Appendix C

Water Quality Management Plan

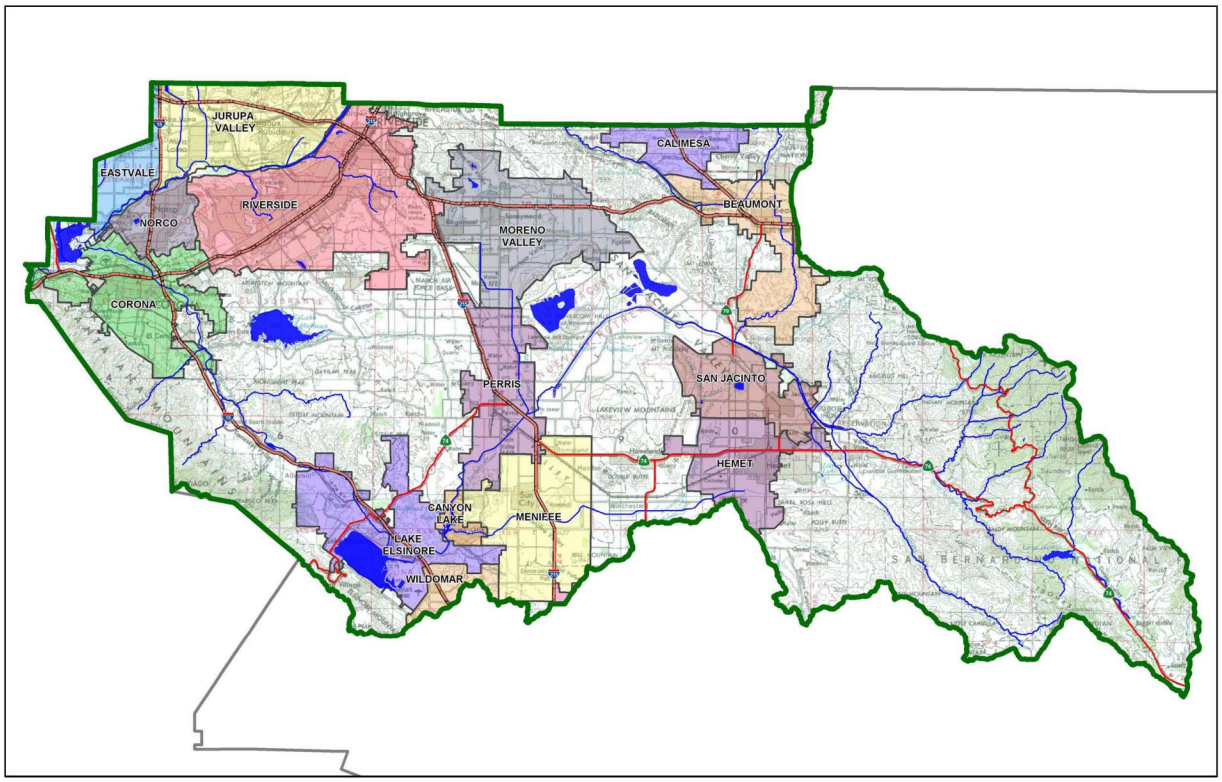
Project Specific Water Quality Management Plan

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

Project Title: Double Butte Battery Storage Project

Development No: DEV2022-026

Design Review/Case No: PLN22-0281-Double Butte Battery Storage



☒ Preliminary
☐ Final

Original Date Prepared: 12/02/2022

Revision Date(s): 2/3/2025

Prepared for Compliance with
Regional Board Order No. R8-2010-0033
Template revised June 30, 2016

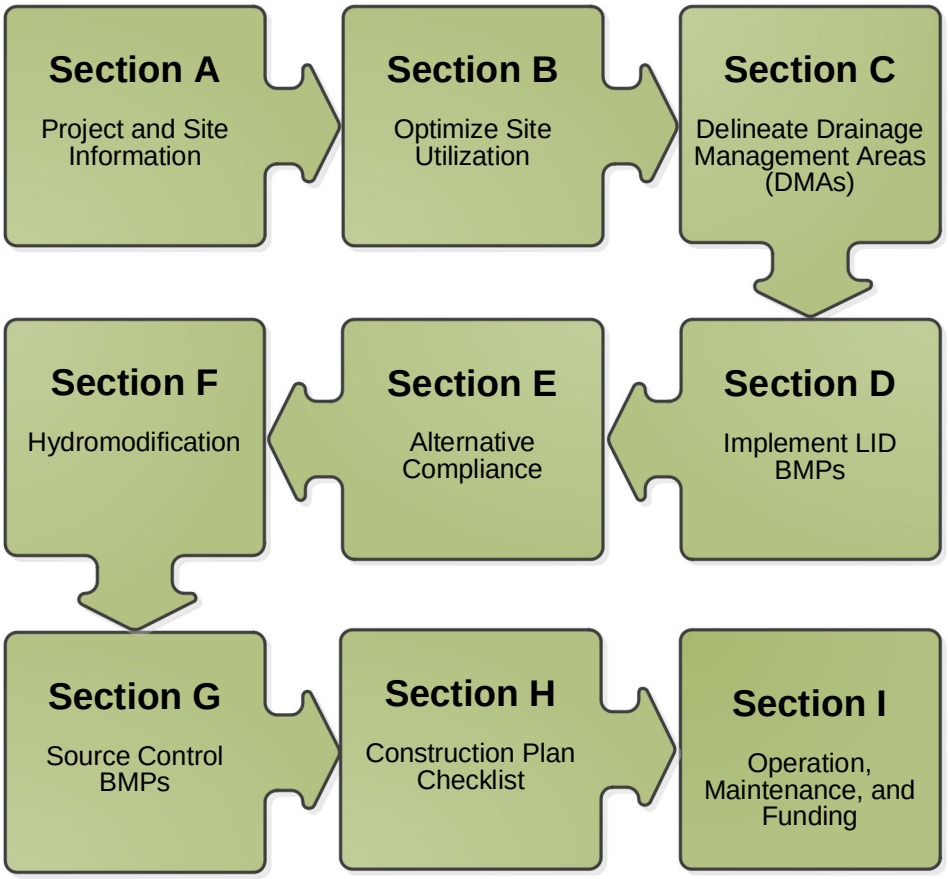
Contact Information:

Prepared for:
AES
Ken Koch
Ken.Koch@aes.com
(661) 433-6744

Prepared by:
Kimley-Horn and Associates
(714) 939-1030

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 AES by Kimley-Horn for the Double Butte project.

This WQMP is intended to comply with the requirements of the City of Menifee for Order No. R8-2010-033 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 the City of Menifee Water Quality Ordinance (Municipal Code Section 15.01.060).

"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
Ken Koch	
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	02/03/2025 Date
Ashley Teani Preparer's Printed Name	P.E. Preparer's Title/Position

Preparer's Licensure:

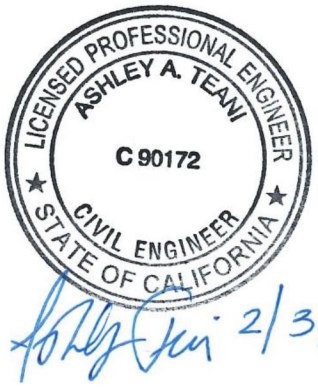


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Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Industrial
Planning Area:	3
Community Name:	Menifee North
Development Name:	Double Butte Battery Storage
PROJECT LOCATION	
Latitude & Longitude (DMS): 33.738, -117.165	
Project Watershed and Sub-Watershed: Santa Ana Watershed and San Jacinto Valley Subwatershed	
Gross Acres: 49.25	
APN(s): 331-190-014, 331-190-010, 331-190-017, 331-190-011, 331-190-047, 331-190-060, 331-190-056	
Map Book and Page No.: Riverside County Book 331 Page 19	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Industrial
Proposed or Potential SIC Code(s)	221114
Area of Impervious Project Footprint (SF)	1,179,237
Total Area of proposed Impervious Surfaces within the Project Footprint (SF)/or Replacement	222,477
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 Footprint (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)	N/A
What is the Water Quality Design Storm Depth for the project?	0.61 inches

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
- BMP Locations (Lat/Long)

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, 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
San Jacinto River	N/A	MUN, AGR, IND,PROC,GWR,NAV, POW, REC1, REC2, COMM, WARM, LWRM, COLD, BIOL, WILD, RARE, SPWN, EST	~4 Miles
Canyon Lake	Nutrients	MUN, AGR, GWR, REC1, REC2, COMM, WARM, WILD	N/A
Lake Elsinore	DDT, Nutrients, Organic Enrichment/Low Dissolved Oxygen, PCBs, Toxicity	REC1, REC2, COMM, WARM, WILD, RARE	~17 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)* RCFCD Encroachment Permit and City of Menifee Grading 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.

Consideration of "highest and best use" of the discharge should also be considered. For example, Lake Elsinore is evaporating faster than runoff from natural precipitation can recharge it. Requiring infiltration of 85% of runoff events for projects tributary to Lake Elsinore would only exacerbate current water quality problems associated with Pollutant concentration due to lake water evaporation. In cases where rainfall events have low potential to recharge Lake Elsinore (i.e. no hydraulic connection between groundwater to Lake Elsinore, or other factors), requiring infiltration of Urban Runoff from projects is counterproductive to the overall watershed goals. Project proponents, in these cases, would be allowed to discharge Urban Runoff, provided they used equally effective filtration-based BMPs.

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?

The project will largely preserve existing drainage patterns.

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

Existing vegetative cover includes non-native seasonal grasses with fair to poor cover. Vegetation is non-native and will not be preserved. Proposed native landscaping will be used for vegetative buffers.

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

The underlying infiltration rates are insufficient for infiltration BMPs.

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

Impervious areas were minimized wherever practical.

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

Runoff from impervious surfaces will discharge into BiofiItration BMPs located onsite before discharging into the existing storm drain system.

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][2]	Area (Sq. Ft.)	DMA Type
A	Concrete or Asphalt	230,123	D
A	Compacted Soil (Unpaved Parking)	173,985	D
A	Natural (C Soil)	554,390	D
A	Ornamental Landscaping	36,501	D
B	Concrete or Asphalt	43,032	D
C	Ornamental Landscaping	31,500	A
D	Concrete or Asphalt	20,034	D
D	Ornamental Landscaping	4,452	D
E	Concrete or Asphalt	14,119	D
F	Ornamental Landscaping	39,604	A

[1]Reference Table 2-1 in the WQMP Guidance Document to populate this column
[2]If multi-surface provide back-up

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

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
C	31,500	Ornamental Landscaping	
F	39,604	Ornamental Landscaping	

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

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

$$[D] = [B] + \frac{[B] \cdot [C]}{[A]}$$

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

DMA					Receiving Self-Retaining DMA		
DMA Name/ ID	Area (square feet) [A]	Post-project surface type	Impervious fraction [B]	Product [C] = [A] x [B]	DMA name /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	Biofiltration Basin (BIO-1)
B	Modular Wetland System (MWS-1)
D	Modular Wetland System (MWS-2)
E	Modular Wetland System (MWS-3)

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.

Implement LID BMPs

C.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; proceed to section D.3

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 C.6 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:	all	
…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: Low infiltration rates		

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.

C.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 none 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: 3.60

Type of Landscaping (Conservation Design or Active Turf): Conservation

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: 7.85

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: .855

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: 6.72

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)
6.72	3.6

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: Insert Area (Acres)

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: TUTIA Factor

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: Required number of toilet users

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)
Insert Area (Acres)	Insert Area (Acres)

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: Projected Average Daily Use (gpd)

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: Insert Area (Acres)

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-4 in Chapter 2 to determine the minimum demand for non-potable uses per tributary impervious acre.

Enter the factor from Table 2-4: Enter Value

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 gallons per day of non-potable use that would be required.

Minimum required use: Minimum use required (gpd)

Step 5: Determine if harvesting stormwater runoff for other non-potable use is feasible for the project by comparing the projected average daily use (Step 1) to the minimum required non-potable use (Step 4).

Minimum required non-potable use (Step 4)	Projected average daily use (Step 1)
Minimum use required (gpd)	Projected Average Daily Use (gpd)

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 per Section 3.4.2 of the WQMP Guidance Document.

C.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.

C.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 C.7 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy				No LID (Alternative Compliance)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment	
A	☐	☐	☐	☒	☐
B	☐	☐	☐	☒	☐
D	☐	☐	☐	☒	☐
E	☐	☐	☐	☒	☐

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.

Biofiltration or other LID treatment is used throughout the site for all DMAs.

C.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 C.8 DCV Calculations for LID BMP BIO-1

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	**DMA Runoff Factor**	DMA Areas x Runoff Factor	*Biofiltration Basin*		
	[A]		[B]	[C]	[A] x [C]			
A-1	*2726*	*Concrete or Asphalt*	*1*	*0.89*	*2431.6*			
A-1	*10962*	*Natural (C Soil)*	*0.3*	*0.23*	*2468.3*			
A-1	*4246*	*Compacted Soil (e.g. unpaved parking)*	*0.4*	*0.28*	*1187.7*			
A-2	*227397*	*Concrete or Asphalt*	*1*	*0.89*	*202838.1*			
A-2	*169740*	*Compacted Soil (e.g. unpaved parking)*	*0.4*	*0.28*	*47478.3*			
A-2	*548702*	*Natural (C Soil)*	*0.3*	*0.23*	*123549*			
A-2	*32050*	*Ornamental Landscaping*	*0.1*	*0.11*	*3540.2*			
	Σ= ***995823***				Σ= 383984.8	0.61	19494.2	24284

[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

Section D: 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.

N/A

D.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 D.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

D.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 D.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

D.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 D.3.1 Treatment Control BMP Sizing MWS-1

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Area x Runoff Factor		*MWS-1*		
	[A]		[B]	[C]	[A] x [C]				
B	11597	Concrete or Asphalt	1	0.89	5552.7	*Design Storm Depth (in)*	*Minimum Design Flow Rate (cubic feet or cfs)*	*Total Storm Water Credit % Reduction*	*Proposed Flow (cubic feet or cfs)*
B	31291	Concrete or Asphalt	1	0.89	38558.5				
	A_T = 42888				Σ= 38256.1	0.61	0.5	N/A	0.577

Table D.4.3 Treatment Control BMP Sizing MWS-2

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Area x Runoff Factor		*MWS-2*		
	[A]		[B]	[C]	[A] x [C]				
D	16378	Concrete or Asphalt	1	0.89	6525.9	*Design Storm Depth (in)*	*Minimum Design Flow Rate (cubic feet or cfs)*	*Total Storm Water Credit % Reduction*	*Proposed Flow (cubic feet or cfs)*
D	4452	Ornamental Landcaping	0.1	0.11	491.8				
	A_T = 25594				Σ= 15101	0.61	0.2	N/A	0.206

Table D.5.4 Treatment Control BMP Sizing MWS-3

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Area x Runoff Factor		MWS-3		
	[A]		[B]	[C]	[A] x [C]				
E-1	14716	Concrete or Asphalt	1	0.89	13126.7	*Design Storm Depth (in)*	*Minimum Design Flow Rate (cubic feet or cfs)*	*Total Storm Water Credit % Reduction*	*Proposed Flow (cubic feet or cfs)*
	A_T = 20792				Σ= 18546.5	0.61	0.2	**N/A**	0.206

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

[E] is for Flow-Based Treatment Control BMPs [E] = .2, for Volume-Based Control Treatment BMPs, [E] 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

D.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 D.6 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		

[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 E: Hydromodification

E.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 E.1 Hydrologic Conditions of Concern Summary

	2 year – 24 hour		
	Pre-condition	Post-condition	% Difference
Time of Concentration			
Volume (Cubic Feet)			

[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.

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 Susceptibility 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:

Project discharges to RCFCD channel, which is concrete lined from the discharge point to the San Jacinto River, which is identified as HCOC exempt.

E.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.

Be sure to include all pertinent documentation used in your analysis of the items a, b or c in Appendix 7.

The project will mitigate for HCOC by complying with method c above. The detention basin will be fitted with an additional orifice to mitigate the 2-year, 24-hour hydrograph. See Appendix 7 for stage-storage-discharge calculations.

	2 year – 24 hour		
	Pre-condition	Post-condition (unmitigated)	% Difference
Time of Concentration	35.56	29.20	-21.8
Volume (Cubic Feet)	116,048	138,399	19.2

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 Source*s: 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
On-site Drain 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.
Landscape/Outdoor Pesticide Use	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 Provide IPM information to new owners, lessees, and operators.

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)	BMP Location (Lat/Long)
BIO-1	Biotreatment Basin	See WQMP Exhibit	33.7371, -117.1668
DET-1	Detention Basin	See WQMP Exhibit	33.7, -117.1
MWS-1	Modular Wetland System 1	See WQMP Exhibit	33.7, -117.1
MWS-2	Modular Wetland System 2	See WQMP Exhibit	33.7, -117.1
MWS-3	Modular Wetland System 3	See WQMP Exhibit	33.7, -117.1
MWS-4	Modular Wetland System 4	See WQMP Exhibit	33.7, -117.1

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: Owner

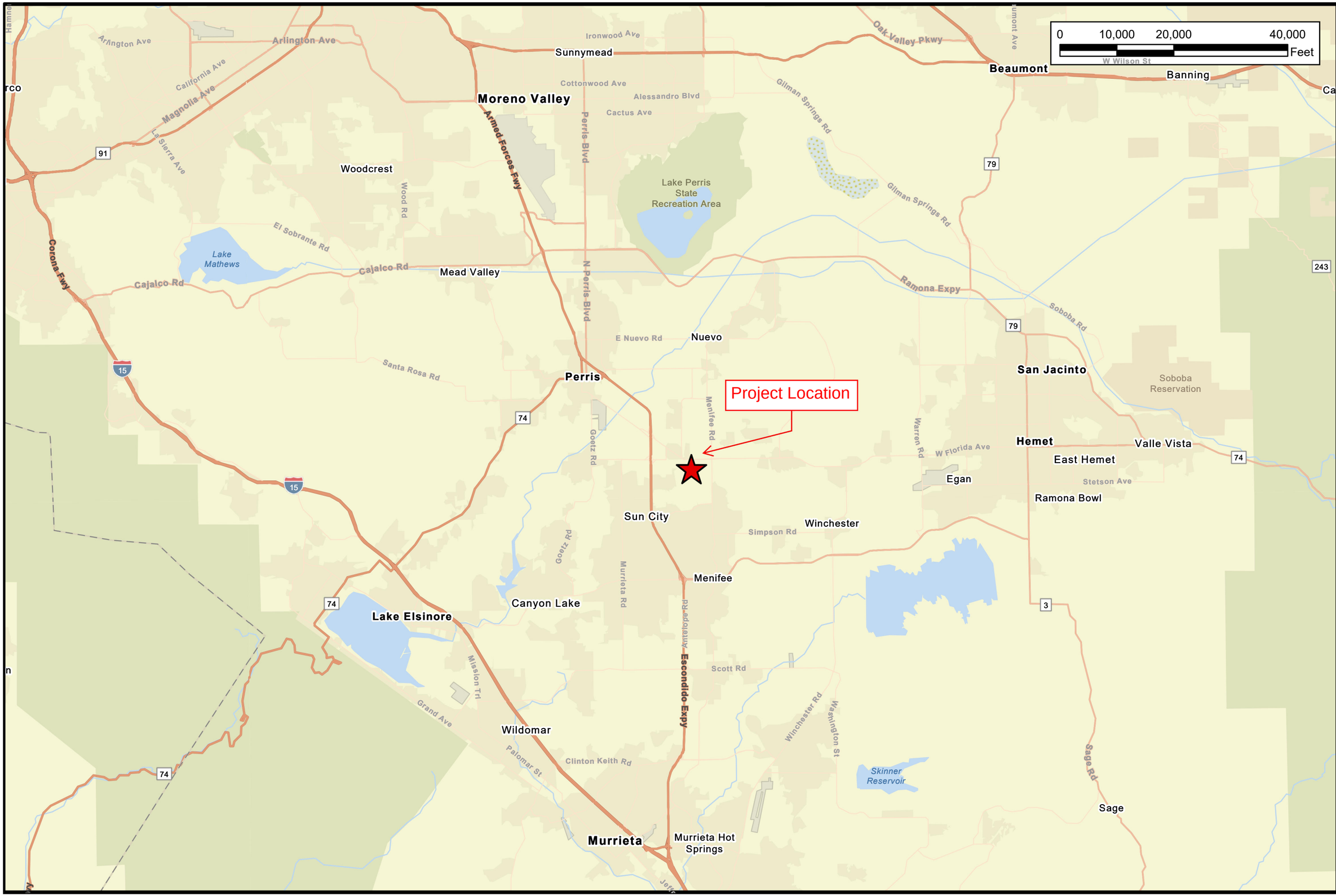
Will the proposed BMPs be maintained by a Home Owners' Association (HOA) or Property Owners Association (POA)?

☐ 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, Receiving Waters Map, and Isohyetal Map



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Orange, CA 92868
(714) 939-1030 Phone
www.Kimley-Horn.com

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MENIFEE, CA

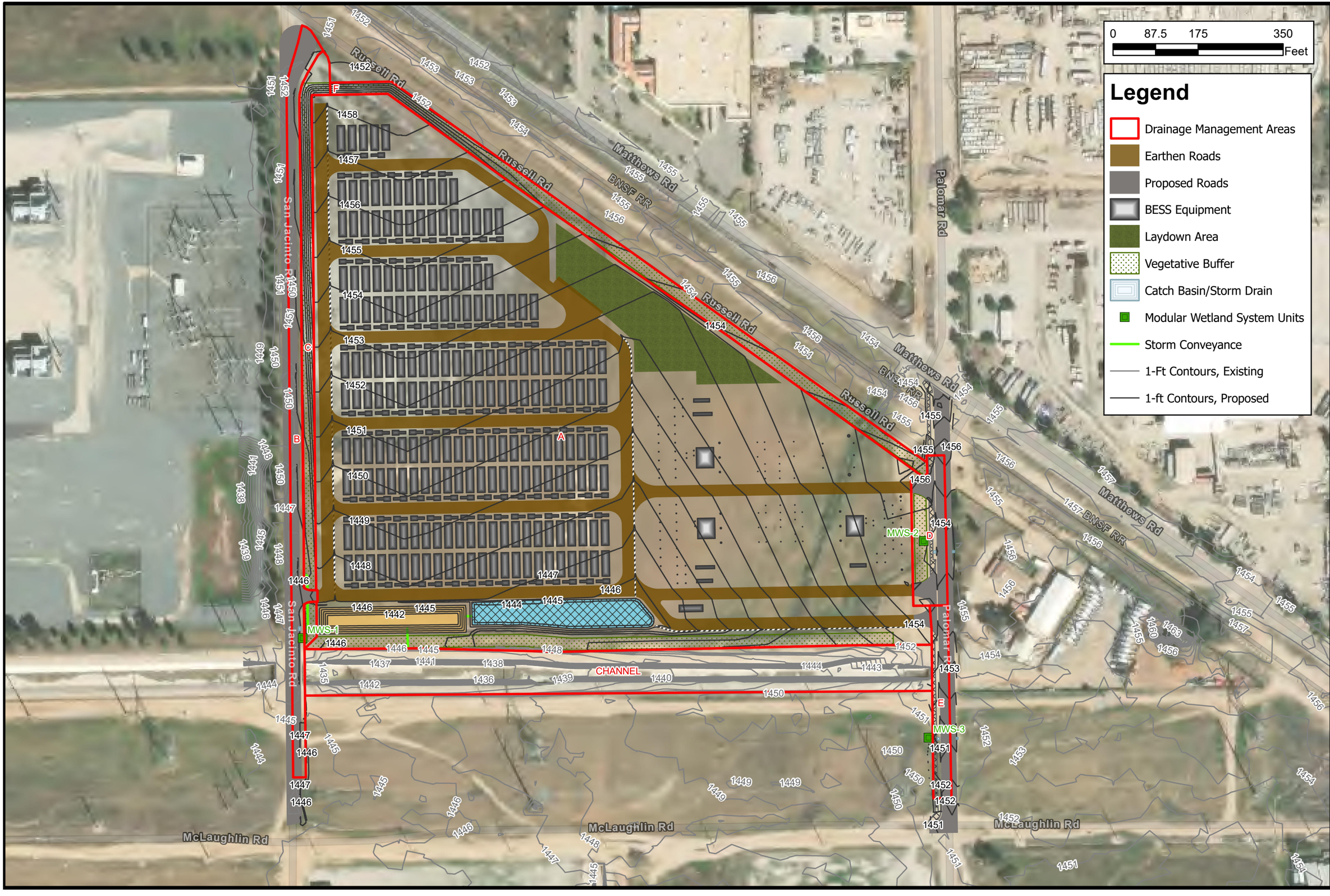
DOUBLE BUTTE BESS

VICINITY MAP

DATE:	NOVEMBER 2022
DESIGN:	NBN
DRAWN:	NBN
CHECKED:	AAT
KH NO.:	094817130

SHEET 1

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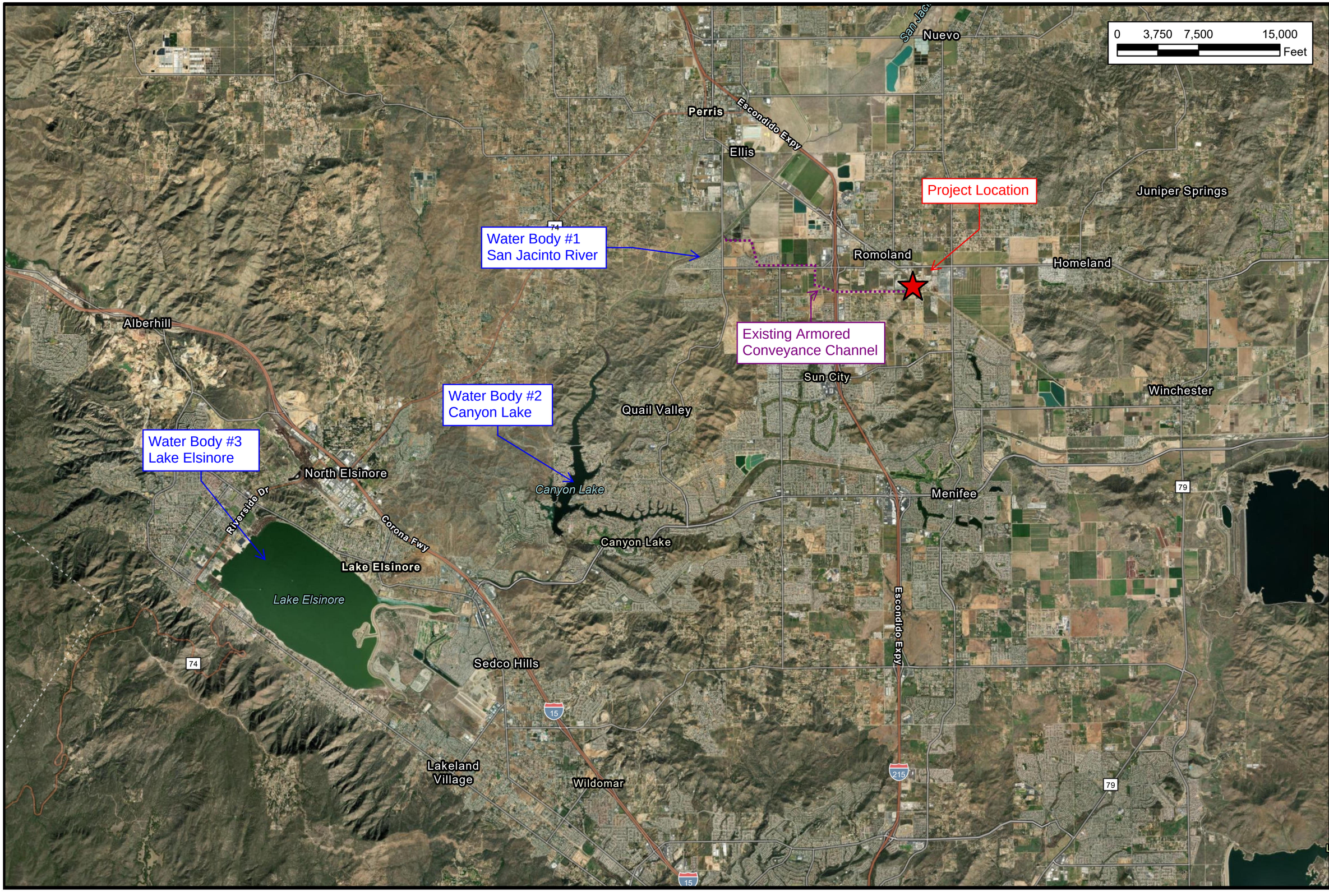
DOUBLE BUTTE BESS

WQMP EXHIBIT

DATE:	JULY 2024
DESIGN:	NBN
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CHECKED:	AAT
KH NO.:	094817130

SHEET
2

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RECEIVING WATERS

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SHEET
3

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T 01 S
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T 03 S
T 04 S
T 05 S
T 06 S
T 07 S
T 08 S

0.85 MiraLoma
0.61 RiversideNorth
0.54 RiversideSouth
0.68 PigeonPass
0.66 MorenoEast
0.85 Beaumont
0.88 PradoDam
0.51 Woodcrest
0.50 LakeMathews
0.68 PerrisReservoir
0.87 VistaGrandeGS
0.70 SanJacintoNWS
1.18 Idyllwild
0.58 SunCity
0.68 Winchester
0.70 ElsinoreNWS
1.11 ElCarisoStation
0.90 HurkeyCreek
0.77 WildomarLaCresta
0.52 SkinnerLake
0.65 Anza
0.77 SantaRosaPlateau
1.00 TemeculaNWS
0.64 AguangaValley

Approximate Project Location

Santa Ana River Watershed
Santa Margarita Watershed

N

Rain Gage Locations

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

Isohyetal Map for the 85th Percentile 24 hour Storm Event

July 2011

Appendix 2: Construction Plans

Grading and Drainage Plans

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

GEOTECHNICAL INVESTIGATION
INFILTRATION REPORT

Prepared For
The AES Corporation

Proposed
Double Butte Battery Energy Storage Systems
Vicinity of Matthews Road and Palomar Road,
Menifee, Riverside County, CA
331190010, 011, 014, 017, 047, 056, 060

Job No: 22-247
September 8, 2022

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Lancaster, California 93534
www.bruingsi.net

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SOIL AND MATERIAL
TESTING AND INSPECTIONS

September 8, 2022 Job No.: 22-247

Mr. Michael Jenkinson, PE
The AES Corporation
282 Century Place, Suite 2000
Louisville, CO 80027

Subject: **Geotechnical Infiltration Investigation Report for the Proposed Double Butte Battery Energy Storage Systems Located in the Vicinity of Matthews Road and Palomar Road, Menifee, Riverside County, CA**
APN 331190010, 011, 014, 017, 047, 056, 060

Dear Mr. Jenkinson:

Presented herewith in is our Geotechnical Engineering Report for the subject project. Our work was performed in accordance with the scope of work outlined in our original proposal dated June 20, 2022.

This report presents the results of our field investigation, laboratory testing, along with our engineering judgment, opinions, conclusions, and recommendations pertaining to the proposed development.

It has been a pleasure to be of service to you on this project. Should you have any questions regarding the contents of this report, or should you require additional information, please contact the undersigned at (661) 273-9078.

Respectfully submitted,

BRUIN GEOTECHNICAL SERVICES, INC.

Ryan D. Duke, P.E.
RDD/mes

REGISTERED PROFESSIONAL ENGINEER
RYAN DUKE
C070729
Exp. 9-30-22
CIVIL
STATE OF CALIFORNIA

GEOTECHNICAL INVESTIGATION INFILTRATION REPORT

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Figure 2	**Test Location Map**

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Appendix B	**Laboratory Test Results**
Appendix C	**Infiltration Results and Cumulative Volume vs. Time Graphs**

GEOTECHNICAL INVESTIGATION INFILTRATION REPORT
Proposed Low Impact Development Storm Water Infiltration Basin
Double Butte Solar Battery Energy Storage Systems
Vicinity of Matthews Road and Palomar Road
Menifee, Riverside County, CA
APN 331190010, 011, 014, 017, 047, 056, 060

1.0 INTRODUCTION

This report presents the results of the geotechnical infiltration investigation performed by Bruin Geotechnical Services, Inc., specifically for the proposed infiltration basin at the subject site based on discussions, preliminary plans provided by the project civil engineer and the client. This report is specific to the proposed development.

The purpose of this investigation was to evaluate the on-site infiltration rate of the subsurface soil utilizing a double-ring infiltrometer, as well as evaluate the geotechnical engineering characteristics relative to the low impact development storm water basin and the proposed development at the subject Site. The report has been prepared in general accordance with the Riverside County Low Impact Development BMP Design Handbook (LAMP), ASTM D 3385, and the Geotechnical Engineering Report referenced below.

> Geotechnical Engineering Report for the Proposed Double Butte Battery Energy Storage Systems Located in the Vicinity of Matthews Road and Palomar Road, Menifee, Riverside County, CA, APN 331190010, 011, 014, 017, 047, 056, 060, Prepared by Bruin Geotechnical Services, Inc., dated August 17, 2022, Job No.: 22-247.

The scope of the authorized geotechnical investigation included the following tasks:

- Perform a site reconnaissance.
- Conduct a field subsurface exploration through soil trenches and soil sampling.
- Perform laboratory testing program of selected soil samples.
- Perform the infiltration testing of on-site soils.
- Perform engineering analyses and calculations of the data.
- Prepare this Geotechnical Investigation Infiltration Report.

This study also includes a review of published and unpublished literature and geotechnical maps with respect to groundwater located in proximity to the site which may have impact on the proposed improvements.

2.0 SITE LOCATION AND DESCRIPTION

The subject square-shaped site, herein after referred to as Site, is located east of the Matthews Road and Palomas Road junction, across the BNSF Railroad in the city of Menifee, Riverside County, California, and consists of seven (7) parcels totaling approximately 27.09 acres. The subject parcels include:

- APN 331190010 – approximately 5.00 acres
- APN 331190011 – approximately 5.00 acres
- APN 331190014 – approximately 3.40 acres
- APN 331190017 – approximately 1.58 acres
- APN 331190047 – approximately 4.61 acres
- APN 331190056 – approximately 3.83 acres
- APN 331190060 – approximately 3.67 acres

At the time of Bruin GSI's field investigation, the site was vacant, undeveloped land. The contiguous APNs are bound by a railroad to the north, an existing solar development to the west, commercial land to the east, and an aqueduct system to the south. The site vegetation consisted of sparse annual weeds and small shrubs.

The Site topography is relatively flat and level gently sloping down to the southwest, with drainage by sheet flow at approximately 1%. The approximate elevation at the site is 1,450 feet above mean sea level.

The intention of the site description is to be illustrative and specifically not intended for use as a legal description of the Site.

The general location of the subject Site is shown on Figure 1.

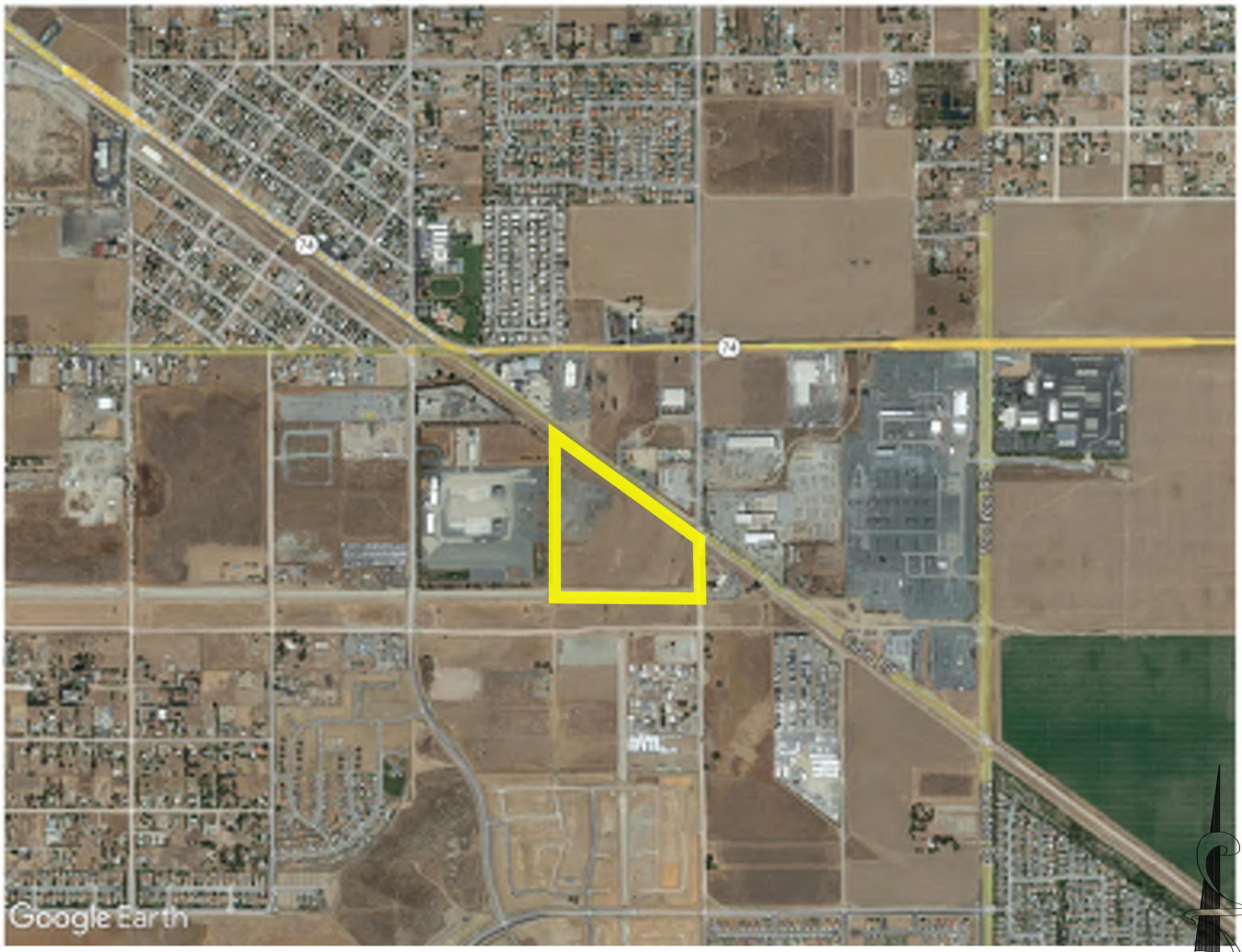
3.0 PROPOSED GRADING AND CONSTRUCTION

Based on our conversations with the client and information obtained through review of the preliminary plans, it is our understanding that the proposed project consists of a Battery Energy Storage System (BESS) Facility. The Project will utilize thickened concrete mat foundations for storage and converter equipment.

It is anticipated that the proposed earthwork will consist of clearing and grubbing of the vegetation, construction of shallow infiltration basins (approximately three to four feet deep, with maximum 4:1 slopes) and minor grading with cuts and fills of less than one (1) foot, maintaining the natural drainage through the site. Dirt or gravel drive areas for interior access are also anticipated.

Vicinity Map

N.T.S.



= Denotes approximate parcel boundary

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Project:
Proposed Double Butte Battery Storage
Vicinity of Matthews Road and Palomar Road,
Menifee, Riverside County, CA

Job Number:

22-247

Figure 1

4.0 PROPOSED INFILTRATION SYSTEM

Based on our review of the plans, a total of one (1) infiltration basin is proposed on the Site for the purpose of percolating the sheet-flow storm-drain water for the proposed industrial development. Due to the flat topography of the Site and proposed grading, it is anticipated the stormwater drainage by sheet-flow will be collected by proposed concrete swales and/or ribbon gutters and continue to the proposed basin. The proposed rectangular-shaped infiltration basin will be constructed with an invert of approximately three to four (3-4) feet below the existing ground surface and 4:1 cut slopes.

5.0 GEOTECHNICAL AND INFILTRATION INVESTIGATION

The geotechnical investigation included a field subsurface exploration program through trenching, obtaining bulk, grab, and undisturbed soil samples, and laboratory testing on soil samples collected during the infiltration testing program. These programs were performed in accordance with our Geotechnical Investigation Infiltration Report Proposal dated June 20, 2022. The scope of work did not include environmental assessment or investigation for the presence or absence of hazardous substances or toxic materials in structures, soil, and surface water, air, below or around the site. The field subsurface exploration, laboratory testing programs, and Infiltration testing protocol are described below, as required by Riverside County and ASTM D 3385.

A site reconnaissance was made by our representative prior to instigating the field exploration and infiltration testing program. The Site was observed, and boundaries roughly located for purposes of underground utility locating. As required by law, Bruin GSI contacted Underground Service Alert (one-call notification service) to attain underground utility marking and clearance, a minimum of 72 hours prior to performing the field subsurface investigation.

The field exploration program was conducted on August 31, 2022, under the technical supervision of our engineer, and consisted of Double Ring Infiltrometer test (ASTM D 3385 tested method) and exploratory excavation. Infiltration testing was performed based on the Test Requirements defined in the Riverside County LAMP, ASTM D 3385, and further described in section 5.1 of this report.

5.1 Field Exploration Program

The approximate locations of the exploratory trenches were determined by sighting and pacing from existing site improvements, such as streets, and the use of a hand-held GPS unit and should be only considered accurate to the degree implied by the method used. Test Hole Locations and pertinent Boring Locations from the Referenced Geotechnical Engineering Report are shown on Figure 2.

Test Location Map

N.T.S.



B1 = Denotes Approximate Boring (B) or Test Hole (TH) Location

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Project:

Proposed Double Butte Battery Storage
Vicinity of Matthews Road and Palomar Road,
Menifee, Riverside County, CA

Job Number:

22-247

Figure 2

Soil samples were obtained at various depths within the Test Holes prior to infiltration testing and returned to the laboratory for analysis and testing.

Final Test Hole logs and pertinent Boring Logs presented in Appendix A are Bruin GSI's interpretation of the field logs prepared by our representative during excavation, as well as laboratory test results. The stratification lines represent approximate boundaries between soil types. The actual soil transitions may be gradual.

5.2 Infiltration Testing Protocol

The Riverside County Low Impact Development BMP Design Handbook was used to determine the protocol required for infiltration testing procedures for this project. The LAMP provides examples of appropriate type of testing for various types of LID features. The use of Double-Ring Infiltrometer Test following the procedures as provided in ASTM D3385 is generally appropriate for shallow LID Feature Depths.

Riverside County requires a minimum of two (2) tests with at least one (1) test per each LID Feature. Using the Double-Ring Infiltrometer requires approximately six (6) square feet of horizontal surface area of testing to accommodate the testing infiltrometer and Mariotte tubes at the invert elevation of the proposed basin. It was determined to excavate two (2) representative locations within the limits of designated location of the basin using a tractor-mounted backhoe equipped with a thirty-six-inch bucket. The excavations for Test Hole 1 and Test Hole 2, with dimensions approximately three (3) feet square (3x3), were excavated to a depth of four (4) feet and six (6) feet, respectively, below existing ground surface (bgs).

For each test hole, two Mariotte tubes (10,000cc and 3,000cc capacity) were used to keep the water level constant within the outer and inner rings of the infiltrometer. These calibrated tubes (marked in one-centimeter increments) were placed inside the pit, near the location of the infiltrometer rings and were used as measurement of the volume of water needed to maintain the head during the duration of the test. A three-eighths (3/8) inch ID clear vinyl tubing connected the twelve (12) inch inner diameter ring and the twenty-four (24) inch diameter ring to the Mariotte Tubes. Rubber splash plates were used at the bottom of each ring to convey the water, preventing erosion and disturbance of the test pit's bottom.

The twelve (12) inch diameter ring was carefully driven with minimal disturbance of the soil surface into the ground approximately one (1) inch below the ground surface and filled with water up to one (1) inch above the proposed invert elevation using the 3,000 cc Mariotte Tube. The twenty-four (24) inch diameter ring was carefully driven with minimal disturbance of the soil surface into the ground approximately one and one-half (1.5) inches below the ground surface and filled with water up to one and one-quarter (1.25) inches above the proposed invert

elevation using the 10,000 cc Mariotte Tube. The remaining three-eighths (3/8) inch ID clear vinyl tubing connected the Mariotte Tubes to the fifty-five (55) gallon water tank.

During the initial fill of water, the rings were filled with water using a 0.50 cubic foot receptacle, up to the desired depth in each ring. A measurement of the water pH was obtained. Once the fluid became level and constant then the flow of fluid from the Mariotte Tubes were used to maintain the liquid level throughout the test. The readings of the volume of water, water surface elevation, and water temperature were checked every fifteen (15) minutes during the first hour, every thirty (30) minutes during the second hour; and every one (1) hour afterwards, until reaching a minimum of six (6) hours. The driving cap was paced over the rings during intervals of liquid measurements to minimize evaporation.

Once the instantaneous flow rate stabilized (i.e., the highest and lowest readings were within ten (10) percent of each other, for three consecutive readings), the water drop on Mariotte Tube was recorded until the test pit was empty (falling phase of the test). The total combined time of the test exceeded the four (4) hour minimum.

Infiltration Test Results are presented in Section 7.0 of this report.

5.3 Laboratory Testing

Select soil samples collected during trenching and drilling activities at the Site were then tested in the laboratory to assist in evaluating engineering properties of subsurface materials deemed within structural influence and to provide data required for conclusions related to the infiltration characteristics.

The soil samples were classified in accordance with the Unified Soils Classification System and a testing program was established. The samples were tested to determine the following:

- In-situ moisture ASTM D 2937
- Identification of soils ASTM D 2488
- Material Finer than the No. 200 Sieve ASTM D 1140
- Sand Equivalent Value ASTM D 2419

Pertinent tabular and graphic test results from the referenced Geotechnical Engineering Report are presented in Appendix B.

5.4 Site and Subsurface Conditions

Native materials were encountered within our infiltration test holes and exploratory borings from the referenced Geotechnical Engineering Report. The subsurface soil appears relatively uniform across the subject site and the soil encountered in the exploratory borings generally consists of silty sand with clay (SM) with occasional sandy clay (CL) and clayey sand (SC) to the maximum depth explored of twenty (20) feet below ground surface.

Based on the blow counts obtained during sampling, and in-situ densities obtained, the native material encountered was noted to be medium dense or firm to very dense or hard. The subsurface materials were noted to be slightly moist to saturated. No groundwater or perched water was encountered through the depth explored (20 feet below ground surface).

6.0 DESIGN CRITERIA

To determine the infiltration rate for design purposes, the volume of liquid added to the inner ring to maintain the liquid level constant (measure of liquid infiltrating the soil) during the test is converted to an incremental infiltration velocity by dividing by the area of the inner ring (in inches per hour) and plotted versus time elapsed.

The Riverside County LAMP requires the application of a safety/reduction factor to the raw measurements established at the Site in order to determine the site-specific long-term infiltration rate to be used for design. The Total Reduction Factor (RF) is applied to the raw infiltration rate in order to determine the design infiltration rate that will represent the long-term performance of the proposed infiltration BMPs.

The Infiltration Testing Requirements section of the Riverside County LAMP provides the minimum required safety or reduction factor for each type of infiltration test.

$$Total\ Reduction\ Factor\ (RF) = 3$$

The reduction factor (RF) was applied to the stabilized infiltration rates obtaining the design infiltration rate of the basin. Utilizing the raw infiltration rate of 0.066 inches per hour (0.006 feet per hour) and reduction factor of 3, the design infiltration rate obtained from Test Hole 1 (slowest rate) was calculated to be **0.022 inches per hour (.002 feet per hour)**.

The Riverside County Water Quality Management (WQMP) requires that the infiltration rate must be at least 0.83 inches per hour. The Riverside County WQMP further outlines that “If the average ‘in-situ’ tested infiltration rate for the site is less than 1.6 inches per hour, LID Infiltration BMPs (infiltration basins, infiltration trenches, etc.) shall not be used.”

It is our professional opinion that the infiltration rate is not sufficient, and the Infiltration Basin is not recommended for construction.

Data calculations, reduction factors, raw and calculated design infiltration rates, as well as unit conversions are shown in Appendix C.

7.0 OPINIONS AND CONCLUSIONS

Based upon the results of our investigation, the proposed development is not considered feasible from a geotechnical standpoint.

The soils explored and tested at the Site were found to be relatively uniform in classification, infiltration, and strength. Based on the laboratory testing and subsurface data obtained, it is Bruin GSI's opinion that the upper Site soils will be not suitable for infiltration purposes and do not meet or exceed the county minimum rates required.

Based on our calculations of the design infiltration rates, verified with the laboratory test results on soil samples obtained on each infiltration basin locations, it is our professional opinion the proposed infiltration basins are not feasible from a geotechnical perspective.

Refer to the Geotechnical Engineering Report for the proposed development prepared by Bruin Geotechnical Services Inc. referenced herein for guidelines regarding grading and remedy any soil related issues relative to structures.

8.0 ADDITIONAL SERVICES

Final project plans and specifications should be reviewed prior to construction to confirm that the full intent of the recommendations presented herein have been applied to design and construction. This report is based on the assumption that an adequate testing and inspection program along with client consultation will be performed during final design and construction phases to verify compliance with the recommendations of this report.

Retaining Bruin GSI as the geotechnical consultant to provide additional services from preliminary design through project completion will assure continuity of services.

Additional services include:

- Consultation during design stages of the project.
- Review, stamp and signature of the grading and building plans.
- Observation and testing during rough grading, fine grading and trench backfill as well as placement of engineered fill.
- Consultation as required during construction.

Cost estimates can be prepared if requested. Please contact our office.

9.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report is based on the development plans provided to our office. If structure design changes or structure locations changes occur, the conclusion and recommendations in this report may not be considered valid unless the changes are reviewed and the conclusions of this report are modified or approved by the Geotechnical Consultant.

The subsurface conditions and characteristics described herein have been projected from individual borings or test pits placed across the subject property. Actual variations in the subsurface conditions and characteristics may occur.

If conditions encountered during construction differ from those described in this report, this office should be notified so as to consider the necessity for modifications. No responsibility for construction compliance with the design concepts, specifications, or recommendations is assumed unless on-site construction review is performed during the course of construction, which pertains to the specific recommendations contained herein.

It is recommended that Bruin GSI be provided the opportunity for a general review of final design and specifications in order that the geotechnical recommendations may be properly interpreted and implemented in the design specifications. If Bruin GSI is not accorded the privilege of making this recommended review, Bruin GSI can assume no responsibility for misinterpretation of the recommendations contained in this report.

This report has been prepared in accordance with generally accepted practice and standards in this community at this time. No warranties, either expressed or implied, are made as to the professional advice provided under the terms of the agreement and included in this report. This report has been prepared for the exclusive use of The AES Corporation and their authorized agents. Unauthorized reproduction of any portion of this report without expressed written permission is prohibited.

If parties other than Bruin GSI are engaged to provide construction geotechnical services, they must be notified that they will be required to assume complete responsibility for the geotechnical phase of the project by concurring with the findings and recommendations in this report or providing alternate recommendations.

10.0 CLOSURE

The conclusions, recommendations, and opinions presented herein are: (1) based upon our evaluation and interpretations of the limited data obtained from our field and laboratory

programs; (2) based upon an interpolation of soil conditions between and beyond the borings and/or trenches; (3) are subject to confirmation of the actual conditions encountered during construction; and, (4) are based upon the assumption that sufficient observation and testing will be provided during the grading, infrastructure installation and building phases of site development, (5) a design level Geotechnical Engineering Report will be completed to address subsurface conditions and issues and provide remedial recommendations to reduce potential adverse impacts of soils on the proposed development.

APPENDIX A

Test Hole and Boring Logs and Classification Key

Client:	**AES - Double Butte**	**TEST HOLE LOG 1**	
Project Location:	**Menifee**		
Date(s) trenched	**8/31/2022**	Page 1 of 1	
Total Depth of Trench	**4' BGS**		
Trenching Equipment	**Backhoe**	Logged By	**LW**
Sampling Method(s)	**Hand-Sampler**	Checked By:	**MS**
Trench Backfill	**Native Cuttings**	Notes:	**Post-Infiltration Testing**
Project number: **22-247**	Ground- water	**None Encountered**	**Center of Hole**

Depth	Sample	USCS	Graphic Log	Material Description	Dry Unit Weight pcf	Water Content %
		SM		Reddish brown very silty fine to medium sand w/ clay (cemented) Medium dense, very moist		12.1
5'				Excavation terminated @ 4' bgs No groundwater encountered No caving		
10'						
15'						
20'						
25'						
30'						

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Client:	**AES - Double Butte**
Project Location:	**Menifee**
Date(s) trenched	**8/31/2022**
Total Depth of Trench	**6' BGS**
Trenching Equipment	**Backhoe**
Sampling Method(s)	**Hand-Sampler**
Trench Backfill	**Native Cuttings**
Ground- water	**None Encountered**

TEST HOLE LOG 2

Logged By	**LW**
Checked By:	**MS**
Notes:	**Post-Infiltration Testing**
	Center of Hole

Project number: **22-247**

Depth	Sample	USCS	Graphic Log	Material Description	Dry Unit Weight pcf	Water Content %
		SM		Dark reddish brown silty fine to medium sand w/ clay (cemented) Medium dense, moist		9.2
5'		CL		Dark brown fine to medium sandy clay w/ slight silt (cemented) hard, very moist		13.2
10'				Excavation terminated @ 6' bgs No groundwater encountered No caving		
15'						
20'						
25'						
30'						

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SOIL CLASSIFICATION KEY

MAJOR DIVISIONS			SYMBOL		TYPICAL NAMES
Coarse Grained Soils 50% or more larger than #200 sieve	**Gravels** More than half coarse-fraction is larger than No. 4 sieve size	Clean gravels with little or no fines	GW		Well graded gravels, gravel-sand mixtures
			GP		Poorly graded gravels, gravel-sand mixtures
		Gravel with over 12% fines	GM		Silty gravels, poorly graded gravel-sand-silt mixtures
			GC		Clayey gravels, poorly graded gravel-sand-clay mixtures
	Sands More than half coarse-fraction is smaller than No. 4 sieve size	Clean sands with little or no fines	SW		Well graded sands, gravelly sands
			SP		Poorly graded sands, gravelly sands
		Sands with over 12% fines	SM		Silty sands, poorly graded sand-silt mixtures
			SC		Clayey sands, poorly graded sand-clay mixtures
Fine Grained Soils 50% or more smaller than #200 sieve	**Silts and Clays** Liquid limit less than 50		ML		Inorganic silts, rock flour, clayey silts
			CL		Inorganic clays of low to medium plasticity, sandy clays, silty clays
			OL		Organic clays and organic silty clays of low plasticity
	Silts and Clays Liquid limit greater than 50		MH		Inorganic silts, micaceous or diatomaceous fine sandy/silty soils, elastic silts
			CH		Inorganic clays with high plasticity, fat clays
			OH		Organic clays of medium to high plasticity, organic silts
Highly Organic Soils			Pt		Peat and other highly organic soils

CLASSIFICATION SYSTEM BASED ON THE UNIFIED SOIL CLASSIFICATION SYSTEM

Excavation Log Key

Depth	Sample	USCS	Graphic Log	Material Description	Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %
1	2	3	4	5	6	7	8

COLUMN DESCRIPTIONS

1	Depth in feet below the ground surface
2	Sampling Method see "symbols" below
3	USCS symbol
4	Graphic depiction of the subsurface material
5	Description of the material encountered. May include consistency, moisture, color, and other descriptors
6	Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval
7	Dry weight per unit volume of soil sample measured in laboratory units in pounds per cubic foot
8	Water content of the sample expressed as a percentage of the dry weight of the sample

ABBREVIATIONS

DIST = Disturbed Sample
N/R = No Recovery
CHEM = Chemical Test
N/A = Not Analyzed

SAMPLING METHOD SYMBOLS


Hand Sample


Bulk Sample


Grab Sample

GENERAL NOTES

1. Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.

2. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

Date(s) drilled	**7/15/2022**	**LOG OF BORING 7**	
Drilling Contractor	**GP Drilling**	**Page 1 of 1**	
Drilling Method	**Hollow Stem Auger**		
Drill Rig Type	**CME 75**	Logged By:	**AM**
Drill Bit Size/Type	**8"**	Checked By:	**MS**
Sampling Method(s)	**CSS/Bulk**	Total Depth of Borehole	**20' BGS**
Client: **AES - Double Butte BESS**	Groundwater	**None Encountered**	Boring Location: **See Figure 2**
Project Number: **22-247**	Borehole Backfill	**Native/ Cuttings**	Notes:
Project Location: **Menifee, CA**	Hammer Data	**140#, 30" drop**	

Depth	Sample	USCS	Graphic Log	Material Description	Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %
		SM		Reddish brown very silty fine to medium sand w/ clay Medium dense, very moist	18-20	104.6	11.7
		SM		Dark yellowish brown silty fine to medium sand w/ clay Medium dense, moist	22-30	116.1	7.9
5'		SM		Dark yellowish brown silty fine to medium sand w/ coarse sand & occ #4 gravel Dense, moist	50/6"	113.7	7.5
		SM		Brown silty fine to medium sand Dense, moist	50/6"	119.5	8.8
10'		SM		Brown silty fine to medium sand Dense, moist	27-50/6"	113.1	9.8
15'		SM		Yellowish brown silty fine to medium sand w/ coarse sand Medium dense, saturated	18-25	113.9	17.1
20'		SM		Brown silty fine to medium sand w/ clay Medium dense, very moist	21-18	118.2	13.4
25'				Boring terminated @ 20' bgs No groundwater No caving			
30'							

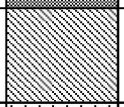
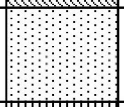
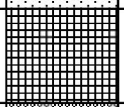
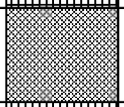
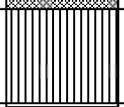
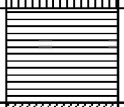
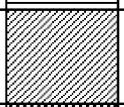
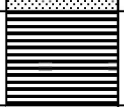
Date(s) drilled	**7/15/2022**	**LOG OF BORING 8**	
Drilling Contractor	**GP Drilling**	**Page 1 of 1**	
Drilling Method	**Hollow Stem Auger**		
Drill Rig Type	**CME 75**	Logged By:	**AM**
Drill Bit Size/Type	**8"**	Checked By:	**MS**
Sampling Method(s)	**CSS**	Total Depth of Borehole	**20' BGS**
Client: **AES - Double Butte BESS**	Groundwater	**None Encountered**	Boring Location: **See Figure 2**
Project Number: **22-247**	Borehole Backfill	**Native/ Cuttings**	Notes:
Project Location: **Menifee, CA**	Hammer Data	**140#, 30" drop**	

Depth	Sample	USCS	Graphic Log	Material Description	Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %
	■	SM		Brown silty fine to medium sand	18-20	117.2	3.2
				Medium dense, dry			
	■	SM		Orange brown silty fine to medium sand w/ clay (cemented)	12-30	102.9	10.1
5'				Medium dense, moist			
	■	SM		Brown silty fine to medium sand w/ clay	50/6"	110.1	8.0
				Very dense, moist			
	■	SM		Dark yellowish brown silty fine to medium sand w/ clay binder	50/4"	110.8	8.9
				Very dense, moist			
10'	■	SM		Brown silty fine to medium sand	32-50/6"	123.9	9.6
				Very dense, moist			
15'	■	SC		Brown clayey fine to medium sand w/ silt (cemented)	20-39	114.6	14.0
				Medium dense, very moist			
20'	■	SM		Brown silty fine to medium sand w/ clay	23-50/6"	112.3	13.4
				Very dense, very moist			
25'				Boring terminated @ 20' bgs No groundwater No caving			
30'							

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SOIL CLASSIFICATION KEY

MAJOR DIVISIONS			SYMBOL		TYPICAL NAMES
Coarse Grained Soils 50% or more larger than #200 sieve	**Gravels** More than half coarse-fraction is larger than No. 4 sieve size	Clean gravels with little or no fines	GW		Well graded gravels, gravel-sand mixtures
			GP		Poorly graded gravels, gravel-sand mixtures
		Gravel with over 12% fines	GM		Silty gravels, poorly graded gravel-sand-silt mixtures
			GC		Clayey gravels, poorly graded gravel-sand-clay mixtures
	Sands More than half coarse-fraction is smaller than No. 4 sieve size	Clean sands with little or no fines	SW		Well graded sands, gravelly sands
			SP		Poorly graded sands, gravelly sands
		Sands with over 12% fines	SM		Silty sands, poorly graded sand-silt mixtures
			SC		Clayey sands, poorly graded sand-clay mixtures
Fine Grained Soils 50% or more smaller than #200 sieve	**Silts and Clays** Liquid limit less than 50		ML		Inorganic silts, rock flour, clayey silts
			CL		Inorganic clays of low to medium plasticity, sandy clays, silty clays
			OL		Organic clays and organic silty clays of low plasticity
	Silts and Clays Liquid limit greater than 50		MH		Inorganic silts, micaceous or diatomaceous fine sandy/silty soils, elastic silts
			CH		Inorganic clays with high plasticity, fat clays
			OH		Organic clays of medium to high plasticity, organic silts
Highly Organic Soils			Pt		Peat and other highly organic soils

CLASSIFICATION SYSTEM BASED ON THE UNIFIED SOIL CLASSIFICATION SYSTEM

44732 Yucca Avenue
Tel (661) 273-9078

Lancaster, California 93534
www.bruingsi.net

Boring Log Key

Depth	Sample	USCS	Graphic Log	Material Description	Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %
1	2	3	4	5	6	7	8

COLUMN DESCRIPTIONS

1	Depth in feet below the ground surface
2	Sampling Method see "symbols" below
3	USCS symbol
4	Graphic depiction of the subsurface material
5	Description of the material encountered. May include consistency, moisture, color, and other descriptors
6	Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval
7	Dry weight per unit volume of soil sample measured in laboratory units in pounds per cubic foot
8	Water content of the sample expressed as a percentage of the dry weight of the sample

ABBREVIATIONS

DIST = Disturbed Sample
N/R = No Recovery
CHEM = Chemical Test
N/A = Not Analyzed

SAMPLING METHOD SYMBOLS


California Split Spoon (CSS)


Standard Penetration Test (SPT)


Bulk Sample


Grab Sample

GENERAL NOTES

1. Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.

2. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

APPENDIX B

Laboratory Test Data

SUMMARY OF LABORATORY TEST RESULTS

SIEVE ANALYSIS

Percent passing individual sieves

Sample I.D.	1/2"	3/8"	#4	#10	#40	#100	#200
TH1@2’		100	99	91	59	33	23
TH2@2’			100	97	79	56	42
TH2@4’			100	98	76	72	70

SAND EQUIVALENT

Sample I.D.	Sand Equivalent
TH1@2’	22
TH2@4’	8

APPENDIX C

Infiltration Results and Cumulative Volume vs. Time Graph

Bruin Geotechnical Services, Inc.
44732 Yucca Avenue
Lancaster, CA 93534
661-273-9078

Infiltration Basin Percolation Test ASTM D 3385
Double Ring Infiltrometer

DATA CALCULATIONS (INNER RING):

TEST HOLE NO.	STABILIZED FLOW RATE		SURFACE AREA OF PERCOLATION				RAW INFIL. RATE [FT/HR]
	[GAL/HR]	[CF/HR]	DIA. [FT]	RADIUS, [FT]	HEIGHT, [FT]	SURFACE AREA, [SF]	
1	0.035	0.005	1.04	0.52	0.48	0.85	0.005
2	0.050	0.007	1.04	0.52	0.48	0.85	0.008

REDUCTION FACTORS:

RIVERSIDE COUNTY REQUIRED REDUCTION FACTOR	RF
	3

DESIGN INFILTRATION RATE:

CALC. DESIGN INFILTRATION RATE		MIN. INFIL. RATE	CRITERIA MET?
FT/HR	IN/HR	[IN/HR]	
0.002	0.022	0.85	NO
0.003	0.063	0.85	

0.0658825

DOUBLE RING INFILTROMETER TEST

(ASTM D 3385)

Constants:	Diameter (in)	Area (in^2)	Height (in)	Depth of liquid (in)	Liquid No.	Water containers (Vol/DH), in^3/in)
Inner ring	12.375	120	20.25	4.00	1	33.29
Annular Space	24.375	346	20.125	3.50	2	79.62

Project: 22-247 Double Butte

Test Location: Vicinity of Matthews Road and Palomar Road, Menifee, Riverside County, CA

Tested by: LW

Water Source: Clean, tap water pH: 7.5

Water level maintained using: Flow Valve Float Valve **Mariotte Tube**

Depth to water table, (ft): Unknown

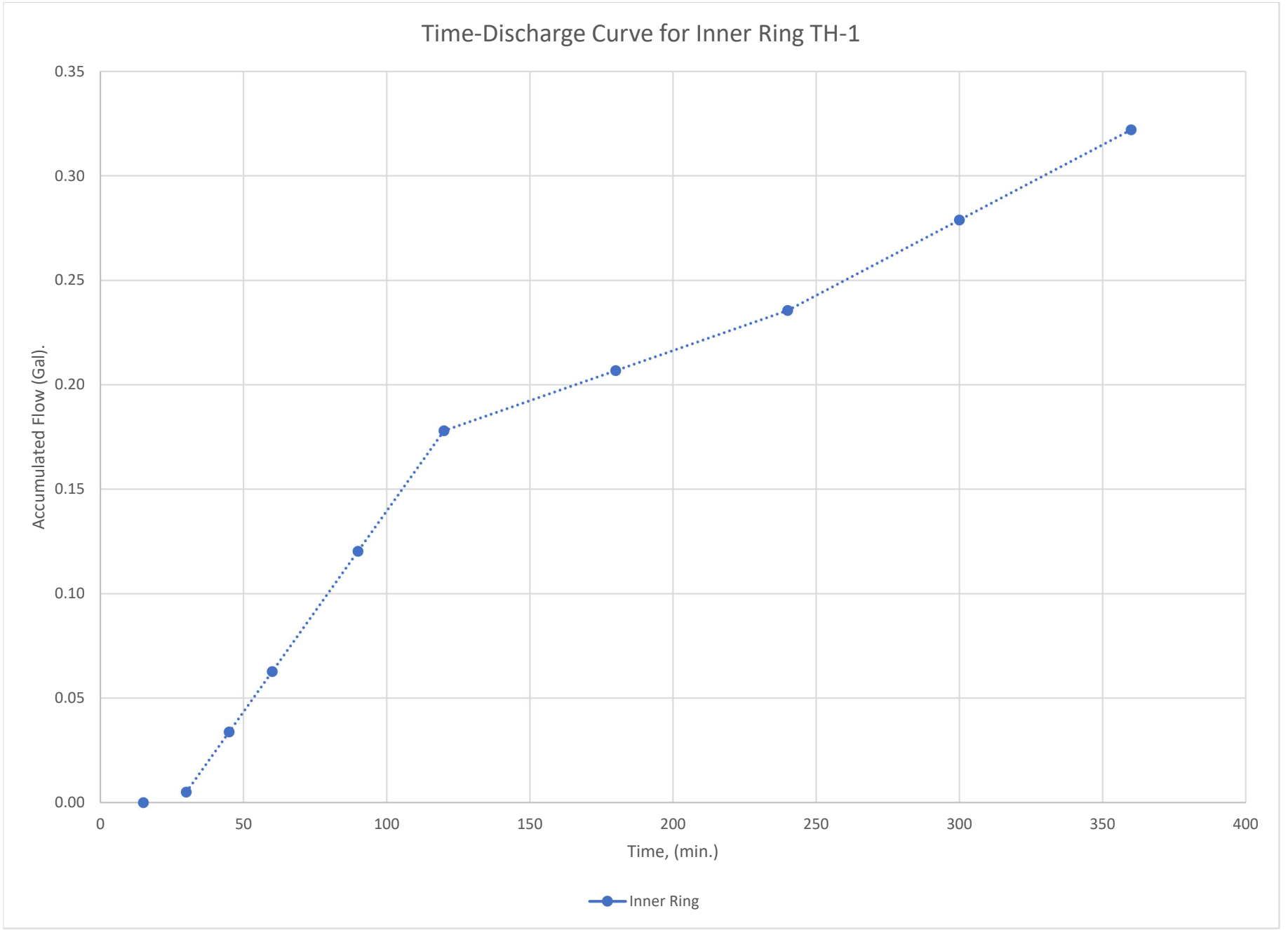
Penetration of rings, (in): Inner: 1.8 Outer: 1.4

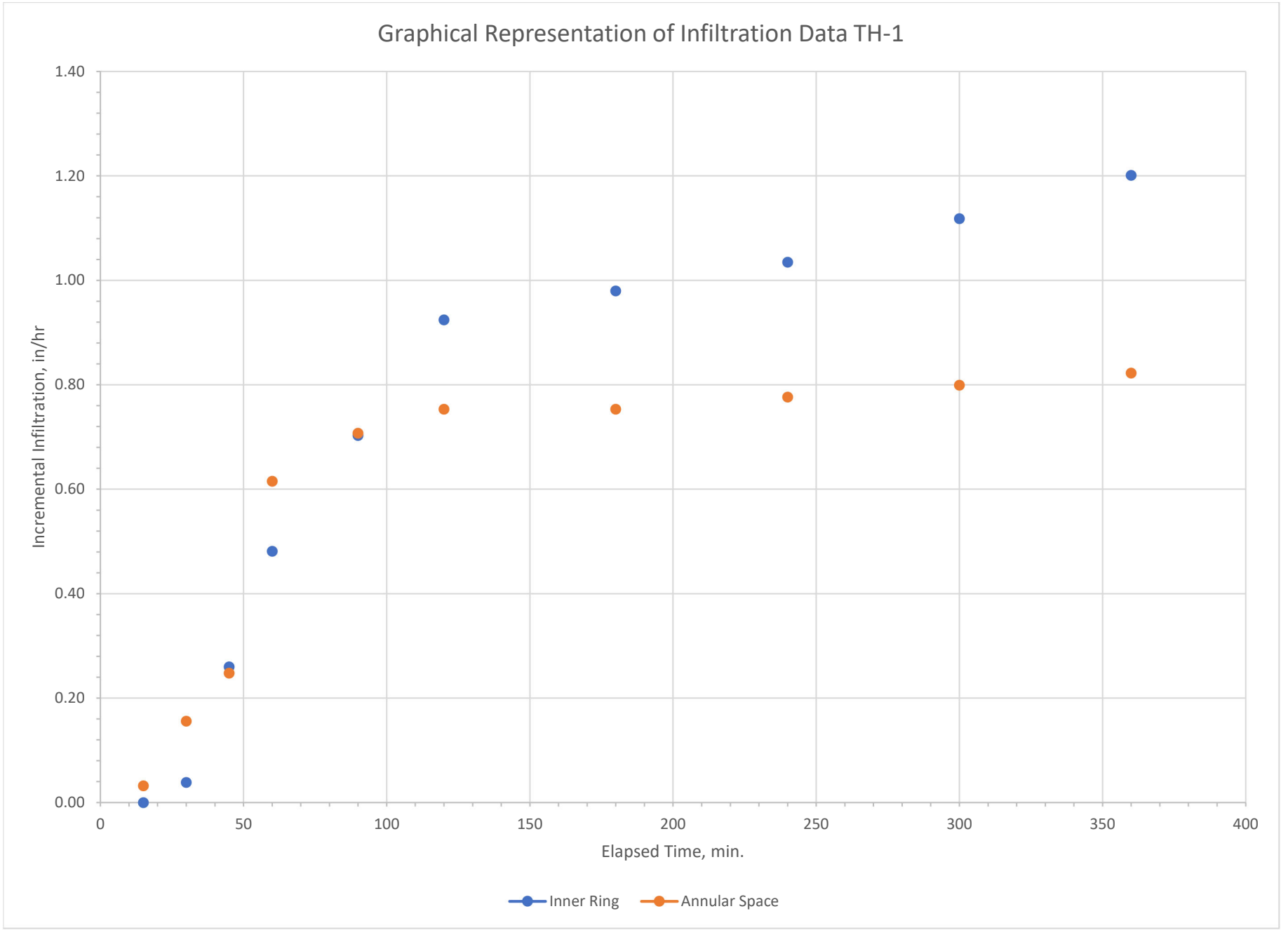
Date: 8/31/22 Test Hole: 1

Invert Depth: 4'

Trial No.		Date	Time hh:mm	Elapsed Time (minutes)	Flow Readings					Water Temp. (°F)	Increm. Infiltration		Remarks
					Inner Ring		Accumul	Annular Space			Inner	Annular	Ground Temp. (°F): 62
					Reading (in)	Flow (in^3)	Flow (gal)	Reading (in)	Flow (in^3)		in/hr	in/hr	Weather Conditions
1	S	8/31/22	9:50		22.8	0	0.00	22.8	3	68	0.00	0.0	partly cloudy, 70°F, no wind
	E	8/31/22	10:05	15	22.8			22.8		68			
2	S	8/31/22	10:07		22.8	1	0.00	22.8	11	69	0.04	0.2	
	E	8/31/22	10:22	30	22.8			22.7		69			
3	S	8/31/22	10:24		22.8	7	0.03	22.7	8	68	0.26	0.2	
	E	8/31/22	10:39	45	22.6			22.6		69			
4	S	8/31/22	10:39		22.6	7	0.06	22.6	32	70	0.48	0.6	
	E	8/31/22	10:54	60	22.4			22.2		70			
5	S	8/31/22	10:54		22.4	13	0.12	22.2	16	70	0.70	0.7	74°F, sunny
	E	8/31/22	11:24	90	22.0			22.0		71			
6	S	8/31/22	11:24		22.8	13	0.18	22.8	8	69	0.92	0.8	Refilled bottles
	E	8/31/22	11:54	120	22.4			22.7		70			
7	S	8/31/22	11:54		22.7	7	0.21 *	22.7	0	71	0.98 *	0.8	
	E	8/31/22	12:54	180	22.5			22.7		71			
8	S	8/31/22	12:54		22.5	7	0.24	22.7	8	71	1.03	0.8	
	E	8/31/22	1:54	240	22.3			22.6		71			
9	S	8/31/22	1:54		22.3	10	0.28 *	22.6	8	72	1.12 *	0.8	81°F, sunny
	E	8/31/22	2:54	300	22.0			22.5		72			
10	S	8/31/22	2:54		22.0	10	0.32	22.5	8	72	1.20	0.8	
	E	8/31/22	3:54	360	21.7			22.4		72			

* Cummulative volume used to determine the raw infiltration rate


Time-Discharge Curve for Inner Ring TH-1
Accumulated Flow (Gal).
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
50
100
150
200
250
300
350
400
Time, (min.)
Inner Ring


Graphical Representation of Infiltration Data TH-1
Incremental Infiltration, in/hr
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0
50
100
150
200
250
300
350
400
Elapsed Time, min.
Inner Ring
Annular Space

DOUBLE RING INFILTROMETER TEST

(ASTM D 3385)

Constants:	Diameter (in)	Area (in^2)	Height (in)	Depth of liquid (in)	Liquid No.	Water containers (Vol/DH), in^3/in)
Inner ring	12.5	123	20.12	4.00	1	37.41
Annular Space	24.45	347	20.125	3.50	2	83.56

Project: 22-247 Double Butte

Test Location: Vicinity of Matthews Road and Palomar Road, Menifee, Riverside County, CA

Tested by: LW

Water Source: Clean, tap water pH: 7.5

Depth to water table, (ft): Unknown

Date: 8/31/22 Test Hole: 2

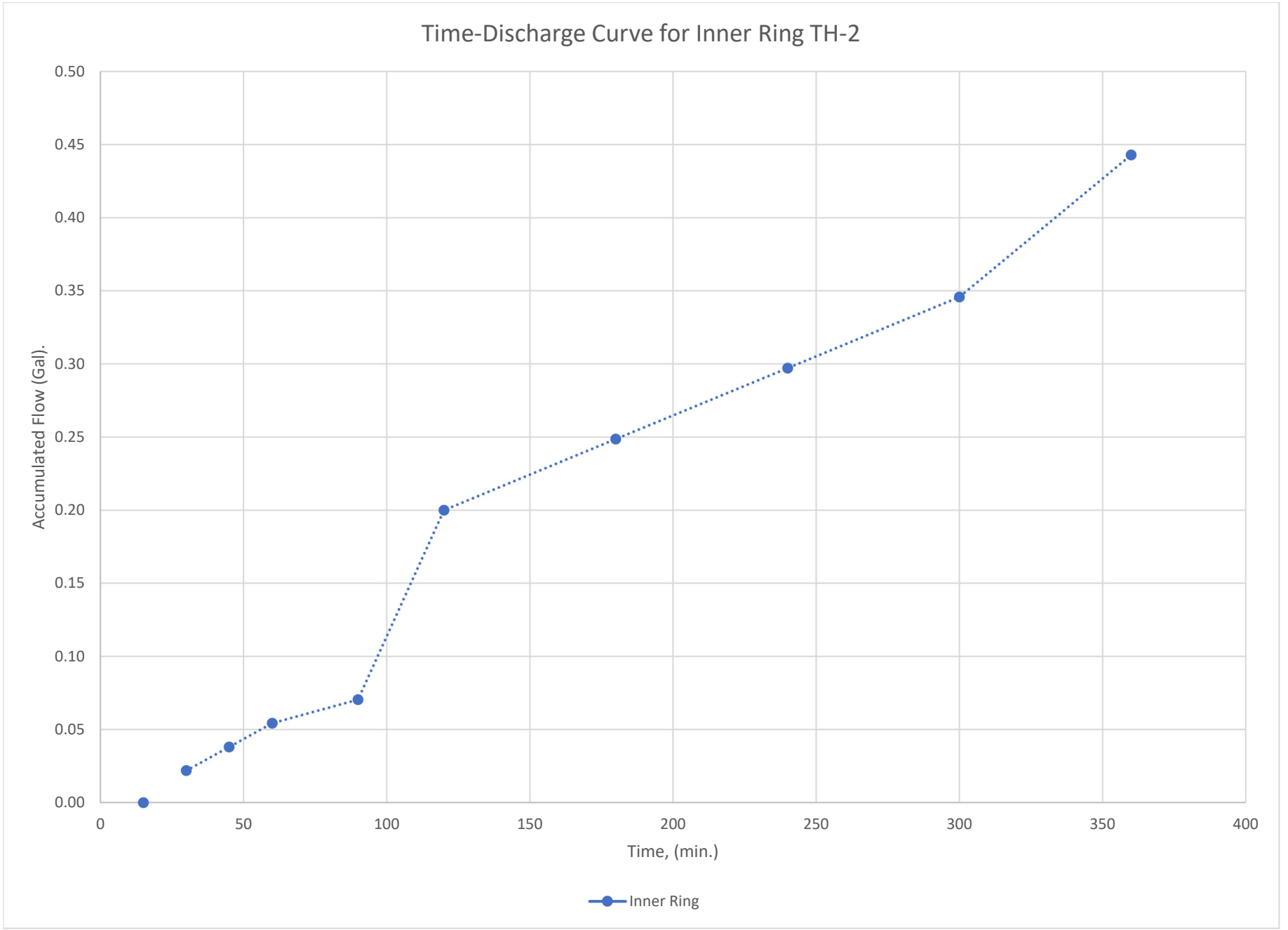
Water level maintained using: Flow Valve Float Valve **Mariotte Tube**

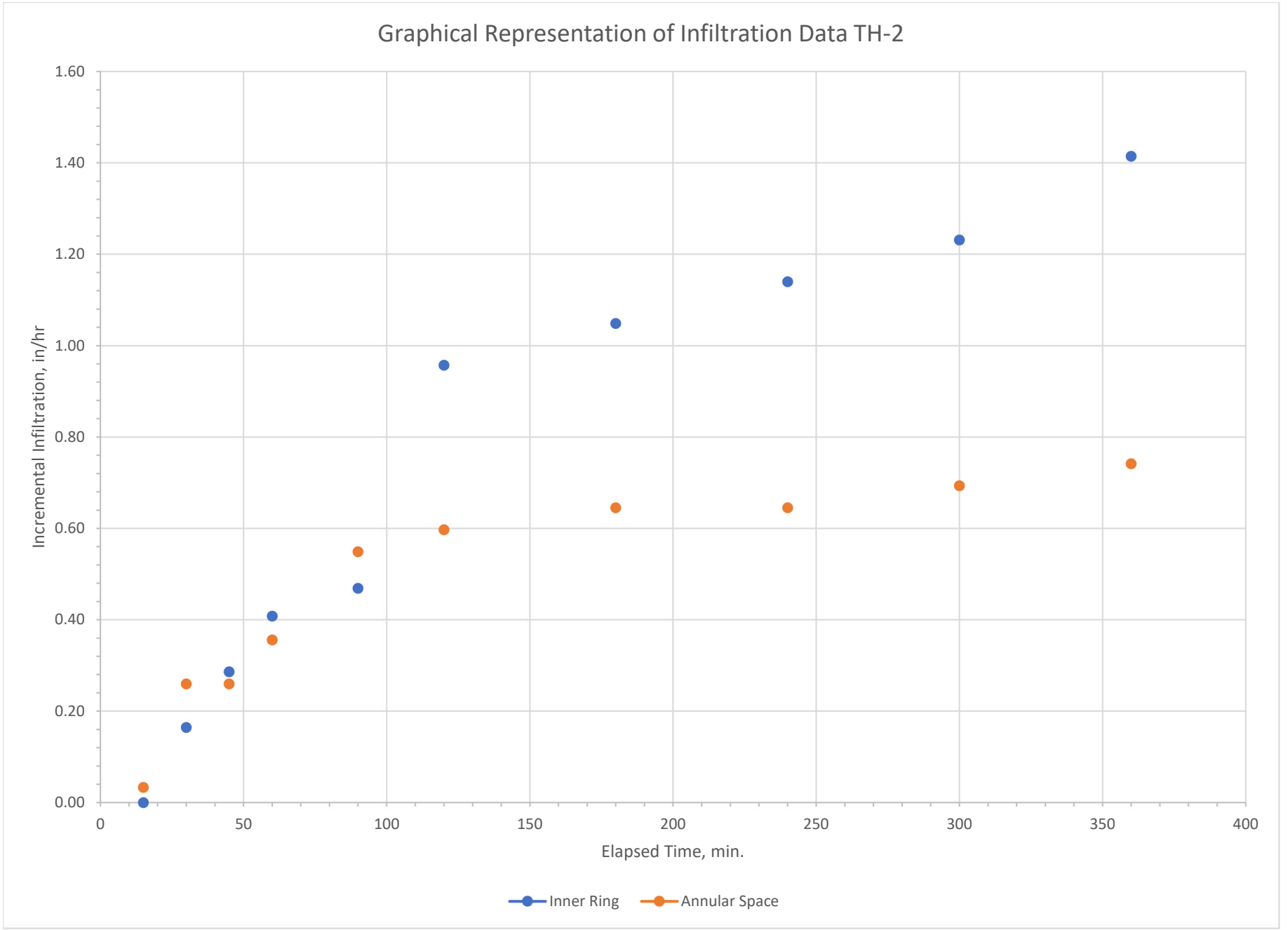
Penetration of rings, (in): Inner: 3.0 Outer: 2.1

Invert Depth: 6'

Trial No.		Date	Time hh:mm	Elapsed Time (minutes)	Flow Readings: Inner Ring Reading (in)	Inner Ring Flow (in^3)	Accumul Flow (gal)	Annular Space Reading (in)	Annular Space Flow (in^3)	Water Temp. (°F)	Increm. Infiltration: Inner in/hr	Increm. Infiltration: Annular in/hr	Remarks
													Ground Temp. (°F): 66
1	S	8/31/22	10:15		22.8	0	0.00	22.8	3	68	0.00	0.0	partly cloudy, 72°F, no wind
	E	8/31/22	10:30	15	22.8			22.8		69			
2	S	8/31/22	10:34		22.8	5	0.02	22.8	20	70	0.16	0.3	
	E	8/31/22	10:49	30	22.7			22.6		70			
3	S	8/31/22	10:52		22.7	4	0.04	22.6	0	70	0.29	0.3	
	E	8/31/22	11:09	45	22.6			22.6		71			
4	S	8/31/22	11:12		22.6	4	0.05	22.6	8	71	0.41	0.4	
	E	8/31/22	11:27	60	22.5			22.5		71			
5	S	8/31/22	11:28		22.5	4	0.07	22.5	33	71	0.47	0.5	
	E	8/31/22	11:48	90	22.4			22.1		72			
6	S	8/31/22	11:48		22.0	30	0.20	22.1	8	72	0.96	0.6	76°F, sunny
	E	8/31/22	12:18	120	21.2			22.0		72			
7	S	8/31/22	12:21		22.8	11	0.25 *	22.8	17	70	1.05 *	0.6	Refill Bottles
	E	8/31/22	1:21	180	22.5			22.6		71			
8	S	8/31/22	1:26		22.5	11	0.30	22.6	0	72	1.14	0.6	
	E	8/31/22	2:26	240	22.2			22.6		72			
9	S	8/31/22	2:30		22.2	11	0.35 *	22.6	17	72	1.23 *	0.7	83°F, sunny
	E	8/31/22	3:30	300	21.9			22.4		73			
10	S	8/31/22	3:35		21.9	22	0.44	22.4	17	73	1.41	0.7	
	E	8/31/22	4:35	360	21.3			22.2		73			

* Cummulative volume used to determine the raw infiltration rate


Time-Discharge Curve for Inner Ring TH-2
Accumulated Flow (Gal).
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
50
100
150
200
250
300
350
400
Time, (min.)
Inner Ring


Graphical Representation of Infiltration Data TH-2
Incremental Infiltration, in/hr
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0
50
100
150
200
250
300
350
400
Elapsed Time, min.
Inner Ring
Annular Space

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Western Riverside Area, California



July 1, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 14, Sep 13, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 25, 2019—Jun 25, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
EnC2	Exeter sandy loam, 2 to 8 percent slopes, eroded	72.2	70.0%
EpC2	Exeter sandy loam, deep, 2 to 8 percent slopes, eroded	9.6	9.3%
GyC2	Greenfield sandy loam, 2 to 8 percent slopes, eroded	12.3	11.9%
MmB	Monserate sandy loam, 0 to 5 percent slopes	3.1	3.0%
MnD2	Monserate sandy loam, shallow, 5 to 15 percent slopes, eroded	5.5	5.3%
RaB2	Ramona sandy loam, 2 to 5 percent slopes, eroded	0.5	0.5%
Totals for Area of Interest		**103.1**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not

mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Western Riverside Area, California

EnC2—Exeter sandy loam, 2 to 8 percent slopes, eroded

Map Unit Setting

National map unit symbol: hcth
Elevation: 20 to 700 feet
Mean annual precipitation: 7 to 20 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 250 to 300 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Exeter and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Exeter

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 16 inches: sandy loam
H2 - 16 to 37 inches: sandy clay loam
H3 - 37 to 50 inches: indurated
H4 - 50 to 60 inches: stratified sandy loam to silt loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: 20 to 40 inches to duripan
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Ramona
Percent of map unit: 5 percent
Hydric soil rating: No

Monserate
Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield
Percent of map unit: 5 percent
Hydric soil rating: No

EpC2—Exeter sandy loam, deep, 2 to 8 percent slopes, eroded

Map Unit Setting
National map unit symbol: hctl
Elevation: 300 to 700 feet
Mean annual precipitation: 7 to 15 inches
Mean annual air temperature: 64 degrees F
Frost-free period: 250 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Exeter and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Exeter

Setting
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile
H1 - 0 to 16 inches: sandy loam
H2 - 16 to 37 inches: sandy clay loam
H3 - 37 to 50 inches: indurated
H4 - 50 to 60 inches: stratified sandy loam to silt loam

Properties and qualities
Slope: 2 to 8 percent
Depth to restrictive feature: 35 to 60 inches to duripan
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Ramona

Percent of map unit: 5 percent
Hydric soil rating: No

Monserate

Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

GyC2—Greenfield sandy loam, 2 to 8 percent slopes, eroded

Map Unit Setting

National map unit symbol: hcvw
Elevation: 100 to 3,500 feet
Mean annual precipitation: 9 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Greenfield and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Greenfield

Setting

Landform: Terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 26 inches: sandy loam
H2 - 26 to 43 inches: fine sandy loam
H3 - 43 to 60 inches: loam
H4 - 60 to 72 inches: stratified loamy sand to sandy loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 3 percent
Hydric soil rating: No

Pachappa

Percent of map unit: 3 percent
Hydric soil rating: No

Arlington

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 3 percent
Hydric soil rating: No

Ramona

Percent of map unit: 3 percent
Hydric soil rating: No

MmB—Monserate sandy loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: hcx4

Elevation: 700 to 2,500 feet
Mean annual precipitation: 10 to 18 inches
Mean annual air temperature: 63 to 64 degrees F
Frost-free period: 220 to 280 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Monserate and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Monserate

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 10 inches: sandy loam
H2 - 10 to 28 inches: sandy clay loam
H3 - 28 to 45 inches: indurated
H4 - 45 to 57 inches: cemented
H5 - 57 to 70 inches: loamy coarse sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: 20 to 39 inches to duripan
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

Tujunga

Percent of map unit: 5 percent
Hydric soil rating: No

Hanford

Percent of map unit: 5 percent

Hydric soil rating: No

MnD2—Monserate sandy loam, shallow, 5 to 15 percent slopes, eroded

Map Unit Setting

National map unit symbol: hcx8
Elevation: 700 to 2,500 feet
Mean annual precipitation: 10 to 18 inches
Mean annual air temperature: 63 to 64 degrees F
Frost-free period: 220 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

Monserate and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Monserate

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 10 inches: sandy loam
H2 - 10 to 18 inches: sandy clay loam
H3 - 18 to 45 inches: indurated
H4 - 45 to 57 inches: cemented
H5 - 57 to 70 inches: loamy coarse sand

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: 10 to 20 inches to duripan
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R019XD060CA - SHALLOW LOAMY (1975)
Hydric soil rating: No

Minor Components

Tujunga
Percent of map unit: 5 percent
Hydric soil rating: No

Hanford
Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield
Percent of map unit: 5 percent
Hydric soil rating: No

RaB2—Ramona sandy loam, 2 to 5 percent slopes, eroded

Map Unit Setting
National map unit symbol: hcy5
Elevation: 250 to 3,500 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 230 to 320 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Ramona and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ramona

Setting
Landform: Terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile
H1 - 0 to 14 inches: sandy loam
H2 - 14 to 23 inches: fine sandy loam
H3 - 23 to 68 inches: sandy clay loam
H4 - 68 to 74 inches: gravelly sandy loam

Properties and qualities
Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 4 percent
Hydric soil rating: No

Arlington

Percent of map unit: 4 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 4 percent
Hydric soil rating: No

Tujunga

Percent of map unit: 3 percent
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

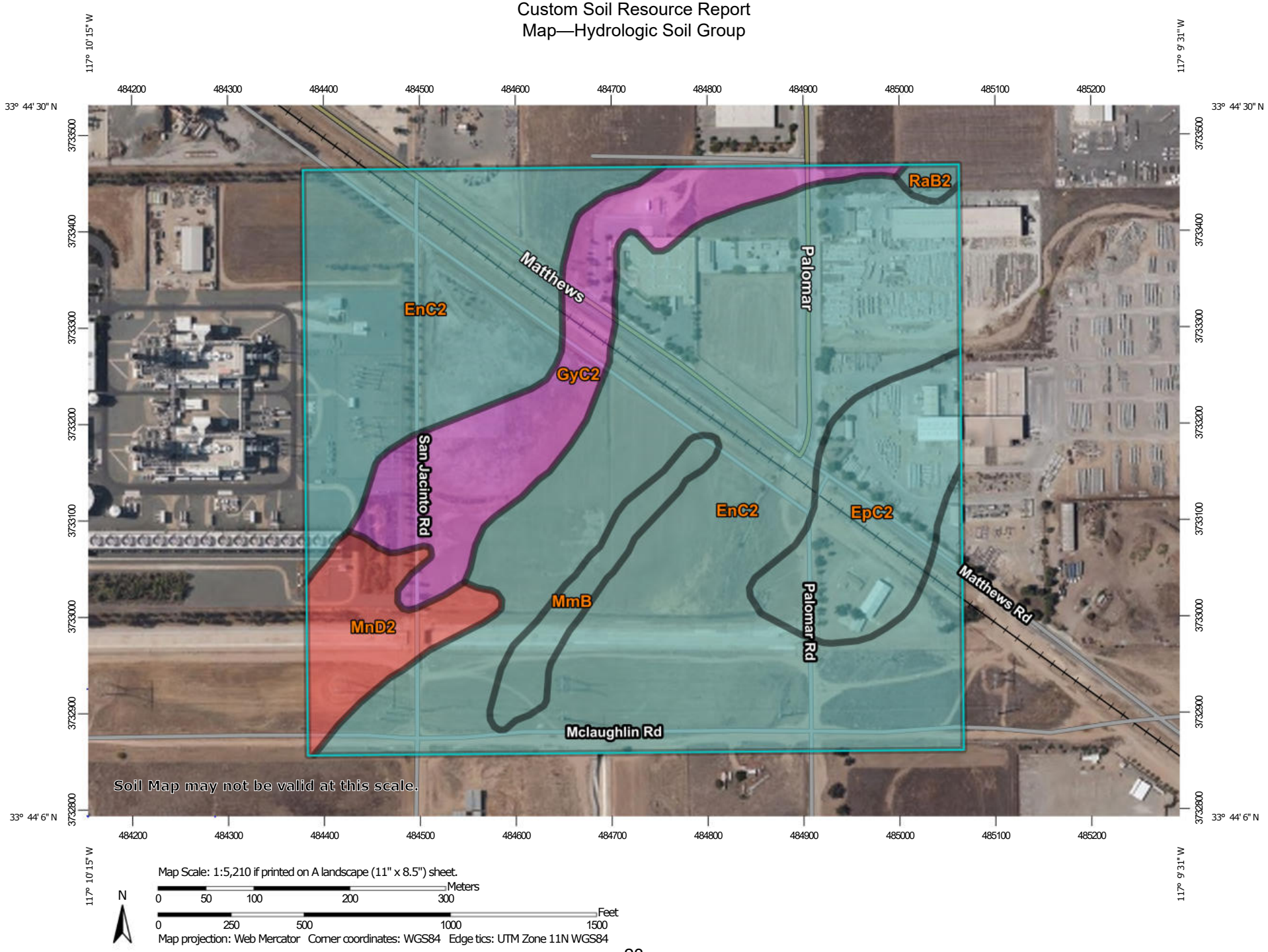
Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.


117° 10' 15" W
117° 9' 31" W
33° 44' 30" N
33° 44' 6" N
484200
484300
484400
484500
484600
484700
484800
484900
485000
485100
485200
3733500
3733400
3733300
3733200
3733100
3733000
3732900
3732800
RaB2
Matthews
Palomar
EnC2
GyC2
San Jacinto Rd
EnC2
EpC2
Matthews Rd
MmB
Palomar Rd
MnD2
Mclaughlin Rd
Soil Map may not be valid at this scale.
Map Scale: 1:5,210 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 50 100 200 300
Feet
0 250 500 1000 1500
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 14, Sep 13, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 25, 2019—Jun 25, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
EnC2	Exeter sandy loam, 2 to 8 percent slopes, eroded	C	72.2	70.0%
EpC2	Exeter sandy loam, deep, 2 to 8 percent slopes, eroded	C	9.6	9.3%
GyC2	Greenfield sandy loam, 2 to 8 percent slopes, eroded	A	12.3	11.9%
MmB	Monserate sandy loam, 0 to 5 percent slopes	C	3.1	3.0%
MnD2	Monserate sandy loam, shallow, 5 to 15 percent slopes, eroded	D	5.5	5.3%
RaB2	Ramona sandy loam, 2 to 5 percent slopes, eroded	C	0.5	0.5%
Totals for Area of Interest			**103.1**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

4.0 PROPOSED INFILTRATION SYSTEM

Based on our review of the plans, a total of one (1) infiltration basin is proposed on the Site for the purpose of percolating the sheet-flow storm-drain water for the proposed industrial development. Due to the flat topography of the Site and proposed grading, it is anticipated the stormwater drainage by sheet-flow will be collected by proposed concrete swales and/or ribbon gutters and continue to the proposed basin. The proposed rectangular-shaped infiltration basin will be constructed with an invert of approximately three to four (3-4) feet below the existing ground surface and 4:1 cut slopes.

5.0 GEOTECHNICAL AND INFILTRATION INVESTIGATION

The geotechnical investigation included a field subsurface exploration program through trenching, obtaining bulk, grab, and undisturbed soil samples, and laboratory testing on soil samples collected during the infiltration testing program. These programs were performed in accordance with our Geotechnical Investigation Infiltration Report Proposal dated June 20, 2022. The scope of work did not include environmental assessment or investigation for the presence or absence of hazardous substances or toxic materials in structures, soil, and surface water, air, below or around the site. The field subsurface exploration, laboratory testing programs, and Infiltration testing protocol are described below, as required by Riverside County and ASTM D 3385.

A site reconnaissance was made by our representative prior to instigating the field exploration and infiltration testing program. The Site was observed, and boundaries roughly located for purposes of underground utility locating. As required by law, Bruin GSI contacted Underground Service Alert (one-call notification service) to attain underground utility marking and clearance, a minimum of 72 hours prior to performing the field subsurface investigation.

The field exploration program was conducted on August 31, 2022, under the technical supervision of our engineer, and consisted of Double Ring Infiltrometer test (ASTM D 3385 tested method) and exploratory excavation. Infiltration testing was performed based on the Test Requirements defined in the Riverside County LAMP, ASTM D 3385, and further described in section 5.1 of this report.

5.1 Field Exploration Program

The approximate locations of the exploratory trenches were determined by sighting and pacing from existing site improvements, such as streets, and the use of a hand-held GPS unit and should be only considered accurate to the degree implied by the method used. Test Hole Locations and pertinent Boring Locations from the Referenced Geotechnical Engineering Report are shown on Figure 2.

Test Location Map

N.T.S.



B1 = Denotes Approximate Boring (B) or Test Hole (TH) Location

BRUIN GEOTECHNICAL SERVICES INC. est. 2004

www.bruingsi.net

Project:

Proposed Double Butte Battery Storage
Vicinity of Matthews Road and Palomar Road,
Menifee, Riverside County, CA

Job Number:

22-247

Figure 2

Soil samples were obtained at various depths within the Test Holes prior to infiltration testing and returned to the laboratory for analysis and testing.

Final Test Hole logs and pertinent Boring Logs presented in Appendix A are Bruin GSI's interpretation of the field logs prepared by our representative during excavation, as well as laboratory test results. The stratification lines represent approximate boundaries between soil types. The actual soil transitions may be gradual.

5.2 Infiltration Testing Protocol

The Riverside County Low Impact Development BMP Design Handbook was used to determine the protocol required for infiltration testing procedures for this project. The LAMP provides examples of appropriate type of testing for various types of LID features. The use of Double-Ring Infiltrometer Test following the procedures as provided in ASTM D3385 is generally appropriate for shallow LID Feature Depths.

Riverside County requires a minimum of two (2) tests with at least one (1) test per each LID Feature. Using the Double-Ring Infiltrometer requires approximately six (6) square feet of horizontal surface area of testing to accommodate the testing infiltrometer and Mariotte tubes at the invert elevation of the proposed basin. It was determined to excavate two (2) representative locations within the limits of designated location of the basin using a tractor-mounted backhoe equipped with a thirty-six-inch bucket. The excavations for Test Hole 1 and Test Hole 2, with dimensions approximately three (3) feet square (3x3), were excavated to a depth of four (4) feet and six (6) feet, respectively, below existing ground surface (bgs).

For each test hole, two Mariotte tubes (10,000cc and 3,000cc capacity) were used to keep the water level constant within the outer and inner rings of the infiltrometer. These calibrated tubes (marked in one-centimeter increments) were placed inside the pit, near the location of the infiltrometer rings and were used as measurement of the volume of water needed to maintain the head during the duration of the test. A three-eighths (3/8) inch ID clear vinyl tubing connected the twelve (12) inch inner diameter ring and the twenty-four (24) inch diameter ring to the Mariotte Tubes. Rubber splash plates were used at the bottom of each ring to convey the water, preventing erosion and disturbance of the test pit's bottom.

The twelve (12) inch diameter ring was carefully driven with minimal disturbance of the soil surface into the ground approximately one (1) inch below the ground surface and filled with water up to one (1) inch above the proposed invert elevation using the 3,000 cc Mariotte Tube. The twenty-four (24) inch diameter ring was carefully driven with minimal disturbance of the soil surface into the ground approximately one and one-half (1.5) inches below the ground surface and filled with water up to one and one-quarter (1.25) inches above the proposed invert

elevation using the 10,000 cc Mariotte Tube. The remaining three-eighths (3/8) inch ID clear vinyl tubing connected the Mariotte Tubes to the fifty-five (55) gallon water tank.

During the initial fill of water, the rings were filled with water using a 0.50 cubic foot receptacle, up to the desired depth in each ring. A measurement of the water pH was obtained. Once the fluid became level and constant then the flow of fluid from the Mariotte Tubes were used to maintain the liquid level throughout the test. The readings of the volume of water, water surface elevation, and water temperature were checked every fifteen (15) minutes during the first hour, every thirty (30) minutes during the second hour; and every one (1) hour afterwards, until reaching a minimum of six (6) hours. The driving cap was paced over the rings during intervals of liquid measurements to minimize evaporation.

Once the instantaneous flow rate stabilized (i.e., the highest and lowest readings were within ten (10) percent of each other, for three consecutive readings), the water drop on Mariotte Tube was recorded until the test pit was empty (falling phase of the test). The total combined time of the test exceeded the four (4) hour minimum.

Infiltration Test Results are presented in Section 7.0 of this report.

5.3 Laboratory Testing

Select soil samples collected during trenching and drilling activities at the Site were then tested in the laboratory to assist in evaluating engineering properties of subsurface materials deemed within structural influence and to provide data required for conclusions related to the infiltration characteristics.

The soil samples were classified in accordance with the Unified Soils Classification System and a testing program was established. The samples were tested to determine the following:

- In-situ moisture ASTM D 2937
- Identification of soils ASTM D 2488
- Material Finer than the No. 200 Sieve ASTM D 1140
- Sand Equivalent Value ASTM D 2419

Pertinent tabular and graphic test results from the referenced Geotechnical Engineering Report are presented in Appendix B.

5.4 Site and Subsurface Conditions

Native materials were encountered within our infiltration test holes and exploratory borings from the referenced Geotechnical Engineering Report. The subsurface soil appears relatively uniform across the subject site and the soil encountered in the exploratory borings generally consists of silty sand with clay (SM) with occasional sandy clay (CL) and clayey sand (SC) to the maximum depth explored of twenty (20) feet below ground surface.

Based on the blow counts obtained during sampling, and in-situ densities obtained, the native material encountered was noted to be medium dense or firm to very dense or hard. The subsurface materials were noted to be slightly moist to saturated. No groundwater or perched water was encountered through the depth explored (20 feet below ground surface).

6.0 DESIGN CRITERIA

To determine the infiltration rate for design purposes, the volume of liquid added to the inner ring to maintain the liquid level constant (measure of liquid infiltrating the soil) during the test is converted to an incremental infiltration velocity by dividing by the area of the inner ring (in inches per hour) and plotted versus time elapsed.

The Riverside County LAMP requires the application of a safety/reduction factor to the raw measurements established at the Site in order to determine the site-specific long-term infiltration rate to be used for design. The Total Reduction Factor (RF) is applied to the raw infiltration rate in order to determine the design infiltration rate that will represent the long-term performance of the proposed infiltration BMPs.

The Infiltration Testing Requirements section of the Riverside County LAMP provides the minimum required safety or reduction factor for each type of infiltration test.

$$Total\ Reduction\ Factor\ (RF) = 3$$

The reduction factor (RF) was applied to the stabilized infiltration rates obtaining the design infiltration rate of the basin. Utilizing the raw infiltration rate of 0.066 inches per hour (0.006 feet per hour) and reduction factor of 3, the design infiltration rate obtained from Test Hole 1 (slowest rate) was calculated to be **0.022 inches per hour (.002 feet per hour)**.

The Riverside County Water Quality Management (WQMP) requires that the infiltration rate must be at least 0.83 inches per hour. The Riverside County WQMP further outlines that “If the average ‘in-situ’ tested infiltration rate for the site is less than 1.6 inches per hour, LID Infiltration BMPs (infiltration basins, infiltration trenches, etc.) shall not be used.”

It is our professional opinion that the infiltration rate is not sufficient, and the Infiltration Basin is not recommended for construction.

Data calculations, reduction factors, raw and calculated design infiltration rates, as well as unit conversions are shown in Appendix C.

7.0 OPINIONS AND CONCLUSIONS

Based upon the results of our investigation, the proposed development is not considered feasible from a geotechnical standpoint.

The soils explored and tested at the Site were found to be relatively uniform in classification, infiltration, and strength. Based on the laboratory testing and subsurface data obtained, it is Bruin GSI's opinion that the upper Site soils will be not suitable for infiltration purposes and do not meet or exceed the county minimum rates required.

Based on our calculations of the design infiltration rates, verified with the laboratory test results on soil samples obtained on each infiltration basin locations, it is our professional opinion the proposed infiltration basins are not feasible from a geotechnical perspective.

Refer to the Geotechnical Engineering Report for the proposed development prepared by Bruin Geotechnical Services Inc. referenced herein for guidelines regarding grading and remedy any soil related issues relative to structures.

8.0 ADDITIONAL SERVICES

Final project plans and specifications should be reviewed prior to construction to confirm that the full intent of the recommendations presented herein have been applied to design and construction. This report is based on the assumption that an adequate testing and inspection program along with client consultation will be performed during final design and construction phases to verify compliance with the recommendations of this report.

Retaining Bruin GSI as the geotechnical consultant to provide additional services from preliminary design through project completion will assure continuity of services.

Additional services include:

- Consultation during design stages of the project.
- Review, stamp and signature of the grading and building plans.
- Observation and testing during rough grading, fine grading and trench backfill as well as placement of engineered fill.
- Consultation as required during construction.

Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

4.0 PROPOSED INFILTRATION SYSTEM

Based on our review of the plans, a total of one (1) infiltration basin is proposed on the Site for the purpose of percolating the sheet-flow storm-drain water for the proposed industrial development. Due to the flat topography of the Site and proposed grading, it is anticipated the stormwater drainage by sheet-flow will be collected by proposed concrete swales and/or ribbon gutters and continue to the proposed basin. The proposed rectangular-shaped infiltration basin will be constructed with an invert of approximately three to four (3-4) feet below the existing ground surface and 4:1 cut slopes.

5.0 GEOTECHNICAL AND INFILTRATION INVESTIGATION

The geotechnical investigation included a field subsurface exploration program through trenching, obtaining bulk, grab, and undisturbed soil samples, and laboratory testing on soil samples collected during the infiltration testing program. These programs were performed in accordance with our Geotechnical Investigation Infiltration Report Proposal dated June 20, 2022. The scope of work did not include environmental assessment or investigation for the presence or absence of hazardous substances or toxic materials in structures, soil, and surface water, air, below or around the site. The field subsurface exploration, laboratory testing programs, and Infiltration testing protocol are described below, as required by Riverside County and ASTM D 3385.

A site reconnaissance was made by our representative prior to instigating the field exploration and infiltration testing program. The Site was observed, and boundaries roughly located for purposes of underground utility locating. As required by law, Bruin GSI contacted Underground Service Alert (one-call notification service) to attain underground utility marking and clearance, a minimum of 72 hours prior to performing the field subsurface investigation.

The field exploration program was conducted on August 31, 2022, under the technical supervision of our engineer, and consisted of Double Ring Infiltrometer test (ASTM D 3385 tested method) and exploratory excavation. Infiltration testing was performed based on the Test Requirements defined in the Riverside County LAMP, ASTM D 3385, and further described in section 5.1 of this report.

5.1 Field Exploration Program

The approximate locations of the exploratory trenches were determined by sighting and pacing from existing site improvements, such as streets, and the use of a hand-held GPS unit and should be only considered accurate to the degree implied by the method used. Test Hole Locations and pertinent Boring Locations from the Referenced Geotechnical Engineering Report are shown on Figure 2.

Test Location Map

N.T.S.



B1 = Denotes Approximate Boring (B) or Test Hole (TH) Location

BRUIN GEOTECHNICAL SERVICES INC. est. 2004

www.bruingsi.net

Project:

Proposed Double Butte Battery Storage
Vicinity of Matthews Road and Palomar Road,
Menifee, Riverside County, CA

Job Number:

22-247

Figure 2

Soil samples were obtained at various depths within the Test Holes prior to infiltration testing and returned to the laboratory for analysis and testing.

Final Test Hole logs and pertinent Boring Logs presented in Appendix A are Bruin GSI's interpretation of the field logs prepared by our representative during excavation, as well as laboratory test results. The stratification lines represent approximate boundaries between soil types. The actual soil transitions may be gradual.

5.2 Infiltration Testing Protocol

The Riverside County Low Impact Development BMP Design Handbook was used to determine the protocol required for infiltration testing procedures for this project. The LAMP provides examples of appropriate type of testing for various types of LID features. The use of Double-Ring Infiltrometer Test following the procedures as provided in ASTM D3385 is generally appropriate for shallow LID Feature Depths.

Riverside County requires a minimum of two (2) tests with at least one (1) test per each LID Feature. Using the Double-Ring Infiltrometer requires approximately six (6) square feet of horizontal surface area of testing to accommodate the testing infiltrometer and Mariotte tubes at the invert elevation of the proposed basin. It was determined to excavate two (2) representative locations within the limits of designated location of the basin using a tractor-mounted backhoe equipped with a thirty-six-inch bucket. The excavations for Test Hole 1 and Test Hole 2, with dimensions approximately three (3) feet square (3x3), were excavated to a depth of four (4) feet and six (6) feet, respectively, below existing ground surface (bgs).

For each test hole, two Mariotte tubes (10,000cc and 3,000cc capacity) were used to keep the water level constant within the outer and inner rings of the infiltrometer. These calibrated tubes (marked in one-centimeter increments) were placed inside the pit, near the location of the infiltrometer rings and were used as measurement of the volume of water needed to maintain the head during the duration of the test. A three-eighths (3/8) inch ID clear vinyl tubing connected the twelve (12) inch inner diameter ring and the twenty-four (24) inch diameter ring to the Mariotte Tubes. Rubber splash plates were used at the bottom of each ring to convey the water, preventing erosion and disturbance of the test pit's bottom.

The twelve (12) inch diameter ring was carefully driven with minimal disturbance of the soil surface into the ground approximately one (1) inch below the ground surface and filled with water up to one (1) inch above the proposed invert elevation using the 3,000 cc Mariotte Tube. The twenty-four (24) inch diameter ring was carefully driven with minimal disturbance of the soil surface into the ground approximately one and one-half (1.5) inches below the ground surface and filled with water up to one and one-quarter (1.25) inches above the proposed invert

elevation using the 10,000 cc Mariotte Tube. The remaining three-eighths (3/8) inch ID clear vinyl tubing connected the Mariotte Tubes to the fifty-five (55) gallon water tank.

During the initial fill of water, the rings were filled with water using a 0.50 cubic foot receptacle, up to the desired depth in each ring. A measurement of the water pH was obtained. Once the fluid became level and constant then the flow of fluid from the Mariotte Tubes were used to maintain the liquid level throughout the test. The readings of the volume of water, water surface elevation, and water temperature were checked every fifteen (15) minutes during the first hour, every thirty (30) minutes during the second hour; and every one (1) hour afterwards, until reaching a minimum of six (6) hours. The driving cap was paced over the rings during intervals of liquid measurements to minimize evaporation.

Once the instantaneous flow rate stabilized (i.e., the highest and lowest readings were within ten (10) percent of each other, for three consecutive readings), the water drop on Mariotte Tube was recorded until the test pit was empty (falling phase of the test). The total combined time of the test exceeded the four (4) hour minimum.

Infiltration Test Results are presented in Section 7.0 of this report.

5.3 Laboratory Testing

Select soil samples collected during trenching and drilling activities at the Site were then tested in the laboratory to assist in evaluating engineering properties of subsurface materials deemed within structural influence and to provide data required for conclusions related to the infiltration characteristics.

The soil samples were classified in accordance with the Unified Soils Classification System and a testing program was established. The samples were tested to determine the following:

- In-situ moisture ASTM D 2937
- Identification of soils ASTM D 2488
- Material Finer than the No. 200 Sieve ASTM D 1140
- Sand Equivalent Value ASTM D 2419

Pertinent tabular and graphic test results from the referenced Geotechnical Engineering Report are presented in Appendix B.

5.4 Site and Subsurface Conditions

Native materials were encountered within our infiltration test holes and exploratory borings from the referenced Geotechnical Engineering Report. The subsurface soil appears relatively uniform across the subject site and the soil encountered in the exploratory borings generally consists of silty sand with clay (SM) with occasional sandy clay (CL) and clayey sand (SC) to the maximum depth explored of twenty (20) feet below ground surface.

Based on the blow counts obtained during sampling, and in-situ densities obtained, the native material encountered was noted to be medium dense or firm to very dense or hard. The subsurface materials were noted to be slightly moist to saturated. No groundwater or perched water was encountered through the depth explored (20 feet below ground surface).

6.0 DESIGN CRITERIA

To determine the infiltration rate for design purposes, the volume of liquid added to the inner ring to maintain the liquid level constant (measure of liquid infiltrating the soil) during the test is converted to an incremental infiltration velocity by dividing by the area of the inner ring (in inches per hour) and plotted versus time elapsed.

The Riverside County LAMP requires the application of a safety/reduction factor to the raw measurements established at the Site in order to determine the site-specific long-term infiltration rate to be used for design. The Total Reduction Factor (RF) is applied to the raw infiltration rate in order to determine the design infiltration rate that will represent the long-term performance of the proposed infiltration BMPs.

The Infiltration Testing Requirements section of the Riverside County LAMP provides the minimum required safety or reduction factor for each type of infiltration test.

$$Total\ Reduction\ Factor\ (RF) = 3$$

The reduction factor (RF) was applied to the stabilized infiltration rates obtaining the design infiltration rate of the basin. Utilizing the raw infiltration rate of 0.066 inches per hour (0.006 feet per hour) and reduction factor of 3, the design infiltration rate obtained from Test Hole 1 (slowest rate) was calculated to be **0.022 inches per hour (.002 feet per hour)**.

The Riverside County Water Quality Management (WQMP) requires that the infiltration rate must be at least 0.83 inches per hour. The Riverside County WQMP further outlines that “If the average ‘in-situ’ tested infiltration rate for the site is less than 1.6 inches per hour, LID Infiltration BMPs (infiltration basins, infiltration trenches, etc.) shall not be used.”

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7.0 OPINIONS AND CONCLUSIONS

Based upon the results of our investigation, the proposed development is not considered feasible from a geotechnical standpoint.

The soils explored and tested at the Site were found to be relatively uniform in classification, infiltration, and strength. Based on the laboratory testing and subsurface data obtained, it is Bruin GSI's opinion that the upper Site soils will be not suitable for infiltration purposes and do not meet or exceed the county minimum rates required.

Based on our calculations of the design infiltration rates, verified with the laboratory test results on soil samples obtained on each infiltration basin locations, it is our professional opinion the proposed infiltration basins are not feasible from a geotechnical perspective.

Refer to the Geotechnical Engineering Report for the proposed development prepared by Bruin Geotechnical Services Inc. referenced herein for guidelines regarding grading and remedy any soil related issues relative to structures.

8.0 ADDITIONAL SERVICES

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- Consultation during design stages of the project.
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- Observation and testing during rough grading, fine grading and trench backfill as well as placement of engineered fill.
- Consultation as required during construction.

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

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	Kimley-Horn	Date	7/15/2024
Designed by	Nicholas Naylor	Case No	PLN22-0281
Company Project Number/Name	Double Butte BESS		

BMP Identification

BMP NAME / ID: BIO-1

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}= 0.61 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	2726	Concrete or Asphalt	1	0.89	2431.6			
A-1	10962	Natural (C Soil)	0.3	0.23	2468.3			
A-1	4246	Compacted Soil (e.g. unpaved parking)	0.4	0.28	1187.7			
A-2	227397	Concrete or Asphalt	1	0.89	202838.1			
A-2	169740	Compacted Soil (e.g. unpaved parking)	0.4	0.28	47478.3			
A-2	548702	Natural (C Soil)	0.3	0.23	123549			
A-2	32050	Ornamental Landscaping	0.1	0.11	3540.2			
	995823	Total			383493.2	0.61	19494.2	24284

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	Kimley-Horn	Date	7/15/2024
Designed by	Nicholas Naylor	Case No	PLN22-0281
Company Project Number/Name	Double Butte BESS		

BMP Identification

BMP NAME / ID: MWS-1

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.61 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	*11597*	*Concrete or Asphalt*	*1*	*0.89*	*10344.5*			
B-2	*31291*	*Concrete or Asphalt*	*1*	*0.89*	*27911.6*			
	42888		***Total***		**38256.1**	**0.61**	***0.5***	***0.577***

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: Kimley-Horn — Date: 7/15/2024

Designed by: Nicholas Naylor — Case No: PLN22-0281

Company Project Number/Name: Double Butte BESS

BMP Identification

BMP NAME / ID: MWS-2

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity — I = 0.61 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 Impervious 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	*D*	*16378*	*Concrete or Asphalt*	*1*	*0.89*	*14609.2*			
	D	*4452*	*Ornamental Landscaping*	*0.1*	*0.11046*	*491.8*			
		20830	***Total***			**15101**	**0.61**	***0.2***	***0.206***

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: Kimley-Horn | Date: 7/15/2024

Designed by: Nicholas Naylor | Case No: PLN22-0281

Company Project Number/Name: Double Butte BESS

BMP Identification

BMP NAME / ID: MWS-3

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.61 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 Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
	E	*14716*	*Concrete or Asphalt*	*1*	*0.89*	*13126.7*			
		14716	**Total**			13126.7	0.61	0.2	0.206

Notes:

Bioretention Facility - Design Procedure	BMP ID	Legend:	Required Entries
	BIO-1		Calculated Cells

Company Name:	Kimley-Horn	Date:	7/9/2024
Designed by:	Ashley Teani	County/City Case No.:	PLN22-0281

Design Volume

Enter the area tributary to this feature	A_T=	23.6	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	19,520	ft^3

Type of Bioretention Facility Design

(●) Side slopes required (parallel to parking spaces or adjacent to walkways)

( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	2.0	ft
Top Width of Bioretention Facility, excluding curb	w_T =	48.7	ft
Total Effective Depth, d_E $d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$	d_E =	1.49	ft
Minimum Surface Area, A_m $A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	13,140	ft^2
Proposed Surface Area	A=	16,726	ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation: Shrubs

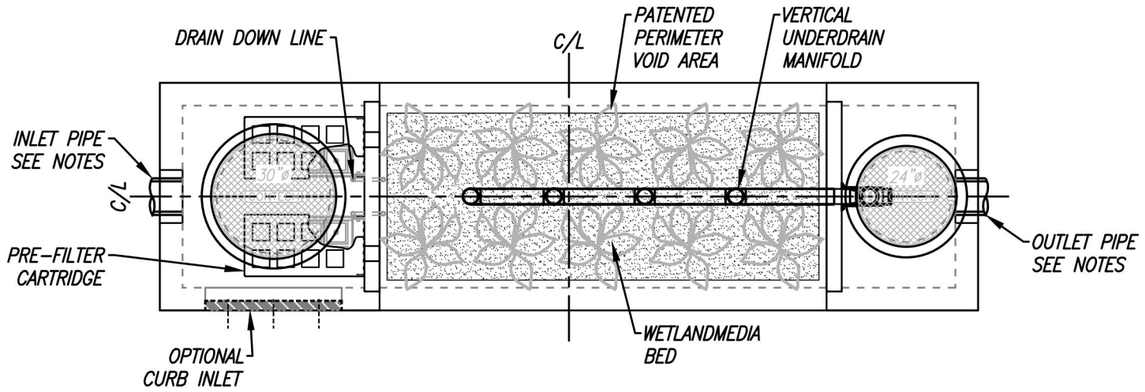
Notes:

MWS Linear 2.0 HGL Sizing Calculations

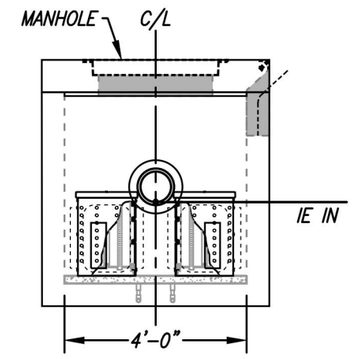
MWS MODEL SIZE	WETLAND PERMITER LENGTH	LOADING RATE GPM/SF	HGL HEIGHT																												
			SHALLOW MODELS																				STANDARD HEIGHT MODEL	HIGH CAPACITY MODELS								
			1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.65	3.70	3.75	3.80	3.85	3.90	3.95
MWS-L-4-4	6.70	1.0	0.022	0.023	0.025	0.026	0.028	0.029	0.031	0.032	0.034	0.035	0.037	0.038	0.040	0.042	0.043	0.045	0.046	0.048	0.049	0.051	0.052	0.054	0.055	0.056	0.057	0.058	0.058	0.059	0.060	0.061
MWS-L-3-6	10.06	1.0	0.032	0.035	0.037	0.039	0.042	0.044	0.046	0.048	0.051	0.053	0.055	0.058	0.060	0.062	0.065	0.067	0.069	0.072	0.074	0.076	0.078	0.081	0.083	0.084	0.085	0.087	0.088	0.089	0.090	0.091
MWS-L-4-6	9.30	1.0	0.030	0.032	0.034	0.036	0.038	0.041	0.043	0.045	0.047	0.049	0.051	0.053	0.055	0.058	0.060	0.062	0.064	0.066	0.068	0.070	0.073	0.075	0.077	0.078	0.079	0.080	0.081	0.082	0.083	0.084
MWS-L-4-8	14.80	1.0	0.048	0.051	0.054	0.058	0.061	0.065	0.068	0.071	0.075	0.078	0.082	0.085	0.088	0.092	0.095	0.099	0.102	0.105	0.109	0.112	0.115	0.119	0.122	0.124	0.126	0.127	0.129	0.131	0.132	0.134
MWS-L-4-13	18.40	1.0	0.059	0.063	0.068	0.072	0.076	0.080	0.084	0.089	0.093	0.097	0.101	0.106	0.110	0.114	0.118	0.122	0.127	0.131	0.135	0.139	0.144	0.148	0.152	0.154	0.156	0.158	0.160	0.163	0.165	0.167
MWS-L-4-15	22.40	1.0	0.072	0.077	0.082	0.087	0.093	0.098	0.103	0.108	0.113	0.118	0.123	0.129	0.134	0.139	0.144	0.149	0.154	0.159	0.165	0.170	0.175	0.180	0.185	0.188	0.190	0.193	0.195	0.198	0.200	0.203
MWS-L-4-17	26.40	1.0	0.085	0.091	0.097	0.103	0.109	0.115	0.121	0.127	0.133	0.139	0.145	0.151	0.158	0.164	0.170	0.176	0.182	0.188	0.194	0.200	0.206	0.212	0.218	0.221	0.224	0.227	0.230	0.233	0.236	0.239
MWS-L-4-19	30.40	1.0	0.098	0.105	0.112	0.119	0.126	0.133	0.140	0.147	0.153	0.160	0.167	0.174	0.181	0.188	0.195	0.202	0.209	0.216	0.223	0.230	0.237	0.244	0.251	0.255	0.258	0.262	0.265	0.269	0.272	0.276
MWS-L-4-21	34.40	1.0	0.111	0.118	0.126	0.134	0.142	0.150	0.158	0.166	0.174	0.182	0.189	0.197	0.205	0.213	0.221	0.229	0.237	0.245	0.253	0.261	0.268	0.276	0.284	0.288	0.292	0.296	0.300	0.304	0.308	0.312
MWS-L-6-8	18.80	1.0	0.060	0.065	0.069	0.073	0.078	0.082	0.086	0.091	0.095	0.099	0.104	0.108	0.112	0.116	0.121	0.125	0.129	0.134	0.138	0.142	0.147	0.151	0.155	0.157	0.160	0.162	0.164	0.166	0.168	0.170
MWS-L-8-8	29.60	1.0	0.095	0.102	0.109	0.115	0.122	0.129	0.136	0.143	0.149	0.156	0.163	0.170	0.177	0.183	0.190	0.197	0.204	0.211	0.217	0.224	0.231	0.238	0.245	0.248	0.251	0.255	0.258	0.262	0.265	0.268
MWS-L-8-12	44.40	1.0	0.143	0.153	0.163	0.173	0.183	0.194	0.204	0.214	0.224	0.234	0.245	0.255	0.265	0.275	0.285	0.296	0.306	0.316	0.326	0.336	0.346	0.357	0.367	0.372	0.377	0.382	0.387	0.392	0.397	0.402
MWS-L-8-16	59.20	1.0	0.190	0.204	0.217	0.231	0.245	0.258	0.272	0.285	0.299	0.312	0.326	0.340	0.353	0.367	0.380	0.394	0.408	0.421	0.435	0.448	0.462	0.476	0.489	0.496	0.503	0.509	0.516	0.523	0.530	0.537
MWS-L-8-20	74.00	1.0	0.238	0.255	0.272	0.289	0.306	0.323	0.340	0.357	0.374	0.391	0.408	0.425	0.442	0.459	0.476	0.493	0.509	0.526	0.543	0.560	0.577	0.594	0.611	0.620	0.628	0.637	0.645	0.654	0.662	0.671
MWS-L-10-20 or MWS-L-8-24	88.80	1.0	0.285	0.306	0.326	0.346	0.367	0.387	0.408	0.428	0.448	0.469	0.489	0.509	0.530	0.550	0.571	0.591	0.611	0.632	0.652	0.673	0.693	0.713	0.734	0.744	0.754	0.764	0.774	0.785	0.795	0.805
4'x'4 media cage	14.80	1.0	0.048	0.051	0.054	0.058	0.061	0.065	0.068	0.071	0.075	0.078	0.082	0.085	0.088	0.092	0.095	0.099	0.102	0.105	0.109	0.112	0.115	0.119	0.122	0.124						

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
TREATMENT FLOW (CFS)			
PRETREATMENT LOADING RATE (GPM/SF)			2.1 GPM/SF
WETLAND MEDIA LOADING RATE (GPM/SF)			1.0
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			_____ (CFS)
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

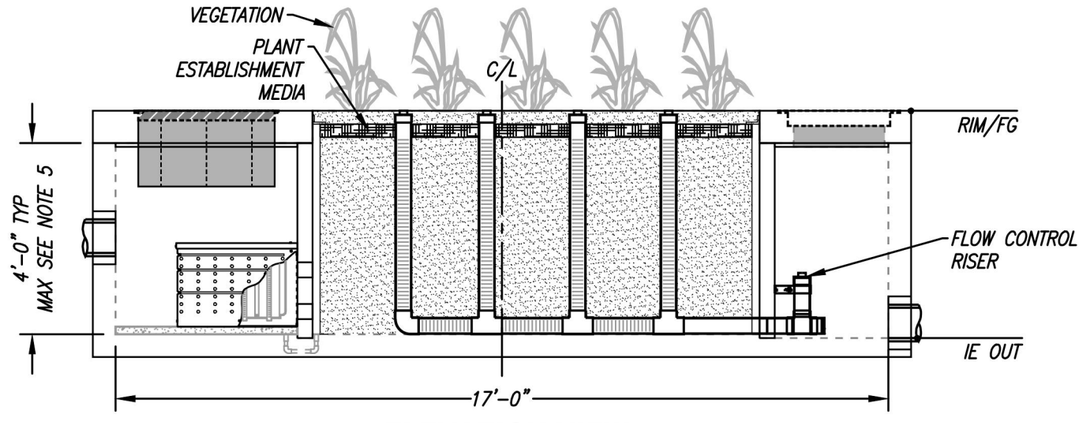
* PRELIMINARY ONLY - NOT FOR CONSTRUCTION



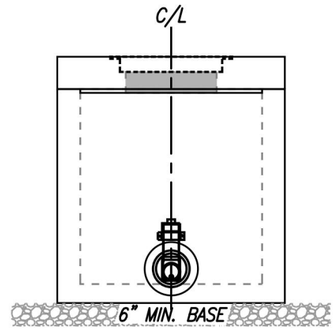
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
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4. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.
5. VERTICAL HEIGHT VARIES BASED ON SITE SPECIFIC REQUIREMENTS.

MODULAR WETLANDS
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

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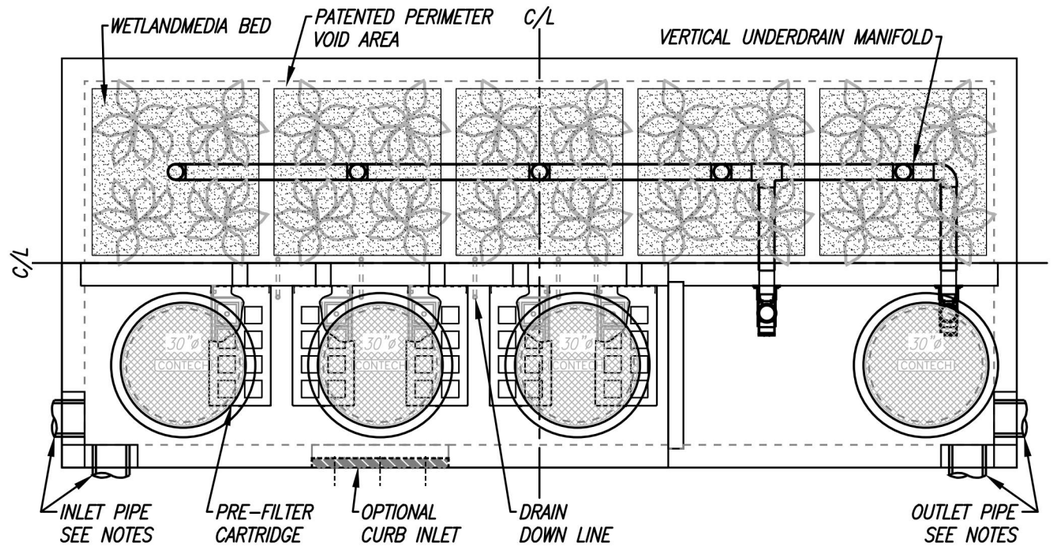
CONTECH® ENGINEERED SOLUTIONS LLC
www.ContechES.com

MWS-L-4-17-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

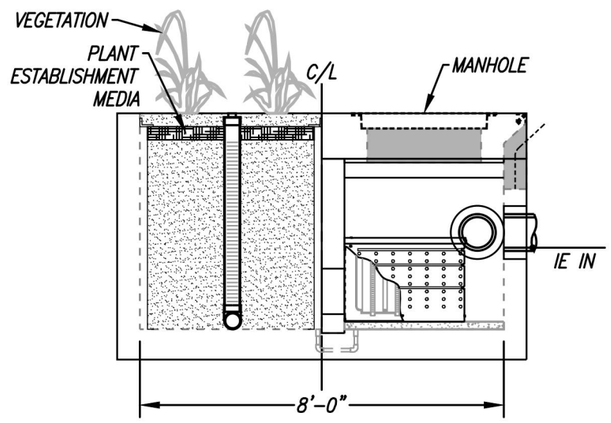
1/12/24TIM.GIRARD

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
TREATMENT FLOW (CFS)			
PRETREATMENT LOADING RATE (GPM/SF)			2.1 GPM/SF
WETLAND MEDIA LOADING RATE (GPM/SF)			1.0
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			_____ (CFS)
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

* PRELIMINARY ONLY - NOT FOR CONSTRUCTION



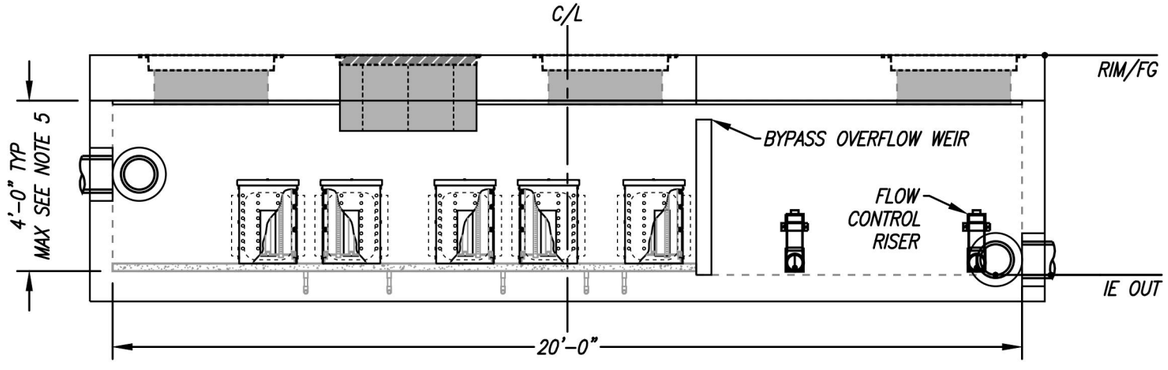
PLAN VIEW



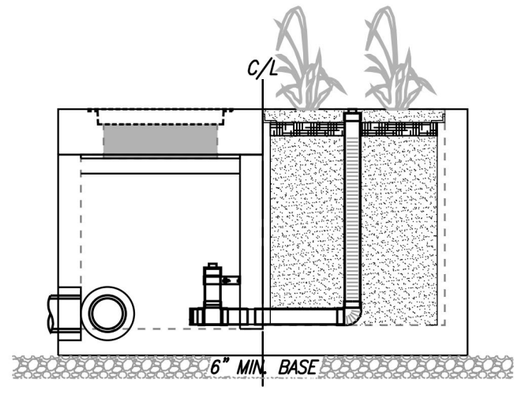
LEFT END VIEW

INSTALLATION NOTES

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3. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
4. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.
5. VERTICAL HEIGHT VARIES BASED ON SITE SPECIFIC REQUIREMENTS.



ELEVATION VIEW



RIGHT END VIEW

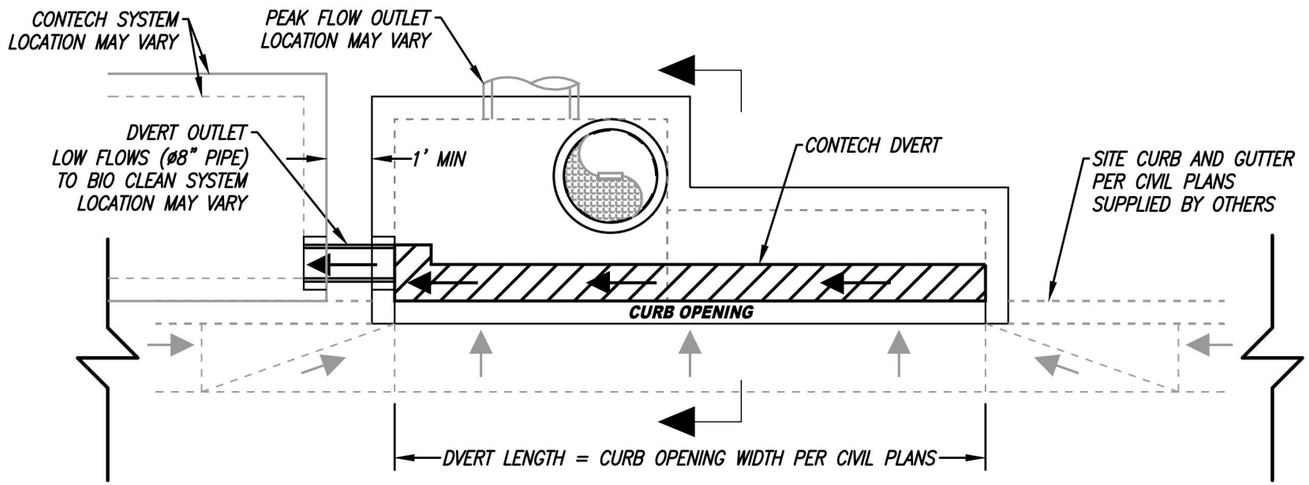
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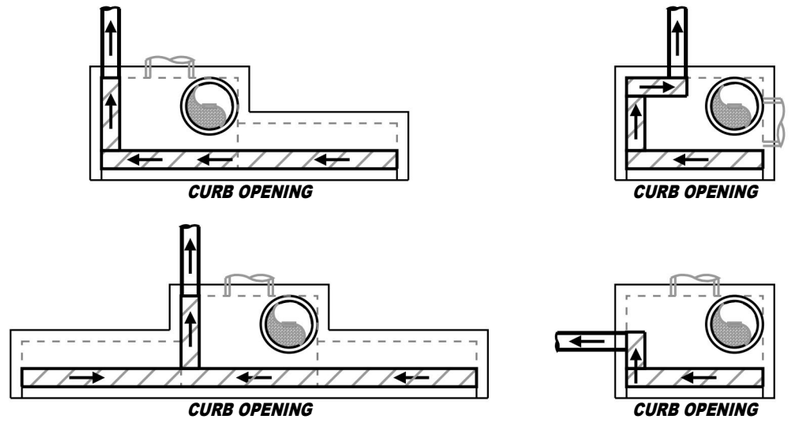
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www.ContechES.com

MWS-L-8-20-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

8/14/23SCOTT.SERTICH

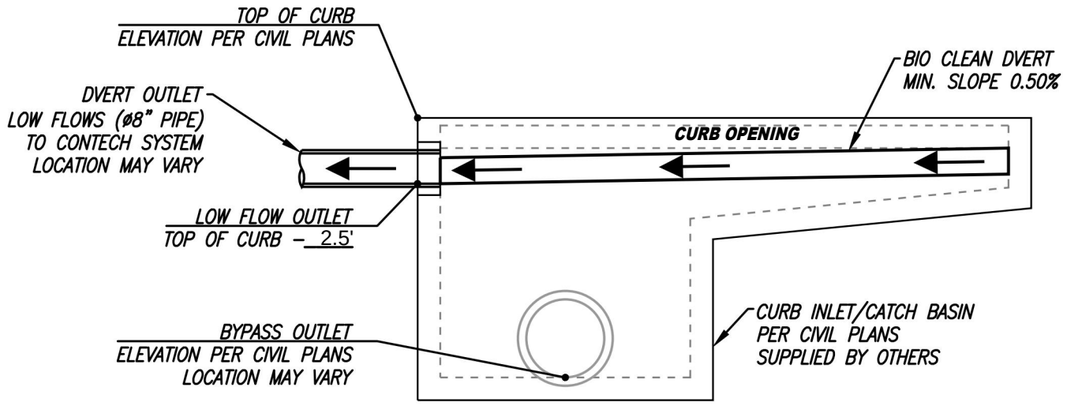


PLAN VIEW

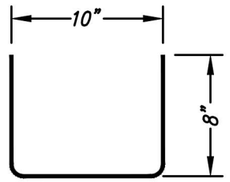


ALTERNATE CONFIGURATIONS

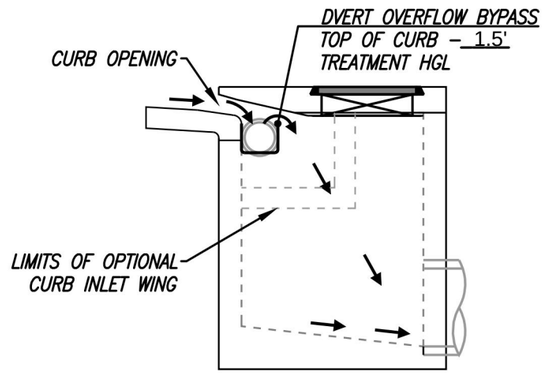
CONTACT CONTECH FOR ADDITIONAL CUSTOM CONFIGURATIONS



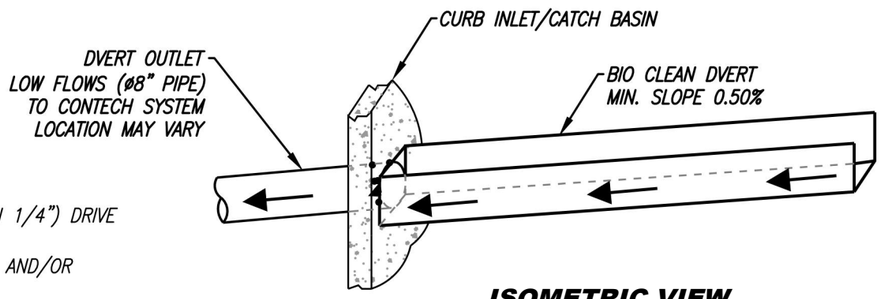
ELEVATION VIEW



DVERT END VIEW



SECTION VIEW



ISOMETRIC VIEW

INSTALLATION NOTES

1. DVERT TO BE CONNECTED TO CONCRETE BELOW CURB OPENING USING 316 STAINLESS STEEL (MIN 1/4") DRIVE PIN ANCHORS SPACED 12" ON CENTER AND 316 STAINLESS STEEL RIVETS (MIN 3/16").
2. ALL SEAMS BETWEEN DVERT AND CONCRETE SHALL BE FILLED WITH WATERTIGHT CONCRETE FILLER AND/OR SILICONE SEALANT.
3. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. PIPES CANNOT INTRUDE BEYOND FLUSH. INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH THE FLOWLINE OF THE DVERT. ALL PIPES SHALL BE SEALED WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
4. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF MODULAR WETLANDS (MWS) UNIT (WHEN DVERT USED IN CONJUNCTION WITH MWS). MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.

MAXIMUM LOW FLOW DIVERSION (CFS)	0.74
LOW FLOW OUTLET PIPE SIZE (INCHES)	ø8"
STATIC HEAD (INCHES)	8"
SAFETY FACTOR	2

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www.ContechES.com

DVERT DVT-10-8
MODULAR TROUGH DIVERSION SYSTEM
STANDARD DETAIL

4/26/23SCOTT.SERTICH

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

Synthetic Unit Hydrograph Method
Loss Rate Estimates

100-year
Existing Conditions

Drainage Area	Soil Group	Cover Type	Curve (RI) Number	Pervious Area Infiltration Rate (in/hr)	Land Use	Decimal Percent of Impervious Area	Adj Infiltration Rate (in/hr)	Subarea (acres)	Total Area (acres)	Subarea/Total Area	Avg Adjusted Infiltration Rate (in/hr)**	Min Loss Rate (inch/hr)	Low Loss Developed Condition = 0.9 - (0.8 x % Impervious) = *
A	C	Grass, Good Cover	88	0.06	Undeveloped, Grassland	0.00	0.06	23.60	23.60	1.00	0.06	0.03	0.90

100-year
Proposed Conditions

Drainage Area	Soil Group	Cover Type	Curve (RI) Number	Pervious Area Infiltration Rate (in/hr)	Land Use	Decimal Percent of Impervious Area	Adj Infiltration Rate (in/hr)	Subarea (acres)	Total Area (acres)	Subarea/Total Area	Avg Adjusted Infiltration Rate (in/hr)**	Min Loss Rate (inch/hr)	Low Loss Developed Condition = 0.9 - (0.8 x % Impervious) = *
A	C	Grass, Good Cover	88	0.06	BESS Development	0.41	0.04	23.60	23.60	1.00	0.04	0.02	0.57

*Minimum low loss value in AES is 0.5; therefore, 0.5 was used for the study where calculated value was less.

**Minimum value in AES is 0.05; therefore, 0.05 was used for the study for areas with a value less than 0.05.

Drainage Area Parameters

Existing Condition

Name	Land Use Type	Soil Type	Area (SF)	Area (AC)	Impervious %
A1	Undeveloped, Grassland	C	85,813.20	1.97	0%
A2	Undeveloped, Grassland	C	943,074.00	21.65	0%
A1	Compacted Earthen Roads	C	96,189.00	2.21	40%
OA-1	Undeveloped, Grassland	C	37,026.00	0.85	0%
OA-2	Undeveloped, Grassland	C	381,587.00	8.82	0%
OB-1	Developed, Commercial	C	28,750.00	3.93	50%
OB-2	Undeveloped, Grassland	C	341,510.00	9.82	0%
			Total Site	49.25	6%

Drainage Area Parameters

Proposed Condition

Name	Land Use Type	Soil Type	Area (SF)	Area (AC)	Impervious Land Cover Type	Area (AC)	Effective Impervious Fraction	Effective Impervious Area (AC)	Composite Impervious Percent (%)
A-1	Developed, Commercial	C	17,860.00	0.41	Native Soil (Type C)	0.16	0.0	0.00	0%
					Earthen Road (Compacted Soil)	0.13	0.4	0.05	12%
					BESS/Substation Pads	0.13	1.0	0.13	32%
A-2	Developed, Commercial	C	982,714.00	22.56	Native Soil (Type C)	12.60	0.0	0.00	0%
					Earthen Road (Compacted Soil)	3.87	0.4	1.55	7%
					BESS/Substation Pads	5.25	1.0	5.25	23%
					Vegetative Buffer	0.84	0.0	0.00	0%
B-1	Paved Road	C	11,534.00	0.26	Paved Road	0.26	1.0	0.26	100%
B-2	Paved Road	C	31,506.58	0.72	Paved Road	0.72	1.0	0.72	100%
C-1	Landscaped Area	C	9,831.45	0.23	Vegetative Buffer	0.23	0.0	0.00	0%
C-2	Landscaped Area	C	19,544.34	0.45	Vegetative Buffer	0.45	0.0	0.00	0%
C-3	Landscaped Area	C	2,130.59	0.05	Vegetative Buffer	0.05	0.0	0.00	0%
D	Paved Road	C	20,037.81	0.46	Paved Road	0.46	1.0	0.46	100%
E	Paved Road	C	14,121.93	0.32	Paved Road	0.32	1.0	0.32	100%
F-1	Landscaped Area	C	9,442.29	0.22	Vegetative Buffer	0.22	0.0	0.00	0%
F-2	Landscaped Area	C	30,210.42	0.69	Vegetative Buffer	0.69	0.0	0.00	0%
O1-1	Developed, Commercial	C	22,651.00	0.52	Native Soil (Type C)	0.26	0.0	0.00	0%
					Development	0.26	0.9	0.23	45%
O1-2	Developed, Commercial	C	136,778.00	3.14	Native Soil (Type C)	3.14	0.0	0.00	0%
O2-1	Undeveloped	C	19,602.00	0.45	Native Soil (Type C)	0.45	0.0	0.00	0%
O2-2	Undeveloped	C	229,997.00	5.28	Native Soil (Type C)	5.28	0.0	0.00	0%
O3-1	Undeveloped	C	29,185.00	0.67	Native Soil (Type C)	0.67	0.0	0.00	0%
O3-2	Undeveloped	C	355,885.00	8.17	Native Soil (Type C)	8.17	0.0	0.00	0%
			Total	48.54			Total Impervious	8.97	18%
			Project Site (Offsite not included)	23.60			Project Site Impervious (Offsite not included)	8.74	37%

```
_____
**************************************************************************

             F L O O D    R O U T I N G    A N A L Y S I S

ACCORDING TO RIVERSIDE COUNTY FLOOD CONTORL AND WATER CONSERVATION DISTRICT
                    (RCFC&WCD) 1978 HYDROLOGY MANUAL
         (c) Copyright 1989-2011 Advanced Engineering Software (aes)
                 (Synthetic Unit Hydrograph Version 18.0)
                 Release Date: 05/01/2011  License ID 1499

                          Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* DOUBLE BUTTE                                                          *
* EXISTING CONDITION                                                    *
* 2 YR HYDROGRAPH                                                       *
 ************************************************************************

  FILE NAME: DB2EXUH.DAT
  TIME/DATE OF STUDY: 21:41 07/09/2024


**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    102.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==========================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =      23.600 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.590 HOURS
         VALLEY S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.060
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.900
         MINIMUM SOIL-LOSS RATE(INCH/HOUR) =   0.030
         USER-ENTERED RAINFALL =  2.06 INCHES
         RCFC&WCD 24-Hour Storm (15-Minute period) SELECTED
         *USER SPECIFIED PRECIPITATION DEPTH-AREA ADJUSTMENT FACTOR = 1.0000


         UNIT HYDROGRAPH TIME UNIT =  15.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  42.373
```

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	4.642	4.416
2	24.169	18.577
3	52.484	26.939
4	68.438	15.178
5	76.597	7.763
6	81.865	5.012
7	85.688	3.637
8	88.521	2.695
9	90.796	2.164
10	92.610	1.726
11	94.121	1.437
12	95.391	1.208
13	96.421	0.980
14	97.243	0.783
15	97.979	0.700
16	98.328	0.333
17	98.633	0.289
18	98.937	0.289
19	99.241	0.289
20	99.545	0.289
21	99.849	0.289
22	100.000	0.144

TOTAL STORM RAINFALL(INCHES) = 2.06
TOTAL SOIL-LOSS(INCHES) = 1.00
TOTAL EFFECTIVE RAINFALL(INCHES) = 1.06

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 1.9629
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 2.0874

2 4 - 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 FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
0.083	0.0000	0.00	Q	.	.	.	.
0.167	0.0000	0.00	Q	.	.	.	.
0.250	0.0000	0.00	Q	.	.	.	.
0.333	0.0001	0.01	Q	.	.	.	.
0.417	0.0002	0.01	Q	.	.	.	.
0.500	0.0003	0.01	Q	.	.	.	.
0.583	0.0004	0.03	Q	.	.	.	.
0.667	0.0006	0.03	Q	.	.	.	.
0.750	0.0008	0.03	Q	.	.	.	.
0.833	0.0010	0.04	Q	.	.	.	.
0.917	0.0013	0.04	Q	.	.	.	.
1.000	0.0016	0.04	Q	.	.	.	.
1.083	0.0019	0.05	Q	.	.	.	.
1.167	0.0022	0.05	Q	.	.	.	.
1.250	0.0025	0.05	Q	.	.	.	.
1.333	0.0029	0.05	Q	.	.	.	.
1.417	0.0033	0.05	Q	.	.	.	.
1.500	0.0036	0.05	Q	.	.	.	.
1.583	0.0040	0.05	Q	.	.	.	.
1.667	0.0044	0.05	Q	.	.	.	.
1.750	0.0047	0.05	Q	.	.	.	.
1.833	0.0051	0.05	Q	.	.	.	.
1.917	0.0055	0.05	Q	.	.	.	.
2.000	0.0058	0.05	Q	.	.	.	.
2.083	0.0062	0.06	Q	.	.	.	.
2.167	0.0066	0.06	Q	.	.	.	.
2.250	0.0070	0.06	Q	.	.	.	.
2.333	0.0075	0.07	Q	.	.	.	.
2.417	0.0079	0.07	Q	.	.	.	.
2.500	0.0084	0.07	Q	.	.	.	.
2.583	0.0089	0.07	Q	.	.	.	.
2.667	0.0094	0.07	Q	.	.	.	.
2.750	0.0098	0.07	Q	.	.	.	.
2.833	0.0104	0.08	Q	.	.	.	.
2.917	0.0109	0.08	Q	.	.	.	.
3.000	0.0114	0.08	Q	.	.	.	.
3.083	0.0120	0.08	Q	.	.	.	.
3.167	0.0126	0.08	Q	.	.	.	.
3.250	0.0131	0.08	Q	.	.	.	.
3.333	0.0137	0.09	Q	.	.	.	.
3.417	0.0143	0.09	Q	.	.	.	.
3.500	0.0149	0.09	Q	.	.	.	.
3.583	0.0156	0.09	Q	.	.	.	.
3.667	0.0162	0.09	Q	.	.	.	.

3.750	0.0168	0.09	Q	.	.	.	.
3.833	0.0174	0.09	Q	.	.	.	.
3.917	0.0181	0.09	Q	.	.	.	.
4.000	0.0187	0.09	Q	.	.	.	.
4.083	0.0194	0.10	Q	.	.	.	.
4.167	0.0201	0.10	Q	.	.	.	.
4.250	0.0207	0.10	Q	.	.	.	.
4.333	0.0215	0.11	Q	.	.	.	.
4.417	0.0222	0.11	Q	.	.	.	.
4.500	0.0229	0.11	Q	.	.	.	.
4.583	0.0237	0.11	Q	.	.	.	.
4.667	0.0245	0.11	Q	.	.	.	.
4.750	0.0252	0.11	Q	.	.	.	.
4.833	0.0261	0.12	Q	.	.	.	.
4.917	0.0269	0.12	Q	.	.	.	.
5.000	0.0278	0.12	Q	.	.	.	.
5.083	0.0286	0.13	Q	.	.	.	.
5.167	0.0295	0.13	Q	.	.	.	.
5.250	0.0304	0.13	Q	.	.	.	.
5.333	0.0313	0.13	Q	.	.	.	.
5.417	0.0322	0.13	Q	.	.	.	.
5.500	0.0331	0.13	Q	.	.	.	.
5.583	0.0340	0.13	Q	.	.	.	.
5.667	0.0349	0.13	Q	.	.	.	.
5.750	0.0358	0.13	Q	.	.	.	.
5.833	0.0367	0.14	Q	.	.	.	.
5.917	0.0376	0.14	Q	.	.	.	.
6.000	0.0386	0.14	Q	.	.	.	.
6.083	0.0395	0.14	Q	.	.	.	.
6.167	0.0405	0.14	Q	.	.	.	.
6.250	0.0415	0.14	Q	.	.	.	.
6.333	0.0426	0.15	Q	.	.	.	.
6.417	0.0436	0.15	Q	.	.	.	.
6.500	0.0447	0.15	Q	.	.	.	.
6.583	0.0458	0.16	Q	.	.	.	.
6.667	0.0469	0.16	Q	.	.	.	.
6.750	0.0480	0.16	Q	.	.	.	.
6.833	0.0491	0.17	Q	.	.	.	.
6.917	0.0503	0.17	Q	.	.	.	.
7.000	0.0515	0.17	Q	.	.	.	.
7.083	0.0527	0.18	QV	.	.	.	.
7.167	0.0539	0.18	QV	.	.	.	.
7.250	0.0551	0.18	QV	.	.	.	.
7.333	0.0565	0.19	QV	.	.	.	.
7.417	0.0578	0.19	QV	.	.	.	.
7.500	0.0591	0.19	QV	.	.	.	.
7.583	0.0608	0.25	QV	.	.	.	.
7.667	0.0625	0.25	QV	.	.	.	.
7.750	0.0642	0.25	QV	.	.	.	.
7.833	0.0668	0.36	.Q	.	.	.	.

7.917	0.0693	0.36	.Q	.	.	.	.
8.000	0.0718	0.36	.Q	.	.	.	.
8.083	0.0754	0.52	.VQ	.	.	.	.
8.167	0.0790	0.52	.VQ	.	.	.	.
8.250	0.0826	0.52	.VQ	.	.	.	.
8.333	0.0876	0.72	.VQ	.	.	.	.
8.417	0.0926	0.72	.VQ	.	.	.	.
8.500	0.0976	0.72	.VQ	.	.	.	.
8.583	0.1039	0.92	.V Q	.	.	.	.
8.667	0.1102	0.92	. VQ	.	.	.	.
8.750	0.1166	0.92	. VQ	.	.	.	.
8.833	0.1241	1.09	. V Q	.	.	.	.
8.917	0.1315	1.09	. V Q	.	.	.	.
9.000	0.1390	1.09	. V Q	.	.	.	.
9.083	0.1478	1.27	. V Q	.	.	.	.
9.167	0.1566	1.27	. V Q	.	.	.	.
9.250	0.1653	1.27	. V Q	.	.	.	.
9.333	0.1757	1.51	. V Q	.	.	.	.
9.417	0.1861	1.51	. V Q	.	.	.	.
9.500	0.1965	1.51	. V Q	.	.	.	.
9.583	0.2086	1.76	. V Q	.	.	.	.
9.667	0.2207	1.76	. V Q	.	.	.	.
9.750	0.2329	1.76	. V Q	.	.	.	.
9.833	0.2466	2.00	. V Q	.	.	.	.
9.917	0.2604	2.00	. V Q	.	.	.	.
10.000	0.2741	2.00	. V Q	.	.	.	.
10.083	0.2889	2.15	. V Q	.	.	.	.
10.167	0.3037	2.15	. V Q	.	.	.	.
10.250	0.3185	2.15	. V Q	.	.	.	.
10.333	0.3326	2.05	. V Q	.	.	.	.
10.417	0.3468	2.05	. V Q	.	.	.	.
10.500	0.3609	2.05	. V Q	.	.	.	.
10.583	0.3735	1.83	. Q	.	.	.	.
10.667	0.3860	1.83	. Q	.	.	.	.
10.750	0.3986	1.83	. Q	.	.	.	.
10.833	0.4116	1.88	. Q	.	.	.	.
10.917	0.4246	1.88	. QV	.	.	.	.
11.000	0.4375	1.88	. QV	.	.	.	.
11.083	0.4520	2.11	. Q	.	.	.	.
11.167	0.4665	2.11	. Q	.	.	.	.
11.250	0.4811	2.11	. QV	.	.	.	.
11.333	0.4963	2.21	. QV	.	.	.	.
11.417	0.5115	2.21	. QV	.	.	.	.
11.500	0.5267	2.21	. Q V	.	.	.	.
11.583	0.5420	2.21	. Q V	.	.	.	.
11.667	0.5572	2.21	. Q V	.	.	.	.
11.750	0.5725	2.21	. Q V	.	.	.	.
11.833	0.5874	2.17	. Q .V	.	.	.	.
11.917	0.6024	2.17	. Q .V	.	.	.	.
12.000	0.6173	2.17	. Q .V	.	.	.	.

12.083	0.6324	2.19	.	Q . V . . .
12.167	0.6476	2.19	.	Q . V . . .
12.250	0.6627	2.19	.	Q . V . . .
12.333	0.6798	2.49	.	Q. V . . .
12.417	0.6970	2.49	.	Q. V . . .
12.500	0.7141	2.49	.	Q. V . . .
12.583	0.7345	2.96	.	.Q V . . .
12.667	0.7550	2.96	.	.Q V . . .
12.750	0.7754	2.96	.	.Q V . . .
12.833	0.7984	3.34	.	. Q V . . .
12.917	0.8214	3.34	.	. Q V . . .
13.000	0.8444	3.34	.	. Q V . . .
13.083	0.8699	3.70	.	. Q V . . .
13.167	0.8954	3.70	.	. Q V . . .
13.250	0.9209	3.70	.	. Q V . . .
13.333	0.9493	4.12	.	. Q V . . .
13.417	0.9776	4.12	.	. Q V . . .
13.500	1.0060	4.12	.	. Q V. . .
13.583	1.0365	4.44	.	. Q V. . .
13.667	1.0671	4.44	.	. Q V . .
13.750	1.0977	4.44	.	. Q V . .
13.833	1.1271	4.28	.	. Q .V . .
13.917	1.1566	4.28	.	. Q . V . .
14.000	1.1861	4.28	.	. Q . V . .
14.083	1.2127	3.87	.	. Q . V . .
14.167	1.2393	3.87	.	. Q . V . .
14.250	1.2660	3.87	.	. Q . V . .
14.333	1.2920	3.78	.	. Q . V . .
14.417	1.3181	3.78	.	. Q . V . .
14.500	1.3441	3.78	.	. Q . V . .
14.583	1.3709	3.88	.	. Q . V . .
14.667	1.3976	3.88	.	. Q . V . .
14.750	1.4244	3.88	.	. Q . V . .
14.833	1.4513	3.91	.	. Q . V . .
14.917	1.4782	3.91	.	. Q . V . .
15.000	1.5051	3.91	.	. Q . V . .
15.083	1.5318	3.87	.	. Q . V. .
15.167	1.5584	3.87	.	. Q . V. .
15.250	1.5851	3.87	.	. Q . V .
15.333	1.6112	3.79	.	. Q . V .
15.417	1.6373	3.79	.	. Q . V .
15.500	1.6634	3.79	.	. Q . V .
15.583	1.6886	3.65	.	. Q . . V .
15.667	1.7137	3.65	.	. Q . . V .
15.750	1.7389	3.65	.	. Q . . V .
15.833	1.7624	3.41	.	. Q . . V .
15.917	1.7859	3.41	.	. Q . . V .
16.000	1.8094	3.41	.	. Q . . V .
16.083	1.8303	3.03	.	. Q . . V .
16.167	1.8512	3.03	.	. Q . . V .

16.250	1.8720	3.03	. . Q . . V .
16.333	1.8884	2.37	. Q. . . V .
16.417	1.9047	2.37	. Q. . . V .
16.500	1.9211	2.37	. Q. . . V .
16.583	1.9318	1.56	. Q . . . V .
16.667	1.9425	1.56	. Q . . . V .
16.750	1.9533	1.56	. Q . . . V .
16.833	1.9608	1.09	. Q . . . V .
16.917	1.9682	1.09	. Q . . . V .
17.000	1.9757	1.09	. Q . . . V .
17.083	1.9815	0.83	. Q . . . V .
17.167	1.9872	0.83	. Q . . . V .
17.250	1.9929	0.83	. Q . . . V .
17.333	1.9976	0.67	. Q . . . V .
17.417	2.0022	0.67	. Q . . . V .
17.500	2.0069	0.67	. Q . . . V .
17.583	2.0107	0.56	. Q . . . V .
17.667	2.0146	0.56	. Q . . . V .
17.750	2.0185	0.56	. Q . . . V .
17.833	2.0218	0.47	.Q . . . V .
17.917	2.0250	0.47	.Q . . . V .
18.000	2.0283	0.47	.Q . . . V .
18.083	2.0310	0.40	.Q . . . V .
18.167	2.0337	0.40	.Q . . . V .
18.250	2.0364	0.40	.Q . . . V.
18.333	2.0387	0.33	.Q . . . V.
18.417	2.0409	0.33	.Q . . . V.
18.500	2.0432	0.33	.Q . . . V.
18.583	2.0450	0.27	.Q . . . V.
18.667	2.0469	0.27	.Q . . . V.
18.750	2.0488	0.27	.Q . . . V.
18.833	2.0503	0.22	Q . . . V.
18.917	2.0518	0.22	Q . . . V.
19.000	2.0533	0.22	Q . . . V.
19.083	2.0546	0.18	Q . . . V.
19.167	2.0558	0.18	Q . . . V.
19.250	2.0570	0.18	Q . . . V.
19.333	2.0581	0.15	Q . . . V.
19.417	2.0591	0.15	Q . . . V.
19.500	2.0602	0.15	Q . . . V.
19.583	2.0611	0.13	Q . . . V.
19.667	2.0620	0.13	Q . . . V.
19.750	2.0629	0.13	Q . . . V.
19.833	2.0637	0.12	Q . . . V.
19.917	2.0645	0.12	Q . . . V.
20.000	2.0653	0.12	Q . . . V.
20.083	2.0661	0.10	Q . . . V.
20.167	2.0668	0.10	Q . . . V.
20.250	2.0675	0.10	Q . . . V.
20.333	2.0681	0.09	Q . . . V.

20.417	2.0687	0.09	Q	.	.	.	V.
20.500	2.0693	0.09	Q	.	.	.	V.
20.583	2.0698	0.08	Q	.	.	.	V.
20.667	2.0704	0.08	Q	.	.	.	V.
20.750	2.0709	0.08	Q	.	.	.	V.
20.833	2.0714	0.07	Q	.	.	.	V.
20.917	2.0719	0.07	Q	.	.	.	V.
21.000	2.0724	0.07	Q	.	.	.	V.
21.083	2.0728	0.06	Q	.	.	.	V.
21.167	2.0732	0.06	Q	.	.	.	V.
21.250	2.0736	0.06	Q	.	.	.	V.
21.333	2.0740	0.05	Q	.	.	.	V.
21.417	2.0743	0.05	Q	.	.	.	V.
21.500	2.0747	0.05	Q	.	.	.	V.
21.583	2.0750	0.05	Q	.	.	.	V.
21.667	2.0754	0.05	Q	.	.	.	V.
21.750	2.0758	0.05	Q	.	.	.	V.
21.833	2.0761	0.05	Q	.	.	.	V.
21.917	2.0765	0.05	Q	.	.	.	V.
22.000	2.0768	0.05	Q	.	.	.	V.
22.083	2.0772	0.05	Q	.	.	.	V.
22.167	2.0775	0.05	Q	.	.	.	V.
22.250	2.0779	0.05	Q	.	.	.	V.
22.333	2.0782	0.05	Q	.	.	.	V.
22.417	2.0786	0.05	Q	.	.	.	V.
22.500	2.0789	0.05	Q	.	.	.	V.
22.583	2.0792	0.05	Q	.	.	.	V.
22.667	2.0796	0.05	Q	.	.	.	V.
22.750	2.0799	0.05	Q	.	.	.	V.
22.833	2.0802	0.05	Q	.	.	.	V.
22.917	2.0806	0.05	Q	.	.	.	V.
23.000	2.0809	0.05	Q	.	.	.	V.
23.083	2.0812	0.04	Q	.	.	.	V.
23.166	2.0815	0.04	Q	.	.	.	V.
23.250	2.0818	0.04	Q	.	.	.	V.
23.333	2.0821	0.04	Q	.	.	.	V.
23.416	2.0824	0.04	Q	.	.	.	V.
23.500	2.0826	0.04	Q	.	.	.	V.
23.583	2.0829	0.04	Q	.	.	.	V.
23.666	2.0832	0.04	Q	.	.	.	V.
23.750	2.0835	0.04	Q	.	.	.	V.
23.833	2.0838	0.04	Q	.	.	.	V.
23.916	2.0841	0.04	Q	.	.	.	V.
24.000	2.0843	0.04	Q	.	.	.	V.
24.083	2.0846	0.04	Q	.	.	.	V.
24.166	2.0849	0.04	Q	.	.	.	V.
24.250	2.0852	0.04	Q	.	.	.	V.
24.333	2.0854	0.03	Q	.	.	.	V.
24.416	2.0856	0.03	Q	.	.	.	V.
24.500	2.0858	0.03	Q	.	.	.	V.

24.583	2.0859	0.02	Q	.	.	.	V.
24.666	2.0861	0.02	Q	.	.	.	V.
24.750	2.0862	0.02	Q	.	.	.	V.
24.833	2.0863	0.01	Q	.	.	.	V.
24.916	2.0864	0.01	Q	.	.	.	V.
25.000	2.0865	0.01	Q	.	.	.	V.
25.083	2.0865	0.01	Q	.	.	.	V.
25.166	2.0866	0.01	Q	.	.	.	V.
25.250	2.0867	0.01	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1515.0
10%	600.0
20%	510.0
30%	450.0
40%	405.0
50%	255.0
60%	225.0
70%	195.0
80%	165.0
90%	45.0

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END OF FLOODSCx ROUTING ANALYSIS

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             F L O O D    R O U T I N G    A N A L Y S I S

ACCORDING TO RIVERSIDE COUNTY FLOOD CONTORL AND WATER CONSERVATION DISTRICT
                    (RCFC&WCD) 1978 HYDROLOGY MANUAL
         (c) Copyright 1989-2011 Advanced Engineering Software (aes)
                 (Synthetic Unit Hydrograph Version 18.0)
                 Release Date: 05/01/2011  License ID 1499

                          Analysis prepared by:



 ************************* DESCRIPTION OF STUDY *************************
* DOUBLE BUTTE                                                          *
* PROPOSED CONDITION                                                    *
* 2 YR HYDROGRAPH                                                       *
 ************************************************************************

  FILE NAME: DB2PRUH.DAT
  TIME/DATE OF STUDY: 14:42 02/07/2024



**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    102.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==========================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =      23.600 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.290 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         VALLEY S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.050
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.600
         MINIMUM SOIL-LOSS RATE(INCH/HOUR) =   0.030
         USER-ENTERED RAINFALL =  2.06 INCHES
         RCFC&WCD 24-Hour Storm (15-Minute period) SELECTED
         *USER SPECIFIED PRECIPITATION DEPTH-AREA ADJUSTMENT FACTOR = 1.0000
```

UNIT HYDROGRAPH TIME UNIT = 15.000 MINUTES
UNIT INTERVAL PERCENTAGE OF LAG-TIME = 86.207

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	14.833	14.112
2	61.256	44.166
3	79.677	17.525
4	87.444	7.389
5	91.978	4.314
6	94.996	2.870
7	97.016	1.923
8	98.251	1.175
9	98.874	0.592
10	99.421	0.520
11	99.768	0.331
12	99.942	0.165
13	100.000	0.055

TOTAL STORM RAINFALL(INCHES) = 2.06
TOTAL SOIL-LOSS(INCHES) = 0.75
TOTAL EFFECTIVE RAINFALL(INCHES) = 1.31

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 1.4784
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 2.5716

2 4 - 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 FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0

0.083	0.0002	0.02	Q	.	.	.	.
0.167	0.0003	0.02	Q	.	.	.	.
0.250	0.0005	0.02	Q	.	.	.	.
0.333	0.0012	0.11	Q	.	.	.	.
0.417	0.0020	0.11	Q	.	.	.	.
0.500	0.0027	0.11	Q	.	.	.	.
0.583	0.0039	0.17	Q	.	.	.	.
0.667	0.0051	0.17	Q	.	.	.	.
0.750	0.0063	0.17	Q	.	.	.	.
0.833	0.0077	0.21	Q	.	.	.	.
0.917	0.0092	0.21	Q	.	.	.	.
1.000	0.0106	0.21	Q	.	.	.	.
1.083	0.0124	0.25	Q	.	.	.	.
1.167	0.0141	0.25	Q	.	.	.	.
1.250	0.0158	0.25	Q	.	.	.	.
1.333	0.0174	0.24	Q	.	.	.	.
1.417	0.0190	0.24	Q	.	.	.	.
1.500	0.0207	0.24	Q	.	.	.	.
1.583	0.0223	0.23	Q	.	.	.	.
1.667	0.0239	0.23	Q	.	.	.	.
1.750	0.0255	0.23	Q	.	.	.	.
1.833	0.0272	0.25	Q	.	.	.	.
1.917	0.0288	0.25	Q	.	.	.	.
2.000	0.0305	0.25	Q	.	.	.	.
2.083	0.0325	0.28	VQ	.	.	.	.
2.167	0.0344	0.28	VQ	.	.	.	.
2.250	0.0364	0.28	VQ	.	.	.	.
2.333	0.0384	0.30	VQ	.	.	.	.
2.417	0.0405	0.30	VQ	.	.	.	.
2.500	0.0425	0.30	VQ	.	.	.	.
2.583	0.0447	0.32	VQ	.	.	.	.
2.667	0.0469	0.32	VQ	.	.	.	.
2.750	0.0490	0.32	VQ	.	.	.	.
2.833	0.0515	0.36	VQ	.	.	.	.
2.917	0.0539	0.36	VQ	.	.	.	.
3.000	0.0564	0.36	VQ	.	.	.	.
3.083	0.0589	0.37	VQ	.	.	.	.
3.167	0.0615	0.37	VQ	.	.	.	.
3.250	0.0641	0.37	VQ	.	.	.	.
3.333	0.0667	0.38	.Q	.	.	.	.
3.417	0.0693	0.38	.Q	.	.	.	.
3.500	0.0719	0.38	.Q	.	.	.	.
3.583	0.0746	0.38	.Q	.	.	.	.
3.667	0.0772	0.38	.Q	.	.	.	.
3.750	0.0799	0.38	.Q	.	.	.	.
3.833	0.0826	0.40	.Q	.	.	.	.
3.917	0.0854	0.40	.Q	.	.	.	.
4.000	0.0881	0.40	.Q	.	.	.	.
4.083	0.0911	0.44	.Q	.	.	.	.

4.167	0.0941	0.44	.Q	.	.	.	.
4.250	0.0971	0.44	.Q	.	.	.	.
4.333	0.1003	0.46	.Q	.	.	.	.
4.417	0.1035	0.46	.Q	.	.	.	.
4.500	0.1067	0.46	.Q	.	.	.	.
4.583	0.1102	0.51	.VQ	.	.	.	.
4.667	0.1137	0.51	.VQ	.	.	.	.
4.750	0.1172	0.51	.VQ	.	.	.	.
4.833	0.1209	0.54	.VQ	.	.	.	.
4.917	0.1246	0.54	.VQ	.	.	.	.
5.000	0.1283	0.54	.VQ	.	.	.	.
5.083	0.1322	0.56	. Q	.	.	.	.
5.167	0.1360	0.56	. Q	.	.	.	.
5.250	0.1399	0.56	. Q	.	.	.	.
5.333	0.1435	0.52	. Q	.	.	.	.
5.417	0.1470	0.52	. Q	.	.	.	.
5.500	0.1506	0.52	. Q	.	.	.	.
5.583	0.1544	0.55	. Q	.	.	.	.
5.667	0.1581	0.55	. Q	.	.	.	.
5.750	0.1619	0.55	. Q	.	.	.	.
5.833	0.1660	0.59	. Q	.	.	.	.
5.917	0.1700	0.59	. Q	.	.	.	.
6.000	0.1741	0.59	. Q	.	.	.	.
6.083	0.1784	0.62	. Q	.	.	.	.
6.167	0.1826	0.62	. Q	.	.	.	.
6.250	0.1869	0.62	. Q	.	.	.	.
6.333	0.1915	0.66	. Q	.	.	.	.
6.417	0.1961	0.66	. QV	.	.	.	.
6.500	0.2006	0.66	. QV	.	.	.	.
6.583	0.2054	0.69	. QV	.	.	.	.
6.667	0.2102	0.69	. QV	.	.	.	.
6.750	0.2150	0.69	. QV	.	.	.	.
6.833	0.2200	0.74	. QV	.	.	.	.
6.917	0.2251	0.74	. QV	.	.	.	.
7.000	0.2302	0.74	. QV	.	.	.	.
7.083	0.2355	0.76	. Q	.	.	.	.
7.167	0.2407	0.76	. Q	.	.	.	.
7.250	0.2459	0.76	. Q	.	.	.	.
7.333	0.2513	0.78	. Q	.	.	.	.
7.417	0.2567	0.78	. Q	.	.	.	.
7.500	0.2620	0.78	. QV	.	.	.	.
7.583	0.2678	0.84	. QV	.	.	.	.
7.667	0.2736	0.84	. QV	.	.	.	.
7.750	0.2793	0.84	. QV	.	.	.	.
7.833	0.2858	0.94	. QV	.	.	.	.
7.917	0.2922	0.94	. QV	.	.	.	.
8.000	0.2987	0.94	. QV	.	.	.	.
8.083	0.3064	1.12	. Q	.	.	.	.
8.167	0.3142	1.12	. Q	.	.	.	.
8.250	0.3219	1.12	. QV	.	.	.	.

8.333	0.3313	1.37	.	Q	.	.	.	.
8.417	0.3407	1.37	.	Q	.	.	.	.
8.500	0.3501	1.37	.	Q	.	.	.	.
8.583	0.3605	1.50	.	VQ	.	.	.	.
8.667	0.3708	1.50	.	VQ	.	.	.	.
8.750	0.3812	1.50	.	VQ	.	.	.	.
8.833	0.3928	1.68	.	Q	.	.	.	.
8.917	0.4044	1.68	.	Q	.	.	.	.
9.000	0.4160	1.68	.	Q	.	.	.	.
9.083	0.4291	1.91	.	VQ	.	.	.	.
9.167	0.4423	1.91	.	VQ	.	.	.	.
9.250	0.4555	1.91	.	Q	.	.	.	.
9.333	0.4706	2.21	.	VQ	.	.	.	.
9.417	0.4858	2.21	.	VQ	.	.	.	.
9.500	0.5010	2.21	.	VQ	.	.	.	.
9.583	0.5179	2.45	.	VQ.	.	.	.	.
9.667	0.5347	2.45	.	VQ.	.	.	.	.
9.750	0.5516	2.45	.	VQ.	.	.	.	.
9.833	0.5700	2.67	.	V Q	.	.	.	.
9.917	0.5884	2.67	.	VQ	.	.	.	.
10.000	0.6068	2.67	.	VQ	.	.	.	.
10.083	0.6251	2.66	.	VQ	.	.	.	.
10.167	0.6434	2.66	.	Q	.	.	.	.
10.250	0.6616	2.66	.	Q	.	.	.	.
10.333	0.6762	2.12	.	Q V	.	.	.	.
10.417	0.6908	2.12	.	Q V	.	.	.	.
10.500	0.7053	2.12	.	Q V	.	.	.	.
10.583	0.7196	2.07	.	Q .V	.	.	.	.
10.667	0.7338	2.07	.	Q .V	.	.	.	.
10.750	0.7480	2.07	.	Q .V	.	.	.	.
10.833	0.7649	2.46	.	Q.V	.	.	.	.
10.917	0.7818	2.46	.	Q. V	.	.	.	.
11.000	0.7988	2.46	.	Q. V	.	.	.	.
11.083	0.8165	2.58	.	Q V	.	.	.	.
11.167	0.8342	2.58	.	Q V	.	.	.	.
11.250	0.8520	2.58	.	Q V	.	.	.	.
11.333	0.8695	2.54	.	Q V	.	.	.	.
11.417	0.8870	2.54	.	Q V	.	.	.	.
11.500	0.9045	2.54	.	Q V	.	.	.	.

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
11.583	0.9217	2.49	.	Q. V	.	.	.
11.667	0.9388	2.49	.	Q. V	.	.	.
11.750	0.9559	2.49	.	Q. V	.	.	.
11.833	0.9721	2.35	.	Q. V	.	.	.
11.917	0.9883	2.35	.	Q. V	.	.	.
12.000	1.0045	2.35	.	Q. V	.	.	.
12.083	1.0223	2.59	.	Q V	.	.	.

12.167	1.0401	2.59	.	Q	V	.	.	.
12.250	1.0580	2.59	.	Q	V	.	.	.
12.333	1.0805	3.27	.	.	Q V	.	.	.
12.417	1.1031	3.27	.	.	Q V	.	.	.
12.500	1.1256	3.27	.	.	Q V	.	.	.
12.583	1.1510	3.69	.	.	Q V	.	.	.
12.667	1.1764	3.69	.	.	Q V	.	.	.
12.750	1.2018	3.69	.	.	Q V	.	.	.
12.833	1.2296	4.05	.	.	Q V	.	.	.
12.917	1.2575	4.05	.	.	Q V	.	.	.
13.000	1.2854	4.05	.	.	Q V	.	.	.
13.083	1.3161	4.45	.	.	Q V		.	.
13.167	1.3467	4.45	.	.	Q V		.	.
13.250	1.3773	4.45	.	.	Q V		.	.
13.333	1.4120	5.03	.	.	QV		.	.
13.417	1.4466	5.03	.	.	Q V		.	.
13.500	1.4813	5.03	.	.	Q V		.	.
13.583	1.5155	4.97	.	.	Q. V		.	.
13.667	1.5498	4.97	.	.	Q. V		.	.
13.750	1.5840	4.97	.	.	Q. V		.	.
13.833	1.6123	4.10	.	.	Q .	V	.	.
13.917	1.6405	4.10	.	.	Q .	V	.	.
14.000	1.6688	4.10	.	.	Q .	V	.	.
14.083	1.6956	3.90	.	.	Q .	V	.	.
14.167	1.7225	3.90	.	.	Q .	V	.	.
14.250	1.7494	3.90	.	.	Q .	V	.	.
14.333	1.7778	4.13	.	.	Q .	V	.	.
14.417	1.8062	4.13	.	.	Q .	V	.	.
14.500	1.8346	4.13	.	.	Q .	V	.	.
14.583	1.8631	4.13	.	.	Q .	V	.	.
14.667	1.8915	4.13	.	.	Q .	V.	.	.
14.750	1.9199	4.13	.	.	Q .	V.	.	.
14.833	1.9480	4.09	.	.	Q .	V	.	.
14.917	1.9762	4.09	.	.	Q .	V	.	.
15.000	2.0043	4.09	.	.	Q .	V	.	.
15.083	2.0317	3.97	.	.	Q .	.V	.	.
15.167	2.0590	3.97	.	.	Q .	. V	.	.
15.250	2.0863	3.97	.	.	Q .	. V	.	.
15.333	2.1126	3.82	.	.	Q .	. V	.	.
15.417	2.1388	3.82	.	.	Q .	. V	.	.
15.500	2.1651	3.82	.	.	Q .	. V	.	.
15.583	2.1897	3.57	.	.	Q .	. V	.	.
15.667	2.2143	3.57	.	.	Q .	. V	.	.
15.750	2.2389	3.57	.	.	Q .	. V	.	.
15.833	2.2606	3.15	.	. Q	.	. V	.	.
15.917	2.2823	3.15	.	. Q	.	. V	.	.
16.000	2.3040	3.15	.	. Q	.	. V	.	.
16.083	2.3220	2.62	.	Q	.	. V	.	.
16.167	2.3400	2.62	.	Q	.	. V	.	.
16.250	2.3580	2.62	.	Q	.	. V	.	.

16.333	2.3676	1.39	.	Q	.	.	V	.
16.417	2.3772	1.39	.	Q	.	.	V	.
16.500	2.3868	1.39	.	Q	.	.	V	.
16.583	2.3929	0.88	.	Q	.	.	V	.
16.667	2.3990	0.88	.	Q	.	.	V	.
16.750	2.4050	0.88	.	Q	.	.	V	.
16.833	2.4093	0.62	.	Q	.	.	V	.
16.917	2.4136	0.62	.	Q	.	.	V	.
17.000	2.4179	0.62	.	Q	.	.	V	.
17.083	2.4214	0.50	.	Q	.	.	V	.
17.167	2.4248	0.50	.	Q	.	.	V	.
17.250	2.4283	0.50	.	Q	.	.	V	.
17.333	2.4316	0.48	.	Q	.	.	V	.
17.417	2.4349	0.48	.	Q	.	.	V	.
17.500	2.4382	0.48	.	Q	.	.	V	.
17.583	2.4413	0.45	.	Q	.	.	V	.
17.667	2.4444	0.45	.	Q	.	.	V	.
17.750	2.4475	0.45	.	Q	.	.	V	.
17.833	2.4504	0.41	.	Q	.	.	V	.
17.917	2.4532	0.41	.	Q	.	.	V	.
18.000	2.4561	0.41	.	Q	.	.	V	.
18.083	2.4586	0.36	.	Q	.	.	V	.
18.167	2.4611	0.36	.	Q	.	.	V	.
18.250	2.4636	0.36	.	Q	.	.	V	.
18.333	2.4659	0.34	.	Q	.	.	V	.
18.417	2.4682	0.34	.	Q	.	.	V	.
18.500	2.4706	0.34	.	Q	.	.	V	.
18.583	2.4727	0.31	.	Q	.	.	V	.
18.667	2.4749	0.31	.	Q	.	.	V	.
18.750	2.4770	0.31	.	Q	.	.	V	.
18.833	2.4788	0.26	.	Q	.	.	V	.
18.917	2.4806	0.26	.	Q	.	.	V	.
19.000	2.4824	0.26	.	Q	.	.	V	.
19.083	2.4839	0.22	Q	.	.	.	V	.
19.167	2.4854	0.22	Q	.	.	.	V	.
19.250	2.4869	0.22	Q	.	.	.	V	.
19.333	2.4886	0.24	Q	.	.	.	V	.
19.417	2.4902	0.24	Q	.	.	.	V	.
19.500	2.4919	0.24	Q	.	.	.	V	.
19.583	2.4938	0.27	.	Q	.	.	V	.
19.667	2.4957	0.27	.	Q	.	.	V	.
19.750	2.4975	0.27	.	Q	.	.	V	.
19.833	2.4992	0.24	Q	.	.	.	V	.
19.917	2.5008	0.24	Q	.	.	.	V	.
20.000	2.5025	0.24	Q	.	.	.	V	.
20.083	2.5039	0.21	Q	.	.	.	V	.
20.167	2.5053	0.21	Q	.	.	.	V	.
20.250	2.5067	0.21	Q	.	.	.	V	.
20.333	2.5083	0.22	Q	.	.	.	V	.
20.417	2.5098	0.22	Q	.	.	.	V	.

20.500	2.5114	0.22	Q	.	.	.	V.
20.583	2.5130	0.23	Q	.	.	.	V.
20.667	2.5145	0.23	Q	.	.	.	V.
20.750	2.5161	0.23	Q	.	.	.	V.
20.833	2.5177	0.22	Q	.	.	.	V.
20.917	2.5192	0.22	Q	.	.	.	V.
21.000	2.5207	0.22	Q	.	.	.	V.
21.083	2.5221	0.20	Q	.	.	.	V.
21.167	2.5234	0.20	Q	.	.	.	V.
21.250	2.5248	0.20	Q	.	.	.	V.
21.333	2.5262	0.21	Q	.	.	.	V.
21.417	2.5277	0.21	Q	.	.	.	V.
21.500	2.5291	0.21	Q	.	.	.	V.
21.583	2.5304	0.19	Q	.	.	.	V.
21.667	2.5317	0.19	Q	.	.	.	V.
21.750	2.5331	0.19	Q	.	.	.	V.
21.833	2.5345	0.21	Q	.	.	.	V.
21.917	2.5359	0.21	Q	.	.	.	V.
22.000	2.5373	0.21	Q	.	.	.	V.
22.083	2.5386	0.19	Q	.	.	.	V.
22.167	2.5399	0.19	Q	.	.	.	V.
22.250	2.5412	0.19	Q	.	.	.	V.
22.333	2.5426	0.20	Q	.	.	.	V.
22.417	2.5440	0.20	Q	.	.	.	V.
22.500	2.5454	0.20	Q	.	.	.	V.
22.583	2.5467	0.18	Q	.	.	.	V.
22.667	2.5479	0.18	Q	.	.	.	V.
22.750	2.5491	0.18	Q	.	.	.	V.
22.833	2.5503	0.17	Q	.	.	.	V.
22.917	2.5514	0.17	Q	.	.	.	V.
23.000	2.5526	0.17	Q	.	.	.	V.
23.083	2.5537	0.16	Q	.	.	.	V.
23.166	2.5548	0.16	Q	.	.	.	V.
23.250	2.5559	0.16	Q	.	.	.	V.
23.333	2.5570	0.16	Q	.	.	.	V.
23.416	2.5581	0.16	Q	.	.	.	V.
23.500	2.5592	0.16	Q	.	.	.	V.
23.583	2.5603	0.16	Q	.	.	.	V.
23.666	2.5614	0.16	Q	.	.	.	V.
23.750	2.5625	0.16	Q	.	.	.	V.
23.833	2.5636	0.16	Q	.	.	.	V.
23.916	2.5647	0.16	Q	.	.	.	V.
24.000	2.5658	0.16	Q	.	.	.	V.

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
24.083	2.5667	0.13	Q	.	.	.	V.
24.166	2.5676	0.13	Q	.	.	.	V.
24.250	2.5686	0.13	Q	.	.	.	V.

```
  24.333      2.5690      0.06  Q         .         .         .         V.
  24.416      2.5694      0.06  Q         .         .         .         V.
  24.500      2.5698      0.06  Q         .         .         .         V.
  24.583      2.5701      0.03  Q         .         .         .         V.
  24.666      2.5703      0.03  Q         .         .         .         V.
  24.750      2.5705      0.03  Q         .         .         .         V.
  24.833      2.5706      0.02  Q         .         .         .         V.
  24.916      2.5708      0.02  Q         .         .         .         V.
  25.000      2.5709      0.02  Q         .         .         .         V.
  25.083      2.5710      0.01  Q         .         .         .         V.
  25.166      2.5711      0.01  Q         .         .         .         V.
  25.250      2.5712      0.01  Q         .         .         .         V.
  25.333      2.5712      0.01  Q         .         .         .         V.
  25.416      2.5713      0.01  Q         .         .         .         V.
  25.500      2.5713      0.01  Q         .         .         .         V.
--------------------------------------------------------------------------------
   TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
   (Note: 100% of Peak Flow Rate estimate assumed to have
   an instantaneous time duration)

   Percentile of Estimated                Duration
       Peak Flow Rate                     (minutes)
   ======================                 =========
              0%                           1530.0
             10%                            750.0
             20%                            510.0
             30%                            450.0
             40%                            420.0
             50%                            315.0
             60%                            225.0
             70%                            195.0
             80%                            120.0
             90%                             30.0


********************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    206.00 IS CODE =   1
--------------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
================================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =       1.140 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
  Warning: Watershed Area is less than 10 acres
        *USER ENTERED "LAG" TIME =    0.100 HOURS
         CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
         THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
```

MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
VALLEY S-GRAPH SELECTED
UNIFORM MEAN SOIL-LOSS(INCH/HOUR) = 0.050
LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.500
MINIMUM SOIL-LOSS RATE(INCH/HOUR) = 0.030
USER-ENTERED RAINFALL = 2.06 INCHES
RCFC&WCD 24-Hour Storm (15-Minute period) SELECTED
*USER SPECIFIED PRECIPITATION DEPTH-AREA ADJUSTMENT FACTOR = 1.0000

UNIT HYDROGRAPH TIME UNIT = 15.000 MINUTES
UNIT INTERVAL PERCENTAGE OF LAG-TIME = 250.000

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	50.817	2.335
2	90.903	1.842
3	97.798	0.317
4	99.444	0.076
5	99.778	0.015
6	99.944	0.008
7	100.000	0.003

TOTAL STORM RAINFALL(INCHES) = 2.06
TOTAL SOIL-LOSS(INCHES) = 0.69
TOTAL EFFECTIVE RAINFALL(INCHES) = 1.37

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 0.0657
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 0.1299

2 4 - 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 FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
0.083	0.0000	0.00	Q	.	.	.	.
0.167	0.0001	0.00	Q	.	.	.	.
0.250	0.0001	0.00	Q	.	.	.	.
0.333	0.0002	0.01	Q	.	.	.	.
0.417	0.0003	0.01	Q	.	.	.	.
0.500	0.0003	0.01	Q	.	.	.	.
0.583	0.0004	0.01	Q	.	.	.	.
0.667	0.0005	0.01	Q	.	.	.	.
0.750	0.0006	0.01	Q	.	.	.	.
0.833	0.0007	0.02	Q	.	.	.	.
0.917	0.0008	0.02	Q	.	.	.	.
1.000	0.0009	0.02	Q	.	.	.	.
1.083	0.0011	0.02	Q	.	.	.	.
1.167	0.0012	0.02	Q	.	.	.	.
1.250	0.0013	0.02	Q	.	.	.	.
1.333	0.0014	0.01	Q	.	.	.	.
1.417	0.0015	0.01	Q	.	.	.	.
1.500	0.0016	0.01	Q	.	.	.	.
1.583	0.0017	0.01	Q	.	.	.	.
1.667	0.0018	0.01	Q	.	.	.	.
1.750	0.0019	0.01	Q	.	.	.	.
1.833	0.0020	0.02	Q	.	.	.	.
1.917	0.0021	0.02	Q	.	.	.	.
2.000	0.0022	0.02	Q	.	.	.	.
2.083	0.0023	0.02	Q	.	.	.	.
2.167	0.0025	0.02	Q	.	.	.	.
2.250	0.0026	0.02	Q	.	.	.	.
2.333	0.0027	0.02	Q	.	.	.	.
2.417	0.0029	0.02	Q	.	.	.	.
2.500	0.0030	0.02	Q	.	.	.	.
2.583	0.0031	0.02	Q	.	.	.	.
2.667	0.0033	0.02	QV	.	.	.	.
2.750	0.0034	0.02	QV	.	.	.	.
2.833	0.0036	0.02	QV	.	.	.	.
2.917	0.0037	0.02	QV	.	.	.	.
3.000	0.0039	0.02	QV	.	.	.	.
3.083	0.0041	0.02	QV	.	.	.	.
3.167	0.0042	0.02	QV	.	.	.	.
3.250	0.0044	0.02	QV	.	.	.	.
3.333	0.0046	0.02	QV	.	.	.	.
3.417	0.0047	0.02	QV	.	.	.	.
3.500	0.0049	0.02	QV	.	.	.	.
3.583	0.0050	0.02	QV	.	.	.	.
3.667	0.0052	0.02	QV	.	.	.	.
3.750	0.0054	0.02	QV	.	.	.	.
3.833	0.0056	0.03	QV	.	.	.	.
3.917	0.0057	0.03	QV	.	.	.	.

4.000	0.0059	0.03	QV	.	.	.	.
4.083	0.0061	0.03	QV	.	.	.	.
4.167	0.0063	0.03	QV	.	.	.	.
4.250	0.0065	0.03	QV	.	.	.	.
4.333	0.0067	0.03	Q V	.	.	.	.
4.417	0.0069	0.03	Q V	.	.	.	.
4.500	0.0071	0.03	Q V	.	.	.	.
4.583	0.0073	0.03	Q V	.	.	.	.
4.667	0.0076	0.03	Q V	.	.	.	.
4.750	0.0078	0.03	Q V	.	.	.	.
4.833	0.0080	0.04	Q V	.	.	.	.
4.917	0.0083	0.04	Q V	.	.	.	.
5.000	0.0085	0.04	Q V	.	.	.	.
5.083	0.0088	0.03	Q V	.	.	.	.
5.167	0.0090	0.03	Q V	.	.	.	.
5.250	0.0092	0.03	Q V	.	.	.	.
5.333	0.0094	0.03	Q V	.	.	.	.
5.417	0.0096	0.03	Q V	.	.	.	.
5.500	0.0099	0.03	Q V	.	.	.	.
5.583	0.0101	0.04	Q V	.	.	.	.
5.667	0.0103	0.04	Q V	.	.	.	.
5.750	0.0106	0.04	Q V	.	.	.	.
5.833	0.0108	0.04	Q V	.	.	.	.
5.917	0.0111	0.04	Q V	.	.	.	.
6.000	0.0114	0.04	Q V	.	.	.	.
6.083	0.0116	0.04	Q V	.	.	.	.
6.167	0.0119	0.04	Q V	.	.	.	.
6.250	0.0122	0.04	Q V	.	.	.	.
6.333	0.0125	0.04	Q V	.	.	.	.
6.417	0.0128	0.04	Q V	.	.	.	.
6.500	0.0131	0.04	Q V	.	.	.	.
6.583	0.0134	0.04	Q V	.	.	.	.
6.667	0.0137	0.04	Q V	.	.	.	.
6.750	0.0140	0.04	Q V	.	.	.	.
6.833	0.0143	0.05	Q V	.	.	.	.
6.917	0.0146	0.05	Q V	.	.	.	.
7.000	0.0150	0.05	Q V	.	.	.	.
7.083	0.0153	0.05	Q V	.	.	.	.
7.167	0.0156	0.05	Q V	.	.	.	.
7.250	0.0159	0.05	Q V	.	.	.	.
7.333	0.0163	0.05	Q V	.	.	.	.
7.417	0.0166	0.05	Q V	.	.	.	.
7.500	0.0170	0.05	Q V	.	.	.	.
7.583	0.0173	0.05	Q V	.	.	.	.
7.667	0.0177	0.05	Q V	.	.	.	.
7.750	0.0181	0.05	Q V	.	.	.	.
7.833	0.0185	0.06	Q V	.	.	.	.
7.917	0.0189	0.06	Q V	.	.	.	.
8.000	0.0193	0.06	Q V	.	.	.	.
8.083	0.0198	0.07	Q V	.	.	.	.

8.167	0.0202	0.07	Q	V . . . .
8.250	0.0207	0.07	Q	V . . . .
8.333	0.0212	0.08	Q	V . . . .
8.417	0.0217	0.08	Q	V . . . .
8.500	0.0223	0.08	Q	V . . . .
8.583	0.0228	0.08	Q	V . . . .
8.667	0.0234	0.08	Q	V . . . .
8.750	0.0240	0.08	Q	V . . . .
8.833	0.0246	0.09	Q	V . . . .
8.917	0.0252	0.09	Q	V . . . .
9.000	0.0259	0.09	Q	V . . . .
9.083	0.0266	0.11	Q	V . . . .
9.167	0.0273	0.11	Q	V . . . .
9.250	0.0281	0.11	Q	V . . . .
9.333	0.0289	0.12	Q	V . . . .
9.417	0.0297	0.12	Q	V. . . .
9.500	0.0305	0.12	Q	V. . . .
9.583	0.0315	0.13	Q	V. . . .
9.667	0.0324	0.13	Q	V. . . .
9.750	0.0333	0.13	Q	V . . .
9.833	0.0342	0.14	Q	V . . .
9.917	0.0352	0.14	Q	V . . .
10.000	0.0362	0.14	Q	V . . .
10.083	0.0370	0.11	Q	.V . . .
10.167	0.0378	0.11	Q	.V . . .
10.250	0.0385	0.11	Q	.V . . .
10.333	0.0391	0.09	Q	. V . . .
10.417	0.0398	0.09	Q	. V . . .
10.500	0.0404	0.09	Q	. V . . .
10.583	0.0411	0.11	Q	. V . . .
10.667	0.0419	0.11	Q	. V . . .
10.750	0.0426	0.11	Q	. V . . .
10.833	0.0435	0.13	Q	. V . . .
10.917	0.0444	0.13	Q	. V . . .
11.000	0.0452	0.13	Q	. V . . .
11.083	0.0461	0.13	Q	. V . . .
11.167	0.0470	0.13	Q	. V . . .
11.250	0.0479	0.13	Q	. V . . .
11.333	0.0487	0.12	Q	. V . . .
11.417	0.0496	0.12	Q	. V . . .
11.500	0.0504	0.12	Q	. V . . .

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
11.583	0.0512	0.11	Q	. V .	.	.	
11.667	0.0520	0.11	Q	. V .	.	.	
11.750	0.0528	0.11	Q	. V .	.	.	
11.833	0.0536	0.11	Q	. V .	.	.	
11.917	0.0543	0.11	Q	. V .	.	.	

12.000	0.0551	0.11	Q	.	V	.	.	.	
12.083	0.0561	0.15	Q	.	V	.	.	.	
12.167	0.0572	0.15	Q	.	V	.	.	.	
12.250	0.0582	0.15	Q	.	V	.	.	.	
12.333	0.0594	0.18	Q	.	V	.	.	.	
12.417	0.0607	0.18	Q	.	V	.	.	.	
12.500	0.0619	0.18	Q	.	V	.	.	.	
12.583	0.0633	0.20	Q	.	V	.	.	.	
12.667	0.0647	0.20	Q	.	V	.	.	.	
12.750	0.0661	0.20	Q	.	V	.	.	.	
12.833	0.0675	0.21	Q	.	V	.	.	.	
12.917	0.0690	0.21	Q	.	V	.	.	.	
13.000	0.0705	0.21	Q	.	V	.	.	.	
13.083	0.0722	0.25	Q	.	V	.	.	.	
13.167	0.0739	0.25	Q	.	V	.	.	.	
13.250	0.0756	0.25	Q	.	V	.	.	.	
13.333	0.0774	0.27	.Q	.	V	.	.	.	
13.417	0.0792	0.27	.Q	.	V	.	.	.	
13.500	0.0811	0.27	.Q	.	V	.	.	.	
13.583	0.0826	0.22	Q	.	V	.	.	.	
13.667	0.0841	0.22	Q	.	V	.	.	.	
13.750	0.0855	0.22	Q	.	V	.	.	.	
13.833	0.0868	0.18	Q	.	V	.	.	.	
13.917	0.0880	0.18	Q	.	V	.	.	.	
14.000	0.0892	0.18	Q	.	V	.	.	.	
14.083	0.0905	0.19	Q	.	V	.	.	.	
14.167	0.0918	0.19	Q	.	V	.	.	.	
14.250	0.0931	0.19	Q	.	V	.	.	.	
14.333	0.0945	0.20	Q	.	V	.	.	.	
14.417	0.0959	0.20	Q	.	V	.	.	.	
14.500	0.0972	0.20	Q	.	V	.	.	.	
14.583	0.0986	0.20	Q	.	V	.	.	.	
14.667	0.0999	0.20	Q	.	V	.	.	.	
14.750	0.1013	0.20	Q	.	V	.	.	.	
14.833	0.1026	0.19	Q	.	V	.	.	.	
14.917	0.1040	0.19	Q	.	V	.	.	.	
15.000	0.1053	0.19	Q	.	V	.	.	.	
15.083	0.1066	0.19	Q	.	V	.	.	.	
15.167	0.1079	0.19	Q	.	V	.	.	.	
15.250	0.1091	0.19	Q	.	V	.	.	.	
15.333	0.1104	0.18	Q	.	V	.	.	.	
15.417	0.1116	0.18	Q	.	V	.	.	.	
15.500	0.1128	0.18	Q	.	V	.	.	.	
15.583	0.1138	0.15	Q	.	V	.	.	.	
15.667	0.1149	0.15	Q	.	V	.	.	.	
15.750	0.1160	0.15	Q	.	V	.	.	.	
15.833	0.1169	0.14	Q	.	V	.	.	.	
15.917	0.1179	0.14	Q	.	V	.	.	.	
16.000	0.1188	0.14	Q	.	V	.	.	.	
16.083	0.1193	0.08	Q	.	V	.	.	.	

16.167	0.1199	0.08	Q	.	.	.	V .
16.250	0.1204	0.08	Q	.	.	.	V .
16.333	0.1206	0.03	Q	.	.	.	V .
16.417	0.1208	0.03	Q	.	.	.	V .
16.500	0.1210	0.03	Q	.	.	.	V .
16.583	0.1211	0.02	Q	.	.	.	V .
16.667	0.1213	0.02	Q	.	.	.	V .
16.750	0.1214	0.02	Q	.	.	.	V .
16.833	0.1215	0.02	Q	.	.	.	V .
16.917	0.1216	0.02	Q	.	.	.	V .
17.000	0.1217	0.02	Q	.	.	.	V .
17.083	0.1218	0.02	Q	.	.	.	V .
17.167	0.1220	0.02	Q	.	.	.	V .
17.250	0.1221	0.02	Q	.	.	.	V .
17.333	0.1223	0.02	Q	.	.	.	V .
17.417	0.1224	0.02	Q	.	.	.	V .
17.500	0.1226	0.02	Q	.	.	.	V .
17.583	0.1227	0.02	Q	.	.	.	V .
17.667	0.1229	0.02	Q	.	.	.	V .
17.750	0.1231	0.02	Q	.	.	.	V .
17.833	0.1232	0.02	Q	.	.	.	V .
17.917	0.1234	0.02	Q	.	.	.	V .
18.000	0.1235	0.02	Q	.	.	.	V .
18.083	0.1236	0.02	Q	.	.	.	V .
18.167	0.1238	0.02	Q	.	.	.	V .
18.250	0.1239	0.02	Q	.	.	.	V .
18.333	0.1240	0.02	Q	.	.	.	V .
18.417	0.1242	0.02	Q	.	.	.	V .
18.500	0.1243	0.02	Q	.	.	.	V .
18.583	0.1244	0.02	Q	.	.	.	V .
18.667	0.1245	0.02	Q	.	.	.	V .
18.750	0.1246	0.02	Q	.	.	.	V .
18.833	0.1247	0.01	Q	.	.	.	V .
18.917	0.1248	0.01	Q	.	.	.	V .
19.000	0.1249	0.01	Q	.	.	.	V .
19.083	0.1250	0.01	Q	.	.	.	V .
19.167	0.1251	0.01	Q	.	.	.	V .
19.250	0.1252	0.01	Q	.	.	.	V .
19.333	0.1253	0.02	Q	.	.	.	V .
19.417	0.1254	0.02	Q	.	.	.	V .
19.500	0.1255	0.02	Q	.	.	.	V .
19.583	0.1256	0.02	Q	.	.	.	V .
19.667	0.1257	0.02	Q	.	.	.	V .
19.750	0.1258	0.02	Q	.	.	.	V .
19.833	0.1259	0.01	Q	.	.	.	V .
19.917	0.1260	0.01	Q	.	.	.	V .
20.000	0.1261	0.01	Q	.	.	.	V .
20.083	0.1262	0.01	Q	.	.	.	V .
20.167	0.1262	0.01	Q	.	.	.	V .
20.250	0.1263	0.01	Q	.	.	.	V .

20.333	0.1264	0.01	Q	.	.	.	V .
20.417	0.1265	0.01	Q	.	.	.	V .
20.500	0.1266	0.01	Q	.	.	.	V .
20.583	0.1267	0.01	Q	.	.	.	V.
20.667	0.1268	0.01	Q	.	.	.	V.
20.750	0.1269	0.01	Q	.	.	.	V.
20.833	0.1270	0.01	Q	.	.	.	V.
20.917	0.1271	0.01	Q	.	.	.	V.
21.000	0.1271	0.01	Q	.	.	.	V.
21.083	0.1272	0.01	Q	.	.	.	V.
21.167	0.1273	0.01	Q	.	.	.	V.
21.250	0.1274	0.01	Q	.	.	.	V.
21.333	0.1275	0.01	Q	.	.	.	V.
21.417	0.1276	0.01	Q	.	.	.	V.
21.500	0.1276	0.01	Q	.	.	.	V.
21.583	0.1277	0.01	Q	.	.	.	V.
21.667	0.1278	0.01	Q	.	.	.	V.
21.750	0.1279	0.01	Q	.	.	.	V.
21.833	0.1280	0.01	Q	.	.	.	V.
21.917	0.1281	0.01	Q	.	.	.	V.
22.000	0.1281	0.01	Q	.	.	.	V.
22.083	0.1282	0.01	Q	.	.	.	V.
22.167	0.1283	0.01	Q	.	.	.	V.
22.250	0.1284	0.01	Q	.	.	.	V.
22.333	0.1285	0.01	Q	.	.	.	V.
22.417	0.1285	0.01	Q	.	.	.	V.
22.500	0.1286	0.01	Q	.	.	.	V.
22.583	0.1287	0.01	Q	.	.	.	V.
22.667	0.1288	0.01	Q	.	.	.	V.
22.750	0.1288	0.01	Q	.	.	.	V.
22.833	0.1289	0.01	Q	.	.	.	V.
22.917	0.1290	0.01	Q	.	.	.	V.
23.000	0.1290	0.01	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1380.0
10%	750.0
20%	525.0
30%	450.0
40%	405.0
50%	255.0
60%	195.0
70%	135.0
80%	60.0

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            90%                                30.0


**************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    304.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==========================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =       1.070 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
  Warning: Watershed Area is less than 10 acres
         *USER ENTERED "LAG" TIME =    0.100 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         VALLEY S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.050
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.500
         MINIMUM SOIL-LOSS RATE(INCH/HOUR) =   0.030
         USER-ENTERED RAINFALL =  2.06 INCHES
         RCFC&WCD 24-Hour Storm (15-Minute period) SELECTED
         *USER SPECIFIED PRECIPITATION DEPTH-AREA ADJUSTMENT FACTOR = 1.0000


         UNIT HYDROGRAPH TIME UNIT =  15.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME = 250.000



==========================================================================
                     UNIT HYDROGRAPH DETERMINATION

--------------------------------------------------------------------------
    INTERVAL          "S" GRAPH          UNIT HYDROGRAPH
     NUMBER          MEAN VALUES          ORDINATES(CFS)
--------------------------------------------------------------------------
        1                50.817                2.192
        2                90.903                1.729
        3                97.798                0.297
        4                99.444                0.071
        5                99.778                0.014
        6                99.944                0.007
        7               100.000                0.002


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TOTAL STORM RAINFALL(INCHES) = 2.06
TOTAL SOIL-LOSS(INCHES) = 0.69
TOTAL EFFECTIVE RAINFALL(INCHES) = 1.37

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 0.0617
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 0.1219

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2 4 - 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

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
0.083	0.0000	0.00	Q	.	.	.	.
0.167	0.0001	0.00	Q	.	.	.	.
0.250	0.0001	0.00	Q	.	.	.	.
0.333	0.0002	0.01	Q	.	.	.	.
0.417	0.0002	0.01	Q	.	.	.	.
0.500	0.0003	0.01	Q	.	.	.	.
0.583	0.0004	0.01	Q	.	.	.	.
0.667	0.0005	0.01	Q	.	.	.	.
0.750	0.0006	0.01	Q	.	.	.	.
0.833	0.0007	0.02	Q	.	.	.	.
0.917	0.0008	0.02	Q	.	.	.	.
1.000	0.0009	0.02	Q	.	.	.	.
1.083	0.0010	0.02	Q	.	.	.	.
1.167	0.0011	0.02	Q	.	.	.	.
1.250	0.0012	0.02	Q	.	.	.	.
1.333	0.0013	0.01	Q	.	.	.	.
1.417	0.0014	0.01	Q	.	.	.	.
1.500	0.0015	0.01	Q	.	.	.	.
1.583	0.0016	0.01	Q	.	.	.	.
1.667	0.0017	0.01	Q	.	.	.	.
1.750	0.0018	0.01	Q	.	.	.	.
1.833	0.0019	0.02	Q	.	.	.	.
1.917	0.0020	0.02	Q	.	.	.	.
2.000	0.0021	0.02	Q	.	.	.	.
2.083	0.0022	0.02	Q	.	.	.	.
2.167	0.0023	0.02	Q	.	.	.	.
2.250	0.0024	0.02	Q	.	.	.	.
2.333	0.0026	0.02	Q	.	.	.	.
2.417	0.0027	0.02	Q	.	.	.	.

2.500	0.0028	0.02	Q	.	.	.	.
2.583	0.0029	0.02	Q	.	.	.	.
2.667	0.0031	0.02	QV	.	.	.	.
2.750	0.0032	0.02	QV	.	.	.	.
2.833	0.0034	0.02	QV	.	.	.	.
2.917	0.0035	0.02	QV	.	.	.	.
3.000	0.0037	0.02	QV	.	.	.	.
3.083	0.0038	0.02	QV	.	.	.	.
3.167	0.0040	0.02	QV	.	.	.	.
3.250	0.0041	0.02	QV	.	.	.	.
3.333	0.0043	0.02	QV	.	.	.	.
3.417	0.0044	0.02	QV	.	.	.	.
3.500	0.0046	0.02	QV	.	.	.	.
3.583	0.0047	0.02	QV	.	.	.	.
3.667	0.0049	0.02	QV	.	.	.	.
3.750	0.0050	0.02	QV	.	.	.	.
3.833	0.0052	0.02	QV	.	.	.	.
3.917	0.0054	0.02	QV	.	.	.	.
4.000	0.0055	0.02	QV	.	.	.	.
4.083	0.0057	0.03	QV	.	.	.	.
4.167	0.0059	0.03	QV	.	.	.	.
4.250	0.0061	0.03	QV	.	.	.	.
4.333	0.0063	0.03	Q V	.	.	.	.
4.417	0.0065	0.03	Q V	.	.	.	.
4.500	0.0067	0.03	Q V	.	.	.	.
4.583	0.0069	0.03	Q V	.	.	.	.
4.667	0.0071	0.03	Q V	.	.	.	.
4.750	0.0073	0.03	Q V	.	.	.	.
4.833	0.0075	0.03	Q V	.	.	.	.
4.917	0.0078	0.03	Q V	.	.	.	.
5.000	0.0080	0.03	Q V	.	.	.	.
5.083	0.0082	0.03	Q V	.	.	.	.
5.167	0.0084	0.03	Q V	.	.	.	.
5.250	0.0086	0.03	Q V	.	.	.	.
5.333	0.0088	0.03	Q V	.	.	.	.
5.417	0.0090	0.03	Q V	.	.	.	.
5.500	0.0093	0.03	Q V	.	.	.	.
5.583	0.0095	0.03	Q V	.	.	.	.
5.667	0.0097	0.03	Q V	.	.	.	.
5.750	0.0099	0.03	Q V	.	.	.	.
5.833	0.0102	0.04	Q V	.	.	.	.
5.917	0.0104	0.04	Q V	.	.	.	.
6.000	0.0107	0.04	Q V	.	.	.	.
6.083	0.0109	0.04	Q V	.	.	.	.
6.167	0.0112	0.04	Q V	.	.	.	.
6.250	0.0114	0.04	Q V	.	.	.	.
6.333	0.0117	0.04	Q V	.	.	.	.
6.417	0.0120	0.04	Q V	.	.	.	.
6.500	0.0123	0.04	Q V	.	.	.	.
6.583	0.0125	0.04	Q V	.	.	.	.

6.667	0.0128	0.04	Q	V	.	.	.	.
6.750	0.0131	0.04	Q	V	.	.	.	.
6.833	0.0134	0.04	Q	V	.	.	.	.
6.917	0.0137	0.04	Q	V	.	.	.	.
7.000	0.0140	0.04	Q	V	.	.	.	.
7.083	0.0143	0.04	Q	V	.	.	.	.
7.167	0.0146	0.04	Q	V	.	.	.	.
7.250	0.0150	0.04	Q	V	.	.	.	.
7.333	0.0153	0.05	Q	V	.	.	.	.
7.417	0.0156	0.05	Q	V	.	.	.	.
7.500	0.0159	0.05	Q	V	.	.	.	.
7.583	0.0163	0.05	Q	V	.	.	.	.
7.667	0.0166	0.05	Q	V	.	.	.	.
7.750	0.0170	0.05	Q	V	.	.	.	.
7.833	0.0173	0.06	Q	V	.	.	.	.
7.917	0.0177	0.06	Q	V	.	.	.	.
8.000	0.0181	0.06	Q	V	.	.	.	.
8.083	0.0185	0.06	Q	V	.	.	.	.
8.167	0.0190	0.06	Q	V	.	.	.	.
8.250	0.0194	0.06	Q	V	.	.	.	.
8.333	0.0199	0.07	Q	V	.	.	.	.
8.417	0.0204	0.07	Q	V	.	.	.	.
8.500	0.0209	0.07	Q	V	.	.	.	.
8.583	0.0214	0.08	Q	V	.	.	.	.
8.667	0.0220	0.08	Q	V	.	.	.	.
8.750	0.0225	0.08	Q	V	.	.	.	.
8.833	0.0231	0.09	Q	V	.	.	.	.
8.917	0.0237	0.09	Q	V	.	.	.	.
9.000	0.0243	0.09	Q	V	.	.	.	.
9.083	0.0250	0.10	Q	V	.	.	.	.
9.167	0.0256	0.10	Q	V	.	.	.	.
9.250	0.0263	0.10	Q	V	.	.	.	.
9.333	0.0271	0.11	Q	V	.	.	.	.
9.417	0.0279	0.11	Q	V	.	.	.	.
9.500	0.0287	0.11	Q	V	.	.	.	.
9.583	0.0295	0.12	Q	V	.	.	.	.
9.667	0.0304	0.12	Q	V	.	.	.	.
9.750	0.0312	0.12	Q	V	.	.	.	.
9.833	0.0321	0.13	Q	V	.	.	.	.
9.917	0.0331	0.13	Q	V	.	.	.	.
10.000	0.0340	0.13	Q	V	.	.	.	.
10.083	0.0347	0.11	Q	V	.	.	.	.
10.167	0.0354	0.11	Q	V	.	.	.	.
10.250	0.0362	0.11	Q	V	.	.	.	.
10.333	0.0367	0.08	Q	V	.	.	.	.
10.417	0.0373	0.08	Q	V	.	.	.	.
10.500	0.0379	0.08	Q	V	.	.	.	.
10.583	0.0386	0.10	Q	V	.	.	.	.
10.667	0.0393	0.10	Q	V	.	.	.	.
10.750	0.0400	0.10	Q	V	.	.	.	.

10.833	0.0408	0.12	Q	. V . . .
10.917	0.0416	0.12	Q	. V . . .
11.000	0.0425	0.12	Q	. V . . .
11.083	0.0433	0.12	Q	. V . . .
11.167	0.0441	0.12	Q	. V . . .
11.250	0.0449	0.12	Q	. V . . .
11.333	0.0457	0.12	Q	. V . . .
11.417	0.0465	0.12	Q	. V . . .
11.500	0.0473	0.12	Q	. V . . .

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
11.583	0.0481	0.11	Q	. V .	.	.	
11.667	0.0488	0.11	Q	. V .	.	.	
11.750	0.0495	0.11	Q	. V .	.	.	
11.833	0.0503	0.11	Q	. V .	.	.	
11.917	0.0510	0.11	Q	. V .	.	.	
12.000	0.0517	0.11	Q	. V .	.	.	
12.083	0.0527	0.14	Q	. V .	.	.	
12.167	0.0536	0.14	Q	. V .	.	.	
12.250	0.0546	0.14	Q	. V .	.	.	
12.333	0.0558	0.17	Q	. V .	.	.	
12.417	0.0570	0.17	Q	. V .	.	.	
12.500	0.0581	0.17	Q	. V.	.	.	
12.583	0.0594	0.19	Q	. V.	.	.	
12.667	0.0607	0.19	Q	. V.	.	.	
12.750	0.0620	0.19	Q	. V	.	.	
12.833	0.0634	0.20	Q	. V	.	.	
12.917	0.0648	0.20	Q	. V	.	.	
13.000	0.0662	0.20	Q	. V	.	.	
13.083	0.0678	0.23	Q	. V	.	.	
13.167	0.0693	0.23	Q	. V	.	.	
13.250	0.0709	0.23	Q	. V	.	.	
13.333	0.0726	0.25	Q	. V	.	.	
13.417	0.0744	0.25	Q	. V	.	.	
13.500	0.0761	0.25	Q	. V	.	.	
13.583	0.0775	0.20	Q	. V	.	.	
13.667	0.0789	0.20	Q	. V	.	.	
13.750	0.0803	0.20	Q	. V	.	.	
13.833	0.0814	0.17	Q	. V	.	.	
13.917	0.0826	0.17	Q	. V	.	.	
14.000	0.0837	0.17	Q	. V	.	.	
14.083	0.0849	0.18	Q	. V	.	.	
14.167	0.0862	0.18	Q	. V .	.	.	
14.250	0.0874	0.18	Q	. V .	.	.	
14.333	0.0887	0.19	Q	. V.	.	.	
14.417	0.0900	0.19	Q	. V.	.	.	
14.500	0.0913	0.19	Q	. V.	.	.	
14.583	0.0925	0.19	Q	. V	.	.	

14.667	0.0938	0.19	Q	.	.	V .
14.750	0.0951	0.19	Q	.	.	V .
14.833	0.0963	0.18	Q	.	.	.V .
14.917	0.0976	0.18	Q	.	.	. V .
15.000	0.0988	0.18	Q	.	.	. V .
15.083	0.1000	0.17	Q	.	.	. V .
15.167	0.1012	0.17	Q	.	.	. V .
15.250	0.1024	0.17	Q	.	.	. V .
15.333	0.1036	0.17	Q	.	.	. V .
15.417	0.1047	0.17	Q	.	.	. V .
15.500	0.1059	0.17	Q	.	.	. V .
15.583	0.1069	0.14	Q	.	.	. V .
15.667	0.1078	0.14	Q	.	.	. V .
15.750	0.1088	0.14	Q	.	.	. V .
15.833	0.1097	0.13	Q	.	.	. V .
15.917	0.1106	0.13	Q	.	.	. V .
16.000	0.1115	0.13	Q	.	.	. V .
16.083	0.1120	0.07	Q	.	.	. V .
16.167	0.1125	0.07	Q	.	.	. V .
16.250	0.1130	0.07	Q	.	.	. V .
16.333	0.1132	0.03	Q	.	.	. V .
16.417	0.1134	0.03	Q	.	.	. V .
16.500	0.1136	0.03	Q	.	.	. V .
16.583	0.1137	0.02	Q	.	.	. V .
16.667	0.1138	0.02	Q	.	.	. V .
16.750	0.1139	0.02	Q	.	.	. V .
16.833	0.1140	0.01	Q	.	.	. V .
16.917	0.1141	0.01	Q	.	.	. V .
17.000	0.1142	0.01	Q	.	.	. V .
17.083	0.1144	0.02	Q	.	.	. V .
17.167	0.1145	0.02	Q	.	.	. V .
17.250	0.1146	0.02	Q	.	.	. V .
17.333	0.1148	0.02	Q	.	.	. V .
17.417	0.1149	0.02	Q	.	.	. V .
17.500	0.1151	0.02	Q	.	.	. V .
17.583	0.1152	0.02	Q	.	.	. V .
17.667	0.1154	0.02	Q	.	.	. V .
17.750	0.1155	0.02	Q	.	.	. V .
17.833	0.1157	0.02	Q	.	.	. V .
17.917	0.1158	0.02	Q	.	.	. V .
18.000	0.1159	0.02	Q	.	.	. V .
18.083	0.1160	0.02	Q	.	.	. V .
18.167	0.1162	0.02	Q	.	.	. V .
18.250	0.1163	0.02	Q	.	.	. V .
18.333	0.1164	0.02	Q	.	.	. V .
18.417	0.1165	0.02	Q	.	.	. V .
18.500	0.1167	0.02	Q	.	.	. V .
18.583	0.1168	0.02	Q	.	.	. V .
18.667	0.1169	0.02	Q	.	.	. V .
18.750	0.1170	0.02	Q	.	.	. V .

18.833	0.1171	0.01	Q	.	.	.	V .
18.917	0.1171	0.01	Q	.	.	.	V .
19.000	0.1172	0.01	Q	.	.	.	V .
19.083	0.1173	0.01	Q	.	.	.	V .
19.167	0.1174	0.01	Q	.	.	.	V .
19.250	0.1175	0.01	Q	.	.	.	V .
19.333	0.1176	0.02	Q	.	.	.	V .
19.417	0.1177	0.02	Q	.	.	.	V .
19.500	0.1178	0.02	Q	.	.	.	V .
19.583	0.1179	0.02	Q	.	.	.	V .
19.667	0.1180	0.02	Q	.	.	.	V .
19.750	0.1181	0.02	Q	.	.	.	V .
19.833	0.1182	0.01	Q	.	.	.	V .
19.917	0.1183	0.01	Q	.	.	.	V .
20.000	0.1183	0.01	Q	.	.	.	V .
20.083	0.1184	0.01	Q	.	.	.	V .
20.167	0.1185	0.01	Q	.	.	.	V .
20.250	0.1186	0.01	Q	.	.	.	V .
20.333	0.1187	0.01	Q	.	.	.	V .
20.417	0.1187	0.01	Q	.	.	.	V .
20.500	0.1188	0.01	Q	.	.	.	V .
20.583	0.1189	0.01	Q	.	.	.	V.
20.667	0.1190	0.01	Q	.	.	.	V.
20.750	0.1191	0.01	Q	.	.	.	V.
20.833	0.1192	0.01	Q	.	.	.	V.
20.917	0.1193	0.01	Q	.	.	.	V.
21.000	0.1193	0.01	Q	.	.	.	V.
21.083	0.1194	0.01	Q	.	.	.	V.
21.167	0.1195	0.01	Q	.	.	.	V.
21.250	0.1196	0.01	Q	.	.	.	V.
21.333	0.1197	0.01	Q	.	.	.	V.
21.417	0.1197	0.01	Q	.	.	.	V.
21.500	0.1198	0.01	Q	.	.	.	V.
21.583	0.1199	0.01	Q	.	.	.	V.
21.667	0.1200	0.01	Q	.	.	.	V.
21.750	0.1200	0.01	Q	.	.	.	V.
21.833	0.1201	0.01	Q	.	.	.	V.
21.917	0.1202	0.01	Q	.	.	.	V.
22.000	0.1203	0.01	Q	.	.	.	V.
22.083	0.1203	0.01	Q	.	.	.	V.
22.167	0.1204	0.01	Q	.	.	.	V.
22.250	0.1205	0.01	Q	.	.	.	V.
22.333	0.1206	0.01	Q	.	.	.	V.
22.417	0.1206	0.01	Q	.	.	.	V.
22.500	0.1207	0.01	Q	.	.	.	V.
22.583	0.1208	0.01	Q	.	.	.	V.
22.667	0.1208	0.01	Q	.	.	.	V.
22.750	0.1209	0.01	Q	.	.	.	V.
22.833	0.1210	0.01	Q	.	.	.	V.
22.917	0.1210	0.01	Q	.	.	.	V.

```
   23.000      0.1211      0.01  Q         .         .         .        V.
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                Duration
        Peak Flow Rate                     (minutes)
    ======================                 =========
               0%                           1380.0
              10%                            750.0
              20%                            525.0
              30%                            450.0
              40%                            405.0
              50%                            255.0
              60%                            195.0
              70%                            135.0
              80%                             60.0
              90%                             30.0
 ================================================================================

   END OF FLOODSCx ROUTING ANALYSIS
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**************************************************************************

             F L O O D    R O U T I N G    A N A L Y S I S

ACCORDING TO RIVERSIDE COUNTY FLOOD CONTORL AND WATER CONSERVATION DISTRICT
                    (RCFC&WCD) 1978 HYDROLOGY MANUAL
         (c) Copyright 1989-2011 Advanced Engineering Software (aes)
                 (Synthetic Unit Hydrograph Version 18.0)
                 Release Date: 05/01/2011  License ID 1499

                          Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* DOUBLE BUTTE                                                          *
* EXISTING CONDITION                                                    *
* 100-YEAR 1-HOUR HYDROGRAPH                                            *
 ************************************************************************

  FILE NAME: DB100UH.DAT
  TIME/DATE OF STUDY: 21:52 07/09/2024


**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    102.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==========================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =      23.600 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.590 HOURS
         VALLEY S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.050
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.600
         USER-ENTERED RAINFALL =  1.59 INCHES
         RCFC&WCD 1-Hour Storm (5-Minute period) SELECTED
         (SLOPE OF INTENSITY-DURATION CURVE = 0.50)
         *USER SPECIFIED PRECIPITATION DEPTH-AREA ADJUSTMENT FACTOR = 1.0000


         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  14.124
```

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	1.182	3.375
2	4.107	8.346
3	8.638	12.933
4	15.006	18.174
5	23.742	24.934
6	33.759	28.592
7	44.149	29.654
8	53.365	26.305
9	59.938	18.759
10	64.762	13.770
11	68.755	11.394
12	71.796	8.679
13	74.488	7.684
14	76.666	6.216
15	78.639	5.630
16	80.382	4.976
17	81.940	4.448
18	83.274	3.806
19	84.591	3.758
20	85.721	3.226
21	86.753	2.946
22	87.698	2.696
23	88.518	2.339
24	89.348	2.371
25	90.135	2.245
26	90.799	1.895
27	91.456	1.875
28	92.082	1.789
29	92.613	1.514
30	93.136	1.493
31	93.659	1.493
32	94.143	1.383
33	94.560	1.189
34	94.975	1.186
35	95.391	1.186
36	95.806	1.186
37	96.146	0.971
38	96.420	0.782
39	96.695	0.782
40	96.969	0.783

41	97.243	0.783
42	97.517	0.782
43	97.792	0.784
44	98.019	0.647
45	98.125	0.305
46	98.227	0.290
47	98.328	0.288
48	98.430	0.290
49	98.531	0.290
50	98.632	0.289
51	98.734	0.290
52	98.835	0.289
53	98.937	0.290
54	99.038	0.289
55	99.139	0.289
56	99.240	0.289
57	99.342	0.289
58	99.443	0.289
59	99.544	0.289
60	99.645	0.289
61	99.746	0.289
62	99.848	0.289
63	99.949	0.289
64	100.000	0.146

TOTAL STORM RAINFALL(INCHES) = 1.59
TOTAL SOIL-LOSS(INCHES) = 0.05
TOTAL EFFECTIVE RAINFALL(INCHES) = 1.54

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 0.0983
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 3.0271

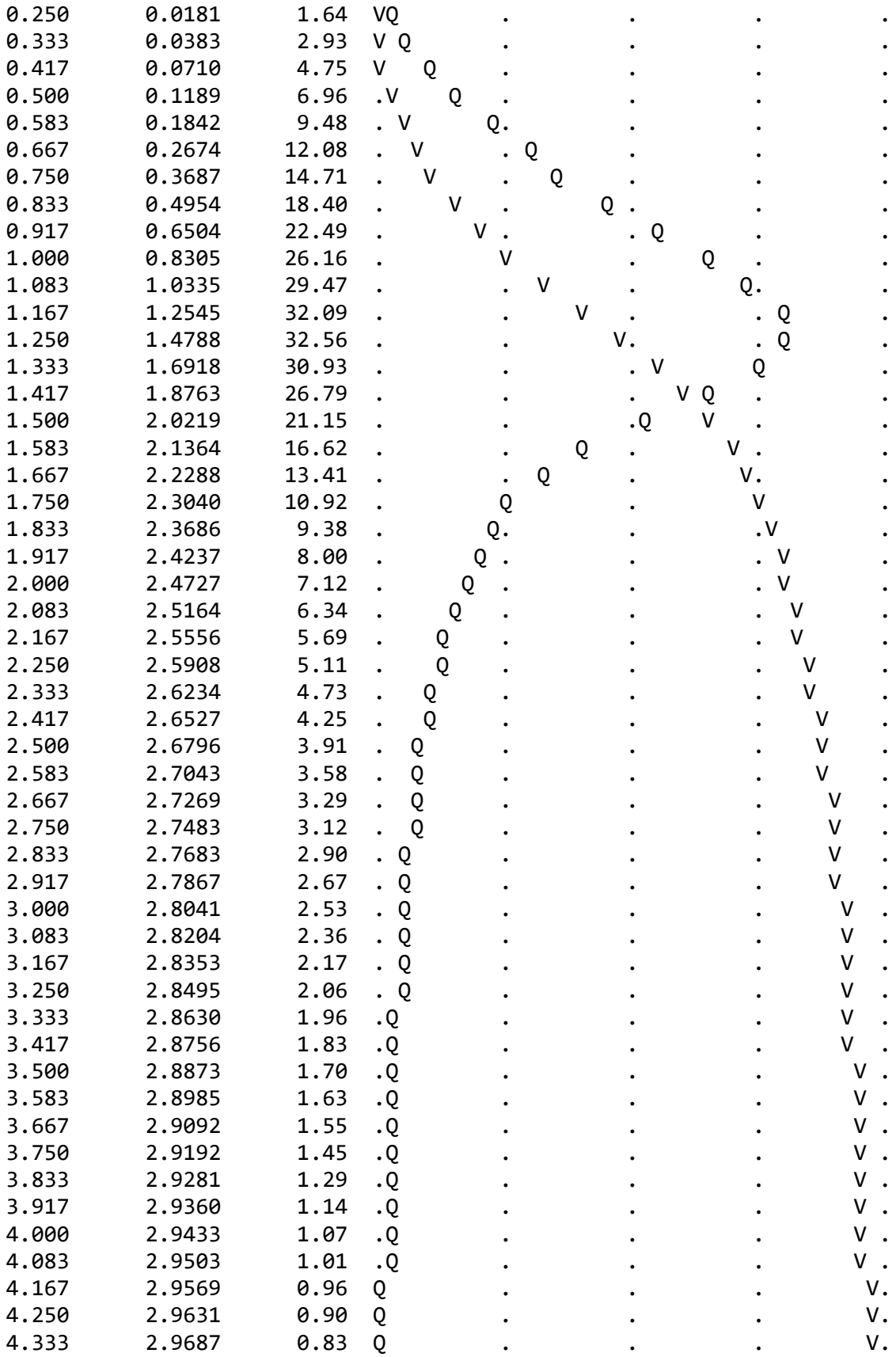
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1 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

==========

HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	10.0	20.0	30.0	40.0
0.083	0.0015	0.22	Q	.	.	.	.
0.167	0.0068	0.77	Q	.	.	.	.



4.417	2.9735	0.69	Q	.	.	.	V.
4.500	2.9772	0.53	Q	.	.	.	V.
4.583	2.9804	0.47	Q	.	.	.	V.
4.667	2.9835	0.45	Q	.	.	.	V.
4.750	2.9866	0.45	Q	.	.	.	V.
4.833	2.9896	0.45	Q	.	.	.	V.
4.917	2.9927	0.45	Q	.	.	.	V.
5.000	2.9958	0.45	Q	.	.	.	V.
5.083	2.9988	0.45	Q	.	.	.	V.
5.167	3.0019	0.45	Q	.	.	.	V.
5.250	3.0050	0.44	Q	.	.	.	V.
5.333	3.0080	0.44	Q	.	.	.	V.
5.417	3.0108	0.42	Q	.	.	.	V.
5.500	3.0136	0.40	Q	.	.	.	V.
5.583	3.0161	0.37	Q	.	.	.	V.
5.667	3.0185	0.35	Q	.	.	.	V.
5.750	3.0208	0.32	Q	.	.	.	V.
5.833	3.0228	0.29	Q	.	.	.	V.
5.917	3.0245	0.26	Q	.	.	.	V.
6.000	3.0260	0.21	Q	.	.	.	V.
6.083	3.0268	0.12	Q	.	.	.	V.
6.167	3.0270	0.04	Q	.	.	.	V.
6.250	3.0271	0.01	Q	.	.	.	V

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	375.0
10%	140.0
20%	95.0
30%	70.0
40%	60.0
50%	50.0
60%	40.0
70%	30.0
80%	30.0
90%	20.0

==========

END OF FLOODSCx ROUTING ANALYSIS

```
**************************************************************************

             F L O O D    R O U T I N G    A N A L Y S I S

ACCORDING TO RIVERSIDE COUNTY FLOOD CONTORL AND WATER CONSERVATION DISTRICT
                    (RCFC&WCD) 1978 HYDROLOGY MANUAL
         (c) Copyright 1989-2011 Advanced Engineering Software (aes)
                 (Synthetic Unit Hydrograph Version 18.0)
                 Release Date: 05/01/2011  License ID 1499

                          Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* DOUBLE BUTTE                                                          *
* PROPOSED CONDITION                                                    *
* 100-YEAR 1-HOUR HYDROGRAPH                                            *
 ************************************************************************

  FILE NAME: DB100UH.DAT
  TIME/DATE OF STUDY: 13:52 02/07/2024



**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    102.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==========================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =      23.600 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.290 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         VALLEY S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.050
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.600
         USER-ENTERED RAINFALL =  1.59 INCHES
         RCFC&WCD 1-Hour Storm (5-Minute period) SELECTED
         (SLOPE OF INTENSITY-DURATION CURVE = 0.50)
         *USER SPECIFIED PRECIPITATION DEPTH-AREA ADJUSTMENT FACTOR = 1.0000
```

UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES
UNIT INTERVAL PERCENTAGE OF LAG-TIME = 28.736

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	2.704	7.718
2	12.172	27.022
3	29.624	49.811
4	49.812	57.618
5	63.099	37.923
6	70.858	22.147
7	76.063	14.855
8	79.951	11.096
9	83.018	8.754
10	85.517	7.133
11	87.554	5.815
12	89.262	4.872
13	90.753	4.257
14	92.046	3.690
15	93.136	3.110
16	94.148	2.890
17	95.004	2.443
18	95.834	2.370
19	96.459	1.781
20	97.017	1.593
21	97.574	1.592
22	98.037	1.320
23	98.255	0.622
24	98.462	0.589
25	98.668	0.588
26	98.874	0.589
27	99.080	0.589
28	99.286	0.589
29	99.493	0.589
30	99.699	0.589
31	99.905	0.589
32	100.000	0.271

TOTAL STORM RAINFALL(INCHES) = 1.59
TOTAL SOIL-LOSS(INCHES) = 0.05
TOTAL EFFECTIVE RAINFALL(INCHES) = 1.54

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 0.0983
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 3.0271

==========

1 - 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 FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0. 12.5 25.0 37.5 50.0
0.083	0.0034	0.50	Q . . . .
0.167	0.0190	2.26	VQ . . . .
0.250	0.0575	5.60	V Q . . . .
0.333	0.1242	9.69	.V Q . . . .
0.417	0.2127	12.85	. V Q . . .
0.500	0.3183	15.34	. V . Q . . .
0.583	0.4407	17.77	. V . Q . . .
0.667	0.5818	20.49	. V . Q . . .
0.750	0.7479	24.11	. V. Q. . .
0.833	0.9603	30.84	. . V . Q . .
0.917	1.2398	40.59	. . V . . Q .
1.000	1.5764	48.88	. . V . Q.
1.083	1.9096	48.37	. . . V . Q .
1.167	2.1644	37.00	. . . VQ. .
1.250	2.3420	25.79	. . Q V .
1.333	2.4650	17.86	. . Q . . V .
1.417	2.5557	13.17	. Q . . V .
1.500	2.6273	10.40	. Q . . . V .
1.583	2.6859	8.50	. Q . . . V .
1.667	2.7346	7.08	. Q . . . V .
1.750	2.7760	6.01	. Q . . . V .
1.833	2.8119	5.20	. Q . . . V .
1.917	2.8427	4.48	. Q . . . V .
2.000	2.8694	3.87	. Q . . . V .
2.083	2.8928	3.41	. Q . . . V .
2.167	2.9132	2.95	. Q . . . V .
2.250	2.9312	2.62	. Q . . . V .
2.333	2.9462	2.18	.Q . . . V .
2.417	2.9593	1.91	.Q . . . V.
2.500	2.9710	1.69	.Q . . . V.

```
   2.583      2.9807      1.42  .Q        .         .         .         V.
   2.667      2.9880      1.05  Q         .         .         .         V.
   2.750      2.9942      0.90  Q         .         .         .         V.
   2.833      2.9998      0.81  Q         .         .         .         V.
   2.917      3.0050      0.76  Q         .         .         .         V.
   3.000      3.0099      0.71  Q         .         .         .         V.
   3.083      3.0144      0.66  Q         .         .         .         V.
   3.167      3.0185      0.59  Q         .         .         .         V.
   3.250      3.0220      0.52  Q         .         .         .         V.
   3.333      3.0249      0.42  Q         .         .         .         V.
   3.417      3.0265      0.22  Q         .         .         .         V.
   3.500      3.0270      0.07  Q         .         .         .         V.
   3.583      3.0271      0.02  Q         .         .         .         V.
--------------------------------------------------------------------------------
   TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
   (Note: 100% of Peak Flow Rate estimate assumed to have
   an instantaneous time duration)

   Percentile of Estimated                Duration
       Peak Flow Rate                     (minutes)
   ======================                 =========
              0%                            215.0
             10%                            100.0
             20%                             70.0
             30%                             55.0
             40%                             40.0
             50%                             30.0
             60%                             25.0
             70%                             20.0
             80%                             15.0
             90%                             10.0



 ********************************************************************************
   FLOW PROCESS FROM NODE    200.00 TO NODE    206.00 IS CODE =   1
 --------------------------------------------------------------------------------
   >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
 ================================================================================

       (UNIT-HYDROGRAPH ADDED TO STREAM #1)

          WATERSHED AREA =       1.140 ACRES
          BASEFLOW =   0.000 CFS/SQUARE-MILE
   Warning: Watershed Area is less than 10 acres
          *USER ENTERED "LAG" TIME =    0.100 HOURS
           CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
           THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
           MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
          VALLEY S-GRAPH SELECTED
```

UNIFORM MEAN SOIL-LOSS(INCH/HOUR) = 0.050
LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.500
USER-ENTERED RAINFALL = 1.59 INCHES
RCFC&WCD 1-Hour Storm (5-Minute period) SELECTED
(SLOPE OF INTENSITY-DURATION CURVE = 0.50)
*USER SPECIFIED PRECIPITATION DEPTH-AREA ADJUSTMENT FACTOR = 1.0000

UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES
UNIT INTERVAL PERCENTAGE OF LAG-TIME = 83.333

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	13.994	1.929
2	59.664	6.297
3	78.792	2.637
4	86.766	1.099
5	91.428	0.643
6	94.514	0.426
7	96.650	0.294
8	98.044	0.192
9	98.699	0.090
10	99.289	0.081
11	99.716	0.059
12	99.929	0.029
13	100.000	0.010

TOTAL STORM RAINFALL(INCHES) = 1.59
TOTAL SOIL-LOSS(INCHES) = 0.05
TOTAL EFFECTIVE RAINFALL(INCHES) = 1.54

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 0.0047
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 0.1462

1 - 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 FIVE-MINUTE UNIT INTERVALS(CFS)

(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0. 2.5 5.0 7.5 10.0
0.083	0.0009	0.12	Q . . . .
0.167	0.0045	0.54	.VQ . . . .
0.250	0.0096	0.74	. Q . . . .
0.333	0.0156	0.87	. QV . . . .
0.417	0.0224	0.99	. Q V . . . .
0.500	0.0299	1.10	. Q V . . . .
0.583	0.0386	1.26	. Q V . . .
0.667	0.0487	1.46	. Q . V . . .
0.750	0.0608	1.76	. Q . V . . .
0.833	0.0797	2.74	. Q .V . . .
0.917	0.1060	3.82	. . Q . V. . .
1.000	0.1225	2.40	. Q. . . V .
1.083	0.1327	1.48	. Q . . . V .
1.167	0.1380	0.76	. Q . . . V .
1.250	0.1410	0.45	.Q . . . V .
1.333	0.1430	0.29	.Q . . . V.
1.417	0.1443	0.19	Q . . . V.
1.500	0.1451	0.11	Q . . . V.
1.583	0.1456	0.08	Q . . . V.
1.667	0.1459	0.05	Q . . . V.
1.750	0.1461	0.03	Q . . . V.
1.833	0.1462	0.01	Q . . . V.
1.917	0.1462	0.00	Q . . . V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	115.0
10%	70.0
20%	50.0
30%	35.0
40%	20.0
50%	15.0
60%	15.0
70%	10.0
80%	5.0
90%	5.0

```
****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    304.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =       1.070 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
  Warning: Watershed Area is less than 10 acres
         *USER ENTERED "LAG" TIME =    0.100 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         VALLEY S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.050
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.500
         USER-ENTERED RAINFALL =  1.59 INCHES
         RCFC&WCD 1-Hour Storm (5-Minute period) SELECTED
         (SLOPE OF INTENSITY-DURATION CURVE = 0.50)
         *USER SPECIFIED PRECIPITATION DEPTH-AREA ADJUSTMENT FACTOR = 1.0000


         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  83.333



============================================================================
                     UNIT HYDROGRAPH DETERMINATION

----------------------------------------------------------------------------
    INTERVAL          "S" GRAPH          UNIT HYDROGRAPH
     NUMBER          MEAN VALUES          ORDINATES(CFS)
----------------------------------------------------------------------------
        1               13.994                1.811
        2               59.664                5.910
        3               78.792                2.475
        4               86.766                1.032
        5               91.428                0.603
        6               94.514                0.399
        7               96.650                0.276
        8               98.044                0.180
        9               98.699                0.085
       10               99.289                0.076
       11               99.716                0.055
       12               99.929                0.028
       13              100.000                0.009
```

TOTAL STORM RAINFALL(INCHES) = 1.59
TOTAL SOIL-LOSS(INCHES) = 0.05
TOTAL EFFECTIVE RAINFALL(INCHES) = 1.54

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 0.0045
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 0.1372

==========

1 - 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 FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0. 2.5 5.0 7.5 10.0
0.083	0.0008	0.12	Q
0.167	0.0043	0.50	.VQ
0.250	0.0090	0.69	. Q
0.333	0.0146	0.81	. QV
0.417	0.0210	0.92	. Q V
0.500	0.0281	1.03	. Q V
0.583	0.0363	1.18	. Q V
0.667	0.0457	1.37	. Q . V
0.750	0.0571	1.65	. Q . V
0.833	0.0748	2.57	. Q .V
0.917	0.0995	3.59	. . Q . V.
1.000	0.1150	2.25	. Q. . . V
1.083	0.1246	1.39	. Q . . . V
1.167	0.1295	0.71	. Q . . . V
1.250	0.1324	0.42	.Q . . . V .
1.333	0.1343	0.27	.Q . . . V.
1.417	0.1355	0.17	Q . . . V.
1.500	0.1362	0.10	Q . . . V.
1.583	0.1367	0.07	Q . . . V.
1.667	0.1370	0.05	Q . . . V.
1.750	0.1371	0.03	Q . . . V.
1.833	0.1372	0.01	Q . . . V.
1.917	0.1372	0.00	Q . . . V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have

an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	115.0
10%	70.0
20%	50.0
30%	35.0
40%	20.0
50%	15.0
60%	15.0
70%	10.0
80%	5.0
90%	5.0

END OF FLOODSCx ROUTING ANALYSIS

```
******************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2011 Advanced Engineering Software (aes)
                    (Rational Tabling Version 18.0)
                Release Date: 07/01/2011  License ID 1499

                          Analysis prepared by:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* DOUBLE BUTTE                                                          *
* EXISTING CONDITION                                                    *
* 2-YEAR                                                                *
 ************************************************************************

  FILE NAME: DB2EX.DAT
  TIME/DATE OF STUDY: 00:07 07/10/2024
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.870
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.900
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.310
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.590
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4081456
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4092145
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =    2.00   1-HOUR INTENSITY(INCH/HOUR) =   0.418
  SLOPE OF INTENSITY DURATION CURVE = 0.4081
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

```
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  UPSTREAM ELEVATION(FEET) =   1454.60
  DOWNSTREAM ELEVATION(FEET) =   1450.80
  ELEVATION DIFFERENCE(FEET) =      3.80
  TC = 0.937*[(  300.00**3)/(     3.80)]**.2 =   21.991
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.629
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .4611
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.57
  TOTAL AREA(ACRES) =      1.97   TOTAL RUNOFF(CFS) =      0.57

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1450.80  DOWNSTREAM(FEET) =   1445.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   850.00   CHANNEL SLOPE =  0.0061
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.57
  FLOW VELOCITY(FEET/SEC) =   1.17 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  12.07   Tc(MIN.) =   34.07
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1150.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.526
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .4209
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =   21.65   SUBAREA RUNOFF(CFS) =    4.80
  TOTAL AREA(ACRES) =       23.6   TOTAL RUNOFF(CFS) =       5.37
  TC(MIN.) =   34.07
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  UPSTREAM ELEVATION(FEET) =   1451.50
  DOWNSTREAM ELEVATION(FEET) =   1449.50
  ELEVATION DIFFERENCE(FEET) =      2.00
  TC = 0.937*[(  300.00**3)/(     2.00)]**.2 =   25.003
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.597
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .4493
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.23
  TOTAL AREA(ACRES) =      0.85   TOTAL RUNOFF(CFS) =      0.23

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1449.50  DOWNSTREAM(FEET) =   1444.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =   950.00   CHANNEL SLOPE =  0.0056
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.23
  FLOW VELOCITY(FEET/SEC) =   1.12 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  14.13   Tc(MIN.) =   39.13
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =    1250.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.497
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .4082
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    8.76   SUBAREA RUNOFF(CFS) =    1.78
  TOTAL AREA(ACRES) =        9.6   TOTAL RUNOFF(CFS) =       2.01
  TC(MIN.) =   39.13

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
==============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  UPSTREAM ELEVATION(FEET) =   1456.50
  DOWNSTREAM ELEVATION(FEET) =   1454.50
  ELEVATION DIFFERENCE(FEET) =      2.00
  TC = 0.303*[(  300.00**3)/(     2.00)]**.2 =    8.084
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.947
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8651
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.54
  TOTAL AREA(ACRES) =      0.66   TOTAL RUNOFF(CFS) =      0.54

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1454.50  DOWNSTREAM(FEET) =   1451.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   285.00   CHANNEL SLOPE =  0.0105
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.54
  FLOW VELOCITY(FEET/SEC) =   1.54 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.09   Tc(MIN.) =   11.17
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =     585.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.830
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5226
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    7.84   SUBAREA RUNOFF(CFS) =    3.40
  TOTAL AREA(ACRES) =        8.5   TOTAL RUNOFF(CFS) =       3.94
  TC(MIN.) =   11.17
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        8.5  TC(MIN.) =     11.17
  PEAK FLOW RATE(CFS)   =       3.94
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
******************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2011 Advanced Engineering Software (aes)
                    (Rational Tabling Version 18.0)
                Release Date: 07/01/2011  License ID 1499

                          Analysis prepared by:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* DOUBLE BUTTE                                                          *
* PROPOSED CONDITION                                                    *
* 2-YEAR                                                                *
 ************************************************************************

  FILE NAME: DB2PR.DAT
  TIME/DATE OF STUDY: 15:49 07/15/2024
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.870
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.900
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.310
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.590
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4081456
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4092145
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =    2.00   1-HOUR INTENSITY(INCH/HOUR) =   0.418
  SLOPE OF INTENSITY DURATION CURVE = 0.4081
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

```
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  UPSTREAM ELEVATION(FEET) =   1452.00
  DOWNSTREAM ELEVATION(FEET) =   1451.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  TC = 0.303*[(  300.00**3)/(     1.00)]**.2 =    9.287
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.895
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8639
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.20
  TOTAL AREA(ACRES) =      0.26   TOTAL RUNOFF(CFS) =      0.20

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1451.00  DOWNSTREAM ELEVATION(FEET) = 1446.40
  STREET LENGTH(FEET) =   850.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.40
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    3.34
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.37
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.31
```

```
  STREET FLOW TRAVEL TIME(MIN.) =  10.31   Tc(MIN.) =   19.60
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.659
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8572
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.72      SUBAREA RUNOFF(CFS) =    0.41
  TOTAL AREA(ACRES) =        1.0        PEAK FLOW RATE(CFS) =       0.61

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   5.34
  FLOW VELOCITY(FEET/SEC.) =  1.35   DEPTH*VELOCITY(FT*FT/SEC.) =   0.35
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1150.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   190.00
  UPSTREAM ELEVATION(FEET) =   1458.50
  DOWNSTREAM ELEVATION(FEET) =   1456.00
  ELEVATION DIFFERENCE(FEET) =      2.50
  TC = 0.303*[(  190.00**3)/(     2.50)]**.2 =    5.878
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.078
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8679
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.38
  TOTAL AREA(ACRES) =      0.41   TOTAL RUNOFF(CFS) =      0.38

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1456.00  DOWNSTREAM(FEET) =   1447.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   845.00   CHANNEL SLOPE =  0.0107
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.38
  FLOW VELOCITY(FEET/SEC) =   1.55 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   9.10   Tc(MIN.) =   14.98
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    1035.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
    2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.736
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8596
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =   22.55   SUBAREA RUNOFF(CFS) =   14.27
  TOTAL AREA(ACRES) =       23.0   TOTAL RUNOFF(CFS) =      14.65
  TC(MIN.) =   14.98

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   200.00
  UPSTREAM ELEVATION(FEET) =   1455.10
  DOWNSTREAM ELEVATION(FEET) =   1453.00
  ELEVATION DIFFERENCE(FEET) =      2.10
  TC = 0.303*[(  200.00**3)/(     2.10)]**.2 =    6.277
    2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.050
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8673
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.42
  TOTAL AREA(ACRES) =      0.46   TOTAL RUNOFF(CFS) =      0.42

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   235.00
  UPSTREAM ELEVATION(FEET) =   1454.00
  DOWNSTREAM ELEVATION(FEET) =   1451.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  TC = 0.303*[(  235.00**3)/(     3.00)]**.2 =    6.439
    2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.039
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8671
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.31
  TOTAL AREA(ACRES) =      0.34   TOTAL RUNOFF(CFS) =      0.31

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    601.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
```

```
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS SINGLE FAMILY (1/4 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   160.00
  UPSTREAM ELEVATION(FEET) =   1457.00
  DOWNSTREAM ELEVATION(FEET) =   1455.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  TC = 0.393*[(  160.00**3)/(     2.00)]**.2 =    7.182
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.993
  SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .7307
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.38
  TOTAL AREA(ACRES) =      0.52   TOTAL RUNOFF(CFS) =      0.38

****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1455.00  DOWNSTREAM(FEET) =   1454.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   530.00   CHANNEL SLOPE =  0.0019
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.38
  FLOW VELOCITY(FEET/SEC) =   0.65 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  13.56   Tc(MIN.) =   20.74
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =     690.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    602.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.644
  SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .6832
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    3.14   SUBAREA RUNOFF(CFS) =    1.38
  TOTAL AREA(ACRES) =        3.7   TOTAL RUNOFF(CFS) =       1.76
  TC(MIN.) =   20.74

****************************************************************************
  FLOW PROCESS FROM NODE    700.00 TO NODE    701.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS: UNDEVELOPED WITH POOR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   250.00
  UPSTREAM ELEVATION(FEET) =   1455.00
```

```
  DOWNSTREAM ELEVATION(FEET) =   1453.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  TC = 0.533*[(  250.00**3)/(     2.00)]**.2 =   12.734
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.786
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5109
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.18
  TOTAL AREA(ACRES) =      0.45   TOTAL RUNOFF(CFS) =      0.18

****************************************************************************
  FLOW PROCESS FROM NODE    701.00 TO NODE    702.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1453.00  DOWNSTREAM(FEET) =   1451.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   405.00   CHANNEL SLOPE =  0.0049
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.18
  FLOW VELOCITY(FEET/SEC) =   1.05 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.40   Tc(MIN.) =   19.14
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    702.00 =     655.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    702.00 TO NODE    702.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.666
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .4738
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    5.28   SUBAREA RUNOFF(CFS) =    1.67
  TOTAL AREA(ACRES) =        5.7   TOTAL RUNOFF(CFS) =       1.85
  TC(MIN.) =   19.14

****************************************************************************
  FLOW PROCESS FROM NODE    800.00 TO NODE    801.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS: UNDEVELOPED WITH POOR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   250.00
  UPSTREAM ELEVATION(FEET) =   1451.50
  DOWNSTREAM ELEVATION(FEET) =   1449.50
  ELEVATION DIFFERENCE(FEET) =      2.00
  TC = 0.533*[(  250.00**3)/(     2.00)]**.2 =   12.734
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.786
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5109
```

```
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.67   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE    801.00 TO NODE    802.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1449.50  DOWNSTREAM(FEET) =   1444.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1025.00   CHANNEL SLOPE =  0.0052
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.27
  FLOW VELOCITY(FEET/SEC) =   1.08 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  15.84   Tc(MIN.) =   28.57
  LONGEST FLOWPATH FROM NODE    800.00 TO NODE    802.00 =    1275.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    802.00 TO NODE    802.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.565
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .4370
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    8.17   SUBAREA RUNOFF(CFS) =    2.02
  TOTAL AREA(ACRES) =        8.8   TOTAL RUNOFF(CFS) =       2.29
  TC(MIN.) =   28.57
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        8.8  TC(MIN.) =     28.57
  PEAK FLOW RATE(CFS)   =       2.29
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
******************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
          RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                      (RCFC&WCD)  1978 HYDROLOGY MANUAL
           (c) Copyright 1982-2011 Advanced Engineering Software (aes)
                      (Rational Tabling Version 18.0)
                  Release Date: 07/01/2011  License ID 1499

                              Analysis prepared by:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* DOUBLE BUTTE                                                          *
* EXISTING CONDITION                                                    *
* 100-YEAR                                                              *
 ************************************************************************

  FILE NAME: DB100EX.DAT
  TIME/DATE OF STUDY: 00:09 07/10/2024
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.870
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.900
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.310
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.590
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4081456
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4092145
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.590
  SLOPE OF INTENSITY DURATION CURVE = 0.4092
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

```
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  UPSTREAM ELEVATION(FEET) =   1454.60
  DOWNSTREAM ELEVATION(FEET) =   1450.80
  ELEVATION DIFFERENCE(FEET) =      3.80
  TC = 0.937*[(  300.00**3)/(     3.80)]**.2 =   21.991
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.398
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7201
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      3.40
  TOTAL AREA(ACRES) =      1.97   TOTAL RUNOFF(CFS) =      3.40

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1450.80  DOWNSTREAM(FEET) =   1445.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   850.00   CHANNEL SLOPE =  0.0061
  CHANNEL FLOW THRU SUBAREA(CFS) =       3.40
  FLOW VELOCITY(FEET/SEC) =   1.51 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   9.38   Tc(MIN.) =   31.37
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1150.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.073
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6982
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =   21.65   SUBAREA RUNOFF(CFS) =   31.34
  TOTAL AREA(ACRES) =      23.6   TOTAL RUNOFF(CFS) =      34.74
  TC(MIN.) =   31.37
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  UPSTREAM ELEVATION(FEET) =   1451.50
  DOWNSTREAM ELEVATION(FEET) =   1449.50
  ELEVATION DIFFERENCE(FEET) =      2.00
  TC = 0.937*[(  300.00**3)/(     2.00)]**.2 =   25.003
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.275
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7124
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.38
  TOTAL AREA(ACRES) =      0.85   TOTAL RUNOFF(CFS) =      1.38

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1449.50  DOWNSTREAM(FEET) =   1444.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =   950.00   CHANNEL SLOPE =  0.0056
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.38
  FLOW VELOCITY(FEET/SEC) =   1.19 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  13.29   Tc(MIN.) =   38.29
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =    1250.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.911
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6852
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    8.76   SUBAREA RUNOFF(CFS) =   11.47
  TOTAL AREA(ACRES) =        9.6   TOTAL RUNOFF(CFS) =      12.85
  TC(MIN.) =   38.29

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
```

```
        DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  UPSTREAM ELEVATION(FEET) =   1456.50
  DOWNSTREAM ELEVATION(FEET) =   1454.50
  ELEVATION DIFFERENCE(FEET) =      2.00
  TC = 0.303*[(  300.00**3)/(     2.00)]**.2 =    8.084
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.611
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8872
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      2.11
  TOTAL AREA(ACRES) =      0.66   TOTAL RUNOFF(CFS) =      2.11

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1454.50  DOWNSTREAM(FEET) =   1451.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   285.00   CHANNEL SLOPE =  0.0105
  CHANNEL FLOW THRU SUBAREA(CFS) =       2.11
  FLOW VELOCITY(FEET/SEC) =   1.79 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.66   Tc(MIN.) =   10.74
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =     585.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.214
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7586
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    7.84   SUBAREA RUNOFF(CFS) =   19.12
  TOTAL AREA(ACRES) =        8.5   TOTAL RUNOFF(CFS) =      21.23
  TC(MIN.) =   10.74
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        8.5  TC(MIN.) =     10.74
  PEAK FLOW RATE(CFS)   =      21.23
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
******************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2011 Advanced Engineering Software (aes)
                    (Rational Tabling Version 18.0)
                Release Date: 07/01/2011  License ID 1499

                          Analysis prepared by:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* DOUBLE BUTTE                                                          *
* PROPOSED CONDITION                                                    *
* 100-YEAR                                                              *
 ************************************************************************

  FILE NAME: DB100PR.DAT
  TIME/DATE OF STUDY: 12:07 07/15/2024
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.870
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.900
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.310
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.590
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4081456
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4092145
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.590
  SLOPE OF INTENSITY DURATION CURVE = 0.4092
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

```
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  UPSTREAM ELEVATION(FEET) =   1452.00
  DOWNSTREAM ELEVATION(FEET) =   1451.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  TC = 0.303*[(  300.00**3)/(     1.00)]**.2 =    9.287
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.412
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8866
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.79
  TOTAL AREA(ACRES) =      0.26   TOTAL RUNOFF(CFS) =      0.79

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1451.00  DOWNSTREAM ELEVATION(FEET) = 1446.40
  STREET LENGTH(FEET) =   850.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.62
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.33
    HALFSTREET FLOOD WIDTH(FEET) =    9.59
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.59
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.53
```

```
  STREET FLOW TRAVEL TIME(MIN.) =   8.90   Tc(MIN.) =   18.19
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.591
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8831
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.72      SUBAREA RUNOFF(CFS) =    1.65
  TOTAL AREA(ACRES) =        1.0        PEAK FLOW RATE(CFS) =       2.43

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.37   HALFSTREET FLOOD WIDTH(FEET) =  11.60
  FLOW VELOCITY(FEET/SEC.) =  1.74   DEPTH*VELOCITY(FT*FT/SEC.) =   0.64
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1150.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  UPSTREAM ELEVATION(FEET) =   1452.00
  DOWNSTREAM ELEVATION(FEET) =   1451.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  TC = 0.937*[(  300.00**3)/(     1.00)]**.2 =   28.721
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.149
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7038
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.42
  TOTAL AREA(ACRES) =      0.28   TOTAL RUNOFF(CFS) =      0.42

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1451.00  DOWNSTREAM(FEET) =   1446.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   750.00   CHANNEL SLOPE =  0.0063
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.42
  FLOW VELOCITY(FEET/SEC) =   1.19 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  10.53   Tc(MIN.) =   39.25
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =    1050.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.892
 UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6835
 SOIL CLASSIFICATION IS "C"
 SUBAREA AREA(ACRES) =    0.45   SUBAREA RUNOFF(CFS) =    0.58
 TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =       1.01
 TC(MIN.) =   39.25

****************************************************************************
 FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS COMMERCIAL
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   190.00
 UPSTREAM ELEVATION(FEET) =   1458.50
 DOWNSTREAM ELEVATION(FEET) =   1456.00
 ELEVATION DIFFERENCE(FEET) =      2.50
 TC = 0.303*[(  190.00**3)/(     2.50)]**.2 =    5.878
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.114
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8886
 SOIL CLASSIFICATION IS "C"
 SUBAREA RUNOFF(CFS) =      1.50
 TOTAL AREA(ACRES) =      0.41   TOTAL RUNOFF(CFS) =      1.50

****************************************************************************
 FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1456.00  DOWNSTREAM(FEET) =   1447.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   845.00   CHANNEL SLOPE =  0.0107
 CHANNEL FLOW THRU SUBAREA(CFS) =       1.50
 FLOW VELOCITY(FEET/SEC) =   1.67 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   8.41   Tc(MIN.) =   14.29
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    1035.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.860
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8844
 SOIL CLASSIFICATION IS "C"
 SUBAREA AREA(ACRES) =   22.55   SUBAREA RUNOFF(CFS) =   57.04
 TOTAL AREA(ACRES) =       23.0   TOTAL RUNOFF(CFS) =      58.54
 TC(MIN.) =   14.29
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   200.00
  UPSTREAM ELEVATION(FEET) =   1455.10
  DOWNSTREAM ELEVATION(FEET) =   1453.00
  ELEVATION DIFFERENCE(FEET) =      2.10
  TC = 0.303*[(  200.00**3)/(     2.10)]**.2 =    6.277
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.005
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8883
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.64
  TOTAL AREA(ACRES) =      0.46   TOTAL RUNOFF(CFS) =      1.64

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   235.00
  UPSTREAM ELEVATION(FEET) =   1454.00
  DOWNSTREAM ELEVATION(FEET) =   1451.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  TC = 0.303*[(  235.00**3)/(     3.00)]**.2 =    6.439
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.963
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8882
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.20
  TOTAL AREA(ACRES) =      0.34   TOTAL RUNOFF(CFS) =      1.20

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    601.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY (1/4 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   160.00
  UPSTREAM ELEVATION(FEET) =   1457.00
  DOWNSTREAM ELEVATION(FEET) =   1455.00
```

```
  ELEVATION DIFFERENCE(FEET) =      2.00
  TC = 0.393*[(  160.00**3)/(     2.00)]**.2 =    7.182
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.790
  SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .8386
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.65
  TOTAL AREA(ACRES) =      0.52   TOTAL RUNOFF(CFS) =      1.65

****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1455.00  DOWNSTREAM(FEET) =   1454.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   530.00   CHANNEL SLOPE =  0.0019
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.65
  FLOW VELOCITY(FEET/SEC) =   0.72 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  12.29   Tc(MIN.) =   19.47
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =     690.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    602.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.520
  SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .8136
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    3.14   SUBAREA RUNOFF(CFS) =    6.44
  TOTAL AREA(ACRES) =       3.7   TOTAL RUNOFF(CFS) =       8.09
  TC(MIN.) =   19.47

****************************************************************************
  FLOW PROCESS FROM NODE    700.00 TO NODE    701.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH POOR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   250.00
  UPSTREAM ELEVATION(FEET) =   1455.00
  DOWNSTREAM ELEVATION(FEET) =   1453.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  TC = 0.533*[(  250.00**3)/(     2.00)]**.2 =   12.734
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.998
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7501
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.01
```

```
  TOTAL AREA(ACRES) =      0.45   TOTAL RUNOFF(CFS) =      1.01

****************************************************************************
  FLOW PROCESS FROM NODE    701.00 TO NODE    702.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1453.00  DOWNSTREAM(FEET) =   1451.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   405.00   CHANNEL SLOPE =  0.0049
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.01
  FLOW VELOCITY(FEET/SEC) =   1.06 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.39   Tc(MIN.) =   19.12
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    702.00 =     655.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    702.00 TO NODE    702.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.539
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7282
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    5.28   SUBAREA RUNOFF(CFS) =    9.76
  TOTAL AREA(ACRES) =        5.7   TOTAL RUNOFF(CFS) =      10.77
  TC(MIN.) =   19.12

****************************************************************************
  FLOW PROCESS FROM NODE    800.00 TO NODE    801.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH POOR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   250.00
  UPSTREAM ELEVATION(FEET) =   1451.50
  DOWNSTREAM ELEVATION(FEET) =   1449.50
  ELEVATION DIFFERENCE(FEET) =      2.00
  TC = 0.533*[(  250.00**3)/(     2.00)]**.2 =   12.734
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.998
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7501
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.51
  TOTAL AREA(ACRES) =      0.67   TOTAL RUNOFF(CFS) =      1.51

****************************************************************************
  FLOW PROCESS FROM NODE    801.00 TO NODE    802.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
```

```
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1449.50  DOWNSTREAM(FEET) =   1444.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1025.00   CHANNEL SLOPE =  0.0052
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.51
  FLOW VELOCITY(FEET/SEC) =   1.17 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  14.63   Tc(MIN.) =   27.36
  LONGEST FLOWPATH FROM NODE    800.00 TO NODE    802.00 =    1275.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    802.00 TO NODE    802.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.193
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7069
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    8.17   SUBAREA RUNOFF(CFS) =   12.66
  TOTAL AREA(ACRES) =        8.8   TOTAL RUNOFF(CFS) =      14.17
  TC(MIN.) =   27.36

****************************************************************************
  FLOW PROCESS FROM NODE    900.00 TO NODE    901.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  UPSTREAM ELEVATION(FEET) =   1453.80
  DOWNSTREAM ELEVATION(FEET) =   1453.50
  ELEVATION DIFFERENCE(FEET) =      0.30
  TC = 0.937*[(  300.00**3)/(     0.30)]**.2 =   36.539
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.948
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6883
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.20
  TOTAL AREA(ACRES) =      0.15   TOTAL RUNOFF(CFS) =      0.20

****************************************************************************
  FLOW PROCESS FROM NODE    901.00 TO NODE    902.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1453.50  DOWNSTREAM(FEET) =   1453.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1100.00   CHANNEL SLOPE =  0.0005
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  NOTE: CHANNEL SLOPE OF .001 WAS ASSUMED IN VELOCITY ESTIMATION
```

```
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.20
  FLOW VELOCITY(FEET/SEC) =   0.47 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =  38.65   Tc(MIN.) =   75.19
  LONGEST FLOWPATH FROM NODE    900.00 TO NODE    902.00 =    1400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    902.00 TO NODE    902.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.450
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6369
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    0.69   SUBAREA RUNOFF(CFS) =    0.64
  TOTAL AREA(ACRES) =        0.8   TOTAL RUNOFF(CFS) =       0.84
  TC(MIN.) =   75.19
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.8  TC(MIN.) =     75.19
  PEAK FLOW RATE(CFS)   =       0.84
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

Double Butte
Operation and Maintenance Plan

I. Inspection and Maintenance Log

BMP INSPECTION & MAINTENANCE LOG
DOUBLE BUTTE

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed	Date
Biofiltration Basin (BIO-1)		
Detention Basin (DET-1)		
Modular Wetland System 1 (MWS-1)		
Modular Wetland System 2 (MWS-2)		
Modular Wetland System 3 (MWS-3)		
Modular Wetland System 4 (MWS-4)		

II. Updates, Revisions, and Errata

This page is left intentionally blank to allow for updates and revisions to be added.

III. Responsibility of Maintenance

A. General

A copy of the operation and maintenance agreement has been included as an attachment to the Operation and Maintenance (O&M) Plan:

The following party is responsible for the operation and maintenance of all LID BMPs and source control BMPs within the private property at The Homestead Project:

Blue Sky Endeavors, LLC
2180 South 1300 East, Suite 600
Salt Lake City, Utah 84106

The responsible party shall serve or designate a corporate officer authorized to negotiate and execute any contracts that might be necessary for future changes to operation and maintenance of the LID BMPs or implement remedial measures if problems occur.

Employees or contractors who will report to the designated contact and are responsible for conducting Stormwater BMP operation and maintenance procedures within this document. All pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs have been included in Appendix 9.

Designated Respondent in case of off-hours maintenance problem:

_____
Designated Respondent Printed Name/Title

_____
Phone Number

Note: Updated contact information must be provided to the Permittee immediately whenever a property is sold or transferred and whenever designated individuals or contractors change.

WQMP Implementation and Funding Responsibility

This project-specific WQMP has been prepared for the Costanzo Investments by Kimley-Horn and Associates, Inc. for the Raising Cane's Temecula project. This document is intended to provide guidance for proper BMP implementation and on-going maintenance for the Project BMP facilities.

The undersigned shall be responsible for the implementation of this O&M Plan and ensure that this document is amended as appropriate to reflect up-to-date conditions at the site. The O&M plan will be reviewed by maintenance and service employees, outside contractors, or any other persons having responsibility from implementation portions of the O&M plan. At least one copy of this O&M Plan and 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 O&M Plan and WQMP. The undersigned is aware that implementation of this O&M Plan and WQMP is enforceable under the City of Temecula Water Quality Ordinance. If the undersigned transfers interest in the subject property, the undersigned shall notify the successor their responsibility to implement the O&M Plan and WQMP. It is still the responsibility of the owner to maintain the LID BMPs in accordance with the O&M Plan until that responsibility is formally transferred.

The funding source for operation and maintenance of each BMP identified in the project-specific WQMP shall be the responsibility of MJPA until responsibility is transferred. The owner/operator recognizes that a source of funding is required to support the ongoing operation and maintenance of BMPs, and that funding will continue for the life of the project. By certifying the final project specific WQMP, the Project applicant is certifying that the funding responsibilities have been addressed and will be transferred to future owners as deemed necessary.

_____

Owner's /Responsible Party Signature

_____

Owner's /Responsible Party Printed Name

_____

Owner's /Responsible Party Title or Position

_____Date

B. Staff Training Program

All staff will undergo training to learn about the stormwater treatment mechanism and proper maintenance of the LID BMPs. Training will be required for all persons responsible for maintenance of the roadside BMPs. Due to the location of the BMPs along the roadway, safety training for maintenance personnel will be required. Documentation and records of each staff (contractor or personal) member who has received training shall be recorded in the log below.

BMP STAFF TRAINING
DOUBLE BUTTE

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

Staff Name	Date	Brief Description of training received

IV. Summary of Drainage Management Areas and BMPs

The project will drain to the south/southwest to a proposed biofiltration basin at the south end of the site. High flows will overtop the water quality BMP and into the detention basin immediately adjacent. The detention basin is designed to mitigate the 2-year and 100-year peak flows for HCOC and high flow mitigation. High flows will be ultimately conveyed via pipe or surface flow to the detention basin in the southwest corner of the site before outfall to the RCFCD channel.

Offsite flows that are not diverted through the Biofiltration Basin will be treated with Modular Wetland System units. These systems will be placed in the proper downstream locations so to capture and treat all flow not treated by other means.

After treatment, all flows will discharge in the RCFCD channel running westerly along the southern border of the site.

V. Stormwater BMP Design Documentation

This section of the O&M Manual is designated for As-Builts of each stormwater BMP and Manufacturer's data, manuals and maintenance requirements.

VI. Maintenance Schedule or Matrix

A. Maintenance Schedule for each Facility with Specific requirements

Pervious/Landscaped Areas: Open space areas shall be kept free of trash and debris. All trimming, pruning, and removal of fallen organic material from plants, shrubs, and trees are to be collected per an established landscape maintenance plan and disposed in the appropriate location or transported to a green-waste collection facility. The planting materials are to remain as indicated on the approved set of landscape planting plans. Additional actions should be taken to ensure that the surface flow paths, storm drain outlet and inlet in the area are cleared of debris or vegetation obstructions.

Pavement: Impervious areas draining to the project BMPs shall be kept free of trash, debris, and other environmentally hazardous material at all times. Remove and dispose of these materials immediately.

Irrigation Systems: Water conservation is to be maintained at all times per the approved irrigation plans. Monitoring of the irrigation system should be provided at least twice monthly or as necessary to ensure that appropriate watering levels are maintained as well as to verify that no piping or irrigation heads are leaking. Any debris, sediment, mineral and grit deposits should be removed from the irrigation system at regular intervals to provide consistent watering.

Storm Drain System: Inlets, outlets, cleanouts, manholes, and pipelines are to be inspected quarterly and after each storm event or according to an existing maintenance program. All parts of the system are to be periodically cleaned to ensure that the system works properly during any storm event. All hardscape, landscape, parking, and driveway areas shall be kept clean, sanitary and free from any accumulation of debris, sediments and waste materials that could enter the storm drain system.

Bioretention facility: The Bioretention Facility area shall be inspected for erosion, dead vegetation, soggy soils, or standing water. The use of fertilizers and pesticides on the plants inside the Infiltration Facility should be minimized. Keep adjacent landscape areas maintained, remove clippings from landscape maintenance activities, remove trash and debris, replace damaged grass and/or plants, and replace surface mulch/cobble as needed to maintain a 2 to 3-inch soil cover. Facilities should be inspected for ponding after storm events.

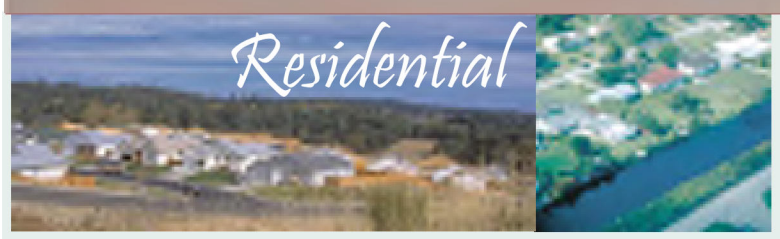
BMP Maintenance Matrix

BMP Requiring Maintenance	Responsible Party	Visual Inspection Frequency	Inspection Location	Maintenance Frequency	Maintenance Requirements
Pervious/Landscaped Areas	Owner	Twice Monthly or according to an established maintenance schedule.	Throughout the pervious cover areas.	At least twice monthly or according to the established maintenance schedule	(See above)
Irrigation Systems	Owner	Twice Monthly or according to an established maintenance schedule.	Throughout the landscaped areas within site.	As necessary based on observations made during inspection or per maintenance schedule.	(See above)
Storm Drain System	Owner	Quarterly and after storms.	Locations are identified in the WQMP Appendix 2.	As necessary based on observations made during inspection.	(See above)
Pavement	Owner	Weekly or according to an established maintenance schedule.	Parking Lot.	At least twice monthly or immediately following the visual observation of any adverse conditions.	(See above)
Biofiltration Facility	Owner	Twice Monthly and after storm events, or according to an established maintenance schedule.	Location shown on the WQMP site plan in Appendix 1.	Twice Monthly and after storm events, or according to an established maintenance schedule.	(See above)
Modular Wetland Systems	Owner	Twice Monthly and after storm events, or according to an established maintenance schedule.	Location shown on the WQMP site plan in Appendix 1.	Twice Monthly and after storm events, or according to an established maintenance schedule.	(See above)

Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information

Stormwater Pollution Solutions



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.

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.

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.

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.



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 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.



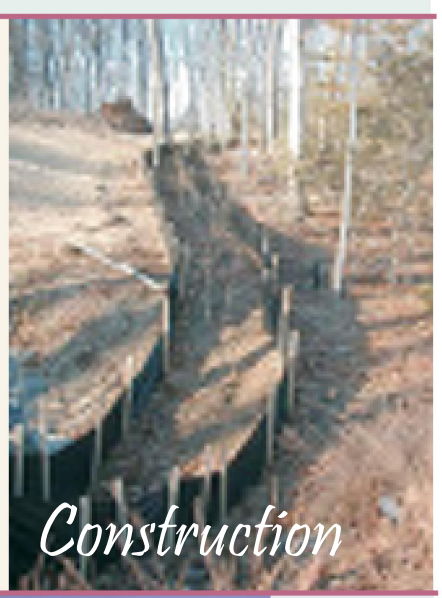
Commercial

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.

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.

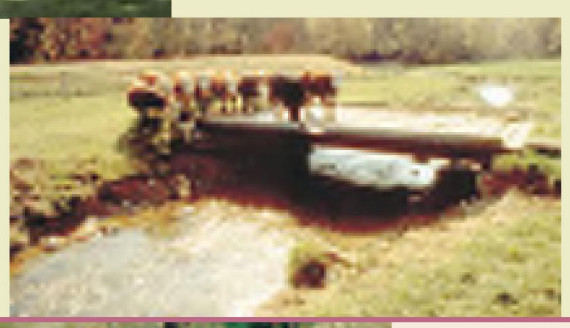
- Divert stormwater away from disturbed or exposed areas of the construction site.
- Install silt fences, vehicle mud removal areas, vegetative cover, and other sediment and erosion controls and properly maintain them, especially after rainstorms.
- Prevent soil erosion by minimizing disturbed areas during construction projects, and seed and mulch bare areas as soon as possible.



Construction

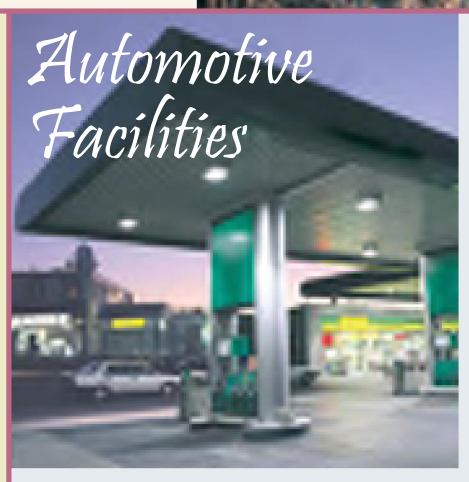


Agriculture



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.

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.

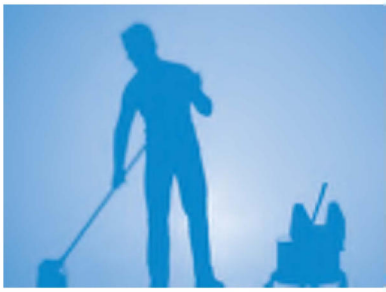
Outdoor Storage BMPs

- 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.



Landscaping and garden maintenance activities can be major contributors to water pollution. Soils, yard wastes, over-watering and garden chemicals become part of the urban runoff mix that winds its way through streets, gutters and storm drains before entering lakes, rivers, streams, etc. Urban runoff pollution contaminates water and harms aquatic life!

In Riverside County, report illegal discharges into the storm drain, call
1-800-506-2555
"Only Rain Down the Storm Drain"

Important Links:

Riverside County Household Hazardous Waste Collection Information
1-800-304-2226 or www.rivcowm.org

Riverside County Backyard Composting Program
1-800-366-SAVE

Integrated Pest Management (IPM) Solutions
www.ipm.ucdavis.edu

California Master Gardener Programs
www.mastergardeners.org
www.camastergardeners.ucdavis.edu

California Native Plant Society
www.cnps.org

The Riverside County "Only Rain Down the Storm Drain" Pollution Prevention Program gratefully acknowledges Orange County's Storm Water Program for their contribution to this brochure.

...Only Rain Down ...the Storm Drain

What you should know for... Landscape and Gardening

Best Management tips for:

- Professionals
- Novices
- Landscapers
- Gardeners
- Cultivators



Tips for Landscape & Gardening

This brochure will help you to get the most of your lawn and gardening efforts and keep our waterways clean. Clean waterways provide recreation, establish thriving fish habitats, secure safe sanctuaries for wildlife, and add beauty to our communities. NEVER allow gardening products or waste water to enter the street, gutter or storm drain.

General Landscaping Tips

- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Prevent erosion of slopes by planting fast-growing, dense ground covering plants. These will shield and bind the soil.



- Plant native vegetation to reduce the amount of water, fertilizers and pesticides applied to the landscape.
- Never apply pesticides or fertilizers when rain is predicted within the next 48 hours.

Garden & Lawn Maintenance

- Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro-spray systems. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.



- Consider recycling your green waste and adding "nature's own fertilizer" to your lawn or garden.
- Read labels and use only as directed. Do not over-apply pesticides or fertilizers. Apply to spots as needed, rather than blanketing an entire area.
- Store pesticides, fertilizers and other chemicals in a dry covered area to prevent exposure that may result in the deterioration of containers and packaging.
- Rinse empty pesticide containers and re-use rinse water as you would use the product. Do not dump rinse water down storm drains or sewers. Dispose of empty containers in the trash.
- When available, use non-toxic alternatives to traditional pesticides, and use pesticides specifically designed to control the pest you are targeting.
- Try natural long-term common sense solutions first. Integrated Pest Management (IPM) can provide landscaping guidance and solutions, such as:
  - **Physical Controls** - Try hand picking, barriers, traps or caulking holes to control weeds and pests.
  - **Biological Controls** - Use predatory insects to control harmful pests.
  - **Chemical Controls** - Check out www.ipm.ucdavis.edu before using chemicals. Remember, all chemicals should be used cautiously and in moderation.
- If fertilizer is spilled, sweep up the spill before irrigating. If the spill is liquid, apply an absorbent material such as cat litter, and then sweep it up and dispose of it in the trash.
- Take unwanted pesticides to a Household Waste Collection Center to be recycled.
- *Dumping toxics into the street, gutter or storm drain is illegal!*

www.bewaterwise.com Great water conservation tips and drought tolerant garden designs.

www.ourwaterourworld.com Learn how to safely manage home and garden pests.

Additional information can also be found on the back of this brochure.

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

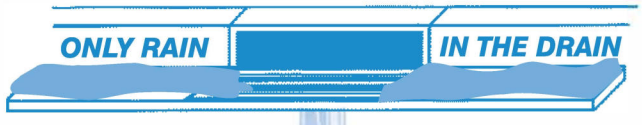


Storm drain pollution prevention information for:

- 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?

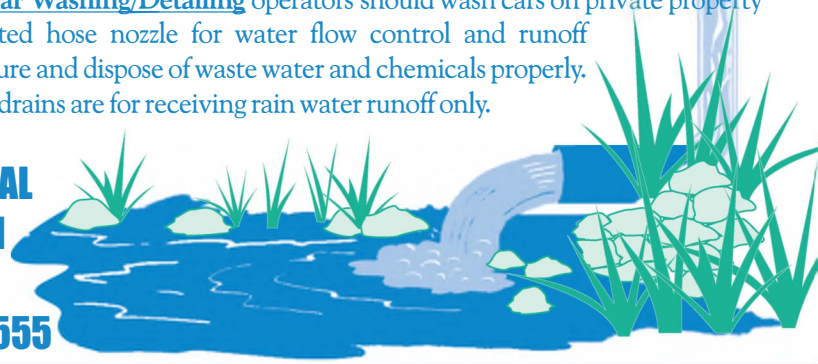
Storm drains are NOT connected to sanitary sewer systems and treatment plants!



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.

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.

CASQA California Stormwater Quality Association

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

Landscape Maintenance SC-73



Objectives

- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

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

Description

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

Approach

Pollution Prevention

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

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

Suggested Protocols

Mowing, Trimming, and Weeding

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

Planting

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

Waste Management

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

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

Irrigation

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

Fertilizer and Pesticide Management

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

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

Inspection

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

Training

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

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

Spill Response and Prevention

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

Other Considerations

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

Requirements

Costs

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

Maintenance

Not applicable

Supplemental Information

Further Detail of the BMP

Waste Management

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

Contractors and Other Pesticide Users

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

References and Resources

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

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

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

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

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

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

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.

- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Redeveloping Existing Installations

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

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

Other Resources

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

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

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

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