.00	0.00	0.00	408.46	408.46	49464.38	6.92
82	0.00	0.00	0.00	0.00	408.46	408.46	49055.92	6.83
81	0.06	0.00	13.59	0.00	403.02	416.62	48647.46	6.75
80	0.19	0.02	45.42	0.33	390.16	435.91	48230.84	6.67
79	0.29	0.04	68.79	0.53	380.73	450.05	47794.93	6.58
78	0.40	0.05	94.45	0.72	370.39	465.56	47344.88	6.50
77	0.69	0.07	160.80	0.95	343.76	505.51	46879.32	6.42
76	1.03	0.09	240.62	1.24	311.72	553.57	46373.81	6.33
75	1.25	0.11	292.39	1.50	290.90	584.79	45820.23	6.25
74	1.42	0.13	332.80	1.77	274.63	609.20	45235.44	6.17
73	1.57	0.14	368.11	2.02	260.41	630.54	44626.24	6.08
72	1.71	0.16	399.47	2.28	247.76	649.51	43995.70	6.00
71	1.83	0.18	427.87	2.54	236.29	666.71	43346.19	5.92
70	1.94	0.20	453.44	2.81	225.96	682.21	42679.48	5.83
69	2.04	0.22	477.55	3.06	216.22	696.82	41997.27	5.75
68	2.13	0.23	499.52	3.29	207.34	710.14	41300.45	5.67
67	2.22	0.25	520.47	3.51	198.87	722.84	40590.30	5.58
66	2.31	0.27	539.79	3.72	191.06	734.56	39867.46	5.50
65	2.38	0.28	558.04	3.92	183.68	745.63	39132.89	5.42
64	2.46	0.29	575.43	4.12	176.64	756.19	38387.26	5.33
63	2.53	0.31	591.59	4.31	170.10	766.00	37631.08	5.25
62	2.59	0.32	606.94	4.50	163.89	775.32	36865.07	5.17
61	2.66	0.33	621.52	4.68	157.98	784.18	36089.76	5.08
60	2.72	0.35	635.33	4.86	152.38	792.58	35305.58	5.00
59	2.77	0.36	648.48	5.04	147.05	800.57	34513.00	4.92
58	2.82	0.37	660.97	5.21	141.99	808.17	33712.43	4.83
57	2.88	0.38	672.86	5.38	137.16	815.40	32904.26	4.75
56	2.92	0.40	684.25	5.54	132.54	822.34	32088.86	4.67
55	2.97	0.41	694.95	5.71	128.20	828.86	31266.52	4.58
54	3.01	0.42	704.91	5.86	124.15	834.92	30437.666	4.50
53	3.05	0.43	714.46	6.02	120.27	840.75	29602.74	4.42
52	3.09	0.44	724.06	6.17	116.37	846.60	28762.00	4.33
51	3.13	0.45	732.55	6.31	112.92	851.78	27915.40	4.25
50	**3.17**	**0.46**	**740.76**	**6.45**	**109.57**	**856.79**	**27063.62**	**4.17**
49	3.20	0.47	748.67	6.59	106.36	861.62	26206.83	4.08
48	3.23	0.48	756.08	6.72	103.34	866.14	25345.22	4.00

47	3.26	0.49	763.17	6.85	100.45	870.47	24479.08	3.92
46	3.29	0.50	769.92	6.97	97.70	874.60	23608.60	3.83
45	3.32	0.51	776.40	7.09	95.06	878.56	22734.01	3.75
44	3.34	0.51	782.52	7.20	92.57	882.30	21855.45	3.67
43	3.37	0.52	788.26	7.31	90.23	885.80	20973.16	3.58
42	3.39	0.53	793.85	7.41	87.96	889.22	20087.36	3.50
41	3.41	0.54	799.00	7.51	85.85	892.37	19198.14	3.42
40	3.44	0.54	804.26	7.60	83.71	895.58	18305.77	3.33
39	3.46	0.55	809.10	7.69	81.74	898.54	17410.19	3.25
38	3.48	0.56	814.01	7.77	79.74	901.53	16511.66	3.17
37	3.51	0.59	820.19	8.33	77.05	905.57	15610.12	3.08
36	0.00	0.00	0.00	0.00	408.46	408.46	14704.55	3.00
35	0.00	0.00	0.00	0.00	408.46	408.46	14296.09	2.92
34	0.00	0.00	0.00	0.00	408.46	408.46	13887.63	2.83
33	0.00	0.00	0.00	0.00	408.46	408.46	13479.17	2.75
32	0.00	0.00	0.00	0.00	408.46	408.46	13070.71	2.67
31	0.00	0.00	0.00	0.00	408.46	408.46	12662.25	2.58
30	0.00	0.00	0.00	0.00	408.46	408.46	12253.79	2.50
29	0.00	0.00	0.00	0.00	408.46	408.46	11845.33	2.42
28	0.00	0.00	0.00	0.00	408.46	408.46	11436.87	2.33
27	0.00	0.00	0.00	0.00	408.46	408.46	11028.41	2.25
26	0.00	0.00	0.00	0.00	408.46	408.46	10619.95	2.17
25	0.00	0.00	0.00	0.00	408.46	408.46	10211.49	2.08
24	0.00	0.00	0.00	0.00	408.46	408.46	9803.03	2.00
23	0.00	0.00	0.00	0.00	408.46	408.46	9394.57	1.92
22	0.00	0.00	0.00	0.00	408.46	408.46	8986.11	1.83
21	0.00	0.00	0.00	0.00	408.46	408.46	8577.66	1.75
20	0.00	0.00	0.00	0.00	408.46	408.46	8169.20	1.67
19	0.00	0.00	0.00	0.00	408.46	408.46	7760.74	1.58
18	0.00	0.00	0.00	0.00	408.46	408.46	7352.28	1.50
17	0.00	0.00	0.00	0.00	408.46	408.46	6943.82	1.42
16	0.00	0.00	0.00	0.00	408.46	408.46	6535.36	1.33
15	0.00	0.00	0.00	0.00	408.46	408.46	6126.90	1.25
14	0.00	0.00	0.00	0.00	408.46	408.46	5718.44	1.17
13	0.00	0.00	0.00	0.00	408.46	408.46	5309.98	1.08
12	0.00	0.00	0.00	0.00	408.46	408.46	4901.52	1.00
11	0.00	0.00	0.00	0.00	408.46	408.46	4493.06	0.92
10	0.00	0.00	0.00	0.00	408.46	408.46	4084.60	0.83
9	0.00	0.00	0.00	0.00	408.46	408.46	3676.14	0.75
8	0.00	0.00	0.00	0.00	408.46	408.46	3267.68	0.67
7	0.00	0.00	0.00	0.00	408.46	408.46	2859.22	0.58
6	0.00	0.00	0.00	0.00	408.46	408.46	2450.76	0.50
5	0.00	0.00	0.00	0.00	408.46	408.46	2042.30	0.42
4	0.00	0.00	0.00	0.00	408.46	408.46	1633.84	0.33
3	0.00	0.00	0.00	0.00	408.46	408.46	1225.38	0.25
2	0.00	0.00	0.00	0.00	408.46	408.46	816.92	0.17
1	0.00	0.00	0.00	0.00	408.46	408.46	408.46	0.08

Infiltration Basin - Design Procedure (Rev. 03-2012)	BMP ID DMA D	Legend:	Required Entries / Calculated Cells

Company Name: Thienes Engineering — Date: 1/12/2021

Designed by: — County/City Case No.:

Design Volume

a) Tributary area (BMP subarea)	A_T =	10.55	acres
b) Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	53,478	ft^3

Maximum Depth

a) Infiltration rate	I =	1.65	in/hr
b) Factor of Safety (See Table 1, Appendix A: "Infiltration Testing" from this BMP Handbook)	FS =	3	
c) Calculate D_1 $D_1 = \frac{I\ (in/hr) \times 72\ hrs}{12\ (in/ft) \times FS}$	D_1 =	3.3	ft
d) Enter the depth of freeboard (at least 1 ft)		1	ft
e) Enter depth to historic high ground water (measured from **top** of basin)		50	ft
f) Enter depth to top of bedrock or impermeable layer (measured from **top** of basin)		50	ft
g) D_2 is the smaller of: Depth to groundwater - (10 ft + freeboard) and Depth to impermeable layer - (5 ft + freeboard)	D_2 =	39.0	ft
h) D_{MAX} is the smaller value of D_1 and D_2 but shall not exceed 5 feet	D_{MAX} =	3.3	ft

Basin Geometry

a) Basin side slopes (no steeper than 4:1)	z =	n/a	:1
b) Proposed basin depth (excluding freeboard)	d_B =	2.37	ft
c) Minimum bottom surface area of basin ($A_S = V_{BMP}/d_B$)	A_S =	22565	ft^2
d) Proposed Design Surface Area — Minimum area must be provided	A_D =	12569.0	ft^2

Forebay

a) Forebay volume (minimum 0.5% V_{BMP})	Volume =	267	ft^3
b) Forebay depth (height of berm/splashwall. 1 foot min.)	Depth =	n/a	ft
c) Forebay surface area (minimum)	Area =	#######	ft^2
d) Full height notch-type weir	Width (W) =	n/a	in

Notes: Effective ponding depth to achieve Vbmp = 28.4 inches = (36" x 0.4) + 14" chamber ponding

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Thienes Engineering, Inc. | Date: 1/12/2021

Designed by: Luis Prado | Case No:

Company Project Number/Name: Temescal Canyon Road (3905)

BMP Identification

BMP NAME / ID: STC "E" (DMA E)

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.85 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
E-1	*150181*	*Concrete or Asphalt*	*1*	*0.89*	*133961.5*			
E-2	*19703*	*Ornamental Landscaping*	*0.1*	*0.11*	*2176.4*			
	169884		***Total***		**136137.9**	**0.85**	***9643.1***	***9644***

Notes:

Tributary area = 3.90 acres

HCOC volume needed = 19,769 CF (Per Appendix 7)

StormTech
Detention • Retention • Recharge
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MC-3500 Site Calculator

Project Information:

Project Name:	Temescal Canyon Road - JN3905 (DMA E)
Location:	Unincorporated Riverside County, CA
Date:	12-Jan
Engineer:	Thienes Engineering Inc.
StormTech RPM:	

System Requirements

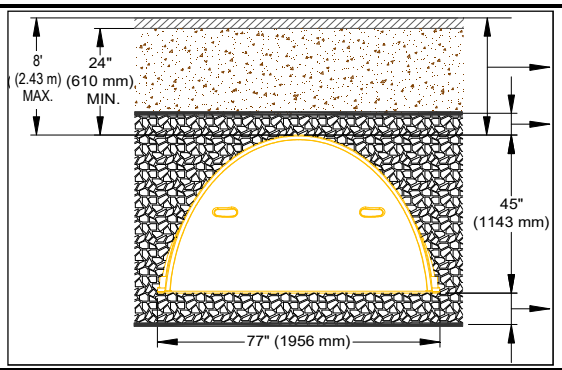
Units		Imperial	
Required Storage Volume		19769	CF
Stone Porosity (Industry Standard = 40%)		40	%
Stone Above Chambers	(12 inch min.)	12	inches
Stone Foundation Depth	(9 inch min.)	36	inches
Average Cover over Chambers	(24 inch min.)	24	inches
Bed size controlled by WIDTH or LENGTH?		WIDTH	
Limiting WIDTH or LENGTH dimension		40	feet
Storage Volume per Chamber		225.1	CF
Storage Volume per End Cap		62.3	CF

System Sizing

Number of Chambers Required	86	each
Number of End Caps Required	10	each
Bed Size (including perimeter stone)	4,755	square feet
Stone Required (including perimeter stone)	1416	tons
Volume of Excavation	1541	cubic yards
Non-woven Filter Fabric Required (20% Safety Factor)	1621	square yards
Length of Isolator Row	133.8	feet
Non-woven Isolator Row Fabric (20% Safety Factor)	232	square yards
Woven Isolator Row Fabric (20% Safety Factor)	294	square yards
Installed Storage Volume	19,982	cubic feet

Controlled by Width (Rows)

Maximum Width =			40	feet
1	row of	18	chambers	
4	row of	17	chambers	
Maximum Length =			133.77	feet
Maximum Width =			37.09	feet



*This represents the estimated material and site work costs (US dollars) for the project. Materials excluded from this estimate are conveyance pipe, pavement design, etc. It is always advisable to seek detailed construction costs from local installers. Please contact STORMTECH at 888-892-2694 for additional cost information.

Project: **Temescal Canyon Road / DMA E**

Chamber Model -	MC-3500	
Units -	**Imperial**	Click Here for Metric
Number of Chambers -	86	
Number of End Caps -	10	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	0.00	ft
Amount of Stone Above Chambers -	12	in
Amount of Stone Below Chambers -	36	in

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☐ Include Perimeter Stone in Calculations

Height of System *(inches)*	Incremental Single Chamber *(cubic feet)*	Incremental Single End Cap *(cubic feet)*	Incremental Chambers *(cubic feet)*	Incremental End Cap *(cubic feet)*	Incremental Stone *(cubic feet)*	Incremental Ch, EC and Stone *(cubic feet)*	Cumulative System (cubic feet)	Elevation (feet)
93	0.00	0.00	0.00	0.00	152.84	152.84	19977.41	7.75
92	0.00	0.00	0.00	0.00	152.84	152.84	19824.56	7.67
91	0.00	0.00	0.00	0.00	152.84	152.84	19671.72	7.58
90	0.00	0.00	0.00	0.00	152.84	152.84	19518.88	7.50
89	0.00	0.00	0.00	0.00	152.84	152.84	19366.03	7.42
88	0.00	0.00	0.00	0.00	152.84	152.84	19213.19	7.33
87	0.00	0.00	0.00	0.00	152.84	152.84	19060.35	7.25
86	0.00	0.00	0.00	0.00	152.84	152.84	18907.51	7.17
85	0.00	0.00	0.00	0.00	152.84	152.84	18754.66	7.08
84	0.00	0.00	0.00	0.00	152.84	152.84	18601.82	7.00
83	0.00	0.00	0.00	0.00	152.84	152.84	18448.98	6.92
82	0.00	0.00	0.00	0.00	152.84	152.84	18296.13	6.83
81	0.06	0.00	5.00	0.00	150.84	155.84	18143.29	6.75
80	0.19	0.02	16.69	0.24	146.07	163.00	17987.45	6.67
79	0.29	0.04	25.28	0.38	142.58	168.24	17824.45	6.58
78	0.40	0.05	34.71	0.52	138.75	173.98	17656.21	6.50
77	0.69	0.07	59.10	0.68	128.93	188.71	17482.23	6.42
76	1.03	0.09	88.43	0.88	117.12	206.43	17293.52	6.33
75	1.25	0.11	107.46	1.07	109.43	217.96	17087.09	6.25
74	1.42	0.13	122.31	1.26	103.41	226.99	16869.13	6.17
73	1.57	0.14	135.29	1.44	98.15	234.88	16642.14	6.08
72	1.71	0.16	146.82	1.63	93.47	241.91	16407.26	6.00
71	1.83	0.18	157.25	1.82	89.22	248.28	16165.35	5.92
70	1.94	0.20	166.65	2.01	85.38	254.03	15917.07	5.83
69	2.04	0.22	175.51	2.18	81.77	259.46	15663.03	5.75
68	2.13	0.23	183.58	2.35	78.47	264.40	15403.57	5.67
67	2.22	0.25	191.28	2.51	75.33	269.12	15139.17	5.58
66	2.31	0.27	198.38	2.66	72.43	273.47	14870.05	5.50
65	2.38	0.28	205.09	2.80	69.69	277.58	14596.59	5.42
64	2.46	0.29	211.48	2.94	67.07	281.50	14319.01	5.33
63	2.53	0.31	217.42	3.08	64.64	285.14	14037.51	5.25
62	2.59	0.32	223.06	3.21	62.33	288.61	13752.37	5.17
61	2.66	0.33	228.42	3.34	60.14	291.90	13463.76	5.08
60	2.72	0.35	233.50	3.47	58.06	295.02	13171.86	5.00
59	2.77	0.36	238.33	3.60	56.07	298.00	12876.84	4.92
58	2.82	0.37	242.92	3.72	54.19	300.83	12578.83	4.83
57	2.88	0.38	247.29	3.84	52.39	303.52	12278.01	4.75
56	2.92	0.40	251.48	3.96	50.67	306.10	11974.48	4.67
55	2.97	0.41	255.41	4.08	49.05	308.53	11668.38	4.58
54	3.01	0.42	259.07	4.19	47.54	310.80	11359.844	4.50
53	3.05	0.43	262.58	4.30	46.09	312.97	11049.05	4.42
52	3.09	0.44	266.11	4.40	44.64	315.15	10736.08	4.33
51	3.13	0.45	269.23	4.51	43.35	317.08	10420.93	4.25
50	3.17	0.46	272.25	4.61	42.10	318.96	10103.84	4.17
49	**3.20**	**0.47**	**275.15**	**4.71**	**40.90**	**320.76**	**9784.89**	**4.08**
48	3.23	0.48	277.88	4.80	39.77	322.45	9464.13	4.00

47	3.26	0.49	280.48	4.89	38.69	324.07	9141.68	3.92
46	3.29	0.50	282.96	4.98	37.67	325.61	8817.61	3.83
45	3.32	0.51	285.34	5.06	36.68	327.09	8492.00	3.75
44	3.34	0.51	287.59	5.14	35.75	328.49	8164.92	3.67
43	3.37	0.52	289.70	5.22	34.87	329.80	7836.43	3.58
42	3.39	0.53	291.76	5.30	34.02	331.07	7506.63	3.50
41	3.41	0.54	293.65	5.37	33.24	332.25	7175.56	3.42
40	3.44	0.54	295.58	5.43	32.44	333.45	6843.31	3.33
39	3.46	0.55	297.36	5.49	31.70	334.56	6509.85	3.25
38	3.48	0.56	299.17	5.55	30.95	335.67	6175.30	3.17
37	3.51	0.59	301.44	5.95	29.89	337.28	5839.62	3.08
36	0.00	0.00	0.00	0.00	152.84	152.84	5502.35	3.00
35	0.00	0.00	0.00	0.00	152.84	152.84	5349.50	2.92
34	0.00	0.00	0.00	0.00	152.84	152.84	5196.66	2.83
33	0.00	0.00	0.00	0.00	152.84	152.84	5043.82	2.75
32	0.00	0.00	0.00	0.00	152.84	152.84	4890.97	2.67
31	0.00	0.00	0.00	0.00	152.84	152.84	4738.13	2.58
30	0.00	0.00	0.00	0.00	152.84	152.84	4585.29	2.50
29	0.00	0.00	0.00	0.00	152.84	152.84	4432.45	2.42
28	0.00	0.00	0.00	0.00	152.84	152.84	4279.60	2.33
27	0.00	0.00	0.00	0.00	152.84	152.84	4126.76	2.25
26	0.00	0.00	0.00	0.00	152.84	152.84	3973.92	2.17
25	0.00	0.00	0.00	0.00	152.84	152.84	3821.07	2.08
24	0.00	0.00	0.00	0.00	152.84	152.84	3668.23	2.00
23	0.00	0.00	0.00	0.00	152.84	152.84	3515.39	1.92
22	0.00	0.00	0.00	0.00	152.84	152.84	3362.55	1.83
21	0.00	0.00	0.00	0.00	152.84	152.84	3209.70	1.75
20	0.00	0.00	0.00	0.00	152.84	152.84	3056.86	1.67
19	0.00	0.00	0.00	0.00	152.84	152.84	2904.02	1.58
18	0.00	0.00	0.00	0.00	152.84	152.84	2751.17	1.50
17	0.00	0.00	0.00	0.00	152.84	152.84	2598.33	1.42
16	0.00	0.00	0.00	0.00	152.84	152.84	2445.49	1.33
15	0.00	0.00	0.00	0.00	152.84	152.84	2292.64	1.25
14	0.00	0.00	0.00	0.00	152.84	152.84	2139.80	1.17
13	0.00	0.00	0.00	0.00	152.84	152.84	1986.96	1.08
12	0.00	0.00	0.00	0.00	152.84	152.84	1834.12	1.00
11	0.00	0.00	0.00	0.00	152.84	152.84	1681.27	0.92
10	0.00	0.00	0.00	0.00	152.84	152.84	1528.43	0.83
9	0.00	0.00	0.00	0.00	152.84	152.84	1375.59	0.75
8	0.00	0.00	0.00	0.00	152.84	152.84	1222.74	0.67
7	0.00	0.00	0.00	0.00	152.84	152.84	1069.90	0.58
6	0.00	0.00	0.00	0.00	152.84	152.84	917.06	0.50
5	0.00	0.00	0.00	0.00	152.84	152.84	764.21	0.42
4	0.00	0.00	0.00	0.00	152.84	152.84	611.37	0.33
3	0.00	0.00	0.00	0.00	152.84	152.84	458.53	0.25
2	0.00	0.00	0.00	0.00	152.84	152.84	305.69	0.17
1	0.00	0.00	0.00	0.00	152.84	152.84	152.84	0.08

Infiltration Basin - Design Procedure (Rev. 03-2012)	BMP ID DMA E	Legend:	Required Entries / Calculated Cells

Company Name: Thienes Engineering — Date: 1/12/2021

Designed by: Luis Prado — County/City Case No.:

Design Volume

a) Tributary area (BMP subarea)	A_T =	3.9	acres
b) Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	9,643	ft^3

Maximum Depth

a) Infiltration rate	I =	5.15	in/hr
b) Factor of Safety (See Table 1, Appendix A: "Infiltration Testing" from this BMP Handbook)	FS =	3	
c) Calculate D_1 $D_1 = \frac{I\ (in/hr) \times 72\ hrs}{12\ (in/ft) \times FS}$	D_1 =	10.3	ft
d) Enter the depth of freeboard (at least 1 ft)		1	ft
e) Enter depth to historic high ground water (measured from **top** of basin)		50	ft
f) Enter depth to top of bedrock or impermeable layer (measured from **top** of basin)		50	ft
g) D_2 is the smaller of: Depth to groundwater - (10 ft + freeboard) and Depth to impermeable layer - (5 ft + freeboard)	D_2 =	39.0	ft
h) D_{MAX} is the smaller value of D_1 and D_2 but shall not exceed 5 feet	D_{MAX} =	10.3	ft

Basin Geometry

a) Basin side slopes (no steeper than 4:1)	z =	n/a	:1
b) Proposed basin depth (excluding freeboard)	d_B =	2.28	ft
c) Minimum bottom surface area of basin ($A_S = V_{BMP}/d_B$)	A_S =	4229	ft^2
d) Proposed Design Surface Area	A_D =	4755.0	ft^2

Forebay

a) Forebay volume (minimum 0.5% V_{BMP})	Volume =	48	ft^3
b) Forebay depth (height of berm/splashwall. 1 foot min.)	Depth =	n/a	ft
c) Forebay surface area (minimum)	Area =	#######	ft^2
d) Full height notch-type weir	Width (W) =	n/a	in

Notes: Effective ponding depth to achieve Vbmp = 27.4 inches = (36" x 0.4) + 13" chamber ponding

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Thienes Engineering, Inc.	Date	1/12/2021
Designed by	Luis Prado	Case No	
Company Project Number/Name	Temescal Canyon Road (3905)		

BMP Identification

BMP NAME / ID: STC "G" (DMA G)

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.85 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
G-1	*39858.2*	*Concrete or Asphalt*	*1*	*0.89*	*35553.5*			
G-2	*21997*	*Ornamental Landscaping*	*0.1*	*0.11*	*2429.7*			
	61855.2	***Total***			**37983.2**	**0.85**	***2690.5***	***2692***

Notes:

Tributary area = 2.42 acres

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MC-3500 Site Calculator

Project Information:

Project Name:	Temescal Canyon Road - JN3905 (DMA G)
Location:	Unincorporated Riverside County, CA
Date:	12-Jan
Engineer:	Thienes Engineering Inc.
StormTech RPM:	

System Requirements

Units		Imperial	
Required Storage Volume		2691	CF
Stone Porosity (Industry Standard = 40%)		40	%
Stone Above Chambers	(12 inch min.)	12	inches
Stone Foundation Depth	(9 inch min.)	9	inches
Average Cover over Chambers	(24 inch min.)	24	inches
Bed size controlled by WIDTH or LENGTH?		WIDTH	
Limiting WIDTH or LENGTH dimension		20	feet
Storage Volume per Chamber		178.9	CF
Storage Volume per End Cap		46.9	CF

System Sizing

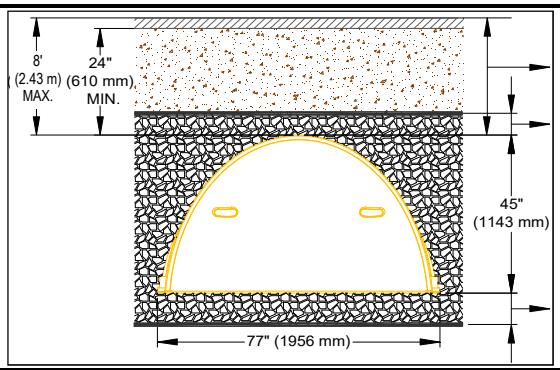
Number of Chambers Required	14	each
Number of End Caps Required	4	each
Bed Size (including perimeter stone)	856	square feet
Stone Required (including perimeter stone)	161	tons
Volume of Excavation	206	cubic yards
Non-woven Filter Fabric Required (20% Safety Factor)	332	square yards
Length of Isolator Row	54.9	feet
Non-woven Isolator Row Fabric (20% Safety Factor)	95	square yards
Woven Isolator Row Fabric (20% Safety Factor)	121	square yards
Installed Storage Volume	2,692	cubic feet

Controlled by Width (Rows)

Maximum Width =	20	feet

2 rows of 7 chambers

Maximum Length =	54.94	feet
Maximum Width =	15.58	feet



*This represents the estimated material and site work costs (US dollars) for the project. Materials excluded from this estimate are conveyance pipe, pavement design, etc. It is always advisable to seek detailed construction costs from local installers. Please contact STORMTECH at 888-892-2694 for additional cost information.

Infiltration Basin - Design Procedure (Rev. 03-2012)	BMP ID: DMA G	Legend:	Required Entries / Calculated Cells

Company Name: Thienes Engineering — Date: 1/12/2021

Designed by: Luis Prado — County/City Case No.:

Design Volume

a) Tributary area (BMP subarea)	A_T =	5.15	acres
b) Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	2,691	ft^3

Maximum Depth

a) Infiltration rate	I =	1.65	in/hr
b) Factor of Safety (See Table 1, Appendix A: "Infiltration Testing" from this BMP Handbook)	FS =	3	
c) Calculate D_1 $D_1 = \frac{I\ (in/hr) \times 72\ hrs}{12\ (in/ft) \times FS}$	D_1 =	3.3	ft
d) Enter the depth of freeboard (at least 1 ft)		1	ft
e) Enter depth to historic high ground water (measured from **top** of basin)		50	ft
f) Enter depth to top of bedrock or impermeable layer (measured from **top** of basin)		50	ft
g) D_2 is the smaller of: Depth to groundwater - (10 ft + freeboard) and Depth to impermeable layer - (5 ft + freeboard)	D_2 =	39.0	ft
h) D_{MAX} is the smaller value of D_1 and D_2 but shall not exceed 5 feet	D_{MAX} =	3.3	ft

Basin Geometry

a) Basin side slopes (no steeper than 4:1)	z =	n/a	:1
b) Proposed basin depth (excluding freeboard) Depth may not exceed Dmax	d_B =	4.45	ft
c) Minimum bottom surface area of basin ($A_S = V_{BMP}/d_B$)	A_S =	605	ft^2
d) Proposed Design Surface Area	A_D =	856.0	ft^2

Forebay

a) Forebay volume (minimum 0.5% V_{BMP})	Volume =	13	ft^3
b) Forebay depth (height of berm/splashwall. 1 foot min.)	Depth =	n/a	ft
c) Forebay surface area (minimum)	Area =	#######	ft^2
d) Full height notch-type weir	Width (W) =	n/a	in

Notes: Effective ponding depth to achieve Vbmp = 53.4 inches = [(9" +12") x 0.4)] + 45" chamber ponding

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Thienes Engineering, Inc.	Date	1/12/2021
Designed by	Luis Prado	Case No	
Company Project Number/Name	Temescal Canyon Road (3905)		

BMP Identification

BMP NAME / ID: STC "H" (DMA H)

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.85 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
H-1	*74227*	*Concrete or Asphalt*	*1*	*0.89*	*66210.5*			
H-2	*12893*	*Ornamental Landscaping*	*0.1*	*0.11*	*1424.1*			
	87120		***Total***		**67634.6**	**0.85**	***4790.8***	***4933***

Notes:

Tributary area =2.00 acres

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Subsurface Stormwater Management℠

MC-3500 Site Calculator

Project Information:

Project Name:	Temescal Canyon Road - JN3905 (DMA H)
Location:	Unincorporated Riverside County, CA
Date:	12-Jan
Engineer:	Thienes Engineering Inc.
StormTech RPM:	

System Requirements

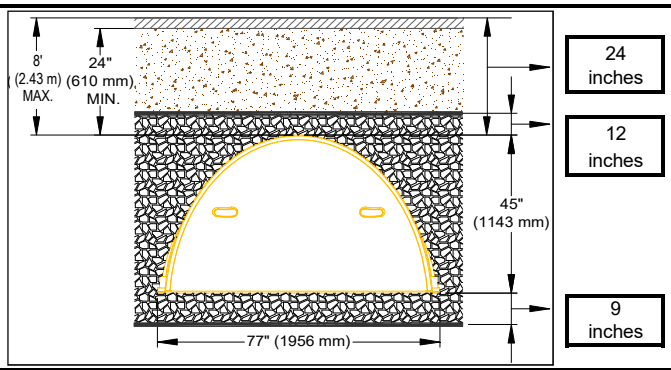
Units		Imperial	
Required Storage Volume		4791	CF
Stone Porosity (Industry Standard = 40%)		40	%
Stone Above Chambers	(12 inch min.)	12	inches
Stone Foundation Depth	(9 inch min.)	9	inches
Average Cover over Chambers	(24 inch min.)	24	inches
Bed size controlled by WIDTH or LENGTH?		WIDTH	
Limiting WIDTH or LENGTH dimension		25	feet
Storage Volume per Chamber		178.9	CF
Storage Volume per End Cap		46.9	CF

System Sizing

Number of Chambers Required	26	each
Number of End Caps Required	6	each
Bed Size (including perimeter stone)	1,525	square feet
Stone Required (including perimeter stone)	281	tons
Volume of Excavation	367	cubic yards
Non-woven Filter Fabric Required (20% Safety Factor)	542	square yards
Length of Isolator Row	69.3	feet
Non-woven Isolator Row Fabric (20% Safety Factor)	120	square yards
Woven Isolator Row Fabric (20% Safety Factor)	152	square yards
Installed Storage Volume	4,933	cubic feet

Controlled by Width (Rows)

Maximum Width =		25	feet
2 rows of	9	chambers	
1 row of	8	chambers	
Maximum Length =		69.27	feet
Maximum Width =		22.75	feet



*This represents the estimated material and site work costs (US dollars) for the project. Materials excluded from this estimate are conveyance pipe, pavement design, etc. It is always advisable to seek detailed construction costs from local installers. Please contact STORMTECH at 888-892-2694 for additional cost information.

Infiltration Basin - Design Procedure (Rev. 03-2012)	BMP ID: DMA H	Legend:	Required Entries / Calculated Cells
Company Name: Thienes Engineering			Date: 1/12/2021
Designed by: Luis Prado			County/City Case No.:

Design Volume

a) Tributary area (BMP subarea)	A_T =	2	acres
b) Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	4,791	ft^3

Maximum Depth

a) Infiltration rate	I =	5.15	in/hr
b) Factor of Safety (See Table 1, Appendix A: "Infiltration Testing" from this BMP Handbook)	FS =	3	
c) Calculate D_1 $D_1 = \frac{I\ (in/hr) \times 72\ hrs}{12\ (in/ft) \times FS}$	D_1 =	10.3	ft
d) Enter the depth of freeboard (at least 1 ft)		1	ft
e) Enter depth to historic high ground water (measured from **top** of basin)		50	ft
f) Enter depth to top of bedrock or impermeable layer (measured from **top** of basin)		50	ft
g) D_2 is the smaller of: Depth to groundwater - (10 ft + freeboard) and Depth to impermeable layer - (5 ft + freeboard)	D_2 =	39.0	ft
h) D_{MAX} is the smaller value of D_1 and D_2 but shall not exceed 5 feet	D_{MAX} =	10.3	ft

Basin Geometry

a) Basin side slopes (no steeper than 4:1)	z =	n/a	:1
b) Proposed basin depth (excluding freeboard)	d_B =	4.45	ft
c) Minimum bottom surface area of basin ($A_S = V_{BMP}/d_B$)	A_S =	1077	ft^2
d) Proposed Design Surface Area	A_D =	1525.0	ft^2

Forebay

a) Forebay volume (minimum 0.5% V_{BMP})	Volume =	24	ft^3
b) Forebay depth (height of berm/splashwall. 1 foot min.)	Depth =	n/a	ft
c) Forebay surface area (minimum)	Area =	#######	ft^2
d) Full height notch-type weir	Width (W) =	n/a	in

Notes: Effective ponding depth to achieve Vbmp = 53.4 inches = [(9" +12") x 0.4)] + 45" chamber ponding

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Thienes Engineering, Inc.	Date	1/12/2021
Designed by	Luis Prado	Case No	
Company Project Number/Name	Temescal Canyon Road (3905)		

BMP Identification

BMP NAME / ID: STC "I" (DMA I)

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.85 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
I-1	*38280.4*	*Concrete or Asphalt*	*1*	*0.89*	*34146.1*			
I-2	*4844*	*Ornamental Landscaping*	*0.1*	*0.11*	*535.1*			
	43124.4		*Total*		34681.2	*0.85*	*2456.6*	*2513*

Notes:

Tributary area = 0.99 acres

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Subsurface Stormwater Management℠

MC-3500 Site Calculator

Project Information:

Project Name:	Temescal Canyon Road - JN3905 (DMA I)
Location:	Unincorporated Riverside County, CA
Date:	12-Jan
Engineer:	Thienes Engineering Inc.
StormTech RPM:	

System Requirements

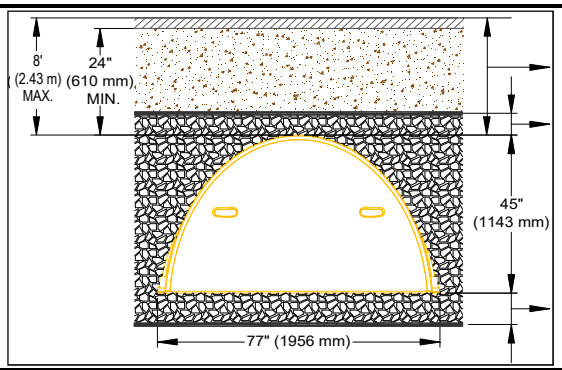
Units		Imperial	
Required Storage Volume		2457	CF
Stone Porosity (Industry Standard = 40%)		40	%
Stone Above Chambers	(12 inch min.)	12	inches
Stone Foundation Depth	(9 inch min.)	9	inches
Average Cover over Chambers	(24 inch min.)	24	inches
Bed size controlled by WIDTH or LENGTH?		WIDTH	
Limiting WIDTH or LENGTH dimension		20	feet
Storage Volume per Chamber		178.9	CF
Storage Volume per End Cap		46.9	CF

System Sizing

Number of Chambers Required	13	each
Number of End Caps Required	4	each
Bed Size (including perimeter stone)	805	square feet
Stone Required (including perimeter stone)	152	tons
Volume of Excavation	194	cubic yards
Non-woven Filter Fabric Required (20% Safety Factor)	318	square yards
Length of Isolator Row	54.9	feet
Non-woven Isolator Row Fabric (20% Safety Factor)	95	square yards
Woven Isolator Row Fabric (20% Safety Factor)	121	square yards
Installed Storage Volume	2,513	cubic feet

Controlled by Width (Rows)

Maximum Width =		20	feet
1	row of 7	chambers	
1	row of 6	chambers	
Maximum Length =		54.94	feet
Maximum Width =		15.58	feet



*This represents the estimated material and site work costs (US dollars) for the project. Materials excluded from this estimate are conveyance pipe, pavement design, etc. It is always advisable to seek detailed construction costs from local installers. Please contact STORMTECH at 888-892-2694 for additional cost information.

Infiltration Basin - Design Procedure (Rev. 03-2012)	BMP ID DMA I	Legend:	Required Entries / Calculated Cells

Company Name: Thienes Engineering — Date: 1/12/2021

Designed by: Luis Prado — County/City Case No.:

Design Volume

a) Tributary area (BMP subarea)	A_T =	0.99	acres
b) Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	2,457	ft^3

Maximum Depth

a) Infiltration rate	I =	5.8	in/hr
b) Factor of Safety (See Table 1, Appendix A: "Infiltration Testing" from this BMP Handbook)	FS =	3	
c) Calculate D_1 $D_1 = \frac{I\ (in/hr) \times 72\ hrs}{12\ (in/ft) \times FS}$	D_1 =	11.6	ft
d) Enter the depth of freeboard (at least 1 ft)		1	ft
e) Enter depth to historic high ground water (measured from **top** of basin)		50	ft
f) Enter depth to top of bedrock or impermeable layer (measured from **top** of basin)		50	ft
g) D_2 is the smaller of: Depth to groundwater - (10 ft + freeboard) and Depth to impermeable layer - (5 ft + freeboard)	D_2 =	39.0	ft
h) D_{MAX} is the smaller value of D_1 and D_2 but shall not exceed 5 feet	D_{MAX} =	11.6	ft

Basin Geometry

a) Basin side slopes (no steeper than 4:1)	z =	n/a	:1
b) Proposed basin depth (excluding freeboard)	d_B =	4.45	ft
c) Minimum bottom surface area of basin ($A_S = V_{BMP}/d_B$)	A_S =	552	ft^2
d) Proposed Design Surface Area	A_D =	805.0	ft^2

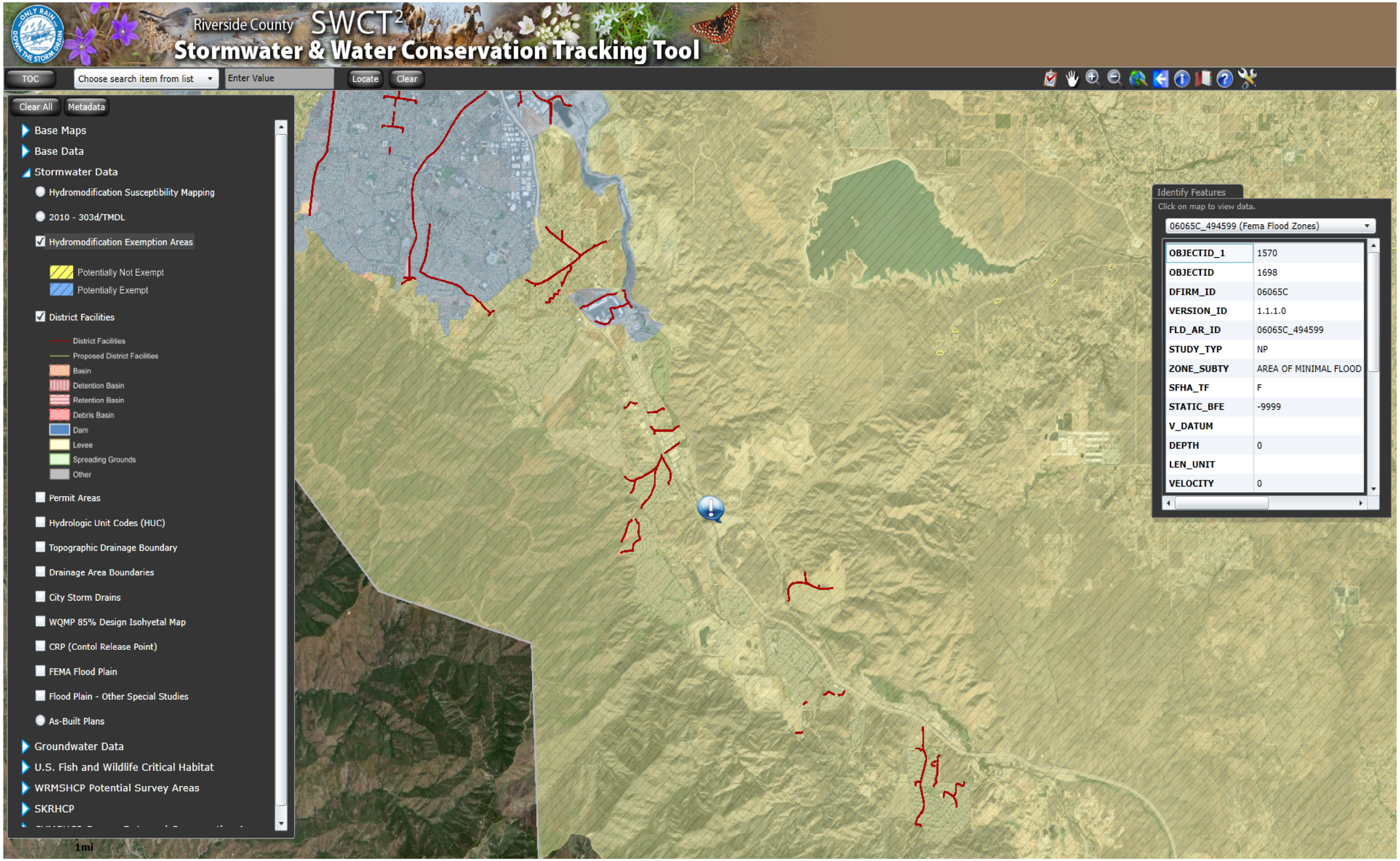
Forebay

a) Forebay volume (minimum 0.5% V_{BMP})	Volume =	12	ft^3
b) Forebay depth (height of berm/splashwall. 1 foot min.)	Depth =	n/a	ft
c) Forebay surface area (minimum)	Area =	#######	ft^2
d) Full height notch-type weir	Width (W) =	n/a	in

Notes: Effective ponding depth to achieve Vbmp = 53.4 inches = [(9" +12") x 0.4)] + 45" chamber ponding

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern


Riverside County SWCT²
Stormwater & Water Conservation Tracking Tool
TOC
Choose search item from list
Enter Value
Locate
Clear
Clear All
Metadata
Base Maps
Base Data
Stormwater Data
Hydromodification Susceptibility Mapping
2010 - 303d/TMDL
Hydromodification Exemption Areas
Potentially Not Exempt
Potentially Exempt
District Facilities
District Facilities
Proposed District Facilities
Basin
Detention Basin
Retention Basin
Debris Basin
Dam
Levee
Spreading Grounds
Other
Permit Areas
Hydrologic Unit Codes (HUC)
Topographic Drainage Boundary
Drainage Area Boundaries
City Storm Drains
WQMP 85% Design Isohyetal Map
CRP (Contol Release Point)
FEMA Flood Plain
Flood Plain - Other Special Studies
As-Built Plans
Groundwater Data
U.S. Fish and Wildlife Critical Habitat
WRMSHCP Potential Survey Areas
SKRHCP
1mi
Identify Features
Click on map to view data.
06065C_494599 (Fema Flood Zones)
OBJECTID_1 1570
OBJECTID 1698
DFIRM_ID 06065C
VERSION_ID 1.1.1.0
FLD_AR_ID 06065C_494599
STUDY_TYP NP
ZONE_SUBTY AREA OF MINIMAL FLOOD
SFHA_TF F
STATIC_BFE -9999
V_DATUM
DEPTH 0
LEN_UNIT
VELOCITY 0

HCOC VOLUME SUMMARY

EXISTING 2 YR, 24 HR VOL =	25,046	CF
PROPOSED 2 YR, 24 HR VOL =	205,380	CF
HCOC MITIGATION VOL =	**170,065**	CF
AREA TRIBUTARY TO CHAMBERS =	**33.55**	AC
HCOC VOL PER AREA RATIO =	**5,069**	CF/AC

DMA	TRIBUTARY AREA (AC)	HCOC VOL. REQ'D (CF)	DCV (CF)	*ADDITIONAL VOL. REQ'D TO MEET HCOC (CF)	# OF CHAMBERS REQUIRED TO MEET HCOC	HEIGHT OF CHAMBERS WHERE DCV IS ACHIEVED (IN)
DMA A	4.60	23,317	10,235	13,082	125	27
DMA B	4.20	21,290	10,094	11,196	91	48
DMA C	10.30	52,211	25,829	26,382	229	50
DMA D	10.55	53,478	26,454	27,024	234	50
DMA E	3.90	19,769	9,643	10,126	86	49
TOTAL	**33.55**	**170,065**	**82,255**	**87,810**	**765**	

* THIS IS THE DIFFERENCE BETWEEN THE HCOC VOL. REQ'D AND THE DCV

U n i t H y d r o g r a p h A n a l y s i s

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Study date 01/11/21 File: 3905EX2242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6400

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

TEMESCAL VALLEY COMMERCE CENTER
EXISTING CONDITION
2-YEAR 24-HOUR

Drainage Area = 34.85(Ac.) = 0.054 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 34.85(Ac.) = 0.054 Sq. Mi.
Length along longest watercourse = 2031.00(Ft.)
Length along longest watercourse measured to centroid = 1048.00(Ft.)
Length along longest watercourse = 0.385 Mi.
Length along longest watercourse measured to centroid = 0.198 Mi.
Difference in elevation = 20.50(Ft.)
Slope along watercourse = 53.2939 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.127 Hr.
Lag time = 7.64 Min.
25% of lag time = 1.91 Min.
40% of lag time = 3.05 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
34.85	1.98	69.00

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
34.85	6.50	226.53

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 1.980(In)
Area Averaged 100-Year Rainfall = 6.500(In)

Point rain (area averaged) = 1.980(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.980(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
34.850	86.00	0.000

Total Area Entered = 34.85(Ac.)

RI AMC2	RI AMC-1	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
86.0	71.6	0.343	0.000	0.343	1.000	0.343
					Sum (F) =	0.343

Area averaged mean soil loss (F) (In/Hr) = 0.343
Minimum soil loss rate ((In/Hr)) = 0.172

(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	65.477	9.500	3.336
2	0.167	130.954	37.564	13.193
3	0.250	196.431	24.706	8.677
4	0.333	261.909	9.507	3.339
5	0.417	327.386	5.748	2.019
6	0.500	392.863	3.858	1.355
7	0.583	458.340	2.631	0.924
8	0.667	523.817	1.984	0.697
9	0.750	589.294	1.499	0.527
10	0.833	654.772	1.107	0.389
11	0.917	720.249	0.771	0.271
12	1.000	785.726	0.655	0.230
13	1.083	851.203	0.470	0.165
			Sum = 100.000	Sum= 35.122

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.016	(0.608)	0.014	0.002
2	0.17	0.07	0.016	(0.606)	0.014	0.002
3	0.25	0.07	0.016	(0.604)	0.014	0.002
4	0.33	0.10	0.024	(0.601)	0.021	0.002
5	0.42	0.10	0.024	(0.599)	0.021	0.002
6	0.50	0.10	0.024	(0.597)	0.021	0.002
7	0.58	0.10	0.024	(0.594)	0.021	0.002
8	0.67	0.10	0.024	(0.592)	0.021	0.002
9	0.75	0.10	0.024	(0.590)	0.021	0.002
10	0.83	0.13	0.032	(0.587)	0.029	0.003
11	0.92	0.13	0.032	(0.585)	0.029	0.003
12	1.00	0.13	0.032	(0.583)	0.029	0.003
13	1.08	0.10	0.024	(0.580)	0.021	0.002
14	1.17	0.10	0.024	(0.578)	0.021	0.002
15	1.25	0.10	0.024	(0.576)	0.021	0.002
16	1.33	0.10	0.024	(0.573)	0.021	0.002
17	1.42	0.10	0.024	(0.571)	0.021	0.002
18	1.50	0.10	0.024	(0.569)	0.021	0.002
19	1.58	0.10	0.024	(0.567)	0.021	0.002
20	1.67	0.10	0.024	(0.564)	0.021	0.002
21	1.75	0.10	0.024	(0.562)	0.021	0.002
22	1.83	0.13	0.032	(0.560)	0.029	0.003
23	1.92	0.13	0.032	(0.558)	0.029	0.003
24	2.00	0.13	0.032	(0.555)	0.029	0.003
25	2.08	0.13	0.032	(0.553)	0.029	0.003
26	2.17	0.13	0.032	(0.551)	0.029	0.003
27	2.25	0.13	0.032	(0.549)	0.029	0.003
28	2.33	0.13	0.032	(0.546)	0.029	0.003
29	2.42	0.13	0.032	(0.544)	0.029	0.003
30	2.50	0.13	0.032	(0.542)	0.029	0.003
31	2.58	0.17	0.040	(0.540)	0.036	0.004
32	2.67	0.17	0.040	(0.537)	0.036	0.004
33	2.75	0.17	0.040	(0.535)	0.036	0.004
34	2.83	0.17	0.040	(0.533)	0.036	0.004
35	2.92	0.17	0.040	(0.531)	0.036	0.004
36	3.00	0.17	0.040	(0.529)	0.036	0.004
37	3.08	0.17	0.040	(0.526)	0.036	0.004
38	3.17	0.17	0.040	(0.524)	0.036	0.004
39	3.25	0.17	0.040	(0.522)	0.036	0.004
40	3.33	0.17	0.040	(0.520)	0.036	0.004
41	3.42	0.17	0.040	(0.518)	0.036	0.004
42	3.50	0.17	0.040	(0.516)	0.036	0.004
43	3.58	0.17	0.040	(0.513)	0.036	0.004
44	3.67	0.17	0.040	(0.511)	0.036	0.004
45	3.75	0.17	0.040	(0.509)	0.036	0.004

46	3.83	0.20	0.048	(	0.507)	0.043	0.005
47	3.92	0.20	0.048	(	0.505)	0.043	0.005
48	4.00	0.20	0.048	(	0.503)	0.043	0.005
49	4.08	0.20	0.048	(	0.501)	0.043	0.005
50	4.17	0.20	0.048	(	0.498)	0.043	0.005
51	4.25	0.20	0.048	(	0.496)	0.043	0.005
52	4.33	0.23	0.055	(	0.494)	0.050	0.006
53	4.42	0.23	0.055	(	0.492)	0.050	0.006
54	4.50	0.23	0.055	(	0.490)	0.050	0.006
55	4.58	0.23	0.055	(	0.488)	0.050	0.006
56	4.67	0.23	0.055	(	0.486)	0.050	0.006
57	4.75	0.23	0.055	(	0.484)	0.050	0.006
58	4.83	0.27	0.063	(	0.482)	0.057	0.006
59	4.92	0.27	0.063	(	0.480)	0.057	0.006
60	5.00	0.27	0.063	(	0.477)	0.057	0.006
61	5.08	0.20	0.048	(	0.475)	0.043	0.005
62	5.17	0.20	0.048	(	0.473)	0.043	0.005
63	5.25	0.20	0.048	(	0.471)	0.043	0.005
64	5.33	0.23	0.055	(	0.469)	0.050	0.006
65	5.42	0.23	0.055	(	0.467)	0.050	0.006
66	5.50	0.23	0.055	(	0.465)	0.050	0.006
67	5.58	0.27	0.063	(	0.463)	0.057	0.006
68	5.67	0.27	0.063	(	0.461)	0.057	0.006
69	5.75	0.27	0.063	(	0.459)	0.057	0.006
70	5.83	0.27	0.063	(	0.457)	0.057	0.006
71	5.92	0.27	0.063	(	0.455)	0.057	0.006
72	6.00	0.27	0.063	(	0.453)	0.057	0.006
73	6.08	0.30	0.071	(	0.451)	0.064	0.007
74	6.17	0.30	0.071	(	0.449)	0.064	0.007
75	6.25	0.30	0.071	(	0.447)	0.064	0.007
76	6.33	0.30	0.071	(	0.445)	0.064	0.007
77	6.42	0.30	0.071	(	0.443)	0.064	0.007
78	6.50	0.30	0.071	(	0.441)	0.064	0.007
79	6.58	0.33	0.079	(	0.439)	0.071	0.008
80	6.67	0.33	0.079	(	0.437)	0.071	0.008
81	6.75	0.33	0.079	(	0.435)	0.071	0.008
82	6.83	0.33	0.079	(	0.433)	0.071	0.008
83	6.92	0.33	0.079	(	0.431)	0.071	0.008
84	7.00	0.33	0.079	(	0.429)	0.071	0.008
85	7.08	0.33	0.079	(	0.427)	0.071	0.008
86	7.17	0.33	0.079	(	0.425)	0.071	0.008
87	7.25	0.33	0.079	(	0.423)	0.071	0.008
88	7.33	0.37	0.087	(	0.421)	0.078	0.009
89	7.42	0.37	0.087	(	0.419)	0.078	0.009
90	7.50	0.37	0.087	(	0.417)	0.078	0.009
91	7.58	0.40	0.095	(	0.416)	0.086	0.010
92	7.67	0.40	0.095	(	0.414)	0.086	0.010
93	7.75	0.40	0.095	(	0.412)	0.086	0.010
94	7.83	0.43	0.103	(	0.410)	0.093	0.010
95	7.92	0.43	0.103	(	0.408)	0.093	0.010
96	8.00	0.43	0.103	(	0.406)	0.093	0.010
97	8.08	0.50	0.119	(	0.404)	0.107	0.012
98	8.17	0.50	0.119	(	0.402)	0.107	0.012
99	8.25	0.50	0.119	(	0.400)	0.107	0.012
100	8.33	0.50	0.119	(	0.399)	0.107	0.012
101	8.42	0.50	0.119	(	0.397)	0.107	0.012
102	8.50	0.50	0.119	(	0.395)	0.107	0.012
103	8.58	0.53	0.127	(	0.393)	0.114	0.013
104	8.67	0.53	0.127	(	0.391)	0.114	0.013
105	8.75	0.53	0.127	(	0.389)	0.114	0.013
106	8.83	0.57	0.135	(	0.387)	0.121	0.013
107	8.92	0.57	0.135	(	0.386)	0.121	0.013
108	9.00	0.57	0.135	(	0.384)	0.121	0.013
109	9.08	0.63	0.150	(	0.382)	0.135	0.015
110	9.17	0.63	0.150	(	0.380)	0.135	0.015
111	9.25	0.63	0.150	(	0.378)	0.135	0.015
112	9.33	0.67	0.158	(	0.377)	0.143	0.016
113	9.42	0.67	0.158	(	0.375)	0.143	0.016
114	9.50	0.67	0.158	(	0.373)	0.143	0.016
115	9.58	0.70	0.166	(	0.371)	0.150	0.017
116	9.67	0.70	0.166	(	0.369)	0.150	0.017
117	9.75	0.70	0.166	(	0.368)	0.150	0.017
118	9.83	0.73	0.174	(	0.366)	0.157	0.017
119	9.92	0.73	0.174	(	0.364)	0.157	0.017
120	10.00	0.73	0.174	(	0.362)	0.157	0.017
121	10.08	0.50	0.119	(	0.361)	0.107	0.012
122	10.17	0.50	0.119	(	0.359)	0.107	0.012
123	10.25	0.50	0.119	(	0.357)	0.107	0.012
124	10.33	0.50	0.119	(	0.355)	0.107	0.012

125	10.42	0.50	0.119	(	0.354)	0.107	0.012
126	10.50	0.50	0.119	(	0.352)	0.107	0.012
127	10.58	0.67	0.158	(	0.350)	0.143	0.016
128	10.67	0.67	0.158	(	0.348)	0.143	0.016
129	10.75	0.67	0.158	(	0.347)	0.143	0.016
130	10.83	0.67	0.158	(	0.345)	0.143	0.016
131	10.92	0.67	0.158	(	0.343)	0.143	0.016
132	11.00	0.67	0.158	(	0.342)	0.143	0.016
133	11.08	0.63	0.150	(	0.340)	0.135	0.015
134	11.17	0.63	0.150	(	0.338)	0.135	0.015
135	11.25	0.63	0.150	(	0.337)	0.135	0.015
136	11.33	0.63	0.150	(	0.335)	0.135	0.015
137	11.42	0.63	0.150	(	0.333)	0.135	0.015
138	11.50	0.63	0.150	(	0.332)	0.135	0.015
139	11.58	0.57	0.135	(	0.330)	0.121	0.013
140	11.67	0.57	0.135	(	0.328)	0.121	0.013
141	11.75	0.57	0.135	(	0.327)	0.121	0.013
142	11.83	0.60	0.143	(	0.325)	0.128	0.014
143	11.92	0.60	0.143	(	0.324)	0.128	0.014
144	12.00	0.60	0.143	(	0.322)	0.128	0.014
145	12.08	0.83	0.198	(	0.320)	0.178	0.020
146	12.17	0.83	0.198	(	0.319)	0.178	0.020
147	12.25	0.83	0.198	(	0.317)	0.178	0.020
148	12.33	0.87	0.206	(	0.316)	0.185	0.021
149	12.42	0.87	0.206	(	0.314)	0.185	0.021
150	12.50	0.87	0.206	(	0.312)	0.185	0.021
151	12.58	0.93	0.222	(	0.311)	0.200	0.022
152	12.67	0.93	0.222	(	0.309)	0.200	0.022
153	12.75	0.93	0.222	(	0.308)	0.200	0.022
154	12.83	0.97	0.230	(	0.306)	0.207	0.023
155	12.92	0.97	0.230	(	0.305)	0.207	0.023
156	13.00	0.97	0.230	(	0.303)	0.207	0.023
157	13.08	1.13	0.269	(	0.301)	0.242	0.027
158	13.17	1.13	0.269	(	0.300)	0.242	0.027
159	13.25	1.13	0.269	(	0.298)	0.242	0.027
160	13.33	1.13	0.269	(	0.297)	0.242	0.027
161	13.42	1.13	0.269	(	0.295)	0.242	0.027
162	13.50	1.13	0.269	(	0.294)	0.242	0.027
163	13.58	0.77	0.182	(	0.292)	0.164	0.018
164	13.67	0.77	0.182	(	0.291)	0.164	0.018
165	13.75	0.77	0.182	(	0.289)	0.164	0.018
166	13.83	0.77	0.182	(	0.288)	0.164	0.018
167	13.92	0.77	0.182	(	0.286)	0.164	0.018
168	14.00	0.77	0.182	(	0.285)	0.164	0.018
169	14.08	0.90	0.214	(	0.284)	0.192	0.021
170	14.17	0.90	0.214	(	0.282)	0.192	0.021
171	14.25	0.90	0.214	(	0.281)	0.192	0.021
172	14.33	0.87	0.206	(	0.279)	0.185	0.021
173	14.42	0.87	0.206	(	0.278)	0.185	0.021
174	14.50	0.87	0.206	(	0.276)	0.185	0.021
175	14.58	0.87	0.206	(	0.275)	0.185	0.021
176	14.67	0.87	0.206	(	0.274)	0.185	0.021
177	14.75	0.87	0.206	(	0.272)	0.185	0.021
178	14.83	0.83	0.198	(	0.271)	0.178	0.020
179	14.92	0.83	0.198	(	0.269)	0.178	0.020
180	15.00	0.83	0.198	(	0.268)	0.178	0.020
181	15.08	0.80	0.190	(	0.267)	0.171	0.019
182	15.17	0.80	0.190	(	0.265)	0.171	0.019
183	15.25	0.80	0.190	(	0.264)	0.171	0.019
184	15.33	0.77	0.182	(	0.263)	0.164	0.018
185	15.42	0.77	0.182	(	0.261)	0.164	0.018
186	15.50	0.77	0.182	(	0.260)	0.164	0.018
187	15.58	0.63	0.150	(	0.259)	0.135	0.015
188	15.67	0.63	0.150	(	0.257)	0.135	0.015
189	15.75	0.63	0.150	(	0.256)	0.135	0.015
190	15.83	0.63	0.150	(	0.255)	0.135	0.015
191	15.92	0.63	0.150	(	0.253)	0.135	0.015
192	16.00	0.63	0.150	(	0.252)	0.135	0.015
193	16.08	0.13	0.032	(	0.251)	0.029	0.003
194	16.17	0.13	0.032	(	0.249)	0.029	0.003
195	16.25	0.13	0.032	(	0.248)	0.029	0.003
196	16.33	0.13	0.032	(	0.247)	0.029	0.003
197	16.42	0.13	0.032	(	0.246)	0.029	0.003
198	16.50	0.13	0.032	(	0.244)	0.029	0.003
199	16.58	0.10	0.024	(	0.243)	0.021	0.002
200	16.67	0.10	0.024	(	0.242)	0.021	0.002
201	16.75	0.10	0.024	(	0.241)	0.021	0.002
202	16.83	0.10	0.024	(	0.239)	0.021	0.002
203	16.92	0.10	0.024	(	0.238)	0.021	0.002

204	17.00	0.10	0.024	(	0.237)	0.021	0.002
205	17.08	0.17	0.040	(	0.236)	0.036	0.004
206	17.17	0.17	0.040	(	0.235)	0.036	0.004
207	17.25	0.17	0.040	(	0.233)	0.036	0.004
208	17.33	0.17	0.040	(	0.232)	0.036	0.004
209	17.42	0.17	0.040	(	0.231)	0.036	0.004
210	17.50	0.17	0.040	(	0.230)	0.036	0.004
211	17.58	0.17	0.040	(	0.229)	0.036	0.004
212	17.67	0.17	0.040	(	0.228)	0.036	0.004
213	17.75	0.17	0.040	(	0.227)	0.036	0.004
214	17.83	0.13	0.032	(	0.225)	0.029	0.003
215	17.92	0.13	0.032	(	0.224)	0.029	0.003
216	18.00	0.13	0.032	(	0.223)	0.029	0.003
217	18.08	0.13	0.032	(	0.222)	0.029	0.003
218	18.17	0.13	0.032	(	0.221)	0.029	0.003
219	18.25	0.13	0.032	(	0.220)	0.029	0.003
220	18.33	0.13	0.032	(	0.219)	0.029	0.003
221	18.42	0.13	0.032	(	0.218)	0.029	0.003
222	18.50	0.13	0.032	(	0.217)	0.029	0.003
223	18.58	0.10	0.024	(	0.216)	0.021	0.002
224	18.67	0.10	0.024	(	0.215)	0.021	0.002
225	18.75	0.10	0.024	(	0.214)	0.021	0.002
226	18.83	0.07	0.016	(	0.213)	0.014	0.002
227	18.92	0.07	0.016	(	0.212)	0.014	0.002
228	19.00	0.07	0.016	(	0.211)	0.014	0.002
229	19.08	0.10	0.024	(	0.210)	0.021	0.002
230	19.17	0.10	0.024	(	0.209)	0.021	0.002
231	19.25	0.10	0.024	(	0.208)	0.021	0.002
232	19.33	0.13	0.032	(	0.207)	0.029	0.003
233	19.42	0.13	0.032	(	0.206)	0.029	0.003
234	19.50	0.13	0.032	(	0.205)	0.029	0.003
235	19.58	0.10	0.024	(	0.204)	0.021	0.002
236	19.67	0.10	0.024	(	0.203)	0.021	0.002
237	19.75	0.10	0.024	(	0.202)	0.021	0.002
238	19.83	0.07	0.016	(	0.201)	0.014	0.002
239	19.92	0.07	0.016	(	0.200)	0.014	0.002
240	20.00	0.07	0.016	(	0.199)	0.014	0.002
241	20.08	0.10	0.024	(	0.198)	0.021	0.002
242	20.17	0.10	0.024	(	0.197)	0.021	0.002
243	20.25	0.10	0.024	(	0.197)	0.021	0.002
244	20.33	0.10	0.024	(	0.196)	0.021	0.002
245	20.42	0.10	0.024	(	0.195)	0.021	0.002
246	20.50	0.10	0.024	(	0.194)	0.021	0.002
247	20.58	0.10	0.024	(	0.193)	0.021	0.002
248	20.67	0.10	0.024	(	0.192)	0.021	0.002
249	20.75	0.10	0.024	(	0.192)	0.021	0.002
250	20.83	0.07	0.016	(	0.191)	0.014	0.002
251	20.92	0.07	0.016	(	0.190)	0.014	0.002
252	21.00	0.07	0.016	(	0.189)	0.014	0.002
253	21.08	0.10	0.024	(	0.189)	0.021	0.002
254	21.17	0.10	0.024	(	0.188)	0.021	0.002
255	21.25	0.10	0.024	(	0.187)	0.021	0.002
256	21.33	0.07	0.016	(	0.186)	0.014	0.002
257	21.42	0.07	0.016	(	0.186)	0.014	0.002
258	21.50	0.07	0.016	(	0.185)	0.014	0.002
259	21.58	0.10	0.024	(	0.184)	0.021	0.002
260	21.67	0.10	0.024	(	0.184)	0.021	0.002
261	21.75	0.10	0.024	(	0.183)	0.021	0.002
262	21.83	0.07	0.016	(	0.182)	0.014	0.002
263	21.92	0.07	0.016	(	0.182)	0.014	0.002
264	22.00	0.07	0.016	(	0.181)	0.014	0.002
265	22.08	0.10	0.024	(	0.181)	0.021	0.002
266	22.17	0.10	0.024	(	0.180)	0.021	0.002
267	22.25	0.10	0.024	(	0.179)	0.021	0.002
268	22.33	0.07	0.016	(	0.179)	0.014	0.002
269	22.42	0.07	0.016	(	0.178)	0.014	0.002
270	22.50	0.07	0.016	(	0.178)	0.014	0.002
271	22.58	0.07	0.016	(	0.177)	0.014	0.002
272	22.67	0.07	0.016	(	0.177)	0.014	0.002
273	22.75	0.07	0.016	(	0.176)	0.014	0.002
274	22.83	0.07	0.016	(	0.176)	0.014	0.002
275	22.92	0.07	0.016	(	0.175)	0.014	0.002
276	23.00	0.07	0.016	(	0.175)	0.014	0.002
277	23.08	0.07	0.016	(	0.175)	0.014	0.002
278	23.17	0.07	0.016	(	0.174)	0.014	0.002
279	23.25	0.07	0.016	(	0.174)	0.014	0.002
280	23.33	0.07	0.016	(	0.173)	0.014	0.002
281	23.42	0.07	0.016	(	0.173)	0.014	0.002
282	23.50	0.07	0.016	(	0.173)	0.014	0.002

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283  23.58     0.07      0.016       (  0.173)       0.014        0.002
284  23.67     0.07      0.016       (  0.172)       0.014        0.002
285  23.75     0.07      0.016       (  0.172)       0.014        0.002
286  23.83     0.07      0.016       (  0.172)       0.014        0.002
287  23.92     0.07      0.016       (  0.172)       0.014        0.002
288  24.00     0.07      0.016       (  0.172)       0.014        0.002
              (Loss Rate Not Used)
    Sum =     100.0                                  Sum =     2.4
       Flood volume = Effective rainfall      0.20(In)
        times area      34.9(Ac.)/[(In)/(Ft.)] =       0.6(Ac.Ft)
       Total soil loss =      1.78(In)
       Total soil loss =     5.175(Ac.Ft)
       Total rainfall =      1.98(In)
       Flood volume =       25046.4 Cubic Feet
       Total soil loss =      225417.5 Cubic Feet
       ---------------------------------------------------------------------
        Peak flow rate of this hydrograph =      0.932(CFS)
       ---------------------------------------------------------------------
       +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          24 - H O U R    S T O R M
                     R u n o f f      H y d r o g r a p h
       ---------------------------------------------------------------------
                  Hydrograph in   5   Minute intervals ((CFS))

       ---------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5       5.0       7.5      10.0
 ---------------------------------------------------------------------------
   0+ 5       0.0000      0.01  Q         |         |         |         |
   0+10       0.0002      0.03  Q         |         |         |         |
   0+15       0.0005      0.04  Q         |         |         |         |
   0+20       0.0008      0.05  Q         |         |         |         |
   0+25       0.0012      0.06  Q         |         |         |         |
   0+30       0.0017      0.07  Q         |         |         |         |
   0+35       0.0022      0.07  Q         |         |         |         |
   0+40       0.0028      0.08  Q         |         |         |         |
   0+45       0.0033      0.08  Q         |         |         |         |
   0+50       0.0039      0.08  Q         |         |         |         |
   0+55       0.0046      0.09  Q         |         |         |         |
   1+ 0       0.0053      0.10  Q         |         |         |         |
   1+ 5       0.0060      0.10  Q         |         |         |         |
   1+10       0.0066      0.09  Q         |         |         |         |
   1+15       0.0072      0.09  Q         |         |         |         |
   1+20       0.0078      0.09  Q         |         |         |         |
   1+25       0.0084      0.09  Q         |         |         |         |
   1+30       0.0090      0.09  Q         |         |         |         |
   1+35       0.0096      0.08  Q         |         |         |         |
   1+40       0.0102      0.08  Q         |         |         |         |
   1+45       0.0107      0.08  Q         |         |         |         |
   1+50       0.0113      0.09  Q         |         |         |         |
   1+55       0.0120      0.10  Q         |         |         |         |
   2+ 0       0.0127      0.10  Q         |         |         |         |
   2+ 5       0.0135      0.11  Q         |         |         |         |
   2+10       0.0142      0.11  Q         |         |         |         |
   2+15       0.0149      0.11  QV        |         |         |         |
   2+20       0.0157      0.11  QV        |         |         |         |
   2+25       0.0165      0.11  QV        |         |         |         |
   2+30       0.0172      0.11  QV        |         |         |         |
   2+35       0.0180      0.11  QV        |         |         |         |
   2+40       0.0189      0.12  QV        |         |         |         |
   2+45       0.0198      0.13  QV        |         |         |         |
   2+50       0.0207      0.13  QV        |         |         |         |
   2+55       0.0216      0.14  QV        |         |         |         |
   3+ 0       0.0226      0.14  QV        |         |         |         |
   3+ 5       0.0235      0.14  QV        |         |         |         |
   3+10       0.0244      0.14  QV        |         |         |         |
   3+15       0.0254      0.14  QV        |         |         |         |
   3+20       0.0264      0.14  QV        |         |         |         |
   3+25       0.0273      0.14  QV        |         |         |         |
   3+30       0.0283      0.14  QV        |         |         |         |
   3+35       0.0292      0.14  Q V       |         |         |         |
   3+40       0.0302      0.14  Q V       |         |         |         |
   3+45       0.0311      0.14  Q V       |         |         |         |
   3+50       0.0321      0.14  Q V       |         |         |         |
   3+55       0.0332      0.15  Q V       |         |         |         |
   4+ 0       0.0343      0.16  Q V       |         |         |         |
   4+ 5       0.0354      0.16  Q V       |         |         |         |
   4+10       0.0365      0.16  Q V       |         |         |         |
   4+15       0.0376      0.16  Q V       |         |         |         |
   4+20       0.0388      0.17  Q V       |         |         |         |
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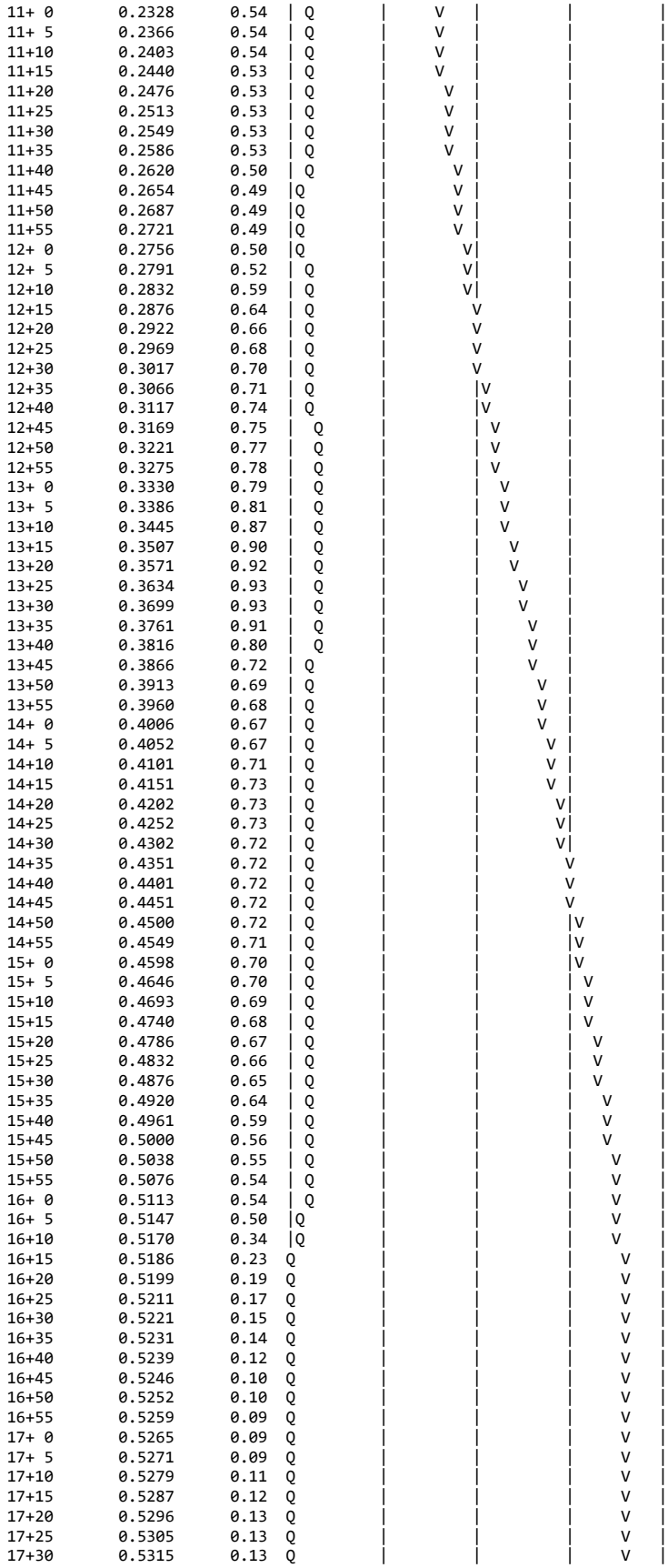
 4+25       0.0400      0.18  Q V       |         |         |         |
 4+30       0.0413      0.19  Q V       |         |         |         |
 4+35       0.0426      0.19  Q V       |         |         |         |
 4+40       0.0439      0.19  Q  V      |         |         |         |
 4+45       0.0452      0.19  Q  V      |         |         |         |
 4+50       0.0466      0.20  Q  V      |         |         |         |
 4+55       0.0480      0.21  Q  V      |         |         |         |
 5+ 0       0.0495      0.21  Q  V      |         |         |         |
 5+ 5       0.0509      0.21  Q  V      |         |         |         |
 5+10       0.0523      0.19  Q  V      |         |         |         |
 5+15       0.0535      0.18  Q  V      |         |         |         |
 5+20       0.0547      0.18  Q  V      |         |         |         |
 5+25       0.0560      0.19  Q  V      |         |         |         |
 5+30       0.0573      0.19  Q  V      |         |         |         |
 5+35       0.0587      0.20  Q   V     |         |         |         |
 5+40       0.0601      0.21  Q   V     |         |         |         |
 5+45       0.0616      0.21  Q   V     |         |         |         |
 5+50       0.0631      0.22  Q   V     |         |         |         |
 5+55       0.0646      0.22  Q   V     |         |         |         |
 6+ 0       0.0661      0.22  Q   V     |         |         |         |
 6+ 5       0.0676      0.22  Q   V     |         |         |         |
 6+10       0.0692      0.23  Q   V     |         |         |         |
 6+15       0.0709      0.24  Q   V     |         |         |         |
 6+20       0.0726      0.24  Q    V    |         |         |         |
 6+25       0.0743      0.25  Q    V    |         |         |         |
 6+30       0.0760      0.25  Q    V    |         |         |         |
 6+35       0.0777      0.25  |Q   V    |         |         |         |
 6+40       0.0795      0.26  |Q   V    |         |         |         |
 6+45       0.0814      0.27  |Q   V    |         |         |         |
 6+50       0.0833      0.27  |Q   V    |         |         |         |
 6+55       0.0852      0.27  |Q   V    |         |         |         |
 7+ 0       0.0870      0.28  |Q    V   |         |         |         |
 7+ 5       0.0890      0.28  |Q    V   |         |         |         |
 7+10       0.0909      0.28  |Q    V   |         |         |         |
 7+15       0.0928      0.28  |Q    V   |         |         |         |
 7+20       0.0947      0.28  |Q    V   |         |         |         |
 7+25       0.0967      0.29  |Q    V   |         |         |         |
 7+30       0.0988      0.30  |Q    V   |         |         |         |
 7+35       0.1009      0.30  |Q     V  |         |         |         |
 7+40       0.1030      0.32  |Q     V  |         |         |         |
 7+45       0.1053      0.32  |Q     V  |         |         |         |
 7+50       0.1075      0.33  |Q     V  |         |         |         |
 7+55       0.1099      0.34  |Q     V  |         |         |         |
 8+ 0       0.1123      0.35  |Q     V  |         |         |         |
 8+ 5       0.1148      0.36  |Q     V  |         |         |         |
 8+10       0.1174      0.38  |Q      V |         |         |         |
 8+15       0.1201      0.40  |Q      V |         |         |         |
 8+20       0.1229      0.40  |Q      V |         |         |         |
 8+25       0.1258      0.41  |Q      V |         |         |         |
 8+30       0.1286      0.41  |Q      V |         |         |         |
 8+35       0.1314      0.42  |Q       V|         |         |         |
 8+40       0.1344      0.43  |Q       V|         |         |         |
 8+45       0.1374      0.44  |Q       V|         |         |         |
 8+50       0.1404      0.44  |Q       V|         |         |         |
 8+55       0.1436      0.45  |Q       V|         |         |         |
 9+ 0       0.1467      0.46  |Q        V         |         |         |
 9+ 5       0.1500      0.47  |Q        V         |         |         |
 9+10       0.1534      0.49  |Q        V         |         |         |
 9+15       0.1569      0.51  | Q       V         |         |         |
 9+20       0.1605      0.52  | Q       |V        |         |         |
 9+25       0.1642      0.53  | Q       |V        |         |         |
 9+30       0.1679      0.54  | Q       |V        |         |         |
 9+35       0.1717      0.55  | Q       |V        |         |         |
 9+40       0.1756      0.56  | Q       | V       |         |         |
 9+45       0.1795      0.57  | Q       | V       |         |         |
 9+50       0.1835      0.58  | Q       | V       |         |         |
 9+55       0.1876      0.59  | Q       |  V      |         |         |
10+ 0       0.1917      0.60  | Q       |  V      |         |         |
10+ 5       0.1957      0.59  | Q       |  V      |         |         |
10+10       0.1993      0.52  | Q       |  V      |         |         |
10+15       0.2025      0.47  |Q        |   V     |         |         |
10+20       0.2056      0.45  |Q        |   V     |         |         |
10+25       0.2087      0.44  |Q        |   V     |         |         |
10+30       0.2117      0.43  |Q        |   V     |         |         |
10+35       0.2147      0.44  |Q        |   V     |         |         |
10+40       0.2181      0.49  |Q        |    V    |         |         |
10+45       0.2217      0.52  | Q       |    V    |         |         |
10+50       0.2254      0.53  | Q       |    V    |         |         |
10+55       0.2291      0.54  | Q       |    V    |         |         |
```



17+35	0.5324	0.14	Q	|	|	|	V |
17+40	0.5333	0.14	Q	|	|	|	V |
17+45	0.5343	0.14	Q	|	|	|	V |
17+50	0.5352	0.14	Q	|	|	|	V |
17+55	0.5361	0.13	Q	|	|	|	V |
18+ 0	0.5369	0.12	Q	|	|	|	V |
18+ 5	0.5377	0.12	Q	|	|	|	V |
18+10	0.5385	0.11	Q	|	|	|	V |
18+15	0.5393	0.11	Q	|	|	|	V |
18+20	0.5400	0.11	Q	|	|	|	V |
18+25	0.5408	0.11	Q	|	|	|	V |
18+30	0.5416	0.11	Q	|	|	|	V |
18+35	0.5423	0.11	Q	|	|	|	V |
18+40	0.5430	0.10	Q	|	|	|	V |
18+45	0.5437	0.09	Q	|	|	|	V |
18+50	0.5442	0.09	Q	|	|	|	V |
18+55	0.5448	0.07	Q	|	|	|	V |
19+ 0	0.5452	0.07	Q	|	|	|	V |
19+ 5	0.5457	0.07	Q	|	|	|	V |
19+10	0.5462	0.07	Q	|	|	|	V |
19+15	0.5467	0.08	Q	|	|	|	V |
19+20	0.5473	0.08	Q	|	|	|	V |
19+25	0.5479	0.09	Q	|	|	|	V |
19+30	0.5486	0.10	Q	|	|	|	V |
19+35	0.5493	0.10	Q	|	|	|	V |
19+40	0.5500	0.09	Q	|	|	|	V |
19+45	0.5506	0.09	Q	|	|	|	V |
19+50	0.5512	0.08	Q	|	|	|	V |
19+55	0.5517	0.07	Q	|	|	|	V |
20+ 0	0.5521	0.07	Q	|	|	|	V |
20+ 5	0.5526	0.06	Q	|	|	|	V |
20+10	0.5531	0.07	Q	|	|	|	V |
20+15	0.5536	0.08	Q	|	|	|	V |
20+20	0.5542	0.08	Q	|	|	|	V |
20+25	0.5547	0.08	Q	|	|	|	V |
20+30	0.5553	0.08	Q	|	|	|	V |
20+35	0.5559	0.08	Q	|	|	|	V |
20+40	0.5564	0.08	Q	|	|	|	V |
20+45	0.5570	0.08	Q	|	|	|	V |
20+50	0.5575	0.08	Q	|	|	|	V |
20+55	0.5580	0.07	Q	|	|	|	V |
21+ 0	0.5585	0.06	Q	|	|	|	V |
21+ 5	0.5589	0.06	Q	|	|	|	V |
21+10	0.5594	0.07	Q	|	|	|	V |
21+15	0.5599	0.08	Q	|	|	|	V |
21+20	0.5605	0.08	Q	|	|	|	V |
21+25	0.5609	0.07	Q	|	|	|	V|
21+30	0.5614	0.06	Q	|	|	|	V|
21+35	0.5618	0.06	Q	|	|	|	V|
21+40	0.5623	0.07	Q	|	|	|	V|
21+45	0.5628	0.08	Q	|	|	|	V|
21+50	0.5634	0.08	Q	|	|	|	V|
21+55	0.5638	0.07	Q	|	|	|	V|
22+ 0	0.5642	0.06	Q	|	|	|	V|
22+ 5	0.5647	0.06	Q	|	|	|	V|
22+10	0.5652	0.07	Q	|	|	|	V|
22+15	0.5657	0.08	Q	|	|	|	V|
22+20	0.5662	0.08	Q	|	|	|	V|
22+25	0.5667	0.07	Q	|	|	|	V|
22+30	0.5671	0.06	Q	|	|	|	V|
22+35	0.5675	0.06	Q	|	|	|	V|
22+40	0.5679	0.06	Q	|	|	|	V|
22+45	0.5683	0.06	Q	|	|	|	V|
22+50	0.5687	0.06	Q	|	|	|	V|
22+55	0.5691	0.06	Q	|	|	|	V|
23+ 0	0.5695	0.06	Q	|	|	|	V|
23+ 5	0.5699	0.06	Q	|	|	|	V|
23+10	0.5703	0.06	Q	|	|	|	V|
23+15	0.5707	0.06	Q	|	|	|	V|
23+20	0.5710	0.06	Q	|	|	|	V|
23+25	0.5714	0.06	Q	|	|	|	V|
23+30	0.5718	0.06	Q	|	|	|	V|
23+35	0.5722	0.06	Q	|	|	|	V|
23+40	0.5726	0.06	Q	|	|	|	V|
23+45	0.5730	0.06	Q	|	|	|	V|
23+50	0.5733	0.06	Q	|	|	|	V|
23+55	0.5737	0.06	Q	|	|	|	V|
24+ 0	0.5741	0.06	Q	|	|	|	V|
24+ 5	0.5745	0.05	Q	|	|	|	V|

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  24+10       0.5747      0.03  Q        |         |         |        V|
  24+15       0.5748      0.02  Q        |         |         |        V|
  24+20       0.5748      0.01  Q        |         |         |        V|
  24+25       0.5749      0.01  Q        |         |         |        V|
  24+30       0.5749      0.01  Q        |         |         |        V|
  24+35       0.5749      0.00  Q        |         |         |        V|
  24+40       0.5750      0.00  Q        |         |         |        V|
  24+45       0.5750      0.00  Q        |         |         |        V|
  24+50       0.5750      0.00  Q        |         |         |        V|
  24+55       0.5750      0.00  Q        |         |         |        V|
  25+ 0       0.5750      0.00  Q        |         |         |         V
-------------------------------------------------------------------------
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U n i t H y d r o g r a p h A n a l y s i s

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Study date 01/11/21 File: 3905PR2242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6400

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

TEMESCAL VALLEY COMMERCE CENTER
PROPOSED CONDITION
2-YEAR 24-HOUR

Drainage Area = 34.85(Ac.) = 0.054 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 34.85(Ac.) = 0.054 Sq. Mi.
Length along longest watercourse = 2794.00(Ft.)
Length along longest watercourse measured to centroid = 1445.00(Ft.)
Length along longest watercourse = 0.529 Mi.
Length along longest watercourse measured to centroid = 0.274 Mi.
Difference in elevation = 38.13(Ft.)
Slope along watercourse = 72.0567 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.077 Hr.
Lag time = 4.60 Min.
25% of lag time = 1.15 Min.
40% of lag time = 1.84 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
34.85	1.98	69.00

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
34.85	6.50	226.53

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 1.980(In)
Area Averaged 100-Year Rainfall = 6.500(In)

Point rain (area averaged) = 1.980(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.980(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
34.850	56.00	0.900

Total Area Entered = 34.85(Ac.)

RI AMC2	RI AMC-1	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
56.0	36.0	0.706	0.900	0.134	1.000	0.134
					Sum (F) =	0.134

Area averaged mean soil loss (F) (In/Hr) = 0.134
Minimum soil loss rate ((In/Hr)) = 0.067

(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	108.733	21.858	7.677
2	0.167	217.465	48.812	17.144
3	0.250	326.198	14.457	5.078
4	0.333	434.931	6.609	2.321
5	0.417	543.664	3.671	1.289
6	0.500	652.396	2.307	0.810
7	0.583	761.129	1.354	0.476
8	0.667	869.862	0.932	0.327
			Sum = 100.000	Sum= 35.122

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.016	(0.238)	0.003	0.013
2	0.17	0.07	0.016	(0.237)	0.003	0.013
3	0.25	0.07	0.016	(0.236)	0.003	0.013
4	0.33	0.10	0.024	(0.235)	0.004	0.019
5	0.42	0.10	0.024	(0.234)	0.004	0.019
6	0.50	0.10	0.024	(0.233)	0.004	0.019
7	0.58	0.10	0.024	(0.232)	0.004	0.019
8	0.67	0.10	0.024	(0.231)	0.004	0.019
9	0.75	0.10	0.024	(0.230)	0.004	0.019
10	0.83	0.13	0.032	(0.230)	0.006	0.026
11	0.92	0.13	0.032	(0.229)	0.006	0.026
12	1.00	0.13	0.032	(0.228)	0.006	0.026
13	1.08	0.10	0.024	(0.227)	0.004	0.019
14	1.17	0.10	0.024	(0.226)	0.004	0.019
15	1.25	0.10	0.024	(0.225)	0.004	0.019
16	1.33	0.10	0.024	(0.224)	0.004	0.019
17	1.42	0.10	0.024	(0.223)	0.004	0.019
18	1.50	0.10	0.024	(0.222)	0.004	0.019
19	1.58	0.10	0.024	(0.222)	0.004	0.019
20	1.67	0.10	0.024	(0.221)	0.004	0.019
21	1.75	0.10	0.024	(0.220)	0.004	0.019
22	1.83	0.13	0.032	(0.219)	0.006	0.026
23	1.92	0.13	0.032	(0.218)	0.006	0.026
24	2.00	0.13	0.032	(0.217)	0.006	0.026
25	2.08	0.13	0.032	(0.216)	0.006	0.026
26	2.17	0.13	0.032	(0.215)	0.006	0.026
27	2.25	0.13	0.032	(0.214)	0.006	0.026
28	2.33	0.13	0.032	(0.214)	0.006	0.026
29	2.42	0.13	0.032	(0.213)	0.006	0.026
30	2.50	0.13	0.032	(0.212)	0.006	0.026
31	2.58	0.17	0.040	(0.211)	0.007	0.032
32	2.67	0.17	0.040	(0.210)	0.007	0.032
33	2.75	0.17	0.040	(0.209)	0.007	0.032
34	2.83	0.17	0.040	(0.208)	0.007	0.032
35	2.92	0.17	0.040	(0.208)	0.007	0.032
36	3.00	0.17	0.040	(0.207)	0.007	0.032
37	3.08	0.17	0.040	(0.206)	0.007	0.032
38	3.17	0.17	0.040	(0.205)	0.007	0.032
39	3.25	0.17	0.040	(0.204)	0.007	0.032
40	3.33	0.17	0.040	(0.203)	0.007	0.032
41	3.42	0.17	0.040	(0.202)	0.007	0.032
42	3.50	0.17	0.040	(0.202)	0.007	0.032
43	3.58	0.17	0.040	(0.201)	0.007	0.032
44	3.67	0.17	0.040	(0.200)	0.007	0.032
45	3.75	0.17	0.040	(0.199)	0.007	0.032
46	3.83	0.20	0.048	(0.198)	0.009	0.039
47	3.92	0.20	0.048	(0.197)	0.009	0.039
48	4.00	0.20	0.048	(0.197)	0.009	0.039
49	4.08	0.20	0.048	(0.196)	0.009	0.039
50	4.17	0.20	0.048	(0.195)	0.009	0.039

51	4.25	0.20	0.048	(	0.194)	0.009	0.039
52	4.33	0.23	0.055	(	0.193)	0.010	0.045
53	4.42	0.23	0.055	(	0.192)	0.010	0.045
54	4.50	0.23	0.055	(	0.192)	0.010	0.045
55	4.58	0.23	0.055	(	0.191)	0.010	0.045
56	4.67	0.23	0.055	(	0.190)	0.010	0.045
57	4.75	0.23	0.055	(	0.189)	0.010	0.045
58	4.83	0.27	0.063	(	0.188)	0.011	0.052
59	4.92	0.27	0.063	(	0.187)	0.011	0.052
60	5.00	0.27	0.063	(	0.187)	0.011	0.052
61	5.08	0.20	0.048	(	0.186)	0.009	0.039
62	5.17	0.20	0.048	(	0.185)	0.009	0.039
63	5.25	0.20	0.048	(	0.184)	0.009	0.039
64	5.33	0.23	0.055	(	0.183)	0.010	0.045
65	5.42	0.23	0.055	(	0.183)	0.010	0.045
66	5.50	0.23	0.055	(	0.182)	0.010	0.045
67	5.58	0.27	0.063	(	0.181)	0.011	0.052
68	5.67	0.27	0.063	(	0.180)	0.011	0.052
69	5.75	0.27	0.063	(	0.179)	0.011	0.052
70	5.83	0.27	0.063	(	0.179)	0.011	0.052
71	5.92	0.27	0.063	(	0.178)	0.011	0.052
72	6.00	0.27	0.063	(	0.177)	0.011	0.052
73	6.08	0.30	0.071	(	0.176)	0.013	0.058
74	6.17	0.30	0.071	(	0.175)	0.013	0.058
75	6.25	0.30	0.071	(	0.175)	0.013	0.058
76	6.33	0.30	0.071	(	0.174)	0.013	0.058
77	6.42	0.30	0.071	(	0.173)	0.013	0.058
78	6.50	0.30	0.071	(	0.172)	0.013	0.058
79	6.58	0.33	0.079	(	0.172)	0.014	0.065
80	6.67	0.33	0.079	(	0.171)	0.014	0.065
81	6.75	0.33	0.079	(	0.170)	0.014	0.065
82	6.83	0.33	0.079	(	0.169)	0.014	0.065
83	6.92	0.33	0.079	(	0.169)	0.014	0.065
84	7.00	0.33	0.079	(	0.168)	0.014	0.065
85	7.08	0.33	0.079	(	0.167)	0.014	0.065
86	7.17	0.33	0.079	(	0.166)	0.014	0.065
87	7.25	0.33	0.079	(	0.165)	0.014	0.065
88	7.33	0.37	0.087	(	0.165)	0.016	0.071
89	7.42	0.37	0.087	(	0.164)	0.016	0.071
90	7.50	0.37	0.087	(	0.163)	0.016	0.071
91	7.58	0.40	0.095	(	0.162)	0.017	0.078
92	7.67	0.40	0.095	(	0.162)	0.017	0.078
93	7.75	0.40	0.095	(	0.161)	0.017	0.078
94	7.83	0.43	0.103	(	0.160)	0.019	0.084
95	7.92	0.43	0.103	(	0.159)	0.019	0.084
96	8.00	0.43	0.103	(	0.159)	0.019	0.084
97	8.08	0.50	0.119	(	0.158)	0.021	0.097
98	8.17	0.50	0.119	(	0.157)	0.021	0.097
99	8.25	0.50	0.119	(	0.157)	0.021	0.097
100	8.33	0.50	0.119	(	0.156)	0.021	0.097
101	8.42	0.50	0.119	(	0.155)	0.021	0.097
102	8.50	0.50	0.119	(	0.154)	0.021	0.097
103	8.58	0.53	0.127	(	0.154)	0.023	0.104
104	8.67	0.53	0.127	(	0.153)	0.023	0.104
105	8.75	0.53	0.127	(	0.152)	0.023	0.104
106	8.83	0.57	0.135	(	0.151)	0.024	0.110
107	8.92	0.57	0.135	(	0.151)	0.024	0.110
108	9.00	0.57	0.135	(	0.150)	0.024	0.110
109	9.08	0.63	0.150	(	0.149)	0.027	0.123
110	9.17	0.63	0.150	(	0.149)	0.027	0.123
111	9.25	0.63	0.150	(	0.148)	0.027	0.123
112	9.33	0.67	0.158	(	0.147)	0.029	0.130
113	9.42	0.67	0.158	(	0.147)	0.029	0.130
114	9.50	0.67	0.158	(	0.146)	0.029	0.130
115	9.58	0.70	0.166	(	0.145)	0.030	0.136
116	9.67	0.70	0.166	(	0.144)	0.030	0.136
117	9.75	0.70	0.166	(	0.144)	0.030	0.136
118	9.83	0.73	0.174	(	0.143)	0.031	0.143
119	9.92	0.73	0.174	(	0.142)	0.031	0.143
120	10.00	0.73	0.174	(	0.142)	0.031	0.143
121	10.08	0.50	0.119	(	0.141)	0.021	0.097
122	10.17	0.50	0.119	(	0.140)	0.021	0.097
123	10.25	0.50	0.119	(	0.140)	0.021	0.097
124	10.33	0.50	0.119	(	0.139)	0.021	0.097
125	10.42	0.50	0.119	(	0.138)	0.021	0.097
126	10.50	0.50	0.119	(	0.138)	0.021	0.097
127	10.58	0.67	0.158	(	0.137)	0.029	0.130
128	10.67	0.67	0.158	(	0.136)	0.029	0.130
129	10.75	0.67	0.158	(	0.136)	0.029	0.130

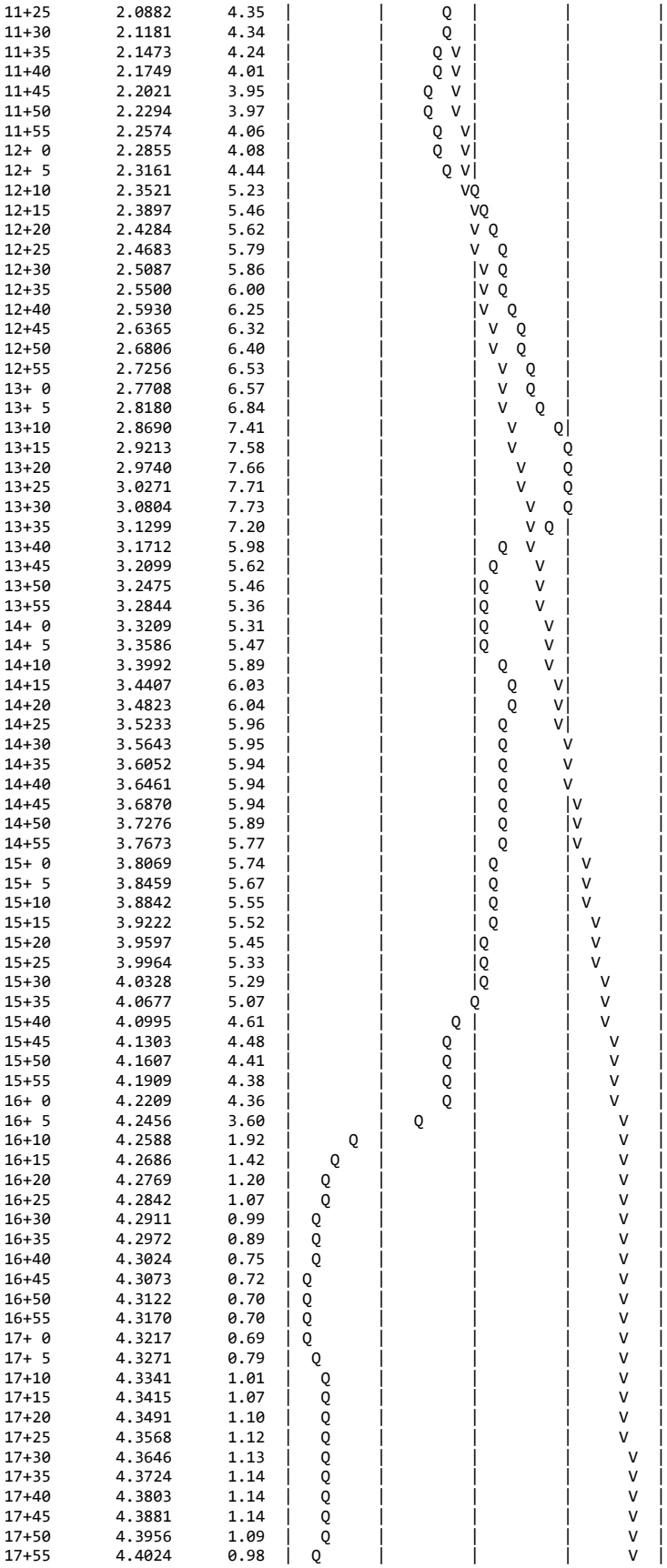
130	10.83	0.67	0.158	(	0.135)	0.029	0.130
131	10.92	0.67	0.158	(	0.134)	0.029	0.130
132	11.00	0.67	0.158	(	0.134)	0.029	0.130
133	11.08	0.63	0.150	(	0.133)	0.027	0.123
134	11.17	0.63	0.150	(	0.132)	0.027	0.123
135	11.25	0.63	0.150	(	0.132)	0.027	0.123
136	11.33	0.63	0.150	(	0.131)	0.027	0.123
137	11.42	0.63	0.150	(	0.130)	0.027	0.123
138	11.50	0.63	0.150	(	0.130)	0.027	0.123
139	11.58	0.57	0.135	(	0.129)	0.024	0.110
140	11.67	0.57	0.135	(	0.128)	0.024	0.110
141	11.75	0.57	0.135	(	0.128)	0.024	0.110
142	11.83	0.60	0.143	(	0.127)	0.026	0.117
143	11.92	0.60	0.143	(	0.126)	0.026	0.117
144	12.00	0.60	0.143	(	0.126)	0.026	0.117
145	12.08	0.83	0.198	(	0.125)	0.036	0.162
146	12.17	0.83	0.198	(	0.125)	0.036	0.162
147	12.25	0.83	0.198	(	0.124)	0.036	0.162
148	12.33	0.87	0.206	(	0.123)	0.037	0.169
149	12.42	0.87	0.206	(	0.123)	0.037	0.169
150	12.50	0.87	0.206	(	0.122)	0.037	0.169
151	12.58	0.93	0.222	(	0.121)	0.040	0.182
152	12.67	0.93	0.222	(	0.121)	0.040	0.182
153	12.75	0.93	0.222	(	0.120)	0.040	0.182
154	12.83	0.97	0.230	(	0.120)	0.041	0.188
155	12.92	0.97	0.230	(	0.119)	0.041	0.188
156	13.00	0.97	0.230	(	0.118)	0.041	0.188
157	13.08	1.13	0.269	(	0.118)	0.048	0.221
158	13.17	1.13	0.269	(	0.117)	0.048	0.221
159	13.25	1.13	0.269	(	0.117)	0.048	0.221
160	13.33	1.13	0.269	(	0.116)	0.048	0.221
161	13.42	1.13	0.269	(	0.115)	0.048	0.221
162	13.50	1.13	0.269	(	0.115)	0.048	0.221
163	13.58	0.77	0.182	(	0.114)	0.033	0.149
164	13.67	0.77	0.182	(	0.114)	0.033	0.149
165	13.75	0.77	0.182	(	0.113)	0.033	0.149
166	13.83	0.77	0.182	(	0.113)	0.033	0.149
167	13.92	0.77	0.182	(	0.112)	0.033	0.149
168	14.00	0.77	0.182	(	0.111)	0.033	0.149
169	14.08	0.90	0.214	(	0.111)	0.038	0.175
170	14.17	0.90	0.214	(	0.110)	0.038	0.175
171	14.25	0.90	0.214	(	0.110)	0.038	0.175
172	14.33	0.87	0.206	(	0.109)	0.037	0.169
173	14.42	0.87	0.206	(	0.109)	0.037	0.169
174	14.50	0.87	0.206	(	0.108)	0.037	0.169
175	14.58	0.87	0.206	(	0.107)	0.037	0.169
176	14.67	0.87	0.206	(	0.107)	0.037	0.169
177	14.75	0.87	0.206	(	0.106)	0.037	0.169
178	14.83	0.83	0.198	(	0.106)	0.036	0.162
179	14.92	0.83	0.198	(	0.105)	0.036	0.162
180	15.00	0.83	0.198	(	0.105)	0.036	0.162
181	15.08	0.80	0.190	(	0.104)	0.034	0.156
182	15.17	0.80	0.190	(	0.104)	0.034	0.156
183	15.25	0.80	0.190	(	0.103)	0.034	0.156
184	15.33	0.77	0.182	(	0.103)	0.033	0.149
185	15.42	0.77	0.182	(	0.102)	0.033	0.149
186	15.50	0.77	0.182	(	0.102)	0.033	0.149
187	15.58	0.63	0.150	(	0.101)	0.027	0.123
188	15.67	0.63	0.150	(	0.101)	0.027	0.123
189	15.75	0.63	0.150	(	0.100)	0.027	0.123
190	15.83	0.63	0.150	(	0.100)	0.027	0.123
191	15.92	0.63	0.150	(	0.099)	0.027	0.123
192	16.00	0.63	0.150	(	0.099)	0.027	0.123
193	16.08	0.13	0.032	(	0.098)	0.006	0.026
194	16.17	0.13	0.032	(	0.098)	0.006	0.026
195	16.25	0.13	0.032	(	0.097)	0.006	0.026
196	16.33	0.13	0.032	(	0.097)	0.006	0.026
197	16.42	0.13	0.032	(	0.096)	0.006	0.026
198	16.50	0.13	0.032	(	0.096)	0.006	0.026
199	16.58	0.10	0.024	(	0.095)	0.004	0.019
200	16.67	0.10	0.024	(	0.095)	0.004	0.019
201	16.75	0.10	0.024	(	0.094)	0.004	0.019
202	16.83	0.10	0.024	(	0.094)	0.004	0.019
203	16.92	0.10	0.024	(	0.093)	0.004	0.019
204	17.00	0.10	0.024	(	0.093)	0.004	0.019
205	17.08	0.17	0.040	(	0.092)	0.007	0.032
206	17.17	0.17	0.040	(	0.092)	0.007	0.032
207	17.25	0.17	0.040	(	0.091)	0.007	0.032
208	17.33	0.17	0.040	(	0.091)	0.007	0.032

209	17.42	0.17	0.040	(	0.090)	0.007	0.032
210	17.50	0.17	0.040	(	0.090)	0.007	0.032
211	17.58	0.17	0.040	(	0.089)	0.007	0.032
212	17.67	0.17	0.040	(	0.089)	0.007	0.032
213	17.75	0.17	0.040	(	0.089)	0.007	0.032
214	17.83	0.13	0.032	(	0.088)	0.006	0.026
215	17.92	0.13	0.032	(	0.088)	0.006	0.026
216	18.00	0.13	0.032	(	0.087)	0.006	0.026
217	18.08	0.13	0.032	(	0.087)	0.006	0.026
218	18.17	0.13	0.032	(	0.086)	0.006	0.026
219	18.25	0.13	0.032	(	0.086)	0.006	0.026
220	18.33	0.13	0.032	(	0.086)	0.006	0.026
221	18.42	0.13	0.032	(	0.085)	0.006	0.026
222	18.50	0.13	0.032	(	0.085)	0.006	0.026
223	18.58	0.10	0.024	(	0.084)	0.004	0.019
224	18.67	0.10	0.024	(	0.084)	0.004	0.019
225	18.75	0.10	0.024	(	0.084)	0.004	0.019
226	18.83	0.07	0.016	(	0.083)	0.003	0.013
227	18.92	0.07	0.016	(	0.083)	0.003	0.013
228	19.00	0.07	0.016	(	0.082)	0.003	0.013
229	19.08	0.10	0.024	(	0.082)	0.004	0.019
230	19.17	0.10	0.024	(	0.082)	0.004	0.019
231	19.25	0.10	0.024	(	0.081)	0.004	0.019
232	19.33	0.13	0.032	(	0.081)	0.006	0.026
233	19.42	0.13	0.032	(	0.080)	0.006	0.026
234	19.50	0.13	0.032	(	0.080)	0.006	0.026
235	19.58	0.10	0.024	(	0.080)	0.004	0.019
236	19.67	0.10	0.024	(	0.079)	0.004	0.019
237	19.75	0.10	0.024	(	0.079)	0.004	0.019
238	19.83	0.07	0.016	(	0.079)	0.003	0.013
239	19.92	0.07	0.016	(	0.078)	0.003	0.013
240	20.00	0.07	0.016	(	0.078)	0.003	0.013
241	20.08	0.10	0.024	(	0.078)	0.004	0.019
242	20.17	0.10	0.024	(	0.077)	0.004	0.019
243	20.25	0.10	0.024	(	0.077)	0.004	0.019
244	20.33	0.10	0.024	(	0.077)	0.004	0.019
245	20.42	0.10	0.024	(	0.076)	0.004	0.019
246	20.50	0.10	0.024	(	0.076)	0.004	0.019
247	20.58	0.10	0.024	(	0.076)	0.004	0.019
248	20.67	0.10	0.024	(	0.075)	0.004	0.019
249	20.75	0.10	0.024	(	0.075)	0.004	0.019
250	20.83	0.07	0.016	(	0.075)	0.003	0.013
251	20.92	0.07	0.016	(	0.074)	0.003	0.013
252	21.00	0.07	0.016	(	0.074)	0.003	0.013
253	21.08	0.10	0.024	(	0.074)	0.004	0.019
254	21.17	0.10	0.024	(	0.073)	0.004	0.019
255	21.25	0.10	0.024	(	0.073)	0.004	0.019
256	21.33	0.07	0.016	(	0.073)	0.003	0.013
257	21.42	0.07	0.016	(	0.073)	0.003	0.013
258	21.50	0.07	0.016	(	0.072)	0.003	0.013
259	21.58	0.10	0.024	(	0.072)	0.004	0.019
260	21.67	0.10	0.024	(	0.072)	0.004	0.019
261	21.75	0.10	0.024	(	0.072)	0.004	0.019
262	21.83	0.07	0.016	(	0.071)	0.003	0.013
263	21.92	0.07	0.016	(	0.071)	0.003	0.013
264	22.00	0.07	0.016	(	0.071)	0.003	0.013
265	22.08	0.10	0.024	(	0.071)	0.004	0.019
266	22.17	0.10	0.024	(	0.070)	0.004	0.019
267	22.25	0.10	0.024	(	0.070)	0.004	0.019
268	22.33	0.07	0.016	(	0.070)	0.003	0.013
269	22.42	0.07	0.016	(	0.070)	0.003	0.013
270	22.50	0.07	0.016	(	0.069)	0.003	0.013
271	22.58	0.07	0.016	(	0.069)	0.003	0.013
272	22.67	0.07	0.016	(	0.069)	0.003	0.013
273	22.75	0.07	0.016	(	0.069)	0.003	0.013
274	22.83	0.07	0.016	(	0.069)	0.003	0.013
275	22.92	0.07	0.016	(	0.069)	0.003	0.013
276	23.00	0.07	0.016	(	0.068)	0.003	0.013
277	23.08	0.07	0.016	(	0.068)	0.003	0.013
278	23.17	0.07	0.016	(	0.068)	0.003	0.013
279	23.25	0.07	0.016	(	0.068)	0.003	0.013
280	23.33	0.07	0.016	(	0.068)	0.003	0.013
281	23.42	0.07	0.016	(	0.068)	0.003	0.013
282	23.50	0.07	0.016	(	0.068)	0.003	0.013
283	23.58	0.07	0.016	(	0.067)	0.003	0.013
284	23.67	0.07	0.016	(	0.067)	0.003	0.013
285	23.75	0.07	0.016	(	0.067)	0.003	0.013
286	23.83	0.07	0.016	(	0.067)	0.003	0.013
287	23.92	0.07	0.016	(	0.067)	0.003	0.013

```
288  24.00     0.07      0.016       (  0.067)       0.003        0.013
              (Loss Rate Not Used)
    Sum =     100.0                                  Sum =    19.5
       Flood volume = Effective rainfall      1.62(In)
        times area      34.9(Ac.)/[(In)/(Ft.)] =       4.7(Ac.Ft)
       Total soil loss =      0.36(In)
       Total soil loss =     1.035(Ac.Ft)
       Total rainfall =      1.98(In)
       Flood volume =      205380.3 Cubic Feet
       Total soil loss =       45083.5 Cubic Feet
       ---------------------------------------------------------------------
        Peak flow rate of this hydrograph =      7.733(CFS)
       ---------------------------------------------------------------------
       +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          24 - H O U R    S T O R M
                     R u n o f f      H y d r o g r a p h
       ---------------------------------------------------------------------
                  Hydrograph in   5   Minute intervals ((CFS))

       ---------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5       5.0       7.5      10.0
 ------------------------------------------------------------------------
   0+ 5       0.0007      0.10  Q         |         |         |         |
   0+10       0.0029      0.32  VQ        |         |         |         |
   0+15       0.0056      0.39  VQ        |         |         |         |
   0+20       0.0088      0.47  VQ        |         |         |         |
   0+25       0.0129      0.60  V Q       |         |         |         |
   0+30       0.0173      0.64  V Q       |         |         |         |
   0+35       0.0219      0.66  V Q       |         |         |         |
   0+40       0.0265      0.67  V Q       |         |         |         |
   0+45       0.0312      0.68  V Q       |         |         |         |
   0+50       0.0363      0.73  V Q       |         |         |         |
   0+55       0.0421      0.85  V  Q      |         |         |         |
   1+ 0       0.0481      0.88  V  Q      |         |         |         |
   1+ 5       0.0539      0.84  V  Q      |         |         |         |
   1+10       0.0590      0.74  V Q       |         |         |         |
   1+15       0.0640      0.71  V Q       |         |         |         |
   1+20       0.0688      0.70  V Q       |         |         |         |
   1+25       0.0736      0.70  V Q       |         |         |         |
   1+30       0.0783      0.69  V Q       |         |         |         |
   1+35       0.0831      0.69  V Q       |         |         |         |
   1+40       0.0878      0.68  V Q       |         |         |         |
   1+45       0.0925      0.68  V Q       |         |         |         |
   1+50       0.0975      0.73  V Q       |         |         |         |
   1+55       0.1034      0.85  V  Q      |         |         |         |
   2+ 0       0.1094      0.88  V  Q      |         |         |         |
   2+ 5       0.1156      0.89  V  Q      |         |         |         |
   2+10       0.1218      0.90  |V Q      |         |         |         |
   2+15       0.1280      0.91  |V Q      |         |         |         |
   2+20       0.1343      0.91  |V Q      |         |         |         |
   2+25       0.1406      0.91  |V Q      |         |         |         |
   2+30       0.1469      0.91  |V Q      |         |         |         |
   2+35       0.1535      0.96  |V Q      |         |         |         |
   2+40       0.1609      1.07  |V  Q     |         |         |         |
   2+45       0.1685      1.11  |V  Q     |         |         |         |
   2+50       0.1763      1.12  |V  Q     |         |         |         |
   2+55       0.1841      1.13  |V  Q     |         |         |         |
   3+ 0       0.1919      1.14  |V  Q     |         |         |         |
   3+ 5       0.1997      1.14  |V  Q     |         |         |         |
   3+10       0.2076      1.14  |V  Q     |         |         |         |
   3+15       0.2154      1.14  |V  Q     |         |         |         |
   3+20       0.2233      1.14  |V  Q     |         |         |         |
   3+25       0.2312      1.14  |V  Q     |         |         |         |
   3+30       0.2390      1.14  | V Q     |         |         |         |
   3+35       0.2469      1.14  | V Q     |         |         |         |
   3+40       0.2547      1.14  | V Q     |         |         |         |
   3+45       0.2626      1.14  | V Q     |         |         |         |
   3+50       0.2708      1.19  | V Q     |         |         |         |
   3+55       0.2798      1.30  | V  Q    |         |         |         |
   4+ 0       0.2890      1.34  | V  Q    |         |         |         |
   4+ 5       0.2983      1.35  | V  Q    |         |         |         |
   4+10       0.3076      1.36  | V  Q    |         |         |         |
   4+15       0.3170      1.36  | V  Q    |         |         |         |
   4+20       0.3268      1.42  | V  Q    |         |         |         |
   4+25       0.3373      1.53  | V   Q   |         |         |         |
   4+30       0.3481      1.56  | V   Q   |         |         |         |
   4+35       0.3589      1.58  |  V  Q   |         |         |         |
   4+40       0.3699      1.59  |  V  Q   |         |         |         |
   4+45       0.3808      1.59  |  V  Q   |         |         |         |
```

4+50	0.3922	1.65	V Q				
4+55	0.4043	1.76	V Q				
5+ 0	0.4166	1.79	V Q				
5+ 5	0.4284	1.71	V Q				
5+10	0.4387	1.49	V Q				
5+15	0.4485	1.43	V Q				
5+20	0.4585	1.45	V Q				
5+25	0.4692	1.55	V Q				
5+30	0.4801	1.57	V Q				
5+35	0.4913	1.63	V Q				
5+40	0.5033	1.75	V Q				
5+45	0.5156	1.79	V Q				
5+50	0.5281	1.80	V Q				
5+55	0.5406	1.82	V Q				
6+ 0	0.5531	1.82	V Q				
6+ 5	0.5660	1.87	V Q				
6+10	0.5797	1.99	V Q				
6+15	0.5936	2.02	V Q				
6+20	0.6076	2.03	V Q				
6+25	0.6217	2.04	V Q				
6+30	0.6358	2.05	V Q				
6+35	0.6503	2.10	V Q				
6+40	0.6655	2.22	V Q				
6+45	0.6810	2.25	V Q				
6+50	0.6966	2.26	V Q				
6+55	0.7122	2.27	V Q				
7+ 0	0.7279	2.28	V Q				
7+ 5	0.7436	2.28	V Q				
7+10	0.7593	2.28	V Q				
7+15	0.7751	2.28	V Q				
7+20	0.7911	2.33	V Q				
7+25	0.8079	2.44	V Q				
7+30	0.8250	2.48	V Q				
7+35	0.8425	2.54	V Q				
7+40	0.8608	2.66	V Q				
7+45	0.8794	2.70	V Q				
7+50	0.8985	2.77	V Q				
7+55	0.9184	2.89	V Q				
8+ 0	0.9385	2.93	V Q				
8+ 5	0.9595	3.05	V Q				
8+10	0.9821	3.28	V Q				
8+15	1.0052	3.35	V Q				
8+20	1.0285	3.38	V Q				
8+25	1.0519	3.40	V Q				
8+30	1.0754	3.41	V Q				
8+35	1.0993	3.47	V Q				
8+40	1.1240	3.58	V Q				
8+45	1.1489	3.62	V Q				
8+50	1.1742	3.68	V Q				
8+55	1.2004	3.80	V Q				
9+ 0	1.2269	3.84	V Q				
9+ 5	1.2541	3.96	V Q				
9+10	1.2830	4.19	V Q				
9+15	1.3124	4.26	V Q				
9+20	1.3423	4.35	V Q				
9+25	1.3731	4.48	V Q				
9+30	1.4042	4.52	V Q				
9+35	1.4359	4.59	V Q				
9+40	1.4683	4.71	V Q				
9+45	1.5011	4.75	V Q				
9+50	1.5343	4.82	V Q				
9+55	1.5683	4.94	V Q				
10+ 0	1.6026	4.98	V Q				
10+ 5	1.6346	4.65	V Q				
10+10	1.6614	3.88	VQ				
10+15	1.6865	3.66	Q				
10+20	1.7110	3.55	Q				
10+25	1.7351	3.50	QV				
10+30	1.7589	3.46	QV				
10+35	1.7843	3.69	QV				
10+40	1.8134	4.23	VQ				
10+45	1.8437	4.39	V Q				
10+50	1.8745	4.47	V Q				
10+55	1.9056	4.51	V Q				
11+ 0	1.9368	4.54	V Q				
11+ 5	1.9678	4.50	V Q				
11+10	1.9982	4.40	VQ				
11+15	2.0282	4.37	Q				
11+20	2.0582	4.35	Q				



18+ 0	4.4089	0.95	| Q	|	|	|	V |
18+ 5	4.4153	0.93	| Q	|	|	|	V |
18+10	4.4217	0.92	| Q	|	|	|	V |
18+15	4.4280	0.92	| Q	|	|	|	V |
18+20	4.4343	0.91	| Q	|	|	|	V |
18+25	4.4406	0.91	| Q	|	|	|	V |
18+30	4.4469	0.91	| Q	|	|	|	V |
18+35	4.4528	0.86	| Q	|	|	|	V |
18+40	4.4580	0.75	| Q	|	|	|	V |
18+45	4.4629	0.72	| Q	|	|	|	V |
18+50	4.4674	0.65	| Q	|	|	|	V |
18+55	4.4711	0.53	| Q	|	|	|	V |
19+ 0	4.4745	0.50	|Q	|	|	|	V |
19+ 5	4.4782	0.53	| Q	|	|	|	V |
19+10	4.4825	0.63	| Q	|	|	|	V |
19+15	4.4870	0.66	| Q	|	|	|	V |
19+20	4.4919	0.72	| Q	|	|	|	V |
19+25	4.4977	0.84	| Q	|	|	|	V |
19+30	4.5037	0.87	| Q	|	|	|	V |
19+35	4.5095	0.84	| Q	|	|	|	V |
19+40	4.5146	0.74	| Q	|	|	|	V |
19+45	4.5195	0.71	| Q	|	|	|	V |
19+50	4.5240	0.65	| Q	|	|	|	V |
19+55	4.5277	0.53	| Q	|	|	|	V |
20+ 0	4.5311	0.50	|Q	|	|	|	V |
20+ 5	4.5347	0.53	| Q	|	|	|	V |
20+10	4.5391	0.63	| Q	|	|	|	V |
20+15	4.5436	0.66	| Q	|	|	|	V |
20+20	4.5482	0.67	| Q	|	|	|	V |
20+25	4.5528	0.67	| Q	|	|	|	V |
20+30	4.5575	0.68	| Q	|	|	|	V |
20+35	4.5622	0.68	| Q	|	|	|	V |
20+40	4.5669	0.68	| Q	|	|	|	V |
20+45	4.5716	0.68	| Q	|	|	|	V |
20+50	4.5760	0.63	| Q	|	|	|	V |
20+55	4.5796	0.52	| Q	|	|	|	V |
21+ 0	4.5830	0.49	|Q	|	|	|	V |
21+ 5	4.5866	0.53	| Q	|	|	|	V |
21+10	4.5909	0.63	| Q	|	|	|	V |
21+15	4.5954	0.66	| Q	|	|	|	V |
21+20	4.5997	0.62	| Q	|	|	|	V|
21+25	4.6032	0.51	| Q	|	|	|	V|
21+30	4.6066	0.49	|Q	|	|	|	V|
21+35	4.6102	0.52	| Q	|	|	|	V|
21+40	4.6145	0.63	| Q	|	|	|	V|
21+45	4.6190	0.66	| Q	|	|	|	V|
21+50	4.6233	0.62	| Q	|	|	|	V|
21+55	4.6268	0.51	| Q	|	|	|	V|
22+ 0	4.6301	0.49	|Q	|	|	|	V|
22+ 5	4.6337	0.52	| Q	|	|	|	V|
22+10	4.6381	0.63	| Q	|	|	|	V|
22+15	4.6426	0.66	| Q	|	|	|	V|
22+20	4.6468	0.62	| Q	|	|	|	V|
22+25	4.6504	0.51	| Q	|	|	|	V|
22+30	4.6537	0.49	|Q	|	|	|	V|
22+35	4.6570	0.47	|Q	|	|	|	V|
22+40	4.6602	0.47	|Q	|	|	|	V|
22+45	4.6634	0.46	|Q	|	|	|	V|
22+50	4.6665	0.46	|Q	|	|	|	V|
22+55	4.6697	0.46	|Q	|	|	|	V|
23+ 0	4.6728	0.46	|Q	|	|	|	V|
23+ 5	4.6760	0.46	|Q	|	|	|	V|
23+10	4.6791	0.46	|Q	|	|	|	V|
23+15	4.6822	0.46	|Q	|	|	|	V|
23+20	4.6854	0.46	|Q	|	|	|	V|
23+25	4.6885	0.46	|Q	|	|	|	V|
23+30	4.6917	0.46	|Q	|	|	|	V|
23+35	4.6948	0.46	|Q	|	|	|	V|
23+40	4.6980	0.46	|Q	|	|	|	V|
23+45	4.7011	0.46	|Q	|	|	|	V|
23+50	4.7042	0.46	|Q	|	|	|	V|
23+55	4.7074	0.46	|Q	|	|	|	V|
24+ 0	4.7105	0.46	|Q	|	|	|	V|
24+ 5	4.7130	0.36	|Q	|	|	|	V|
24+10	4.7139	0.13	Q	|	|	|	V|
24+15	4.7144	0.07	Q	|	|	|	V|
24+20	4.7146	0.04	Q	|	|	|	V|
24+25	4.7148	0.02	Q	|	|	|	V|
24+30	4.7149	0.01	Q	|	|	|	V|

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   24+35       4.7149      0.00  Q         |         |         |         V
--------------------------------------------------------------------------
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Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section G of the WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table G.1on page 23 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ A. **On-site storm drain inlets**	☒ **Locations of inlets.**	☒ **Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.**	☒ **Maintain and periodically repaint or replace inlet markings.** ☒ **Provide stormwater pollution prevention information to new site owners, lessees, or operators.** ☒ **See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** ☒ **Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."**
☒ B. **Interior floor drains and elevator shaft sump pumps**		☒ **State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.**	☒ **Inspect and maintain drains to prevent blockages and overflow.**
☐ C. **Interior parking garages**		☐ **State that parking garage floor drains will be plumbed to the sanitary sewer.**	☐ **Inspect and maintain drains to prevent blockages and overflow.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☐ D1. **Need for future indoor & structural pest control**		☐ **Note building design features that discourage entry of pests.**	☐ **Provide Integrated Pest Management information to owners, lessees, and operators.**
☒ D2. **Landscape/ Outdoor Pesticide Use**	☐ **Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained.** ☒ **Show self-retaining landscape areas, if any.** ☐ **Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)**	**State that final landscape plans will accomplish all of the following.** ☐ **Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.** ☒ **Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.** ☒ **Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.** ☒ **Consider using pest-resistant plants, especially adjacent to hardscape.** **To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.**	☒ **Maintain landscaping using minimum or no pesticides.** ☒ **See applicable operational BMPs in "What you should know for…..Landscape and Gardening"** at http://rcflood.org/stormwater/**Error! Hyperlink reference not valid.** ☒ **Provide IPM information to new owners, lessees and operators.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ E. **Pools, spas, ponds, decorative fountains, and other water features.**	❑ **Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)**	**If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.**	❑ **See applicable operational BMPs in** "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/
❑ F. **Food service**	❑ **For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment.** ❑ **On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.**	❑ **Describe the location and features of the designated cleaning area.** ❑ **Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.**	❑ **See the brochure, "**The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/ **Provide this brochure to new site owners, lessees, and operators.**
☒ G. **Refuse areas**	☒ **Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas.** ☒ **If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area.** ❑ **Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.**	☒ **State how site refuse will be handled and provide supporting detail to what is shown on plans.** ☒ **State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.**	☒ **State how the following will be implemented:** **Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ H. **Industrial processes.**	☐ **Show process area.**	☒ **If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."**	☒ **See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ I. **Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)**	❑ **Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area.** ❑ **Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults.** ❑ **Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.**	**Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.** **Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for:** ▪ **Hazardous Waste Generation** ▪ **Hazardous Materials Release Response and Inventory** ▪ **California Accidental Release (CalARP)** ▪ **Aboveground Storage Tank** ▪ **Uniform Fire Code Article 80 Section 103(b) & (c) 1991** ▪ **Underground Storage Tank** **www.cchealth.org/groups/hazmat/**	❑ **See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ J. **Vehicle and Equipment Cleaning**	❑ **Show on drawings as appropriate:** **(1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses.** **(2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use).** **(3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer.** **(4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.**	❑ **If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.**	**Describe operational measures to implement the following (if applicable):** ❑ **Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system.** Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/ ❑**Car dealerships and similar may rinse cars with water only.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ K. **Vehicle/Equipment Repair and Maintenance**	❑ **Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater.** ❑ **Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas.** ❑ **Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.**	❑ **State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area.** ❑ **State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.** ❑ **State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.**	**In the Stormwater Control Plan, note that all of the following restrictions apply to use the site:** ❑ **No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains.** ❑ **No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately.** ❑ **No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.** Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations". Brochure can be found at http://rcflood.org/stormwater/ Refer to Outdoor Cleaning Activities and Professional Mobile Service Providers for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ L. **Fuel Dispensing Areas**	❑ **Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable.** ❑ **Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.**		❑ **The property owner shall dry sweep the fueling area routinely.** ❑ **See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

[6] **The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ M. **Loading Docks**	☒ **Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer.** ❑ **Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation.** ❑ **Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.**		☒ **Move loaded and unloaded items indoors as soon as possible.** ☒ **See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ N. **Fire Sprinkler Test Water**		❑ **Provide a means to drain fire sprinkler test water to the sanitary sewer.**	❑ **See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**
O. **Miscellaneous Drain or Wash Water or Other Sources** ❑ **Boiler drain lines** ❑ **Condensate drain lines** ❑ **Rooftop equipment** ❑ **Drainage sumps** ❑ **Roofing, gutters, and trim.** ❑ **Other sources**		❑ **Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system.** ❑ **Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system.** ❑ **Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment.** ❑ **Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.** ❑ **Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.** **Include controls for other sources as specified by local reviewer.**	

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ P. **Plazas, sidewalks, and parking lots.**			☒ **Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.**

Appendix 9: O&M

Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

Operation and Maintenance Plan

Project Title: Temescal Valley Commerce Center (CUP200044)

Original Date Prepared: January 13, 2021

Revision Date(s): _____

Revision Date(s): _____

Revision Date(s): _____

Revision Date(s): _____

Contact Information:

Prepared for:
Dawson Canyon LLC
11777 San Vicente Boulevard, Suite 780
Los Angeles, CA 90049
Phone: (949) 296-7006
Contact: Matt Englhard

Prepared by:
Thienes Engineering, Inc.
14349 Firestone Boulevard
La Mirada, CA 90638
(714) 521-4811
Contact: Luis Prado (luisp@thieneseng.com)
Job No. 3905

Table of Contents

I. Inspection and Maintenance Log 2
II. Updates, Revisions, and Errata 3
III. Introduction 4
IV. Responsibility for Maintenance 6
IV.A General 6
IV.B Staff Training Program 6
IV.C Records 6
IV.D Safety 6
V. Summary of Drainage Management Areas and Stormwater BMPs 7
V.A Drainage Areas 7
V.B Structural Post-Construction BMPs 8
V.C Self-Retaining Areas or Other 8
VI. Stormwater BMP Design Documentation 9
VI.A "As-Built" Drawings of each Stormwater BMP 9
VI.B Manufacturer's Data, Manuals, and Maintenance Requirements 9
VI.C Specific Operation and Maintenance Concerns and Troubleshooting 9
VII. Maintenance Schedule or Matrix 9
VII.A Maintenance Schedule 9
VII.B Service Agreement Information 9

List of Appendices

Appendix 1: Inspection and Maintenance Logs
Appendix 2: Updates, Revisions, and Errata
Appendix 3: Maintenance Mechanism
Appendix 4: Training Records
Appendix 5: Site Plan and Details
Appendix 6: "As-Built" Drawings
Appendix 7: Manufacturer Information
Appendix 8: Service Agreement Information

I. Inspection and Maintenance Log

Date	Observations/Actions	Inspector

Additional inspection and maintenance logs to be included in Appendix 1 of this O&M Plan.

II. Updates, Revisions, and Errata

Revision Number	Date	Brief Description of Update/Revision/Errata, include section and page number	Prepared and Approved By

Additional updates, revisions, and errata to be include in Appendix 2 of this O&M Plan.

III. Introduction

Project Description:

The overall project encompasses approximately 39.26 acres of improvements, which includes 34.85 acres of onsite work, and 4.41 acres of offsite work. Proposed improvements include a 183,456 square foot building and vehicle parking located adjacent to all sides of the building. A truck dock and trailer parking will be on the south side of the building. The east and west portions of the building will be loading areas. Landscape will be throughout the site and along the perimeter. Per the soils engineer, infiltration is feasible therefore underground infiltration chambers will be proposed to retain the runoff produced by the 85th percentile storm rainfall depth. Mitigation for the street widening improvements on the surrounding streets will be provided onsite via underground infiltration chambers. Additional storage in the underground chambers will be provided to mitigate the hydrologic conditions of concern (HCOC).

Existing Site:

The project site is currently unpaved and barren. The site generally surface drains to the north and appears to pond stormwater prior to discharging into the Temescal Wash.

Stormwater is currently draining onto the site from offsite portions of the previous larger development and the bordering hillside to the southeast. Run-on surface drains to the north, down the vegetated slopes, and enters the site through the compacted surface of the neighboring southerly property. A gutter is proposed along the southerly property line to intercept and convey offsite run-on northeast, to the Temescal Wash.

Hydrology:

Runoff from the northeasterly drive aisle and auto parking areas will surface drain to catch basins located in northeasterly parking lot. An onsite storm drain system, Line “B”, will convey stormwater northwest toward the easterly loading area.

Drainage from the southerly drive aisle entrance and auto parking areas along the southeast property line will surface drain northeasterly to a catch basin in the easterly parking lot. An onsite storm drain system, Line “A”, will convey runoff to the northwest, collect runoff from the abutting drive aisle, and continue toward the easterly loading area.

Stormwater from the easterly auto parking and loading area will collect in catch basins east of the proposed building. Line “A” will convey stormwater to the north, confluence with Line “B”, turn west around the building, and continue toward the southeast portion of the Temescal Canyon Road and Dawson Canyon Road intersection.

The westerly and southwesterly vehicle parking, southerly truck yard, and westerly loading area will surface drain to catch basins located in the parking lot, truck yard, and westerly loading area. The southerly storm drain system, Line “C” will convey runoff to the north and confluence with Line “A”.

Runoff north of the building will surface drain to catch basins in the northerly auto parking and laterals will convey the stormwater to Line “A”. Line “A” will ultimately discharge into a proposed storm drain system in Temescal Canyon Road.

Lastly, approximately 1.30 acres, comprised of self-treating areas and some driveways, along Dawson Canyon Road and Park Canyon Road will sheet flow offsite without first being routed to the onsite BMPs.

IV. Responsibility for Maintenance

IV.A General

Funding will be provided by the owner:

Dawson Canyon LLC
11777 San Vicente Boulevard, Suite 780
Los Angeles, CA 90049
Phone: (949) 296-7006
Contact: Matt Englhard

A copy of the Covenant Agreement will be attached in Appendix 3 of this O&M Plan.

IV.B Staff Training Program

Staff training records and descriptions will be inserted in Appendix 4 of this O&M Plan.

IV.C Records

Maintenance records are to be inserted chronologically in Appendix 1 of this O&M Plan.

IV.D Safety

All maintenance procedures shall comply with the latest OSHA standards.

V. Summary of Drainage Management Areas and Stormwater BMPs

V.A Drainage Areas

See Appendix 5 of this O&M Plan for WQMP site map.

DMA Name or ID	Surface Type(s)[1]	Area (Sq. Ft.)	Area (Acres)	DMA Type
A-1	Concrete or Asphalt	156,555	3.59	Type D
A-2	Ornamental Landscaping	43,821	1.01	Type D
B-1	Concrete or Asphalt	156,486	3.59	Type D
B-2	Ornamental Landscaping	26,466	0.61	Type D
C-1	Roofs/Conc/Asphalt	403,150	9.26	Type D
C-2	Ornamental Landscaping	45,518	1.04	Type D
D-1	Roofs/Conc/Asphalt	412,905	9.48	Type D
D-2	Ornamental Landscaping	46,653	1.07	Type D
E-1	Concrete or Asphalt	150,181	3.45	Type D
E-2	Ornamental Landscaping	19,703	0.45	Type D
F	Ornamental Landscaping	56,628	1.30	Type A
G-1	Concrete or Asphalt	39,858	0.92	Type D
G-2	Ornamental Landscaping	21,997	0.50	Type D
H-1	Concrete or Asphalt	74,227	1.70	Type D
H-2	Ornamental Landscaping	12,893	0.30	Type D
I-1	Concrete or Asphalt	38,280	0.88	Type D
I-2	Ornamental Landscaping	4,844	0.11	Type D

Geo-location of the BMPs using latitude and longitude coordinates

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)	Latitude	Longitude
A	On-site storm drain inlets	Conceptual Grading Plans	---	---
B	Interior floor drains and elevator shaft sump pumps	N/A	---	---
D2	Landscape / Outdoor Pesticide Use	On-site Landscape Improvement Plans	---	---
G	Refuse Areas	Conceptual Grading Plans	---	---
H	Industrial processes	Conceptual Grading Plans (indoors, if any)	---	---
M	Loading Docks	Conceptual Grading Plans	---	---
P	Plazas, sidewalks, and parking lots	Conceptual Grading Plans	---	---
STC "A"	Underground Infiltration System	Conceptual Grading Plans	33.780316	-117.485067
STC "B"	Underground Infiltration System	Conceptual Grading Plans	33.782186	-117.484095
STC "C"	Underground Infiltration System	Conceptual Grading Plans	33.782909	-117.485679
STC "D"	Underground Infiltration System	Conceptual Grading Plans	33.782105	-117.487088
STC "E"	Underground Infiltration System	Conceptual Grading Plans	33.782937	-117.488080
STC "G"	Underground Infiltration System	Conceptual Grading Plans	33.783567	-117.486753
STC "H"	Underground Infiltration System	Conceptual Grading Plans	33.782749	-117.488094
STC "I"	Underground Infiltration System	Conceptual Grading Plans	33.779600	-117.485216

V.B Structural Post-Construction BMPs

See Appendix 5 of this O&M Plan for WQMP site map.

Additional BMP details are available in Appendix 10 of the WQMP.

V.C Self-Retaining Areas or Other

Table V.1 Type 'A', Self-Treating Areas

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
DMA F	56,628	Drought Tolerant	Timed Sprinklers

VI. Stormwater BMP Design Documentation

VI.A "As-Built" Drawings of each Stormwater BMP

See Appendix 6 of this O&M Plan for "as-built" drawings.

VI.B Manufacturer's Data, Manuals, and Maintenance Requirements

Not applicable, there are no manufactured stormwater BMPs.

VI.C Specific Operation and Maintenance Concerns and Troubleshooting

Not applicable.

VII. Maintenance Schedule or Matrix

VII.A Maintenance Schedule

Schedule (Underground Infiltration System)	Inspection and Maintenance Activity (Underground Infiltration Chambers)
The isolator row shall be inspected semi-annually (by October 1st and February 1st) and cleaned by water-flush and vacuum when solids accumulate to 3" depth. Maintenance to be conducted through service contract with the vendor or equally qualified contractor.	The isolator row shall be inspected for debris and sediment accumulations and maintained by a qualified technician and he/she will properly dispose of all wastes and inspect for standing water. A manhole is installed in order to inspect and maintain the inlet row. All entry into the chamber system must be done per OSHA codes to ensure operator and inspector safety. Inspection ports should be checked 48 hours after storm events to see that the water is draining down, at least once each rainy season, following a major storm event. Records shall be maintained by owner to document inspections.

VII.B Service Agreement Information

See Appendix 8 of this O&M Plan for service agreement information with any contractors regarding the O&M of BMPs at the site, if any.

Appendix 1: Inspection and Maintenance Logs

Insert Additional Inspection or Maintenance Logs Here

Date	Observations/Actions	Inspector

Appendix 2: Updates, Revisions, and Errata

Insert Additional Updates, Revisions, and Errata Logs Here

Revision Number	Date	Brief Description of Update/Revision/Errata, include section and page number	Prepared and Approved By

Appendix 3: Maintenance Mechanism

Copy of Covenant Agreement
Establishing Notification Process And Responsibility
For Water Quality Management Plan Implementation And Maintenance

Notification Process and Responsibility

1. **Name:** _____
   Title: _____
   Phone No.: _____

   WQMP Responsibilities, Duties, and Activities:
   (1) Routine inspections to evaluate BMP effectiveness.
   (2) Identifying when BMPs require maintenance.
   (3) Working with qualified contractors to maintain the BMP.
   (4) Recordkeeping of inspections and maintenance activities.

2. **Name:** _____
   Title: _____
   Phone No.: _____

   WQMP Responsibilities, Duties, and Activities:
   (1) Cleaning, repairing, servicing, and maintenance of BMP.

3. **Name:** _____
   Title: _____
   Phone No.: _____

   WQMP Responsibilities, Duties, and Activities:
   (1) In event of failure, and with City Engineer's authorization, modify or replace with an upgraded BMP to prevent future failure.
   (2) Notify successors of BMPs and maintenance requirements.

Recorded at the request of:
COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT

THIS INSTRUMENT IS FOR THE BENEFIT
OF THE COUNTY OF RIVERSIDE AND
ENTITLED TO BE RECORDED WITHOUT
FEE.(GOV. CODE 6103)

RETURN TO:
RIVERSIDE COUNTY TRANSPORTATION
DEPARTMENT. **STOP NO. 1080**

COVENANT AND AGREEMENT REGARDING WATER QUALITY MANAGEMENT PLAN BMP, CONSENT TO INSPECT, MAINTENANCE AND INDEMNIFICATION

APN:_____ PROJECT No._____ IP No._____

OWNER(S):_____

PROPERTY ADDRESS:_____

LEGAL DESCRIPTION:_____
_____
_____

THIS AGREEMENT is made and entered into in Riverside County, California, this _____ day of _____ Year_____, by and between_____, (hereinafter referred to as "Covenantor" or "Owner") and the COUNTY OF RIVERSIDE via its Department of Transportation, a political subdivision of the State of California (hereinafter referred to as "County").

RECITALS

WHEREAS, the Covenantor owns real property ("Property") in the County of Riverside, State of California, more specifically described in Exhibit "A" and depicted in Exhibit "B", each of these exhibits is attached, and incorporated herein by this reference;

WHEREAS, the County is the owner of interests in that certain real property within the unincorporated area of the County of Riverside, State of California, containing storm drains, pipelines, and related appurtenances constituting the County's municipal separate storm sewer system (the County's "MS4");

WHEREAS, Covenantor intends to develop, improve, and/or use the Property is such a way that approval by the County for such development, improvement, and/or use is required pursuant to applicable laws;

WHEREAS, As a condition for said approval by the County, County required Covenantor, and Covenantor desires to, restrict the use of the Property according to the conditions, covenants, equitable servitudes, and restrictions contained herein for the express benefit of the County's MS4, which include requirements that the Property incorporate post construction on-site stormwater quality control measures;

WHEREAS, the Covenantor/Owner has chosen to install one or more _____, hereinafter referred to as "Device", as the on-site control measure to minimize pollutants in urban runoff;

WHEREAS, said Device has been installed in accordance with plans and specifications accepted by the County;

WHEREAS, said Device, with installation on private property, is a private facility with all maintenance or replacement, therefore, the sole responsibility of the Covenantor/Owner in accordance with the terms of this Agreement;

WHEREAS, the Covenantor/Owner is aware that periodic and continuous maintenance, including, but not necessarily limited to, filter material replacement and sediment removal, is required to assure peak performance of Device and that, furthermore, such maintenance activity will require compliance with all Local, State, or Federal laws and regulations, including those pertaining; to confined space and waste disposal methods, in effect at the time such maintenance occurs;

NOW THEREFORE, incorporating the foregoing Recitals and in consideration of the covenants and conditions contained herein, and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, and expressly for the benefit of, and to bind, their sucessors in interest, the parties hereto agree as follows:

1. Covenantor/Owner hereby provides the County or County's designee complete access to the Device and its immediate vicinity and such access onto the property to permit access to the devise at any time, upon twenty-four *(24)* hour advance notice in writing, of any duration for the purpose of inspection, sampling and testing of the Device. County shall make every effort at all times to minimize or avoid interference with Owner's use of the Property.

2. Covenantor/Owner shall use its best efforts diligently to maintain the Device in a manner assuring peak performance at all times. All reasonable precautions shall be exercised by Owner and Owner's representative or contractor in the removal and extraction of material(s) from the Device and the ultimate disposal of the material(s) in a manner consistent with all relevant laws and regulations in effect at the time. As may be requested

from time to time by the County / Regional Water Quality Control Board (RWQCB), the Owner shall provide the RWQCB with documentation identifying the material(s) removed, the quantity, and disposal destination.

3. In the event Covenantor/Owner, or its successors or assigns, fails to accomplish the necessary maintenance contemplated by this Agreement, within five (5) days of being given written notice by the County, the County is hereby authorized to cause any maintenance necessary to be done and charge the entire cost and expense to the Owner or Owner's successors or assigns, including administrative costs and interest thereon at the maximum rate authorized by the Civil Code from the date of notice of expense until paid in full.

4. The County may require the Covenantor/Owner to post security in a form and for a time period satisfactory to the County to guarantee the performance of the obligations stated herein. Should the Owner fail to perform the obligations under this Agreement, the County may, in the case of a cash deposit, certificate of deposit or letter of credit, act for the Owner using the proceeds from it, or in the case of a surety bond, require the sureties to perform the obligations of the Agreement.

5. The County may, but shall not be obligated to, enforce this Agreement by a proceeding at law or in equity against any person or persons violating or attempting to violate any condition, covenant, equitable servitude, or restriction provided for herein, either to restrain such violation or to recover damages.

6. This Agreement constitutes the entire agreement and understanding between the parties with respect to the subject matter of this Agreement and supersedes all prior or contemporaneous agreements and understandings with respect to the subject matter hereof, whether oral or written.

7. If any part of this Agreement is declared by a final decision of a court of competent jurisdiction to be invalid for any reason, such shall not affect the validity of the rest of the Agreement. The other parts of this Agreement shall remain in effect as if this Agreement had been executed without the invalid parts(s). The parties declare that they intend and desire that the remaining parts of this Agreement continue to be effective without any part(s) that have been declared invalid.

8. This Agreement may be executed in counterparts, each of which so executed shall, irrespective of the date of its execution and delivery, be deemed an orginal, and all such counterparts together shall constitute one and the same instrument.

9. This Agreement shall be recorded in the Office of the Recorder of Riverside County, California and shall constitute notice to all successors and assigns of the title to said Property of the obligation herein set forth.

10. In the event of legal action occasioned by any default or action of the Covenantor/Owner, or its successors or assigns, then the Covenantor/Owner and its

successors or assigns agree(s) to pay all costs incurred by the County in enforcing the terms of this Agreement, including reasonable attorney's fees and costs, and that the same shall become a part of the lien against said Property.

11. Covenantor/Owner agrees to indemnify, defend, and hold harmless the County, its elected officers, employees, agents, and contractors from and against any and all liability, expense, including costs and reasonable legal fees, and claims of damage of any nature whatsoever including, but not limited to, death, bodily injury, personal injury, or property damage arising from or connected with the County inspection of the Property except where such liability, expense, or claim for damage results from the sole negligence or willful misconduct of the County.

12. It is the intent of the parties hereto that burdens and benefits herein undertaken shall constitute covenants that run with said Property and constitute a lien thereon against.

13. The obligations herein undertaken shall be binding upon the heirs, successors, executors, administrators and assigns of the parties hereto and any other present or future interest holders or estate holders in the property. The term "Owner" shall include not only the present Owner, but also its heirs, successors in interest and in title to the property, executors, administrators, and assigns. Owner shall notify any successor to title of all or part of the Property about the existence of this Agreement. Owner shall provide such notice prior to such successor obtaining an interest in all or part of the Property. Owner shall provide a copy of such notice to the County at the same time such notice is provided to the successor.

14. Time is of the essence in the performance of this Agreement.

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15. Any notice to a party required or called for in this Agreement shall be served in person, or by deposit in the U.S. Mail, first class postage prepaid, to the address set forth below. Notice(s) shall be deemed effective upon receipt, or seventy-two *(72)* hours after deposit in the U.S. Mail, whichever is earlier. A party may change a notice address only by providing written notice thereof to the other party.

COVENANTOR/OWNER:

COUNTY:

Riverside County Department of Transportation
Attn: Transportation Assistant Director
4080 Lemon Street
Riverside, CA

COUNTY OF RIVERSIDE TRANSPORTATION DEPARTMENT		**COVENANTOR/OWNER**
_____	_____	_____
Patricia Romo, P.E.	Date	Company/Corporation/Partnership
Assistant Director of Transportation		
		_____
		(Print Name)
_____	_____	_____
(Attest)	Date	(Print Title)

ACKNOWLEDGMENT

State of California
County of _____

On _____ before me, _____,
(here insert name and title of the officer)

personally appeared _____

_____

_____,

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 _____

(Seal)

Appendix 4: Training Records

Insert Training Records with Brief Discussion Here

Appendix 5: Site Plan and Details

WQMP Site Map and BMP Details

Appendix 6: "As-Built" Drawings

Insert "As-Builts" Here When Available

Appendix 7: Manufacturer Information

Brochures, Manuals, and Maintenance Requirements

Appendix 8: Service Agreement Information

Insert Contractor Information (if any)

Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information

WHEN IT RAINS
IT DRAINS
After the Storm
For more information contact:
or visit
www.epa.gov/npdes/stormwater
www.epa.gov/nps
EPA United States Environmental Protection Agency
EPA 833-B-03-002
January 2003
Internet Address (URL) • HTTP://www.epa.gov
Recycled/Recyclable • Printed With Vegetable
Oil Based Inks on 100% Postconsumer,
Process Chlorine Free Recycled Paper
THE YEAR OF CLEAN WATER
Celebration of Recommitment
A Citizen's Guide to
Understanding Stormwater
WHEN IT RAINS
IT DRAINS

What is stormwater runoff?

Stormwater runoff occurs when precipitation from rain or snowmelt flows over the ground. Impervious surfaces like driveways, sidewalks, and streets prevent stormwater from naturally soaking into the ground.

Why is stormwater runoff a problem?

Stormwater can pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water.

The effects of pollution

Polluted stormwater runoff can have many adverse effects on plants, fish, animals, and people.

- Sediment can cloud the water and make it difficult or impossible for aquatic plants to grow. Sediment also can destroy aquatic habitats.
- Excess nutrients can cause algae blooms. When algae die, they sink to the bottom and decompose in a process that removes oxygen from the water. Fish and other aquatic organisms can't exist in water with low dissolved oxygen levels.

- Bacteria and other pathogens can wash into swimming areas and create health hazards, often making beach closures necessary.
- Debris—plastic bags, six-pack rings, bottles, and cigarette butts—washed into waterbodies can choke, suffocate, or disable aquatic life like ducks, fish, turtles, and birds.
- Household hazardous wastes like insecticides, pesticides, paint, solvents, used motor oil, and other auto fluids can poison aquatic life. Land animals and people can become sick or die from eating diseased fish and shellfish or ingesting polluted water.
- Polluted stormwater often affects drinking water sources. This, in turn, can affect human health and increase drinking water treatment costs.

Stormwater Pollution Solutions

Education is essential to changing people's behavior. Signs and markers near storm drains warn residents that pollutants entering the drains will be carried untreated into a local waterbody.

Residential

Recycle or properly dispose of household products that contain chemicals, such as insecticides, pesticides, paint, solvents, and used motor oil and other auto fluids. Don't pour them onto the ground or into storm drains.

Auto care

Washing your car and degreasing auto parts at home can send detergents and other contaminants through the storm sewer system. Dumping automotive fluids into storm drains has the same result as dumping the materials directly into a waterbody.

- Use a commercial car wash that treats or recycles its wastewater, or wash your car on your yard so the water infiltrates into the ground.
- Repair leaks and dispose of used auto fluids and batteries at designated drop-off or recycling locations.

Lawn care

Excess fertilizers and pesticides applied to lawns and gardens wash off and pollute streams. In addition, yard clippings and leaves can wash into storm drains and contribute nutrients and organic matter to streams.

- Don't overwater your lawn. Consider using a soaker hose instead of a sprinkler.
- Use pesticides and fertilizers sparingly. When use is necessary, use these chemicals in the recommended amounts. Use organic mulch or safer pest control methods whenever possible.
- Compost or mulch yard waste. Don't leave it in the street or sweep it into storm drains or streams.
- Cover piles of dirt or mulch being used in landscaping projects.

Septic systems

Leaking and poorly maintained septic systems release nutrients and pathogens (bacteria and viruses) that can be picked up by stormwater and discharged into nearby waterbodies. Pathogens can cause public health problems and environmental concerns.

- Inspect your system every 3 years and pump your tank as necessary (every 3 to 5 years).
- Don't dispose of household hazardous waste in sinks or toilets.

Pet waste

Pet waste can be a major source of bacteria and excess nutrients in local waters.

- When walking your pet, remember to pick up the waste and dispose of it properly. Flushing pet waste is the best disposal method. Leaving pet waste on the ground increases public health risks by allowing harmful bacteria and nutrients to wash into the storm drain and eventually into local waterbodies.

Residential landscaping

Permeable Pavement—Traditional concrete and asphalt don't allow water to soak into the ground. Instead these surfaces rely on storm drains to divert unwanted water. Permeable pavement systems allow rain and snowmelt to soak through, decreasing stormwater runoff.

Rain Barrels—You can collect rainwater from rooftops in mosquito-proof containers. The water can be used later on lawn or garden areas.

Rain Gardens and Grassy Swales—Specially designed areas planted with native plants can provide natural places for rainwater to collect and soak into the ground. Rain from rooftop areas or paved areas can be diverted into these areas rather than into storm drains.

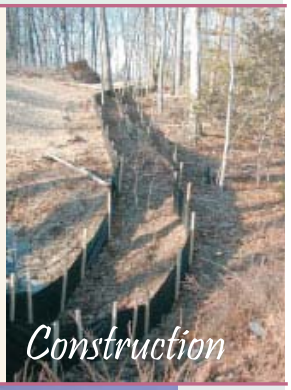
Vegetated Filter Strips—Filter strips are areas of native grass or plants created along roadways or streams. They trap the pollutants stormwater picks up as it flows across driveways and streets.

Commercial

Dirt, oil, and debris that collect in parking lots and paved areas can be washed into the storm sewer system and eventually enter local waterbodies.

- Sweep up litter and debris from sidewalks, driveways and parking lots, especially around storm drains.
- Cover grease storage and dumpsters and keep them clean to avoid leaks.
- Report any chemical spill to the local hazardous waste cleanup team. They'll know the best way to keep spills from harming the environment.

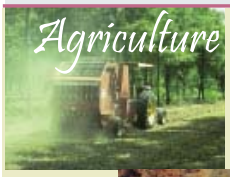
Construction



Erosion controls that aren't maintained can cause excessive amounts of sediment and debris to be carried into the stormwater system. Construction vehicles can leak fuel, oil, and other harmful fluids that can be picked up by stormwater and deposited into local waterbodies.

- Divert stormwater away from disturbed or exposed areas of the construction site.
- Install silt fences, vehicle mud removal areas, vegetative cover, and other sediment and erosion controls and properly maintain them, especially after rainstorms.
- Prevent soil erosion by minimizing disturbed areas during construction projects, and seed and mulch bare areas as soon as possible.

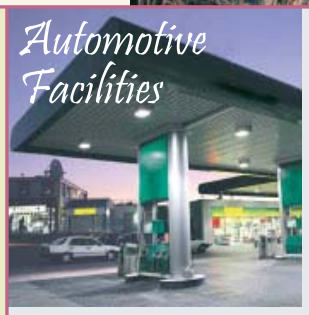
Agriculture



Lack of vegetation on streambanks can lead to erosion. Overgrazed pastures can also contribute excessive amounts of sediment to local waterbodies. Excess fertilizers and pesticides can poison aquatic animals and lead to destructive algae blooms. Livestock in streams can contaminate waterways with bacteria, making them unsafe for human contact.

- Keep livestock away from streambanks and provide them a water source away from waterbodies.
- Store and apply manure away from waterbodies and in accordance with a nutrient management plan.
- Vegetate riparian areas along waterways.
- Rotate animal grazing to prevent soil erosion in fields.
- Apply fertilizers and pesticides according to label instructions to save money and minimize pollution.

Automotive Facilities



Uncovered fueling stations allow spills to be washed into storm drains. Cars waiting to be repaired can leak fuel, oil, and other harmful fluids that can be picked up by stormwater.

- Clean up spills immediately and properly dispose of cleanup materials.
- Provide cover over fueling stations and design or retrofit facilities for spill containment.
- Properly maintain fleet vehicles to prevent oil, gas, and other discharges from being washed into local waterbodies.
- Install and maintain oil/water separators.

Forestry

Improperly managed logging operations can result in erosion and sedimentation.

- Conduct preharvest planning to prevent erosion and lower costs.
- Use logging methods and equipment that minimize soil disturbance.
- Plan and design skid trails, yard areas, and truck access roads to minimize stream crossings and avoid disturbing the forest floor.
- Construct stream crossings so that they minimize erosion and physical changes to streams.
- Expedite revegetation of cleared areas.

For Information:

For more information on the General Industrial Storm Water Permit contact:

State Water Resources Control Board (SWRCB)
(916) 657-1146 or www.swrcb.ca.gov/ or, at your Regional Water Quality Control Board (RWQCB).

Santa Ana Region (8)
California Tower
3737 Main Street, Ste. 500
Riverside, CA 92501-3339
(909) 782-4130

San Diego Region (9)
9771 Clairemont Mesa Blvd., Ste. A
San Diego, CA 92124
(619) 467-2952

Colorado River Basin Region (7)
73-720 Fred Waring Dr., Ste. 100
Palm Desert, CA 92260
(760) 346-7491

SPILL RESPONSE AGENCY:
HAZ-MAT: (909) 358-5055
HAZARDOUS WASTE DISPOSAL: (909) 358-5055
RECYCLING INFORMATION: 1-800-366-SAVE
TO REPORT ILLEGAL DUMPING OR A CLOGGED STORM DRAIN: 1-800-506-2555

To order additional brochures or to obtain information on other pollution prevention activities, call: (909) 955-1111.

StormWater CleanWater
PROTECTION PROGRAM

Riverside County gratefully acknowledges the State Water Quality Control Board and the American Public Works Association, Storm Water Quality Task Force for the information provided in this brochure.

DID YOU KNOW . . .

YOUR FACILITY MAY NEED A STORM WATER PERMIT?

Many industrial facilities and manufacturing operations must obtain coverage under the Industrial Activities Storm Water General Permit

FIND OUT IF YOUR FACILITY MUST OBTAIN A PERMIT

StormWater Pollution . . . What you should know

Riverside County has two drainage systems - sanitary sewers and storm drains. The storm drain system is designed to help prevent flooding by carrying excess rainwater away from streets. Since the storm drain system does not provide for water treatment, it also serves the *unintended* function of transporting pollutants directly to our waterways.

Unlike sanitary sewers, storm drains are not connected to a treatment plant - they flow directly to our local streams, rivers and lakes.

In recent years, awareness of the need to protect water quality has increased. As a result, federal, state, and local programs have been established to reduce polluted stormwater discharges to our waterways. The emphasis of these programs is to prevent stormwater pollution since it's much easier, and less costly, than cleaning up "after the fact."

National Pollutant Discharge Elimination System (NPDES)

In 1987, the Federal Clean Water Act was amended to establish a framework for regulating industrial stormwater discharges under the NPDES permit program. In California, NPDES permits are issued by the State Water Resources Control Board (SWRCB) and the nine (9) Regional Water Quality Control Boards (RWQCB). In general, certain industrial facilities and manufacturing operations must obtain coverage under the Industrial Activities Storm Water General Permit if the type of facilities or operations falls into one of the several categories described in this brochure.

How Do I Know If I Need A Permit?

Following are ***general descriptions*** of the industry categories types that are regulated by the Industrial Activities Storm Water General Permit. Contact your local Region Water Quality Control Board to determine if your facility/operation requires coverage under the Permit.

➜ Facilities such as cement manufacturing; feedlots; fertilizer manufacturing; petroleum refining; phosphate manufacturing; steam electric power generation; coal mining; mineral mining and processing; ore mining and dressing; and asphalt emulsion;

➜ Facilities classified as lumber and wood products (except wood kitchen cabinets); pulp, paper, and paperboard mills; chemical producers (except some pharmaceutical and biological products); petroleum and coal products; leather production and products; stone, clay and glass products; primary metal industries; fabricated structural metal; ship and boat building and repairing;

➜ Active or inactive mining operations and oil and gas exploration, production, processing, or treatment operations;

➜ Hazardous waste treatment, storage, or disposal facilities;

➜ Landfills, land application sites and open dumps that receive or have received any industrial waste; unless there is a new overlying land use such as a golf course, park, etc., and there is no discharge associated with the landfill;

➜ Facilities involved in the recycling of materials, including metal scrap yards, battery reclaimers, salvage yards, and automobile junkyards;

➜ Steam electric power generating facilities, facilities that generate steam for electric power by combustion;

➜ Transportation facilities that have vehicle maintenance shops, fueling facilities, equipment cleaning operations, or airport deicing operations. This includes school bus maintenance facilities operated by a school district;

➜ Sewage treatment facilities;

➜ Facilities that have areas where material handling equipment or activities, raw materials, intermediate products, final products, waste materials, by-products, or industrial machinery are exposed to storm water.

How do I obtain coverage under the Industrial Activities Storm Water General Permit?

Obtain a permit application package from your local Regional Water Quality Control Board listed on the back of this brochure or the State Water Resources Control Board (SWRCB). Submit a completed Notice of Intent (NOI) form, site map and the appropriate fee ($250 or $500) to the SWRCB. Facilities must submit an NOI thirty (30) days prior to beginning operation. Once you submit the NOI, the State Board will send you a letter acknowledging receipt of your NOI and will assign your facility a waste discharge identification number (WDID No.). You will also receive an annual fee billing. These billings should roughly coincide with the date the State Board processed your original NOI submittal.

What are the requirements of the Industrial Activities Storm Water General Permit?

The basic requirements of the Permit are:

1. The facility must eliminate any non-stormwater discharges or obtain a separate permit for such discharges.

2. The facility must develop and implement a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP must identify sources of pollutants that may be exposed to stormwater. Once the sources of pollutants have been identified, the facility operator must develop and implement Best Management Practices (BMPs) to minimize or prevent polluted runoff.

   Guidance in preparing a SWPPP is available from a document prepared by the California Storm Water Quality Task Force called the California Storm Water Best Management Practice Handbook.

3. The facility must develop and implement a Monitoring Program that includes conducting visual observations and collecting samples of the facility's storm water discharges associated with industrial activity. The General Permit requires that the analysis be conducted by a laboratory that is certified by the State of California.

4. The facility must submit to the Regional Board, every July 1, an annual report that includes the results of its monitoring program.

A Non-Storm Water Discharge is... *any discharge to a storm drain system that is not composed entirely of storm water. The following non-storm water discharges are authorized by the General Permit: fire hydrant flushing; potable water sources, including potable water related to the operation, maintenance, or testing of potable water systems; drinking fountain water; atmospheric condensates including refrigeration, air conditioning, and compressor condensate; irrigation drainage; landscape watering; springs; non-contaminated ground water; foundation or footing drainage; and sea water infiltration where the sea waters are discharged back into the sea water source.*

A BMP is . . . *a technique, process, activity, or structure used to reduce the pollutant content of a storm water discharge. BMPs may include simple, non-structural methods such as good housekeeping, staff training and preventive maintenance. Additionally, BMPs may include structural modifications such as the installation of berms, canopies or treatment control (e.g. setting basins, oil/water separators, etc.)*

WARNING*: There are significant penalties for non-compliance: a minimum fine of $5,000 for failing to obtain permit coverage, and, up to $10,000 per day, per violation plus $10 per gallon of discharge in excess of 1,000 gallons.*

Stormwater Pollution

What you should know for...

Industrial & Commercial Facilities

Best Management Practices (BMPS) for:

- Industrial Facilities
- Commercial Facilities

Riverside County Stormwater Program Members

City of Banning
(951) 922-3105

City of Beaumont
(951) 769-8520

City of Calimesa
(909) 795-9801

City of Canyon Lake
(951) 244-2955

City of Cathedral City
(760) 770-0340

City of Coachella
(760) 398-3502

City of Corona
(951) 736-2447

City of Desert Hot Springs
(760) 329-6411

City of Eastvale
(951) 361-0900

City of Hemet
(951) 765-2300

City of Indian Wells
(760) 346-2489

City of Indio
(760) 391-4000

City of Jurupa Valley
(951) 332-6464

City of Lake Elsinore
(951) 674-3124

City of La Quinta
(760) 777-7000

City of Menifee
(951) 672-6777

City of Moreno Valley
(951) 413-3000

City of Murrieta
(951) 304-2489

City of Norco
(951) 270-5607

City of Palm Desert
(760) 346-0611

City of Palm Springs
(760) 323-8299

City of Perris
(951) 943-6100

City of Rancho Mirage
(760) 324-4511

City of Riverside
(951) 826-5311

City of San Jacinto
(951) 487-7330

City of Temecula
(951) 694-6444

City of Wildomar
(951) 677-7751

Coachella Valley Water District
(760) 398-2651

County of Riverside
(951) 955-1000

Riverside County Flood Control District
(951) 955-1200

YOU can prevent Stormwater Pollution following these practices...

Industrial and Commercial Facilities

The Riverside County Stormwater Program has identified a number of Best Management Practices (BMPs) for Industrial and Commercial Facilities. These BMPs control and reduce stormwater pollutants from reaching our storm drain system and ultimately our local water bodies. City and County ordinances require businesses to use these BMPs to protect our water quality. Local cities and the County are required to verify implementation of these BMPs by performing regular facility inspections.

Prohibited Discharges

Discontinue all non-stormwater discharges to the storm drain system. It is *prohibited* to discharge any chemicals, paints, debris, wastes or wastewater into the gutter, street or storm drain.

Outdoor Storage BMPs

- Install covers and secondary containment areas for all hazardous materials and wastes stored outdoors in accordance with County and/or City standards.
- Keep all temporary waste containers covered, at all times when not in use.
- Sweep outdoor areas instead of using a hose or pressure washer.
- Move all process operations including vehicle/equipment maintenance inside of the building or under a covered and contained area.
- Wash equipment and vehicles in a contained and covered wash bay which is closed-loop or connected to a clarifier sized to local standards and discharged to a sanitary sewer or take them to a commercial car wash.

Spills and Clean Up BMPs

- Keep the work site clean and orderly. Remove debris in a timely fashion. Sweep up the area.
- Clean up spills immediately when they occur, using dry clean up methods such as absorbent materials or sweep followed by proper disposal of materials.
- Always have a spill kit available near chemical loading dock doors and vehicle maintenance and fueling areas.
- Follow your Business Emergency Plan, as filed with the local Fire Department.
- Report all prohibited discharges and non-implementation of BMPs to your local Stormwater Coordinator as listed on the back of this pamphlet.

- Report hazardous materials spills to 951-358-5055 or call after hours to 951-782-2973 or, if an emergency, call the Fire Department's Haz Mat Team at 911.

Plastic Manufacturing Facilities BMPs

AB 258 requires plastic product manufacturers to use BMPs, such as safe storage and clean-up procedures to prevent plastic pellets (nurdles) from entering the waterway. The plastic pellets are released into the environment during transporting, packaging and processing and migrate to waterways through the storm drain system. AB 258 will help protect fish and wildlife from the hazards of plastic pollution.

Training BMPs

As prescribed by your City and County Stormwater Ordinance(s), train employees in spill procedures and prohibit non-stormwater discharges to the storm drain system. Applicable BMP examples can be found at www.cabmphandbooks.com.

Permitting

Stormwater discharges associated with specific categories for industrial facilities are regulated by the State Water Resources Control Board through an Industrial Stormwater General Permit. A copy of this General Permit and application forms are available at: www.waterboards.ca.gov, select stormwater then the industrial quick link.

To report illegal dumping or for more information on stormwater pollution prevention call: 1-800-506-2555 or e-mail us at: fcnpdes@rcflood.org.

Helpful telephone numbers and links:

Riverside County Stormwater Protection Partners

Flood Control District	(951) 955-1200
County of Riverside	(951) 955-1000
City of Banning	(951) 922-3105
City of Beaumont	(951) 769-8520
City of Calimesa	(909) 795-9801
City of Canyon Lake	(951) 244-2955
Cathedral City	(760) 770-0327
City of Coachella	(760) 398-4978
City of Corona	(951) 736-2447
City of Desert Hot Springs	(760) 329-6411
City of Eastvale	(951) 361-0900
City of Hemet	(951) 765-2300
City of Indian Wells	(760) 346-2489
City of Indio	(760) 391-4000
City of Lake Elsinore	(951) 674-3124
City of La Quinta	(760) 777-7000
City of Menifee	(951) 672-6777
City of Moreno Valley	(951) 413-3000
City of Murrieta	(951) 304-2489
City of Norco	(951) 270-5607
City of Palm Desert	(760) 346-0611
City of Palm Springs	(760) 323-8299
City of Perris	(951) 943-6100
City of Rancho Mirage	(760) 324-4511
City of Riverside	(951) 361-0900
City of San Jacinto	(951) 654-7337
City of Temecula	(951) 694-6444
City of Wildomar	(951) 677-7751

REPORT ILLEGAL STORM DRAIN DISPOSAL
1-800-506-2555 or e-mail us at
fcnpdes@rcflood.org

- Riverside County Flood Control and Water Conservation District
  www.rcflood.org

Online resources include:

- California Storm Water Quality Association
  www.casqa.org
- State Water Resources Control Board
  www.waterboards.ca.gov
- Power Washers of North America
  www.thepwna.org

Stormwater Pollution

What you should know for...

Outdoor Cleaning Activities and Professional Mobile Service Providers

Storm drain pollution prevention information for:

- Car Washing / Mobile Detailers
- Window and Carpet Cleaners
- Power Washers
- Waterproofers / Street Sweepers
- Equipment cleaners or degreasers and all mobile service providers

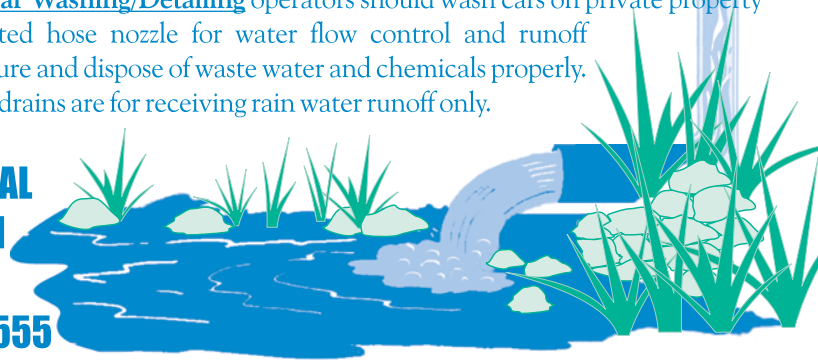
Do you know where street flows actually go?

Storm drains are NOT connected to sanitary sewer systems and treatment plants!

The primary purpose of storm drains is to carry *rain* water away from developed areas to prevent flooding. Pollutants discharged to storm drains are transported directly into rivers, lakes and streams. Soaps, degreasers, automotive fluids, litter and a host of materials are washed off buildings, sidewalks, plazas and parking areas. Vehicles and equipment must be properly managed to prevent the pollution of local waterways.

Unintentional spills by mobile service operators can flow into storm drains and pollute our waterways. **Avoid mishaps.** *Always* have a **Spill Response Kit** on hand to clean up unintentional spills. Only emergency **Mechanical** repairs should be done in City streets, using drip pans for spills. **Plumbing** should be done on private property. Always store chemicals in a leak-proof container and keep covered when not in use. **Window/Power Washing** waste water shouldn't be released into the streets, but should be disposed of in a sanitary sewer, landscaped area or in the soil. Soiled **Carpet Cleaning** wash water should be filtered before being discharged into the sanitary sewer. Dispose of all filter debris properly. **Car Washing/Detailing** operators should wash cars on private property and use a regulated hose nozzle for water flow control and runoff prevention. Capture and dispose of waste water and chemicals properly. Remember, storm drains are for receiving rain water runoff only.

REPORT ILLEGAL STORM DRAIN DISPOSAL 1-800-506-2555



Help Protect Our Waterways!

Use these guidelines for Outdoor Cleaning Activities and Wash Water Disposal

Did you know that disposing of pollutants into the street, gutter, storm drain or body of water is *PROHIBITED* by law and can result in stiff penalties?

Best Management Practices

Waste wash water from Mechanics, Plumbers, Window/Power Washers, Carpet Cleaners, Car Washing and Mobile Detailing activities may contain significant quantities of motor oil, grease, chemicals, dirt, detergents, brake pad dust, litter and other materials.

Best Management Practices, or BMPs as they are known, are guides to prevent pollutants from entering the storm drains. ***Each of us*** can do our part to keep stormwater clean by using the suggested BMPs below:

Simple solutions for both light and heavy duty jobs:

Do...consider dry cleaning methods first such as a mop, broom, rag or wire brush. Always keep a spill response kit on site.

Do...prepare the work area before power cleaning by using sand bags, rubber mats, vacuum booms, containment pads or temporary berms to keep wash water away from the gutters and storm drains.

Do...use vacuums or other machines to remove and collect loose debris or litter before applying water.

Do...obtain the property owner's permission to dispose of ***small amounts*** of power washing waste water on to landscaped, gravel or unpaved surfaces.

Do...check your local sanitary sewer agency's policies on wash water disposal regulations before disposing of wash water into the sewer. (See list on reverse side)

Do...be aware that if discharging to landscape areas, soapy wash water may damage landscaping. Residual wash water may remain on paved surfaces to evaporate. Sweep up solid residuals and dispose of properly. Vacuum booms are another option for capturing and collecting wash water.

Do...check to see if local ordinances prevent certain activities.

Do not let...wash or waste water from sidewalk, plaza or building cleaning go into a street or storm drain.

Report illegal storm drain disposal
Call Toll Free
1-800-506-2555

Using Cleaning Agents

Try using biodegradable/phosphate-free products. They are easier on the environment, but don't confuse them with being toxic free. Soapy water entering the storm drain system can impact the delicate aquatic environment.

When cleaning surfaces with a ***high-pressure washer*** or ***steam cleaner***, additional precautions should be taken to prevent the discharge of pollutants into the storm drain system. These two methods of surface cleaning can loosen additional material that can contaminate local waterways.

Think Water Conservation

Minimize water use by using high pressure, low volume nozzles. Be sure to check all hoses for leaks. Water is a precious resource, don't let it flow freely and be sure to shut it off in between uses.

Screening Wash Water

Conduct thorough dry cleanup before washing exterior surfaces, such as buildings and decks ***with loose paint***, sidewalks or plaza areas. Keep debris from entering the storm drain after cleaning by first passing the wash water through a "20 mesh" or finer screen to catch the solid materials, then dispose of the mesh in a refuse container. Do not let the remaining wash water enter a street, gutter or storm drain.

Drain Inlet Protection & Collection of Wash Water

- Prior to any washing, block all storm drains with an impervious barrier such as sandbags or berms, or seal the storm drain with plugs or other appropriate materials.
- Create a containment area with berms and traps or take advantage of a low spot to keep wash water contained.
- Wash vehicles and equipment on grassy or gravel areas so that the wash water can seep into the ground.
- Pump or vacuum up all wash water in the contained area.

Concrete/Coring/Saw Cutting and Drilling Projects

Protect any down-gradient inlets by using dry activity techniques whenever possible. If water is used, minimize the amount of water used during the coring/drilling or saw cutting process. Place a barrier of sandbags and/or absorbent berms to protect the storm drain inlet or watercourse. Use a shovel or wet vacuum to remove the residue from the pavement. Do not wash residue or particulate matter into a storm drain inlet or watercourse.

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
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LA MIRADA, CALIFORNIA 90638
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SAMPLE STENCIL

PER BMP SD-13

3.1 INFILTRATION BASIN

Type of BMP	LID - Infiltration
Treatment Mechanisms	Infiltration, Evapotranspiration (when vegetated), Evaporation, and Sedimentation
Maximum Treatment Area	50 acres
Other Names	Bioinfiltration Basin

Description

An Infiltration Basin is a flat earthen basin designed to capture the design capture volume, V_{BMP}. The stormwater infiltrates through the bottom of the basin into the underlying soil over a 72 hour drawdown period. Flows exceeding V_{BMP} must discharge to a downstream conveyance system. Trash and sediment accumulate within the forebay as stormwater passes into the basin. Infiltration basins are highly effective in removing all targeted pollutants from stormwater runoff.

Figure 1 – Infiltration Basin

See Appendix A, and Appendix C, Section 1 of *Basin Guidelines*, for additional requirements.

Siting Considerations

The use of infiltration basins may be restricted by concerns over ground water contamination, soil permeability, and clogging at the site. See the applicable WQMP for any specific feasibility considerations for using infiltration BMPs. Where this BMP is being used, the soil beneath the basin must be thoroughly evaluated in a geotechnical report since the underlying soils are critical to the basin's long term performance. To protect the basin from erosion, the sides and bottom of the basin must be vegetated, preferably with native or low water use plant species.

In addition, these basins may not be appropriate for the following site conditions:

- Industrial sites or locations where spills of toxic materials may occur
- Sites with very low soil infiltration rates
- Sites with high groundwater tables or excessively high soil infiltration rates, where pollutants can affect ground water quality
- Sites with unstabilized soil or construction activity upstream
- On steeply sloping terrain
- Infiltration basins located in a fill condition should refer to Appendix A of this Handbook for details on special requirements/restrictions

Setbacks

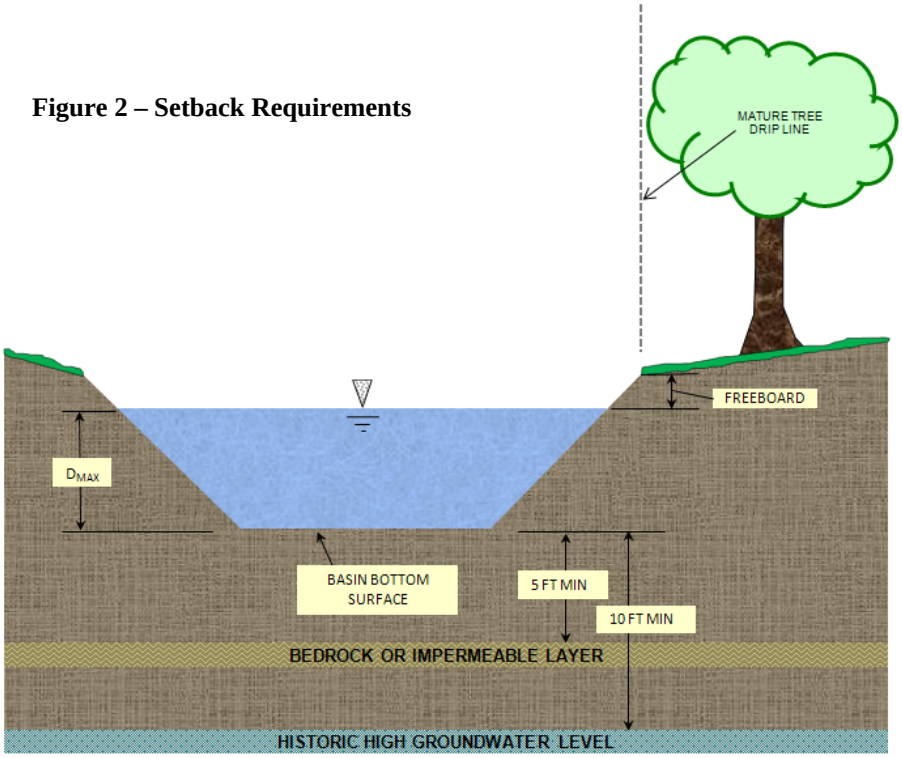
Always consult your geotechnical engineer for site specific recommendations regarding setbacks for infiltration trenches. Recommended setbacks are needed to protect buildings, existing trees, walls, onsite or nearby wells, streams, and tanks. Setbacks should be considered early in the design process since they can affect where infiltration facilities may be placed and how deep they are allowed to be. For instance, depth setbacks can dictate fairly shallow facilities that will have a larger footprint and, in some cases, may make an infiltration basin infeasible. In that instance, another BMP must be selected.

Infiltration basins typically must be set back:

- 10 feet from the historic high groundwater (measured vertically from the bottom of the basin, as shown in Figure 2)
- 5 feet from bedrock or impermeable surface layer (measured vertically from the bottom of the basin, as shown in Figure 2)
- From all existing mature tree drip lines as indicated in Figure 2 (to protect their root structure)
- 100 feet horizontally from wells, tanks or springs

Setbacks to walls and foundations must be included as part of the Geotechnical Report. All other setbacks shall be in accordance with applicable standards of the District's *Basin Guidelines* (Appendix C).

Figure 2 – Setback Requirements



Forebay

A concrete forebay shall be provided to reduce sediment clogging and to reduce erosion. The forebay shall have a design volume of at least 0.5% V_{BMP} and a minimum 1 foot high concrete splashwall / berm. Full height notch-type weir(s), offset from the line of flow from the basin inlet to prevent short circuiting, shall be used to outlet the forebay. It is recommended that two weirs be used and that they be located on opposite sides of the forebay (see Figure 2).

Overflow

Flows exceeding V_{BMP} must discharge to an acceptable downstream conveyance system. Where an adequate outlet is present, an overflow structure may be used. Where an embankment is present, an emergency spillway may be used instead. Overflows must be placed just above the design water surface for V_{BMP} and be near the outlet of the system. The overflow structure shall be similar to the District's Standard Drawing CB 110. Additional details may be found in the District's *Basin Guidelines* (Appendix C).

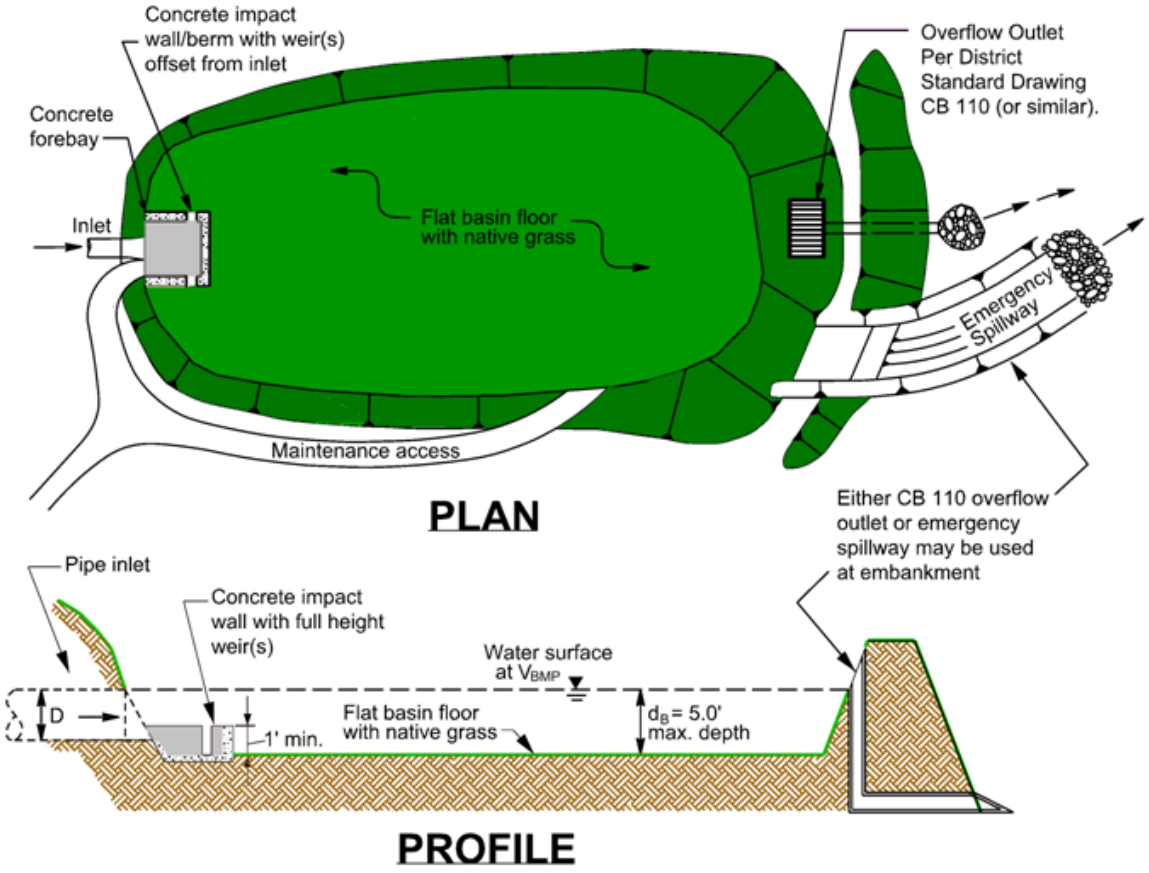


Figure 3 – Infiltration Basin

Landscaping Requirements

Basin vegetation provides erosion protection, improves sediment removal and assists in allowing infiltration to occur. The basin surface and side slopes shall be planted with native grasses. Proper landscape management is also required to ensure that the vegetation does not contribute to water pollution through pesticides, herbicides, or fertilizers. Landscaping shall be in accordance with County of Riverside Ordinance 859 and the District's *Basin Guidelines* (Appendix C), or other guidelines issued by the Engineering Authority.

Maintenance

Normal maintenance of an infiltration basin includes the maintenance of landscaping, debris and trash removal from the surface of the basin, and tending to problems associated with standing water (vectors, odors, etc.). Significant ponding, especially more than 72 hours after an event, may indicate that the basin surface is no longer providing sufficient infiltration and requires aeration. See the District's *Basin Guidelines* (Appendix C) for additional requirements (i.e., fencing, maintenance access, etc.).

Table 1 - Inspection and Maintenance

Schedule	Inspection and Maintenance Activity
Ongoing including just before annual storm seasons and following rainfall events.	• Maintain vegetation as needed. Use of fertilizers, pesticides and herbicides should be strenuously avoided to ensure they don't contribute to water pollution. If appropriate native plant selections and other IPM methods are used, such products shouldn't be needed. If such projects are used, o Products shall be applied in accordance with their labeling, especially in relation to application to water, and in areas subjected to flooding. o Fertilizers should not be applied within 15 days before, after, or during the rain season. • Remove debris and litter from the entire basin to minimize clogging and improve aesthetics. • Check for obvious problems and repair as needed. Address odor, insects, and overgrowth issues associated with stagnant or standing water in the basin bottom. There should be no long-term ponding water. • Check for erosion and sediment laden areas in the basin. Repair as needed. Clean forebay if needed. • Revegetate side slopes where needed.
Annually. If possible, schedule these inspections within 72 hours after a significant rainfall.	• Inspection of hydraulic and structural facilities. Examine the inlet for blockage, the embankment and spillway integrity, as well as damage to any structural element. • Check for erosion, slumping and overgrowth. Repair as needed. • Check basin depth for sediment build up and reduced total capacity. Scrape bottom as needed and remove sediment. Restore to original cross-section and infiltration rate. Replant basin vegetation. • Verify the basin bottom is allowing acceptable infiltration. Use a disc or other method to aerate basin bottom only if there is actual significant loss of infiltrative capacity, rather than on a routine basis[1]. • No water should be present 72 hours after an event. No long term standing water should be present at all. No algae formation should be visible. Correct problem as needed.

1. **CA Stormwater BMP Handbook for New Development and Significant Redevelopment**

Table 2 - Design and Sizing Criteria for Infiltration Basins

Design Parameter	Infiltration Basin
Design Volume	V_{BMP}
Forebay Volume	0.5% V_{BMP}
Drawdown time (maximum)	72 hours
Maximum tributary area	50 acres [2]
Minimum infiltration rate	Must be sufficient to drain the basin within the required Drawdown time over the life of the BMP. The WQMP may include specific requirements for minimum tested infiltration rates.
Maximum Depth	5 feet
Spillway erosion control	Energy dissipators to reduce velocities[1]
Basin Slope	0%
Freeboard (minimum)	1 foot [1]
Historic High Groundwater Setback (max)	10 feet
Bedrock/impermeable layer setback (max)	5 feet
Tree setbacks	Mature tree drip line must not overhang the basin
Set back from wells, tanks or springs	100 feet
Set back from foundations	As recommended in Geotechnical Report

1. **Ventura County's Technical Guidance Manual for Stormwater Quality Control Measures**
2. **CA Stormwater BMP Handbook for New Development and Significant Redevelopment**

Note: The information contained in this BMP Factsheet is intended to be a summary of design considerations and requirements. Additional information which applies to all detention basins may be found in the District's Basin Guidelines (Appendix C). In addition, information herein may be superseded by other guidelines issued by the co-permittee.

INFILTRATION BASIN SIZING PROCEDURE

1. Find the Design Volume, V_{BMP}.
   a) Enter the Tributary Area, $A_{T.}$
   b) Enter the Design Volume, V_{BMP}, determined from Section 2.1 of this Handbook.
2. Determine the Maximum Depth.
   a) Enter the infiltration rate. The infiltration rate shall be established as described in Appendix A: "Infiltration Testing".
   b) Enter the design Factor of Safety from Table 1 in Appendix A: "Infiltration Testing".
   c) The spreadsheet will determine D_1, the maximum allowable depth of the basin based on the infiltration rate along with the maximum drawdown time (72 hours) and the Factor of Safety.

$$D_1 = [(t) \times (I)] / 12s$$

Where I = site infiltration rate (in/hr)
s = safety factor
t = drawdown time (maximum 72 hours)

d) Enter the depth of freeboard.

e) Enter the depth to the historic high groundwater level measured from the top of the basin.

f) Enter the depth to the top of bedrock or other impermeable layer measured from the finished grade.

g) The spreadsheet will determine D_2, the total basin depth (including freeboard, if used) of the basin, based on restrictions to the depth by groundwater and an impermeable layer.

D_2 = Depth to groundwater – (10 + freeboard) (ft);

or

D_2 = Depth to impermeable layer – (5 + freeboard) (ft)

Whichever is least.

h) The spreadsheet will determine the maximum allowable effective depth of basin, D_{MAX}, based on the smallest value between D_1 and D_2. D_{MAX} is the maximum depth of water only and does not include freeboard. D_{MAX} shall not exceed 5 feet.

3. Basin Geometry

a) Enter the basin side slopes, z (no steeper than 4:1).

b) Enter the proposed basin depth, d_B excluding freeboard.

c) The spreadsheet will determine the minimum required surface area of the basin:

$$A_s = V_{BMP} / d_B$$

Where A_s = minimum area required (ft^2)
V_{BMP} = volume of the infiltration basin (ft^3)
d_B= proposed depth not to exceed maximum allowable depth, D_{MAX} (ft)

d) Enter the proposed bottom surface area. This area shall not be less than the minimum required surface area.

4. Forebay

A concrete forebay with a design volume of at least 0.5% V_{BMP} and a minimum 1 foot high concrete splashwall shall be provided. Full-height rectangular weir(s) shall be used to outlet the forebay. The weir(s) must be offset from the line of flow from the basin inlet. It is recommended that two weirs be used and that they be located on opposite sides of the forebay (see Figure 2).

a) The spreadsheet will determine the minimum required forebay volume based on 0.5% V_{BMP}.

b) Enter the proposed depth of the forebay berm/splashwall (1foot minimum).

c) The spreadsheet will determine the minimum required forebay surface area.

d) Enter the width of rectangular weir to be used (minimum 1.5 inches). Weir width should be established based on a 5 minute drawdown time.

StormTech
Detention • Retention • Water Quality
An ADS company

Isolator® Row O&M Manual

THE MOST ADVANCED NAME IN WATER MANAGEMENT SOLUTIONS™

ADS®

THE ISOLATOR® ROW

INTRODUCTION

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a technique to inexpensively enhance Total Suspended Solids (TSS) removal and provide easy access for inspection and maintenance.

THE ISOLATOR ROW

The Isolator Row is a row of StormTech chambers, either SC-160LP, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-4500 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC- 310-3 and SC-740 models) allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of the underlying stone and remain intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber. The non-woven fabric is not required over the SC-160LP, DC-780, MC-3500 or MC-4500 models as these chambers do not have perforated side walls.

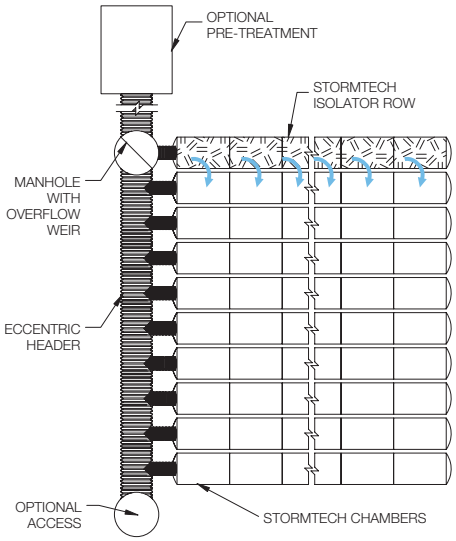
The Isolator Row is typically designed to capture the “first flush” and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole not only provides access to the Isolator Row but typically includes a high flow weir such that storm water flowrates or volumes that exceed the capacity of the Isolator Row overtop the over flow weir and discharge through a manifold to the other chambers.

The Isolator Row may also be part of a treatment train. By treating storm water prior to entry into the chamber system, the service life can be extended and pollutants such as hydrocarbons can be captured. Pre-treatment best management practices can be as simple as deep sump catch basins, oil-water separators or can be innovative storm water treatment devices. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.

Looking down the Isolator Row from the manhole opening, woven geotextile is shown between the chamber and stone base.

StormTech Isolator Row with Overflow Spillway (not to scale)



ISOLATOR ROW INSPECTION/MAINTENANCE

INSPECTION

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

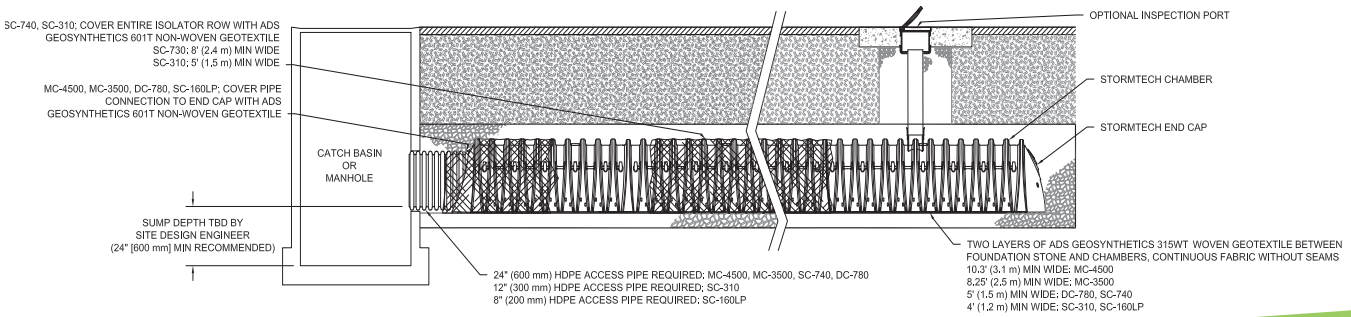
MAINTENANCE

The Isolator Row was designed to reduce the cost of periodic maintenance. By "isolating" sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" are best. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**

StormTech Isolator Row (not to scale)

Note: Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500 and MC-4500 chamber models and is not required over the entire Isolator Row.



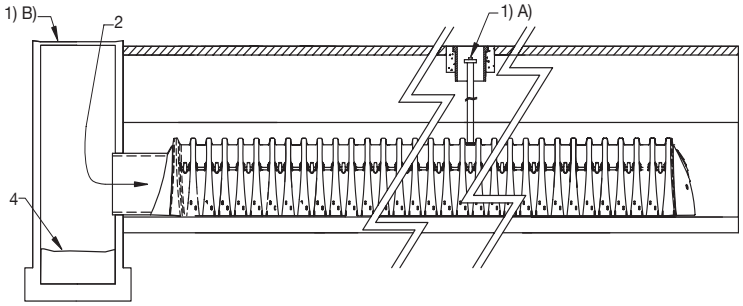
ISOLATOR ROW STEP BY STEP MAINTENANCE PROCEDURES

STEP 1
Inspect Isolator Row for sediment.
- A) Inspection ports (if present)
  - i. Remove lid from floor box frame
  - ii. Remove cap from inspection riser
  - iii. Using a flashlight and stadia rod,measure depth of sediment and record results on maintenance log.
  - iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.
- B) All Isolator Rows
  - i. Remove cover from manhole at upstream end of Isolator Row
  - ii. Using a flashlight, inspect down Isolator Row through outlet pipe
    1. Mirrors on poles or cameras may be used to avoid a confined space entry
    2. Follow OSHA regulations for confined space entry if entering manhole
  - iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2. If not, proceed to Step 3.

STEP 2
Clean out Isolator Row using the JetVac process.
- A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
- B) Apply multiple passes of JetVac until backflush water is clean
- C) Vacuum manhole sump as required

STEP 3
Replace all caps, lids and covers, record observations and actions.

STEP 4
Inspect & clean catch basins and manholes upstream of the StormTech system.



SAMPLE MAINTENANCE LOG

Date	Stadia Rod Readings		Sediment Depth (1)–(2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

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StormTech® Detention • Retention • Water Quality
A division of ADS

Advanced Drainage Systems, Inc.
4640 Trueman Blvd., Hilliard, OH 43026
1-800-821-6710 www.ads-pipe.com

CONTECH®
ENGINEERED SOLUTIONS

CDS® Inspection and Maintenance Guide

CDS TECHNOLOGIES

Maintenance

The CDS system 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 of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	yd3	m3
CDS2015-4	4	1.2	3.0	0.9	0.5	0.4
CDS2015	5	1.5	3.0	0.9	1.3	1.0
CDS2020	5	1.5	3.5	1.1	1.3	1.0
CDS2025	5	1.5	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

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CDS Inspection & Maintenance Log

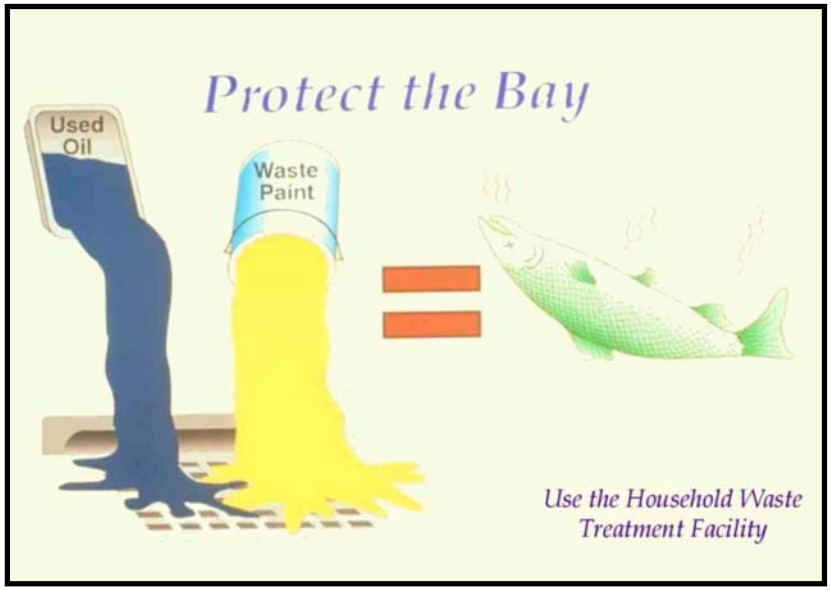
CDS Model: _____ Location: _____

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

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

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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).

- 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

Ferguson, B.K. 1991. Urban Stream Reclamation, p. 324-322, Journal of Soil and Water Conservation.

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

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

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Storm Drain System Cleaning. On line:
http://www.epa.gov/npdes/menuofbmps/poll_16.htm

Site Design & Landscape Planning SD-10

Design Objectives

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

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

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

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

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Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.
- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.
- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.
- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.
- Promote natural vegetation by using parking lot islands and other landscaped areas.
- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.
- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and

regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are 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.

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

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

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

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.

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.

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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.

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