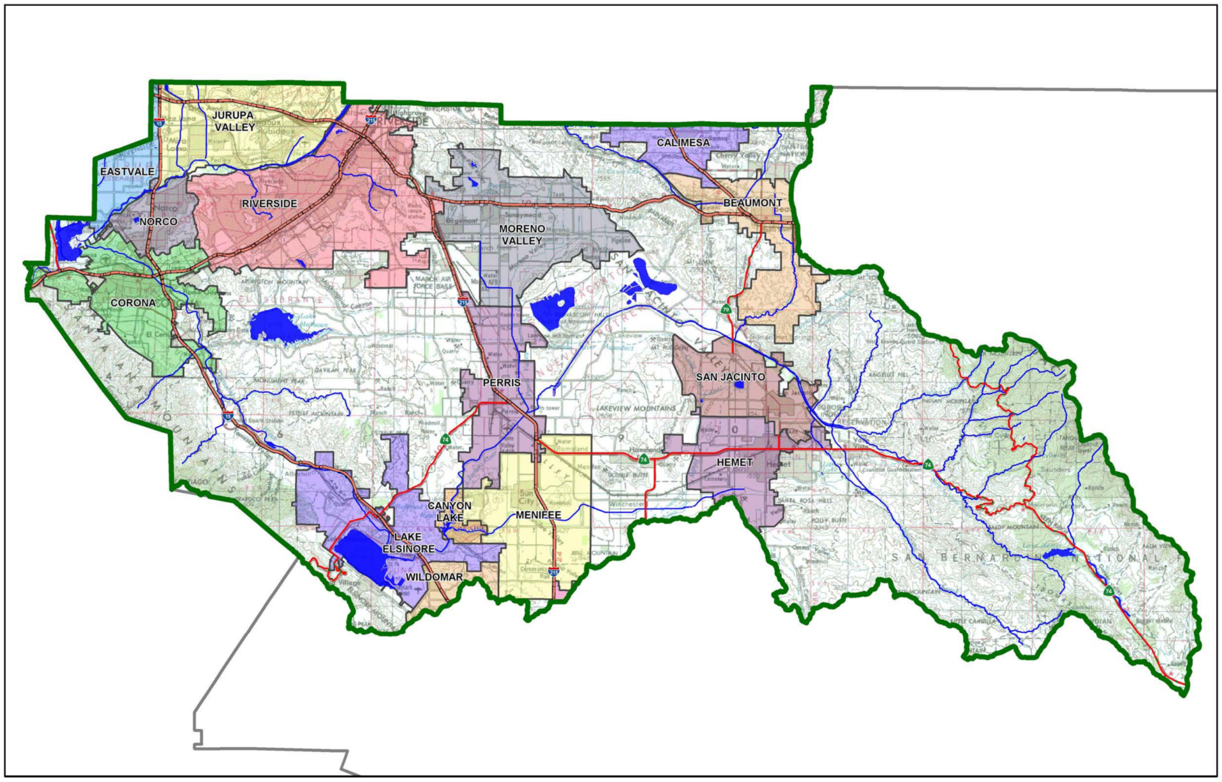
Project Specific Water Quality Management Plan

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

Project Title: South of Iris

Development No: PEN22-0XXX/0XXX

Design Review/Case No: LWQ22-00XX



☒ **Preliminary**
☐ **Final**

Original Date Prepared: April 25, 2022

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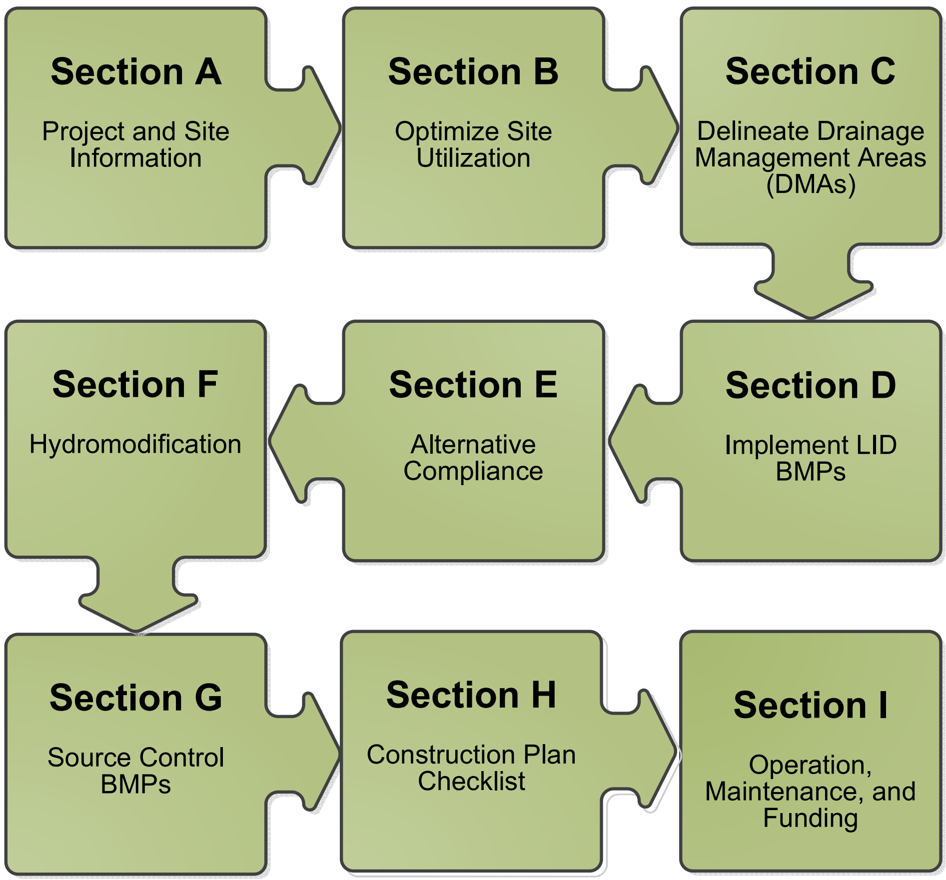
A Brief Introduction

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



OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for Patton Development by GreenbergFarrow for the South of Iris project.

This WQMP is intended to comply with the requirements of the City of Moreno Valley for Ordinance 827 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 Moreno Valley Water Quality Ordinance 827 (Municipal Code Section 8.10, 8.21).

"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
Michael Patton	President
Owner's Printed Name	Owner's Title/Position

PREPARER'S CERTIFICATION

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

______________________________	______________________________
Preparer's Signature	Date
______________________________	______________________________
Preparer's Printed Name	Preparer's Title/Position

Preparer's Licensure:

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Section A: Project and Site Information

PROJECT INFORMATION		
Type of Project:	Residential	
Planning Area:		
Community Name:		
Development Name:	South of Iris	
PROJECT LOCATION		
Latitude & Longitude (DMS): 33°53'11.45"N, 117°13'59.84"W		
Project Watershed and Sub-Watershed: Santa Ana River Watershed, San Jacinto Valley HU, Perris HA, Perris Valley HSA		
Gross Acres: 9.42		
APN(s): 316030002, 316030018, 316030019		
Map Book and Page No.: MB 35/52, MB 8/21		
PROJECT CHARACTERISTICS		
Proposed or Potential Land Use(s)		Residential
Proposed or Potential SIC Code(s)		None
Area of Impervious Project Footprint (SF)		231,768 SF
Total Area of <u>proposed</u> Impervious Surfaces within the Project Footprint (SF)/or Replacement		231,768 SF
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 <u>existing</u> Impervious Surfaces within the Project limits Footprint (SF)		406,223 SF
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)		A
What is the Water Quality Design Storm Depth for the project?		0.65

The project is located across APNs 316030002, 316030018, and 316030019 at the southeast corner of Iris Avenue and Indian Street as shown in Appendix A. The existing 9.33-acre site consists of residential tracts. It generally slopes from northeast to southwest at a gradient of approximately 0.8%. No existing underground storm drain facilities exist near the site that are tributary to the project. The site is bordered by Iris Avenue to the north, Indian Street to the west, Goya Avenue to the south, and Residential development to the east. Iris Avenue and Indian Street are existing improved streets. Goya Avenue is an existing dirt road and is part of street improvements at 0.39-acre and street improvements for the southern portion of Iris Avenue at 0.37-acre for the residential tracts site.

The developed site will be a residential complex with an open space dog park. The site will be graded to generally follow the existing condition drainage patterns to minimize adverse effects to the current topography and minimize the use of import soil. Runoff for the onsite area (Subarea 100) will flow through proposed underground storm drain system which lead to the proposed retention basin located at the southwest corner of the site. The north portion of the offsite runoff from Goya Avenue (Subarea 201) will also be collected via curb inlet and directed to the proposed underground storm drain system which connects to an existing drop inlet on Indian Street. Iris Avenue drainage will drain along the proposed curb and gutter and travel west into an existing curb inlet at the intersection of Iris Avenue and Indian Street.

The basin and storm drain curb inlet will ensure the project detains up to the 100-year stormwater volume exceeding the pre-developed condition while restricting outflow up to the 100-year pre-developed flow rate for the proposed onsite development only. The basin will both detain and infiltrate the project's onsite runoff as no underground storm drain facilities exist near the site.

The basin will operate as a hybrid: it will detain and infiltrate onsite flows for the storm events specified herein while also acting as an infiltration basin to treat the project's runoff. While the hybrid basin will be 5' deep with 1' of freeboard, it will act as an infiltration basin for only the first 2.8' of runoff depth as determined by the BMP calculation sheets herein. The basin will only store runoff in excess of this in order to attenuate runoff to the pre-development condition.

Offsite runoff for Goya Avenue will be treated by proposed curb inlet with an outlet pipe connecting to the existing storm drain inlet west of the project along Indian Street, adjacent to the street right of way. Goya Avenue runoff will be conveyed to these curb inlets through an outlet storm drain pipe into an existing storm drain inlet, pipe sized to treat the water quality volume only. See WQMP Site Plan for locations.

A parkway drain will also be used to convey some of the runoff from the basin to Goya Avenue while restricting flow volumes and flow rates to the predevelopment condition. This water will then flow through the newly developed Goya Avenue along the property frontage and proposed curb inlet which connects to the existing storm drain inlet along Indian Street to the west of the site. For storm events exceeding the capacity of the parkway drain, an emergency overflow weir structure will allow excess runoff to flow over the parkway drain and sidewalk into Goya Avenue.

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
Perris North	None	NONE	N/A
San Jacinto River Reach 3	None	AGR, GWR, MUN, REC1, REC2, WARM, WILD	N/A
San Jacinto River Reach 2 / Canyon Lake (Railroad Canyon Reservoir)	Nutrients	AGR, GWR, WILD, MUN, REC1, REC2, WARM	N/A
San Jacinto River Reach 1	None	AGR, GWR, MUN, REC1, REC2, WARM, WILD	N/A
Lake Elsinore	DDT, Nutrients, Organic Enrichment/Low Dissolved Oxygen, PCBs, Toxicity	MUN, REC1, REC2, WARM, WILD	N/A

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)* Grading & Building	☒ 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?
Yes. The existing topography generally flows to the southwest corner of the project boundary. The proposed grading follows this drainage pattern to gather stormwater in a basin at the southwest corner of the site.

Did you identify and protect existing vegetation? If so, how? If not, why?
No. The existing site is vacant with grasses, weeds, brush, and some barren areas with exposed gravelly soils. Most of the project area will be disturbed during construction and existing vegetation will be removed. The proposed development will construct landscape areas with drought-tolerant vegetation.

Did you identify and preserve natural infiltration capacity? If so, how? If not, why?
Yes. The site's natural infiltration capacity is being utilized in the proposed water quality basin as the primary treatment measure.

Did you identify and minimize impervious area? If so, how? If not, why?
Yes. Open space dog park is provided approximate centered of the site. Pervious areas are also provided around the residences, in landscape island, and at the water quality basin.
Did you identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?
Yes. Runoff from impervious surfaces has been directed to the onsite storm drains, which outlet to the onsite basin for infiltration.

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)[12]	Area (Sq. Ft.)	DMA Type
DMA-1 Residential	Ornamental Landscaping	24,075	D
DMA-2 Residential	Concrete or Asphalt	5,674	D
DMA-3 Residential	Concrete or Asphalt	22,096	D
DMA-4 Residential	Ornamental Landscaping	13,070	D
DMA-5 Residential	Ornamental Landscaping	23,523	D
DMA-6 Residential	Concrete or Asphalt	7,883	D
DMA-7 Residential	Concrete or Asphalt	14,442	D
DMA-8 Residential	Ornamental Landscaping	22,954	D
DMA-9 Residential	Ornamental Landscaping	4,522	D
DMA-10 Residential	Concrete or Asphalt	22,679	D
DMA-11 Residential	Ornamental Landscaping	22,952	D
DMA-12 Residential	Ornamental Landscaping	5,269	D
DMA-13 Residential	Ornamental Landscaping	6,661	D
DMA-14 Residential	Concrete or Asphalt	22,730	D
DMA-15 Open Space	Ornamental Landscaping	22,953	D
DMA-16 Residential	Ornamental Landscaping	5,292	D
DMA-17 Residential	Concrete or Asphalt	5,294	D
DMA-18 Residential	Ornamental Landscaping	10,096	D
DMA-19 Residential	Ornamental Landscaping	25,016	D
DMA-20 Residential	Concrete or Asphalt	16,399	D
DMA-21 Residential	Concrete or Asphalt	17,335	D
DMA-22 Residential	Ornamental Landscaping	24,075	D
DMA-23 Residential	Ornamental Landscaping	5,674	D
DMA-24 Residential	Concrete or Asphalt	22,096	D
DMA-25 Residential	Concrete or Asphalt	13,070	D
DMA-26 Residential	Ornamental Landscaping	23,523	D
DMA-27 Residential	Ornamental Landscaping	7,883	D
DMA-30 Goya Ave	Mixed Surface Types	14,442	D
DMA-31 Iris Ave	Mixed Surface Types	22,954	D

[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)

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)	Storm Depth (inches)	DMA Name / ID	[C] from Table C.4 =	Required Retention Depth (inches)
		[A]	[B]		[C]	[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)	Post-project surface type	Impervious fraction	Product	DMA name /ID	Area (square feet)	Ratio
	[A]		[B]	[C] = [A] x [B]		[D]	[C]/[D]

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

DMA Name or ID	BMP Name or ID
DMA-1 Residential	Drop inlet to DMA-27
DMA-2 Residential	Curb Inlet to DMA-27
DMA-3 Residential	Curb Inlet to DMA-27
DMA-4 Residential	Drop inlet to DMA-27
DMA-5 Residential	Drop inlet to DMA-27
DMA-6 Residential	Curb Inlet to DMA-27
DMA-7 Residential	Curb Inlet to DMA-27
DMA-8 Residential	Drop inlet to DMA-27
DMA-9 Residential	Drop inlet to DMA-27
DMA-10 Residential	Curb Inlet to DMA-27
DMA-11 Residential	Drop inlet to DMA-27
DMA-12 Residential	Drop inlet to DMA-27
DMA-13 Residential	Drop inlet to DMA-27
DMA-14 Residential	Curb Inlet to DMA-27
DMA-15 Open Space	Drain to DMA-14
DMA-16 Residential	Drop inlet to DMA-27
DMA-17 Residential	Curb Inlet to DMA-27
DMA-18 Residential	Drop inlet to DMA-27
DMA-19 Residential	Drop inlet to DMA-27
DMA-20 Residential	Curb Inlet to DMA-27
DMA-21 Residential	Curb Inlet to DMA-27
DMA-22 Residential	Drop inlet to DMA-27
DMA-23 Residential	Drop inlet to DMA-27
DMA-24 Residential	Curb Inlet to DMA-27
DMA-25 Residential	Curb Inlet to DMA-27
DMA-26 Residential	Drain to DMA-24
DMA-27 Residential	Infiltration Basin
DMA-30 Goya Ave	Curb Inlet to Existing Drop Inlet on Indian St
DMA-31 Iris Ave	Existing Curb Inlet at Iris & Indian St

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

Section D: Implement LID BMPs

D.1 Infiltration Applicability

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

If yes has been checked, Infiltration BMPs shall not be used for the site; 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 D.1 Infiltration Feasibility

Does the project site…	YES	NO
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		X
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet of a water supply well?		X
If Yes, list affected DMAs:		
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?		X
If Yes, list affected DMAs:		
…have measured in-situ infiltration rates of less than 1.6 inches / hour?	N/A	
Describe here: The infiltration testing results at a maximum 0.55 in/hr at 5ft and 0.67 in/hr at 10ft		
If Yes, list affected DMAs:		
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?		X
If Yes, list affected DMAs:		
…geotechnical report identify other site-specific factors that would preclude effective and safe infiltration?		X
Describe here:		

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

D.2 Harvest and Use Assessment

Please check what applies*:*

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

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

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

If any of the above boxes have been checked, Harvest and Use BMPs need not be assessed for the site. If 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: 4.005 acres

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

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: 5.320 acres

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: 0.60

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: 3.192 acres

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)
3.192 acres	4.005 acres

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 shutdowns or other lapses in occupancy:

Projected Number of Daily Toilet Users:

Project Type:

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:

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:

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:

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)**

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:

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:

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:

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:

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)**

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.

D.3 Bioretention and Biotreatment Assessment

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

Select one of the following:

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

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

D.4 Feasibility Assessment Summaries

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

Table D.2 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy				No LID (Alternative Compliance)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment	
DMA-1 Residential	☒	☐	☐	☐	☐
DMA-2 Residential	☒	☐	☐	☐	☐
DMA-3 Residential	☒	☐	☐	☐	☐
DMA-4 Residential	☒	☐	☐	☐	☐
DMA-5 Residential	☒	☐	☐	☐	☐
DMA-6 Residential	☒	☐	☐	☐	☐
DMA-7 Residential	☒	☐	☐	☐	☐
DMA-8 Residential	☒	☐	☐	☐	☐
DMA-9 Residential	☒	☐	☐	☐	☐
DMA-10 Residential	☒	☐	☐	☐	☐
DMA-11 Residential	☒	☐	☐	☐	☐
DMA-12 Residential	☒	☐	☐	☐	☐
DMA-13 Residential	☒	☐	☐	☐	☐
DMA-14 Residential	☒	☐	☐	☐	☐
DMA-15 Open Space	☒	☐	☐	☐	☐
DMA-16 Residential	☒	☐	☐	☐	☐
DMA-17 Residential	☒	☐	☐	☐	☐
DMA-18 Residential	☒	☐	☐	☐	☐
DMA-19 Residential	☒	☐	☐	☐	☐
DMA-20 Residential	☒	☐	☐	☐	☐
DMA-21 Residential	☒	☐	☐	☐	☐
DMA-22 Residential	☒	☐	☐	☐	☐
DMA-23 Residential	☒	☐	☐	☐	☐
DMA-24 Residential	☒	☐	☐	☐	☐
DMA-25 Residential	☒	☐	☐	☐	☐
DMA-26 Residential	☒	☐	☐	☐	☐
DMA-27 Residential	☒	☐	☐	☐	☐
DMA-30 Goya Ave	☐	☐	☐	☐	☒
DMA-31 Iris Ave	☐	☐	☐	☐	☒

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.

LID BMPs will be use used for all DMAs.

D.5 LID BMP Sizing

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

Table D.3 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Infiltration Basin*		
	[A]		[B]	[C]	[A] x [C]	*Design Storm Depth (in)*	*Design Capture Volume,* V_{BMP} *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA-1 Residential	24,075	Ornamental Landscaping	*0.1*	*0.11*	*2867.8*			
DMA-2 Residential	5,674	Concrete or Asphalt	*1.0*	*0.89*	*4414.5*			
DMA-3 Residential	22,096	Concrete or Asphalt	*1.0*	*0.89*	*4414.5*			
DMA-4 Residential	13,070	Ornamental Landscaping	*0.1*	*0.11*	*2611.3*			
DMA-5 Residential	23,523	Ornamental Landscaping	*0.1*	*0.11*	*2659.3*			
DMA-6 Residential	7,883	Concrete or Asphalt	1.0	*0.89*	*4278*			
DMA-7 Residential	14,442	Concrete or Asphalt	1.0	*0.89*	*7620.4*			
DMA-8 Residential	22,954	Ornamental Landscaping	*0.1*	*0.11*	*2440.3*			
DMA-9 Residential	4,522	Ornamental Landscaping	*0.1*	*0.11*	*2659.3*			
DMA-10 Residential	22,679	Concrete or Asphalt	1.0	*0.89*	*5061.2*			
DMA-11 Residential	22,952	Ornamental Landscaping	*0.1*	*0.11*	*2440.7*			
DMA-12 Residential	5,269	Ornamental Landscaping	*0.1*	*0.11*	*1443.7*			
DMA-13 Residential	6,661	Ornamental Landscaping	*0.1*	*0.11*	*2598.3*			
DMA-14 Residential	22,730	Concrete or Asphalt	1.0	*0.89*	*7031.6*			
DMA-15 Open Space	22,953	Ornamental Landscaping	*0.1*	*0.11*	*1595.2*			

DMA-16 Residential	5,292	Ornamental Landscaping	*0.1*	*0.11*	*2535.5*			
DMA-17 Residential	5,294	Concrete or Asphalt	1.0	*0.89*	*4033.6*			
DMA-18 Residential	10,096	Ornamental Landscaping	*0.1*	*0.11*	*2505.1*			
DMA-19 Residential	25,016	Ornamental Landscaping	*0.1*	*0.11*	*2535.2*			
DMA-20 Residential	16,399	Concrete or Asphalt	1.0	*0.89*	*4699.9*			
DMA-21 Residential	17,335	Concrete or Asphalt	1.0	*0.89*	*5941.6*			
DMA-22 Residential	24,075	Ornamental Landscaping	*0.1*	*0.11*	*2510.7*			
DMA-23 Residential	5,674	Ornamental Landscaping	*0.1*	*0.11*	*2535.3*			
DMA-24 Residential	22,096	Concrete or Asphalt	1.0	*0.89*	*4720.5*			
DMA-25 Residential	13,070	Concrete or Asphalt	*1.0*	*0.89*	*4722.2*			
DMA-26 Residential	23,523	Ornamental Landscaping	*0.1*	*0.89*	*1115.2*			
DMA-27 Residential	7,883	Ornamental Landscaping	0.1	*0.11*	*2763.2*			
	406190				*94754.1*	0.65	5132.5	81486

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Section E: Alternative Compliance (LID Waiver Program)

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

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

\- *Or* -

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

E.1 Identify Pollutants of Concern

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

Table E.1 Potential Pollutants by Land Use Type

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

P = Potential

N = Not Potential

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

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

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

(4) Specifically petroleum hydrocarbons

(5) Specifically solvents

(6) Bacterial indicators are routinely detected in pavement runoff

E.2 Stormwater Credits

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

Table E.2 Water Quality Credits

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

[1]Cannot Exceed 50%
[2]Obtain corresponding data from Table 3-8 in the WQMP Guidance Document

E.3 Sizing Criteria

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

Table E.3 Treatment Control BMP Sizing

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Area x Runoff Factor		*N/A*		
	[A]		[B]	[C]	[A] x [C]				
N/A						*Design Storm Depth (in)*	*Minimum Design Capture Volume or Design Flow Rate (cubic feet or cfs)*	*Total Storm Water Credit % Reduction*	*Proposed Volume or Flow on Plans (cubic feet or cfs)*
	$A_T = \Sigma[A]$				Σ= [D]	[E]	$[F] = \frac{[D]x[E]}{[G]}$	[F] X (1-[H])	[I]

[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

E.4 Treatment Control BMP Selection

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

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

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

Table E.4 Treatment Control BMP Selection

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

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

Section F: Hydromodification

F.1 Hydrologic Conditions of Concern (HCOC) Analysis

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

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

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

If Yes, HCOC criteria do not apply.

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

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

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

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

Table F.1 Hydrologic Conditions of Concern Summary

	2 year – 24 hour		
	Pre-condition	**Post-condition**	**% Difference**
Time of Concentration			
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:

While the project's runoff will infiltrate runoff up to and including the 100-year storm event in the infiltration basin, any excess runoff will overflow through an emergency overflow parkway drain and then enter the storm drain in Iris Avenue. The runoff will then enter the Kitching Street Channel, which then joins the Perris Valley Channel. It will then flow into the San Jacinto River and outlet into Canyon Lake.

F.2 HCOC Mitigation

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

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

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

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

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

Note: The project site is also exempt from HCOC per the HCOC Applicability Map.

Section G: Source Control BMPs

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

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

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

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

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

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
A. On-site storm drain inlets	Locations of inlets. Install storm drain markers "Only Rain Down the Drain / Drains to Lake"	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."
D2. Landscape/ Outdoor Pesticide Use	Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained. Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.) 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.	Maintain landscaping using minimum or no pesticides.

	To ensure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	
E. Pools, spas, ponds, decorative fountains, and other water features.	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/
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. 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
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 berm 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/	
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
Miscellaneous Drain or Wash Water or Other Sources Rooftop Equipment Roofing, gutters, and trim.	Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment. Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	
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 wash water containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.

Section H: Construction Plan Checklist

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

Table H.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)	BMP Location (Lat/Long)
Infiltration Basin	Infiltration Basin	WQMP SITE PLAN	33.884902°/-117.233652°

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: Refer to Appendix 9 for BMP Operation and Maintenance Plan Requirements.

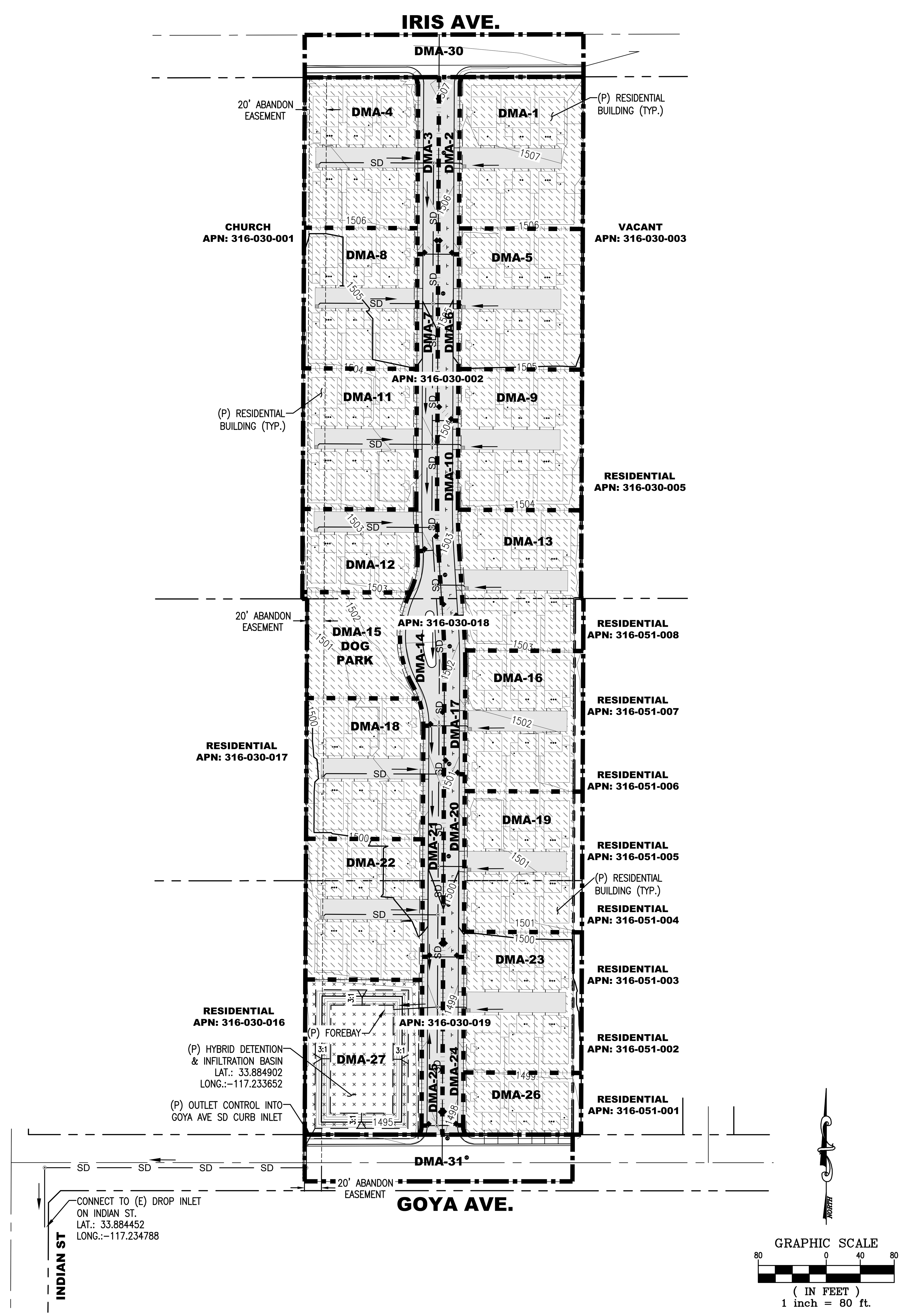
Proposed BMPs will be maintained by a Homeowners' Association (HOA) contact David Patton.

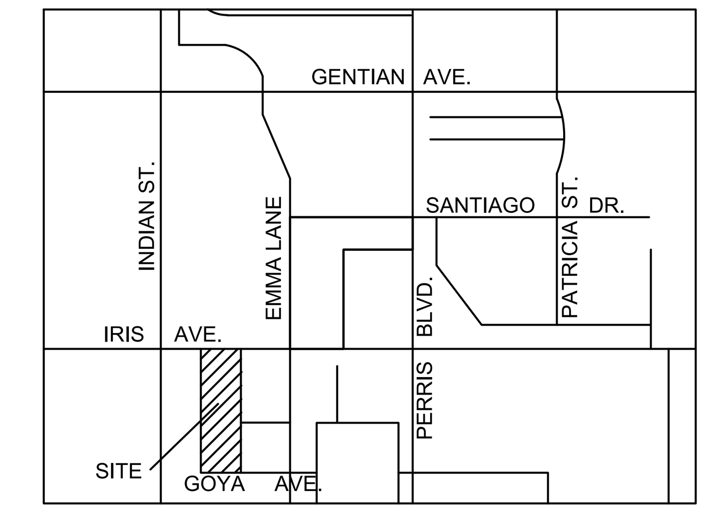
☒ Y ☐ N

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

Appendix 1:Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map





SITE LOCATION MAP

NOT TO SCALE

LEGEND

- PROPOSED BUILDING
- PROPOSED CURB OR CURB & GUTTER
- STORM DRAIN INLET LOCATION
- SD — (P) STORM DRAIN
- DMA-1 RESIDENTIAL (MIXED SURFACE TYPES)
- DMA-2 OPEN SPACE (ORNAMENTAL LANDSCAPE)
- DMA-3 STREETS (CONCRETE OR ASPHALT)
- PROJECT BOUNDARY
- DMA — DRAINAGE MANAGEMENT AREA
- TREE LINE/VEGETATION TO REMAIN
- TREE TO REMAIN

DMAs:

DMA	IMPERVIOUS	PERVIOUS	TOTAL
1	12,919	13,044	25,963
2	4,949	0	4,949
3	4,949	0	4,949
4	12,919	10,722	23,641
5	12,919	11,156	24,075
6	4,796	0	4,796
7	8,543	0	8,543
8	12,919	9,174	22,093
9	12,919	11,156	24,075
10	5,674	0	5,674
11	12,919	9,177	22,096
12	7,913	5,157	13,070
13	13,047	10,476	23,523
14	7,883	0	7,883
15	0	14,442	14,442
16	12,919	10,035	22,954
17	4,522	0	4,522
18	12,919	9,760	22,679
19	12,919	10,033	22,952
20	5,269	0	5,269
21	6,661	0	6,661
22	12,919	9,811	22,730
23	12,919	10,034	22,953
24	5,292	0	5,292
25	5,294	0	5,294
26	5,119	4,977	10,096
27	0	25,016	25,016
30	14,923	1,476	16,399
31	16,361	974	17,335

PEN22-XXXX/XXXX
LST22-XXXXX

UNDERGROUND SERVICE ALERT
CALL:TOLL FREE
1-800-227-2600
TWO WORKING DAYS BEFORE YOU DIG

NOTE:
WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR A GRADING PERMIT HAS BEEN ISSUED.
THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE DESIGN HEREON. IN THE EVENT OF DISCREPANCIES ARISING AFTER CITY APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE CITY.

MARK	BY	DATE	REVISIONS	APPR.	DATE
	DESIGNER			CITY	

SEAL-ENGINEER

JOB NO. 20200259.0

GreenbergFarrow
30 Executive Park, Suite 100
Irvine, CA 92614
t: 949 296 0450 f: 949 296 0479

PREPARED BY:
BAHAREH SEHATZADEH RCE C89859, EXP. 06/30/2023 DATE

BENCHMARK

CITY OF MORENO VALLEY

PATTON SOUTH OF IRIS

WQMP SITE PLAN

INITIAL DESIGN DATE: 04/12/22

FOR: W.O. CITY FILE NO.

SHEET NO. WQMP-1

OF 1 SHEET

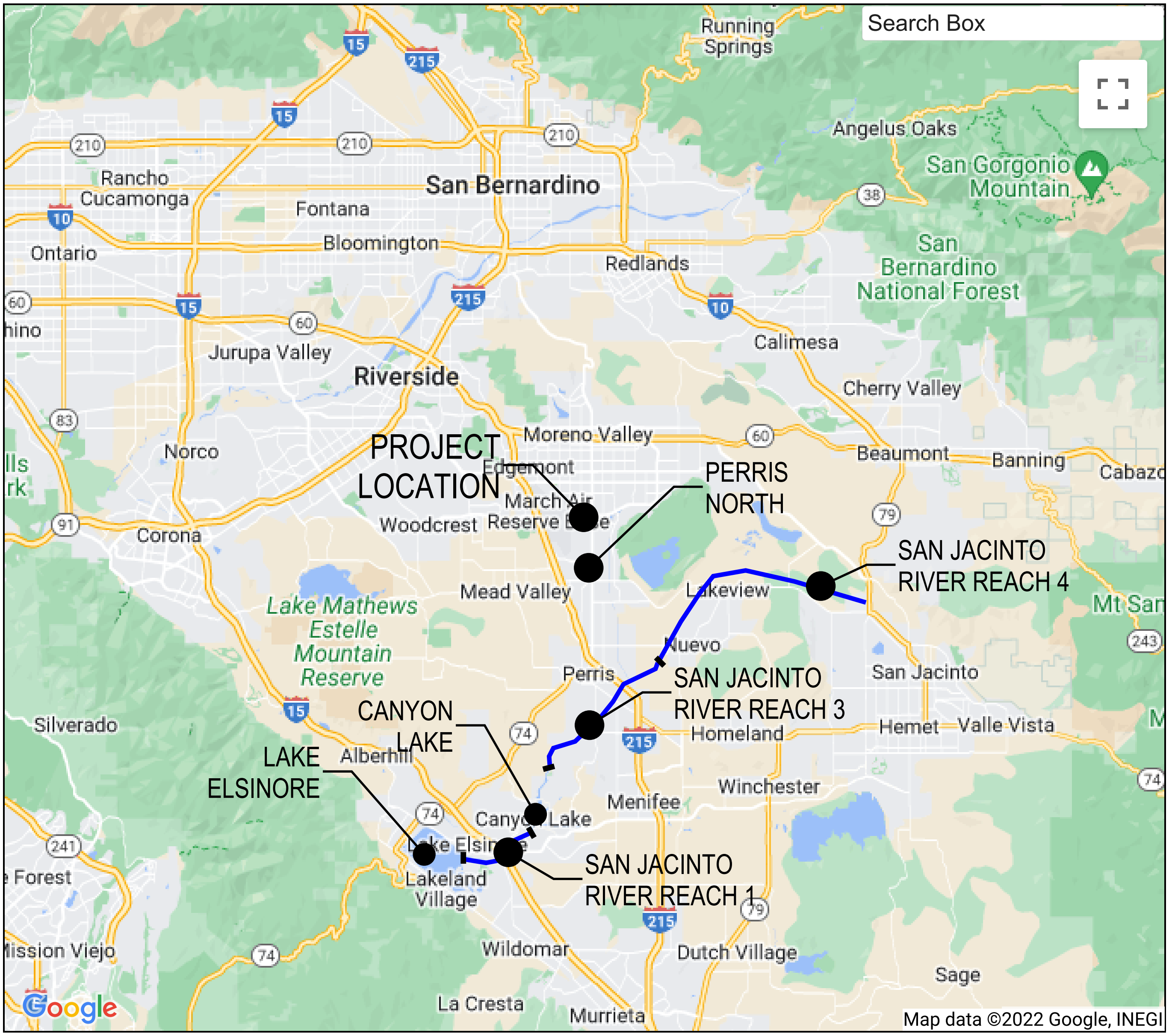
Caltrans Water Quality Planning Tool

The Water Quality Planning Tool was created to help planners and designers comply with environmental permits. It uses a map interface to find information based on a project's location. **This application is being updated for digital accessibility and will continue to function while updates are in progress.**

Layers

- ☐ 303(d) List and TMDLs 2014-2016 (Legend)
- ☐ Areas of Special Biological Significance
- ☐ Arid and Semi-Arid Regions
- ☐ Caltrans Districts
- ☐ Caltrans Facilities
- ☐ Caltrans Tier 1 Monitoring Sites
- ☐ Calwater Watersheds
- ☐ Coastal Zone
- ☐ Counties

Information
Hover over a layer name for a description. Additional information, tables, coordinates, and links are below the map.
Help



Watershed Information

CALWATER WATERSHED

Hydrologic Unit	SAN JACINTO VALLEY	Hydrologic Area	Perris	Hydrologic Sub-Area #	802.11
Hydrologic Sub-Area Name	Perris Valley	Planning Watershed	4802110000	HSA Area (acres)	106456
Latitude, Longitude	33.8864, -117.2329				

WATERSHED BOUNDARY DATASET

Watershed	Lower San Jacinto River	Subwatershed	Moreno Valley	Hydrologic Unit Code	180702020304
Average Annual Precipitation (inches)	13.06				

TMDLs & 303(d) Listed Water Bodies (2014 - 2016 List)

Key: Water body on 303(d) list Water body with a TMDL

Name	Pollutant	Size		Status
Canyon Lake (Railroad Canyon Reservoir)	Nutrients	452.68	Acres	Being addressed with USEPA approved TMDL

Water Quality Objectives

The following waterbodies are in or near HSA 802.11. Click on the waterbody to get information on water quality objectives and beneficial uses

Waterbody Name	Beneficial Uses	Sediment-Sensitive Waterbody
Anza Park Drain	MUN, REC1, REC2, SPWN, WARM, WILD	False
Bautista Creek - Headwaters to Debris Dam	AGR, COLD, GWR, MUN, REC1, REC2, WILD	False
Birch Creek - Tributaries to Birch Creek - Valley Reaches	COLD, GWR, MUN, REC1, REC2, WILD	False
Black Mountain Stream - Tributaries to Black Mountain Stream Creek	AGR, GWR, MUN, REC1, REC2, WARM, WILD	False
Black Mountain Stream - Tributary to San Jacinto River	AGR, GWR, MUN, REC1, REC2, WARM, WILD	False
Canyon Lake (Railroad Canyon Reservoir)	AGR, GWR, MUN, REC1, REC2, WARM, WILD	False
Coyote Creek (within Santa Ana Regional boundary) - San Gabriel River Drainage	MUN, REC1, REC2, WARM, WILD	False
Elsinore, Lake	ALL	False
Evans, Lake	ALL	False
Fulmore, Lake	ALL	False
Hurkey Stream - Tributaries to Black Hurkey Stream	AGR, GWR, MUN, REC1, REC2, WARM, WILD	False
Indian Hurkey Stream - Trbutary to San Jacinto River	AGR, GWR, MUN, REC1, REC2, WARM, WILD	False
Indian Stream - Tributaries to Black Indian Stream	AGR, GWR, MUN, REC1, REC2, WARM, WILD	False
Juaro Canyon Streams - Tributaries to Black Juaro Canyon Streams	AGR, GWR, MUN, REC1, REC2, WARM, WILD	False
Juaro Canyon Streams - Tributary to San Jacinto River	AGR, GWR, MUN, REC1, REC2, WARM, WILD	False
Lake Elsinore - San Jacinto River Basin	REC1, REC2, WARM, WILD	False
Lake Evans - Upper Santa Ana River Basin	COLD, REC1, REC2, WARM, WILD	False
Lake Fulmor - San Jacinto River Basin	AGR, COLD, MUN, REC1, REC2, WARM, WILD	False
Lake Lee - Upper Santa Ana River Basin	AGR, GWR, IND, REC1, REC2, WARM, WILD	False
Lake Mathews - Upper Santa Ana River Basin	AGR, GWR, IND, MUN, PROC, RARE, REC1, REC2, WARM, WILD	False
Lake Perris - San Jacinto River Basin	AGR, COLD, GWR, IND, MUN, PROC, REC1, REC2, WARM, WILD	False
Little San Gorgonio Creek - Tributaries to Little San Gorgonio Creek - Valley Reaches	COLD, GWR, MUN, REC1, REC2, WILD	False
Logan Stream - Tributaries to Logan Stream	AGR, GWR, MUN, REC1, REC2, WARM, WILD	False
Logan Stream - Tributary to San Jacinto River	AGR, GWR, MUN, REC1, REC2, WARM, WILD	False
Mathews, Lake	ALL	False
Mockingbird Reservoir	ALL	False
Mockingbird Reservoir - Upper Santa Ana River Basin	MUN, REC1, REC2, WARM, WILD	False
Oak Glen Creek - Tributaries to Oak Glen Creek - Valley Reaches	GWR, MUN, REC1, REC2, WARM, WILD	False
Offshore Zone - Water between Nearshore Zone and Limit of State Waters	COMM, IND, MAR, MUN, NAV, RARE, REC1, REC2, SPWN, WILD	False

Perris, Lake	ALL	False
Poppet Stream - Tributaries to Black Poppet Stream	AGR, GWR, MUN, REC1, REC2, WARM, WILD	False
Poppet Stream - Tributary to San Jacinto River	AGR, GWR, MUN, REC1, REC2, WARM, WILD	False
Potato Canyon Creek - Tributaries to Potato Canyon Creek - Valley Reaches	COLD, GWR, MUN, REC1, REC2, WILD	False
Protrero Creeks - Tributaries to Black Protrero Creeks	AGR, GWR, MUN, REC1, REC2, WARM, WILD	False
Protrero Creeks - Tributary to San Jacinto River	AGR, GWR, MUN, REC1, REC2, WARM, WILD	False
Salt Creek	REC1, REC2, WARM, WILD	False
San Jacinto River	ALL	False
San Jacinto River	ALL	False
San Jacinto River	ALL	False
San Jacinto River	ALL	False
San Jacinto River - Canyon Lake to Nuevo Road	AGR, GWR, REC1, REC2, WARM, WILD	False
San Jacinto River - Lake Elsinor to Canyon Lake	AGR, GWR, MUN, REC1, REC2, WARM, WILD	False
San Jacinto River Reach 4 - Nuevo Road to North-South Mid-Section Line, T4S/R1W-S8	AGR, GWR, REC1, REC2, WARM, WILD	False
San Jacinto River Reach 5 - North-South Mid-Section Line, T4S/R1W-S8, to Confluence with Poppet Cr	GWR, REC1, REC2, WARM, WILD	False
San Jacinto River Reach 5 - North-South Mid-Section Line, T4S/R1W-S8, to Confluence with Poppet Cr	AGR	False
San Jacinto River Reach 6 - Popper Creek to Cranston Bridge	AGR, GWR, MUN, REC1, REC2, WARM, WILD	False
San Jacinto River Reach 7 - Cranston Bridge to Lake Hemet	AGR, COLD, GWR, MUN, REC1, REC2, WILD	False
San Timoteo Creek Reach 2 - Gage at San Timoteo Canyon Road to Confluence with Yucaipa Creek	ALL	False
San Timoteo Creek Reach 3 - Confluence with Yucaipa Creek to Bunker Hill II Croundwater Subbaisn bondary (T2S/R3W-24_)	GWR, REC1, REC2, WARM, WILD	False
San Timoteo Creek Reach 4 - Bunker Hiil II growndwater Subbasin boundry to Confluence with little San Gorgonio and Noble Creeks (Headwaters of San Tim	GWR, REC1, REC2, WARM, WILD	False
Santa Ana River, Reach 4-Mission Blvd. In Riverside to San Jacinto Fault in San Bernardino	GWR, REC1, REC2, WARM, WILD	False
Santiago Creek Reach 3 - Irvine lake to Modjeska Canyon	REC1, WARM	False
Stone Creek	AGR, COLD, GWR, MUN, REC1, REC2, WILD	False
Strawberry Creek and San Jacinto River, North Fork	AGR, COLD, GWR, MUN, REC1, REC2, WILD	False
Sunnyslope Cahnnel	MUN, REC1, REC2, SPWN, WARM, WILD	False
Temescal Creek Reach 4 - Lee Lake to Mid-section 17 (downstream end of freeway cut) to Elsinor Grownd	AGR, GWR, RARE, REC1, REC2, WARM, WILD	False
Temescal Creek Reach 5 - Mid-section line of Section 17 (Downstream end of freeway cut) to Elsinore G	AGR, GWR, RARE, REC1, REC2, WARM, WILD	False
Temescal Creek Reach 6 - Elsinore Groundwater Subbasin Boundry to Lake Elsinor Outlet	GWR, REC1, REC2, WARM, WILD	False
Tequesquite Arroyo (Sycamore Creek)	GWR, REC1, REC2, SPWN, WARM, WILD	False
Yucaipa Creek - Tributaries to Yucaipa Creek - Valley Reaches	COLD, GWR, MUN, REC1, REC2, WILD	False

Caltrans Facilities

MAINTENANCE STATIONS **FREEWAYS AND HIGHWAYS**

Name	Address

Route	Length (miles)
60	6.9
74	12.2
215	14.1

PARK & RIDE LOTS

Name	District	County	Route	Post Mile
PIGEON PASS	8	RIV	60	14.3

REST AREAS

Name	District	County	Route	Post Mile

Additional Information

Help for the Water Quality Planning Tool

TMDL information from the SWRCB

Construction General Permit information from the SWRCB

Groundwater Depth information from the California Department of Water Resouces

R Factor erosivity calculations

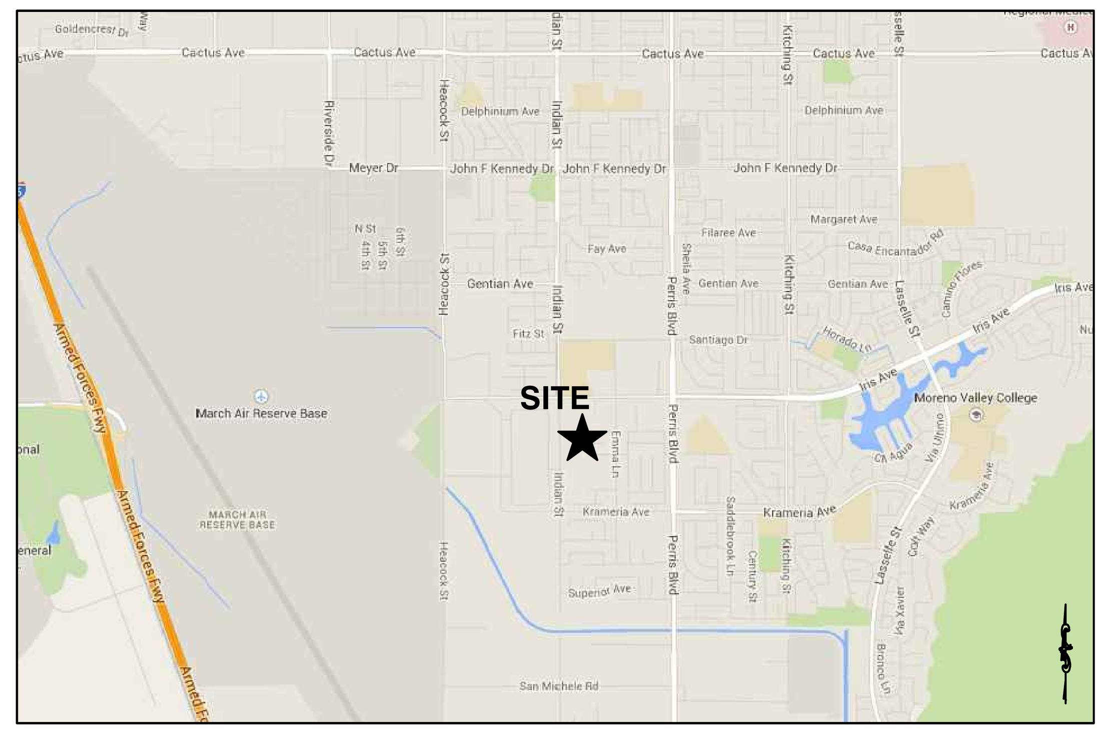
Appendix 2:Construction Plans

Grading and Drainage Plans

IN THE CITY OF MORENO VALLEY, CALIFORNIA

PRELIMINARY GRADING PLAN

PATTON SOUTH OF IRIS
NEC IRIS AVENUE AND INDIAN STREET
COUNTY OF RIVERSIDE, CALIFORNIA



VICINITY MAP
NOT TO SCALE

DEVELOPER/OWNER

SOUTH OF IRIS LLC
CONTACT: MICHAEL D. PATTON
41 CORPORATE PARK, STE. 250
IRVINE, CA 92606
T: (949) 852-0266
F: (949) 660-8906

ENGINEER

GreenbergFarrow
CONTACT: JASON PASCUAL
30 EXECUTIVE PARK, STE. 100
IRVINE, CA 92614
T: (404) 805-5238
F: (949) 296-0479

UTILITY COMPANIES:

THE CONTRACTOR SHALL NOTIFY THE FOLLOWING UTILITIES OR AGENCIES 48 HOURS PRIOR TO START OF CONSTRUCTION OR EXCAVATION.

BOX SPRINGS MUTUAL WATER COMPANY	(951) 653-6419
CHARTER SPECTRUM	(877) 906-9121
CROWN CASTLE	(855) 913-4237
EASTERN MUNICIPAL WATER DISTRICT	(951) 928-3777
EDGEMONT COMMUNITY SERVICES DISTRICT	(951) 784-2632
FRONTIER COMMUNICATION	(800) 921-8101
MORENO VALLEY SPECIAL DISTRICTS	(951) 413-3480
MORENO VALLEY UTILITY	(951) 413-3500
RIVERSIDE TRANSIT AGENCY	(951) 565-5000
SOUTHERN CA EDISON	(800) 655-4555
SOUTHERN CA GAS COMPANY	(800) 427-2200
TRAFFIC SIGNAL MAINTENANCE (CITY)	(951) 413-3140
UNDERGROUND SERVICE ALERT	(800) 422-4133
VERIZON WIRELESS	(800) 922-0204

EARTHWORK:

CUT:	12,915 CU. YD.
FILL:	4,576 CU. YD.
TOTAL:	8,339 CU. YD. <CUT>

SCHOOL DISTRICT:

VAL VERDE UNIFIED SCHOOL

FEMA FLOOD ZONE DESIGNATION:

THE SIZE IS LOCATED IN AN UNSHADED ZONE X.

TOPOGRAPHY:

KELSOE & ASSOCIATES, INC.
CONTACT: BOB KELSOE
T: (909) 890-3730

DATED: 04/2020

ASSESSOR'S PARCEL NUMBER (S):

316-030-002
316-030-018
316-030-019

SHEET INDEX

PARCEL MAP NUMBER(S):

PM NO. 9044: PM: 35/52 PARCEL 2
MB 8/21: PARCEL 7 BLOCK: 2

BASIS OF BEARINGS:

THE BEARINGS SHOWN HEREON ARE BASED ON THE CENTERLINE OF IRIS AVENUE AS SHOWN BY MAP RECORDED IN BOOK 150, PAGE 77 OF RECORDS OF SURVEY, IN THE OFFICE OF THE COUNTY RECORDER OF THE COUNTY OF RIVERSIDE, SHOWN AS NORTH 89°51'01" EAST THEREON.

LEGAL DESCRIPTION:

BEING A SURVEY OF LOTS 2 & 7, IN BLOCK 2 OF RIVERSIDE ALFALFA ACRES PER MAP RECORDED IN BOOK 8, PAGE 21 OF MAPS IN THE OFFICE OF THE COUNTY RECORDER OF THE COUNTY OF RIVERSIDE, LYING WITHIN THE NE 1/4 SEC. 30, T. 3 S., R. 3 W., S.B.B.M.

ACREAGE

ONSITE:	9.33
OFFSITE:	0.77
NET:	10.1

PEN22-XXXX/XXXX
LST22-XXXXX

GreenbergFarrow
30 Executive Park Suite 100
Irvine, CA 92614
t: 949 296 0450 f: 949 296 0479

PROJECT TEAM

ISSUE/REVISION RECORD

DATE	DESCRIPTION

PROFESSIONAL SEAL

PROFESSIONAL IN CHARGE

PROJECT MANAGER
J.PASCUAL

QUALITY CONTROL
J.PASCUAL

DRAWN BY
N.BRISENO

PROJECT NAME

PATTON
SOUTH OF IRIS

NEC IRIS AVENUE
& INDIAN STREET
MORENO VALLEY, CA

PROJECT NUMBER
20211142.0

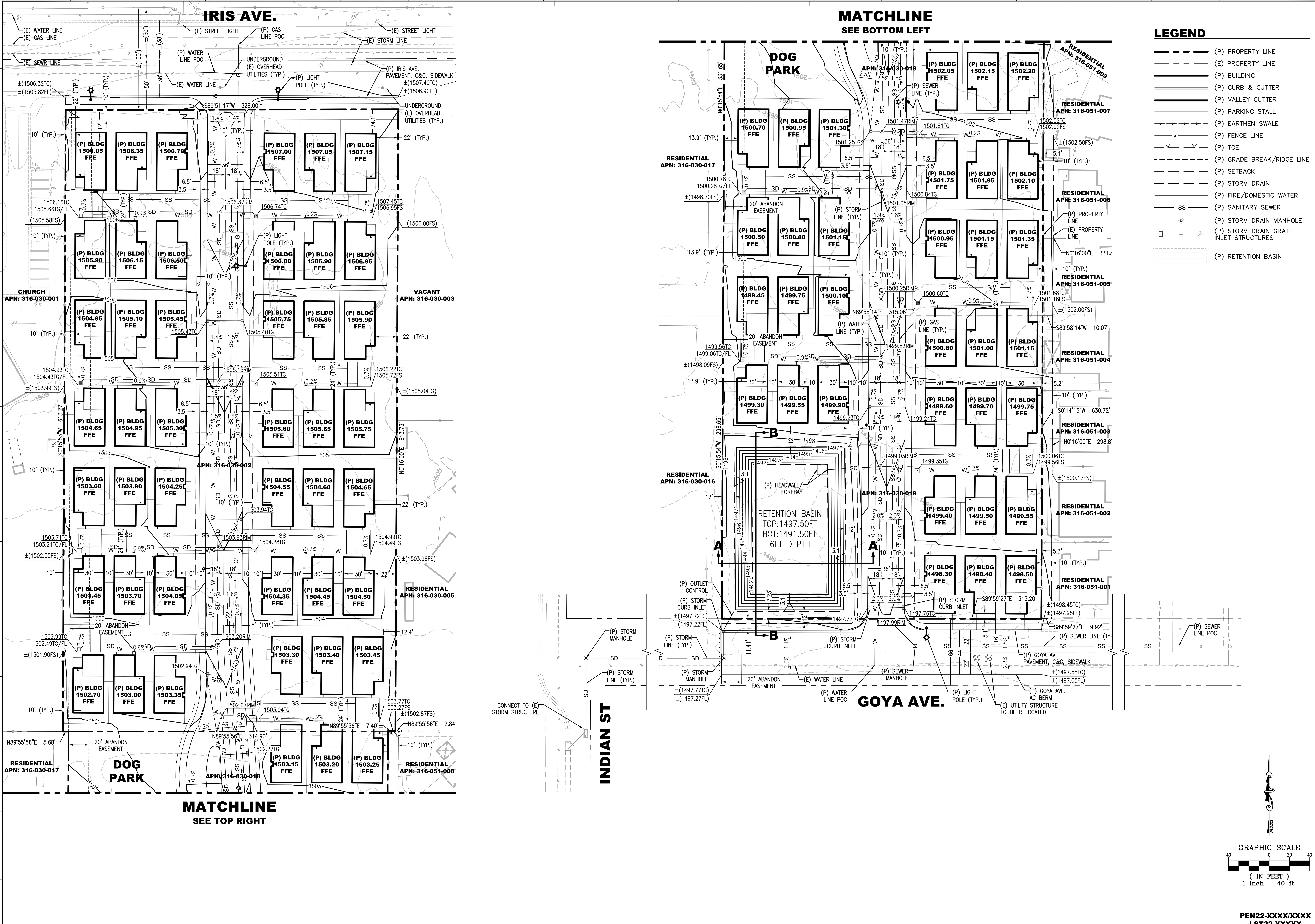
SHEET TITLE

COVER SHEET

SHEET NUMBER

1 OF 4

Revision Date: April 26, 2022



GreenbergFarrow

30 Executive Park Suite 100
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PATTON
SOUTH OF IRIS

NEC IRIS AVENUE
& INDIAN STREET
MORENO VALLEY, CA

PROJECT NUMBER
20211142.0

SHEET TITLE

PRELIMINARY GRADING

SHEET NUMBER

Revision Date: April 26, 2022

GreenbergFarrow
30 Executive Park Suite 100
Irvine, CA 92614
t: 949 296 0450 f: 949 296 0479

PROJECT TEAM

ISSUE/REVISION RECORD

DATE	DESCRIPTION

PROFESSIONAL SEAL

PROFESSIONAL IN CHARGE

PROJECT MANAGER
J.PASCUAL

QUALITY CONTROL
J.PASCUAL

DRAWN BY
N.BRISENO

PROJECT NAME

PATTON
SOUTH OF IRIS

NEC IRIS AVENUE & INDIAN STREET MORENO VALLEY, CA

PROJECT NUMBER
20211142.0

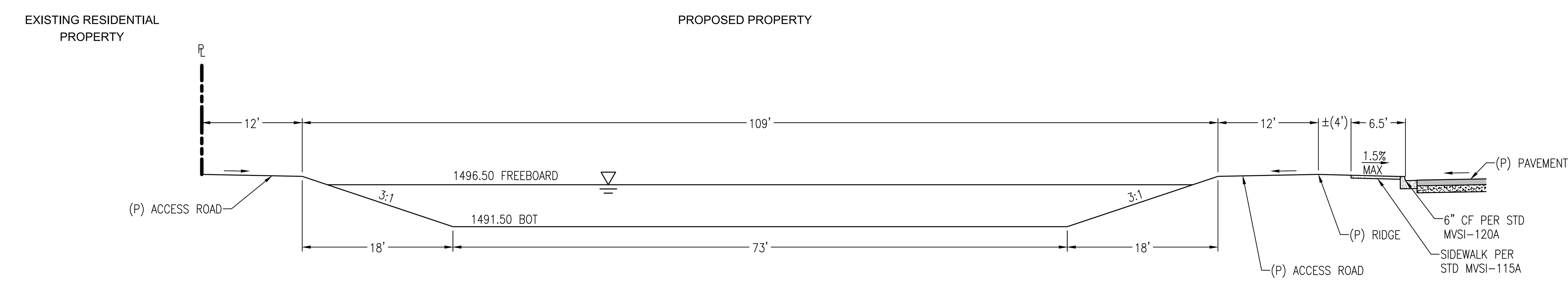
SHEET TITLE

PRELIMINARY UTILITY

SHEET NUMBER

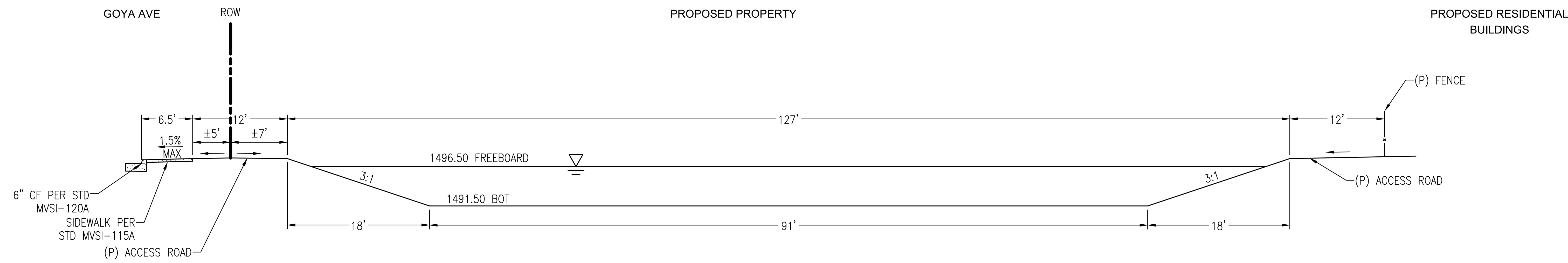
3 OF 4

Revision Date: April 21, 2022



SECTION A-A

NOT TO SCALE



SECTION B-B

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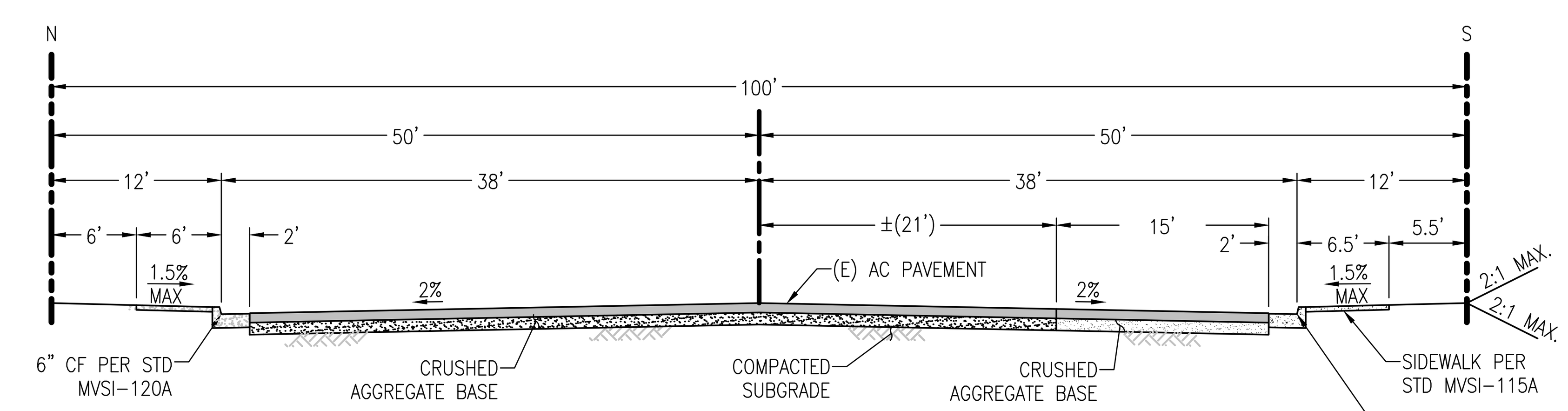
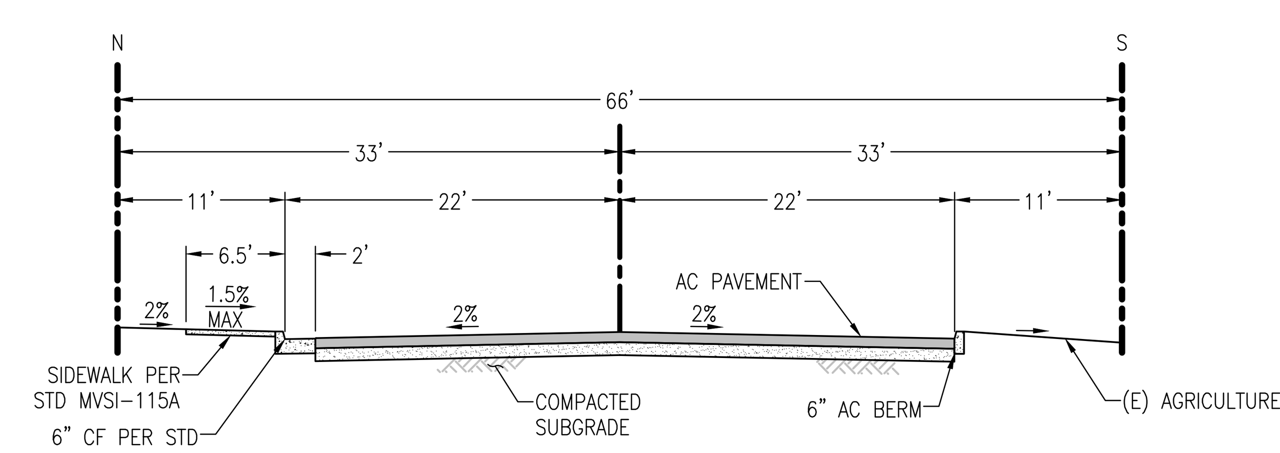


IRIS AVENUE TYPICAL SECTION

COLLECTOR PER MVSI-106B-0

EMMA LANE TO PERRIS BOULEVARD



GOYA AVENUE TYPICAL SECTION

COLLECTOR PER MVSI-106B-0

EMMA LANE TO INDIAN STREET

PEN22-XXXX/XXXX
LST22-XXXXX

GreenbergFarrow
30 Executive Park Suite 100
Irvine, CA 92614
t: 949 296 0450 f: 949 296 0479

PROJECT TEAM

ISSUE/REVISION RECORD

DATE	DESCRIPTION

PROFESSIONAL SEAL

PROFESSIONAL IN CHARGE

PROJECT MANAGER
J.PASCUAL

QUALITY CONTROL
J.PASCUAL

DRAWN BY
N.BRISENO

PROJECT NAME

PATTON
SOUTH OF IRIS

NEC IRIS AVENUE
& INDIAN STREET
MORENO VALLEY, CA

PROJECT NUMBER
20211142.0

SHEET TITLE

SECTIONS SHEET

SHEET NUMBER

4 OF 4

Revision Date: April 26, 2022

Appendix 3:Soils Information

Geotechnical Study and Other Infiltration Testing Data

GEOTECHNICAL ENGINEERING INVESTIGATION
SOUTH OF IRIS LLC
SEQ IRIS AVENUE & INDIAN STREET
MORENO VALLEY, CALIFORNIA

KA PROJECT NO. 112-22039
APRIL 25, 2022

Prepared for:

MR. MICHAEL PATTON
PATTON DEVELOPMENT
41 CORPORATE PARK #250
IRVINE, CALIFORNIA 92606

Prepared by:

KRAZAN & ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING DIVISION
1100 OLYMPIC DRIVE, STE 103
CORONA, CALIFORNIA 92881
(951) 273-1011

April 25, 2022 KA Project No. 112-22039

Mr. Michael Patton
Patton Development
41 Corporate Park #250
Irvine, CA 92606
(949) 852-0266

RE: Geotechnical Engineering Investigation
Proposed South of Iris, LLC
SEQ Iris Avenue & Indian Street
Moreno Valley, California

Dear Mr. Patton:

In accordance with your request, we have completed a Geotechnical Engineering Investigation for the above-referenced site. The results of our investigation are presented in the attached report.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (951) 273-1011.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

Jorge A. Pelayo, PE
Project Engineer
RCE No. 91269

JAP

TABLE OF CONTENTS

April 25, 2022 KA Project No. 112-22039

GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED SOUTH OF IRIS, LLC
SOUTHEAST QUADRANT OF IRIS AVENUE AND INDIAN STREET
MORENO VALLEY, CALIFORNIA

INTRODUCTION

This report presents the results of our Geotechnical Engineering Investigation for the proposed South of Iris residential development to be located in the southeast quadrant of Iris Avenue and Indian Street, in the City of Moreno Valley, California. Discussions regarding site conditions are presented herein, together with conclusions and recommendations pertaining to site preparation, Engineered Fill, utility trench backfill, drainage and landscaping, foundations, concrete floor slabs and exterior flatwork, retaining walls, soil cement reactivity, pavement design, and water infiltration rates.

A site plan showing the approximate boring locations is presented following the text of this report, the attached Site Map, Figure 1. A description of the field investigation, boring logs, and the boring log legend are presented in Appendix A. Appendix A contains a description of the laboratory testing phase of this study; along with the laboratory test results. Appendices B and C contain guides to earthwork and pavement specifications. When conflicts in the text of the report occur with the general specifications in the appendices, the recommendations in the text of the report have precedence.

PURPOSE AND SCOPE

This investigation was conducted to evaluate the soil and groundwater conditions at the subject site, to make geotechnical engineering recommendations for use in design of specific construction elements, and to provide criteria for site preparation and Engineered Fill construction.

Our scope of services was outlined in our proposal dated February 15, 2022 (KA Proposal No. G22017CAC) and included the following:

- A site reconnaissance by a member of our engineering staff to evaluate the surface conditions at the project site.

- A field investigation consisting of drilling a total of nineteen (19) borings to depths of approximately 10 to 50 feet below existing site grades for evaluation of the subsurface conditions at the project site.

- Performance of laboratory tests on representative soil samples obtained from the borings to evaluate the physical and index properties of the subsurface soils.

- Performance of four (4) water infiltration tests at the subject site in order to obtain approximate water infiltration rates for the near surface soil conditions.
- Collection of a bulk sample for laboratory testing of R-value used in our pavement design recommendations.
- Evaluation of the data obtained from the investigation and an engineering analysis to provide recommendations for use in the project design and preparation of construction specifications.
- Preparation of this report summarizing the results, conclusions, recommendations, and findings of our investigation.

PROPOSED CONSTRUCTION

We have reviewed the Site Plan, prepared by Kevin L. Crook Architect Inc. for the proposed development. The proposed development is understood to include construction of a residential development which is anticipated to consist of seventy-eight (78) residential units and one hundred and ninety-nine (199) residential parking spaces. In addition, the proposed development is anticipated to include a tot lot, dog park, a retention basin to the southeast corner of the site, trash enclosures, and asphalt/concrete pavements.

The anticipated finished grade elevation for the proposed structure is assumed to be relatively close to the existing site grades. As a result, only minor cuts and fills are anticipated at the site to account for site drainage. In the event these structural or grading details are inconsistent with the final design criteria, the Soils Engineer should be notified so that we may update this writing as applicable.

SITE LOCATION AND SITE DESCRIPTION

The subject site is roughly rectangular in shape and encompasses approximately 9.4 acres. The subject site is located on Iris Avenue and east of Indian Street in the city of Moreno Valley, California, see the attached Vicinity Map, Figure 2. The site is bound to the south by vacant undeveloped land, to the west by two churches, Indian Street, and a distribution facility beyond, to the north by Iris Avenue and Rainbow Ridge Elementary School beyond, and to the east by a church and residential properties beyond.

The site is currently undeveloped and previously had a single residential house that has since been demolished that was located at the southern portion of the subject site. Ground surface at the site consists of exposed soil and localized weed and brush growth. The site topography is relatively flat and level with no major changes in topography at an approximate elevation of 1502 feet above mean sea level. The site currently drains to the north side of the property.

GEOLOGIC SETTING

The subject site is located within the Peninsular Ranges Geomorphic Province (CGS Note 36). The Peninsular Ranges is a series of ranges is separated by northwest trending valleys, subparallel to faults branching from the San Andreas Fault. The trend of topography is similar to the Coast Ranges, but the geology is more like the Sierra Nevada, with granitic rock intruding the older metamorphic rocks. The Peninsular Ranges extend into lower California and are bound on the east by the Colorado Desert. The Los Angeles Basin and the island group (Santa Catalina, Santa Barbara, and the distinctly terraced San Clemente and San Nicolas islands), together with the surrounding continental shelf (cut by deep submarine fault troughs), are included in this province.

Locally, the site is located within the inactive floodplain of the Santa Ana River near its confluence with Cajon and Lytle Creeks southwest of San Bernardino in the central portion of the Inland Valley. The Inland Valley is bound to the southwest by the Chino Hills, to the north by the San Gabriel Mountains, to the northeast by the San Bernardino Mountains, and to the southeast by the hilly uplands that separate it from the San Jacinto Basin. These mountain ranges are part of the Transverse Ranges Geomorphic Province of California. The Inland Valley is dominated by faults and adjacent anticlinal uplifts. The intervening synclinal troughs are filled with poorly consolidated Upper Pleistocene and unconsolidated Holocene sediments. Tectonism of the region is dominated by the interaction of the East Pacific Plate and the North American Plate along a transform boundary.

The near-surface deposits in the vicinity of the subject site are indicated to be comprised of recent alluvium consisting of unconsolidated sands, silt, and clays derived from erosion of local mountain ranges. Deposits encountered on the subject site during exploratory drilling are discussed in detail in this report.

Numerous moderate to large earthquakes have affected the area of the subject site within historic time. Based on the proximity of several dominant active faults and seismogenic structures, as well as the historic seismic record, the area of the subject site is considered subject to relatively high seismicity. The nearest significant active faults are the San Jacinto and Elsinore fault zones, which are approximately 6.5 and 15.9 miles away from the subject site, respectively. The area in consideration shows no mapped faults on-site according to maps prepared by the California Geologic Survey and published by the International Conference of Building Officials (ICBO). No evidence of surface faulting was observed on the property during our reconnaissance.

FIELD AND LABORATORY INVESTIGATIONS

Subsurface soil conditions were explored by drilling a total of nineteen (19) borings (B-1 to B-19) to depths of approximately 10 to 50 feet below existing site grade, using a truck-mounted drill rig; in addition, four (4) borings (IT-1 and IT-4) were advanced to a depth of ten to fifteen feet for the purpose of infiltration testing. A bulk subgrade sample was obtained from the site for laboratory R-Value testing. The approximate boring and bulk sample locations are shown on the attached, Site Map, Figure 1. During drilling operations, penetration tests were performed at regular intervals to evaluate the soil consistency and to obtain information regarding the engineering properties of the subsurface soils. Soil samples were retained for laboratory testing. The soils encountered were continuously examined and visually classified in accordance with the Unified Soil Classification System. A more detailed description of the field investigation is presented in Appendix A.

Laboratory tests were performed on selected soil samples to evaluate their physical characteristics and engineering properties. The laboratory testing program was formulated with emphasis on the evaluation of natural moisture, density, gradation, shear strength, consolidation potential, R-Value, and moisture-density relationships of the materials encountered. In addition, chemical tests were performed to evaluate the corrosivity of the soils to buried concrete and metal. Details of the laboratory test program and results of the laboratory tests are summarized in Appendix A. This information, along with the field observations, was used to prepare the final boring logs in Appendix A.

SOIL PROFILE AND SUBSURFACE CONDITIONS

Based on our findings, the subsurface conditions encountered appear typical of those found in the geologic region of the site. In general, the surface soils consisted of approximately 6 to 12 inches of very loose silty sand. These soils are disturbed, have low strength characteristics and are highly compressible when saturated.

Beneath the loose surface soils, medium dense to very dense silty sand encountered up to the maximum depth explored, 50 feet below ground surface. Groundwater was not encountered during our field exploration and data suggests that groundwater in the vicinity of the subject site is estimated at depths in excess of 50 feet below surface.

Field and laboratory tests suggest that these soils are moderately strong and slightly compressible. Penetration resistance ranged from 14 to 54 blows per foot. Dry densities ranged from 110 to 127 pcf. Representative soil samples consolidated approximately 0.8 and 1.3 percent under a 2 ksf load when saturated. Representative soil samples had angles of internal friction of 31 degrees with cohesion values of 100 psf. These soils strength characteristics extended to the termination depth of our borings.

For additional information about the soils encountered, please refer to the logs of borings in Appendix A.

GROUNDWATER

Test boring locations were checked for the presence of groundwater during and immediately following the drilling operations. Groundwater was not encountered during our field exploration. Although, it should be recognized that water table elevations may fluctuate with time, being dependent upon seasonal precipitation, irrigation, land use, and climatic conditions, as well as other factors. Therefore, water level observations at the time of the field investigation may vary from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

SEISMICITY AND LIQUEFACTION POTENTIAL

Seismicity is a general term relating to the abrupt release of accumulated strain energy in the rock materials of the earth's crust in a given geographical area. The recurrence of accumulation and subsequent release of strain have resulted in faults and fault systems. Fault patterns and density reflect relative degrees of regional stress through time, but do not necessarily indicate recent seismic activity;

therefore, the degree of seismic risk must be determined or estimated by the seismic record in any given region.

Soil liquefaction is a state of soil particle suspension caused by a complete loss of strength when the effective stress drops to zero. Liquefaction normally occurs under saturated conditions in soils such as clean sand in which the strength is purely frictional. However, liquefaction has occurred in soils other than clean sand. Liquefaction usually occurs under vibratory conditions such as those induced by seismic events.

To evaluate the liquefaction potential of the site, the following items were evaluated:

1) Soil type
2) Groundwater depth
3) Relative density
4) Initial confining pressure
5) Intensity and duration of ground shaking

The State of California has not prepared a State of California Seismic Hazard Zones Map for the area where the project site is situated. Thus, the subject site is not located in an area designated by the State of California as a liquefaction hazard zone. Furthermore, the Riverside County GIS Map for Liquefaction identifies the subject site in an area designated as a low Liquefaction Potential Hazard Zone.

Subsurface soil conditions encountered at the subject site consisted of dense to very dense granular soil. Groundwater was not encountered at the subject site and is not anticipated to be located within a depth of 50 feet below site grades. Based on the conditions encountered and the results of our laboratory testing, the subsurface conditions encountered at the subject site are not considered to be subject to liquefaction.

FAULT RUPTURE HAZARD ZONES

The Alquist-Priolo Geologic Hazards Zones Act went into effect in March, 1973. Since that time, the Act has been amended 11 times (Hart, 2007). The purpose of the Act, as provided in California Geologic Survey (CGS) Special Publication 42 (SP 42), is to prohibit the location of most structures for human occupancy across the traces of active faults and to mitigate thereby the hazard of fault-rupture." The Act was renamed the Alquist-Priolo Earthquake Fault Zoning Act in 1994, and at that time, the originally designated "Special Studies Zones" was renamed the "Earthquake Fault Zones." Review of the Earthquake Zones of Required Investigation (EQZApp) prepared by the CGS indicates that no earthquake fault zones are located on or projected to cross the vicinity of the subject site. The nearest zoned fault is a portion of the San Jacinto Fault Zone, located approximately 6.5 miles from the subject site.

SEISMIC HAZARDS ZONES

In 1990, the California State Legislature passed the Seismic Hazard Mapping Act to protect public safety from the effects of strong shaking, liquefaction, landslides, or other ground failure, and other hazards caused by earthquakes. The Act requires that the State Geologist delineate various seismic hazards zones on Seismic Hazards Zones Maps. Specifically, the maps identify areas where soil liquefaction and earthquake-induced landslides are most likely to occur. A site-specific geotechnical evaluation is required prior to permitting most urban developments within the mapped zones. The Act also requires sellers of real property within the zones to disclose this fact to potential buyers. A Seismic Hazard Zones Map has not been prepared for the vicinity of the subject site to date. Furthermore, the County of Riverside Liquefaction Susceptibility Map has identified the site as having a Low Liquefaction Potential.

OTHER HAZARDS

Rockfall, Landslide, Slope Instability, and Debris Flow: The subject site is relatively flat and level. It is our understanding that there are no significant slopes proposed as part of the proposed development. Provided the recommendations presented in this report are implemented into the design and construction of the anticipated development, rockfalls, landslides, slope instability, and debris flows are not anticipated to pose a hazard to the subject site.

Seiches: Seiches are large waves generated within enclosed bodies of water. The site is not located in close proximity to any lakes or reservoirs. As such, seiches are not anticipated to pose a hazard to the subject site.

Tsunamis: Tsunamis are tidal waves generated by fault displacement or major ground movement. The site is several miles from the ocean. As such, tsunamis are not anticipated to pose a hazard to the subject site.

Hydroconsolidation: The near surface soils encountered at the subject site were found to be medium dense to dense. The underlying native soils were found to be dense to very dense. Provided the recommendations in this report are incorporated into the design and construction of the proposed development, hydroconsolidation is not anticipated to be a significant concern for the subject site.

Expansive Soil

The near-surface silty sand soils encountered at the site have been identified through laboratory testing as having a low expansion potential. Expansive soils have the potential to undergo volume change, or shrinkage and swelling, with changes in soil moisture. As expansive soils dry, the soil shrinks; when moisture is reintroduced into the soil, the soil swells.

SOIL CORROSIVITY

Corrosion tests were performed to evaluate the soil corrosivity to the buried structures. The tests consisted of sulfate content, chloride content, and resistivity and the results of the tests are included as follows:

Parameter	Results	Test Method
Resistivity	5,000 ohm-cm	CA 643
Sulfate	181 ppm	CA 417
Chloride	52 ppm	CA 422
pH	7.6	EPA 9045C

INFILTRATION TESTING

Estimated infiltration rates were determined using the results of open borehole percolation testing performed at the subject site. The percolation testing indicated that the near surface dense silty sand soil was found to have infiltration rates of approximately 0.46, 0.53, 0.58, and 0.73 inch per hour, respectively. The locations of these infiltration tests are presented on the attached Site Map, Figure 1.

The soil infiltration rates are based on tests conducted with clean water. The infiltration rates may vary with time as a result of soil clogging from water impurities. A factor of safety should be incorporated into the design of the infiltration system to compensate for these factors as determined appropriate by the designer. In addition, routine maintenance consisting of clearing the system of clogged soils and debris should be expected.

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of our field and laboratory investigations, along with previous geotechnical experience in the project area, the following is a summary of our evaluations, conclusions, and recommendations.

Administrative Summary

In brief, the subject site and soil conditions, with the exception of the loose surficial soils, appear to be conducive to the development of the project.

Fill material was not encountered in our borings. However, fill may be located between or beyond our borings. It is anticipated fill soils will consist of silty sands. The thickness and extent of fill material was determined based on limited test borings and visual observation. Verification of the extent of fill should be determined during site grading. It is recommended that fill soils that have not been properly compacted and certified be excavated and recompacted. Prior to backfilling, the bottom of the excavation should be observed by Krazan & Associates, Inc. to verify no additional removal is required.

Presently, the site consists of vacant land surrounded by churches, residential neighborhoods, and vacant land. Associated with the surrounding developments may be buried structures, such as utility lines and irrigation lines that extend into the project site. Demolition activities should include proper removal of any buried structures or loosely backfilled excavations encountered. The resulting excavations should be backfilled with Engineered Fill. It is suspected that demolition activities of the existing structures will disturb the upper soils. After demolition activities, it is recommended that these disturbed soils be removed and/or recompacted. This compaction effort should stabilize the upper soils and locate any unsuitable or pliant areas not found during our field investigation.

To reduce post-construction soil movement and provide uniform support for the buildings and other foundations, overexcavation and recompaction within the proposed building footprint areas should be performed to a minimum depth of at least five (5) feet below existing grades or two (2) feet below the bottom of the proposed foundation bearing grades. In addition, any fill soil present in the building area should be removed and re-placed as compacted Engineered Fill. The actual depth of the overexcavation and recompaction should be determined by our field representative during construction. The exposed subgrade at the base of the overexcavation should then be scarified, moisture-conditioned as necessary, and compacted. The overexcavation and recompaction should also extend laterally five feet (5’) beyond edges of the proposed footings or building limits. Any undocumented fill encountered during grading should be removed and replaced with Engineered Fill.

To reduce post-construction soil movement and provide uniform support for the proposed parking and drive area, overexcavation and recompaction of the near surface soil in the proposed parking area should be performed to a minimum depth of at least twelve (12) inches below existing grades or proposed subgrade, whichever is deeper. The actual depth of the overexcavation and recompaction should be determined by our field representative during construction. The overexcavation and recompaction should also extend laterally at least three (3) feet beyond edges of the proposed paving limits or to the property boundary. Any undocumented fill encountered during grading should be removed and replaced with Engineered Fill.

Fill soils should be placed in lifts approximately 6 inches thick, moisture-conditioned to a minimum of 2 percent above optimum moisture-content, and compacted to achieve at least 95 percent maximum density based on ASTM Test Method D1557. Additional lifts should not be placed if the previous lift did not meet the required density or if soil conditions are not stable.

Unless designed by the project structural engineer, concrete slabs-on-grade should be a minimum of five (5) inches thick. It is recommended that the concrete slab be reinforced to reduce crack separation and possible vertical offset at the cracks. We recommend at least No. 3 reinforcing bars placed on 18-inch centers, be used for this purpose. Thicker floor slabs with increased concrete strength and reinforcement should be designed wherever heavy concentrated loads, heavy equipment, or machinery is anticipated.

The exterior floors should be poured separately in order to act independently of the walls and foundation system. Exterior finish grades should be sloped a minimum of 2 percent away from all interior slab areas to preclude ponding of water adjacent to the structures. All fills required to bring the building pads to grade should be Engineered Fills.

The upper soils, during wet winter months, become very moist due to the absorptive characteristics of the soil. Earthwork operations performed during winter months may encounter very moist unstable soils, which may require removal to grade a stable building foundation. Project site winterization consisting of placement of aggregate base and protecting exposed soils during the construction phase should be performed.

Sandy soil conditions were encountered at the site. These cohesionless soils have a tendency to cave in trench wall excavations. Shoring or sloping back trench sidewalls may be required within these sandy soils.

Groundwater Influence on Structures/Construction

During our field investigation free groundwater was not encountered in any of the borings drilled as part of this investigation. It is not anticipated that groundwater will impact the proposed development. If groundwater is encountered, our firm should be consulted prior to dewatering the site. In addition to the groundwater level, if earthwork is performed during or soon after periods of precipitation, the subgrade soils may become saturated, pump, or not respond to densification techniques. Typical remedial measures include discing and aerating the soil during dry weather; mixing the soil with dryer materials; removing and replacing the soil with an approved fill material; or mixing the soil with an approved lime or cement product. Our firm should be consulted prior to implementing remedial measures to observe the unstable subgrade conditions and provide appropriate recommendations.

Site Preparation

General site clearing should include removal of vegetation; existing utilities; structures including foundations; existing stockpiled soil; trees and associated root systems; rubble; rubbish; and any loose and/or saturated materials. Site stripping should extend to a minimum depth of 2 to 4 inches, or until all organics in excess of 3 percent by volume are removed. Deeper stripping may be required in localized areas. These materials will not be suitable for use as Engineered Fill. However, stripped topsoil may be stockpiled and reused in landscape or non-structural areas.

Overexcavation and Recompaction – Building and Foundation Areas

To reduce post-construction soil movement and provide uniform support for the buildings and other foundations, overexcavation and recompaction within the proposed building footprint areas should be performed to a minimum depth of at least five (5) feet below existing grades or two (2) feet below the bottom of the proposed foundation bearing grades. In addition, any fill soil present in the building area should be removed and re-placed as compacted Engineered Fill. The actual depth of the overexcavation and recompaction should be determined by our field representative during construction. The exposed subgrade at the base of the overexcavation should then be scarified, moisture-conditioned as necessary, and compacted. The overexcavation and recompaction should also extend laterally five feet (5') beyond edges of the proposed footings or building limits. Any undocumented fill encountered during grading should be removed and replaced with Engineered Fill.

Overexcavation and Recompaction – Proposed Parking Area

To reduce post-construction soil movement and provide uniform support for the proposed parking and drive areas, overexcavation and recompaction of the near surface soil in the proposed parking area should be performed to a minimum depth of at least twelve (12) inches below existing grades or proposed subgrade, whichever is deeper. The actual depth of the overexcavation and recompaction should be determined by our field representative during construction. The overexcavation and recompaction should also extend laterally at least three (3) feet beyond edges of the proposed paving limits or to the property boundary. Any undocumented fill encountered during grading should be removed and replaced with Engineered Fill.

Any buried structures encountered during construction should be properly removed and the resulting excavations backfilled with Engineered Fill, compacted to a minimum of 95 percent of the maximum dry density based on ASTM Test Method D1557. Excavations, depressions, or soft and pliant areas extending below planned finished subgrade levels should be cleaned to firm, undisturbed soil and backfilled with Engineered Fill. In general, any septic tanks, debris pits, cesspools, or similar structures should be entirely removed. Concrete footings should be removed to an equivalent depth of at least 3 feet below proposed footing elevations or as recommended by the Soils Engineer. Any other buried structures encountered, should be removed in accordance with the recommendations of the Soils Engineer. The resulting excavations should be backfilled with Engineered Fill.

The upper soils, during wet winter months become very moist due to the absorptive characteristics of the soil. Earthwork operations performed during winter months may encounter very moist unstable soils, which may require removal to grade a stable building foundation. Project site winterization consisting of placement of aggregate base and protecting exposed soils during the construction phase should be performed.

A representative of our firm should be present during all site clearing and grading operations to test and observe earthwork construction. This testing and observation is an integral part of our service as acceptance of earthwork construction is dependent upon compaction of the material and the stability of the material. The Soils Engineer may reject any material that does not meet compaction and stability requirements. Further recommendations of this report are predicated upon the assumption that earthwork construction will conform to recommendations set forth in this section and the Engineered Fill section.

Engineered Fill

The on-site upper native soils are predominately silty sand soils. These soils will be suitable for reuse as Engineered Fill, provided they are cleansed of excessive organics, fragments greater than 6 inches in diameter, and debris.

The preferred materials specified for Engineered Fill are suitable for most applications with the exception of exposure to erosion. Project site winterization and protection of exposed soils during the construction phase should be the sole responsibility of the Contractor, since he has complete control of the project site at that time.

Imported Fill should consist of a well-graded, slightly cohesive, fine silty sand or sandy silt, with relatively impervious characteristics when compacted. This material should be approved by the Soils Engineer prior to use and should typically possess the following characteristics:

Percent Passing No. 200 Sieve	20 to 50
Plasticity Index	10 maximum
UBC Standard 29-2 Expansion Index	15 maximum

Fill soils should be placed in lifts approximately 6 inches thick, moisture-conditioned to a minimum of 2 percent above optimum moisture content, and compacted to achieve at least 95 percent maximum dry density based on ASTM Test Method D1557. Additional lifts should not be placed if the previous lift did not meet the required density or if soil conditions are not stable.

Drainage and Landscaping

The ground surface should slope away from building pad and pavement areas toward appropriate drop inlets or other surface drainage devices. In accordance with Section 1804.4 of the 2019 California Building Code, it is recommended that the ground surface adjacent to foundations be sloped a minimum of 5 percent for a minimum distance of 10 feet away from structures, or to an approved alternative means of drainage conveyance. Swales used for conveyance of drainage and located within 10 feet of foundations should be sloped a minimum of 2 percent. Impervious surfaces, such as pavement and exterior concrete flatwork, within 10 feet of building foundations should be sloped a minimum of 2 percent away from the structure. Drainage gradients should be maintained to carry all surface water to collection facilities and off-site. These grades should be maintained for the life of the project.

Slots or weep holes should be placed in drop inlets or other surface drainage devices in pavement areas to allow free drainage of adjoining base course materials. Cutoff walls should be installed at pavement edges adjacent to vehicular traffic areas; these walls should extend to a minimum depth of 12 inches below pavement subgrades to limit the amount of seepage water that can infiltrate the pavements. Where cutoff walls are undesirable subgrade drains can be constructed to transport excess water away from planters to drainage interceptors. If cutoff walls can be successfully used at the site, construction of subgrade drains is considered unnecessary.

Utility Trench Backfill

Utility trenches should be excavated according to accepted engineering practice following OSHA (Occupational Safety and Health Administration) standards by a Contractor experienced in such work. The responsibility for the safety of open trenches should be borne by the Contractor. Traffic and vibration adjacent to trench walls should be reduced; cyclic wetting and drying of excavation side slopes should be avoided. Depending upon the location and depth of some utility trenches, groundwater flow into open excavations could be experienced, especially during or shortly following periods of precipitation.

Utility trench backfill placed in or adjacent to buildings and exterior slabs should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Utility trench backfill placed in pavement areas should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Pipe bedding should be in accordance with pipe manufacturer's recommendations.

Sandy soil conditions were encountered at the site. These cohesionless soils have a tendency to cave in trench wall excavations. Shoring or sloping back trench sidewalls may be required within these sandy and gravelly soils.

The Contractor is responsible for removing all water-sensitive soils from the trench regardless of the backfill location and compaction requirements. The Contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction.

Foundations - Conventional

The proposed structures may be supported on a shallow foundation system bearing on a minimum of three (3) feet of Engineered Fill. Spread and continuous footings can be designed for the following maximum allowable soil bearing pressures:

Load	Allowable Loading
Dead Load Only	2,000 psf
Dead-Plus-Live Load	2,600 psf
Total Load, including wind or seismic loads	3,500 psf

The footings should have a minimum depth of 18 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower. Footings should have a minimum width of 15 inches, regardless of load.

The total soil movement is not expected to exceed 1 inch. Differential movement measured across a horizontal distance of 30 feet should be less than ½ inch. Most of the settlement is expected to occur during construction as the loads are applied. However, additional post-construction settlement may occur if the foundation soils are flooded or saturated.

The footing excavations should not be allowed to dry out any time prior to pouring concrete. It is recommended that footings be reinforced by at least one No. 4 reinforcing bar in both top and bottom.

Resistance to lateral footing displacement can be computed using an allowable friction factor of 0.30 acting between the base of foundations and the supporting subgrade. Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 250 pounds per cubic foot acting against the appropriate vertical footing faces. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance. A ⅓ increase in the above value may be used for short duration, wind, or seismic loads. All of the above earth pressures are unfactored and are, therefore, not inclusive of factors of safety.

Floor Slabs and Exterior Flatwork

Concrete slab-on-grade floors should be underlain by a water vapor retarder. The water vapor retarder should be installed in accordance with accepted engineering practices. The water vapor retarder should consist of a vapor retarder sheeting underlain by a minimum of 3 inches of compacted, clean, gravel of ¾-inch maximum size. To aid in concrete curing an optional 2 to 4 inches of granular fill may be placed on top of the vapor retarder. The granular fill should consist of damp clean sand with at least 10 to 30 percent of the sand passing the 100 sieve. The sand should be free of clay, silt, or organic material. Rock dust which is manufactured sand from rock crushing operations is typically suitable for the granular fill. This granular fill material should be compacted.

Unless designed by the project structural engineer, concrete slabs-on-grade should be a minimum of five (5) inches thick. It is recommended that the concrete slab be reinforced to reduce crack separation and possible vertical offset at the cracks. We recommend at least No. 3 reinforcing bars placed on 18-inch centers, be used for this purpose. Thicker floor slabs with increased concrete strength and reinforcement should be designed wherever heavy concentrated loads, heavy equipment, or machinery is anticipated.

The exterior floors should be poured separately in order to act independently of the walls and foundation system. Exterior finish grades should be sloped a minimum of 2 percent away from all interior slab areas to preclude ponding of water adjacent to the structures. All fills required to bring the building pads to grade should be Engineered Fills.

Moisture within the structure may be derived from water vapors, which were transformed from the moisture within the soils. This moisture vapor can travel through the vapor membrane and penetrate the slab-on-grade. This moisture vapor penetration can affect floor coverings and produce mold and mildew in the structure. To reduce moisture vapor intrusion, it is recommended that a vapor retarder be installed. It is recommended that the utility trenches within the structure be compacted, as specified in our report, to reduce the transmission of moisture through the utility trench backfill. Special attention to the immediate drainage and irrigation around the building is recommended. Positive drainage should be established away from the structure and should be maintained throughout the life of the structure. Ponding of water should not be allowed adjacent to the structure. Over-irrigation within landscaped areas adjacent to the structure should not be performed. In addition, ventilation of the structure (i.e. ventilation fans) is recommended to reduce the accumulation of interior moisture.

Lateral Earth Pressures and Retaining Walls

Walls retaining horizontal backfill and capable of deflecting a minimum of 0.1 percent of its height at the top may be designed using an equivalent fluid active pressure of 39 pounds per square foot per foot of depth. Walls incapable of this deflection or are fully constrained walls against deflection may be designed for an equivalent fluid at-rest pressure of 59 pounds per square foot per foot of depth. Expansive soils should not be used for backfill against walls. The wedge of non-expansive backfill material should extend from the bottom of each retaining wall outward and upward at a slope of 2:1

(horizontal to vertical) or flatter. The stated lateral earth pressures do not include the effects of hydrostatic water pressures generated by infiltrating surface water that may accumulate behind the retaining walls; or loads imposed by construction equipment, foundations, or roadways.

During grading and backfilling operations adjacent to any walls, heavy equipment should not be allowed to operate within a lateral distance of 5 feet from the wall, or within a lateral distance equal to the wall height, whichever is greater, to avoid developing excessive lateral pressures. Within this zone, only hand-operated equipment (“whackers,” vibratory plates, or pneumatic compactors) should be used to compact the backfill soils.

Retaining and/or below grade walls should be drained with either perforated pipe encased in free-draining gravel or a prefabricated drainage system. The gravel zone should have a minimum width of 12 inches and should extend upward to within 12 inches of the top of the wall. The upper 12 inches of backfill should consist of native soils, concrete, asphaltic concrete, or other suitable backfill to reduce surface drainage into the wall drain system. The aggregate should conform to Class 2 permeable materials graded in accordance with CalTrans Standard Specifications (2018). Prefabricated drainage systems, such as Miradrain®, Enkadrain®, or an equivalent substitute, are acceptable alternatives in lieu of gravel provided they are installed in accordance with the manufacturer’s recommendations. If a prefabricated drainage system is proposed, our firm should review the system for final acceptance prior to installation.

Drainage pipes should be placed with perforations down and should discharge in a non-erosive manner away from foundations and other improvements. The pipes should be placed no higher than 6 inches above the heel of the wall, in the center line of the drainage blanket and should have a minimum diameter of four inches. Collector pipes may be either slotted or perforated. Slots should be no wider than ⅛ inch in diameter, while perforations should be no more than ¼ inch in diameter. If retaining walls are less than 6 feet in height, the perforated pipe may be omitted in lieu of weep holes on 4 feet maximum spacing. The weep holes should consist of 4-inch diameter holes (concrete walls) or unmortared head joints (masonry walls) and not be higher than 18 inches above the lowest adjacent grade. Two 8-inch square overlapping patches of geotextile fabric (conforming to CalTrans Standard Specifications for “edge drains”) should be affixed to the rear wall opening of each weep hole to retard soil piping.

R-Value Test Results and Pavement Design

One bulk soil sample was obtained from the project site for R-Value testing at the location shown on the attached site plan. The sample was tested in accordance with the State of California Materials Manual Test Designation 301. Results of the test are as follows:

Sample	Depth	Description	R-Value at Equilibrium
R1	0-36"	Silty Sand (SM)	65

The test results are moderate and indicate good subgrade support characteristics under dynamic traffic loads. The following table shows the recommended pavement sections for various traffic indices.

Traffic Index	Asphaltic Concrete	Class II Aggregate Base*	Compacted Subgrade**
4.0	2.0"	4.0"	12.0"
4.5	2.5"	4.0"	12.0"
5.0	2.5"	4.0"	12.0"
5.5	3.0"	4.0"	12.0"
6.0	3.0"	4.0"	12.0"
6.5	3.5"	4.0"	12.0"
7.0	4.0"	4.0"	12.0"
7.5	4.0"	4.0"	12.0"

**** 95% compaction based on ASTM Test Method D1557 or CAL 216***
***** 95% compaction based on ASTM Test Method D1557 or CAL 216***

If traffic indices are not available, an estimated (typical value) index of 4.5 may be used for light automobile traffic and an index of 7.0 may be used for light truck traffic. Following grading operations, it is recommended additional R-Value testing be performed to verify the design R-Value.

The following recommendations are for light-duty and heavy-duty Portland Cement Concrete pavement sections.

PORTLAND CEMENT PAVEMENT
LIGHT DUTY

Traffic Index	Portland Cement Concrete***	Class II Aggregate Base*	Compacted Subgrade**
4.5	5.0"	--	12.0"

HEAVY DUTY

Traffic Index	Portland Cement Concrete***	Class II Aggregate Base*	Compacted Subgrade**
7.0	6.5"	--	12.0"

**** 95% compaction based on ASTM Test Method D1557 or CAL 216***
***** 95% compaction based on ASTM Test Method D1557 or CAL 216***
******Minimum compressive strength of 3000 psi***

Seismic Parameters – 2019 California Building Code

The Site Class per Section 1613 of the 2019 California Building Code (2019 CBC) and ASCE 7-16, Chapter 20 is based upon the site soil conditions. It is our opinion that a Site Class D is most consistent with the subject site soil conditions. For seismic design of the structures based on the seismic provisions of the 2019 CBC, we recommend the following parameters:

Seismic Item	Value	CBC Reference
Site Class	D	Section 1613.2.2
Site Coefficient F_a	1.000	Table 1613.2.3 (1)
S_S	1.500	Section 1613.2.1
S_{MS}	1.500	Section 1613.2.3
S_{DS}	1.000	Section 1613.2.4
Site Coefficient F_v	1.700	Table 1613.2.3 (2)
S_1	0.600	Section 1613.2.1
S_{M1}	1.020	Section 1613.2.3
S_{D1}	0.680	Section 1613.2.4
T_S	0.680	Section 1613.2
PGA_M	0.638	Figure 22.7

***** Based on Equivalent Lateral Force (ELF) Design Procedure being used.

<u>Infiltration Testing</u>

The shallow soil conditions present at the subject site were evaluated by drilling shallow borings in the vicinity of the infiltration test. The borings drilled at the site indicated the subsurface soil conditions consisted of medium dense to dense silty sand.

Infiltration rates were determined using the results of open borehole infiltration testing performed at the subject site. Infiltration testing performed on the near surface silty sand soil indicate infiltration rates of approximately 0.46, 0.53, 0.58, and 0.73 inch per hour, respectively. Detailed results of the percolation test and infiltration rate results are attached in tabular format. The soil percolation rates are based on tests conducted with clean water. The infiltration rates may vary with time as a result of soil clogging from water impurities. A factor of safety should be incorporated into the design of the percolation system to compensate for these factors as determined appropriate by the designer. In addition, periodic maintenance consisting of clearing the bottom of the system of clogged soils should be expected.

It is recommended that the location of the infiltration systems not be closer than ten feet (10’) as measured laterally from the edge of the adjacent property line, ten feet (10’) from the outside edge of any foundation and five (5’) from the edge of any right-of way to the outside edges of the infiltration system.

If the infiltration location is within ten feet (10’) of the proposed foundation, it is recommended that this infiltration system should be impervious from the finished ground surface to a depth that will achieve a diagonal distance of a minimum of ten feet (10’) below the bottom of the closest footing in the project.

Soil Cement Reactivity

Excessive sulfate in either the soil or native water may result in an adverse reaction between the cement in concrete (or stucco) and the soil. HUD/FHA and CBC have developed criteria for evaluation of sulfate levels and how they relate to cement reactivity with soil and/or water.

One soil sample was obtained from the site and tested in accordance with State of California Materials Manual Test Designation 417. The sulfate concentration detected from the soil sample indicated moderate sulfate exposure value as established by HUD/FHA and CBC. Therefore, it is recommended that concrete in contact with soil utilize Type II Cement and have a minimum compressive strength of 4,000 psi and a water to cement ratio of 0.50.

Electrical resistivity testing of the soil indicates that the onsite soils may have a moderate potential for metal loss from electrochemical corrosion process. A qualified corrosion engineer should be consulted regarding the corrosion effects of the onsite soils on underground metal utilities.

Compacted Material Acceptance

Compaction specifications are not the only criteria for acceptance of the site grading or other such activities. However, the compaction test is the most universally recognized test method for assessing the performance of the Grading Contractor. The numerical test results from the compaction test cannot be used to predict the engineering performance of the compacted material. Therefore, the acceptance of compacted materials will also be dependent upon the stability of that material. The Soils Engineer has the option of rejecting any compacted material regardless of the degree of compaction if that material is considered to be unstable or if future instability is suspected. A specific example of rejection of fill material passing the required percent compaction is a fill which has been compacted with an in-situ moisture content significantly less than optimum moisture. This type of dry fill (brittle fill) is susceptible to future settlement if it becomes saturated or flooded.

Testing and Inspection

A representative of Krazan & Associates, Inc. should be present at the site during the earthwork activities to confirm that actual subsurface conditions are consistent with the exploratory fieldwork. This activity is an integral part of our service, as acceptance of earthwork construction is dependent upon compaction testing and stability of the material. This representative can also verify that the intent of these recommendations is incorporated into the project design and construction. Krazan & Associates, Inc. will not be responsible for grades or staking, since this is the responsibility of the Prime Contractor.

LIMITATIONS

Soils Engineering is one of the newest divisions of Civil Engineering. This branch of Civil Engineering is constantly improving as new technologies and understanding of earth sciences advance. Although your site was analyzed using the most appropriate and most current techniques and methods, undoubtedly there will be substantial future improvements in this branch of engineering. In addition to advancements in the field of Soils Engineering, physical changes in the site, either due to excavation or fill placement, new agency regulations, or possible changes in the proposed structure after the soils report is completed may require the soils report to be professionally reviewed. In light of this, the Owner should be aware that there is a practical limit to the usefulness of this report without critical review. Although the time limit for this review is strictly arbitrary, it is suggested that 2 years be considered a reasonable time for the usefulness of this report.

Foundation and earthwork construction are characterized by the presence of a calculated risk that soil and groundwater conditions have been fully revealed by the original foundation investigation. This risk is derived from the practical necessity of basing interpretations and design conclusions on limited sampling of the earth. The recommendations made in this report are based on the assumption that soil conditions do not vary significantly from those disclosed during our field investigation. If any variations or undesirable conditions are encountered during construction, the Soils Engineer should be notified so that supplemental recommendations may be made.

The conclusions of this report are based on the information provided regarding the proposed construction. If the proposed construction is relocated or redesigned, the conclusions in this report may not be valid. The Soils Engineer should be notified of any changes so the recommendations may be reviewed and re-evaluated.

This report is a Geotechnical Engineering Investigation with the purpose of evaluating the soil conditions in terms of foundation design. The scope of our services did not include any Environmental Site Assessment for the presence or absence of hazardous and/or toxic materials in the soil, groundwater, or atmosphere; or the presence of wetlands. Any statements, or absence of statements, in this report or on any boring log regarding odors, unusual or suspicious items, or conditions observed, are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous and/or toxic assessment.

The geotechnical engineering information presented herein is based upon professional interpretation utilizing standard engineering practices and a degree of conservatism deemed proper for this project. It is not warranted that such information and interpretation cannot be superseded by future geotechnical engineering developments. We emphasize that this report is valid for the project outlined above and should not be used for any other sites.

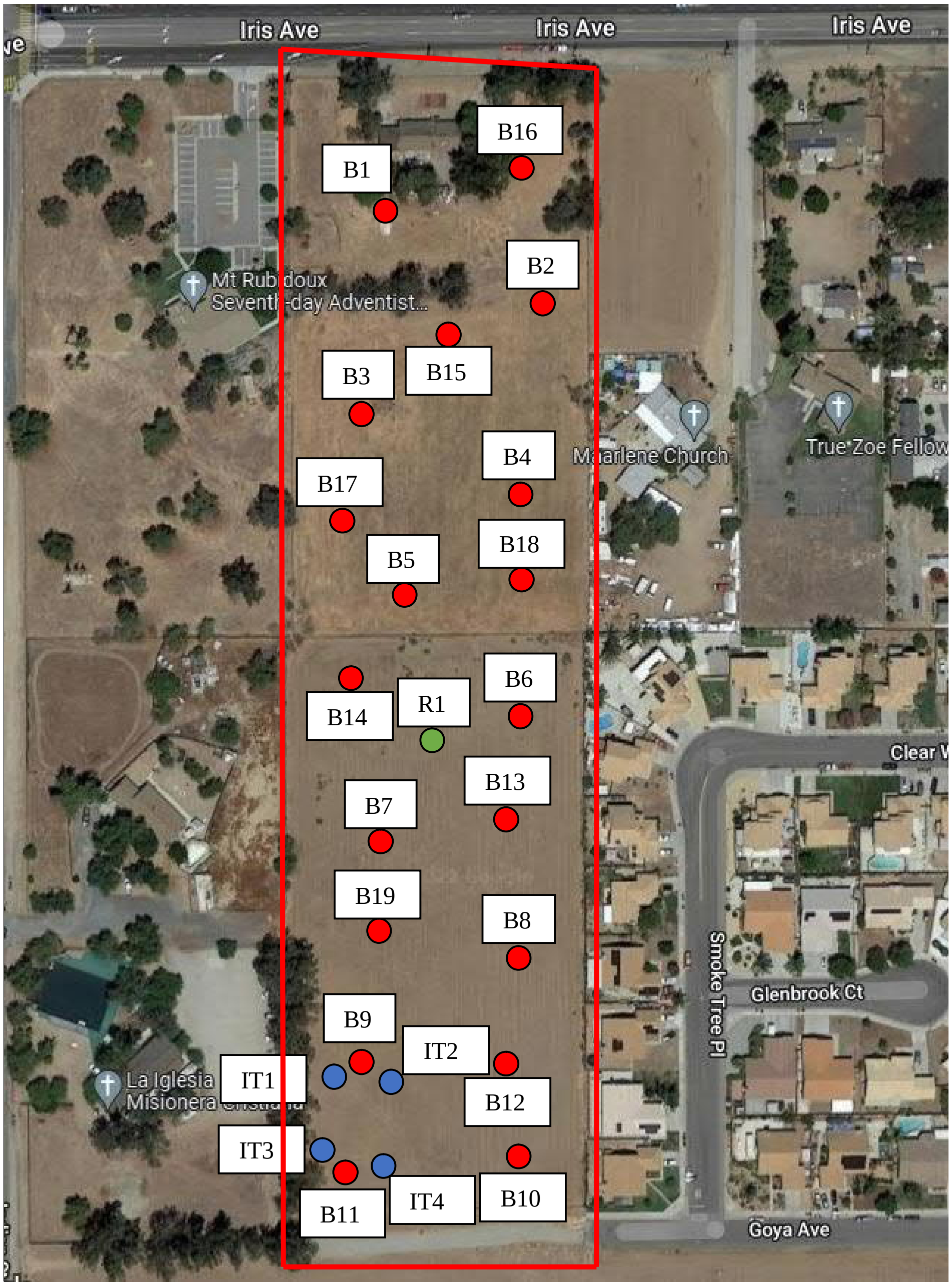
If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (951) 273-1011.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

Jorge A. Pelayo, MS, PE
Project Engineer
RCE No. 91269

Angel Menchaca, EIT
Staff Engineer

Figures



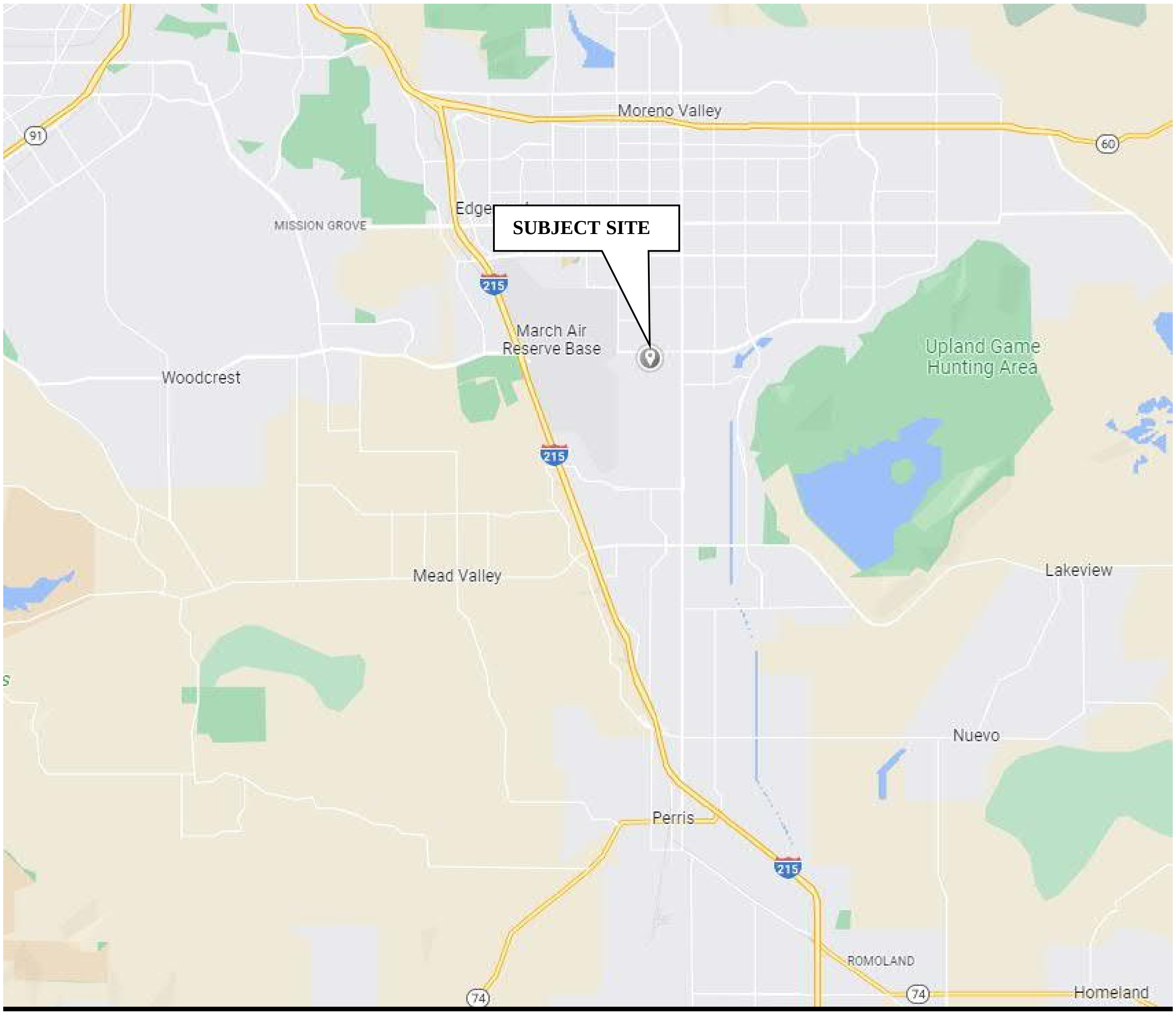
Approximate Boring Location

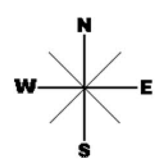
Approximate R-Value Location

Approximate Infiltration Test Location

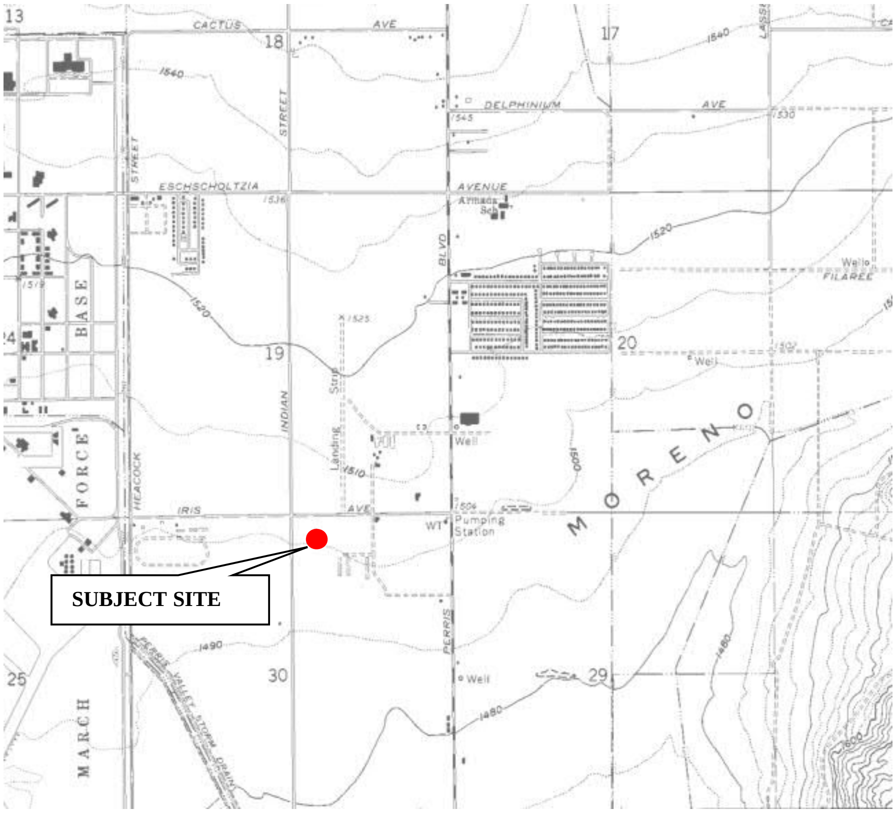
N
W E
S

SITE MAP	Scale: NTS	Date: April, 2022	Krazan GEOTECHNICAL ENGINEERING
PROPOSED SOUTH OF IRIS LLC SEQ IRIS AVENUE AND INDIAN STREET MORENO VALLEY, CA	Drawn by: AM	Approved by: JP	
	Project No. 112-22039	Figure No. 1	





VICINITY MAP	**Scale:** NTS	**Date:** April, 2022	**Krazan** GEOTECHNICAL ENGINEERING
PROPOSED SOUTH OF IRIS LLC SEQ IRIS AVENUE AND INDIAN STREET MORENO VALLEY, CA	**Drawn by:** AM	**Approved by:** JP	
	Project No. 112-22039	**Figure No.** 2	



MAP EXPLANATION

Potentially Active Faults

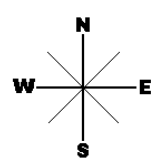
Faults considered to have been active during Quaternary time; solid line where accurately located, long dash where approximately located, short dash where inferred, dotted where concealed; query (?) indicates additional uncertainty. Evidence of historic offset indicated by year of earthquake-associated event or C for displacement caused by creep or possible creep.

Aerial photo lineaments (not field checked); based on youthful geomorphic and other features believed to be the results of Quaternary faulting.

Special Studies Zone Boundaries

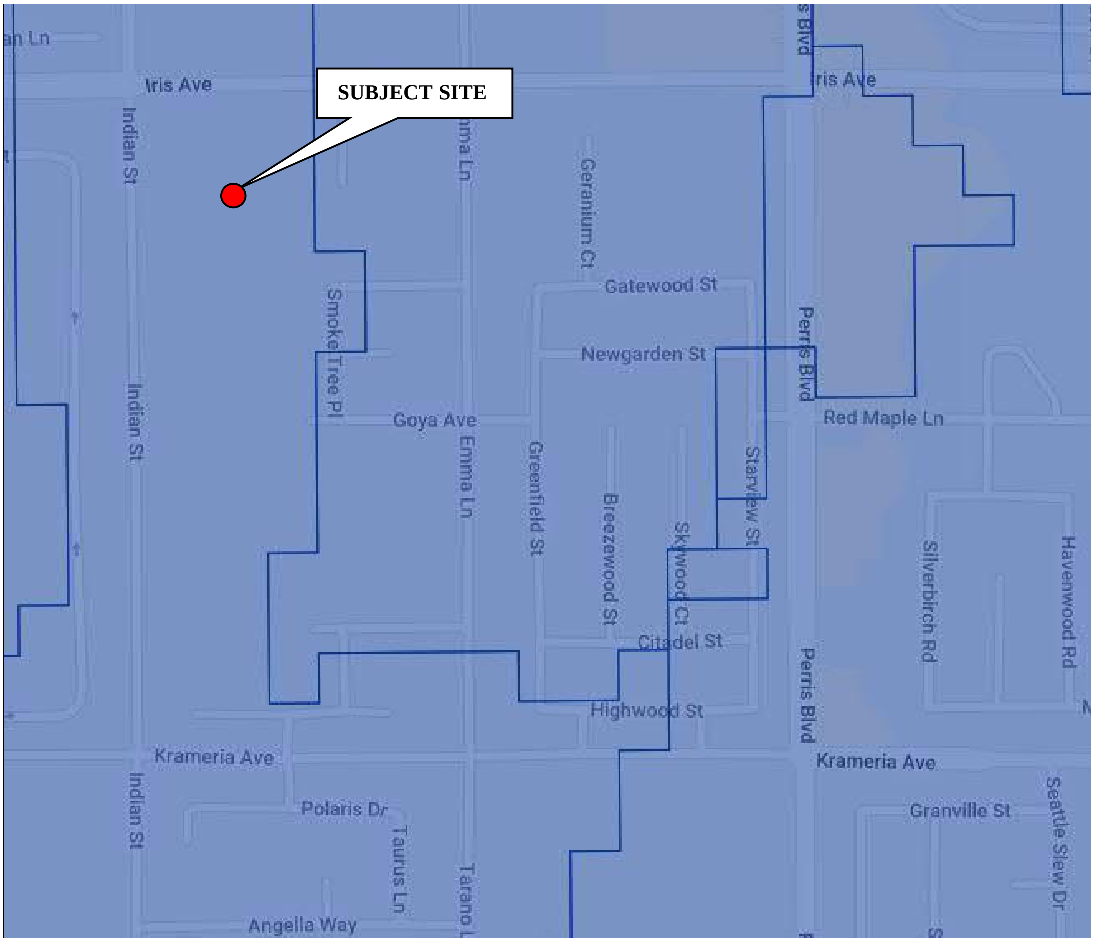
These are delineated as straight-line segments that connect consecutively numbered turning points so as to define one or more special studies zone segments.

Seaward projection of zone boundary.



Source: State of California Seismic Hazards Map, Sunnymead Quadrangle

EARTHQUAKE ZONES OF REQUIRED INVESTIGATION MAP	**Scale:** NTS	**Date:** April, 2022	Krazan GEOTECHNICAL ENGINEERING
PROPOSED SOUTH OF IRIS LLC SEQ IRIS AVENUE AND INDIAN STREET MORENO VALLEY, CA	**Drawn by:** AM	**Approved by:** JP	
	Project No. 112-22039	**Figure No.** 3	



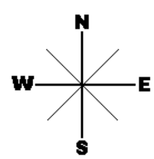
SUSCEPTIBILITY	Low
DEFINITION_4	N/A
DEFINITION_2	50'<GW<100' Contains Etypes: SED{TPud, TPaud, Pud, PMCaud, PMCaf, PINDmf, PINDauf, PINDaud, PINDaf, PHWClf, PDWr, Paud, Paf}
DEFINITION_3	50'<GW<100', Contains Etype: SED{TPHUCac, Phac, HUCac, HPUCac, Hac}

N
W E
S

Source: gis.countyofriverside.us

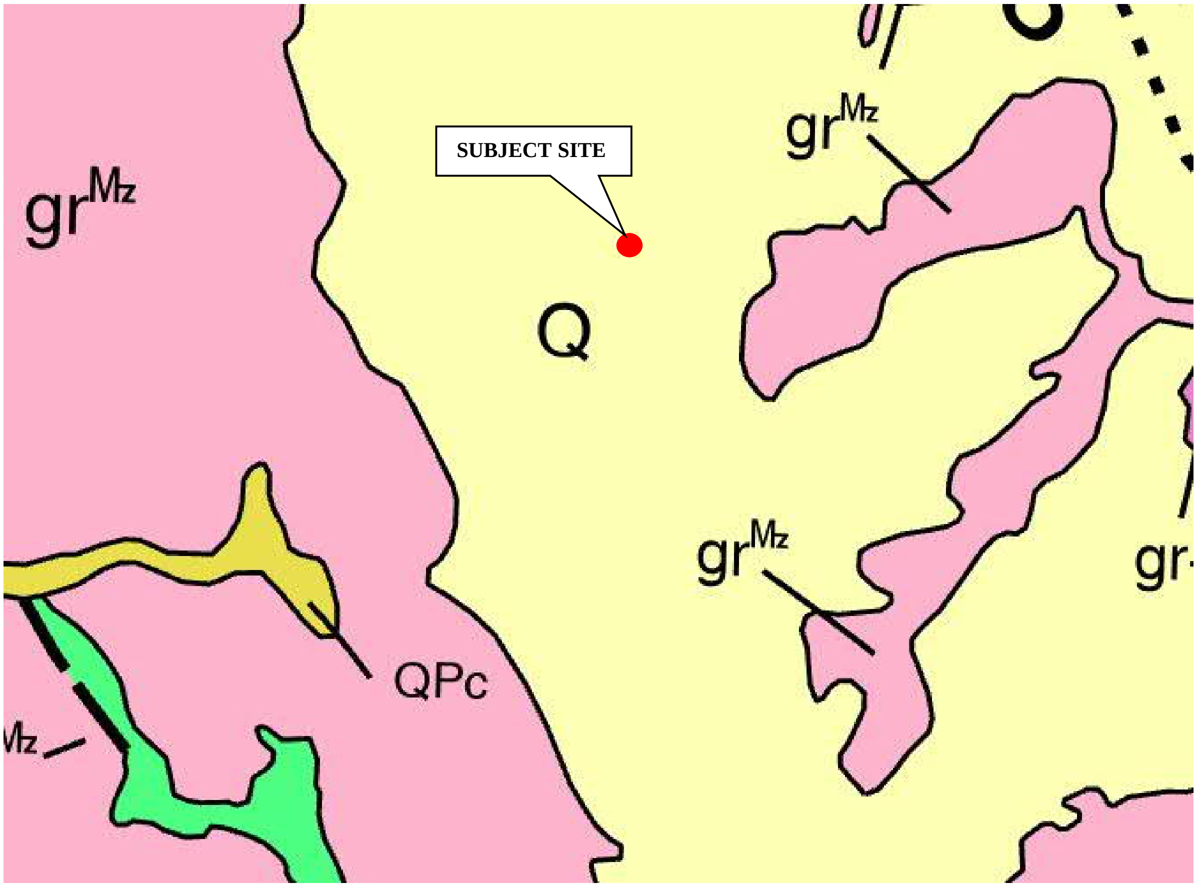
LIQUEFACTION: COUNTY OF RIVERSIDE GIS LIQUEFACTION MAP	**Scale:** NTS	**Date:** March, 2022	**Krazan** GEOTECHNICAL ENGINEERING
PROPOSED SOUTH OF IRIS LLC SEQ IRIS AVENUE AND INDIAN STREET MORENO VALLEY, CA	**Drawn by:** AM	**Approved by:** JP	
	Project No. 112-22039	**Figure No.** 4	

Depth to groundwater about 60 feet below the ground surface elevation measured at well number 338982N1171940W001 about 2.4 miles northeast from the project site



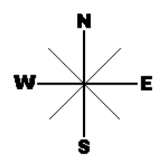
Source: Bureau of Land Management, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA, USDA

HISTORICAL GROUNDWATER	**Scale:** NTS	**Date:** March, 2022	Krazan GEOTECHNICAL ENGINEERING
PROPOSED SOUTH OF IRIS LLC SEQ IRIS AVENUE AND INDIAN STREET MORENO VALLEY, CA	**Drawn by:** AM	**Approved by:** JP	
	Project No. 112-22039	**Figure No.** 5	



Generalized Rock Types: Q

General Lithology	marine and nonmarine (continental) sedimentary rocks
Age	Pleistocene-Holocene
Description	Alluvium, lake, playa, and terrace deposits; unconsolidated and semi-consolidated. Mostly nonmarine, but includes marine deposits near the coast.



Source: Department of Conservation: Geologic Map of California, 2010

GEOLOGIC MAP	**Scale:** NTS	**Date:** March, 2022	Krazan **GEOTECHNICAL ENGINEERING**
PROPOSED SOUTH OF IRIS LLC SEQ IRIS AVENUE AND INDIAN STREET MORENO VALLEY, CA	**Drawn by:** AM	**Approved by:** JP	
	Project No. 112-22039	**Figure No.** 6	

Appendix A

Log of Borings
&
Laboratory Testing

APPENDIX A

FIELD AND LABORATORY INVESTIGATIONS

Field Investigation

The field investigation consisted of a surface reconnaissance and a subsurface exploratory program. Nineteen (19) 8½-inch diameter exploratory borings were advanced. The boring locations are shown on the attached Site Plan, Figure 1.

The soils encountered were logged in the field during the exploration and, with supplementary laboratory test data, are described in accordance with the Unified Soil Classification System.

Modified standard penetration tests and standard penetration tests were performed at selected depths. This test represents the resistance to driving a 2½-inch and 1½-inch diameter split barrel sampler, respectively. The driving energy was provided by a hammer weighing 140 pounds falling 30 inches. Relatively undisturbed soil samples were obtained while performing this test. Bag samples of the disturbed soil were obtained from the auger cuttings. The modified standard penetration tests are identified in the sample type on the boring logs with a full shaded in block. The standard penetration tests are identified in the sample type on the boring logs with one-half of the block shaded. All samples were returned to our Corona laboratory for evaluation.

Laboratory Investigation

The laboratory investigation was programmed to determine the physical and mechanical properties of the foundation soil underlying the site. Test results were used as criteria for determining the engineering suitability of the surface and subsurface materials encountered.

In-situ moisture content, dry density, consolidation, direct shear, and sieve analysis tests were completed for the undisturbed samples representative of the subsurface material. Expansion index and R-Value tests were completed for select bag samples obtained from the auger cuttings. These tests, supplemented by visual observation, comprised the basis for our evaluation of the site material.

UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS
(more than 50% of material is larger than No. 200 sieve size.)

GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size		Clean Gravels (Less than 5% fines)
	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
	GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
		Gravels with fines (More than 12% fines)
	GM	Silty gravels, gravel-sand-silt mixtures
	GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size		Clean Sands (Less than 5% fines)
	SW	Well-graded sands, gravelly sands, little or no fines
	SP	Poorly graded sands, gravelly sands, little or no fines
		Sands with fines (More than 12% fines)
	SM	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand-clay mixtures

FINE-GRAINED SOILS
(50% or more of material is smaller than No. 200 sieve size.)

SILTS AND CLAYS Liquid limit less than 50%	ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS	PT	Peat and other highly organic soils

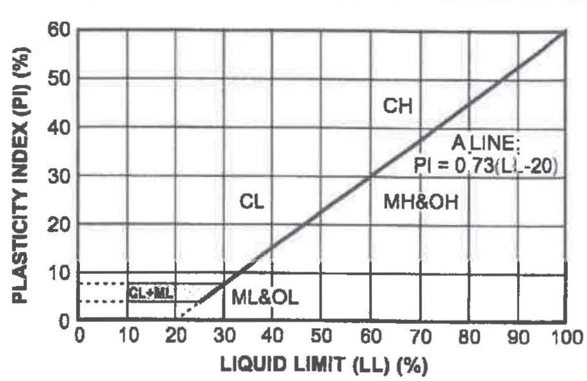
CONSISTENCY CLASSIFICATION

Description	Blows per Foot
Granular Soils	
Very Loose	< 5
Loose	5 – 15
Medium Dense	16 – 40
Dense	41 – 65
Very Dense	> 65
Cohesive Soils	
Very Soft	< 3
Soft	3 – 5
Firm	6 – 10
Stiff	11 – 20
Very Stiff	21 – 40
Hard	> 40

GRAIN SIZE CLASSIFICATION

Grain Type	*Standard Sieve Size*	*Grain Size in Millimeters*
Boulders	Above 12 inches	Above 305
Cobbles	12 to 13 inches	305 to 76.2
Gravel	3 inches to No. 4	76.2 to 4.76
Coarse-grained	3 to ¾ inches	76.2 to 19.1
Fine-grained	¾ inches to No. 4	19.1 to 4.76
Sand	No. 4 to No. 200	4.76 to 0.074
Coarse-grained	No. 4 to No. 10	4.76 to 2.00
Medium-grained	No. 10 to No. 40	2.00 to 0.042
Fine-grained	No. 40 to No. 200	0.042 to 0.074
Silt and Clay	Below No. 200	Below 0.074

PLASTICITY CHART



Standard Penetration Split Spoon Sampler

California Modified Split Spoon Sampler

Sieve Analysis

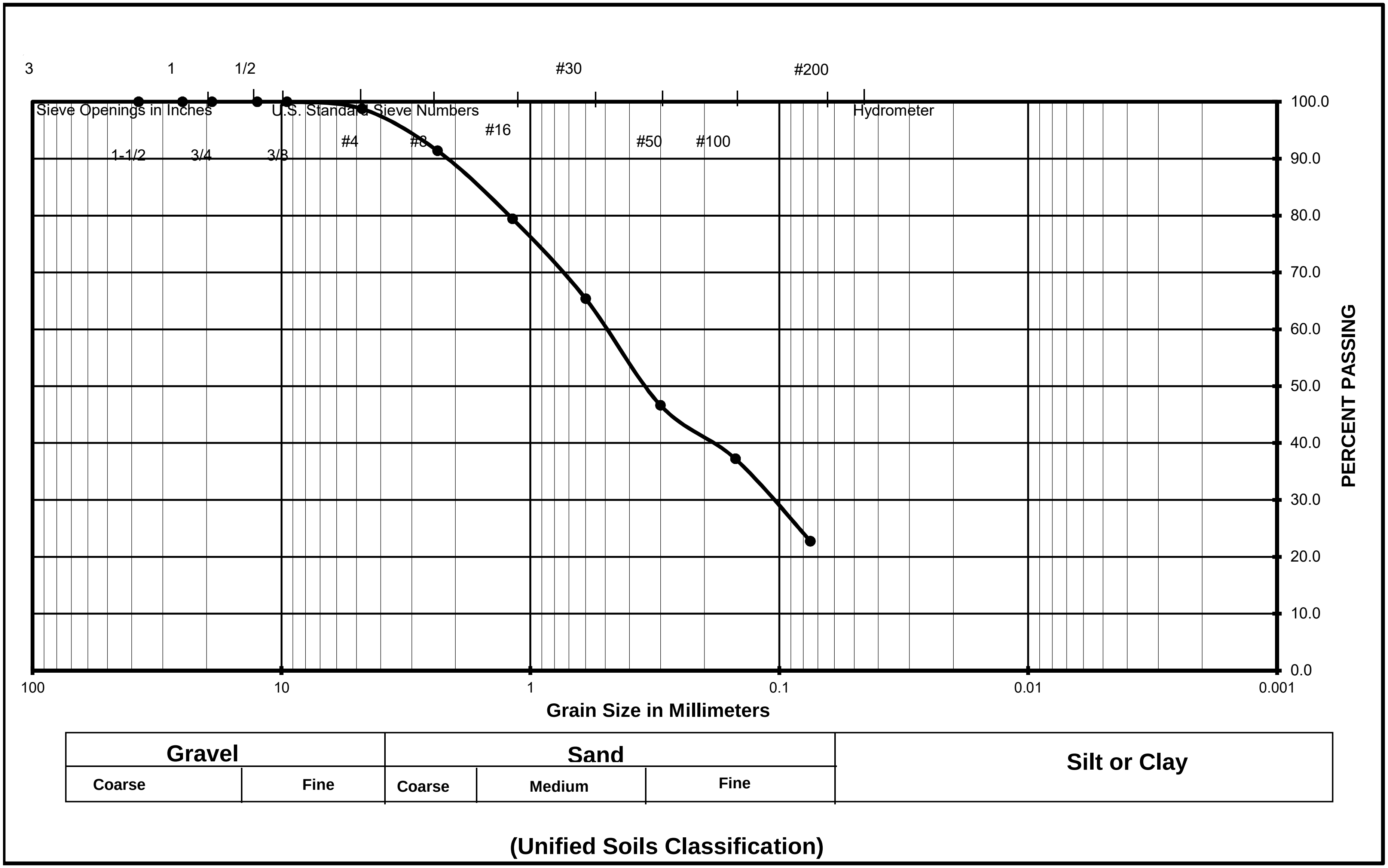
Project Number	: 11222039
Project Name	: South of Iris GEI Moreno Valley
Date	: 4/25/2022
Sample Location	: B-1 @ 10'
Soil Classification	: SM

Wet Weight	:	737.30
Dry Weight	:	737.30
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50				100.0
3/8"	9.50				100.0
#4	4.75	9.1	1.2	1.2	98.8
#8	2.36	54.5	7.4	8.6	91.4
#16	1.18	88.1	11.9	20.6	79.4
#30	0.60	103.5	14.0	34.6	65.4
#50	0.30	138.3	18.8	53.4	46.6
#100	0.15	69.4	9.4	62.8	37.2
#200	0.08	106.7	14.5	77.3	22.7

Krazan Testing Laboratory

Grain Size Analysis



Project Name	South of Iris GEI Moreno Valley
Project Number	11222039
Soil Classification	SM
Sample Number	B-1 @ 10'

Krazan Testing Laboratory

Sieve Analysis

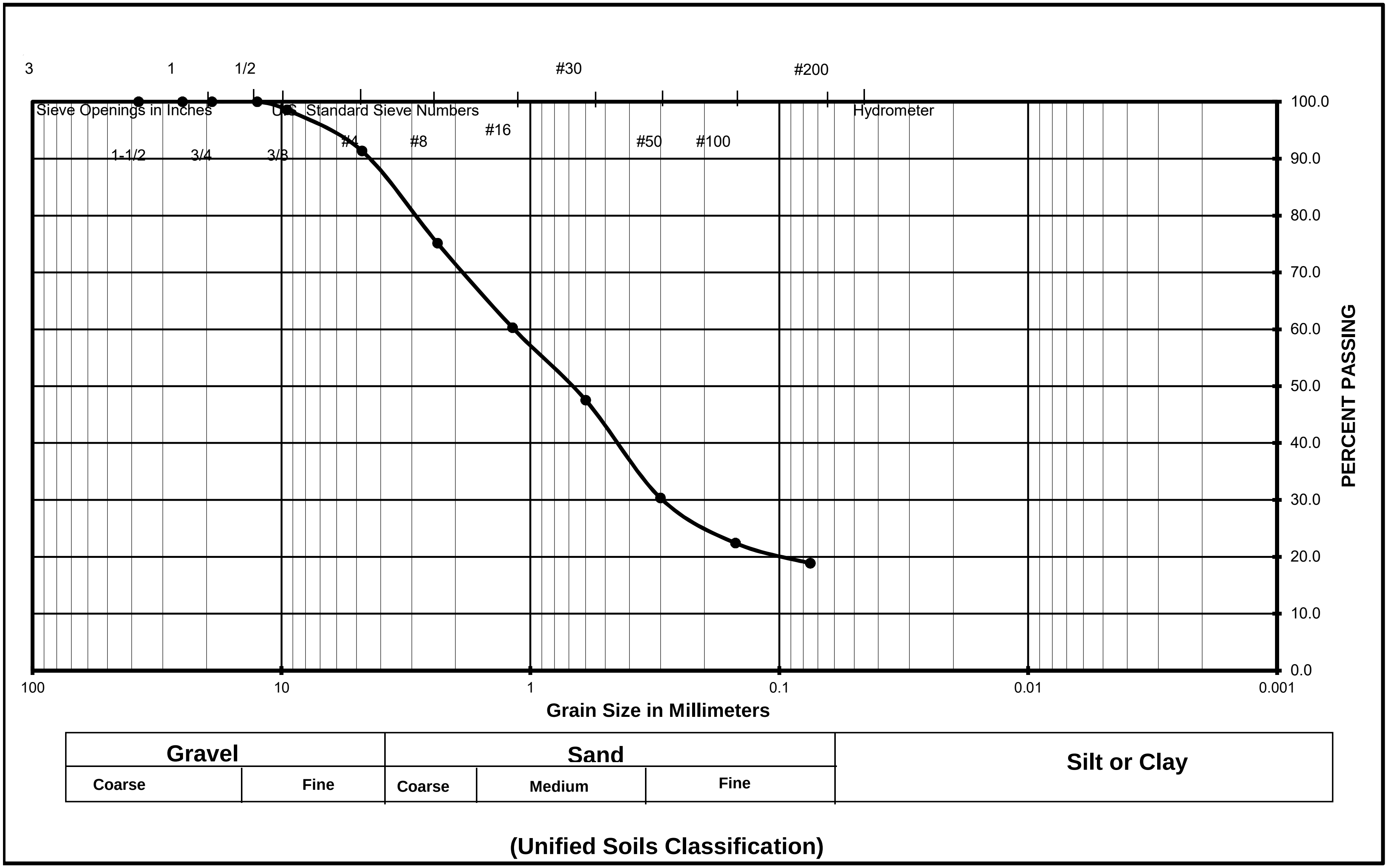
Project Number : 11222039
Project Name : South of Iris GEI Moreno Valley
Date : 4/25/2022
Sample Location : B-1 @ 15'
Soil Classification : SM

Wet Weight	:	678.10
Dry Weight	:	678.10
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50				100.0
3/8"	9.50	9.7	1.4	1.4	98.6
#4	4.75	48.9	7.2	8.6	91.4
#8	2.36	110.1	16.2	24.9	75.1
#16	1.18	100.6	14.8	39.7	60.3
#30	0.60	86.4	12.7	52.5	47.5
#50	0.30	116.8	17.2	69.7	30.3
#100	0.15	53.7	7.9	77.6	22.4
#200	0.08	24.0	3.5	81.1	18.9

Krazan Testing Laboratory

Grain Size Analysis



Project Name	South of Iris GEI Moreno Valley
Project Number	11222039
Soil Classification	SM
Sample Number	B-1 @ 15'

Krazan Testing Laboratory

Sieve Analysis

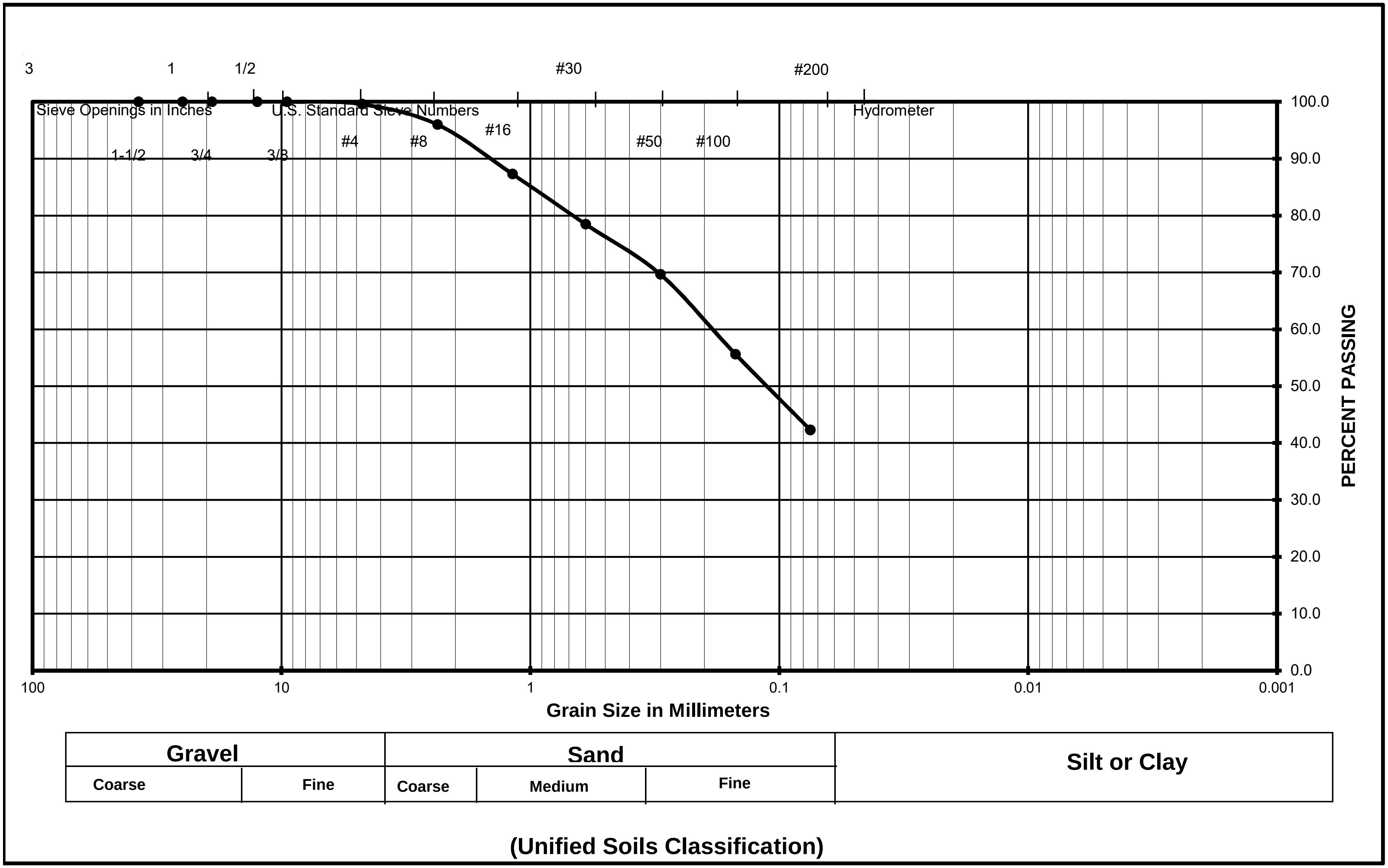
Project Number	: 11222039
Project Name	: South of Iris GEI Moreno Valley
Date	: 4/25/2022
Sample Location	: B-1 @ 20'
Soil Classification	: SM

Wet Weight	:	475.30
Dry Weight	:	475.30
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50				100.0
3/8"	9.50				100.0
#4	4.75	2.0	0.4	0.4	99.6
#8	2.36	17.1	3.6	4.0	96.0
#16	1.18	41.3	8.7	12.7	87.3
#30	0.60	41.9	8.8	21.5	78.5
#50	0.30	42.0	8.8	30.4	69.6
#100	0.15	66.6	14.0	44.4	55.6
#200	0.08	63.4	13.3	57.7	42.3

Krazan Testing Laboratory

Grain Size Analysis



Project Name	South of Iris GEI Moreno Valley
Project Number	11222039
Soil Classification	SM
Sample Number	B-1 @ 20'

Krazan Testing Laboratory

Sieve Analysis

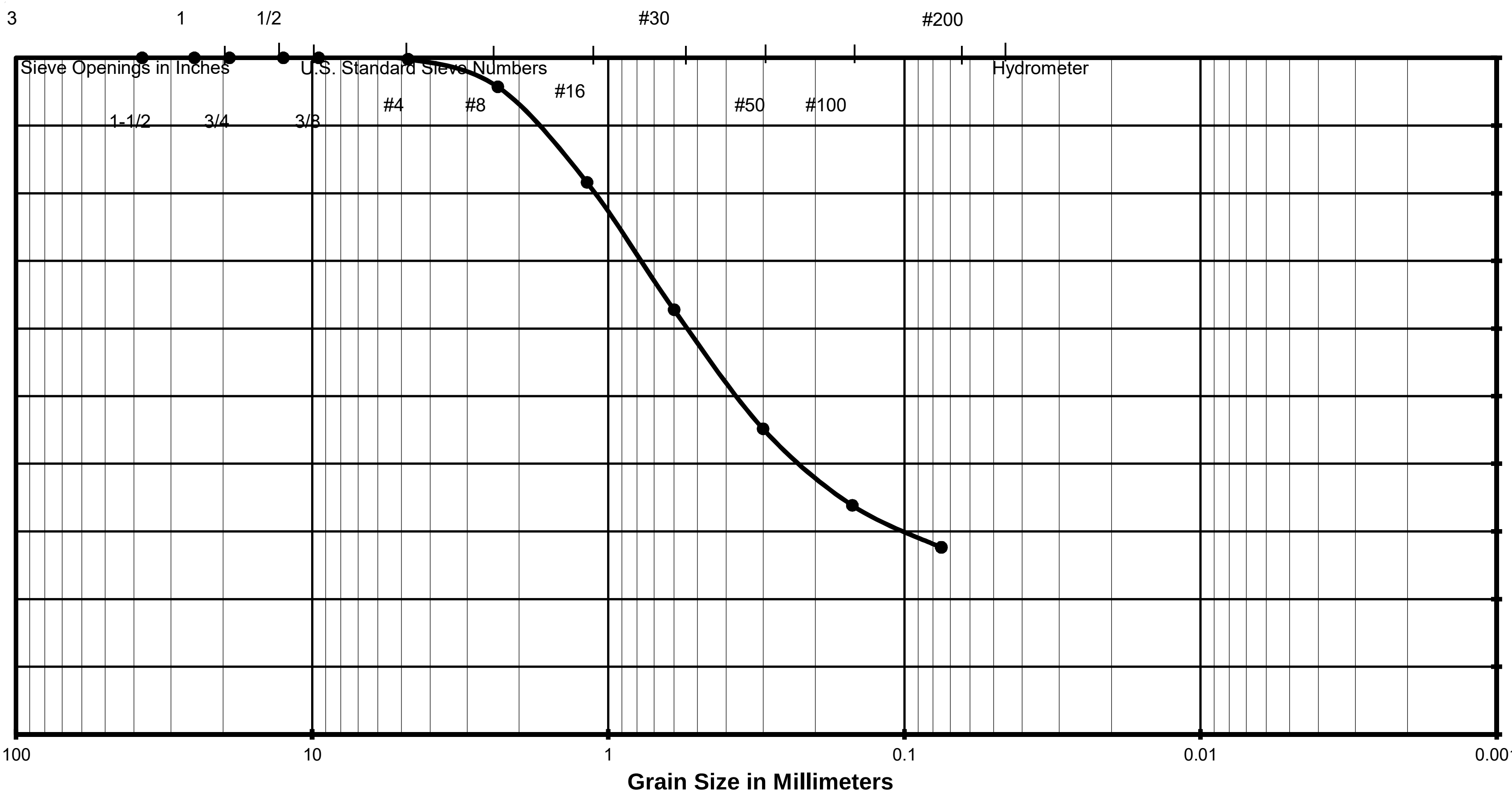
Project Number	: 11222039
Project Name	: South of Iris GEI Moreno Valley
Date	: 4/25/2022
Sample Location	: B-1 @ 25'
Soil Classification	: SM

Wet Weight	:	432.30
Dry Weight	:	432.30
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50				100.0
3/8"	9.50				100.0
#4	4.75	0.8	0.2	0.2	99.8
#8	2.36	17.8	4.1	4.3	95.7
#16	1.18	61.1	14.1	18.4	81.6
#30	0.60	81.3	18.8	37.2	62.8
#50	0.30	76.1	17.6	54.8	45.2
#100	0.15	48.9	11.3	66.2	33.8
#200	0.08	26.9	6.2	72.4	27.6

Krazan Testing Laboratory

Grain Size Analysis



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	South of Iris GEI Moreno Valley
Project Number	11222039
Soil Classification	SM
Sample Number	B-1 @ 25'

Krazan Testing Laboratory

Sieve Analysis

Project Number	: 11222039
Project Name	: South of Iris GEI Moreno Valley
Date	: 4/25/2022
Sample Location	: B-1 @ 30'
Soil Classification	: SM

Wet Weight	:	450.70
Dry Weight	:	450.70
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50				100.0
3/8"	9.50				100.0
#4	4.75	7.2	1.6	1.6	98.4
#8	2.36	31.0	6.9	8.5	91.5
#16	1.18	46.2	10.3	18.7	81.3
#30	0.60	52.1	11.6	30.3	69.7
#50	0.30	59.9	13.3	43.6	56.4
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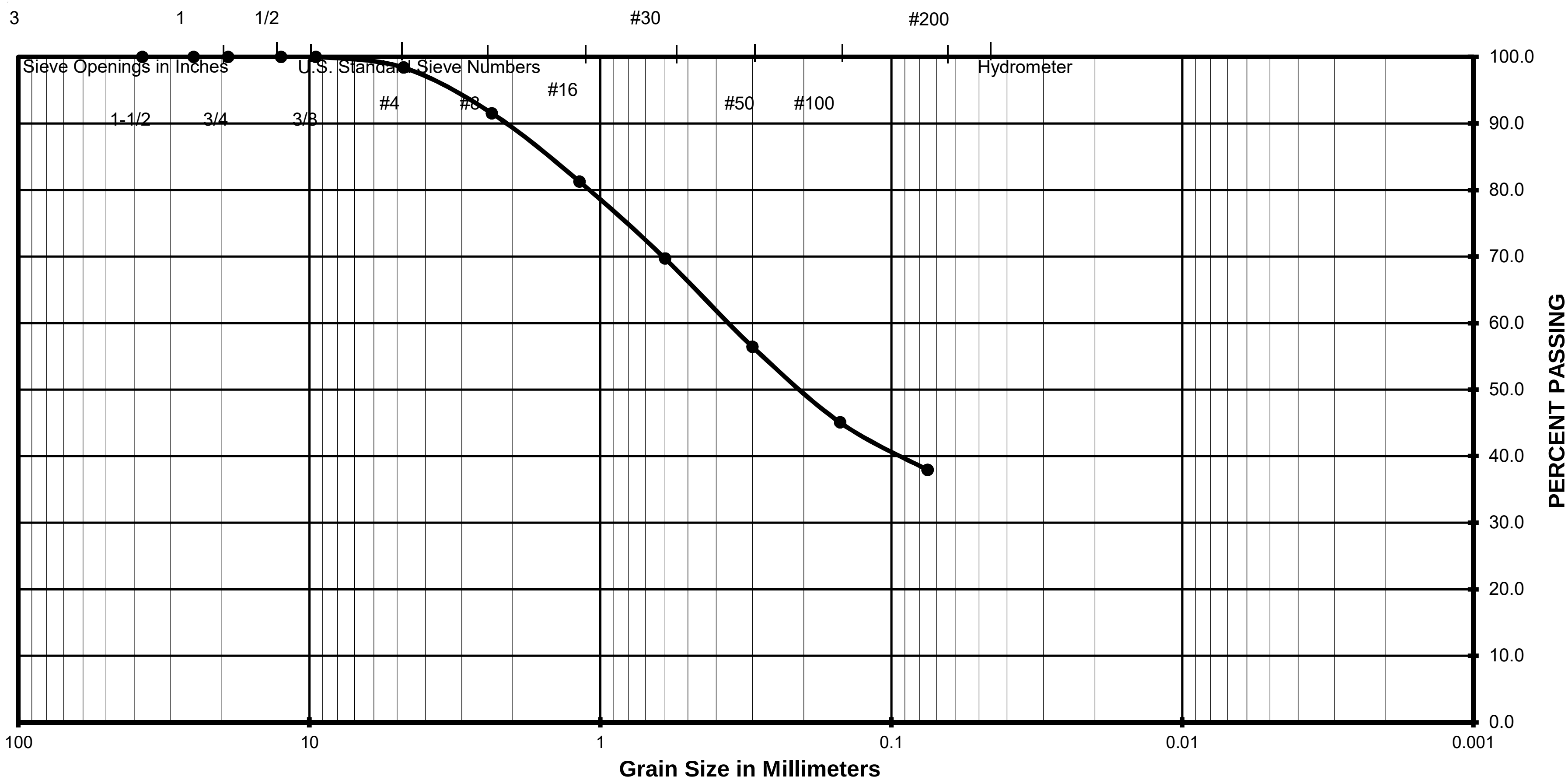
#200	0.08	32.2	7.1	62.1	37.9

Krazan Testing Laboratory

Grain Size Analysis



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	South of Iris GEI Moreno Valley
Project Number	11222039
Soil Classification	SM
Sample Number	B-1 @ 30'

Krazan Testing Laboratory

Sieve Analysis

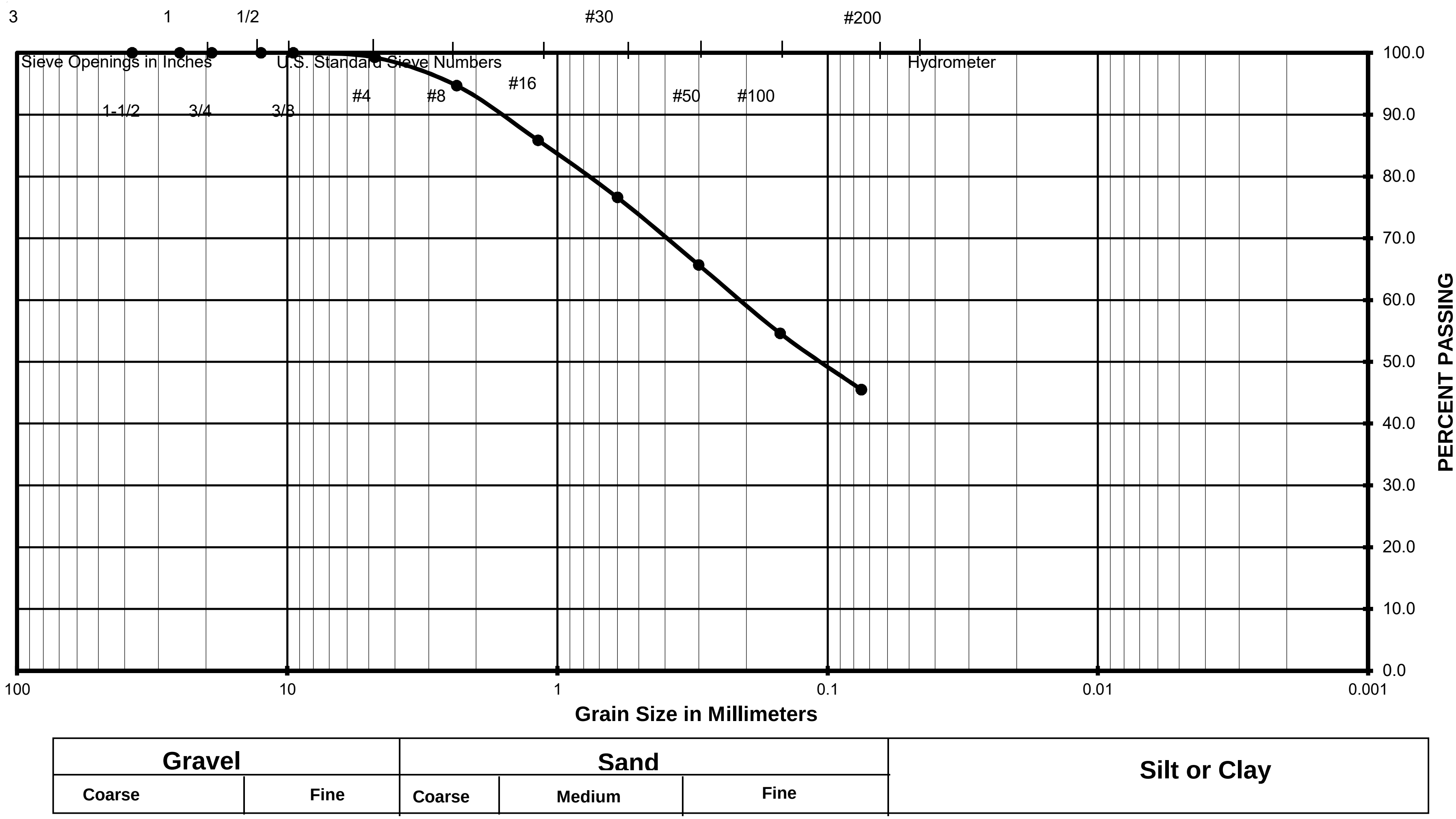
Project Number : 11222039
Project Name : South of Iris GEI Moreno Valley
Date : 4/25/2022
Sample Location : B-1 @ 35'
Soil Classification : SM

Wet Weight	:	442.80
Dry Weight	:	442.80
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50				100.0
3/8"	9.50				100.0
#4	4.75	3.3	0.7	0.7	99.3
#8	2.36	20.2	4.6	5.3	94.7
#16	1.18	39.2	8.9	14.2	85.8
#30	0.60	41.0	9.3	23.4	76.6
#50	0.30	48.3	10.9	34.3	65.7
#100	0.15	49.0	11.1	45.4	54.6
#200	0.08	40.4	9.1	54.5	45.5

Krazan Testing Laboratory

Grain Size Analysis



(Unified Soils Classification)

Project Name	South of Iris GEI Moreno Valley
Project Number	11222039
Soil Classification	SM
Sample Number	B-1 @ 35'

Krazan Testing Laboratory

Sieve Analysis

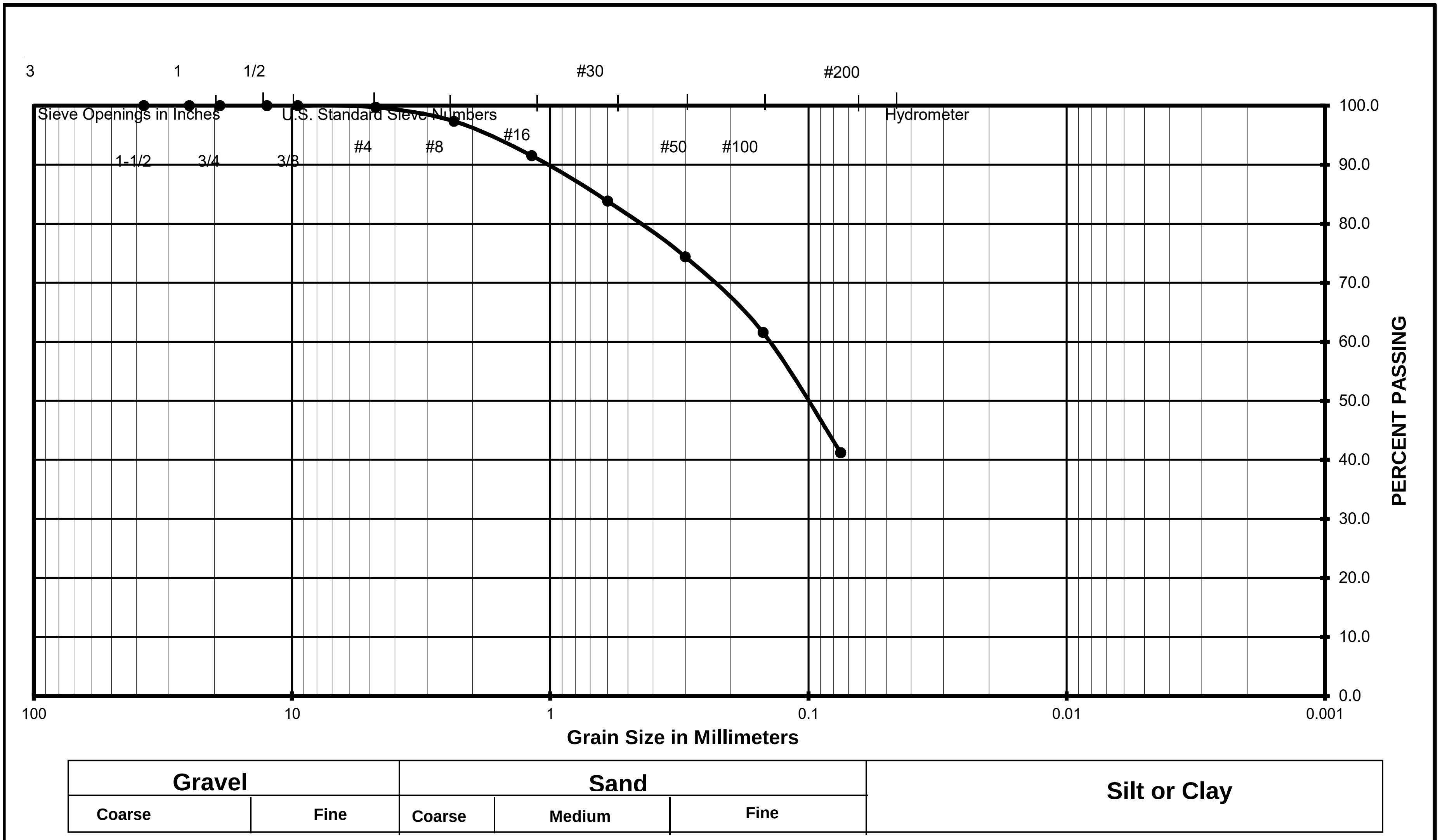
Project Number : 11222039
Project Name : South of Iris GEI Moreno Valley
Date : 4/25/2022
Sample Location : B-1 @ 40'
Soil Classification : SM

Wet Weight	:	439.90
Dry Weight	:	439.90
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50				100.0
3/8"	9.50				100.0
#4	4.75	1.2	0.3	0.3	99.7
#8	2.36	10.4	2.4	2.6	97.4
#16	1.18	25.7	5.8	8.5	91.5
#30	0.60	33.9	7.7	16.2	83.8
#50	0.30	41.4	9.4	25.6	74.4
#100	0.15	56.4	12.8	38.4	61.6
#200	0.08	89.6	20.4	58.8	41.2

Krazan Testing Laboratory

Grain Size Analysis



(Unified Soils Classification)

Project Name	South of Iris GEI Moreno Valley
Project Number	11222039
Soil Classification	SM
Sample Number	B-1 @ 40'

Krazan Testing Laboratory

Sieve Analysis

Project Number : 11222039
Project Name : South of Iris GEI Moreno Valley
Date : 4/25/2022
Sample Location : B-1 @ 45'
Soil Classification : SM

Wet Weight	:	371.70
Dry Weight	:	371.70
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50				100.0
3/8"	9.50				100.0
#4	4.75	1.6	0.4	0.4	99.6
#8	2.36	8.1	2.2	2.6	97.4
#16	1.18	26.6	7.2	9.8	90.2
#30	0.60	29.3	7.9	17.6	82.4
#50	0.30	32.6	8.8	26.4	73.6
#100	0.15	58.6	15.8	42.2	57.8
#200	0.08	74.6	20.1	62.3	37.7

Krazan Testing Laboratory

Grain Size Analysis

Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	South of Iris GEI Moreno Valley
Project Number	11222039
Soil Classification	SM
Sample Number	B-1 @ 45'

Krazan Testing Laboratory

Sieve Analysis

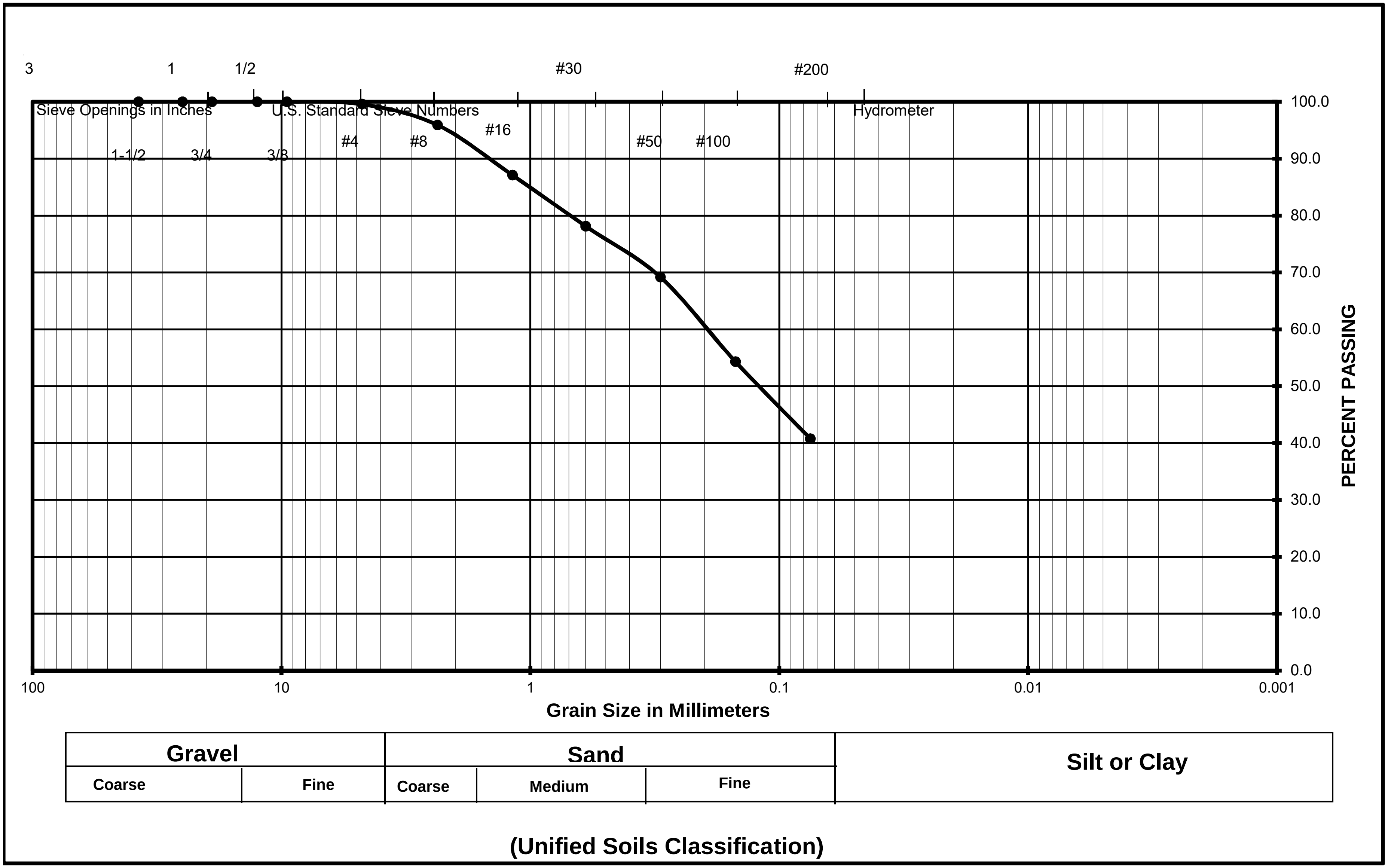
Project Number	: 11222039
Project Name	: South of Iris GEI Moreno Valley
Date	: 4/25/2022
Sample Location	: B-1 @ 50'
Soil Classification	: SM

Wet Weight	:	467.80
Dry Weight	:	467.80
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50				100.0
3/8"	9.50				100.0
#4	4.75	2.0	0.4	0.4	99.6
#8	2.36	17.1	3.7	4.1	95.9
#16	1.18	41.3	8.8	12.9	87.1
#30	0.60	41.9	9.0	21.9	78.1
#50	0.30	42.0	9.0	30.8	69.2
#100	0.15	69.4	14.8	45.7	54.3
#200	0.08	63.4	13.6	59.2	40.8

Krazan Testing Laboratory

Grain Size Analysis



Project Name	South of Iris GEI Moreno Valley
Project Number	11222039
Soil Classification	SM
Sample Number	B-1 @ 50'

Krazan Testing Laboratory

Sieve Analysis

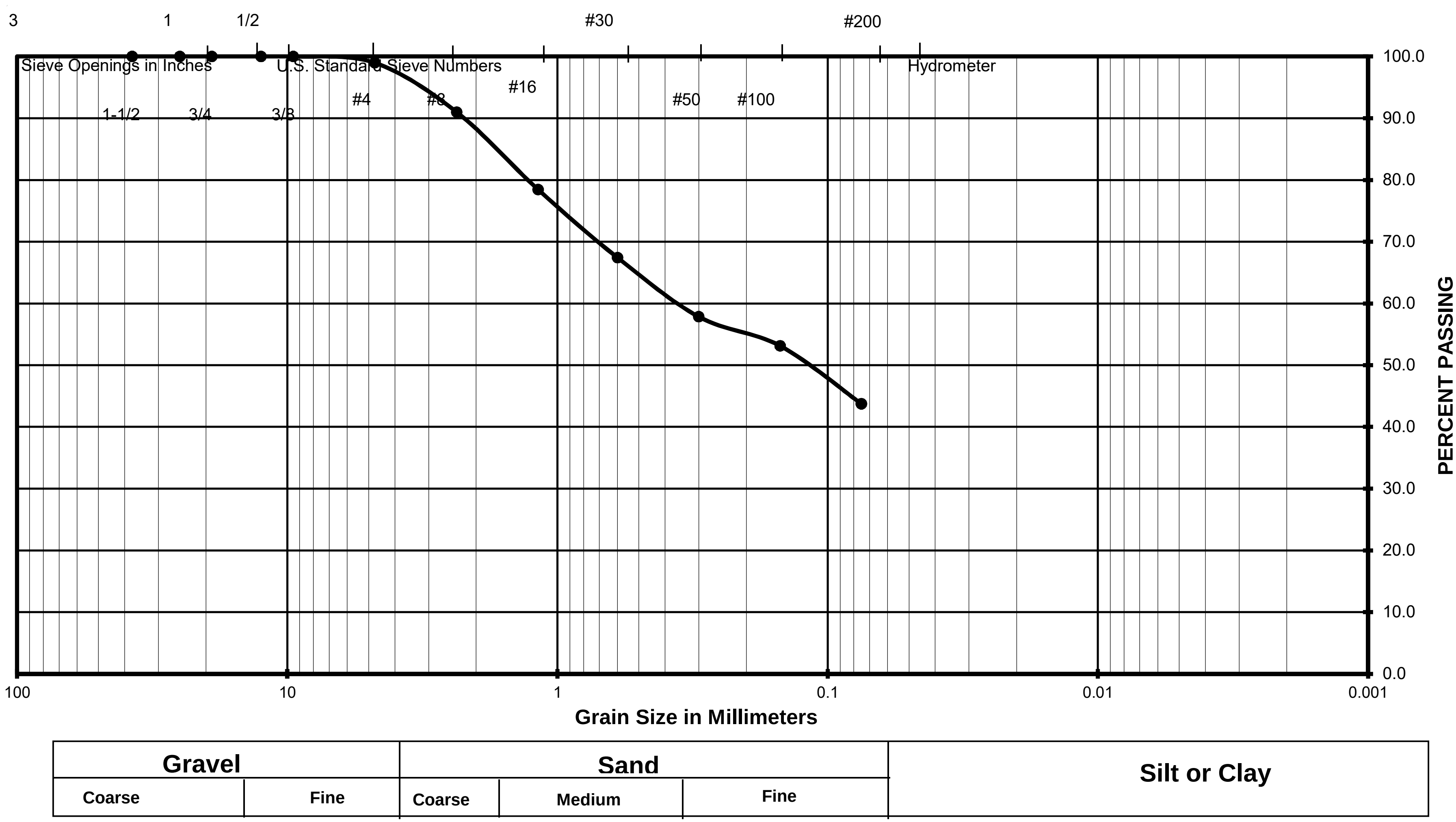
Project Number : 11222039
Project Name : South of Iris GEI Moreno Valley
Date : 4/24/2022
Sample Location : B-1 @ 50'
Soil Classification : SM

Wet Weight	:	481.10
Dry Weight	:	481.10
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50				100.0
3/8"	9.50				100.0
#4	4.75	4.9	1.0	1.0	99.0
#8	2.36	38.5	8.0	9.0	91.0
#16	1.18	60.3	12.5	21.6	78.4
#30	0.60	53.0	11.0	32.6	67.4
#50	0.30	46.1	9.6	42.2	57.8
#100	0.15	22.7	4.7	46.9	53.1
#200	0.08	45.2	9.4	56.3	43.7

Krazan Testing Laboratory

Grain Size Analysis



(Unified Soils Classification)

Project Name	South of Iris GEI Moreno Valley
Project Number	11222039
Soil Classification	SM
Sample Number	B-1 @ 50'

Krazan Testing Laboratory

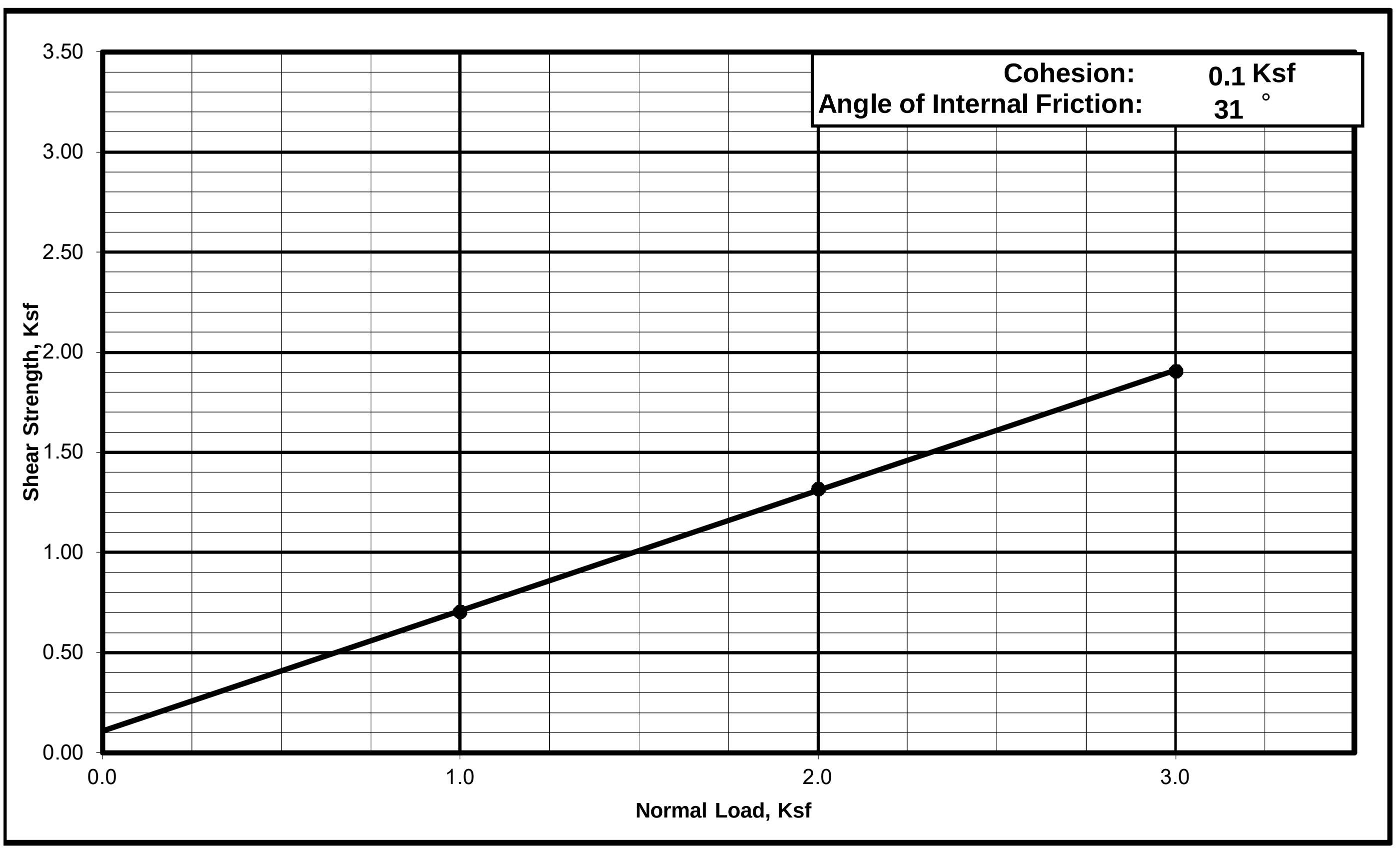
Direct Shear of Consolidated, Drained Soils
ASTM D - 3080 / AASHTO T - 236

Project Number : 11222039
Project Name : South of Iris GEI Moreno Valley
Date : 4/25/2022
Sample Location : B-2 @ 5'
Soil Classification : SM
Sample Surface Area : 0.0289

STRESS DISPLACEMENT DATA

Lat. Disp. (in.)	Normal Load		
	1000	2000	3000
0	0	0	0
0.030	8	15	29
0.060	15	29	46
0.090	20	45	55
0.120	26	51	72
0.150	35	58	89
0.180	43	64	102
0.210	49	69	119
0.240	53	78	130
0.270	57	90	141
0.300	60	101	155
0.330	61	117	171
0.360	61	115	165

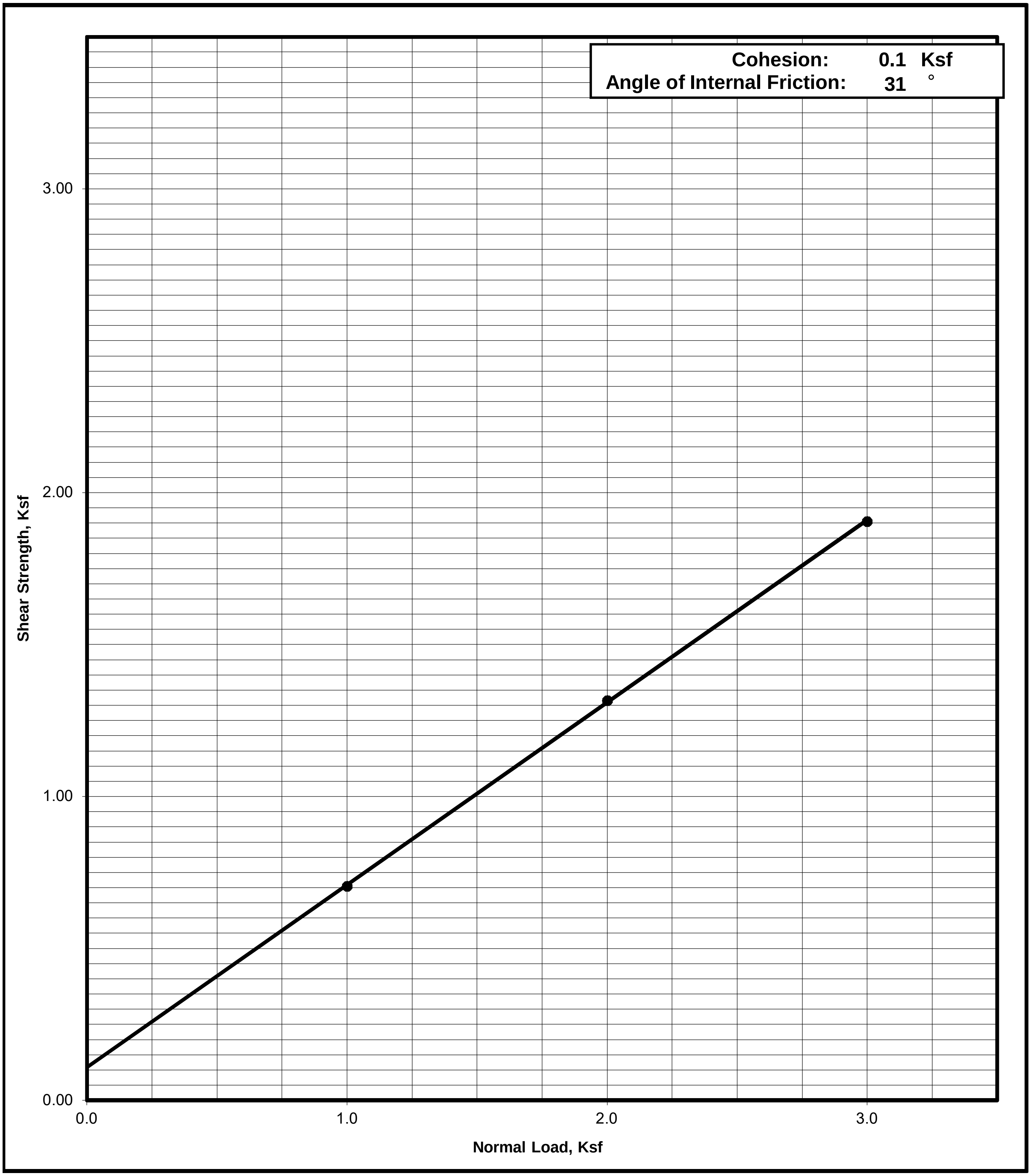
Normal Load psf	Shear force lbs	Shear Stress psf
1000	20.4	705
2000	38.0	1316
3000	55.1	1906



Krazan Testing Laboratory

Shear Strength Diagram (Direct Shear)
ASTM D - 3080 / AASHTO T - 236

Project Number	Boring No. & Depth	Soil Type	Date
11222039	B-2 @ 5'	SM	4/25/2022



Krazan Testing Laboratory

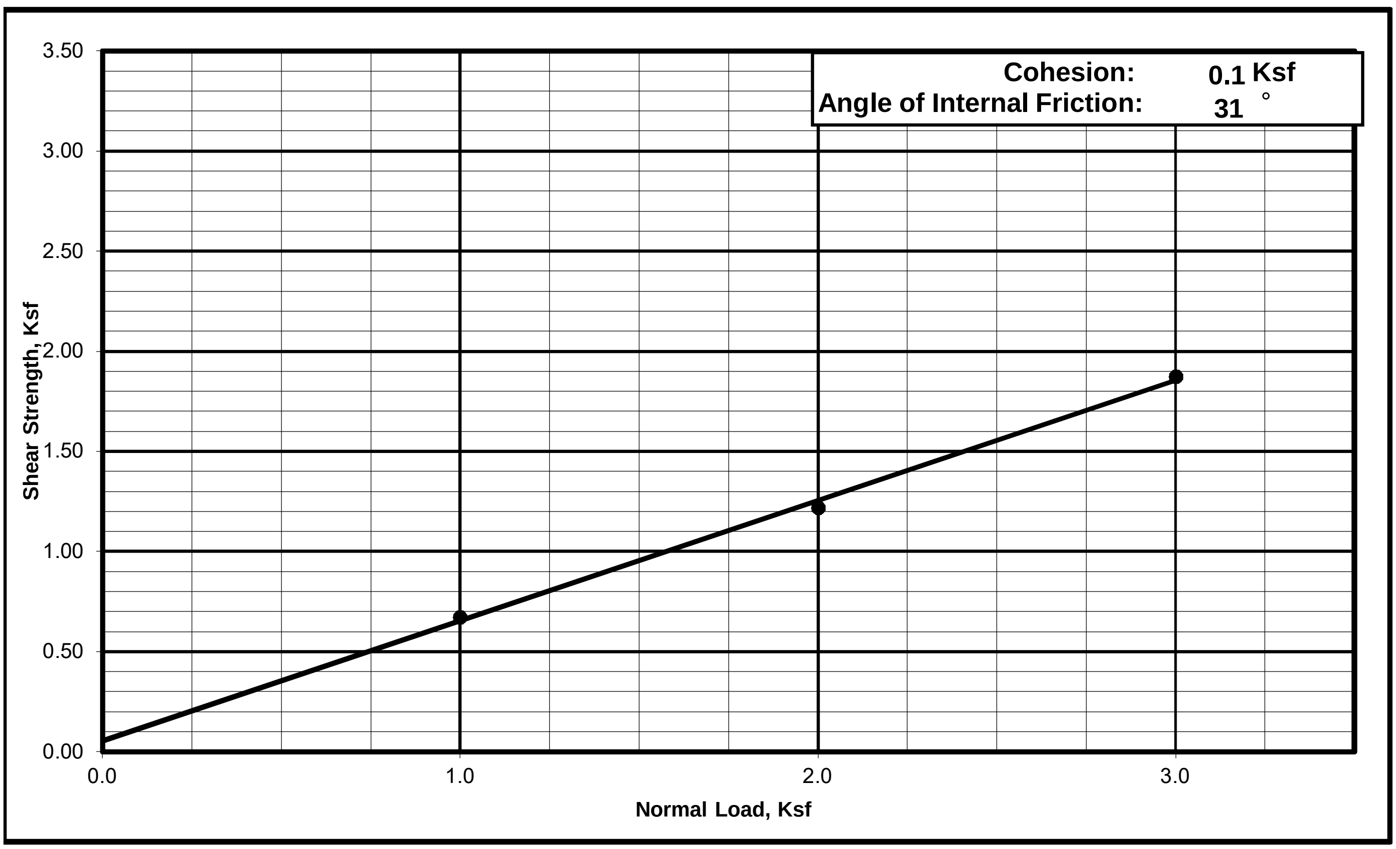
Direct Shear of Consolidated, Drained Soils
ASTM D - 3080 / AASHTO T - 236

Project Number : 11222039
Project Name : South of Iris GEI Moreno Valley
Date : 4/25/2022
Sample Location : B-19 @ 5'
Soil Classification : SM
Sample Surface Area : 0.0289

STRESS DISPLACEMENT DATA

Lat. Disp. (in.)	Normal Load		
	1000	2000	3000
0	0	0	0
0.030	10	15	25
0.060	12	29	42
0.090	18	45	50
0.120	24	51	68
0.150	32	58	85
0.180	40	64	98
0.210	45	68	115
0.240	48	72	125
0.270	54	80	132
0.300	58	90	145
0.330	58	105	155
0.360	58	108	168

Normal Load psf	Shear force lbs	Shear Stress psf
1000	19.4	672
2000	35.2	1218
3000	54.1	1873

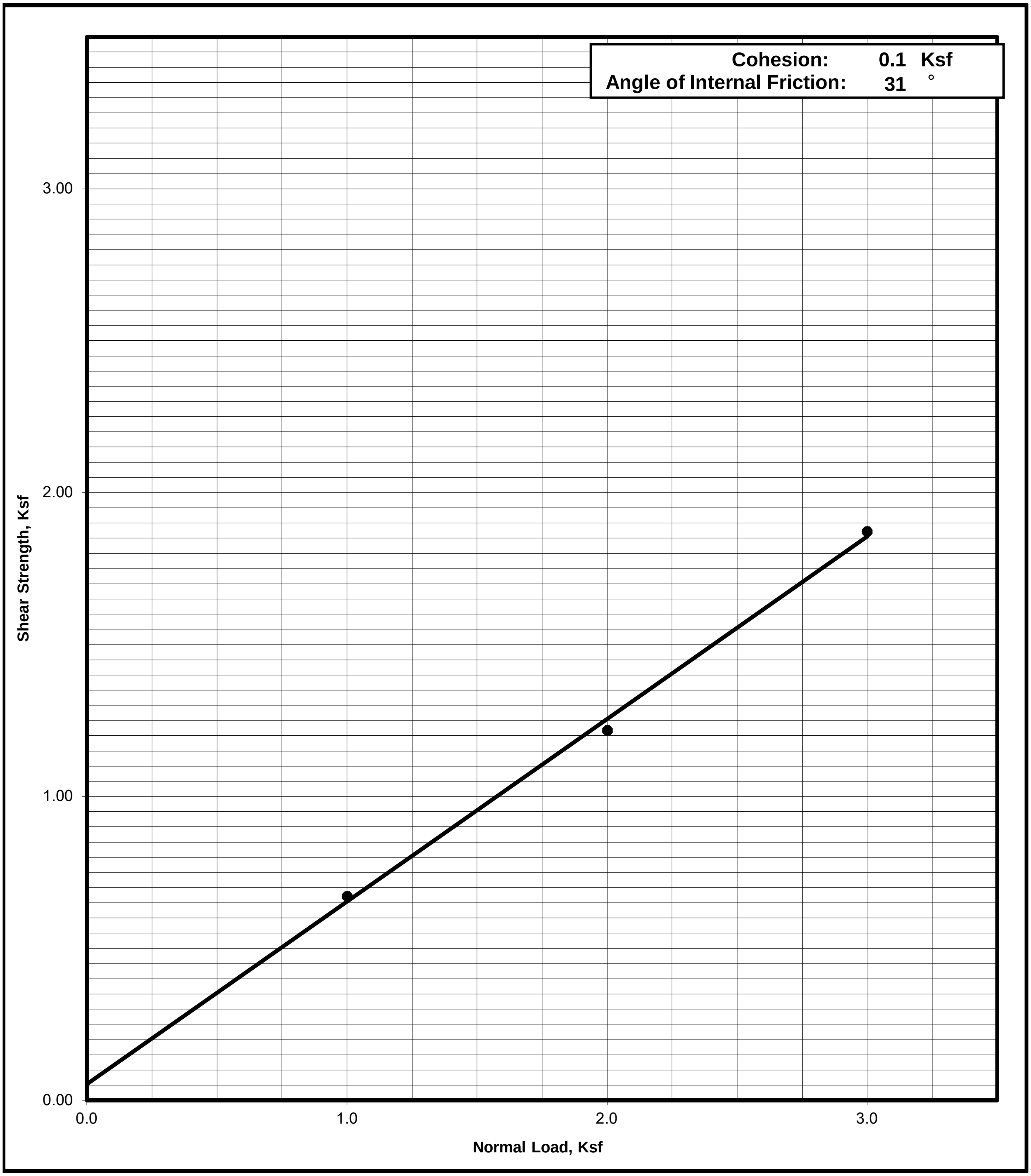


Krazan Testing Laboratory

Shear Strength Diagram (Direct Shear)

ASTM D - 3080 / AASHTO T - 236

Project Number	Boring No. & Depth	Soil Type	Date
11222039	B-19 @ 5'	SM	4/25/2022



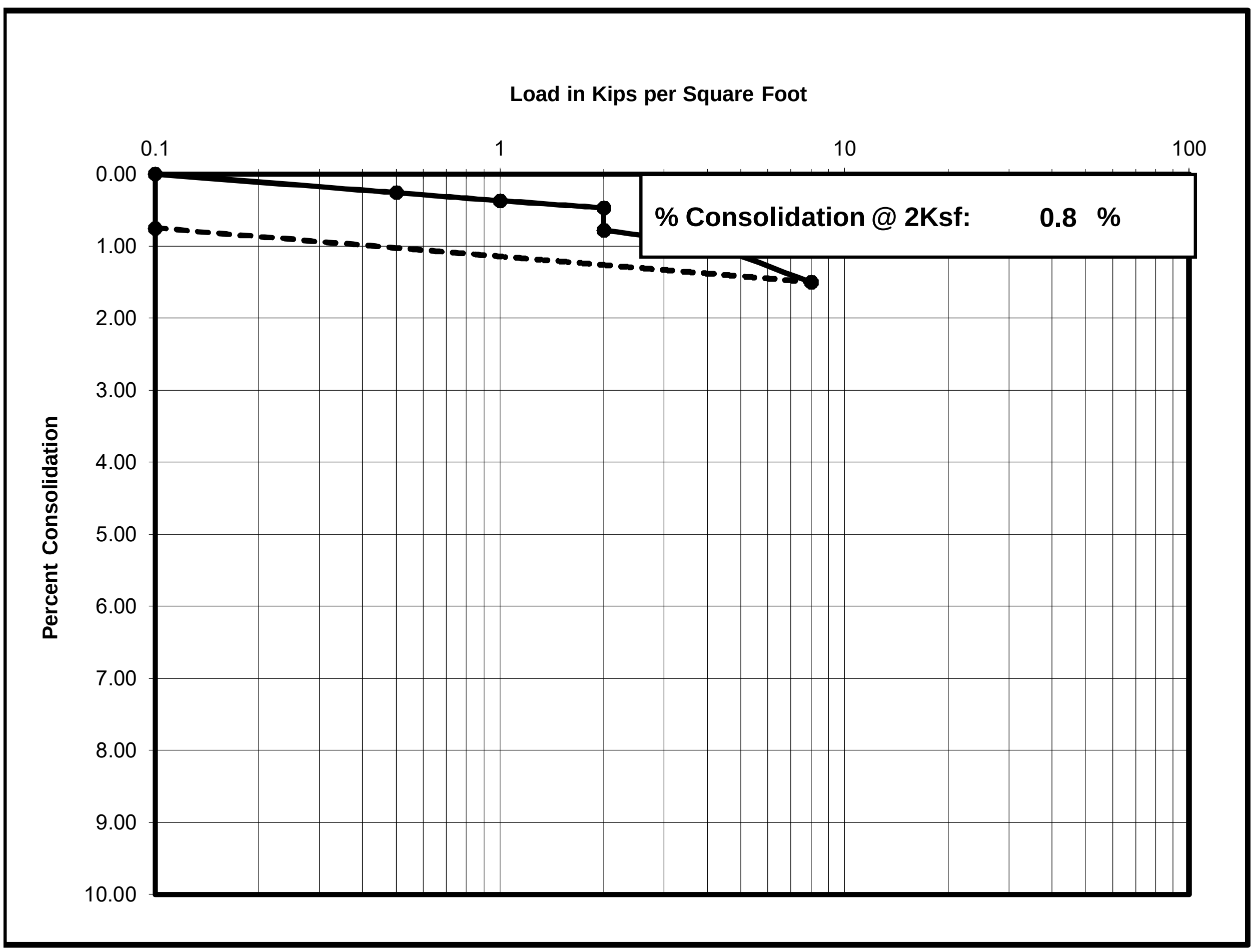
Krazan Testing Laboratory

One Dimensional Consolidation Properties of Soil

ASTM D - 2435 / AASHTO T - 216

Project Number : 11222039
Project Name : South of Iris GEI Moreno Valley
Date : 4/25/2022
Sample Location : B-3 @ 5'
Soil Classification : SM
Sample Condition : Undisturbed

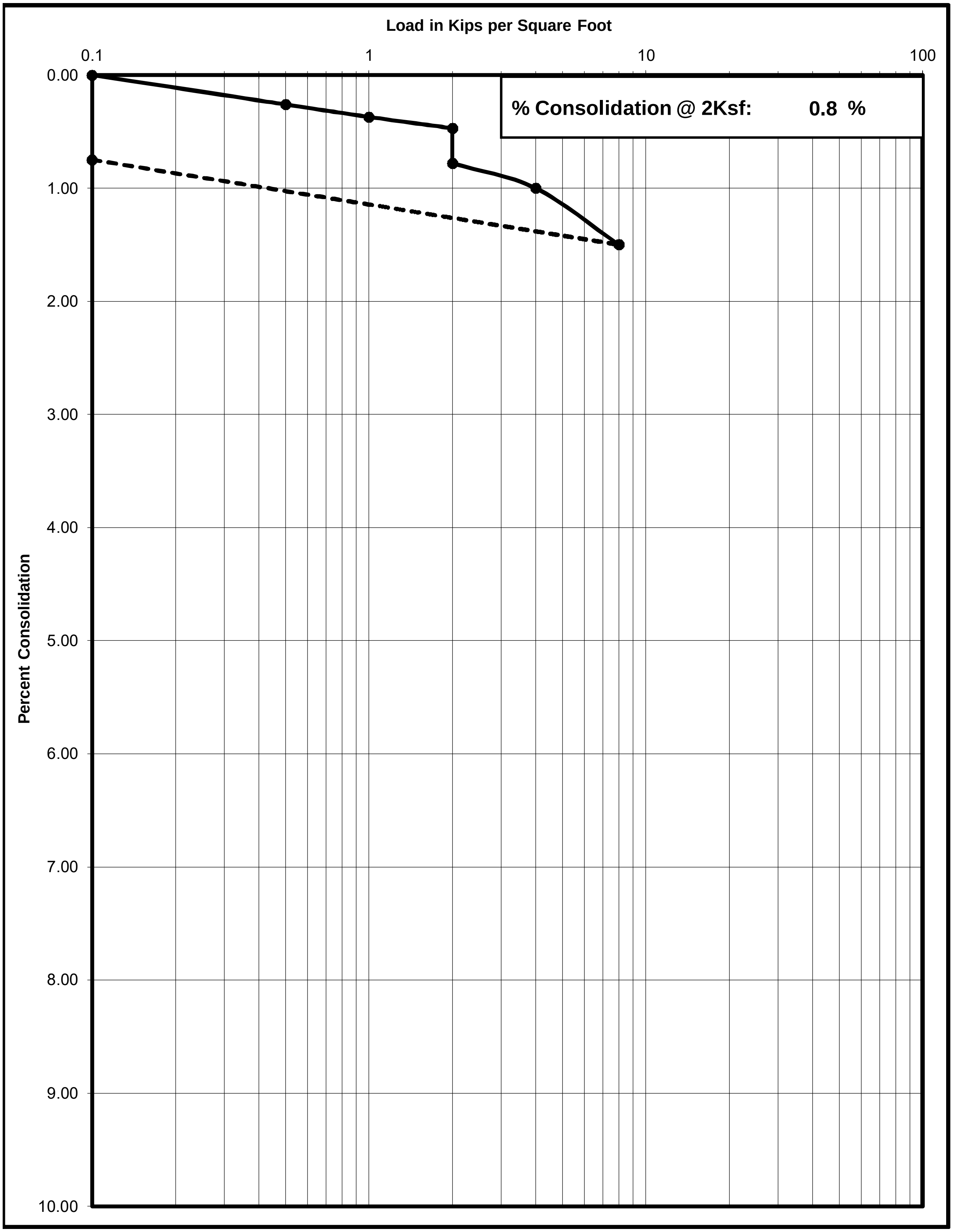
LOAD (ksf)	Reading	% Consolidation
0.1	0.0014	--
0.5	0.0026	0.26
1	0.0037	0.37
2	0.0047	0.47
Satur.	0.0078	0.78
4	0.01	1.00
8	0.015	1.50
0.1	0.0075	0.75



Krazan Testing Laboratory

Consolidation Test

Project No	Boring No. & Depth	Date	Soil Classification
11222039	B-3 @ 5'	4/25/2022	SM



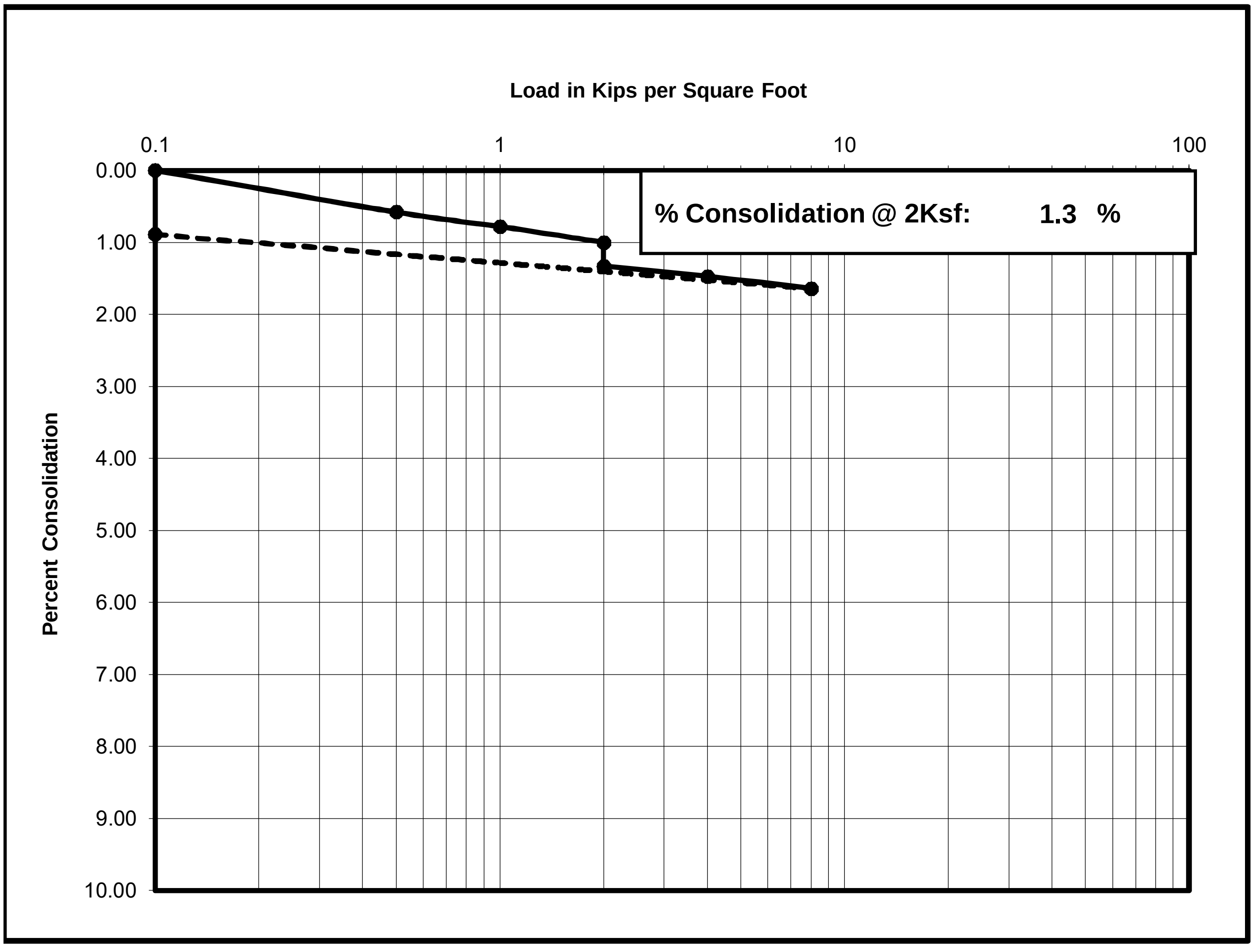
Krazan Testing Laboratory

One Dimensional Consolidation Properties of Soil

ASTM D - 2435 / AASHTO T - 216

Project Number : 11222039
Project Name : South of Iris GEI Moreno Valley
Date : 4/25/2022
Sample Location : B-8 @ 5'
Soil Classification : SM
Sample Condition : Undisturbed

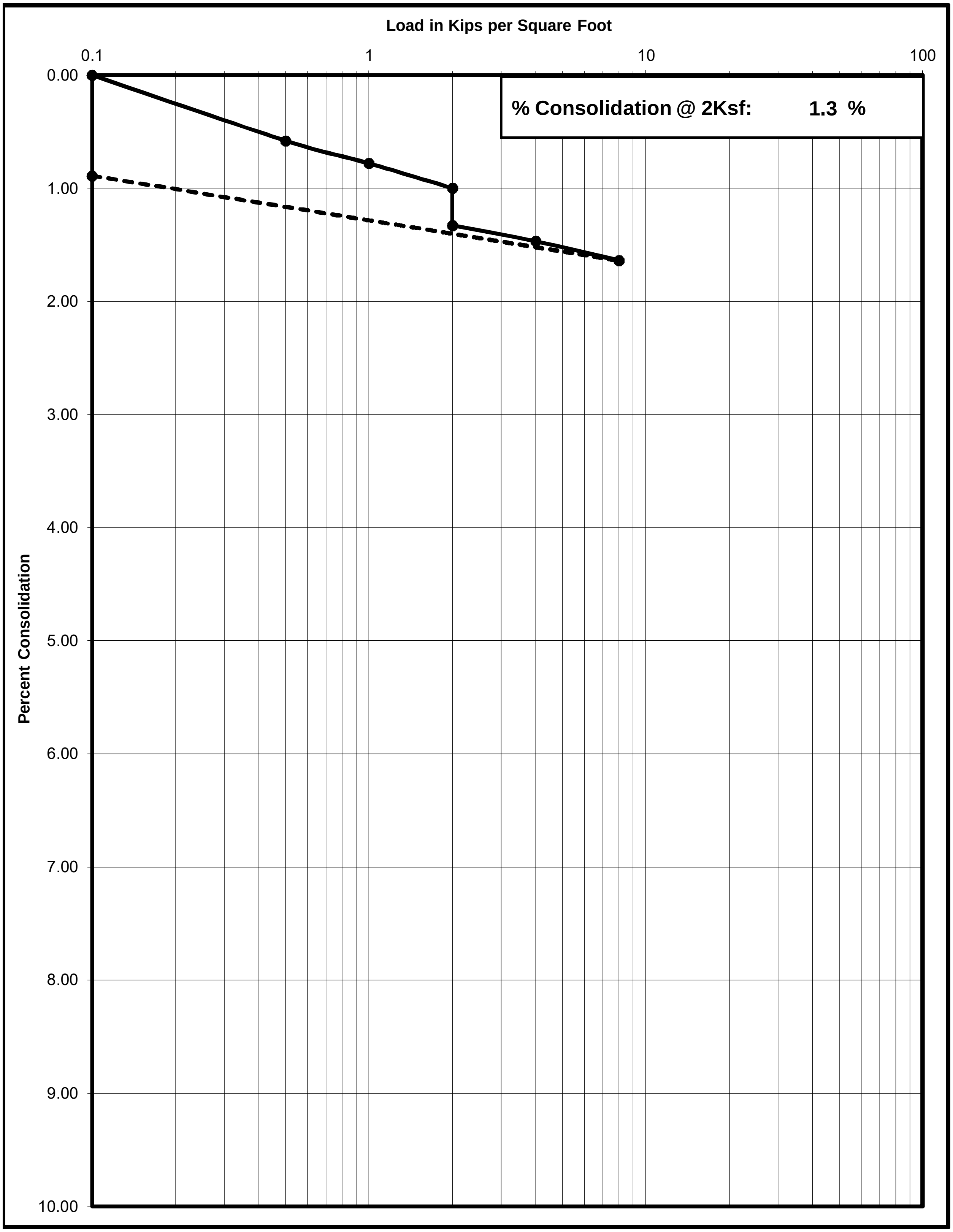
LOAD (ksf)	Reading	% Consolidation
0.1	0.0035	--
0.5	0.0058	0.58
1	0.0078	0.78
2	0.01	1.00
Satur.	0.0133	1.33
4	0.0147	1.47
8	0.0164	1.64
0.1	0.0089	0.89



Krazan Testing Laboratory

Consolidation Test

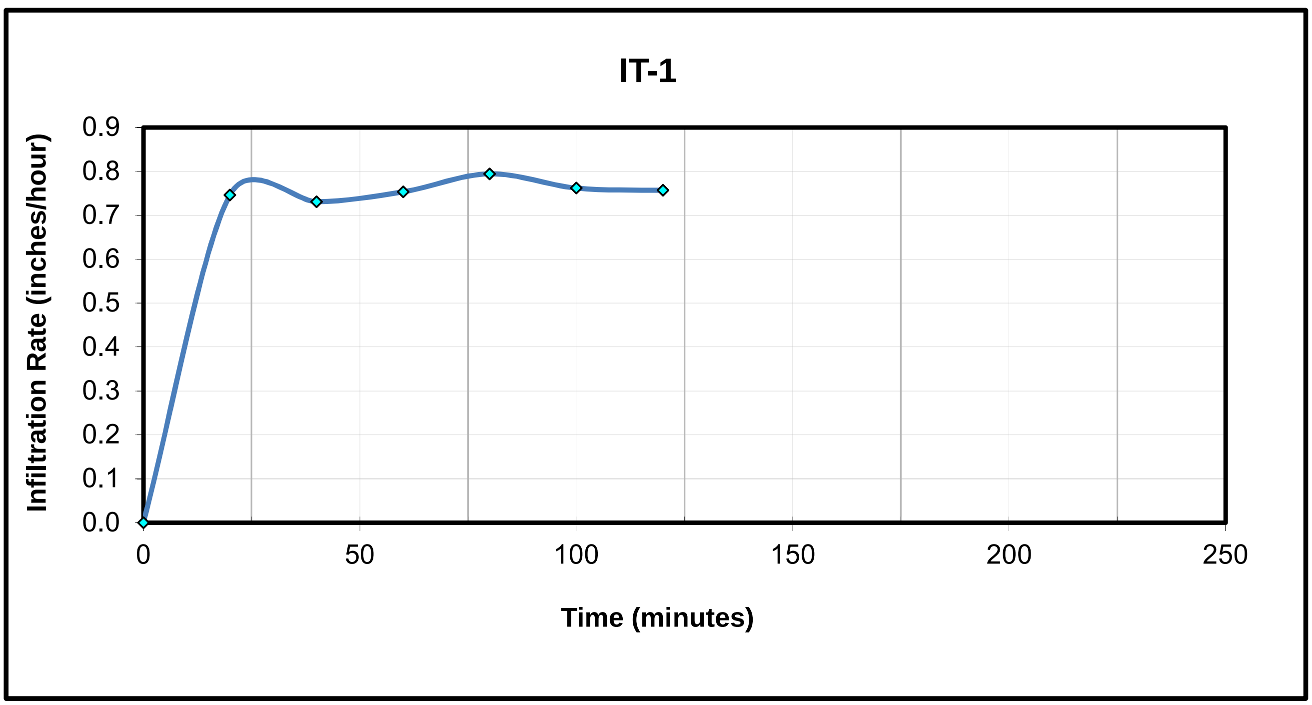
Project No	Boring No. & Depth	Date	Soil Classification
11222039	B-8 @ 5'	4/25/2022	SM



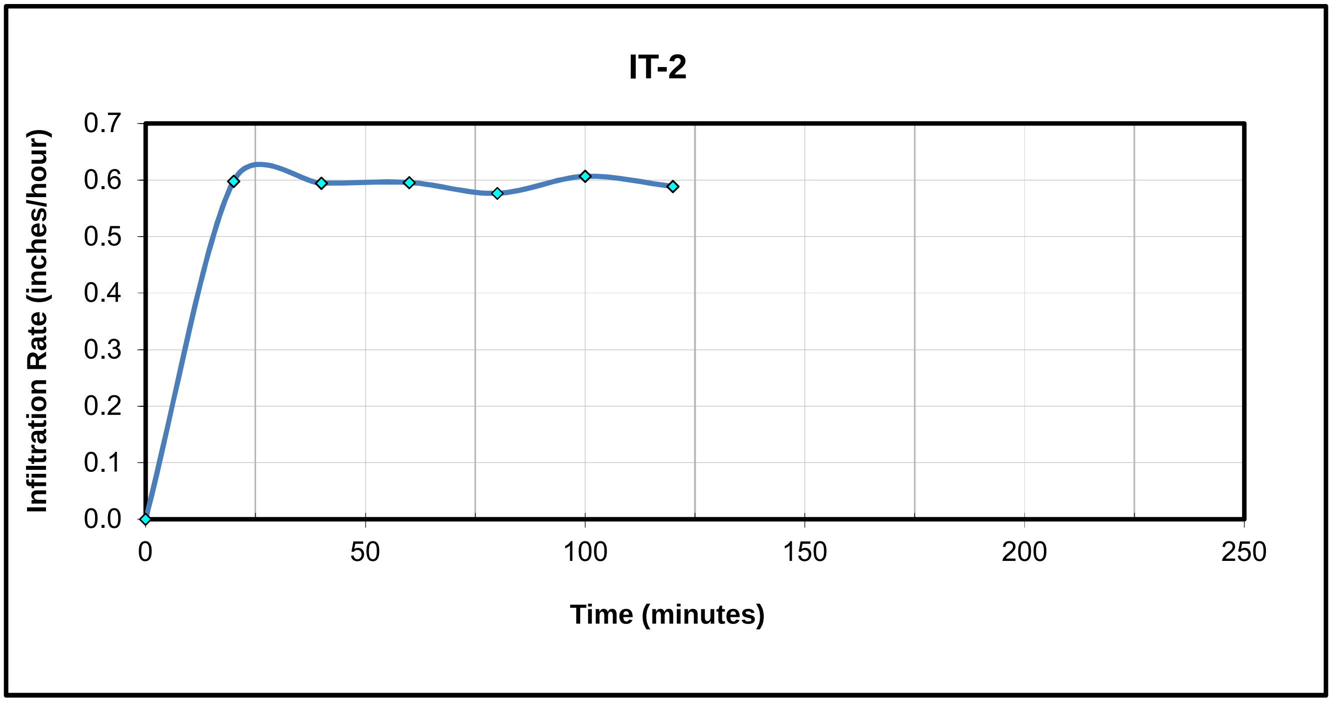
Krazan Testing Laboratory

RESULTS OF INFILTRATION TESTS - REVERSE BOREHOLE						
Project #	**11222039**				**Date**	**3/18/2022**
Project Name	South of Iris GEI Moreno Valley					
Project Address	Southeast Quadrant Iris Avenue and Indian Street, Moreno Valley, CA					
Test No:	IT-1	**Total Depth (in.)**		120	**Test Size (in)**	8
Depth To Water	>50'	**Soil Classification**		SM		

Reading	Elasped Time(min.)	Incremental Time (min.)	Initial Depth To Water(in.)	Final Depth To Water(in.)	Incremental Fall of Water(in.)	Incremental Infiltration Rate (in/hr)
Start	0	0.00		11.00	--	--
1	20.00	20.00	11.00	24.00	13.00	0.75
2	40.00	20.00	24.00	35.25	11.25	0.73
3	60.00	20.00	35.25	45.50	10.25	0.75
4	80.00	20.00	45.50	55.00	9.50	0.79
5	100.00	20.00	55.00	63.00	8.00	0.76
6	120.00	20.00	63.00	70.00	7.00	0.76
	Infiltration Rate in Inches per Hour					**0.73**

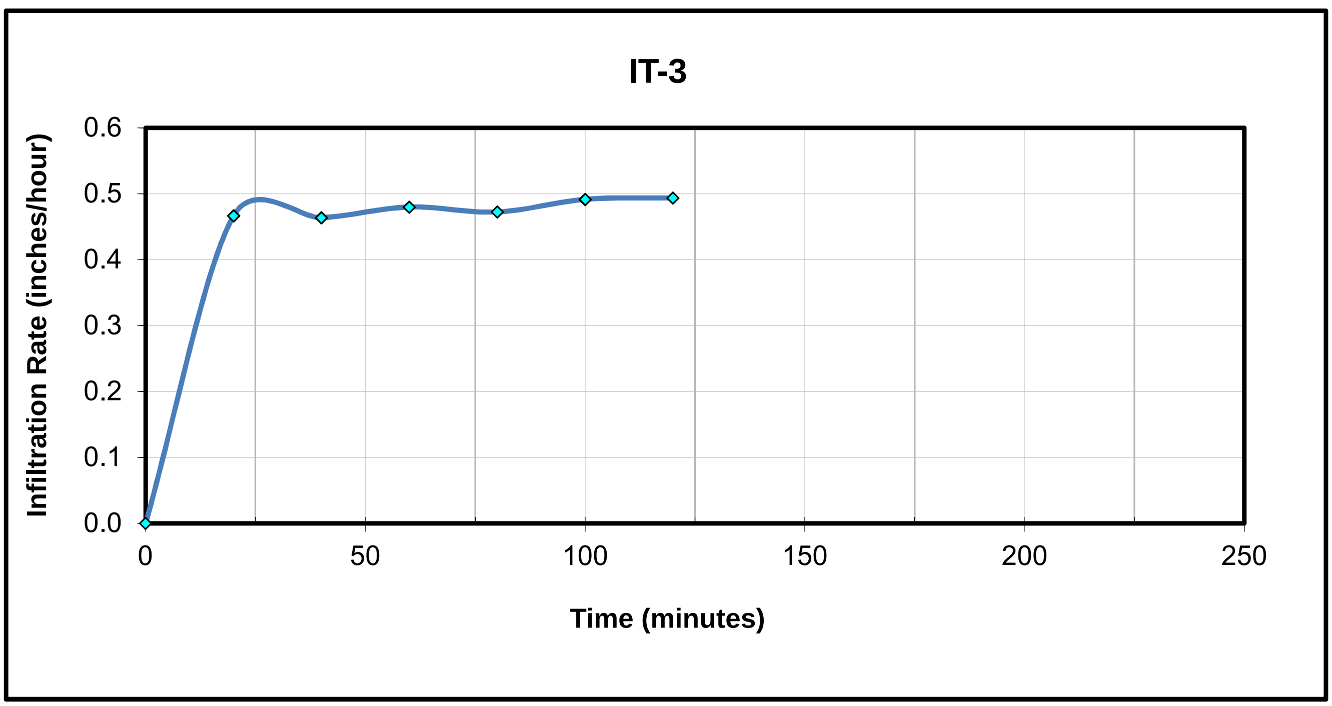


RESULTS OF INFILTRATION TESTS - REVERSE BOREHOLE						
Project #	**11222039**				**Date**	**3/18/2022**
Project Name	South of Iris GEI Moreno Valley					
Project Address	Southeast Quadrant Iris Avenue and Indian Street, Moreno Valley, CA					
Test No:	IT-2	**Total Depth (in.)**		180	**Test Size (in)**	8
Depth To Water	>50'	**Soil Classification**		SM		
Reading	**Elasped Time(min.)**	**Incremental Time (min.)**	**Initial Depth To Water(in.)**	**Final Depth To Water(in.)**	**Incremental Fall of Water(in.)**	**Incremental Infiltration Rate (in/hr)**
Start	0	0.00		24.00	--	--
1	20.00	20.00	24.00	39.00	15.00	0.60
2	40.00	20.00	39.00	52.50	13.50	0.59
3	60.00	20.00	52.50	64.75	12.25	0.60
4	80.00	20.00	64.75	75.50	10.75	0.58
5	100.00	20.00	75.50	85.75	10.25	0.61
6	120.00	20.00	85.75	94.75	9.00	0.59
	Infiltration Rate in Inches per Hour					**0.58**



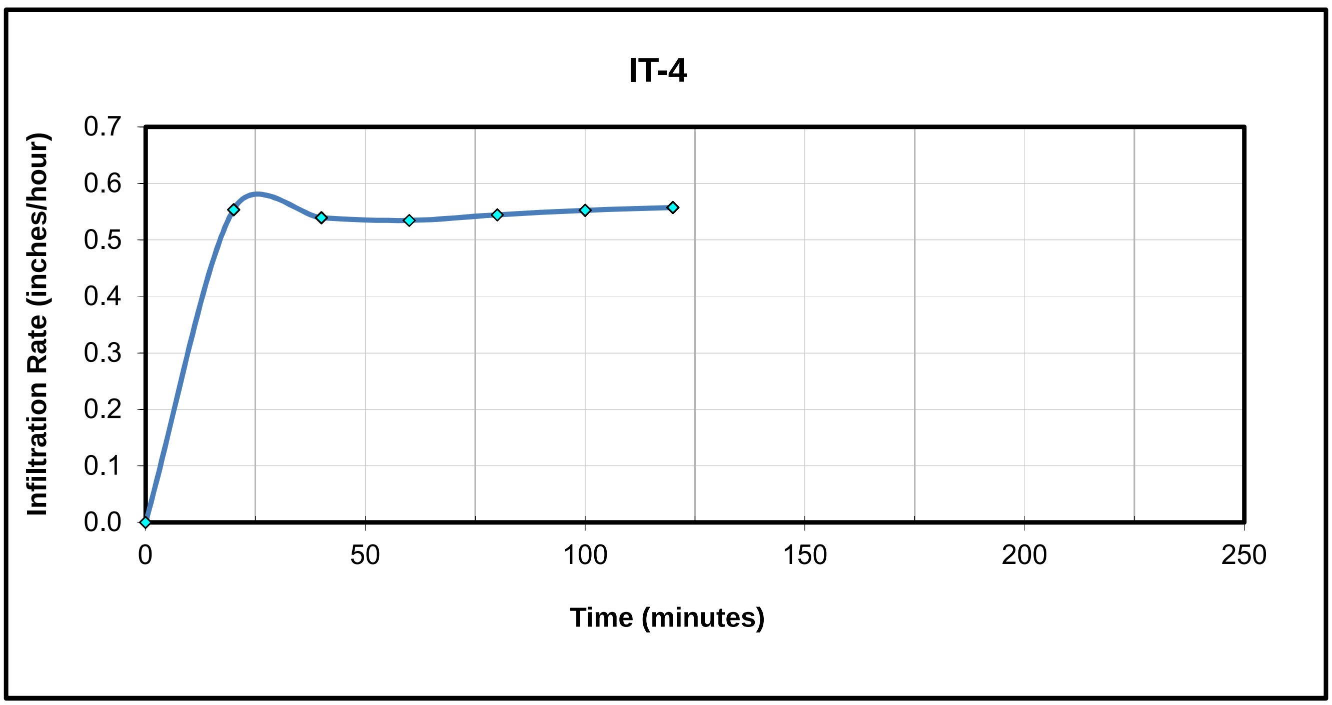
RESULTS OF INFILTRATION TESTS - REVERSE BOREHOLE						
Project #	**11222039**				**Date**	**3/18/2022**
Project Name	South of Iris GEI Moreno Valley					
Project Address	Southeast Quadrant Iris Avenue and Indian Street, Moreno Valley, CA					
Test No:	IT-3	**Total Depth (in.)**		180	**Test Size (in)**	8
Depth To Water	>50'	**Soil Classification**		SM		

Reading	Elasped Time(min.)	Incremental Time (min.)	Initial Depth To Water(in.)	Final Depth To Water(in.)	Incremental Fall of Water(in.)	Incremental Infiltration Rate (in/hr)
Start	0	0.00		15.00	--	--
1	20.00	20.00	15.00	27.50	12.50	0.47
2	40.00	20.00	27.50	39.00	11.50	0.46
3	60.00	20.00	39.00	50.00	11.00	0.48
4	80.00	20.00	50.00	60.00	10.00	0.47
5	100.00	20.00	55.00	65.00	10.00	0.49
6	120.00	20.00	65.00	74.25	9.25	0.49
	Infiltration Rate in Inches per Hour					**0.46**



RESULTS OF INFILTRATION TESTS - REVERSE BOREHOLE						
Project #	**11222039**				**Date**	**3/18/2022**
Project Name	South of Iris GEI Moreno Valley					
Project Address	Southeast Quadrant Iris Avenue and Indian Street, Moreno Valley, CA					
Test No:	IT-4	**Total Depth (in.)**		120	**Test Size (in)**	8
Depth To Water	>50'	**Soil Classification**		SM		

Reading	Elasped Time(min.)	Incremental Time (min.)	Initial Depth To Water(in.)	Final Depth To Water(in.)	Incremental Fall of Water(in.)	Incremental Infiltration Rate (in/hr)
Start	0	0.00		20.00	--	--
1	20.00	20.00	20.00	29.00	9.00	0.55
2	40.00	20.00	29.00	37.00	8.00	0.54
3	60.00	20.00	37.00	44.25	7.25	0.53
4	80.00	20.00	44.25	51.00	6.75	0.54
5	100.00	20.00	51.00	57.25	6.25	0.55
6	120.00	20.00	57.25	63.00	5.75	0.56
	Infiltration Rate in Inches per Hour					**0.53**



ANAHEIM TEST LAB, INC

196 Technology Drive, Unit D
Irvine, CA 92618
Phone (949)336-6544

DATE: 4/20/2022

P.O. NO: Verbal

LAB NO: C-5877

SPECIFICATION: CTM-643/417/422

MATERIAL: Soil

Krazan & Associates, Inc.
1100 Olympic Drive, Ste. 103
Corona, CA 92888

Project No: 11222039
Project Name: Moreno Valley
Sample ID: B9 @ 0-5'

ANALYTICAL REPORT

CORROSION SERIES
SUMMARY OF DATA

pH	MIN. RESISTIVITY per CT. 643 ohm-cm	SOLUBLE SULFATES per CT. 417 ppm	SOLUBLE CHLORIDES per CT. 422 ppm
7.6	5,000	181	52

RESPECTFULLY SUBMITTED

WES BRIDGER LAB MANAGER

ANAHEIM TEST LAB, INC

196 Technology Drive, Unit D
Irvine, CA 92618
Phone (949) 336-6544

TO:

Krazan & Associates, Inc.
1100 Olympic Drive, Ste. 103
Corona, CA 92888

DATE: 4/20/2022

P.O. NO.: Verbal

LAB NO.: C-5882

SPECIFICATION: CA 301

MATERIAL: Brown, Silty Sand w. F. Gravel

Project No.: 11222039
Project: Moreno Valley
Sample ID: R1 @ 0-3'

ANALYTICAL REPORT
"R" VALUE

BY EXUDATION	BY EXPANSION
65	N/A

RESPECTFULLY SUBMITTED

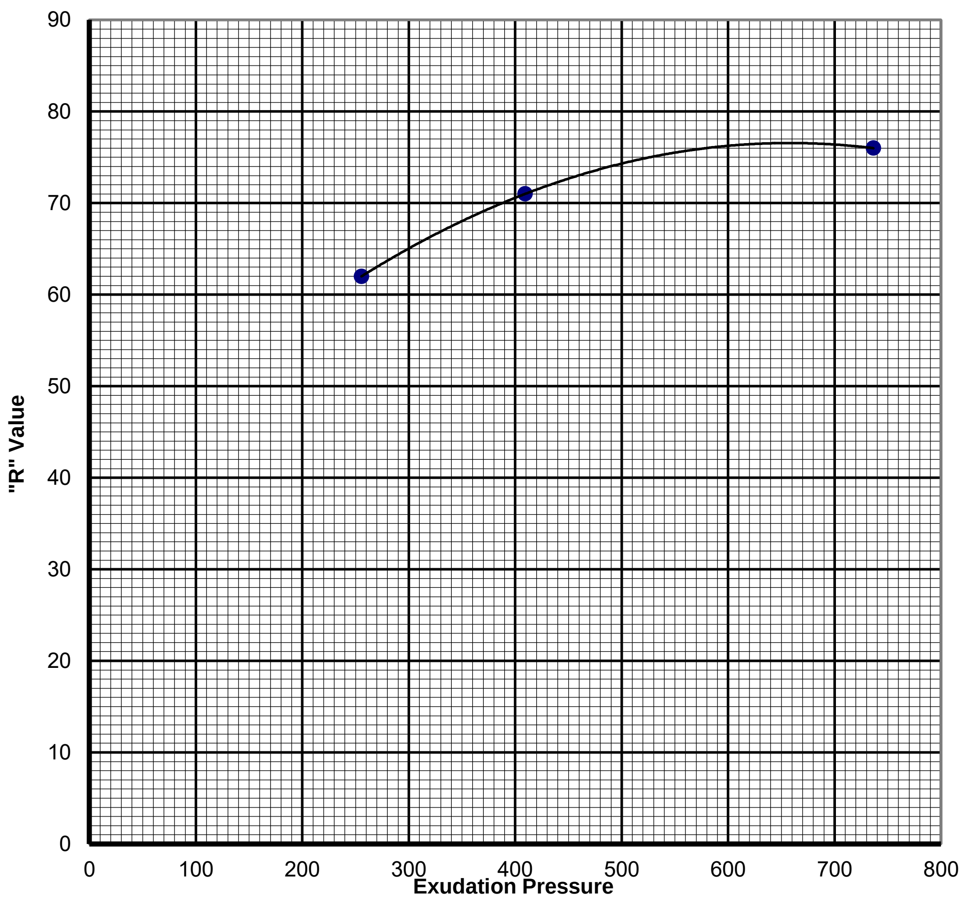
WES BRIDGER LAB MANAGER

"R" VALUE CA 301

Client: Krazan & Associates, Inc. **ATL No.:** C 5882 **Date:** 4/20/2022
Client Reference No.: 11222039
Sample: R1 @ 0-5' **Soil Type:** Brown, Silty Sand w. F Gravel

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	350	350	350	
Initial Moisture Content	%	2.1	2.1	2.1	
Moisture at Compaction	%	8.9	8.4	8.0	
Briquette Height	in.	2.52	2.53	2.51	
Dry Density	pcf	127.1	129.6	130.3	
EXUDATION PRESSURE	psi	256	409	736	
EXPANSION PRESSURE	psf	0	26	52	
Ph at 1000 pounds	psi	26	20	17	
Ph at 2000 pounds	psi	43	34	28	
Displacement	turns	4.21	3.81	3.68	
"R" Value		62	71	76	
CORRECTED "R" VALUE		62	71	76	

Final "R" Value	
BY EXUDATION: @ 300 psi	**65**
BY EXPANSION: TI = 5.0	**N/A**



General Earthwork Specifications

Appendix B

APPENDIX B

EARTHWORK SPECIFICATIONS

GENERAL

When the text of the report conflicts with the general specifications in this appendix, the recommendations in the report have precedence.

SCOPE OF WORK: These specifications and applicable plans pertain to and include all earthwork associated with the site rough grading, including but not limited to the furnishing of all labor, tools, and equipment necessary for site clearing and grubbing, stripping, preparation of foundation materials for receiving fill, excavation, processing, placement and compaction of fill and backfill materials to the lines and grades shown on the project grading plans, and disposal of excess materials.

PERFORMANCE: The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications. This work shall be inspected and tested by a representative of Krazan and Associates, Inc., hereinafter known as the Soils Engineer and/or Testing Agency. Attainment of design grades when achieved shall be certified by the project Civil Engineer. Both the Soils Engineer and the Civil Engineer are the Owner's representatives. If the Contractor should fail to meet the technical or design requirements embodied in this document and on the applicable plans, he shall make the necessary readjustments until all work is deemed satisfactory as determined by both the Soils Engineer and the Civil Engineer. No deviation from these specifications shall be made except upon written approval of the Soils Engineer, Civil Engineer or project Architect.

No earthwork shall be performed without the physical presence or approval of the Soils Engineer. The Contractor shall notify the Soils Engineer at least 2 working days prior to the commencement of any aspect of the site earthwork.

The Contractor agrees that he shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the Contractor shall defend, indemnify and hold the Owner and the Engineers harmless from any and all liability, real or alleged, in connection with the performance of work on this project, except for liability arising from the sole negligence of the Owner or the Engineers.

TECHNICAL REQUIREMENTS: All compacted materials shall be densified to a density not less than 95 percent relative compaction based on ASTM Test Method D1557 or CAL-216, as specified in the technical portion of the Soil Engineer's report. The location and frequency of field density tests shall be as determined by the Soils Engineer. The results of these tests and compliance with these specifications shall be the basis upon which satisfactory completion of work will be judged by the Soils Engineer.

SOILS AND FOUNDATION CONDITIONS: The Contractor is presumed to have visited the site and to have familiarized himself with existing site conditions and the contents of the data presented in the soil report.

The Contractor shall make his own interpretation of the data contained in said report, and the Contractor shall not be relieved of liability under the Contract documents for any loss sustained as a result of any variance between conditions indicated by or deduced from said report and the actual conditions encountered during the progress of the work.

DUST CONTROL: The work includes dust control as required for the alleviation or prevention of any dust nuisance on or about the site or the borrow area, or off-site if caused by the Contractor's operation either during the performance of the earthwork or resulting from the conditions in which the Contractor leaves the site. The Contractor shall assume all liability, including court costs of codefendants, for all claims related to dust or windblown materials attributable to his work.

SITE PREPARATION

Site preparation shall consist of site clearing and grubbing and the preparations of foundation materials for receiving fill.

CLEARING AND GRUBBING: The Contractor shall accept the site in this present condition and shall demolish and/or remove from the area of designated project earthwork all structures, both surface and subsurface, trees, brush, roots, debris, organic matter, and all other matter determined by the Soils Engineer to be deleterious or otherwise unsuitable. Such materials shall become the property of the Contractor and shall be removed from the site.

Tree root systems in proposed building areas should be removed to a minimum depth of 3 feet and to such an extent which would permit removal of all roots larger than 1 inch. Tree roots removed in parking areas may be limited to the upper 1½ feet of the ground surface. Backfill of tree root excavations should not be permitted until all exposed surfaces have been inspected and the Soils Engineer is present for the proper control of backfill placement and compaction. Burning in areas which are to receive fill materials shall not be permitted.

SUBGRADE PREPARATION: Surfaces to receive Engineered Fill, building or slab loads shall be prepared as outlined above, excavated/scarified to a depth of 12 inches, moisture-conditioned as necessary, and compacted to 95 percent relative compaction.

Loose soil areas, areas of uncertified fill, and/or areas of disturbed soils shall be moisture-conditioned as necessary and recompacted to 95 percent relative compaction. All ruts, hummocks, or other uneven surface features shall be removed by surface grading prior to placement of any fill materials. All areas which are to receive fill materials shall be approved by the Soils Engineer prior to the placement of any of the fill material.

EXCAVATION: All excavation shall be accomplished to the tolerance normally defined by the Civil Engineer as shown on the project grading plans. All over-excavation below the grades specified shall be backfilled at the Contractor's expense and shall be compacted in accordance with the applicable technical requirements.

FILL AND BACKFILL MATERIAL: No material shall be moved or compacted without the presence of the Soils Engineer. Material from the required site excavation may be utilized for construction site fills provided prior approval is given by the Soils Engineer. All materials utilized for constructing site fills shall be free from vegetation or other deleterious matter as determined by the Soils Engineer.

PLACEMENT, SPREADING AND COMPACTION: The placement and spreading of approved fill materials and the processing and compaction of approved fill and native materials shall be the responsibility of the Contractor. However, compaction of fill materials by flooding, ponding, or jetting shall not be permitted unless specifically approved by local code, as well as the Soils Engineer.

Both cut and fill areas shall be surface-compacted to the satisfaction of the Soils Engineer prior to final acceptance.

SEASONAL LIMITS: No fill material shall be placed, spread, or rolled while it is frozen or thawing or during unfavorable wet weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until the Soils Engineer indicates that the moisture content and density of previously placed fill are as specified.

General Paving Specifications

Appendix C

APPENDIX C

PAVEMENT SPECIFICATIONS

1. DEFINITIONS - The term "pavement" shall include asphaltic concrete surfacing, untreated aggregate base, and aggregate subbase. The term "subgrade" is that portion of the area on which surfacing, base, or subbase is to be placed.

The term “Standard Specifications”: hereinafter referred to is the 2018 Standard Specifications of the State of California, Department of Transportation, and the "Materials Manual" is the Materials Manual of Testing and Control Procedures, State of California, Department of Public Works, Division of Highways. The term "relative compaction" refers to the field density expressed as a percentage of the maximum laboratory density as defined in the applicable tests outlined in the Materials Manual.

2. SCOPE OF WORK - This portion of the work shall include all labor, materials, tools, and equipment necessary for, and reasonably incidental to the completion of the pavement shown on the plans and as herein specified, except work specifically notes as "Work Not Included."

3. PREPARATION OF THE SUBGRADE - The Contractor shall prepare the surface of the various subgrades receiving subsequent pavement courses to the lines, grades, and dimensions given on the plans. The upper 12 inches of the soil subgrade beneath the pavement section shall be compacted to a minimum relative compaction of 95 percent. The finished subgrades shall be tested and approved by the Soils Engineer prior to the placement of additional pavement courses.

4. UNTREATED AGGREGATE BASE - The aggregate base material shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate base material shall conform to the requirements of Section 26 of the Standard Specifications for Class 2 material, 1½ inches maximum size. The aggregate base material shall be compacted to a minimum relative compaction of 95 percent. The aggregate base material shall be spread and compacted in accordance with Section 26 of the Standard Specifications. The aggregate base material shall be spread in layers not exceeding 6 inches and each layer of aggregate material course shall be tested and approved by the Soils Engineer prior to the placement of successive layers.

5. AGGREGATE SUBBASE - The aggregate subbase shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate subbase material shall conform to the requirements of Section 25 of the Standard Specifications for Class 2 material. The aggregate subbase material shall be compacted to a minimum relative compaction of 95 percent, and it shall be spread and compacted in accordance with Section 25 of the Standard Specifications. Each layer of aggregate subbase shall be tested and approved by the Soils Engineer prior to the placement of successive layers.

6. ASPHALTIC CONCRETE SURFACING - Asphaltic concrete surfacing shall consist of a mixture of mineral aggregate and paving grade asphalt, mixed at a central mixing plant and spread and compacted on a prepared base in conformity with the lines, grades, and dimensions shown on the plans. The viscosity grade of the asphalt shall be PG 64-10. The mineral aggregate shall be Type B, ½ inch maximum size, medium grading, and shall conform to the requirements set forth in Section 39 of the Standard Specifications. The drying, proportioning, and mixing of the materials shall conform to Section 39.

The prime coat, spreading and compacting equipment, and spreading and compacting the mixture shall conform to the applicable chapters of Section 39, with the exception that no surface course shall be placed when the atmospheric temperature is below 50 degrees F. The surfacing shall be rolled with a combination steel-wheel and pneumatic rollers, as described in Section 39-6. The surface course shall be placed with an approved self-propelled mechanical spreading and finishing machine.

7. FOG SEAL COAT - The fog seal (mixing type asphaltic emulsion) shall conform to and be applied in accordance with the requirements of Section 37.

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

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	South of Iris LLC	Date	4/25/2022
Designed by	NB	Case No	
Company Project Number/Name	202111420 Patton South of Iris		

BMP Identification

BMP NAME / ID

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}= 0.65 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)*
DMA-1	*25963*	*Ornamental Landscaping*	*0.1*	*0.11*	*2867.8*			
DMA-2	*4949*	*Concrete or Asphalt*	*1*	*0.89*	*4414.5*			
DMA-3	*4949*	*Concrete or Asphalt*	*1*	*0.89*	*4414.5*			
DMA-4	*23641*	*Ornamental Landscaping*	*0.1*	*0.11*	*2611.3*			
DMA-5	*24075*	*Ornamental Landscaping*	*0.1*	*0.11*	*2659.3*			
DMA-6	*4796*	*Concrete or Asphalt*	*1*	*0.89*	*4278*			
DMA-7	*8543*	*Concrete or Asphalt*	*1*	*0.89*	*7620.4*			
DMA-8	*22093*	*Ornamental Landscaping*	*0.1*	*0.11*	*2440.3*			
DMA-9	*24075*	*Ornamental Landscaping*	*0.1*	*0.11*	*2659.3*			
DMA-10	*5674*	*Concrete or Asphalt*	*1*	*0.89*	*5061.2*			
DMA-11	*22096*	*Ornamental Landscaping*	*0.1*	*0.11*	*2440.7*			
DMA-12	*13070*	*Ornamental Landscaping*	*0.1*	*0.11*	*1443.7*			
DMA-13	*23523*	*Ornamental Landscaping*	*0.1*	*0.11*	*2598.3*			
DMA-14	*7883*	*Concrete or Asphalt*	*1*	*0.89*	*7031.6*			
DMA-15	*14442*	*Ornamental Landscaping*	*0.1*	*0.11*	*1595.2*			
DMA-16	*22954*	*Ornamental Landscaping*	*0.1*	*0.11*	*2535.5*			
DMA-17	*4522*	*Concrete or Asphalt*	*1*	*0.89*	*4033.6*			
DMA-18	*22679*	*Ornamental Landscaping*	*0.1*	*0.11*	*2505.1*			
DMA-19	*22952*	*Ornamental Landscaping*	*0.1*	*0.11*	*2535.2*			
DMA-20	*5269*	*Concrete or Asphalt*	*1*	*0.89*	*4699.9*			
DMA-21	*6661*	*Concrete or Asphalt*	*1*	*0.89*	*5941.6*			
DMA-22	*22730*	*Ornamental Landscaping*	*0.1*	*0.11*	*2510.7*			
DMA-23	*22953*	*Ornamental Landscaping*	*0.1*	*0.11*	*2535.3*			
DMA-24	*5292*	*Concrete or Asphalt*	*1*	*0.89*	*4720.5*			
	365784		***Total***		**86153.5**	**0.65**	***4666.6***	***81486***

Notes:

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

(Rev. 10-2011)

Legend: Required Entries | Calculated Cells

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

Company Name South of Iris LLC — Date 4/25/2022

Designed by NB — Case No

Company Project Number/Name 202111420 Patton South of Iris

BMP Identification

BMP NAME / ID

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}= 0.65 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)*
DMA-25	*5294*	*Concrete or Asphalt*	*1*	*0.89*	*4722.2*			
DMA-26	*10096*	*Ornamental Landscaping*	*0.1*	*0.11*	*1115.2*			
DMA-27	*25016*	*Ornamental Landscaping*	*0.1*	*0.11*	*2763.2*			
	40406	***Total***			**8600.6**	**0.65**	***465.9***	***81486***

Notes:

Infiltration Basin - Design Procedure (Rev. 03-2012)	BMP ID	Legend:	Required Entries
	DMA 1-27		Calculated Cells

Company Name:	South of Iris LLC	Date:	4/25/2022
Designed by:	NB	County/City Case No.:	

Design Volume

a) Tributary area (BMP subarea)	A_T =	9.33	acres
b) Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	5,133	ft^3

Maximum Depth

a) Infiltration rate	I =	0.67	in/hr
b) Factor of Safety (See Table 1, Appendix A: "Infiltration Testing" from this BMP Handbook)	FS =	3	
c) Calculate D_1 $\quad D_1 = \dfrac{\text{I (in/hr) x 72 hrs}}{\text{12 (in/ft) x FS}}$	D_1 =	1.3	ft
d) Enter the depth of freeboard (at least 1 ft)		1	ft
e) Enter depth to historic high ground water (measured from **top** of basin)		50	ft
f) Enter depth to top of bedrock or impermeable layer (measured from **top** of basin)		20	ft
g) D_2 is the smaller of: Depth to groundwater - (10 ft + freeboard) and Depth to impermeable layer - (5 ft + freeboard)	D_2 =	14.0	ft
h) D_{MAX} is the smaller value of D_1 and D_2 but shall not exceed 5 feet	D_{MAX} =	1.3	ft

Basin Geometry

a) Basin side slopes (no steeper than 4:1)	z =	4	:1
b) Proposed basin depth (excluding freeboard) — Depth may not exceed Dmax	d_B =	6	ft
c) Minimum bottom surface area of basin (A_S= V_{BMP}/d_B)	A_S =	855	ft^2
d) Proposed Design Surface Area	A_D =	11650	ft^2

Forebay

a) Forebay volume (minimum 0.5% V_{BMP})	Volume =	26	ft^3
b) Forebay depth (height of berm/splashwall. 1 foot min.)	Depth =	1	ft
c) Forebay surface area (minimum)	Area =	26	ft^2
d) Full height notch-type weir	Width (W) =	1.5	in

Appendix 7:Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

HCOC Applicability Map

Hydromodification Susceptibility Documentation Report and Mapping
Riverside County Flood Control and Water Conservation District

Map 2

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.**

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
☐ 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.**

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
☒ 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/

S T O R M W A T E R   P O L L U T A N T   S O U R C E S / S O U R C E   C O N T R O L   C H E C K L I S T

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.**

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
❑ 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**

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
☒ 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.**	

S T O R M W A T E R   P O L L U T A N T   S O U R C E S / S O U R C E   C O N T R O L   C H E C K L I S T

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

Appendix 10:Educational Materials

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

Graphic by: Margie Winter

Objectives

- Contain
- Educate
- Reduce/Minimize

Targeted Constituents

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

Description

Non-stormwater discharges are those flows that do not consist entirely of stormwater. For municipalities non-stormwater discharges present themselves in two situations. One is from fixed facilities owned and/or operated by the municipality. The other situation is non-stormwater discharges that are discovered during the normal operation of a field program. Some non-stormwater discharges do not include pollutants and may be discharged to the storm drain. These include uncontaminated groundwater and natural springs. There are also some non-stormwater discharges that typically do not contain pollutants and may be discharged to the storm drain with conditions. These include car washing, and surface cleaning. However, there are certain non-stormwater discharges that pose environmental concern. These discharges may originate from illegal dumping or from internal floor drains, appliances, industrial processes, sinks, and toilets that are connected to the nearby storm drainage system. These discharges (which may include: process waste waters, cooling waters, wash waters, and sanitary wastewater) can carry substances (such as paint, oil, fuel and other automotive fluids, chemicals and other pollutants) into storm drains. The ultimate goal is to effectively eliminate non-stormwater discharges to the stormwater drainage system through implementation of measures to detect, correct, and enforce against illicit connections and illegal discharges.

Approach

The municipality must address non-stormwater discharges from its fixed facilities by assessing the types of non-stormwater discharges and implementing BMPs for the discharges determined to pose environmental concern. For field programs

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the field staff must be trained to now what to look for regarding non-stormwater discharges and the procedures to follow in investigating the detected discharges.

Suggested Protocols

Fixed Facility

General

- Post "No Dumping" signs with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Stencil 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.
- Landscaping and beautification efforts of hot spots might also discourage future dumping, as well as provide open space and increase property values.
- Lighting or barriers may also be needed to discourage future dumping.

Illicit Connections

- Locate discharges from the fixed facility drainage system to the municipal storm drain system through review of "as-built" piping schematics.
- Use techniques such as smoke testing, dye testing and television camera inspection (as noted below) to verify physical connections.
- Isolate problem areas and plug illicit discharge points.

Visual Inspection and Inventory

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

Review Infield Piping

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

Smoke Testing

- Smoke testing of wastewater and stormwater collection systems is used to detect connections between the two systems.

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

  Dye Testing

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

TV Inspection of Storm Sewer

- TV Cameras can be employed to visually identify illicit connections to the fixed facility storm drain system.

Illegal Dumping

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- Clean up spills on paved surfaces with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.
- Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.
- For larger spills, a private spill cleanup company or Hazmat team may be necessary.
- See fact sheet SC-11 Spill Prevention, Control, and Clean Up.

Field Program

General

- Develop clear protocols and lines of communication for effectively prohibiting non-stormwater discharges, especially ones that involve more than one jurisdiction and those that are not classified as hazardous, which are often not responded to as effectively as they need to be.
- Stencil 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.
- See SC-74 Stormwater Drainage System Maintenance for additional information.

Field Inspection

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- During routine field program maintenance field staff should look for evidence of illegal discharges or illicit connection:
  - 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 and notify appropriate investigating agency.
- If trained, conduct field investigation of non-stormwater discharges to determine whether they pose a threat to water quality.

Recommended Complaint Investigation Equipment

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

– Educational materials

Reporting

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

Enforcement

- Educate the responsible party if identified on the impacts of their actions, explain the stormwater requirements, and provide information regarding Best Management Practices (BMP), as appropriate. Initiate follow-up and/or enforcement procedures.
- If an illegal discharge is traced to a commercial, residential or industrial source, conduct the following activities or coordinate the following activities with the appropriate agency:
  - Contact the responsible party to discuss methods of eliminating the non-stormwater discharge, including disposal options, recycling, and possible discharge to the sanitary sewer (if within POTW limits).
  - Provide information regarding BMPs to the responsible party, where appropriate.
  - Begin enforcement procedures, if appropriate.
  - Continue inspection and follow-up activities until the illicit discharge activity has ceased.
- If an illegal discharge is traced to a commercial or industrial activity, coordinate information on the discharge with the jurisdiction's commercial and industrial facility inspection program.

Training

- Train technical staff to identify and document illegal dumping incidents.
- Well-trained employees can reduce human errors that lead to accidental releases or spills. The employee should have the tools and knowledge to immediately begin cleaning up a spill if one should occur. Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.
- Train employees to identify non-stormwater discharges and report them to the appropriate departments.
- Train staff who have the authority to conduct surveillance and inspections, and write citations for those caught illegally dumping.

- Train municipal staff responsible for surveillance and inspection 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).
- Educate the identified responsible party on the impacts of his or her actions.

Spill Response and Prevention

- See SC-11 Spill Prevention Control and Clean Up

Other Considerations

- The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal. The cost of fees for dumping at a proper waste disposal facility are often more than the fine for an illegal dumping offense, thereby discouraging people from complying with the law. The absence of routine or affordable pickup service for trash and recyclables in some communities also encourages illegal dumping. A lack of understanding regarding applicable laws or the inadequacy of existing laws may also contribute to the problem.
- Municipal codes should include sections prohibiting the discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.
- Many facilities do not have accurate, up-to-date schematic drawings.
- Can be difficult to locate illicit connections especially if there is groundwater infiltration.

Requirements

Costs

- Eliminating illicit connections can be expensive especially if structural modifications are required such re-plumbing cross connections under an existing slab.
- Minor cost to train field crews regarding the identification of non-stormwater discharges. The primary cost is for a fully integrated program to identify and eliminate illicit connections and illegal dumping. However, by combining with other municipal programs (i.e. pretreatment program) cost may be lowered.
- Municipal cost for containment and disposal may be borne by the discharger.

Maintenance

Not applicable

Supplemental Information

Further Detail of the BMP

What constitutes a "non-stormwater" discharge?

- Non-stormwater discharges are discharges not made up entirely of stormwater and include water used directly in the manufacturing process (process wastewater), air conditioning condensate and coolant, non-contact cooling water, cooling equipment condensate, outdoor secondary containment water, vehicle and equipment wash water, landscape irrigation, sink and drinking fountain wastewater, sanitary wastes, or other wastewaters.

Permit Requirements

- Current municipal NPDES permits require municipalities to effectively prohibit non-stormwater discharges unless authorized by a separate NPDES permit or allowed in accordance with the current NPDES permit conditions. Typically the current permits allow certain non-stormwater discharges in the storm drain system as long as the discharges are not significant sources of pollutants. In this context the following non-stormwater discharges are typically allowed:

  - Diverted stream flows;
  - Rising found waters;
  - Uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20));
  - Uncontaminated pumped ground water;
  - Foundation drains;
  - Springs;
  - Water from crawl space pumps;
  - Footing drains;
  - Air conditioning condensation;
  - Flows from riparian habitats and wetlands;
  - Water line and hydrant flushing ;
  - Landscape irrigation;
  - Planned and unplanned discharges from potable water sources;
  - Irrigation water;
  - Individual residential car washing; and
  - Lawn watering.

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

Illegal Dumping

- 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

Outreach

One of the keys to success of reducing or eliminating illegal dumping is increasing the number of people on the street who are aware of the problem and who have the tools to at least identify the incident, if not correct it. There we a number of ways of accomplishing this:

- Train municipal staff from all departments (public works, utilities, street cleaning, parks and recreation, industrial waste inspection, hazardous waste inspection, sewer maintenance) to recognize and report the incidents.

- Deputize municipal staff who may come into contact with illegal dumping with the authority to write illegal dumping tickets for offenders caught in the act (see below).

- Educate the public. As many as 3 out of 4 people do not understand that in most communities the storm drain does not go to the wastewater treatment plant. Unfortunately, with the heavy emphasis in recent years on public education about solid waste management, including recycling and household hazardous waste, the sewer system (both storm and sanitary) has been the likely recipient of cross-media transfers of waste.

- Provide the public with a mechanism for reporting incidents such as a hot line and/or door hanger (see below).

- Help areas where incidents occur more frequently set up environmental watch programs (like crime watch programs).

- Train volunteers to notice and report the presence and suspected source of an observed pollutant to the appropriate public agency.

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  - Diverted stream flows;
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  - Uncontaminated pumped ground water;
  - Foundation drains;
  - Springs;
  - Water from crawl space pumps;
  - Footing drains;
  - Air conditioning condensation;
  - Flows from riparian habitats and wetlands;
  - Water line and hydrant flushing ;
  - Landscape irrigation;
  - Planned and unplanned discharges from potable water sources;
  - Irrigation water;
  - Individual residential car washing; and
  - Lawn watering.

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

Storm Drain Stenciling

- Stencil storm drain inlets with a message to prohibit illegal dumpings, especially in areas with waste handling facilities.
- Encourage public reporting of improper waste disposal by a HOTLINE number stenciled onto the storm drain inlet.
- See Supplemental Information section of this fact sheet for further detail on stenciling program approach.

Oil Recycling

- Contract collection and hauling of used oil to a private licensed used oil hauler/recycler.
- Comply with all applicable state and federal regulations regarding storage, handling, and transport of petroleum products.
- Create procedures for collection such as; collection locations and schedule, acceptable containers, and maximum amounts accepted.
- The California Integrated Waste Management Board has a Recycling Hotline, (800) 553-2962, that provides information and recycling locations for used oil.

Household Hazardous Waste

- Provide household hazardous waste (HHW) collection facilities. Several types of collection approaches are available including permanent, periodic, or mobile centers, curbside collection, or a combination of these systems.

Training

- Train municipal employees and contractors in proper and consistent methods for waste disposal.
- Train municipal employees to recognize and report illegal dumping.
- Train employees and subcontractors in proper hazardous waste management.

Spill Response and Prevention

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

Other Considerations

- Federal Regulations (RCRA, SARA, CERCLA) and state regulations exist regarding the disposal of hazardous waste.
- Municipalities are required to have a used oil recycling element and a HHW element within their integrated waste management plan.
- Significant liability issues are involved with the collection, handling, and disposal of HHW.

Examples

The City of Palo Alto has developed a public participation program for reporting dumping violations. When a concerned citizen or public employee encounters evidence of illegal dumping, a door hanger (similar in format to hotel "Do Not Disturb" signs) is placed on the front doors in the neighborhood. The door hanger notes that a violation has occurred in the neighborhood, informs the reader why illegal dumping is a problem, and notes that illegal dumping carries a significant financial penalty. Information is also provided on what citizens can do as well as contact numbers for more information or to report a violation.

The Port of Long Beach has a state of the art database incorporating storm drain infrastructure, potential pollutant sources, facility management practices, and a pollutant tracking system.

The State Department of Fish and Game has a hotline for reporting violations called CalTIP (1-800-952-5400). The phone number may be used to report any violation of a Fish and Game code (illegal dumping, poaching, etc.).

The California Department of Toxic Substances Control's Waste Alert Hotline, 1-800-69TOXIC, can be used to report hazardous waste violations.

References and Resources

http://www.stormwatercenter.net/

California's Nonpoint Source Program Plan http://www.co.clark.wa.us/pubworks/bmpman.pdf

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

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

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program
(http://www.projectcleanwater.org)

Santa Clara Valley Urban Runoff Pollution Prevention Program
http://www.scvurppp-w2k.com/pdf%20documents/PS_ICID.PDF

Spill Prevention, Control & Cleanup SC-11

Photo Credit: Geoff Brosseau

Objectives

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

Targeted Constituents

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

Description

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

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

Approach

Pollution Prevention

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

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

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

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

Suggested Protocols (including equipment needs)

Spill Prevention

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

■ If consistent illegal dumping is observed at the facility:

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

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

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

■ Routine maintenance:

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

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

- Label all containers according to their contents (e.g., solvent, gasoline).

- Label hazardous substances regarding the potential hazard (corrosive, radioactive, flammable, explosive, poisonous).

- Prominently display required labels on transported hazardous and toxic materials (per US DOT regulations).

- Identify key spill response personnel.

Spill Control and Cleanup Activities

- Follow the Spill Prevention Control and Countermeasure Plan.

- Clean up leaks and spills immediately.

- Place a stockpile of spill cleanup materials where it will be readily accessible (e.g., near storage and maintenance areas).

- On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste. Physical methods for the cleanup of dry chemicals include the use of brooms, shovels, sweepers, or plows.

- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.

- Chemical cleanups of material can be achieved with the use of adsorbents, gels, and foams. Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.

- For larger spills, a private spill cleanup company or Hazmat team may be necessary.

Reporting

- Report spills that pose an immediate threat to human health or the environment to the Regional Water Quality Control Board.

- Federal regulations require that any oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hour).

- Report spills to local agencies, such as the fire department; they can assist in cleanup.

- Establish a system for tracking incidents. The system should be designed to identify the following:

  - Types and quantities (in some cases) of wastes

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

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

  - Responsible parties

Training

- Educate employees about spill prevention and cleanup.

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

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

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

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

- Train employees to recognize and report illegal dumping incidents.

Other Considerations (Limitations and Regulations)

- A Spill Prevention Control and Countermeasure Plan (SPCC) is required for facilities that are subject to the oil pollution regulations specified in Part 112 of Title 40 of the Code of Federal Regulations or if they have a storage capacity of 10,000 gallons or more of petroleum. (Health and Safety Code 6.67)

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

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

Requirements

Costs (including capital and operation & maintenance)

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

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

Maintenance (including administrative and staffing)

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

Supplemental Information

Further Detail of the BMP

Reporting

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

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

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

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

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

Aboveground Tank Leak and Spill Control

Accidental releases of materials from aboveground liquid storage tanks present the potential for contaminating stormwater with many different pollutants. Materials spilled, leaked, or lost from tanks may accumulate in soils or on impervious surfaces and be carried away by stormwater runoff.

The most common causes of unintentional releases are:

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

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

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

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

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

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

Vehicle Leak and Spill Control

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

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

Vehicle and Equipment Maintenance

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

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

Vehicle and Equipment Fueling

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

Industrial Spill Prevention Response

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

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

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

References and Resources

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

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

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

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

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

Drainage System Maintenance SC-44

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Targeted Constituents

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

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.

Approach

Pollution Prevention

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

Suggested Protocols

Catch Basins/Inlet Structures

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

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- Clean catch basins, storm drain inlets, and other conveyance structures before the wet season to remove sediments and debris accumulated during the summer.

- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Clean and repair as needed.

- Keep accurate logs of the number of catch basins cleaned.

- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.

- Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed. Do not dewater near a storm drain or stream.

Storm Drain Conveyance System

- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.

- Collect and pump flushed effluent to the sanitary sewer for treatment whenever possible.

Pump Stations

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.

- Do not allow discharge to reach the storm drain system when cleaning a storm drain pump station or other facility.

- Conduct routine maintenance at each pump station.

- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.

Open Channel

- Modify storm channel characteristics to improve channel hydraulics, increase pollutant removals, and enhance channel/creek aesthetic and habitat value.

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

Illicit Connections and Discharges

- Look for evidence of illegal discharges or illicit connections during routine maintenance of conveyance system and drainage structures:

  - Is there evidence of spills such as paints, discoloring, etc?

- Are there any odors associated with the drainage system?

- Record locations of apparent illegal discharges/illicit connections?

- Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of upgradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.

- Eliminate the discharge once the origin of flow is established.

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

■ Refer to fact sheet SC-10 Non-Stormwater Discharges.

Illegal Dumping

■ Inspect and clean up hot spots and other storm drainage areas regularly where illegal dumping and disposal occurs.

■ Establish a system for tracking incidents. The system should be designed to identify the following:

- Illegal dumping hot spots

- Types and quantities (in some cases) of wastes

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

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

- Responsible parties

■ Post "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.

■ Refer to fact sheet SC-10 Non-Stormwater Discharges.

Training

■ Train crews in proper maintenance activities, including record keeping and disposal.

■ Allow only properly trained individuals to handle hazardous materials/wastes.

■ Have staff involved in detection and removal of illicit connections trained in the following:

- OSHA-required Health and Safety Training (29 CFR 1910.120) plus annual refresher training (as needed).

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

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

Spill Response and Prevention

- Investigate all reports of spills, leaks, and/or illegal dumping promptly.

- Clean up all spills and leaks using "dry" methods (with absorbent materials and/or rags) or dig up, remove, and properly dispose of contaminated soil.

- Refer to fact sheet SC-11 Spill Prevention, Control, and Cleanup.

Other Considerations (Limitations and Regulations)

- Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.

- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, liquid/sediment disposal, and prohibition against disposal of flushed effluent to sanitary sewer in some areas.

- Regulations may include adoption of substantial penalties for illegal dumping and disposal.

- Local municipal codes may include sections prohibiting discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.

Requirements

Costs

- An aggressive catch basin cleaning program could require a significant capital and O&M budget.

- The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal. The primary cost is for staff time. Cost depends on how aggressively a program is implemented. Other cost considerations for an illegal dumping program include:

  - Purchase and installation of signs.

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

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

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

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

Maintenance

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

Supplemental Information

Further Detail of the BMP

Storm Drain Flushing

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

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

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

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

References and Resources

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

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

Ferguson, B.K. 1991. Urban Stream Reclamation, p. 324-322, Journal of Soil and Water Conservation.

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

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

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

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

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Storm Drain System Cleaning. On line:
http://www.epa.gov/npdes/menuofbmps/poll_16.htm

Site Design & Landscape Planning SD-10

Design Objectives

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

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

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

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.

- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.

- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.

- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.

- Promote natural vegetation by using parking lot islands and other landscaped areas.

- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.

- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

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

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

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

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

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

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

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

Roof Runoff Controls

Rain Garden

Design Objectives

☑ Maximize Infiltration

☑ Provide Retention

☑ Slow Runoff

Minimize Impervious Land Coverage

Prohibit Dumping of Improper Materials

☑ Contain Pollutants

Collect and Convey

Description

Various roof runoff controls are available to address stormwater that drains off rooftops. The objective is to reduce the total volume and rate of runoff from individual lots, and retain the pollutants on site that may be picked up from roofing materials and atmospheric deposition. Roof runoff controls consist of directing the roof runoff away from paved areas and mitigating flow to the storm drain system through one of several general approaches: cisterns or rain barrels; dry wells or infiltration trenches; pop-up emitters, and foundation planting. The first three approaches require the roof runoff to be contained in a gutter and downspout system. Foundation planting provides a vegetated strip under the drip line of the roof.

Approach

Design of individual lots for single-family homes as well as lots for higher density residential and commercial structures should consider site design provisions for containing and infiltrating roof runoff or directing roof runoff to vegetative swales or buffer areas. Retained water can be reused for watering gardens, lawns, and trees. Benefits to the environment include reduced demand for potable water used for irrigation, improved stormwater quality, increased groundwater recharge, decreased runoff volume and peak flows, and decreased flooding potential.

Suitable Applications

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

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

One method of addressing roof runoff is to direct roof downspouts to cisterns or rain barrels. A cistern is an above ground storage vessel with either a manually operated valve or a permanently open outlet. Roof runoff is temporarily stored and then released for irrigation or infiltration between storms. The number of rain

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barrels needed is a function of the rooftop area. Some low impact developers recommend that every house have at least 2 rain barrels, with a minimum storage capacity of 1000 liters. Roof barrels serve several purposes including mitigating the first flush from the roof which has a high volume, amount of contaminants, and thermal load. Several types of rain barrels are commercially available. Consideration must be given to selecting rain barrels that are vector proof and childproof. In addition, some barrels are designed with a bypass valve that filters out grit and other contaminants and routes overflow to a soak-away pit or rain garden.

If the cistern has an operable valve, the valve can be closed to store stormwater for irrigation or infiltration between storms. This system requires continual monitoring by the resident or grounds crews, but provides greater flexibility in water storage and metering. If a cistern is provided with an operable valve and water is stored inside for long periods, the cistern must be covered to prevent mosquitoes from breeding.

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say ¼ to ½ inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

Roof downspouts can be directed to dry wells or infiltration trenches. A dry well is constructed by excavating a hole in the ground and filling it with an open graded aggregate, and allowing the water to fill the dry well and infiltrate after the storm event. An underground connection from the downspout conveys water into the dry well, allowing it to be stored in the voids. To minimize sedimentation from lateral soil movement, the sides and top of the stone storage matrix can be wrapped in a permeable filter fabric, though the bottom may remain open. A perforated observation pipe can be inserted vertically into the dry well to allow for inspection and maintenance.

In practice, dry wells receiving runoff from single roof downspouts have been successful over long periods because they contain very little sediment. They must be sized according to the amount of rooftop runoff received, but are typically 4 to 5 feet square, and 2 to 3 feet deep, with a minimum of 1-foot soil cover over the top (maximum depth of 10 feet).

To protect the foundation, dry wells must be set away from the building at least 10 feet. They must be installed in solids that accommodate infiltration. In poorly drained soils, dry wells have very limited feasibility.

Infiltration trenches function in a similar manner and would be particularly effective for larger roof areas. An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. These are described under Treatment Controls.

Pop-up Drainage Emitter

Roof downspouts can be directed to an underground pipe that daylights some distance from the building foundation, releasing the roof runoff through a pop-up emitter. Similar to a pop-up irrigation head, the emitter only opens when there is flow from the roof. The emitter remains flush to the ground during dry periods, for ease of lawn or landscape maintenance.

Foundation Planting

Landscape planting can be provided around the base to allow increased opportunities for stormwater infiltration and protect the soil from erosion caused by concentrated sheet flow coming off the roof. Foundation plantings can reduce the physical impact of water on the soil and provide a subsurface matrix of roots that encourage infiltration. These plantings must be sturdy enough to tolerate the heavy runoff sheet flows, and periodic soil saturation.

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.

Supplemental Information

Examples

- City of Ottawa's Water Links Surface –Water Quality Protection Program
- City of Toronto Downspout Disconnection Program
- City of Boston, MA, Rain Barrel Demonstration Program

Other Resources

Hager, Marty Catherine, Stormwater, "Low-Impact Development", January/February 2003. www.stormh2o.com

Low Impact Urban Design Tools, Low Impact Development Design Center, Beltsville, MD. www.lid-stormwater.net

Start at the Source, Bay Area Stormwater Management Agencies Association, 1999 Edition

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Designing New Installations

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

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

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- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.

- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:

  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff

  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect

  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible

  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth

- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

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

Other Resources

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

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

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

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

Storm Drain Signage SD-13

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

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

Designing New Installations

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

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

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

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

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

Redeveloping Existing Installations

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

Additional Information

Maintenance Considerations

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

Placement

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

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

Supplemental Information

Examples

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

Other Resources

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

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

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

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

Trash Storage Areas SD-32

Design Objectives

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

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.

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.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- 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.

A Citizen's Guide to Understanding Stormwater

WHEN IT RAINS IT DRAINS

United States Environmental Protection Agency

EPA 833-B-03-002

January 2003

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THE YEAR OF CLEAN WATER — Celebration & Recommitment

For more information contact:

or visit
www.epa.gov/npdes/stormwater
www.epa.gov/nps

After the Storm

WHEN IT RAINS IT DRAINS

What is stormwater runoff?

Stormwater runoff occurs when precipitation from rain or snowmelt flows over the ground. Impervious surfaces like driveways, sidewalks, and streets prevent stormwater from naturally soaking into the ground.

Why is stormwater runoff a problem?

Stormwater can pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water.

The effects of pollution

Polluted stormwater runoff can have many adverse effects on plants, fish, animals, and people.

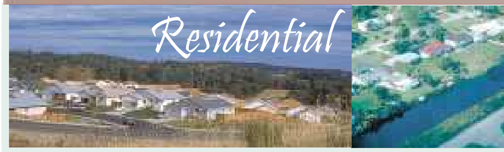
- Sediment can cloud the water and make it difficult or impossible for aquatic plants to grow. Sediment also can destroy aquatic habitats.
- Excess nutrients can cause algae blooms. When algae die, they sink to the bottom and decompose in a process that removes oxygen from the water. Fish and other aquatic organisms can't exist in water with low dissolved oxygen levels.

- Bacteria and other pathogens can wash into swimming areas and create health hazards, often making beach closures necessary.
- Debris—plastic bags, six-pack rings, bottles, and cigarette butts—washed into waterbodies can choke, suffocate, or disable aquatic life like ducks, fish, turtles, and birds.
- Household hazardous wastes like insecticides, pesticides, paint, solvents, used motor oil, and other auto fluids can poison aquatic life. Land animals and people can become sick or die from eating diseased fish and shellfish or ingesting polluted water.

- Polluted stormwater often affects drinking water sources. This, in turn, can affect human health and increase drinking water treatment costs.

Stormwater Pollution Solutions

Residential



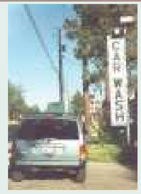
Recycle or properly dispose of household products that contain chemicals, such as insecticides, pesticides, paint, solvents, and used motor oil and other auto fluids. Don't pour them onto the ground or into storm drains.

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.

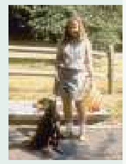
- Use a commercial car wash that treats or recycles its wastewater, or wash your car on your yard so the water infiltrates into the ground.
- Repair leaks and dispose of used auto fluids and batteries at designated drop-off or recycling locations.

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



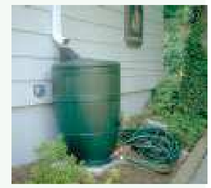
Pet waste can be a major source of bacteria and excess nutrients in local waters.

- 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

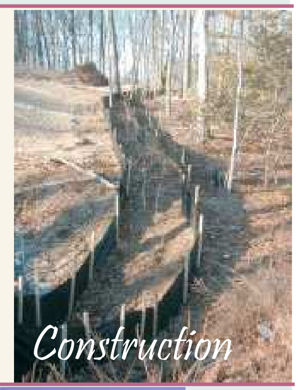
Dirt, oil, and debris that collect in parking lots and paved areas can be washed into the storm sewer system and eventually enter local waterbodies.

- 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.

Construction

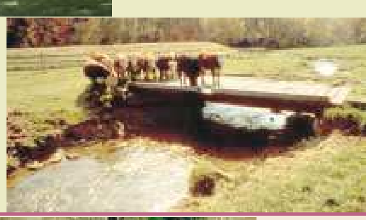
Erosion controls that aren't maintained can cause excessive amounts of sediment and debris to be carried into the stormwater system. Construction vehicles can leak fuel, oil, and other harmful fluids that can be picked up by stormwater and deposited into local waterbodies.

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



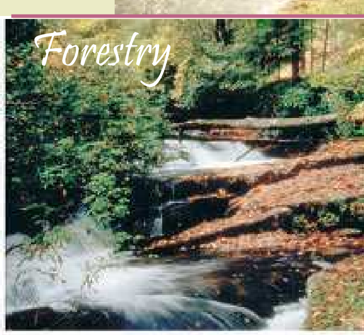
Agriculture

Lack of vegetation on streambanks can lead to erosion. Overgrazed pastures can also contribute excessive amounts of sediment to local waterbodies. Excess fertilizers and pesticides can poison aquatic animals and lead to destructive algae blooms. Livestock in streams can contaminate waterways with bacteria, making them unsafe for human contact.



- Keep livestock away from streambanks and provide them a water source away from waterbodies.
- Store and apply manure away from waterbodies and in accordance with a nutrient management plan.
- Vegetate riparian areas along waterways.
- Rotate animal grazing to prevent soil erosion in fields.
- Apply fertilizers and pesticides according to label instructions to save money and minimize pollution.

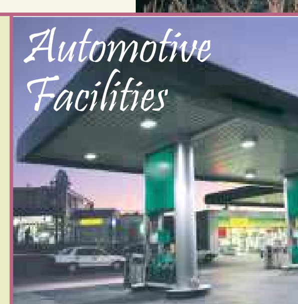
Forestry



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.

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.

Stormwater Pollution Found in Your Area!

This is not a citation.

This is to inform you that our staff found the following pollutants in the storm sewer system in your area. This storm sewer system leads directly to

______________________________ .

❑ Motor oil

❑ Oil filters

❑ Antifreeze/ transmission fluid

❑ Paint

❑ Solvent/degreaser

❑ Cooking grease

❑ Detergent

❑ Home improvement waste (concrete, mortar)

❑ Pet waste

❑ Yard waste (leaves, grass, mulch)

❑ Excessive dirt and gravel

❑ Trash

❑ Construction debris

❑ Pesticides and fertilizers

❑ Other

____

For more information or to report an illegal discharge of pollutants, please call:

Riverside County Residents, Call . . .
1-800-506-2555

WHEN IT RAINS
IT DRAINS

EPA
United States
Environmental Protection
Agency

www.epa.gov/npdes/stormwater

EPA 833-F-03-002
April 2003

Stormwater runoff is precipitation from rain or snowmelt that flows over the ground. As it flows, it can pick up debris, chemicals, dirt, and other pollutants and deposit them into a storm sewer system or waterbody.

Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water.

Remember:
Only Rain Down the Drain

To keep the stormwater leaving your home or workplace clean, follow these simple guidelines:

- Use pesticides and fertilizers sparingly.
- Repair auto leaks.
- Dispose of household hazardous waste, used auto fluids (antifreeze, oil, etc.), and batteries at designated collection or recycling locations.
- Clean up after your pet.
- Use a commercial car wash or wash your car on a lawn or other unpaved surface.
- Sweep up yard debris rather than hosing down areas. Compost or recycle yard waste when possible.
- Clean paint brushes in a sink, not outdoors. Properly dispose of excess paints through a household hazardous waste collection program.
- Sweep up and properly dispose of construction debris like concrete and mortar.

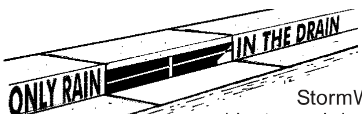
StormWater Pollution . . . What You Should Know

Riverside County has two drainage systems - sewers and storm drains. The storm drain system was designed to reduce flooding by carrying excess rainwater away from streets and developed areas. Since the storm drain system does not provide for water treatment, it also serves the *unintended* function of transporting pollutants directly to our local waterways.

Unlike sanitary sewers, storm drains are not connected to a wastewater treatment plant – they flow directly to our local streams, rivers and lakes.

Stormwater runoff is a part of the natural hydrologic process. However, land development and construction activities can significantly alter natural drainage processes and introduce pollutants into stormwater runoff. Polluted stormwater runoff from construction sites has been identified as a major source of water pollution in California. It jeopardizes the quality of our local waterways and can pose a serious threat to the health of our aquatic ecosystems.

The Cities and County of Riverside StormWater/CleanWater Protection Program



Because preventing pollution is much easier and less costly than cleaning up "after the fact," the Cities and County of Riverside StormWater/CleanWater Protection Program informs residents and businesses on pollution prevention activities. This pamphlet describes various Best Management Practices (BMPs) that construction site operators can use to prevent stormwater pollution.

In accordance with applicable federal and state law, the Cities and County of Riverside have adopted ordinances for stormwater management and discharge control that **prohibit** the discharge of pollutants into the storm drain system or local surface water. This includes discharges from construction sites containing sediment, concrete, mortar, paint, solvents, lubricants, vehicle fluids, fuel, pesticides, and construction debris.

PLEASE NOTE: The Federal, State and local regulations strictly prohibit the discharge of sediment and pollutants into the streets, the storm drain system or waterways. As an owner, operator or supervisor of a construction site, you may be held financially responsible for any environmental damage caused by your subcontractors or employees.

Stormwater Pollution from Construction Activities

The two most common sources of stormwater pollution problems associated with construction activities are ***erosion*** and ***sedimentation***. Failure to maintain adequate erosion and sediment controls at construction sites often results in sediment discharges into the storm drain system, creating multiple problems once it enters local waterways.

Construction vehicles and heavy equipment can also track significant amounts of mud and sediment onto adjacent streets. Additionally, wind may transport construction materials and wastes into streets storm drains, or directly into our local waterways.

StormWater Pollution

What you should know for...

GENERAL CONSTRUCTION & SITE SUPERVISION

Best Management Practices (BMPs) for:

- Developers
- General Contractors
- Home Builders
- Construction Inspectors
- Anyone in the construction business

Resources

State Water Resources Control Board
Division of Water Quality
1001 I Street
Sacramento CA 95814
(916) 341-5455
www.swrcb.ca.gov/stormwtr/

Colorado River Basin Regional Water Quality Control Board - Region 7
73-720 Fred Waring Drive, Suite 100
Palm Desert, CA 92260
(760) 346-7491
www.swrcb.ca.gov/~rwqcb7/

Santa Ana Regional Water Quality Control Board - Region 8
3737 Main Street, Suite 500
Riverside, CA 92501-3348
(909) 782-4130
www.swrcb.ca.gov/~rwqcb8/

San Diego Regional Water Quality Control Board - Region 9
9771 Clairemont Mesa Blvd., Suite A
San Diego, CA 92124
(858) 467-2952
www.swrcb.ca.gov/~rwqcb9/

To report a hazardous materials spill, call:

Riverside County Hazardous Materials Emergency Response Team
(909) 358-5055 8:00 a.m. – 5:00 p.m.
(909) 358-5245 after 5:00 p.m.

In an emergency call: **911**

For recycling and hazardous waste disposal, call:

(909) 358-5055

To report an illegal dumping or a clogged storm drain, call:

1-800-506-2555

To order additional brochures or to obtain information on other pollution prevention activities, please call (909) 955-1200 or visit the StormWater/CleanWater Protection Program website at: www.co.riverside.ca.us/depts/flood/waterquality npdes.asp

StormWater CleanWater PROTECTION PROGRAM

The StormWater/CleanWater Protection Program gratefully acknowledges the Santa Clara Valley Nonpoint Pollution Control Program, Alameda Countywide CleanWater Program and the City of Los Angeles Stormwater Management Division for information provided in this brochure.

What Should You Do?

Advance Planning to Prevent Pollution

- ❑ Remove existing vegetation only as needed.
- ❑ Schedule excavation, grading, and paving operations for dry weather periods, if possible.
- ❑ Designate a specific area of the construction site, well away from storm drain inlets or watercourses, for material storage and equipment maintenance.
- ❑ Develop and implement an effective combination of erosion and sediment controls for the construction site.
- ❑ Practice source reduction by ordering only the amount of materials that are needed to finish the project.
- ❑ Educate your employees and subcontractors about stormwater management requirements and their pollution prevention responsibilities.
- ❑ Control the amount of surface runoff at the construction site by impeding internally generated flows and using berms or drainage ditches to direct incoming offsite flows to go around the site. ***Note:*** *Consult local drainage policies for more information.*

Best Management Practices

The following Best Management Practices (BMPs) can significantly reduce pollutant discharges from your construction site. Compliance with stormwater regulations can be as simple as minimizing stormwater contact with potential pollutants by providing covers and secondary containment for construction materials, designating areas away from storm drain systems for storing equipment and materials and implementing good housekeeping practices at the construction site.

- ❑ Protect all storm drain inlets and streams located near the construction site to prevent sediment-laden water from entering the storm drain system.
- ❑ Limit access to and from the site. Stabilize construction entrances/exits to minimize the track out of dirt and mud onto adjacent streets. Conduct frequent street sweeping.
- ❑ Protect stockpiles and construction materials from winds and rain by storing them under a roof, secured impermeable tarp or plastic sheeting.
- ❑ Avoid storing or stockpiling materials near storm drain inlets, gullies or streams.
- ❑ Phase grading operations to limit disturbed areas and duration of exposure.
- ❑ Perform major maintenance and repairs of vehicles and equipment offsite.
- ❑ Wash out concrete mixers only in designated washout areas at the construction site.
- ❑ Set-up and operate small concrete mixers on tarps or heavy plastic drop cloths.
- ❑ Keep construction sites clean by removing trash, debris, wastes, etc. on a regular basis.
- ❑ Clean-up spills immediately using dry clean-up methods (e.g., absorbent materials such as cat litter, sand or rags for liquid spills; sweeping for dry spills such as cement, mortar or fertilizer) and by removing the contaminated soil from spills on dirt areas. .
- ❑ Prevent erosion by implementing any or a combination of soil stabilization practices such as mulching, surface roughening, permanent or temporary seeding.
- ❑ Maintain all vehicles and equipment in good working condition. Inspect frequently for leaks, and repair promptly.
- ❑ Practice proper waste disposal. Many construction materials and wastes, including solvents, water-based paint, vehicle fluids, broken asphalt and concrete, wood, and cleared vegetation can be recycled. Materials that cannot be recycled must be taken to an appropriate landfill or disposed of as hazardous waste.
- ❑ Cover open dumpsters with secured tarps or plastic sheeting. Never clean out a dumpster by washing it down on the construction site.
- ❑ Arrange for an adequate debris disposal schedule to insure that dumpsters do not overflow.

General Construction Activities Stormwater Permit

(Construction Activities General Permit)

The State Water Resources Control Board (SWRCB) adopted a new Construction Activities General Permit (WQ Order No. 99-08DWQ) on August 19, 1999, superseding the now expired SWRCB statewide General Permit (WQ Order No. 92-08DWQ). This permit is administered and enforced by the SWRCB and the local Regional Water Quality Control Boards (RWQCB). The updated Construction Activities General Permit establishes a number of new stormwater management requirements for construction site operator.

NOTE: *Some construction activies stormwater permits are issued on a regional basis. Consult your local RWQCB to find out if your project requires coverage under any of these permits.*

Frequently Asked Questions:

Does my construction site require coverage under the Construction Activities General Permit?

Yes, if construction activity results in the disturbance of five or more acres of total land area or is part of a common plan of development that results in the disturbance of five or more acres.

How do I obtain coverage under the Construction Activities General Permit?

Obtain the permit package and submit the completed Notice of Intent (NOI) form to the SWRCB prior to grading or disturbing soil at the construction site. For ongoing construction activity involving a change of ownership, the new owner must submit a new NOI within 30 days of the date of change of ownership. The completed NOI along with the required fee should be mailed to the SWRCB.

What must I do to comply with the requirements of the Construction Activities General Permit?

- Implement BMPs for non-stormwater discharges year-round.
- Prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) prior to commencing construction activities.
- Keep a copy of the SWPPP at the construction site for the entire duration of the project.
- Calculate the anticipated stormwater run-off.
- Implement an effective combination of erosion and sediment control on all soil disturbed areas.
- Conduct site inspections prior to anticipated storm events, every 24-hours during extended storm events, and after actual storm event.
- Perform repair and maintenance of BMPs as soon as possible after storm events depending upon worker safety.
- Update the SWPPP as needed, to manage pollutants or reflect changes in site conditions.
- Include description of post construction BMPs at the construction site, including parties responsible for long-term maintenance.

NOTE: *Please refer to the Construction Activities General Permit for detailed information. You may contact the SWRCB, your local RWQCB, or visit the SWRCB website at www.swrcb.ca.gov/stormwtr/ to obtain a State Construction Activities Stormwater General Permit packet.*

How long is this Construction Activities General Permit in effect?

The Permit coverage stays in effect untilyou submit a Notice of Termination (NOT) to the SWRCB. For the purpose of submitting a NOT, all soil disturbing activities have to be completed and one of the three following criteria has to be met:

1. Change of ownership;
2. A uniform vegetative cover with 70 percent coverage has been established; or,
3. Equivalent stabilization measures such as the use of reinforced channel liners, soil cement, fiber matrices, geotextiles, etc., have been employed.

Outdoor Container Storage SC-31

Objectives

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

Targeted Constituents

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

Description

Accidental releases of materials from above ground liquid storage tanks, drums, and dumpsters present the potential for contaminating stormwaters with many different pollutants. Tanks may store many potential stormwater runoff pollutants, such as gasoline, aviation gas, diesel fuel, ammonia, solvents, syrups, etc. Materials spilled, leaked, or lost from storage tanks may accumulate in soils or on other surfaces and be carried away by rainfall runoff. These source controls apply to containers located outside of a building used to temporarily store liquid materials and include installing safeguards against accidental releases, installing secondary containment, conducting regular inspections, and training employees in standard operating procedures and spill cleanup techniques.

Approach

Pollution Prevention

- Educate employees about pollution prevention measures and goals

- Keep an accurate, up-to-date inventory of the materials delivered and stored on-site. Re-evaluate inventory needs and consider purchasing alternative products. Properly dispose of outdated products.

- Try to keep chemicals in their original containers, and keep them well labeled.

CASQA California Stormwater Quality Association

Suggested Protocols

General

- Develop an operations plan that describes procedures for loading and/or unloading. Refer to SC-30 Outdoor Loading/Unloading for more detailed BMP information pertaining to loading and unloading of liquids.
- Protect materials from rainfall, runon, runoff, and wind dispersal:
  - Cover the storage area with a roof.
  - Minimize stormwater runon by enclosing the area or building a berm around it.
  - Use a "doghouse" structure for storage of liquid containers.
  - Use covered dumpsters for waste product containers.
- Employ safeguards against accidental releases:
  - Provide overflow protection devices to warn operator or automatic shut down transfer pumps.
  - Provide protection guards (bollards) around tanks and piping to prevent vehicle or forklift damage, and
  - Provide clear tagging or labeling, and restricting access to valves to reduce human error.
- Berm or surround tank or container with secondary containment system using dikes, liners, vaults, or double walled tanks.
- Contact the appropriate regulatory agency regarding environmental compliance for facilities with "spill ponds" designed to intercept, treat, and/or divert spills.
- Have registered and specifically trained professional engineers can identify and correct potential problems such as loose fittings, poor welding, and improper or poorly fitted gaskets for newly installed tank systems.

Storage Areas

- Provide storage tank piping located below product level with a shut-off valve at the tank; ideally this valve should be an automatic shear valve with the shut-off located inside the tank.
- Provide barriers such as posts or guard rails, where tanks are exposed, to prevent collision damage with vehicles.
- Provide secure storage to prevent vandalism.
- Place tight-fitting lids on all containers.
- Enclose or cover the containers where they are stored.

- Raise the containers off the ground by use of pallet or similar method, with provisions for spill control and secondary containment.

- Contain the material in such a manner that if the container leaks or spills, the contents will not discharge, flow, or be washed into the storm drainage system, surface waters or groundwater.

- Place drip pans or absorbent materials beneath all mounted container taps, and at all potential drip and spill locations during filling and unloading of containers. Drip pans must be cleaned periodically, and all collected liquids and soiled absorbent materials must be reused/recycled or properly disposed.

- Ensure that any underground or aboveground storage tanks shall be designed and managed in accordance with applicable regulations, be identified as a potential pollution source, have secondary containment, such as a berm or dike with an impervious surface.

- Rainfall collected in secondary containment system must not contain pollutants for discharge to storm drain system.

Container Management

- Keep containers in good condition without corrosion or leaky seams.

- Place containers in a lean-to structure or otherwise covered to keep rainfall from reaching the drums.

- Replace containers if they are deteriorating to the point where leakage is occurring. Keep all containers undercover to prevent the entry of stormwater. Employees should be made aware of the importance of keeping the containers free from leaks.

- Keep waste container drums in an area such as a service bay. Drums stored outside must be stored in a lean-to type structure, shed or walk-in container.

Storage of Hazardous Materials

- Storage of reactive, ignitable, or flammable liquids must comply with the fire and hazardous waste codes.

- Place containers in a designated area that is paved, free of cracks and gaps, and impervious in order to contain leaks and spills. The area should also be covered.

- Surround stored hazardous materials and waste with a curb or dike to provide the volume to contain 10 percent of the volume of all of the containers or 110 percent of the volume of the largest container, whichever is greater. The area inside the curb should slope to a drain and a dead-end sump should be installed in the drain.

Inspection

- Provide regular inspections:

  - Inspect storage areas regularly for leaks or spills.

- Conduct routine inspections and check for external corrosion of material containers. Also check for structural failure, spills and overfills due to operator error, failure of piping system.

- Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.

- Visually inspect new tank or container installations for loose fittings, poor welding, and improper or poorly fitted gaskets.

- Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.

- Replace containers that are leaking, corroded, or otherwise deteriorating with ones in good condition. If the liquid chemicals are corrosive, containers made of compatible materials must be used instead of metal drums.

- Label new or secondary containers with the product name and hazards.

Training

- Train employees (e.g. fork lift operators) and contractors in proper spill containment and cleanup. The employee should have the tools and knowledge to immediately begin cleaning up a spill if one should occur.

- Train employees in proper storage measures.

- Use a training log or similar method to document training.

Spill Response and Prevention

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

- Have an emergency plan, equipment and trained personnel ready at all times to deal immediately with major spills.

- Collect all spilled liquids and properly dispose of them.

- Employees trained in emergency spill cleanup procedures should be present when dangerous waste, liquid chemicals, or other wastes are delivered.

- Operator errors can be prevented by using engineering safe guards and thus reducing accidental releases of pollutant.

- Store and maintain appropriate spill cleanup materials in a location known to all near the tank storage area.

- See Aboveground Tank Leak and Spill Control section of the Spill Prevention, Control & Cleanup fact sheet (SC-11) for additional information.

Other Considerations

- Storage sheds often must meet building and fire code requirements.
- The local fire district must be consulted for limitations on clearance of roof covers over containers used to store flammable materials.
- All specific standards set by federal and state laws concerning the storage of oil and hazardous materials must be met.
- Storage of reactive, ignitable, or flammable liquids should comply with the Uniform Fire Code and the National Electric Code.
- Storage of oil and hazardous materials must meet specific federal and state standards including:
  - Spill Prevention Control and Countermeasure Plan (SPCC) Plan
  - Secondary containment
  - Integrity and leak detection monitoring
  - Emergency preparedness plans

Requirements

Costs

- Will vary depending on the size of the facility and the necessary controls, such as berms or safeguards against accidental controls.

Maintenance

- Conduct weekly inspection.
- Sweep and clean the storage area regularly if it is paved, do not hose down the area to a storm drain.

Supplemental Information

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

Further Detail of the BMP

Dikes

One of the best protective measures against contamination of stormwater is diking. Containment dikes are berms or retaining walls that are designed to hold spills. Diking is an effective pollution prevention measure for above ground storage tanks and railcar or tank truck loading and unloading areas. The dike surrounds the area of concern and holds the spill, keeping spill materials separated from the stormwater side of the dike area. Diking can be used in any industrial or municipal facility, but it is most commonly used for controlling large spills or releases from liquid storage areas and liquid transfer areas.

- For single-wall tanks, containment dikes should be large enough to hold the contents of the storage tank for the facility plus rain water.
- For trucks, diked areas should be capable of holding an amount equal to the volume of the tank truck compartment. Diked construction material should be strong enough to safely hold spilled materials.
- Dike materials can consist of earth, concrete, synthetic materials, metal, or other impervious materials.
- Strong acids or bases may react with metal containers, concrete, and some plastics.
- Where strong acids or bases or stored, alternative dike materials should be considered. More active organic chemicals may need certain special liners for dikes.
- Dikes may also be designed with impermeable materials to increase containment capabilities.
- Dikes should be inspected during or after significant storms or spills to check for washouts or overflows.
- Regular checks of containment dikes to insure the dikes are capable of holding spills should be conducted.
- Inability of a structure to retain stormwater, dike erosion, soggy areas, or changes in vegetation indicate problems with dike structures. Damaged areas should be patched and stabilized immediately.
- Accumulated stormwater in the containment are should be analyzed for pollutants before it is released to surface waters. If pollutants are found or if stormwater quality is not determined, then methods other than discharging to surface waters should be employed (e.g., discharge to sanitary sewer if allowed).
- Earthen dikes may require special maintenance of vegetation such as mulching and irrigation.

Curbing

Curbing is a barrier that surrounds an area of concern. Curbing is similar to containment diking in the way that it prevents spills and leaks from being released into the environment. The curbing is usually small scaled and does not contain large spills like diking. Curbing is common at many facilities in small areas where handling and transfer liquid materials occur. Curbing can redirect stormwater away from the storage area. It is useful in areas where liquid materials are transferred from one container to another. Asphalt is a common material used for curbing; however, curbing materials include earth, concrete, synthetic materials, metal, or other impenetrable materials.

- Spilled materials should be removed immediately from curbed areas to allow space for future spills.
- Curbs should have manually-controlled pump systems rather than common drainage systems for collection of spilled materials.
- The curbed area should be inspected regularly to clear clogging debris.
- Maintenance should also be conducted frequently to prevent overflow of any spilled materials as curbed areas are designed only for smaller spills.
- Curbing has the following advantages:
    - Excellent runon control,
    - Inexpensive,
    - Ease of installment,
    - Provides option to recycle materials spilled in curb areas, and
    - Common industry practice.

Examples

The "doghouse" design has been used to store small liquid containers. The roof and flooring design prevent contact with direct rain or runoff. The doghouse has two solid structural walls and two canvas covered walls. The flooring is wire mesh about secondary containment. The unit has been used successfully at Lockheed Missile and Space Company in Sunnyvale.

References and Resources

British Columbia Lake Stewardship Society. Best Management Practices to Protect Water Quality from Non-Point Source Pollution. March 2000
http://www.nalms.org/bclss/storage.html

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

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP) - http://www.projectcleanwater.org/pdf/Model%20Program%20Municipal%20Facilities.pdf

Outdoor Storage of Raw Materials SC-33

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Targeted Constituents

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

Description

Raw materials, by-products, finished products, containers, and material storage areas exposed to rain and/or runoff can pollute stormwater. Stormwater can become contaminated when materials wash off or dissolve into water or are added to runoff by spills and leaks. Improper storage of these materials can result in accidental spills and the release of materials. To prevent or reduce the discharge of pollutants to stormwater from material delivery and storage, pollution prevention and source control measures, such as minimizing the storage of hazardous materials on-site, enclosing or covering materials, storing materials in a designated area, installing secondary containment, conducting regular inspections, preventing stormwater runon and runoff, and training employees and subcontractors must be implemented.

Approach

Pollution Prevention

- Employee education is paramount for successful BMP implementation.
- Minimize inventory of raw materials.
- Keep an accurate, up-to-date inventory of the materials delivered and stored on-site.
- Try to keep chemicals in their original containers, and keep them well labeled.

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Suggested Protocols

General

- Store all materials inside. If this is not feasible, then all outside storage areas should be covered with a roof, and bermed, or enclosed to prevent stormwater contact. At the very minimum, a temporary waterproof covering made of polyethylene, polypropylene or hypalon should be used over all materials stored outside.
- Cover and contain the stockpiles of raw materials to prevent stormwater from running into the covered piles. The covers must be in place at all times when work with the stockpiles is not occurring. (applicable to small stockpiles only).
- If the stockpiles are so large that they cannot feasibly be covered and contained, implement erosion control practices at the perimeter of your site and at any catch basins to prevent erosion of the stockpiled material off site,
- Keep liquids in a designated area on a paved impervious surface within a secondary containment.
- Keep outdoor storage containers in good condition.
- Keep storage areas clean and dry.
- Design paved areas to be sloped in a manner that minimizes the pooling of water on the site, particularly with materials that may leach pollutants into stormwater and/or groundwater, such as compost, logs, and wood chips. A minimum slope of 1.5 percent is recommended.
- Secure drums stored in an area where unauthorized persons may gain access to prevent accidental spillage, pilferage, or any unauthorized use.
- Cover wood products treated with chromated copper arsenate, ammonical copper zinc arsenate, creosote, or pentachlorophenol with tarps or store indoors.

Raw Material Containment

- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items in secondary containers if applicable.
- Prevent the run-on of uncontaminated stormwater from adjacent areas as well as runoff of stormwater from the stockpile areas, by placing a curb along the perimeter of the area. The area inside the curb should slope to a drain. Liquids should be drained to the sanitary sewer if allowed. The drain must have a positive control such as a lock, valve, or plug to prevent release of contaminated liquids.
- Tanks should be bermed or surrounded by a secondary containment system.
- Release accumulated stormwater in petroleum storage areas prior to the next storm. At a minimum, water should pass through an oil/water separator and, if allowed, discharged to a sanitary sewer.

Inspection

- Conduct regular inspections of storage areas so that leaks and spills are detected as soon as possible.
- Conduct routine inspections and check for external corrosion of material containers. Also check for structural failure, spills and overfills due to operator error, failure of piping system.
- Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.
- Visually inspect new tank or container installations for loose fittings, poor welding, and improper or poorly fitted gaskets.
- Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.

Training

- Employees should be well trained in proper material storage.
- Train employees and contractors in proper techniques for spill containment and cleanup.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.
- Have employees trained in spill containment and cleanup present during loading/unloading of dangerous waste, liquid chemicals and other potentially hazardous materials.

Other Considerations

- Storage sheds often must meet building and fire code requirements. Storage of reactive, ignitable, or flammable liquids must comply with the Uniform Fire Code and the National Electric Code.
- Space limitations may preclude storing some materials indoors.
- Some municipalities require that secondary containment areas (regardless of size) be connected to the sanitary sewer, prohibiting any hard connections to the storm drain. Storage sheds often must meet building and fire code requirements.
- The local fire district must be consulted for limitations on clearance of roof covers over containers used to store flammable materials.

Requirements

Costs

- Costs will vary depending on the size of the facility and the necessary controls. They should be low except where large areas may have to be covered.

Maintenance

- Accurate and up-to-date inventories should be kept of all stored materials.
- Berms and curbs may require periodic repair and patching.
- Parking lots or other surfaces near bulk materials storage areas should be swept periodically to remove debris blown or washed from storage area.
- Sweep paved storage areas regularly for collection and disposal of loose solid materials, do not hose down the area to a storm drain or conveyance ditch.
- Keep outdoor storage areas in good condition (e.g. repair roofs, floors, etc. to limit releases to runoff).

Supplemental Information

Further Detail of the BMP

Raw Material Containment

Paved areas should be sloped in a manner that minimize the pooling of water on the site, particularly with materials that may leach pollutants into stormwater and/or groundwater, such as compost, logs, and wood chips. A minimum slope of 1.5 percent is recommended.

- Curbing should be placed along the perimeter of the area to prevent the runon of uncontaminated stormwater from adjacent areas as well as runoff of stormwater from the stockpile areas.
- The storm drainage system should be designed to minimize the use of catch basins in the interior of the area as they tend to rapidly fill with manufacturing material.
- The area should be sloped to drain stormwater to the perimeter where it can be collected or to internal drainage alleyways where material is not stockpiled.
- If the raw material, by-product, or product is a liquid, more information for outside storage of liquids can be found under SC-31, Outdoor Container Storage.

Examples

The “doghouse” design has been used to store small liquid containers. The roof and flooring design prevent contact with direct rain or runoff. The doghouse has two solid structural walls and two canvas covered walls. The flooring is wire mesh about secondary containment. The unit has been used successively at Lockheed Missile and Space Company in Sunnyvale.

References and Resources

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

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 (Revised February 2002 by the California Coastal Commission).

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

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP)
http://www.projectcleanwater.org/pdf/Model%20Program%20Municipal%20Facilities.pdf

Waste Handling & Disposal SC-34

Description

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

Approach

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

General Pollution Prevention Protocols

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

Objectives

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

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

Minimum BMPs Covered	
Good Housekeeping	✓
Preventative Maintenance	✓
Spill and Leak Prevention and Response	✓
Material Handling & Waste Management	✓
Erosion and Sediment Controls	
Employee Training Program	✓
Quality Assurance Record Keeping	✓

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- Use the entire product before disposing of the container.

- To the extent possible, store wastes under cover or indoors after ensuring all safety concerns such as fire hazard and ventilation are addressed.

- Provide containers for each waste stream at each work station. Allow time after shift to clean area.

Good Housekeeping

- Cover storage containers with leak proof lids or some other means. If waste is not in containers, cover all waste piles (plastic tarps are acceptable coverage) and prevent stormwater run-on and runoff with a berm. The waste containers or piles must be covered except when in use.

- Use drip pans or absorbent materials whenever grease containers are emptied by vacuum trucks or other means. Grease cannot be left on the ground. Collected grease must be properly disposed of as garbage.

- Dispose of rinse and wash water from cleaning waste containers into a sanitary sewer if allowed by the local sewer authority. Do not discharge wash water to the street or storm drain. Clean in a designated wash area that drains to a clarifier.

- Transfer waste from damaged containers into safe containers.

- Take special care when loading or unloading wastes to minimize losses. Loading systems can be used to minimize spills and fugitive emission losses such as dust or mist. Vacuum transfer systems can minimize waste loss.

- Keep the waste management area clean at all times by sweeping and cleaning up spills immediately.

- Use dry methods when possible (e.g., sweeping, use of absorbents) when cleaning around restaurant/food handling dumpster areas. If water must be used after sweeping/using absorbents, collect water and discharge through grease interceptor to the sewer.

- Stencil or demarcate storm drains on the facility's property with prohibitive message regarding waste disposal.

- Cover waste piles with temporary covering material such as reinforced tarpaulin, polyethylene, polyurethane, polypropylene or hypalon.

- If possible, move the activity indoor after ensuring all safety concerns such as fire hazard and ventilation are addressed.

Preventative Maintenance

- Prevent stormwater run-on from entering the waste management area by enclosing the area or building a berm around the area.

- Prevent waste materials from directly contacting rain.

- Cover waste piles with temporary covering material such as reinforced tarpaulin, polyethylene, polyurethane, polypropylene or hypalon.
- Cover the area with a permanent roof if feasible.
- Cover dumpsters to prevent rain from washing waste out of holes or cracks in the bottom of the dumpster.
- Check waste containers weekly for leaks and to ensure that lids are on tightly. Replace any that are leaking, corroded, or otherwise deteriorating.
- Sweep and clean the waste management area regularly. Use dry methods when possible (e.g., sweeping, vacuuming, use of absorbents) when cleaning around restaurant/food handling dumpster areas. If water must be used after sweeping/using absorbents, collect water and discharge through grease interceptor to the sewer.
- Inspect and replace faulty pumps or hoses regularly to minimize the potential of releases and spills.
- Repair leaking equipment including valves, lines, seals, or pumps promptly.

Spill Response and Prevention Procedures

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

Material Handling and Waste Management

Litter Control

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

Waste Collection

- Keep waste collection areas clean.

- Inspect solid waste containers for structural damage regularly. Repair or replace damaged containers as necessary.
- Secure solid waste containers; containers must be closed tightly when not in use.
- Do not fill waste containers with washout water or any other liquid.
- Ensure that only appropriate solid wastes are added to the solid waste container. Certain wastes such as hazardous wastes, appliances, fluorescent lamps, pesticides, etc., may not be disposed of in solid waste containers (see chemical/ hazardous waste collection section below).
- Do not mix wastes; this can cause chemical reactions, make recycling impossible, and complicate disposal. Affix labels to all waste containers.

Chemical/Hazardous Wastes

- Select designated hazardous waste collection areas on-site.
- Store hazardous materials and wastes in covered containers and protect them from vandalism.
- Place hazardous waste containers in secondary containment.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Hazardous waste cannot be reused or recycled; it must be disposed of by a licensed hazardous waste hauler.

Employee Training Program

- Educate employees about pollution prevention measures and goals.
- Train employees how to properly handle and dispose of waste using the source control BMPs described above.
- Train employees and subcontractors in proper hazardous waste management.
- Use a training log or similar method to document training.
- Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.

Quality Assurance and Record Keeping

- Keep accurate maintenance logs that document minimum BMP activities performed for waste handling and disposal, types and quantities of waste disposed of, and any improvement actions.
- Keep accurate logs of spill response actions that document what was spilled, how it was cleaned up, and how the waste was disposed.

- Establish procedures to complete logs and file them in the central office.

Potential Capital Facility Costs and Operation & Maintenance Requirements

Facilities

- Capital costs will vary substantially depending on the size of the facility and the types of waste handled. Significant capital costs may be associated with reducing wastes by modifying processes or implementing closed-loop recycling.

- Many facilities will already have indoor covered areas where waste materials will be stored and will require no additional capital expenditures for providing cover.

- If outdoor storage of wastes is required, construction of berms or other means to prevent stormwater run-on and runoff may require appropriate constructed systems for containment.

- Capital investments will likely be required at some sites if adequate cover and containment facilities do not exist and can vary significantly depending upon site conditions.

Maintenance

- Check waste containers weekly for leaks and to ensure that lids are on tightly. Replace any that are leaking, corroded, or otherwise deteriorating.

- Sweep and clean the waste management area regularly. Use dry methods when possible (e.g., sweeping, use of absorbents) when cleaning around restaurant/food handling dumpster areas. If water must be used after sweeping/using absorbents, collect water and discharge through grease interceptor to the sewer.

- Inspect and replace faulty pumps or hoses regularly to minimize the potential of releases and spills.

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

References and Resources

Minnesota Pollution Control Agency, *Industrial Stormwater Best Management Practices Guidebook*. Available online at: http://www.pca.state.mn.us/index.php/view-document.html?gid=10557.

New Jersey Department of Environmental Protection, 2013. *Basic Industrial Stormwater General Permit Guidance Document NJPDES General Permit No NJ0088315,* Revised. Available online at: http://www.nj.gov/dep/dwq/pdf/5G2_guidance_color.pdf.

Orange County Stormwater Program, Best Management Practices for Industrial/Commercial Business Activities. Available online at: http://ocwatersheds.com/documents/bmp/industrialcommercialbusinessesactivities

Oregon Department of Environmental Quality, 2013. *Industrial Stormwater Best Management Practices Manual- BMP 26 Fueling and Liquid Loading/Unloading Operations*. Available online at: http://www.deq.state.or.us/wq/wqpermit/docs/IndBMP021413.pdf.

Sacramento Stormwater Management Program. *Best Management Practices for Industrial Storm Water Pollution Control*. Available online at: http://www.msa.saccounty.net/sactostormwater/documents/guides/industrial-BMP-manual.pdf.

Sacramento County Environmental Management Stormwater Program: Best Management Practices. Available online at: http://www.emd.saccounty.net/EnvHealth/Stormwater/Stormwater-BMPs.html.

Santa Clara Valley Urban Runoff Pollution Prevention Program. http://www.scvurppp-w2k.com/

US EPA. National Pollutant Discharge Elimination System – Industrial Fact Sheet Series for Activities Covered by EPA's Multi Sector General Permit. Available online at: http://cfpub.epa.gov/npdes/stormwater/swsectors.cfm.

Objectives

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

Targeted Constituents

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

Description

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

Approach

Pollution Prevention

- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Encourage proper lawn management and landscaping, including use of native vegetation.
- Encourage use of Integrated Pest Management techniques for pest control.
- Encourage proper onsite recycling of yard trimmings.
- Recycle residual paints, solvents, lumber, and other material as much as possible.

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Suggested Protocols

Pressure Washing of Buildings, Rooftops, and Other Large Objects

- In situations where soaps or detergents are used and the surrounding area is paved, pressure washers must use a waste water collection device that enables collection of wash water and associated solids. A sump pump, wet vacuum or similarly effective device must be used to collect the runoff and loose materials. The collected runoff and solids must be disposed of properly.

- If soaps or detergents are not used, and the surrounding area is paved, wash water runoff does not have to be collected but must be screened. Pressure washers must use filter fabric or some other type of screen on the ground and/or in he catch basin to trap the particles in wash water runoff.

- If you are pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement. Ensure that this practice does not kill grass.

Landscaping Activities

- Do not apply any chemicals (insecticide, herbicide, or fertilizer) directly to surface waters, unless the application is approved and permitted by the state.

- Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.

- Use mulch or other erosion control measures on exposed soils.

- Check irrigation schedules so pesticides will not be washed away and to minimize non-stormwater discharge.

Building Repair, Remodeling, and Construction

- Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.

- Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.

- Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.

- Clean paint brushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.

- Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a catch basin. The containment device(s) must be in place at the beginning of the work day, and accumulated dirty runoff and solids must be collected and disposed of before removing the containment device(s) at the end of the work day.

- If you need to de-water an excavation site, you may need to filter the water before discharging to a catch basin or off-site. In which case you should direct the water through hay bales and filter fabric or use other sediment filters or traps.

- Store toxic material under cover with secondary containment during precipitation events and when not in use. A cover would include tarps or other temporary cover material.

Mowing, Trimming, and Planting

- Dispose of leaves, sticks, or other collected vegetation as garbage, by composting or at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.

- Use mulch or other erosion control measures when soils are exposed.

- Place temporarily stockpiled material away from watercourses and drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.

- Consider an alternative approach when bailing out muddy water; do not put it in the storm drain, pour over landscaped areas.

- Use hand or mechanical weeding where practical.

Fertilizer and Pesticide Management

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.

- Follow manufacturers' recommendations and label directions. Pesticides must never be applied if precipitation is occuring or predicted. Do not apply insecticides within 100 feet of surface waters such as lakes, ponds, wetlands, and streams.

- Use less toxic pesticides that will do the job, whenever possible. Avoid use of copper-based pesticides if possible.

- Do not use pesticides if rain is expected.

- Do not mix or prepare pesticides for application near storm drains.

- Use the minimum amount needed for the job.

- Calibrate fertilizer distributors to avoid excessive application.

- Employ techniques to minimize off-target application (e.g. spray drift) of pesticides, including consideration of alternative application techniques.

- Apply pesticides only when wind speeds are low.
- Work fertilizers into the soil rather than dumping or broadcasting them onto the surface.
- Irrigate slowly to prevent runoff and then only as much as is needed.
- Clean pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Dispose of empty pesticide containers according to the instructions on the container label.
- Use up the pesticides. Rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

Inspection

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

Training

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

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup
- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

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

Requirements

Costs

- Overall costs should be low in comparison to other BMPs.

Maintenance

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

Supplemental Information

Further Detail of the BMP

Fire Sprinkler Line Flushing

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

References and Resources

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

King County - ftp://dnr.metrokc.gov/wlr/dss/spcm/Chapter%203.PDF

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

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

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

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP) -
http://www.projectcleanwater.org/pdf/Model%20Program%20Municipal%20Facilities.pdf

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.

For Information:

For more information on the General Industrial Storm Water Permit contact:

State Water Resources Control Board (SWRCB) (916) 657-1146 or www.swrcb.ca.gov/ or, at your Regional Water Quality Control Board (RWQCB).

Santa Ana Region (8)
California Tower
3737 Main Street, Ste. 500
Riverside, CA 92501-3339
(909) 782-4130

San Diego Region (9)
9771 Clairemont Mesa Blvd., Ste. A
San Diego, CA 92124
(619) 467-2952

Colorado River Basin Region (7)
73-720 Fred Waring Dr., Ste. 100
Palm Desert, CA 92260
(760) 346-7491

SPILL RESPONSE AGENCY:

HAZ-MAT:	(909) 358-5055
HAZARDOUS WASTE DISPOSAL:	(909) 358-5055
RECYCLING INFORMATION:	1-800-366-SAVE
TO REPORT ILLEGAL DUMPING OR A CLOGGED STORM DRAIN:	1-800-506-2555

To order additional brochures or to obtain information on other pollution prevention activities, call: (909) 955-1111.

StormWater CleanWater PROTECTION PROGRAM

Riverside County gratefully acknowledges the State Water Quality Control Board and the American Public Works Association, Storm Water Quality Task Force for the information provided in this brochure.

DID YOU KNOW . . .

YOUR FACILITY MAY NEED A STORM WATER PERMIT?

Many industrial facilities and manufacturing operations must obtain coverage under the Industrial Activities Storm Water General Permit

FIND OUT
IF YOUR FACILITY MUST OBTAIN A PERMIT

StormWater Pollution . . . What you should know

Riverside County has two drainage systems - sanitary sewers and storm drains. The storm drain system is designed to help prevent flooding by carrying excess rainwater away from streets. Since the storm drain system does not provide for water treatment, it also serves the *unintended* function of transporting pollutants directly to our waterways.

Unlike sanitary sewers, storm drains are not connected to a treatment plant - they flow directly to our local streams, rivers and lakes.

In recent years, awareness of the need to protect water quality has increased. As a result, federal, state, and local programs have been established to reduce polluted stormwater discharges to our waterways. The emphasis of these programs is to prevent stormwater pollution since it's much easier, and less costly, than cleaning up "after the fact."

National Pollutant Discharge Elimination System (NPDES)

In 1987, the Federal Clean Water Act was amended to establish a framework for regulating industrial stormwater discharges under the NPDES permit program. In California, NPDES permits are issued by the State Water Resources Control Board (SWRCB) and the nine (9) Regional Water Quality Control Boards (RWQCB). In general, certain industrial facilities and manufacturing operations must obtain coverage under the Industrial Activities Storm Water General Permit if the type of facilities or operations falls into one of the several categories described in this brochure.

How Do I Know If I Need A Permit?

Following are ***general descriptions*** of the industry categories types that are regulated by the Industrial Activities Storm Water General Permit. Contact your local Region Water Quality Control Board to determine if your facility/operation requires coverage under the Permit.

➜ Facilities such as cement manufacturing; feedlots; fertilizer manufacturing; petroleum refining; phosphate manufacturing; steam electric power generation; coal mining; mineral mining and processing; ore mining and dressing; and asphalt emulsion;

➜ Facilities classified as lumber and wood products (except wood kitchen cabinets); pulp, paper, and paperboard mills; chemical producers (except some pharmaceutical and biological products); petroleum and coal products; leather production and products; stone, clay and glass products; primary metal industries; fabricated structural metal; ship and boat building and repairing;

➜ Active or inactive mining operations and oil and gas exploration, production, processing, or treatment operations;

➜ Hazardous waste treatment, storage, or disposal facilities;

➜ Landfills, land application sites and open dumps that receive or have received any industrial waste; unless there is a new overlying land use such as a golf course, park, etc., and there is no discharge associated with the landfill;

➜ Facilities involved in the recycling of materials, including metal scrap yards, battery reclaimers, salvage yards, and automobile junkyards;

➜ Steam electric power generating facilities, facilities that generate steam for electric power by combustion;

➜ Transportation facilities that have vehicle maintenance shops, fueling facilities, equipment cleaning operations, or airport deicing operations. This includes school bus maintenance facilities operated by a school district;

➜ Sewage treatment facilities;

➜ Facilities that have areas where material handling equipment or activities, raw materials, intermediate products, final products, waste materials, by-products, or industrial machinery are exposed to storm water.

How do I obtain coverage under the Industrial Activities Storm Water General Permit?

Obtain a permit application package from your local Regional Water Quality Control Board listed on the back of this brochure or the State Water Resources Control Board (SWRCB). Submit a completed Notice of Intent (NOI) form, site map and the appropriate fee ($250 or $500) to the SWRCB. Facilities must submit an NOI thirty (30) days prior to beginning operation. Once you submit the NOI, the State Board will send you a letter acknowledging receipt of your NOI and will assign your facility a waste discharge identification number (WDID No.). You will also receive an annual fee billing. These billings should roughly coincide with the date the State Board processed your original NOI submittal.

What are the requirements of the Industrial Activities Storm Water General Permit?

The basic requirements of the Permit are:

1. The facility must eliminate any non-stormwater discharges or obtain a separate permit for such discharges.

2. The facility must develop and implement a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP must identify sources of pollutants that may be exposed to stormwater. Once the sources of pollutants have been identified, the facility operator must develop and implement Best Management Practices (BMPs) to minimize or prevent polluted runoff.

   Guidance in preparing a SWPPP is available from a document prepared by the California Storm Water Quality Task Force called the California Storm Water Best Management Practice Handbook.

3. The facility must develop and implement a Monitoring Program that includes conducting visual observations and collecting samples of the facility's storm water discharges associated with industrial activity. The General Permit requires that the analysis be conducted by a laboratory that is certified by the State of California.

4. The facility must submit to the Regional Board, every July 1, an annual report that includes the results of its monitoring program.

A Non-Storm Water Discharge is... *any discharge to a storm drain system that is not composed entirely of storm water. The following non-storm water discharges are authorized by the General Permit: fire hydrant flushing; potable water sources, including potable water related to the operation, maintenance, or testing of potable water systems; drinking fountain water; atmospheric condensates including refrigeration, air conditioning, and compressor condensate; irrigation drainage; landscape watering; springs; non-contaminated ground water; foundation or footing drainage; and sea water infiltration where the sea waters are discharged back into the sea water source.*

A BMP is . . . *a technique, process, activity, or structure used to reduce the pollutant content of a storm water discharge. BMPs may include simple, non-structural methods such as good housekeeping, staff training and preventive maintenance. Additionally, BMPs may include structural modifications such as the installation of berms, canopies or treatment control (e.g. setting basins, oil/water separators, etc.)*

WARNING*: There are significant penalties for non-compliance: a minimum fine of $5,000 for failing to obtain permit coverage, and, up to $10,000 per day, per violation plus $10 per gallon of discharge in excess of 1,000 gallons.*

PRELIMINARY HYDROLOGY STUDY

SOUTH OF IRIS

Southeast Corner of Iris Avenue & Indian Street
Moreno Valley, California
PEN22-XXXX/0XXX
LST22-XXXX

Prepared for:
Patton Development
41 Corporate Park #250
Irvine, CA 92606

Reviewed by:
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GreenbergFarrow
30 Executive Park, Suite 100
Irvine, California, 92614
t: 949.296.0450 f: 949.296.0479
Project No. 20200259.0

Prepared by: ______________________________ Date: __________

Bahareh Sehatzadeh, PE
RCE# C89859 Exp. 06.30.2023

Date Prepared: 4/25/22

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SECTIONS:

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SECTION I - INTRODUCTION

1.1 PURPOSE

This report presents the hydrologic analysis for the proposed development located at the southeast corner of Iris Avenue & Indian Street, in the City of Moreno Valley, County of Riverside, State of California. The main objective of this report was to analyze the post construction “peak” run-off quantities for the proposed development.

1.2 PROJECT DESCRIPTION

The project is located across APNs 316030002, 316030018, and 316030019 at the southeast corner of Iris Avenue and Indian St as shown in Appendix A. The existing 9.33-acre site consists of residential tracts. It generally slopes from northeast to southwest at a gradient of approximately 0.8%. No existing underground storm drain facilities exist near the site that are tributary to the project. The site is bordered by Iris Avenue to the north, Indian Street to the west, Goya Avenue to the south, and Residential development to the east. Iris Avenue and Indian Street are existing improved streets. Along the project site frontage, Goya Avenue is an existing dirt road and is part of street improvements at 0.39-acre and street improvements for southern portion of Iris Avenue at 0.37-acre for the residential tracts site.

The developed site will be an apartment complex with a clubhouse and open space. The site will be graded to generally follow the existing condition drainage patterns to minimize adverse effects to the current topography and minimize the use of import soil. Runoff for the onsite area (Subarea 100) will flow through proposed underground storm drains which lead to the proposed detention basin located at the southwest corner of the site. The north portion of the offsite runoff from Goya Avenue (Subarea 201) will also be collected via curb inlet and directed to the proposed underground storm drain system which connects to an existing drop inlet on Indian Street. Iris Avenue drainage will drain along the proposed curb and gutter and travel west into an existing curb inlet at the intersection of Iris Avenue and Indian Street.

The basin and storm drain curb inlet will ensure the project detains up to the 100-year stormwater volume exceeding the pre-developed condition while restricting outflow up to the 100-year pre-developed flow rate for the proposed onsite development only. The basin will both detain and infiltrate the project’s onsite runoff as no underground storm drain facilities exist near the site.

The basin will operate as a hybrid: it will detain and infiltrate onsite flows for the storm events specified herein while also acting as an infiltration basin to treat the project's runoff. While the hybrid basin will be 5' deep with 1’ of freeboard, it will act as an infiltration basin for only the first 2.8' of runoff depth as determined by the BMP calculation sheets herein. The basin will only store runoff in excess of this in order to attenuate runoff to the pre-development condition.

Offsite runoff for Goya Avenue will be treated by proposed curb inlet with an outlet pipe connecting to the existing storm drain inlet west of the project along Indian Street, adjacent to the street right of way. Goya Avenue runoff will be conveyed to these curb inlets through an outlet storm drain pipe into an existing storm drain inlet, pipe sized to treat the water quality volume only. Please see the Hydrology Map in Appendix D for delineation.

SECTION II - FLOW VOLUMES

2.1 METHODOLOGY

This hydrology study was based on the Riverside County Flood Control and Water Conservation District (RCFC&WCD) Hydrology Manual dated April 1978. This manual allows the use of two methods: the Rational Method and the Synthetic Unit Hydrograph Method.

The Rational Method was used to determine peak flow rates for each tributary area for pipe sizing to ensure that capacity for the 10-year and 100-year storm events were met. The Synthetic Unit Hydrograph Method was used to calculate pre-developed and post-developed runoff volumes and peak flow rates for the 2, 5, 10, and 100-year storm events at durations of 1, 3, 6, and 24 hours.

Basin modeling was performed using the Hydraflow Hydrographs Extension for Autodesk Civil 3D 2019. Synthetic Unit Hydrograph Method storm events were input into the extension to simulate basin depths, volumes, and outlet flow rates for each scenario. Basin modeling also includes losses due to infiltration at a rate at an average of 0.575 inches/hour. This number comes from the four (4) infiltration test at 0.46, 0.53, 0.58 and 0.73 inches/hour reported by the geotechnical report along with a 3.0 safety factor from the Table 1 Infiltration Testing Requirements of the Riverside County Low Impact Development BMP Design Handbook.

Stormwater quality volumes were determined in the project water quality management plan (WQMP). See project WQMP for more information.

Please see Appendix C for Riverside County Approved CivilD Bonadiman Software Calculations as well as basin sizing calculations. See Appendix D: Hydrology Map for an illustration of drainage patterns, tributary sub areas, and storm drain pipes to convey runoff to the onsite basin.

2.2 DESIGN CRITERIA

Rational Method

Design Storm: 10 & 100-year

Soil Type: "B" (assumed for all areas).

Runoff Coefficients: A conservative on-site runoff coefficient of 0.90 was used for calculation of the post-developed runoff.

Synthetic Unit Hydrograph Method

Design Storms: 2, 5, 10, 100 year at 1, 3, 6, 24 hours

Antecedent Moisture Condition (AMC):

I (2 & 5-year)
II (10 & 100-year)

SECTION III - SUMMARY

Both the Rational Method and the Synthetic Unit Hydrograph Method were used to evaluate the hydraulic and hydrologic performance of the proposed development using the parameters described in Section 2.2. Peak runoff and storage for the development were calculated and are summarized in the following tables. The results of both calculations show that the proposed basin and storm drains are adequately sized to both convey and detain the runoff in excess of the pre-developed condition for the storm events indicated.

Post-Developed Impervious Calculation

Type	Area (SF)	Area (AC)	% of Total	% Imp.	Impervious Area (SF)	Impervious Area (AC)	Note
Residential Apartments	126,724	2.91	31%	80%	101,379	2.3	80% impervious from RCFC&WCD Hydrology Manual Plate E-6.3
Open Space	174,455	4.00	43%	0%	0	0.0	
Residential Street & Sidewalk	105,044	2.41	26%	100%	105,044	2.4	
TOTAL	406,223	9.33	1.00			4.7	
					Weighted % Impervious:	47%	

Please see Appendices C & D for detailed calculations and locations of facilities.

Please note that Hydromodification and Hydrologic Conditions of Concern (HCOC) criteria do not apply to this project due to the downstream Canyon Lake sump. See the project WQMP for more information.

Rational Method Stormwater Calculations Summary

Condition	t_c	Q_{100}
Pre-Developed	23.47 min	12.284 CFS
Post-Developed		
Subarea 100 (Onsite)	9.07 min	36.203 CFS

Synthetic Unit Hydrograph Method Stormwater Calculations Summary

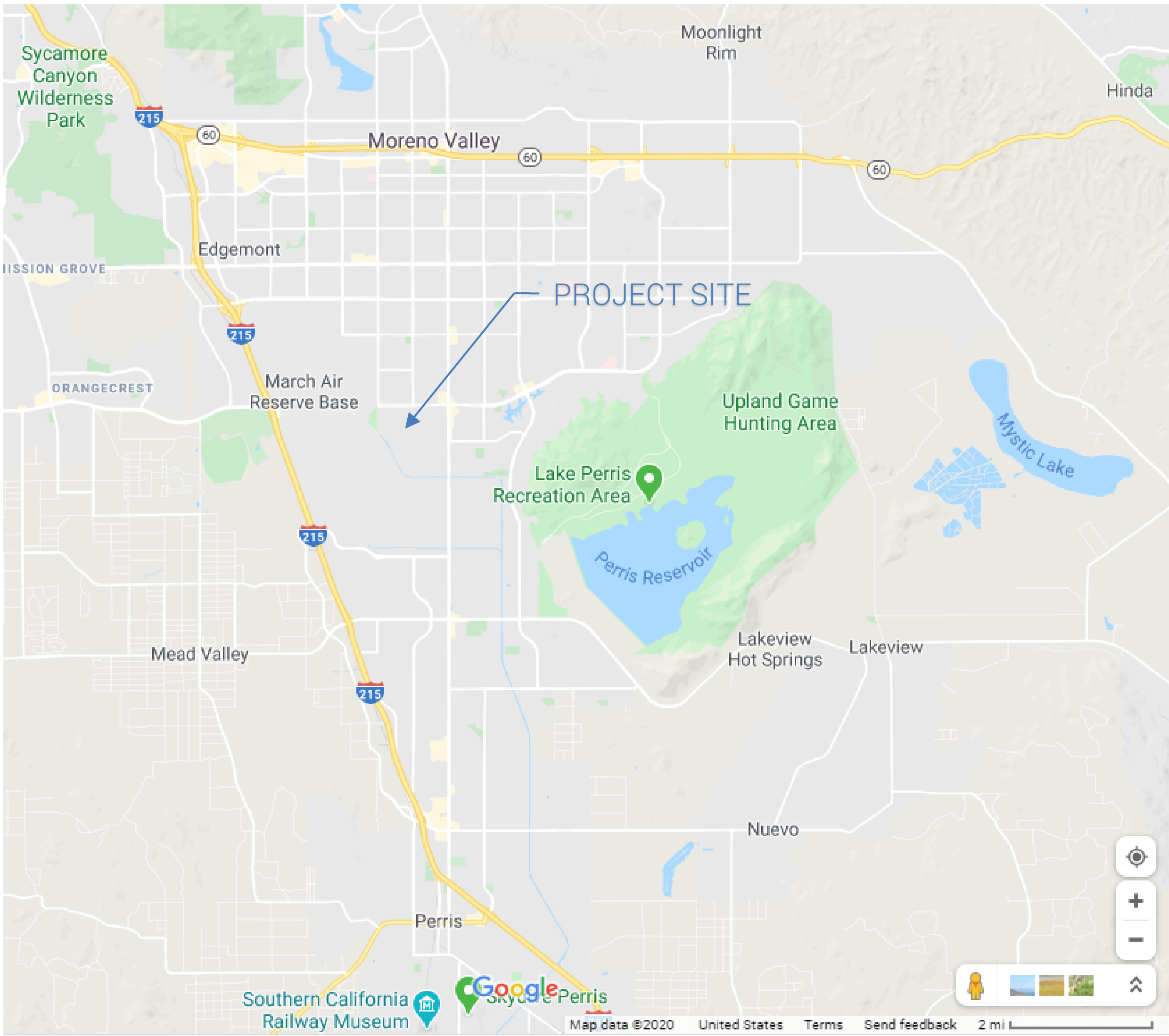
Condition	$V_{100YR, 24HR}$	$Q_{100YR, 24HR}$
Pre-Developed Runoff	68,747.90 CF	4.158 CFS
Post-Developed Runoff (Onsite) entering basin	132,006.10 CF	4.987 CFS
Required Basin Parameters: Min. Required Basin Storage Max. Allowable Outflow		
Provided Basin Parameters: Provided Basin Storage Max. Outflow Control		

Basin Fill Elevation Summary

Elevation		Note
1497.50	Top of basin	5’ deep with 1.0’ freeboard
1XXX.XX	100-year water surface elevation	X.XX’ deep
1XXX.XX	Maximum Water Quality Treatment Depth	2.8’ deep (21.1-hour drawdown time at 0.575”/hr. infiltration rate)
1497.50	Bottom of Basin	

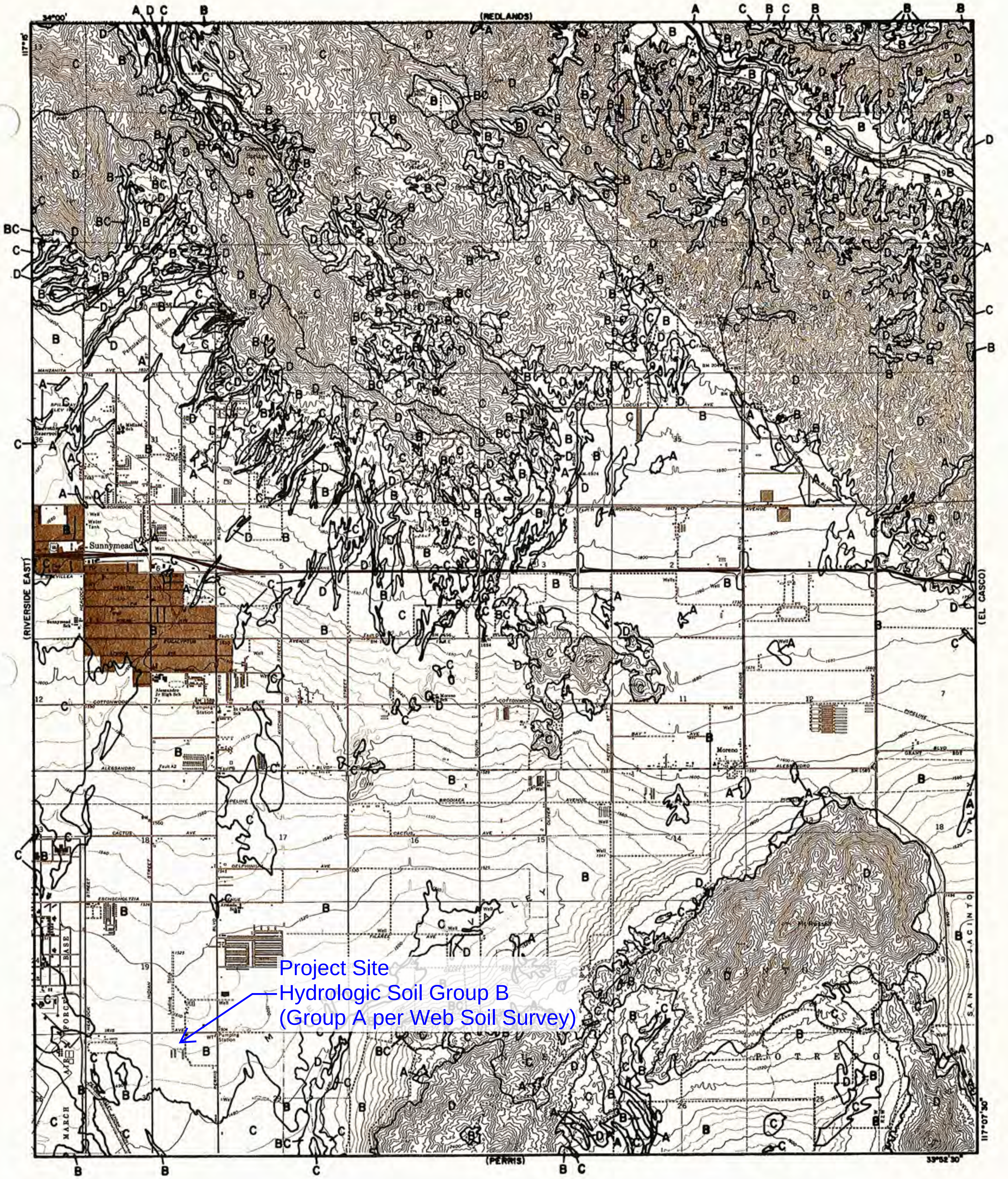
APPENDIX A

Vicinity Map



APPENDIX B

Reference Riverside County Hydrology Manual Plates



LEGEND
SOILS GROUP BOUNDARY
A SOILS GROUP DESIGNATION

RCFC & WCD
HYDROLOGY MANUAL

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR SUNNYMEAD

PLATE C-1.17

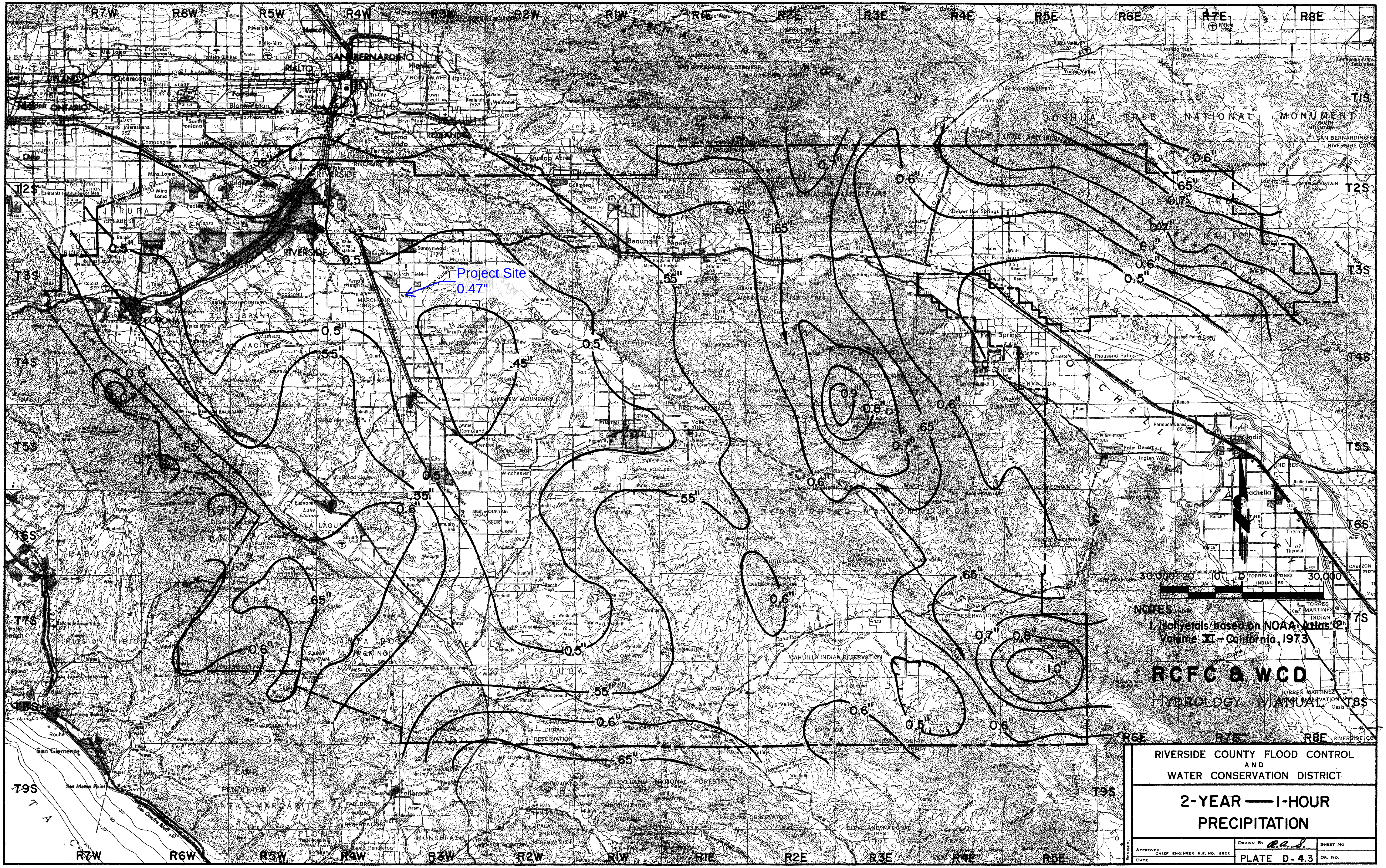
RAINFALL INTENSITY—INCHES PER HOUR

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	FREQUENCY 100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	FREQUENCY 100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE = .500			SLOPE = .550		

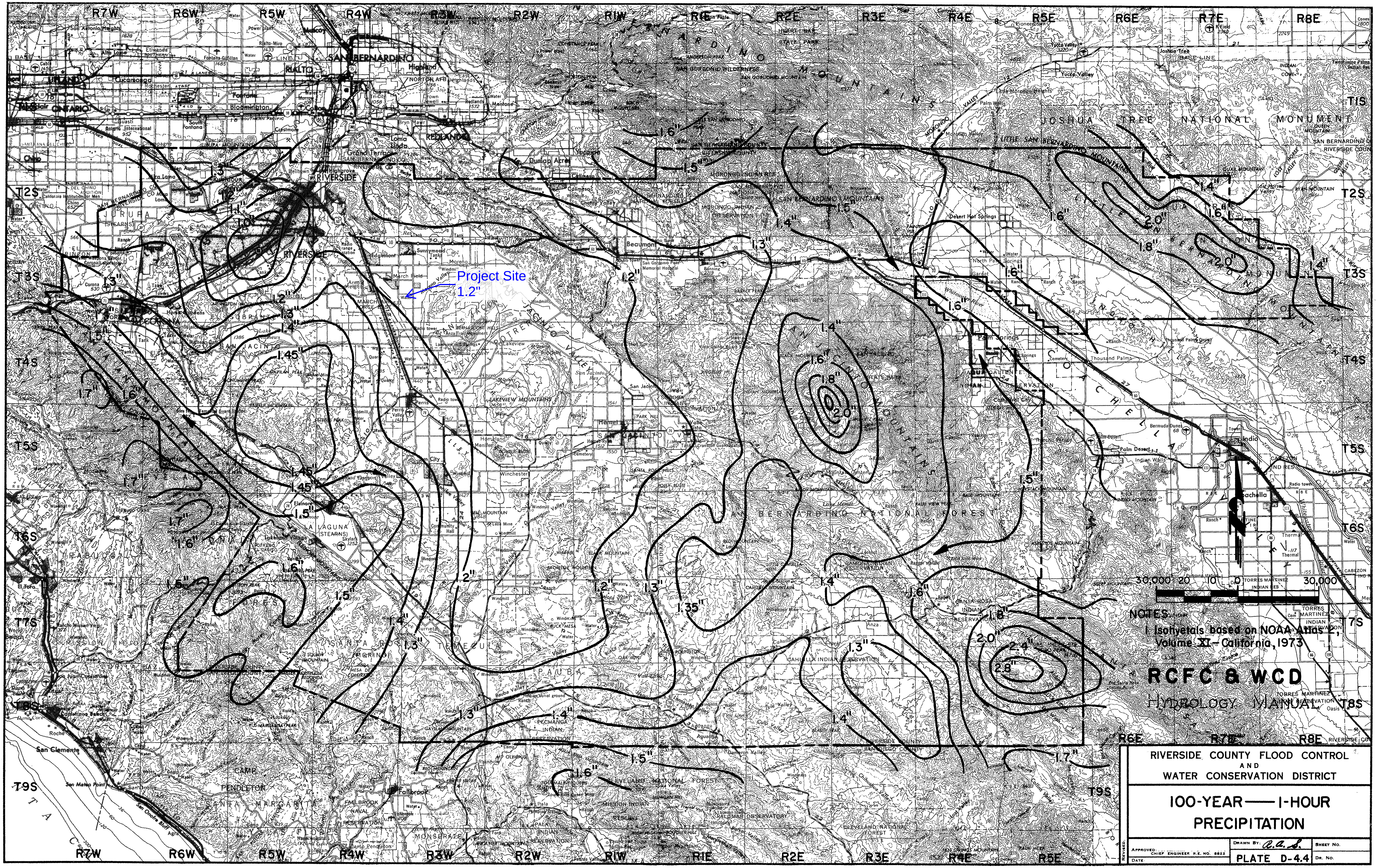
RCFC & WCD

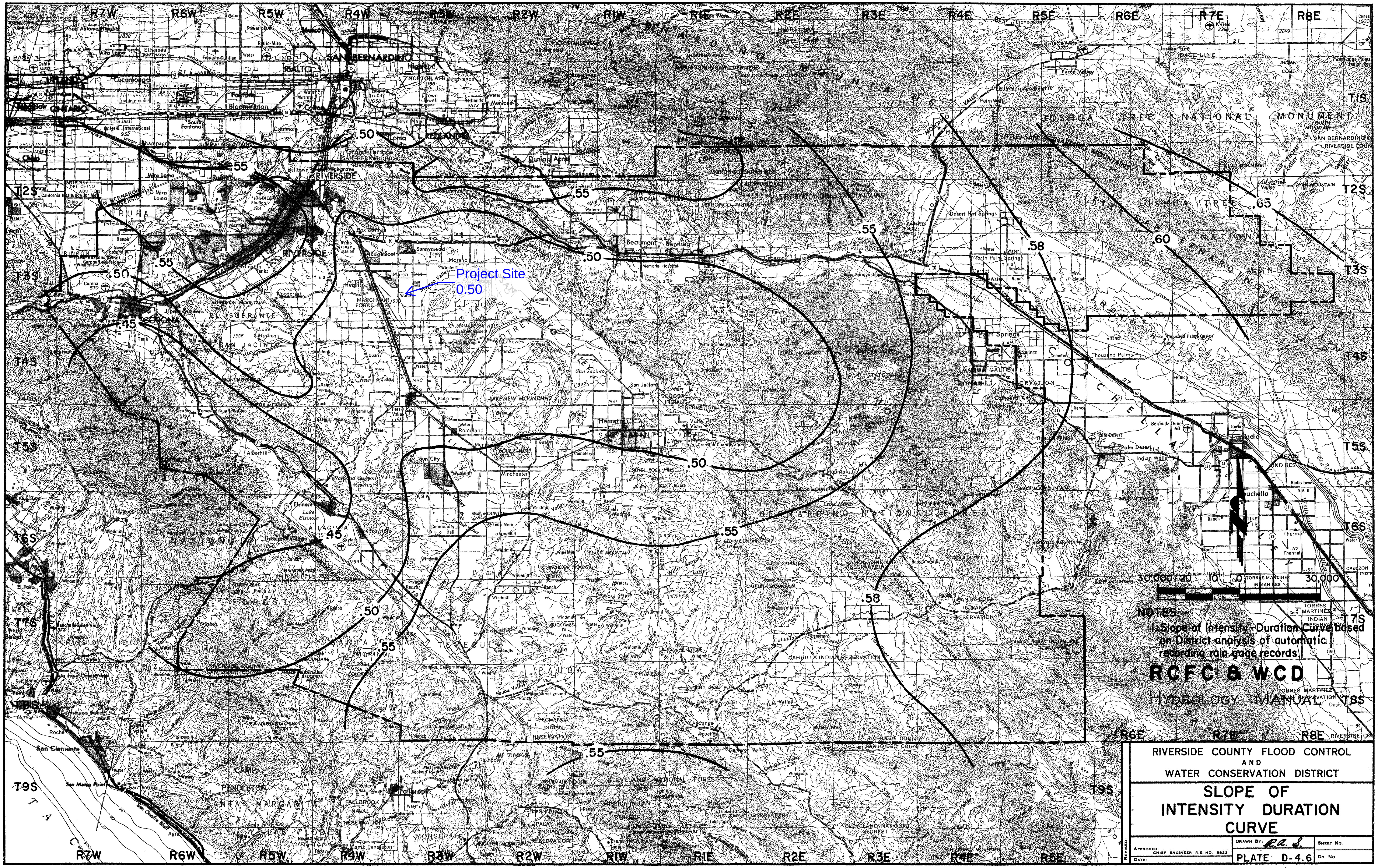
HYDROLOGY MANUAL

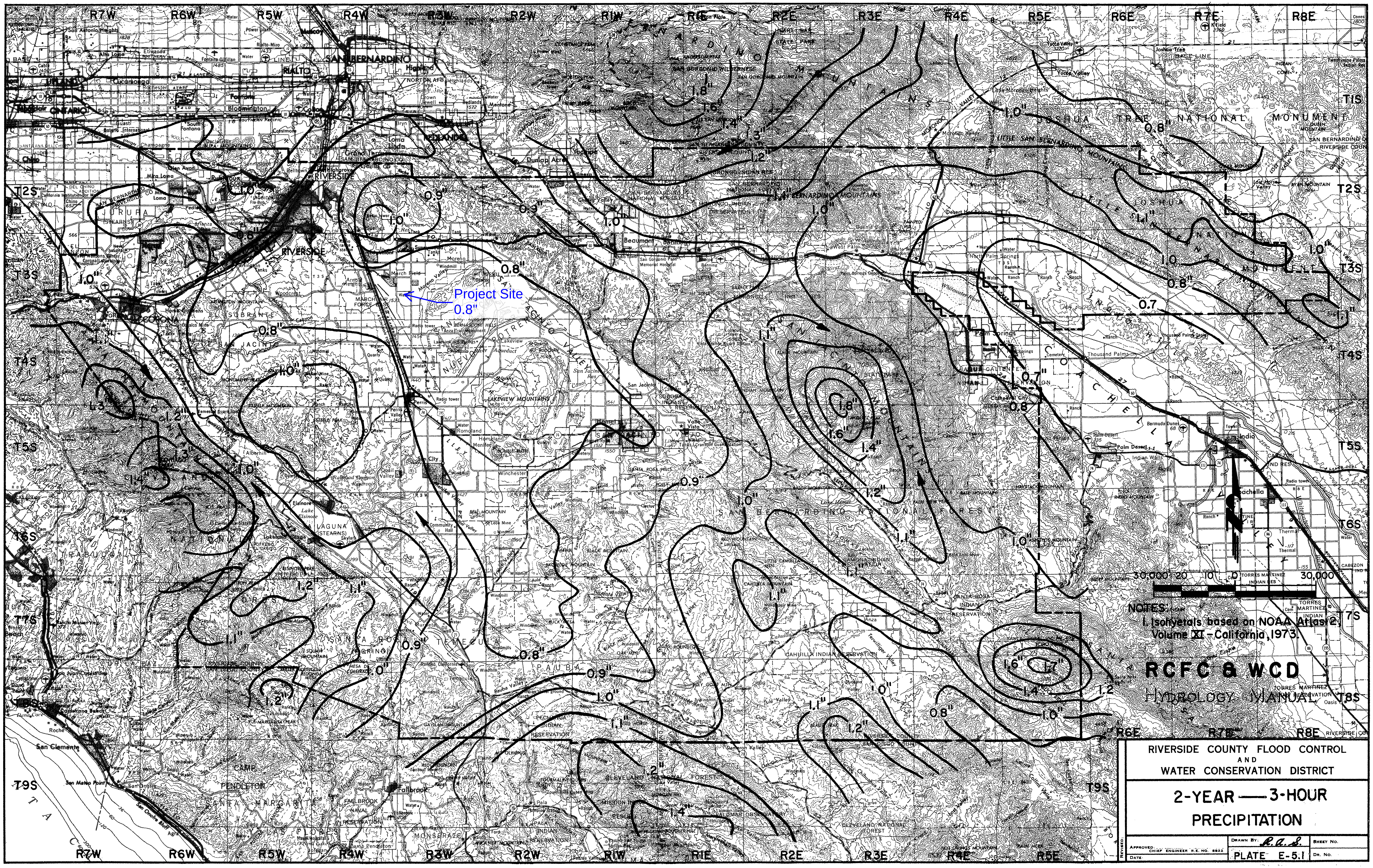
STANDARD
INTENSITY—DURATION
CURVES DATA



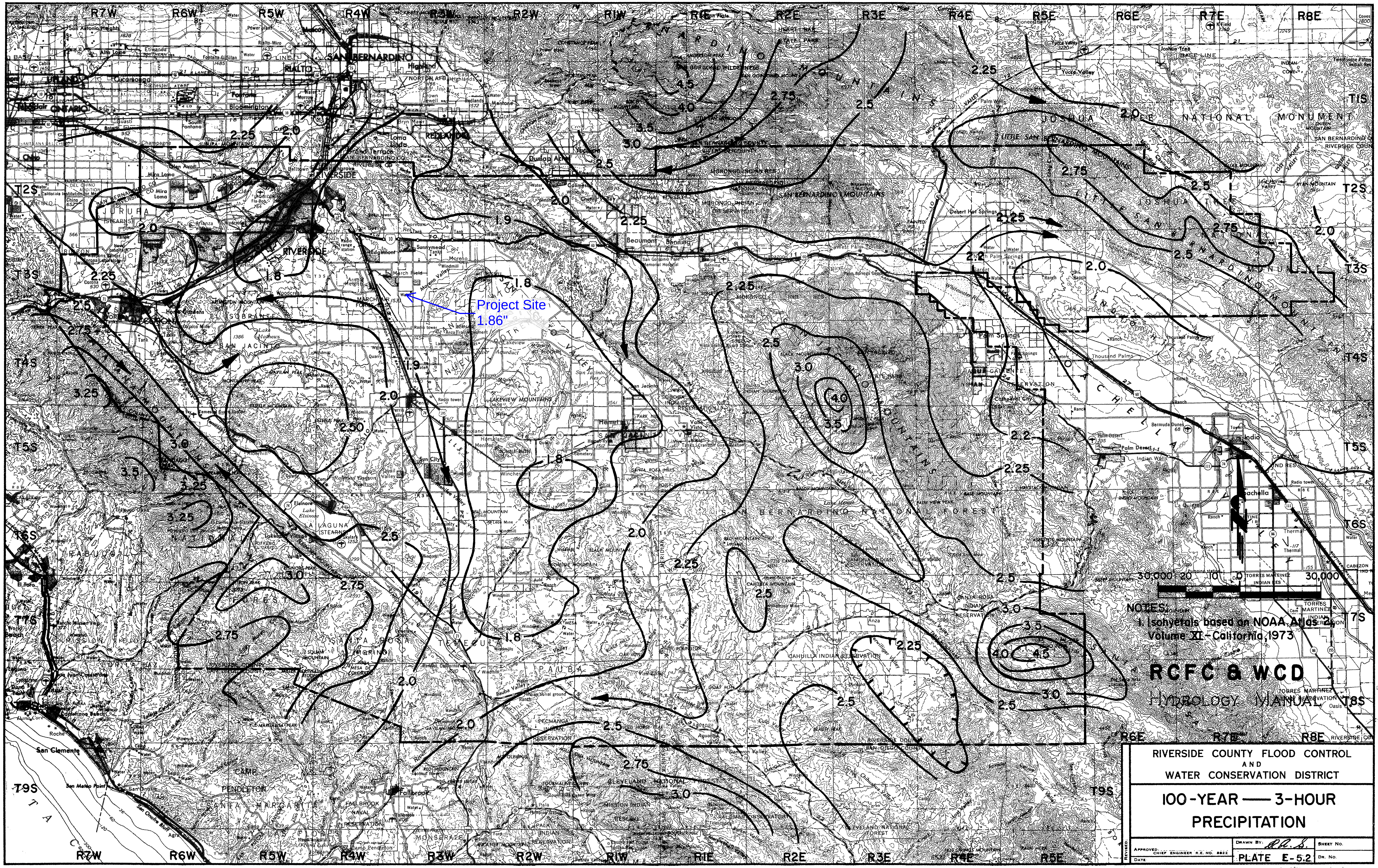
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 1-HOUR PRECIPITATION
PLATE D-4.3
RCFC & WCD
HYDROLOGY MANUAL
NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
Project Site
0.47"
SAN BERNARDINO
RIVERSIDE
REDLANDS
CORONA
ONTARIO
JOSHUA TREE NATIONAL MONUMENT
SAN BERNARDINO NATIONAL FOREST
CLEVELAND NATIONAL FOREST
Palm Springs
San Clemente
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
R3E
R4E
R5E
R6E
R7E
R8E
T1S
T2S
T3S
T4S
T5S
T6S
T7S
T8S
T9S

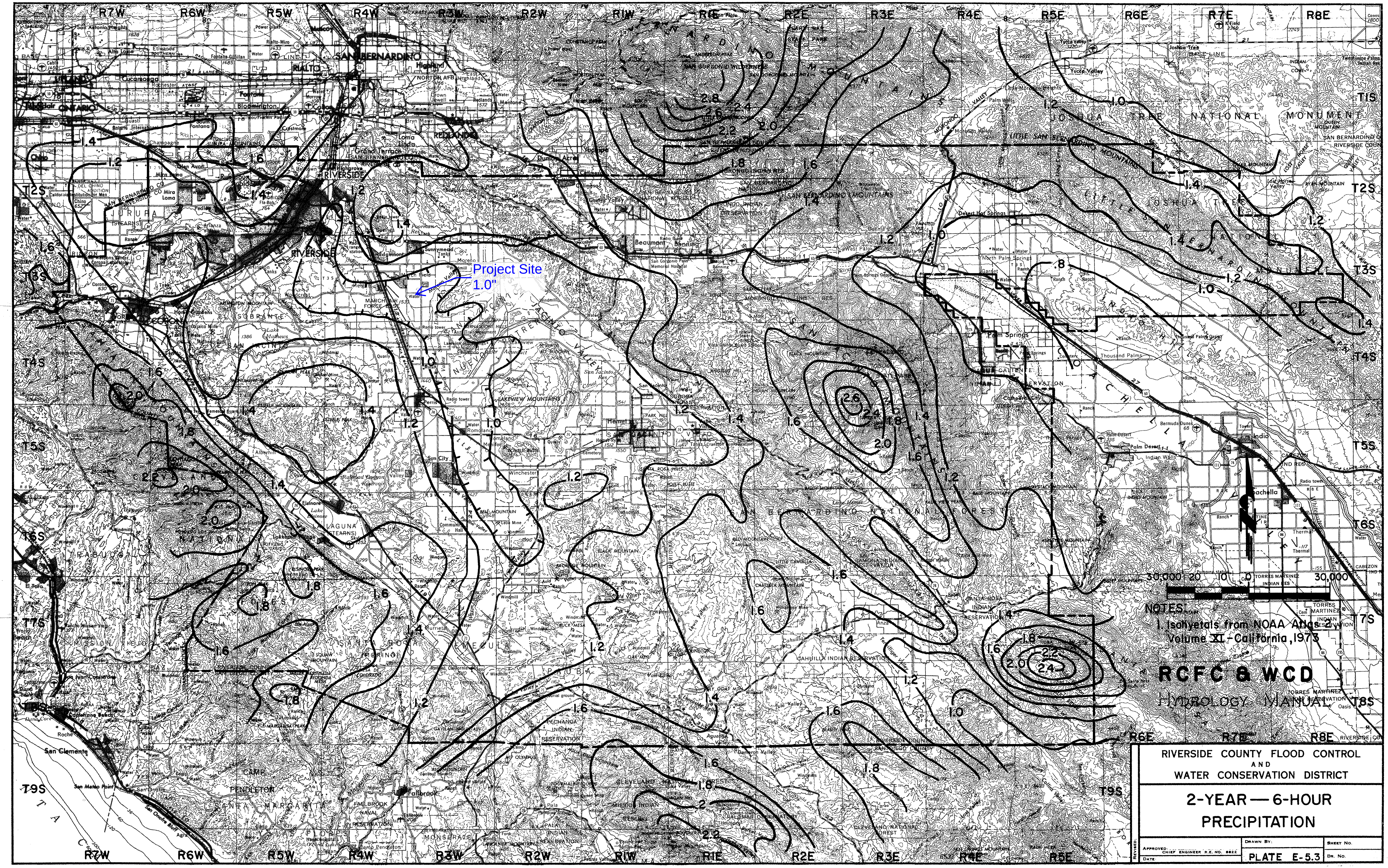

Project Site
1.2"
NOTES
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
100-YEAR — 1-HOUR
PRECIPITATION
PLATE D-4.4
SAN BERNARDINO
RIVERSIDE
JOSHUA TREE NATIONAL MONUMENT
SAN BERNARDINO NATIONAL FOREST
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
R3E
R4E
R5E
R6E
R7E
R8E
T1S
T2S
T3S
T4S
T5S
T6S
T7S
T8S
T9S


Project Site
0.50
NOTES:
1. Slope of Intensity-Duration Curve based on District analysis of automatic recording rain gage records.
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
SLOPE OF INTENSITY DURATION CURVE
PLATE D-4.6
.45
.50
.55
.58
.60
.65

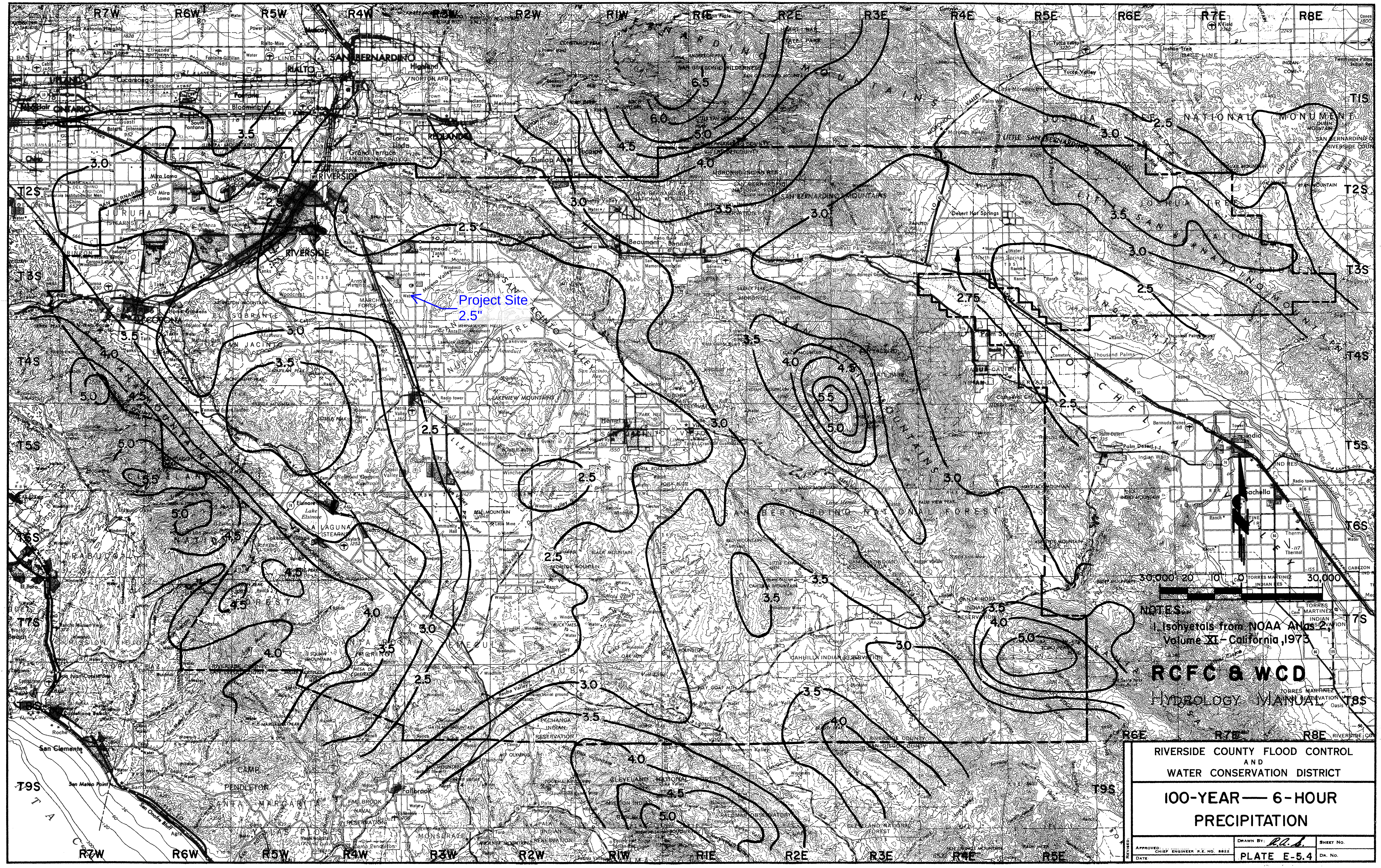


Project Site
0.8"
NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973.
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
2-YEAR — 3-HOUR
PRECIPITATION
PLATE E-5.1

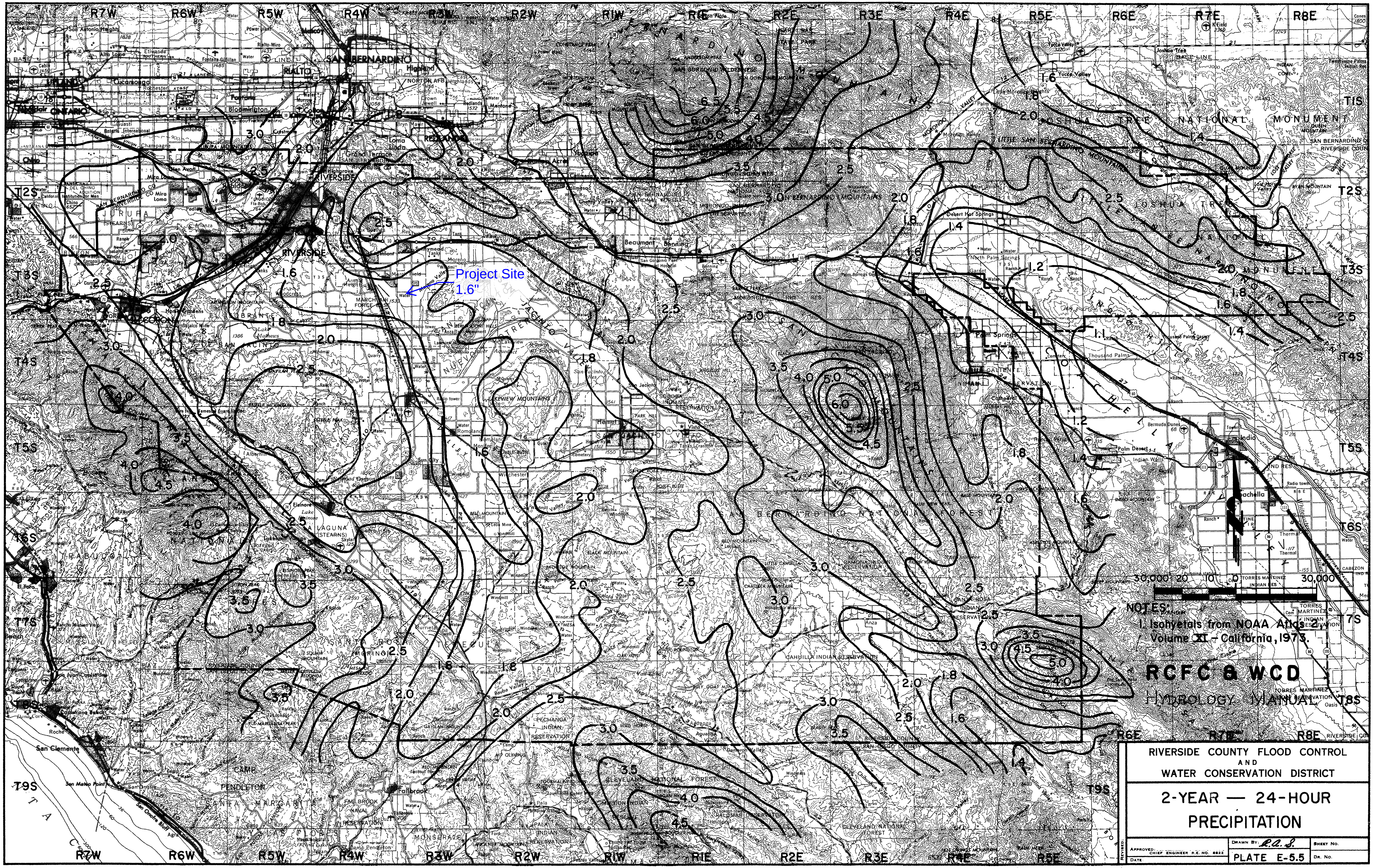

Project Site
1.86"
NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
100-YEAR —— 3-HOUR
PRECIPITATION
PLATE E-5.2



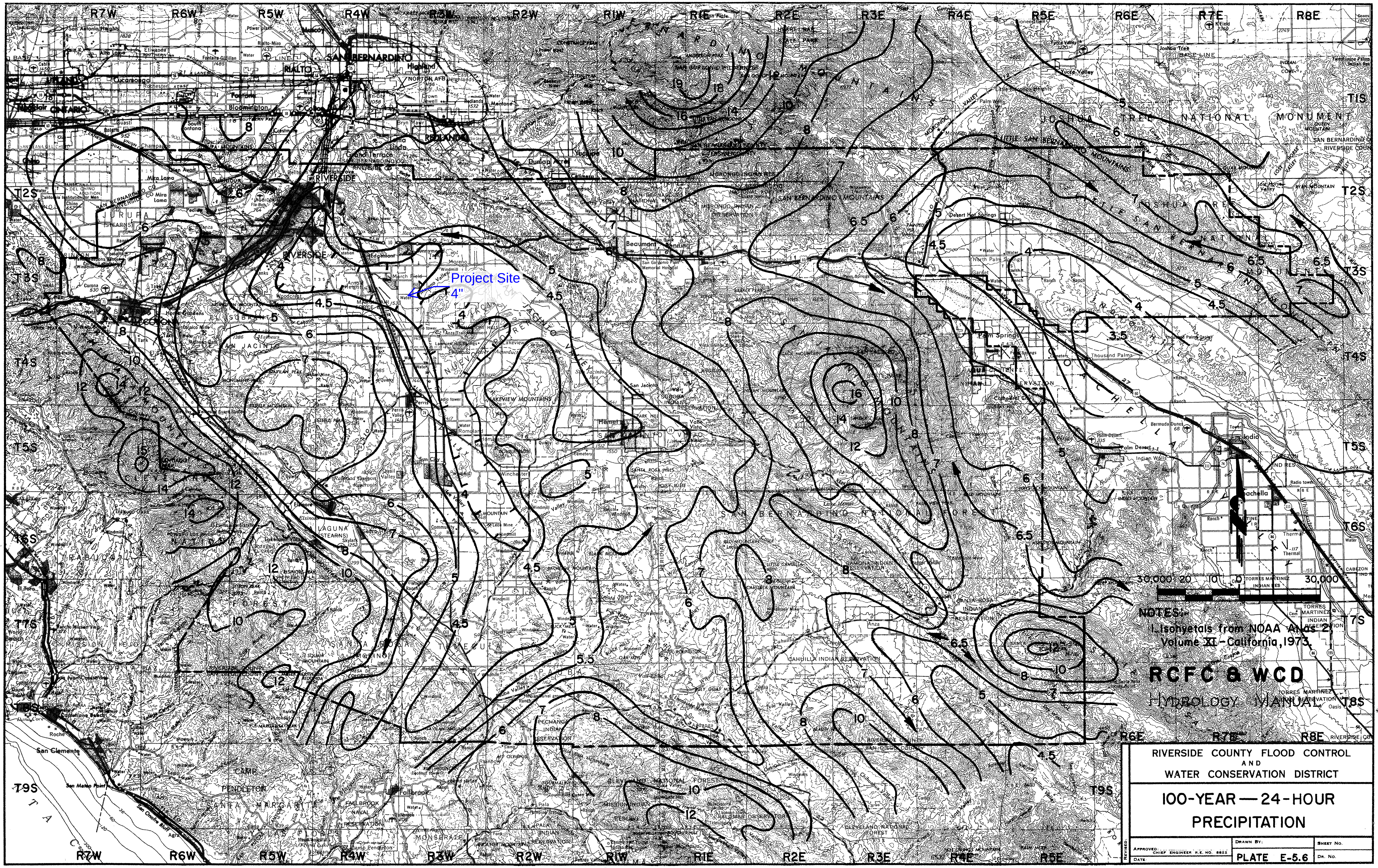
Project Site
1.0"
NOTES:
1. Isohyetals from NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 6-HOUR PRECIPITATION
PLATE E-5.3
SAN BERNARDINO
RIVERSIDE
JOSHUA TREE NATIONAL MONUMENT
SAN BERNARDINO NATIONAL FOREST



Project Site
2.5"
NOTES:
1. Isohyetals from NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
100-YEAR — 6-HOUR
PRECIPITATION
PLATE E-5.4



Project Site
1.6"
NOTES:
1. Isohyetals from NOAA Atlas
Volume XI - California, 1973.
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
2-YEAR — 24-HOUR
PRECIPITATION
PLATE E-5.5


Project Site
4"
NOTES:
1. Isohyetals from NOAA Atlas 2
Volume XI - California, 1973.
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
100-YEAR — 24-HOUR
PRECIPITATION
PLATE E-5.6
JOSHUA TREE NATIONAL MONUMENT
SAN BERNARDINO NATIONAL FOREST
CLEVELAND NATIONAL FOREST
RIVERSIDE
SAN BERNARDINO
Palm Springs
Hemet
Beaumont
Banning
Elsinore
Indio
Coachella
San Clemente
Fallbrook
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
R3E
R4E
R5E
R6E
R7E
R8E
T1S
T2S
T3S
T4S
T5S
T6S
T7S
T8S
T9S

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
NATURAL COVERS -					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparrel, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparrel, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	72	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	28	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
URBAN COVERS -					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
AGRICULTURAL COVERS -					
Fallow (Land plowed but not tilled or seeded)		76	85	90	92

RCFC & WCD
HYDROLOGY MANUAL

RUNOFF INDEX NUMBERS FOR PERVIOUS AREAS

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
AGRICULTURAL COVERS (cont.) -					
Legumes, Close Seeded (Alfalfa, sweetclover, timothy, etc.)	Poor	66	77	85	89
	Good	58	72	81	85
Orchards, Deciduous (Apples, apricots, pears, walnuts, etc.)		See Note 4			
Orchards, Evergreen (Citrus, avocados, etc.)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
Pasture, Dryland (Annual grasses)	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Pasture, Irrigated (Legumes and perennial grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
Row Crops (Field crops - tomatoes, sugar beets, etc.)	Poor	72	81	88	91
	Good	67	78	85	89
Small Grain (Wheat, oats, barley, etc.)	Poor	65	76	84	88
	Good	63	75	83	87
Vineyard		See Note 4			

Notes:

1. All runoff index (RI) numbers are for Antecedent Moisture Condition (AMC) II.

2. Quality of cover definitions:
   Poor-Heavily grazed or regularly burned areas. Less than 50 percent of the ground surface is protected by plant cover or brush and tree canopy.
   Fair-Moderate cover with 50 percent to 75 percent of the ground surface protected.
   Good-Heavy or dense cover with more than 75 percent of the ground surface protected.

3. See Plate C-2 for a detailed description of cover types.

4. Use runoff index numbers based on ground cover type. See discussion under "Cover Type Descriptions" on Plate C-2.

5. Reference Bibliography item 17.

RCFC & WCD
HYDROLOGY MANUAL

RUNOFF INDEX NUMBERS FOR PERVIOUS AREAS

APPENDIX C.1

Rational Method Post Development Calculations

```
                 Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
        Rational Hydrology Study       Date: 04/27/22  File:10YRPOST.out
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

 English (in-lb) Units used in input data file

------------------------------------------------------------------------


Program License Serial Number 6215

------------------------------------------------------------------------
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) =   10.00 Antecedent Moisture Condition = 1

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sunnymead-Moreno ] area used.
10 year storm 10 minute intensity =  2.010(In/Hr)
10 year storm 60 minute intensity =  0.820(In/Hr)
100 year storm 10 minute intensity =  2.940(In/Hr)
100 year storm 60 minute intensity =  1.200(In/Hr)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.820(In/Hr)
Slope of intensity duration curve = 0.5000




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      172.000 to Point/Station      169.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   239.490(Ft.)
Top (of initial area) elevation =  1507.020(Ft.)
Bottom (of initial area) elevation =  1506.740(Ft.)
Difference in elevation =     0.280(Ft.)
Slope =    0.00117  s(percent)=      0.12
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.152 min.
Rainfall intensity =      1.902(In/Hr) for a    10.0 year storm
```

```
APARTMENT subarea type
Runoff Coefficient = 0.800
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.907(CFS)
Total initial stream area =        0.596(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      169.000 to Point/Station      168.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1498.378(Ft.)
Downstream point/station elevation =  1498.000(Ft.)
Pipe length  =    37.75(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.907(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.907(CFS)
Normal flow depth in pipe =    4.53(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    5.23(In.)
Pipe flow velocity =      4.07(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =    11.31 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      174.000 to Point/Station      173.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   210.840(Ft.)
Top (of initial area) elevation =  1507.060(Ft.)
Bottom (of initial area) elevation =  1505.700(Ft.)
Difference in elevation =     1.360(Ft.)
Slope =    0.00645  s(percent)=       0.65
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.531 min.
Rainfall intensity =      2.314(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.809
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
```

```
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      1.015(CFS)
Total initial stream area =        0.542(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      173.000 to Point/Station      168.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1499.381(Ft.)
Downstream point/station elevation =  1498.000(Ft.)
Pipe length  =   138.05(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.015(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.015(CFS)
Normal flow depth in pipe =    4.85(In.)
Flow top width inside pipe =    8.97(In.)
Critical Depth =    5.55(In.)
Pipe flow velocity =      4.18(Ft/s)
Travel time through pipe =    0.55 min.
Time of concentration (TC) =     8.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      168.000 to Point/Station      161.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1498.000(Ft.)
Downstream point/station elevation =  1497.385(Ft.)
Pipe length  =   107.21(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.015(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.015(CFS)
Normal flow depth in pipe =    5.80(In.)
Flow top width inside pipe =    8.62(In.)
Critical Depth =    5.55(In.)
Pipe flow velocity =      3.37(Ft/s)
Travel time through pipe =    0.53 min.
Time of concentration (TC) =     8.61 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      171.000 to Point/Station      167.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   200.000(Ft.)
Top (of initial area) elevation =  1506.890(Ft.)
Bottom (of initial area) elevation =  1505.430(Ft.)
Difference in elevation =     1.460(Ft.)
```

```
Slope =    0.00730  s(percent)=       0.73
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.194 min.
Rainfall intensity =      2.368(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.810
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.217(CFS)
Total initial stream area =        0.113(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      167.000 to Point/Station      161.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1497.505(Ft.)
Downstream point/station elevation =  1497.385(Ft.)
Pipe length  =    12.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.217(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.217(CFS)
Normal flow depth in pipe =    2.48(In.)
Flow top width inside pipe =    5.91(In.)
Critical Depth =    2.80(In.)
Pipe flow velocity =      2.84(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     7.26 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      170.000 to Point/Station      166.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   200.550(Ft.)
Top (of initial area) elevation =  1506.890(Ft.)
Bottom (of initial area) elevation =  1505.400(Ft.)
Difference in elevation =     1.490(Ft.)
Slope =    0.00743  s(percent)=       0.74
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.176 min.
Rainfall intensity =      2.371(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.810
Decimal fraction soil group A = 0.000
```

```
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.217(CFS)
Total initial stream area =       0.113(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      166.000 to Point/Station      161.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1497.625(Ft.)
Downstream point/station elevation =  1497.385(Ft.)
Pipe length  =    24.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.217(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.217(CFS)
Normal flow depth in pipe =    2.48(In.)
Flow top width inside pipe =    5.91(In.)
Critical Depth =    2.81(In.)
Pipe flow velocity =      2.84(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     7.32 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      161.000 to Point/Station      160.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1497.385(Ft.)
Downstream point/station elevation =  1497.050(Ft.)
Pipe length  =    58.27(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.217(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.217(CFS)
Normal flow depth in pipe =    2.90(In.)
Flow top width inside pipe =    6.00(In.)
Critical Depth =    2.81(In.)
Pipe flow velocity =      2.31(Ft/s)
Travel time through pipe =    0.42 min.
Time of concentration (TC) =     7.74 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      165.000 to Point/Station      163.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
```

```
Initial area flow distance =   200.220(Ft.)
Top (of initial area) elevation =  1505.880(Ft.)
Bottom (of initial area) elevation =  1504.470(Ft.)
Difference in elevation =     1.410(Ft.)
Slope =    0.00704  s(percent)=      0.70
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.249 min.
Rainfall intensity =      2.359(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.810
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.969(CFS)
Total initial stream area =        0.507(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      163.000 to Point/Station      160.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1498.810(Ft.)
Downstream point/station elevation =  1497.050(Ft.)
Pipe length  =   138.05(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.969(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.969(CFS)
Normal flow depth in pipe =    4.39(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    5.41(In.)
Pipe flow velocity =      4.53(Ft/s)
Travel time through pipe =    0.51 min.
Time of concentration (TC) =     7.76 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      164.000 to Point/Station      162.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   217.070(Ft.)
Top (of initial area) elevation =  1505.530(Ft.)
Bottom (of initial area) elevation =  1505.510(Ft.)
Difference in elevation =     0.020(Ft.)
Slope =    0.00009  s(percent)=      0.01
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.822 min.
```

```
Rainfall intensity =      1.505(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.790
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.656(CFS)
Total initial stream area =       0.552(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      162.000 to Point/Station      160.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1497.428(Ft.)
Downstream point/station elevation =  1497.050(Ft.)
Pipe length  =    37.75(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.656(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.656(CFS)
Normal flow depth in pipe =    3.77(In.)
Flow top width inside pipe =    8.88(In.)
Critical Depth =    4.42(In.)
Pipe flow velocity =      3.74(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =    17.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      160.000 to Point/Station      159.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1497.050(Ft.)
Downstream point/station elevation =  1496.261(Ft.)
Pipe length  =   137.48(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.656(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.656(CFS)
Normal flow depth in pipe =    4.41(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    4.42(In.)
Pipe flow velocity =      3.05(Ft/s)
Travel time through pipe =    0.75 min.
Time of concentration (TC) =    18.74 min.
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Process from Point/Station      148.000 to Point/Station      156.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   195.750(Ft.)
Top (of initial area) elevation =  1505.400(Ft.)
Bottom (of initial area) elevation =  1503.940(Ft.)
Difference in elevation =     1.460(Ft.)
Slope =    0.00746  s(percent)=       0.75
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.102 min.
Rainfall intensity =      2.383(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.810
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.212(CFS)
Total initial stream area =        0.110(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      156.000 to Point/Station      159.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1496.501(Ft.)
Downstream point/station elevation =  1496.261(Ft.)
Pipe length  =    24.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.212(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.212(CFS)
Normal flow depth in pipe =    2.44(In.)
Flow top width inside pipe =    5.90(In.)
Critical Depth =    2.77(In.)
Pipe flow velocity =      2.82(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     7.24 min.


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Process from Point/Station      158.000 to Point/Station      154.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   205.890(Ft.)
Top (of initial area) elevation =  1504.720(Ft.)
Bottom (of initial area) elevation =  1503.250(Ft.)
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Difference in elevation =     1.470(Ft.)
Slope =    0.00714  s(percent)=       0.71
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.310 min.
Rainfall intensity =      2.349(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.810
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.964(CFS)
Total initial stream area =        0.507(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      159.000 to Point/Station      152.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1496.261(Ft.)
Downstream point/station elevation =  1496.100(Ft.)
Pipe length  =    28.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.964(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.964(CFS)
Normal flow depth in pipe =    5.60(In.)
Flow top width inside pipe =    8.73(In.)
Critical Depth =    5.40(In.)
Pipe flow velocity =      3.34(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     7.45 min.


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Process from Point/Station      154.000 to Point/Station      152.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1497.481(Ft.)
Downstream point/station elevation =  1496.100(Ft.)
Pipe length  =   138.05(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.964(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.964(CFS)
Normal flow depth in pipe =    4.70(In.)
Flow top width inside pipe =    8.99(In.)
Critical Depth =    5.40(In.)
Pipe flow velocity =      4.13(Ft/s)
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Travel time through pipe =    0.56 min.
Time of concentration (TC) =     8.01 min.


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Process from Point/Station      157.000 to Point/Station      155.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   212.830(Ft.)
Top (of initial area) elevation =  1504.580(Ft.)
Bottom (of initial area) elevation =  1504.280(Ft.)
Difference in elevation =     0.300(Ft.)
Slope =    0.00141  s(percent)=      0.14
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.247 min.
Rainfall intensity =      1.984(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.802
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.875(CFS)
Total initial stream area =        0.550(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      155.000 to Point/Station      152.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1496.478(Ft.)
Downstream point/station elevation =  1496.100(Ft.)
Pipe length  =    37.75(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.875(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.875(CFS)
Normal flow depth in pipe =    4.44(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    5.14(In.)
Pipe flow velocity =      4.03(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =    10.40 min.


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Process from Point/Station      152.000 to Point/Station      143.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
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Upstream point/station elevation =  1496.100(Ft.)
Downstream point/station elevation =  1495.539(Ft.)
Pipe length  =    97.74(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.875(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.875(CFS)
Normal flow depth in pipe =    5.26(In.)
Flow top width inside pipe =    8.87(In.)
Critical Depth =    5.14(In.)
Pipe flow velocity =      3.27(Ft/s)
Travel time through pipe =    0.50 min.
Time of concentration (TC) =    10.90 min.


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Process from Point/Station      150.000 to Point/Station      149.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance =   140.670(Ft.)
Top (of initial area) elevation =  1503.700(Ft.)
Bottom (of initial area) elevation =  1502.530(Ft.)
Difference in elevation =     1.170(Ft.)
Slope =    0.00832  s(percent)=       0.83
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.088 min.
Rainfall intensity =      2.574(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.814
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.628(CFS)
Total initial stream area =       0.300(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      149.000 to Point/Station      143.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =  1496.916(Ft.)
Downstream point/station elevation =  1495.539(Ft.)
Pipe length  =   138.05(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.628(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.628(CFS)
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Normal flow depth in pipe =    3.68(In.)
Flow top width inside pipe =    8.85(In.)
Critical Depth =    4.32(In.)
Pipe flow velocity =      3.69(Ft/s)
Travel time through pipe =    0.62 min.
Time of concentration (TC) =     6.71 min.


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Process from Point/Station      143.000 to Point/Station      142.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1495.539(Ft.)
Downstream point/station elevation =  1495.385(Ft.)
Pipe length  =    26.84(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.628(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.628(CFS)
Normal flow depth in pipe =    4.30(In.)
Flow top width inside pipe =    8.99(In.)
Critical Depth =    4.32(In.)
Pipe flow velocity =      3.01(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     6.86 min.


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Process from Point/Station      153.000 to Point/Station      147.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   351.130(Ft.)
Top (of initial area) elevation =  1505.430(Ft.)
Bottom (of initial area) elevation =  1502.940(Ft.)
Difference in elevation =     2.490(Ft.)
Slope =    0.00709  s(percent)=       0.71
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.062 min.
Rainfall intensity =      2.110(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.805
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.333(CFS)
Total initial stream area =        0.196(Ac.)
Pervious area fraction = 0.200
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Process from Point/Station      147.000 to Point/Station      142.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1495.505(Ft.)
Downstream point/station elevation =  1495.385(Ft.)
Pipe length  =    12.02(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.333(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.333(CFS)
Normal flow depth in pipe =    3.16(In.)
Flow top width inside pipe =    5.99(In.)
Critical Depth =    3.51(In.)
Pipe flow velocity =      3.16(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     9.13 min.


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Process from Point/Station      142.000 to Point/Station      141.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1495.385(Ft.)
Downstream point/station elevation =  1495.149(Ft.)
Pipe length  =    41.06(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.333(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.333(CFS)
Normal flow depth in pipe =    3.77(In.)
Flow top width inside pipe =    5.80(In.)
Critical Depth =    3.51(In.)
Pipe flow velocity =      2.56(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =     9.39 min.


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Process from Point/Station      146.000 to Point/Station      144.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   215.650(Ft.)
Top (of initial area) elevation =  1503.250(Ft.)
Bottom (of initial area) elevation =  1503.040(Ft.)
Difference in elevation =     0.210(Ft.)
Slope =    0.00097  s(percent)=       0.10
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.092 min.
Rainfall intensity =      1.907(In/Hr) for a    10.0 year storm
APARTMENT subarea type
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Runoff Coefficient = 0.800
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.824(CFS)
Total initial stream area =       0.540(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      144.000 to Point/Station      141.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1495.532(Ft.)
Downstream point/station elevation =  1495.149(Ft.)
Pipe length  =    38.25(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.824(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.824(CFS)
Normal flow depth in pipe =    4.28(In.)
Flow top width inside pipe =    8.99(In.)
Critical Depth =    4.97(In.)
Pipe flow velocity =      3.97(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =    11.25 min.


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Process from Point/Station      141.000 to Point/Station      138.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1495.149(Ft.)
Downstream point/station elevation =  1494.924(Ft.)
Pipe length  =    39.22(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.824(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.824(CFS)
Normal flow depth in pipe =    5.06(In.)
Flow top width inside pipe =    8.93(In.)
Critical Depth =    4.97(In.)
Pipe flow velocity =      3.22(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =    11.46 min.


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Process from Point/Station      151.000 to Point/Station      139.000
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**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   231.190(Ft.)
Top (of initial area) elevation =  1503.940(Ft.)
Bottom (of initial area) elevation =  1502.220(Ft.)
Difference in elevation =     1.720(Ft.)
Slope =    0.00744  s(percent)=       0.74
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.594 min.
Rainfall intensity =      2.305(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.809
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.242(CFS)
Total initial stream area =        0.130(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      139.000 to Point/Station      138.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1495.164(Ft.)
Downstream point/station elevation =  1494.924(Ft.)
Pipe length  =    24.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.242(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.242(CFS)
Normal flow depth in pipe =    2.63(In.)
Flow top width inside pipe =    5.95(In.)
Critical Depth =    2.97(In.)
Pipe flow velocity =      2.92(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     7.73 min.


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Process from Point/Station      138.000 to Point/Station      131.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1494.924(Ft.)
Downstream point/station elevation =  1494.198(Ft.)
Pipe length  =   126.43(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.242(CFS)
Nearest computed pipe diameter  =      6.00(In.)
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Calculated individual pipe flow  =     0.242(CFS)
Normal flow depth in pipe =    3.09(In.)
Flow top width inside pipe =    6.00(In.)
Critical Depth =    2.97(In.)
Pipe flow velocity =      2.38(Ft/s)
Travel time through pipe =    0.89 min.
Time of concentration (TC) =     8.62 min.


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Process from Point/Station      140.000 to Point/Station      137.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   114.970(Ft.)
Top (of initial area) elevation =  1502.780(Ft.)
Bottom (of initial area) elevation =  1502.050(Ft.)
Difference in elevation =     0.730(Ft.)
Slope =    0.00635  s(percent)=       0.63
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.928 min.
Rainfall intensity =      2.609(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.814
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.703(CFS)
Total initial stream area =        0.331(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      137.000 to Point/Station      133.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   205.300(Ft.)
Top (of initial area) elevation =  1502.940(Ft.)
Bottom (of initial area) elevation =  1501.250(Ft.)
Difference in elevation =     1.690(Ft.)
Slope =    0.00823  s(percent)=       0.82
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.097 min.
Rainfall intensity =      2.384(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.810
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
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Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.348(CFS)
Total initial stream area =        0.180(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      133.000 to Point/Station      131.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1494.317(Ft.)
Downstream point/station elevation =  1494.198(Ft.)
Pipe length  =    11.92(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.348(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.348(CFS)
Normal flow depth in pipe =    3.26(In.)
Flow top width inside pipe =    5.98(In.)
Critical Depth =    3.59(In.)
Pipe flow velocity =      3.20(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     7.16 min.


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Process from Point/Station      134.000 to Point/Station      132.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   205.360(Ft.)
Top (of initial area) elevation =  1502.410(Ft.)
Bottom (of initial area) elevation =  1501.790(Ft.)
Difference in elevation =     0.620(Ft.)
Slope =    0.00302  s(percent)=      0.30
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.674 min.
Rainfall intensity =      2.157(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.806
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.914(CFS)
Total initial stream area =        0.526(Ac.)
Pervious area fraction = 0.200
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Process from Point/Station      132.000 to Point/Station      131.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1494.577(Ft.)
Downstream point/station elevation =  1494.198(Ft.)
Pipe length  =    37.38(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.914(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.914(CFS)
Normal flow depth in pipe =    4.54(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    5.25(In.)
Pipe flow velocity =      4.10(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     8.83 min.


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Process from Point/Station      131.000 to Point/Station      128.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1494.198(Ft.)
Downstream point/station elevation =  1493.872(Ft.)
Pipe length  =    56.89(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.914(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.914(CFS)
Normal flow depth in pipe =    5.41(In.)
Flow top width inside pipe =    8.81(In.)
Critical Depth =    5.25(In.)
Pipe flow velocity =      3.29(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =     9.11 min.


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Process from Point/Station      130.000 to Point/Station      129.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   183.540(Ft.)
Top (of initial area) elevation =  1501.530(Ft.)
Bottom (of initial area) elevation =  1500.320(Ft.)
Difference in elevation =     1.210(Ft.)
Slope =    0.00659  s(percent)=       0.66
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.094 min.
Rainfall intensity =      2.385(In/Hr) for a    10.0 year storm
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APARTMENT subarea type
Runoff Coefficient = 0.810
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      1.005(CFS)
Total initial stream area =        0.520(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      129.000 to Point/Station      128.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1495.251(Ft.)
Downstream point/station elevation =  1493.872(Ft.)
Pipe length  =   137.90(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.005(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.005(CFS)
Normal flow depth in pipe =    4.82(In.)
Flow top width inside pipe =    8.98(In.)
Critical Depth =    5.52(In.)
Pipe flow velocity =      4.17(Ft/s)
Travel time through pipe =    0.55 min.
Time of concentration (TC) =     7.64 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      136.000 to Point/Station      127.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   184.950(Ft.)
Top (of initial area) elevation =  1502.220(Ft.)
Bottom (of initial area) elevation =  1500.840(Ft.)
Difference in elevation =     1.380(Ft.)
Slope =    0.00746  s(percent)=       0.75
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.942 min.
Rainfall intensity =      2.411(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.811
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
```

```
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.201(CFS)
Total initial stream area =        0.103(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      127.000 to Point/Station      128.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1494.113(Ft.)
Downstream point/station elevation =  1493.872(Ft.)
Pipe length  =    24.14(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.201(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.201(CFS)
Normal flow depth in pipe =    2.38(In.)
Flow top width inside pipe =    5.87(In.)
Critical Depth =    2.70(In.)
Pipe flow velocity =      2.78(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     7.09 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      128.000 to Point/Station      121.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1493.872(Ft.)
Downstream point/station elevation =  1493.248(Ft.)
Pipe length  =   108.59(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.201(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.201(CFS)
Normal flow depth in pipe =    2.77(In.)
Flow top width inside pipe =    5.98(In.)
Critical Depth =    2.70(In.)
Pipe flow velocity =      2.27(Ft/s)
Travel time through pipe =    0.80 min.
Time of concentration (TC) =     7.88 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      124.000 to Point/Station      122.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   204.400(Ft.)
Top (of initial area) elevation =  1501.470(Ft.)
Bottom (of initial area) elevation =  1500.600(Ft.)
Difference in elevation =     0.870(Ft.)
```

```
Slope =    0.00426  s(percent)=       0.43
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.083 min.
Rainfall intensity =      2.234(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.807
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.949(CFS)
Total initial stream area =        0.526(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      122.000 to Point/Station      121.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1493.628(Ft.)
Downstream point/station elevation =  1493.248(Ft.)
Pipe length  =    38.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.949(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.949(CFS)
Normal flow depth in pipe =    4.65(In.)
Flow top width inside pipe =    8.99(In.)
Critical Depth =    5.35(In.)
Pipe flow velocity =      4.11(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     8.24 min.


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Process from Point/Station      121.000 to Point/Station      118.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1493.248(Ft.)
Downstream point/station elevation =  1492.922(Ft.)
Pipe length  =    56.89(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.949(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.949(CFS)
Normal flow depth in pipe =    5.54(In.)
Flow top width inside pipe =    8.75(In.)
Critical Depth =    5.35(In.)
Pipe flow velocity =      3.32(Ft/s)
Travel time through pipe =    0.29 min.
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Time of concentration (TC) =     8.52 min.


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Process from Point/Station      120.000 to Point/Station      119.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   197.700(Ft.)
Top (of initial area) elevation =  1500.480(Ft.)
Bottom (of initial area) elevation =  1499.100(Ft.)
Difference in elevation =     1.380(Ft.)
Slope =    0.00698  s(percent)=       0.70
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.225 min.
Rainfall intensity =      2.363(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.810
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.997(CFS)
Total initial stream area =       0.521(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      119.000 to Point/Station      118.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1494.299(Ft.)
Downstream point/station elevation =  1492.922(Ft.)
Pipe length  =   137.72(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.997(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.997(CFS)
Normal flow depth in pipe =    4.80(In.)
Flow top width inside pipe =    8.98(In.)
Critical Depth =    5.49(In.)
Pipe flow velocity =      4.17(Ft/s)
Travel time through pipe =    0.55 min.
Time of concentration (TC) =     7.78 min.


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Process from Point/Station      118.000 to Point/Station      117.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
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Upstream point/station elevation =  1492.922(Ft.)
Downstream point/station elevation =  1492.637(Ft.)
Pipe length  =    49.54(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.997(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.997(CFS)
Normal flow depth in pipe =    5.73(In.)
Flow top width inside pipe =    8.66(In.)
Critical Depth =    5.49(In.)
Pipe flow velocity =      3.36(Ft/s)
Travel time through pipe =    0.25 min.
Time of concentration (TC) =     8.02 min.


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Process from Point/Station      125.000 to Point/Station      116.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   215.050(Ft.)
Top (of initial area) elevation =  1500.840(Ft.)
Bottom (of initial area) elevation =  1499.240(Ft.)
Difference in elevation =     1.600(Ft.)
Slope =    0.00744  s(percent)=       0.74
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.377 min.
Rainfall intensity =      2.339(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.809
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.227(CFS)
Total initial stream area =        0.120(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      116.000 to Point/Station      117.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1492.881(Ft.)
Downstream point/station elevation =  1492.637(Ft.)
Pipe length  =    24.38(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.227(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.227(CFS)
Normal flow depth in pipe =    2.54(In.)
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Flow top width inside pipe =    5.93(In.)
Critical Depth =    2.87(In.)
Pipe flow velocity =      2.87(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     7.52 min.


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Process from Point/Station      125.000 to Point/Station       0.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   215.050(Ft.)
Top (of initial area) elevation =  1500.840(Ft.)
Bottom (of initial area) elevation =  1499.240(Ft.)
Difference in elevation =     1.600(Ft.)
Slope =    0.00744  s(percent)=       0.74
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.377 min.
Rainfall intensity =      2.339(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.809
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.227(CFS)
Total initial stream area =        0.120(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      116.000 to Point/Station      117.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1492.881(Ft.)
Downstream point/station elevation =  1492.637(Ft.)
Pipe length  =    24.38(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.227(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.227(CFS)
Normal flow depth in pipe =    2.54(In.)
Flow top width inside pipe =    5.93(In.)
Critical Depth =    2.87(In.)
Pipe flow velocity =      2.87(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     7.52 min.
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      126.000 to Point/Station      115.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   271.900(Ft.)
Top (of initial area) elevation =  1501.250(Ft.)
Bottom (of initial area) elevation =  1499.230(Ft.)
Difference in elevation =     2.020(Ft.)
Slope =    0.00743  s(percent)=       0.74
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.105 min.
Rainfall intensity =      2.231(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.807
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.216(CFS)
Total initial stream area =        0.120(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      115.000 to Point/Station      117.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1492.753(Ft.)
Downstream point/station elevation =  1492.637(Ft.)
Pipe length  =    11.62(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.216(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.216(CFS)
Normal flow depth in pipe =    2.48(In.)
Flow top width inside pipe =    5.91(In.)
Critical Depth =    2.80(In.)
Pipe flow velocity =      2.83(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     8.17 min.


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Process from Point/Station      117.000 to Point/Station      109.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1492.637(Ft.)
Downstream point/station elevation =  1492.298(Ft.)
Pipe length  =    59.05(Ft.)   Manning's N = 0.012
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```
No. of pipes = 1  Required pipe flow  =     0.216(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.216(CFS)
Normal flow depth in pipe =    2.89(In.)
Flow top width inside pipe =    6.00(In.)
Critical Depth =    2.80(In.)
Pipe flow velocity =      2.31(Ft/s)
Travel time through pipe =    0.43 min.
Time of concentration (TC) =     8.60 min.


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Process from Point/Station      114.000 to Point/Station      112.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   204.440(Ft.)
Top (of initial area) elevation =  1499.930(Ft.)
Bottom (of initial area) elevation =  1499.350(Ft.)
Difference in elevation =     0.580(Ft.)
Slope =    0.00284  s(percent)=       0.28
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.767 min.
Rainfall intensity =      2.145(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.806
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.899(CFS)
Total initial stream area =        0.520(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      112.000 to Point/Station      109.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1492.680(Ft.)
Downstream point/station elevation =  1492.298(Ft.)
Pipe length  =    38.19(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.899(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.899(CFS)
Normal flow depth in pipe =    4.51(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    5.21(In.)
Pipe flow velocity =      4.06(Ft/s)
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Travel time through pipe =    0.16 min.
Time of concentration (TC) =     8.92 min.


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Process from Point/Station      109.000 to Point/Station      100.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1492.298(Ft.)
Downstream point/station elevation =  1491.500(Ft.)
Pipe length  =    51.96(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.899(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.899(CFS)
Normal flow depth in pipe =    3.98(In.)
Flow top width inside pipe =    8.94(In.)
Critical Depth =    5.21(In.)
Pipe flow velocity =      4.76(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =     9.11 min.


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Process from Point/Station      108.000 to Point/Station      104.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   200.530(Ft.)
Top (of initial area) elevation =  1499.230(Ft.)
Bottom (of initial area) elevation =  1497.770(Ft.)
Difference in elevation =     1.460(Ft.)
Slope =    0.00728  s(percent)=       0.73
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.205 min.
Rainfall intensity =      2.366(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.810
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.232(CFS)
Total initial stream area =        0.121(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      104.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
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Upstream point/station elevation =  1493.807(Ft.)
Downstream point/station elevation =  1493.693(Ft.)
Pipe length  =    11.40(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.232(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.232(CFS)
Normal flow depth in pipe =    2.57(In.)
Flow top width inside pipe =    5.94(In.)
Critical Depth =    2.90(In.)
Pipe flow velocity =      2.89(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     7.27 min.


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Process from Point/Station      110.000 to Point/Station      106.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance =   122.880(Ft.)
Top (of initial area) elevation =  1499.180(Ft.)
Bottom (of initial area) elevation =  1498.640(Ft.)
Difference in elevation =     0.540(Ft.)
Slope =    0.00439  s(percent)=      0.44
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.553 min.
Rainfall intensity =      2.481(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.812
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.465(CFS)
Total initial stream area =       0.231(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      106.000 to Point/Station      105.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance =   198.000(Ft.)
Top (of initial area) elevation =  1499.240(Ft.)
Bottom (of initial area) elevation =  1497.760(Ft.)
Difference in elevation =     1.480(Ft.)
Slope =    0.00747  s(percent)=      0.75
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
```

```
Initial area time of concentration =    7.131 min.
Rainfall intensity =      2.379(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.810
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.233(CFS)
Total initial stream area =        0.121(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      105.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1493.939(Ft.)
Downstream point/station elevation =  1493.693(Ft.)
Pipe length  =    24.61(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.233(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.233(CFS)
Normal flow depth in pipe =    2.58(In.)
Flow top width inside pipe =    5.94(In.)
Critical Depth =    2.91(In.)
Pipe flow velocity =      2.89(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     7.27 min.


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Process from Point/Station      103.000 to Point/Station      109.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1493.693(Ft.)
Downstream point/station elevation =  1492.298(Ft.)
Pipe length  =   139.49(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.233(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.233(CFS)
Normal flow depth in pipe =    2.58(In.)
Flow top width inside pipe =    5.94(In.)
Critical Depth =    2.91(In.)
Pipe flow velocity =      2.89(Ft/s)
Travel time through pipe =    0.80 min.
Time of concentration (TC) =     8.08 min.
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Process from Point/Station      102.000 to Point/Station      100.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =     0.100(Ft.)
Top (of initial area) elevation =  1497.500(Ft.)
Bottom (of initial area) elevation =  1491.500(Ft.)
Difference in elevation =     6.000(Ft.)
Slope =   60.00000  s(percent)=    6000.00
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Warning: TC computed to be less than 5 min.; program is assuming the
time of concentration is 5 minutes.
Initial area time of concentration =    5.000 min.
Rainfall intensity =      2.841(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.818
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      1.334(CFS)
Total initial stream area =        0.574(Ac.)
Pervious area fraction = 0.200
End of computations, total study area =            9.39 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.200
Area averaged RI index number =  56.0
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                 Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
        Rational Hydrology Study        Date: 04/27/22  File:10YRPRE.out
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

 English (in-lb) Units used in input data file

------------------------------------------------------------------------


Program License Serial Number 6215

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Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) =   10.00 Antecedent Moisture Condition = 1

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sunnymead-Moreno ] area used.
10 year storm 10 minute intensity =  2.010(In/Hr)
10 year storm 60 minute intensity =  0.820(In/Hr)
100 year storm 10 minute intensity =  2.940(In/Hr)
100 year storm 60 minute intensity =  1.200(In/Hr)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.820(In/Hr)
Slope of intensity duration curve = 0.5000




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Process from Point/Station      201.000 to Point/Station      202.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   536.170(Ft.)
Top (of initial area) elevation =  1507.000(Ft.)
Bottom (of initial area) elevation =  1502.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00933  s(percent)=      0.93
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.675 min.
Rainfall intensity =      1.555(In/Hr) for a    10.0 year storm
```

```
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.578
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  60.60
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      3.623(CFS)
Total initial stream area =        4.030(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of natural channel elevation =   1502.000(Ft.)
End of natural channel elevation =   1497.900(Ft.)
Length of natural channel  =   750.750(Ft.)
Estimated mean flow rate at midpoint of channel =      6.005(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   1.63(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0055
Corrected/adjusted channel slope =  0.0055
Travel time =    7.68 min.     TC =   24.36  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.538
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  60.60
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.287(In/Hr) for a    10.0 year storm
Subarea runoff =      3.668(CFS) for      5.300(Ac.)
Total runoff =      7.291(CFS)  Total area =       9.330(Ac.)
End of computations, total study area =           9.33 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
```

```
Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  78.0
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                  Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
        Rational Hydrology Study       Date: 04/27/22  File:100YRPOST.out
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

 English (in-lb) Units used in input data file

------------------------------------------------------------------------


Program License Serial Number 6215

------------------------------------------------------------------------
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) =  100.00 Antecedent Moisture Condition = 1

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sunnymead-Moreno ] area used.
10 year storm 10 minute intensity =  2.010(In/Hr)
10 year storm 60 minute intensity =  0.820(In/Hr)
100 year storm 10 minute intensity =  2.940(In/Hr)
100 year storm 60 minute intensity =  1.200(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.200(In/Hr)
Slope of intensity duration curve = 0.5000





++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      172.000 to Point/Station      169.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   239.490(Ft.)
Top (of initial area) elevation =  1507.020(Ft.)
Bottom (of initial area) elevation =  1506.740(Ft.)
Difference in elevation =     0.280(Ft.)
Slope =    0.00117  s(percent)=      0.12
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.152 min.
Rainfall intensity =      2.783(In/Hr) for a   100.0 year storm
```

```
APARTMENT subarea type
Runoff Coefficient = 0.817
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      1.356(CFS)
Total initial stream area =        0.596(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      169.000 to Point/Station      168.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1498.378(Ft.)
Downstream point/station elevation =  1498.000(Ft.)
Pipe length  =    37.75(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.356(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.356(CFS)
Normal flow depth in pipe =    5.85(In.)
Flow top width inside pipe =    8.59(In.)
Critical Depth =    6.43(In.)
Pipe flow velocity =      4.46(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    11.29 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      174.000 to Point/Station      173.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   210.840(Ft.)
Top (of initial area) elevation =  1507.060(Ft.)
Bottom (of initial area) elevation =  1505.700(Ft.)
Difference in elevation =     1.360(Ft.)
Slope =    0.00645  s(percent)=      0.65
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.531 min.
Rainfall intensity =      3.387(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.826
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
```

```
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      1.516(CFS)
Total initial stream area =        0.542(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      173.000 to Point/Station      168.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1499.381(Ft.)
Downstream point/station elevation =  1498.000(Ft.)
Pipe length  =   138.05(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.516(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.516(CFS)
Normal flow depth in pipe =    6.35(In.)
Flow top width inside pipe =    8.20(In.)
Critical Depth =    6.80(In.)
Pipe flow velocity =      4.55(Ft/s)
Travel time through pipe =    0.51 min.
Time of concentration (TC) =     8.04 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      168.000 to Point/Station      161.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1498.000(Ft.)
Downstream point/station elevation =  1497.385(Ft.)
Pipe length  =   107.21(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.516(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.516(CFS)
Normal flow depth in pipe =    6.13(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =    6.27(In.)
Pipe flow velocity =      3.76(Ft/s)
Travel time through pipe =    0.48 min.
Time of concentration (TC) =     8.51 min.


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Process from Point/Station      171.000 to Point/Station      167.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   200.000(Ft.)
Top (of initial area) elevation =  1506.890(Ft.)
Bottom (of initial area) elevation =  1505.430(Ft.)
Difference in elevation =     1.460(Ft.)
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Slope =    0.00730  s(percent)=       0.73
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.194 min.
Rainfall intensity =      3.466(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.827
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.324(CFS)
Total initial stream area =        0.113(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      167.000 to Point/Station      161.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1505.430(Ft.)
Downstream point/station elevation =  1497.385(Ft.)
Pipe length  =    12.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.324(CFS)
Nearest computed pipe diameter  =      3.00(In.)
Calculated individual pipe flow  =     0.324(CFS)
Normal flow depth in pipe =    1.34(In.)
Flow top width inside pipe =    2.98(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.20(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =     7.21 min.


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Process from Point/Station      170.000 to Point/Station      166.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   200.550(Ft.)
Top (of initial area) elevation =  1506.890(Ft.)
Bottom (of initial area) elevation =  1505.400(Ft.)
Difference in elevation =     1.490(Ft.)
Slope =    0.00743  s(percent)=       0.74
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.176 min.
Rainfall intensity =      3.470(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.827
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.324(CFS)
Total initial stream area =        0.113(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      166.000 to Point/Station      161.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1497.625(Ft.)
Downstream point/station elevation =  1497.385(Ft.)
Pipe length  =    24.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.324(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.324(CFS)
Normal flow depth in pipe =    3.12(In.)
Flow top width inside pipe =    6.00(In.)
Critical Depth =    3.46(In.)
Pipe flow velocity =      3.15(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     7.30 min.


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Process from Point/Station      161.000 to Point/Station      160.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1497.385(Ft.)
Downstream point/station elevation =  1497.050(Ft.)
Pipe length  =    58.27(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.324(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.324(CFS)
Normal flow depth in pipe =    3.71(In.)
Flow top width inside pipe =    5.83(In.)
Critical Depth =    3.46(In.)
Pipe flow velocity =      2.54(Ft/s)
Travel time through pipe =    0.38 min.
Time of concentration (TC) =     7.69 min.


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Process from Point/Station      165.000 to Point/Station      163.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
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Initial area flow distance =   200.220(Ft.)
Top (of initial area) elevation =  1505.880(Ft.)
Bottom (of initial area) elevation =  1504.470(Ft.)
Difference in elevation =     1.410(Ft.)
Slope =    0.00704  s(percent)=      0.70
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.249 min.
Rainfall intensity =      3.452(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.827
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      1.447(CFS)
Total initial stream area =       0.507(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      163.000 to Point/Station      160.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1498.810(Ft.)
Downstream point/station elevation =  1497.050(Ft.)
Pipe length  =   138.05(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.447(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.447(CFS)
Normal flow depth in pipe =    5.63(In.)
Flow top width inside pipe =    8.71(In.)
Critical Depth =    6.64(In.)
Pipe flow velocity =      4.98(Ft/s)
Travel time through pipe =    0.46 min.
Time of concentration (TC) =     7.71 min.


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Process from Point/Station      164.000 to Point/Station      162.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   217.070(Ft.)
Top (of initial area) elevation =  1505.530(Ft.)
Bottom (of initial area) elevation =  1505.510(Ft.)
Difference in elevation =     0.020(Ft.)
Slope =    0.00009  s(percent)=      0.01
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.822 min.
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Rainfall intensity =      2.202(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.807
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.980(CFS)
Total initial stream area =        0.552(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      162.000 to Point/Station      160.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1497.428(Ft.)
Downstream point/station elevation =  1497.050(Ft.)
Pipe length  =    37.75(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.980(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.980(CFS)
Normal flow depth in pipe =    4.75(In.)
Flow top width inside pipe =    8.99(In.)
Critical Depth =    5.45(In.)
Pipe flow velocity =      4.15(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =    17.97 min.


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Process from Point/Station      160.000 to Point/Station      159.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1497.050(Ft.)
Downstream point/station elevation =  1496.261(Ft.)
Pipe length  =   137.48(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.980(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.980(CFS)
Normal flow depth in pipe =    5.67(In.)
Flow top width inside pipe =    8.69(In.)
Critical Depth =    5.45(In.)
Pipe flow velocity =      3.35(Ft/s)
Travel time through pipe =    0.68 min.
Time of concentration (TC) =    18.66 min.
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Process from Point/Station      148.000 to Point/Station      156.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   195.750(Ft.)
Top (of initial area) elevation =  1505.400(Ft.)
Bottom (of initial area) elevation =  1503.940(Ft.)
Difference in elevation =     1.460(Ft.)
Slope =    0.00746  s(percent)=      0.75
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.102 min.
Rainfall intensity =      3.488(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.827
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.317(CFS)
Total initial stream area =       0.110(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      156.000 to Point/Station      159.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1496.501(Ft.)
Downstream point/station elevation =  1496.261(Ft.)
Pipe length  =    24.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.317(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.317(CFS)
Normal flow depth in pipe =    3.08(In.)
Flow top width inside pipe =    6.00(In.)
Critical Depth =    3.42(In.)
Pipe flow velocity =      3.13(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     7.23 min.


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Process from Point/Station      158.000 to Point/Station      154.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   205.890(Ft.)
Top (of initial area) elevation =  1504.720(Ft.)
Bottom (of initial area) elevation =  1503.250(Ft.)
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Difference in elevation =     1.470(Ft.)
Slope =    0.00714  s(percent)=       0.71
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.310 min.
Rainfall intensity =      3.438(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.827
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      1.441(CFS)
Total initial stream area =        0.507(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      159.000 to Point/Station      152.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1496.261(Ft.)
Downstream point/station elevation =  1496.100(Ft.)
Pipe length  =    28.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.441(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.441(CFS)
Normal flow depth in pipe =    5.95(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =    6.10(In.)
Pipe flow velocity =      3.71(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     7.44 min.


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Process from Point/Station      154.000 to Point/Station      152.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1497.481(Ft.)
Downstream point/station elevation =  1496.100(Ft.)
Pipe length  =   138.05(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.441(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.441(CFS)
Normal flow depth in pipe =    6.11(In.)
Flow top width inside pipe =    8.40(In.)
Critical Depth =    6.63(In.)
Pipe flow velocity =      4.51(Ft/s)
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Travel time through pipe =    0.51 min.
Time of concentration (TC) =     7.95 min.


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Process from Point/Station      157.000 to Point/Station      155.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   212.830(Ft.)
Top (of initial area) elevation =  1504.580(Ft.)
Bottom (of initial area) elevation =  1504.280(Ft.)
Difference in elevation =     0.300(Ft.)
Slope =    0.00141  s(percent)=       0.14
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.247 min.
Rainfall intensity =      2.904(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.819
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      1.308(CFS)
Total initial stream area =        0.550(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      155.000 to Point/Station      152.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1496.478(Ft.)
Downstream point/station elevation =  1496.100(Ft.)
Pipe length  =    37.75(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.308(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.308(CFS)
Normal flow depth in pipe =    5.71(In.)
Flow top width inside pipe =    8.67(In.)
Critical Depth =    6.32(In.)
Pipe flow velocity =      4.43(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    10.39 min.


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Process from Point/Station      152.000 to Point/Station      143.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
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______________________________________________________________________
Upstream point/station elevation =  1496.100(Ft.)
Downstream point/station elevation =  1495.539(Ft.)
Pipe length  =    97.74(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.308(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.308(CFS)
Normal flow depth in pipe =    7.10(In.)
Flow top width inside pipe =    7.34(In.)
Critical Depth =    6.32(In.)
Pipe flow velocity =      3.50(Ft/s)
Travel time through pipe =    0.47 min.
Time of concentration (TC) =    10.85 min.


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Process from Point/Station      150.000 to Point/Station      149.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   140.670(Ft.)
Top (of initial area) elevation =  1503.700(Ft.)
Bottom (of initial area) elevation =  1502.530(Ft.)
Difference in elevation =     1.170(Ft.)
Slope =    0.00832  s(percent)=       0.83
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.088 min.
Rainfall intensity =      3.767(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.830
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.939(CFS)
Total initial stream area =       0.300(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      149.000 to Point/Station      143.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1496.916(Ft.)
Downstream point/station elevation =  1495.539(Ft.)
Pipe length  =   138.05(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.939(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.939(CFS)
```

```
Normal flow depth in pipe =    4.63(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    5.32(In.)
Pipe flow velocity =      4.10(Ft/s)
Travel time through pipe =    0.56 min.
Time of concentration (TC) =     6.65 min.


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Process from Point/Station      143.000 to Point/Station      142.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1495.539(Ft.)
Downstream point/station elevation =  1495.385(Ft.)
Pipe length  =    26.84(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.939(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.939(CFS)
Normal flow depth in pipe =    5.50(In.)
Flow top width inside pipe =    8.77(In.)
Critical Depth =    5.32(In.)
Pipe flow velocity =      3.32(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     6.78 min.


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Process from Point/Station      153.000 to Point/Station      147.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   351.130(Ft.)
Top (of initial area) elevation =  1505.430(Ft.)
Bottom (of initial area) elevation =  1502.940(Ft.)
Difference in elevation =     2.490(Ft.)
Slope =    0.00709  s(percent)=       0.71
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.062 min.
Rainfall intensity =      3.088(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.822
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.497(CFS)
Total initial stream area =        0.196(Ac.)
Pervious area fraction = 0.200
```

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Process from Point/Station      147.000 to Point/Station      142.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1495.505(Ft.)
Downstream point/station elevation =  1495.385(Ft.)
Pipe length  =    12.02(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.497(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.497(CFS)
Normal flow depth in pipe =    4.13(In.)
Flow top width inside pipe =    5.56(In.)
Critical Depth =    4.32(In.)
Pipe flow velocity =      3.45(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     9.12 min.


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Process from Point/Station      142.000 to Point/Station      141.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1495.385(Ft.)
Downstream point/station elevation =  1495.149(Ft.)
Pipe length  =    41.06(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.497(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.497(CFS)
Normal flow depth in pipe =    3.77(In.)
Flow top width inside pipe =    8.88(In.)
Critical Depth =    3.82(In.)
Pipe flow velocity =      2.84(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     9.36 min.


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Process from Point/Station      146.000 to Point/Station      144.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   215.650(Ft.)
Top (of initial area) elevation =  1503.250(Ft.)
Bottom (of initial area) elevation =  1503.040(Ft.)
Difference in elevation =     0.210(Ft.)
Slope =    0.00097  s(percent)=       0.10
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.092 min.
Rainfall intensity =      2.791(In/Hr) for a   100.0 year storm
APARTMENT subarea type
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```
Runoff Coefficient = 0.817
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      1.232(CFS)
Total initial stream area =        0.540(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      144.000 to Point/Station      141.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1495.532(Ft.)
Downstream point/station elevation =  1495.149(Ft.)
Pipe length  =    38.24(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.232(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.232(CFS)
Normal flow depth in pipe =    5.48(In.)
Flow top width inside pipe =    8.78(In.)
Critical Depth =    6.13(In.)
Pipe flow velocity =      4.37(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =    11.24 min.


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Process from Point/Station      141.000 to Point/Station      138.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1495.149(Ft.)
Downstream point/station elevation =  1494.924(Ft.)
Pipe length  =    39.22(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.232(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.232(CFS)
Normal flow depth in pipe =    6.73(In.)
Flow top width inside pipe =    7.82(In.)
Critical Depth =    6.13(In.)
Pipe flow velocity =      3.48(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =    11.43 min.


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Process from Point/Station      151.000 to Point/Station      139.000
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**** INITIAL AREA EVALUATION ****
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```
Initial area flow distance =   231.190(Ft.)
Top (of initial area) elevation =  1503.940(Ft.)
Bottom (of initial area) elevation =  1502.220(Ft.)
Difference in elevation =     1.720(Ft.)
Slope =    0.00744  s(percent)=      0.74
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.594 min.
Rainfall intensity =      3.373(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.826
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.362(CFS)
Total initial stream area =       0.130(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      139.000 to Point/Station      138.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
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```
Upstream point/station elevation =  1495.164(Ft.)
Downstream point/station elevation =  1494.924(Ft.)
Pipe length  =    24.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.362(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.362(CFS)
Normal flow depth in pipe =    3.34(In.)
Flow top width inside pipe =    5.96(In.)
Critical Depth =    3.67(In.)
Pipe flow velocity =      3.23(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =     7.72 min.


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Process from Point/Station      138.000 to Point/Station      131.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
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```
Upstream point/station elevation =  1494.924(Ft.)
Downstream point/station elevation =  1494.198(Ft.)
Pipe length  =   126.43(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.362(CFS)
Nearest computed pipe diameter  =      6.00(In.)
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Calculated individual pipe flow  =     0.362(CFS)
Normal flow depth in pipe =    4.01(In.)
Flow top width inside pipe =    5.65(In.)
Critical Depth =    3.67(In.)
Pipe flow velocity =      2.60(Ft/s)
Travel time through pipe =    0.81 min.
Time of concentration (TC) =     8.53 min.


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Process from Point/Station      140.000 to Point/Station      137.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   114.970(Ft.)
Top (of initial area) elevation =  1502.780(Ft.)
Bottom (of initial area) elevation =  1502.050(Ft.)
Difference in elevation =     0.730(Ft.)
Slope =    0.00635  s(percent)=       0.63
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.928 min.
Rainfall intensity =      3.818(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.831
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      1.050(CFS)
Total initial stream area =        0.331(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      137.000 to Point/Station      133.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   205.300(Ft.)
Top (of initial area) elevation =  1502.940(Ft.)
Bottom (of initial area) elevation =  1501.250(Ft.)
Difference in elevation =     1.690(Ft.)
Slope =    0.00823  s(percent)=       0.82
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.097 min.
Rainfall intensity =      3.489(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.827
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
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Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.520(CFS)
Total initial stream area =        0.180(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      133.000 to Point/Station      131.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1494.317(Ft.)
Downstream point/station elevation =  1494.198(Ft.)
Pipe length  =    11.92(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.520(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.520(CFS)
Normal flow depth in pipe =    4.27(In.)
Flow top width inside pipe =    5.44(In.)
Critical Depth =    4.41(In.)
Pipe flow velocity =      3.47(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     7.15 min.


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Process from Point/Station      134.000 to Point/Station      132.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   205.360(Ft.)
Top (of initial area) elevation =  1502.410(Ft.)
Bottom (of initial area) elevation =  1501.790(Ft.)
Difference in elevation =     0.620(Ft.)
Slope =    0.00302  s(percent)=      0.30
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.674 min.
Rainfall intensity =      3.156(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.823
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      1.366(CFS)
Total initial stream area =        0.526(Ac.)
Pervious area fraction = 0.200
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Process from Point/Station      132.000 to Point/Station      131.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1494.577(Ft.)
Downstream point/station elevation =  1494.198(Ft.)
Pipe length  =    37.83(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.366(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.366(CFS)
Normal flow depth in pipe =    5.88(In.)
Flow top width inside pipe =    8.57(In.)
Critical Depth =    6.46(In.)
Pipe flow velocity =      4.47(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     8.82 min.


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Process from Point/Station      131.000 to Point/Station      128.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1494.198(Ft.)
Downstream point/station elevation =  1493.872(Ft.)
Pipe length  =    56.89(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.366(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.366(CFS)
Normal flow depth in pipe =    5.77(In.)
Flow top width inside pipe =   11.99(In.)
Critical Depth =    5.93(In.)
Pipe flow velocity =      3.66(Ft/s)
Travel time through pipe =    0.26 min.
Time of concentration (TC) =     9.07 min.


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Process from Point/Station      130.000 to Point/Station      129.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   183.540(Ft.)
Top (of initial area) elevation =  1501.530(Ft.)
Bottom (of initial area) elevation =  1500.320(Ft.)
Difference in elevation =     1.210(Ft.)
Slope =    0.00659  s(percent)=       0.66
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.094 min.
Rainfall intensity =      3.490(In/Hr) for a   100.0 year storm
```

```
APARTMENT subarea type
Runoff Coefficient = 0.827
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      1.501(CFS)
Total initial stream area =        0.520(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      129.000 to Point/Station      128.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1495.251(Ft.)
Downstream point/station elevation =  1493.872(Ft.)
Pipe length  =   137.90(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.501(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.501(CFS)
Normal flow depth in pipe =    6.30(In.)
Flow top width inside pipe =    8.24(In.)
Critical Depth =    6.77(In.)
Pipe flow velocity =      4.54(Ft/s)
Travel time through pipe =    0.51 min.
Time of concentration (TC) =     7.60 min.


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Process from Point/Station      136.000 to Point/Station      127.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   184.950(Ft.)
Top (of initial area) elevation =  1502.220(Ft.)
Bottom (of initial area) elevation =  1500.840(Ft.)
Difference in elevation =     1.380(Ft.)
Slope =    0.00746  s(percent)=      0.75
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.942 min.
Rainfall intensity =      3.528(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.828
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
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Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.301(CFS)
Total initial stream area =        0.103(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      127.000 to Point/Station      128.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1494.113(Ft.)
Downstream point/station elevation =  1493.872(Ft.)
Pipe length  =    24.14(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.301(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.301(CFS)
Normal flow depth in pipe =    2.98(In.)
Flow top width inside pipe =    6.00(In.)
Critical Depth =    3.32(In.)
Pipe flow velocity =      3.08(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     7.07 min.


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Process from Point/Station      128.000 to Point/Station      121.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1493.872(Ft.)
Downstream point/station elevation =  1493.248(Ft.)
Pipe length  =   108.59(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.301(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.301(CFS)
Normal flow depth in pipe =    3.54(In.)
Flow top width inside pipe =    5.90(In.)
Critical Depth =    3.32(In.)
Pipe flow velocity =      2.50(Ft/s)
Travel time through pipe =    0.72 min.
Time of concentration (TC) =     7.80 min.


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Process from Point/Station      124.000 to Point/Station      122.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   204.400(Ft.)
Top (of initial area) elevation =  1501.470(Ft.)
Bottom (of initial area) elevation =  1500.600(Ft.)
Difference in elevation =     0.870(Ft.)
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```
Slope =    0.00426  s(percent)=       0.43
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.083 min.
Rainfall intensity =      3.269(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.824
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      1.418(CFS)
Total initial stream area =        0.526(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      122.000 to Point/Station      121.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1493.628(Ft.)
Downstream point/station elevation =  1493.248(Ft.)
Pipe length  =    38.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.418(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.418(CFS)
Normal flow depth in pipe =    6.04(In.)
Flow top width inside pipe =    8.46(In.)
Critical Depth =    6.58(In.)
Pipe flow velocity =      4.50(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     8.22 min.


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Process from Point/Station      121.000 to Point/Station      118.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1493.248(Ft.)
Downstream point/station elevation =  1492.922(Ft.)
Pipe length  =    56.89(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.418(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.418(CFS)
Normal flow depth in pipe =    5.89(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =    6.05(In.)
Pipe flow velocity =      3.69(Ft/s)
Travel time through pipe =    0.26 min.
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Time of concentration (TC) =     8.48 min.


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Process from Point/Station      120.000 to Point/Station      119.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   197.700(Ft.)
Top (of initial area) elevation =  1500.480(Ft.)
Bottom (of initial area) elevation =  1499.100(Ft.)
Difference in elevation =     1.380(Ft.)
Slope =    0.00698  s(percent)=       0.70
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.225 min.
Rainfall intensity =      3.458(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.827
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      1.490(CFS)
Total initial stream area =        0.521(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station      119.000 to Point/Station      118.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1494.299(Ft.)
Downstream point/station elevation =  1492.922(Ft.)
Pipe length  =   137.72(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.490(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.490(CFS)
Normal flow depth in pipe =    6.27(In.)
Flow top width inside pipe =    8.27(In.)
Critical Depth =    6.74(In.)
Pipe flow velocity =      4.54(Ft/s)
Travel time through pipe =    0.51 min.
Time of concentration (TC) =     7.73 min.


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Process from Point/Station      118.000 to Point/Station      117.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
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Upstream point/station elevation =  1492.922(Ft.)
Downstream point/station elevation =  1492.637(Ft.)
Pipe length  =    49.54(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.490(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.490(CFS)
Normal flow depth in pipe =    6.06(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =    6.21(In.)
Pipe flow velocity =      3.74(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =     7.95 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      125.000 to Point/Station      116.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   215.050(Ft.)
Top (of initial area) elevation =  1500.840(Ft.)
Bottom (of initial area) elevation =  1499.240(Ft.)
Difference in elevation =     1.600(Ft.)
Slope =    0.00744  s(percent)=       0.74
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.377 min.
Rainfall intensity =      3.422(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.826
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.339(CFS)
Total initial stream area =        0.120(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      116.000 to Point/Station      117.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1492.881(Ft.)
Downstream point/station elevation =  1492.637(Ft.)
Pipe length  =    24.38(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.339(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.339(CFS)
Normal flow depth in pipe =    3.20(In.)
```

```
Flow top width inside pipe =    5.99(In.)
Critical Depth =    3.54(In.)
Pipe flow velocity =      3.18(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     7.51 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      126.000 to Point/Station      115.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   271.900(Ft.)
Top (of initial area) elevation =  1501.250(Ft.)
Bottom (of initial area) elevation =  1499.230(Ft.)
Difference in elevation =     2.020(Ft.)
Slope =    0.00743  s(percent)=       0.74
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.105 min.
Rainfall intensity =      3.265(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.824
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.323(CFS)
Total initial stream area =        0.120(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      115.000 to Point/Station      117.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1492.753(Ft.)
Downstream point/station elevation =  1492.637(Ft.)
Pipe length  =    11.62(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.323(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.323(CFS)
Normal flow depth in pipe =    3.11(In.)
Flow top width inside pipe =    6.00(In.)
Critical Depth =    3.45(In.)
Pipe flow velocity =      3.14(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     8.17 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      117.000 to Point/Station      109.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1492.637(Ft.)
Downstream point/station elevation =  1492.298(Ft.)
Pipe length  =    11.62(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.323(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.323(CFS)
Normal flow depth in pipe =    2.30(In.)
Flow top width inside pipe =    5.83(In.)
Critical Depth =    3.45(In.)
Pipe flow velocity =      4.67(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     8.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      114.000 to Point/Station      112.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   204.440(Ft.)
Top (of initial area) elevation =  1499.930(Ft.)
Bottom (of initial area) elevation =  1499.350(Ft.)
Difference in elevation =     0.580(Ft.)
Slope =    0.00284  s(percent)=       0.28
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.767 min.
Rainfall intensity =      3.139(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.823
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      1.343(CFS)
Total initial stream area =        0.520(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      109.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1492.680(Ft.)
Downstream point/station elevation =  1492.298(Ft.)
Pipe length  =    38.19(Ft.)   Manning's N = 0.012
```

```
No. of pipes = 1  Required pipe flow  =     1.343(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.343(CFS)
Normal flow depth in pipe =    5.81(In.)
Flow top width inside pipe =    8.61(In.)
Critical Depth =    6.41(In.)
Pipe flow velocity =      4.45(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     8.91 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      100.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1492.298(Ft.)
Downstream point/station elevation =  1491.500(Ft.)
Pipe length  =    51.96(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     1.343(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.343(CFS)
Normal flow depth in pipe =    5.05(In.)
Flow top width inside pipe =    8.93(In.)
Critical Depth =    6.41(In.)
Pipe flow velocity =      5.26(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =     9.07 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      104.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   200.530(Ft.)
Top (of initial area) elevation =  1499.230(Ft.)
Bottom (of initial area) elevation =  1497.770(Ft.)
Difference in elevation =     1.460(Ft.)
Slope =    0.00728  s(percent)=       0.73
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.205 min.
Rainfall intensity =      3.463(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.827
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.346(CFS)
```

```
Total initial stream area =        0.121(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =  1493.807(Ft.)
Downstream point/station elevation =  1493.693(Ft.)
Pipe length  =    11.40(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.346(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.346(CFS)
Normal flow depth in pipe =    3.25(In.)
Flow top width inside pipe =    5.98(In.)
Critical Depth =    3.59(In.)
Pipe flow velocity =      3.20(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     7.26 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      106.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   122.880(Ft.)
Top (of initial area) elevation =  1499.180(Ft.)
Bottom (of initial area) elevation =  1498.640(Ft.)
Difference in elevation =     0.540(Ft.)
Slope =    0.00439  s(percent)=       0.44
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.553 min.
Rainfall intensity =      3.631(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.829
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.695(CFS)
Total initial stream area =        0.231(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      105.000
**** INITIAL AREA EVALUATION ****
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```
Initial area flow distance =   198.000(Ft.)
Top (of initial area) elevation =  1499.240(Ft.)
Bottom (of initial area) elevation =  1497.760(Ft.)
Difference in elevation =     1.480(Ft.)
Slope =    0.00747  s(percent)=       0.75
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.131 min.
Rainfall intensity =      3.481(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.827
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      0.348(CFS)
Total initial stream area =        0.121(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =  1493.939(Ft.)
Downstream point/station elevation =  1493.693(Ft.)
Pipe length  =    24.61(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.348(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.348(CFS)
Normal flow depth in pipe =    3.26(In.)
Flow top width inside pipe =    5.98(In.)
Critical Depth =    3.60(In.)
Pipe flow velocity =      3.20(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     7.26 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      109.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =  1493.693(Ft.)
Downstream point/station elevation =  1492.298(Ft.)
Pipe length  =   139.49(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     0.348(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.348(CFS)
```

```
Normal flow depth in pipe =    3.26(In.)
Flow top width inside pipe =    5.98(In.)
Critical Depth =    3.60(In.)
Pipe flow velocity =      3.20(Ft/s)
Travel time through pipe =    0.73 min.
Time of concentration (TC) =     7.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      100.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =     0.100(Ft.)
Top (of initial area) elevation =  1497.500(Ft.)
Bottom (of initial area) elevation =  1491.500(Ft.)
Difference in elevation =     6.000(Ft.)
Slope =   60.00000  s(percent)=    6000.00
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Warning: TC computed to be less than 5 min.; program is assuming the
time of concentration is 5 minutes.
Initial area time of concentration =    5.000 min.
Rainfall intensity =      4.157(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.835
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      1.991(CFS)
Total initial stream area =        0.574(Ac.)
Pervious area fraction = 0.200
End of computations, total study area =            9.27 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.200
Area averaged RI index number =  56.0
```

```
                 Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
        Rational Hydrology Study       Date: 04/27/22  File:100YRPRE.out
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

 English (in-lb) Units used in input data file

------------------------------------------------------------------------


Program License Serial Number 6215

------------------------------------------------------------------------
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) =  100.00 Antecedent Moisture Condition = 1

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sunnymead-Moreno ] area used.
10 year storm 10 minute intensity =  2.010(In/Hr)
10 year storm 60 minute intensity =  0.820(In/Hr)
100 year storm 10 minute intensity =  2.940(In/Hr)
100 year storm 60 minute intensity =  1.200(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.200(In/Hr)
Slope of intensity duration curve = 0.5000




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   536.170(Ft.)
Top (of initial area) elevation =  1507.000(Ft.)
Bottom (of initial area) elevation =  1502.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00933  s(percent)=      0.93
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.675 min.
Rainfall intensity =      2.276(In/Hr) for a   100.0 year storm
```

```
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.652
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  60.60
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      5.979(CFS)
Total initial stream area =        4.030(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of natural channel elevation =   1502.000(Ft.)
End of natural channel elevation =   1497.900(Ft.)
Length of natural channel  =   750.750(Ft.)
Estimated mean flow rate at midpoint of channel =      9.911(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   1.84(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0055
Corrected/adjusted channel slope =  0.0055
Travel time =    6.79 min.     TC =   23.47  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.620
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  60.60
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.919(In/Hr) for a   100.0 year storm
Subarea runoff =      6.305(CFS) for      5.300(Ac.)
Total runoff =     12.284(CFS)  Total area =      9.330(Ac.)
End of computations, total study area =           9.33 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
```

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 78.0

APPENDIX C.2

Synthetic Unit Hydrograph Calculations per CivilD

U n i t   H y d r o g r a p h   A n a l y s i s

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1
Study date 01/11/22 File: 100YRPOST242242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6215

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

100YRPOST242

Drainage Area = 9.57(Ac.) = 0.015 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 9.57(Ac.) = 0.015 Sq. Mi.
Length along longest watercourse = 1318.88(Ft.)
Length along longest watercourse measured to centroid = 656.30(Ft.)
Length along longest watercourse = 0.250 Mi.
Length along longest watercourse measured to centroid = 0.124 Mi.
Difference in elevation = 10.01(Ft.)
Slope along watercourse = 40.0740 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.048 Hr.
Lag time = 2.86 Min.
25% of lag time = 0.72 Min.
40% of lag time = 1.15 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.57	1.60	15.31

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.57	4.00	38.28

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 1.600(In)
Area Averaged 100-Year Rainfall = 4.000(In)

Point rain (area averaged) = 1.600(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 1.600(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.570	56.00	0.610

Total Area Entered = 9.57(Ac.)

RI AMC2	RI AMC-1	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
56.0	36.0	0.706	0.610	0.318	1.000	0.318
					Sum (F) =	0.318

Area averaged mean soil loss (F) (In/Hr) = 0.318
Minimum soil loss rate ((In/Hr)) = 0.159
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %		Unit Hydrograph (CFS)
1	0.083	174.616	38.645		3.727
2	0.167	349.233	45.177		4.357
3	0.250	523.849	9.915		0.956
4	0.333	698.466	4.119		0.397
5	0.417	873.082	2.145		0.207
			Sum = 100.000	Sum=	9.645

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.013	(0.564)	0.012	0.001
2	0.17	0.07	0.013	(0.562)	0.012	0.001
3	0.25	0.07	0.013	(0.560)	0.012	0.001
4	0.33	0.10	0.019	(0.558)	0.017	0.002
5	0.42	0.10	0.019	(0.556)	0.017	0.002
6	0.50	0.10	0.019	(0.554)	0.017	0.002
7	0.58	0.10	0.019	(0.551)	0.017	0.002
8	0.67	0.10	0.019	(0.549)	0.017	0.002
9	0.75	0.10	0.019	(0.547)	0.017	0.002
10	0.83	0.13	0.026	(0.545)	0.023	0.003
11	0.92	0.13	0.026	(0.543)	0.023	0.003
12	1.00	0.13	0.026	(0.541)	0.023	0.003
13	1.08	0.10	0.019	(0.539)	0.017	0.002
14	1.17	0.10	0.019	(0.536)	0.017	0.002
15	1.25	0.10	0.019	(0.534)	0.017	0.002
16	1.33	0.10	0.019	(0.532)	0.017	0.002
17	1.42	0.10	0.019	(0.530)	0.017	0.002
18	1.50	0.10	0.019	(0.528)	0.017	0.002
19	1.58	0.10	0.019	(0.526)	0.017	0.002
20	1.67	0.10	0.019	(0.524)	0.017	0.002
21	1.75	0.10	0.019	(0.522)	0.017	0.002
22	1.83	0.13	0.026	(0.519)	0.023	0.003
23	1.92	0.13	0.026	(0.517)	0.023	0.003
24	2.00	0.13	0.026	(0.515)	0.023	0.003
25	2.08	0.13	0.026	(0.513)	0.023	0.003
26	2.17	0.13	0.026	(0.511)	0.023	0.003
27	2.25	0.13	0.026	(0.509)	0.023	0.003
28	2.33	0.13	0.026	(0.507)	0.023	0.003
29	2.42	0.13	0.026	(0.505)	0.023	0.003
30	2.50	0.13	0.026	(0.503)	0.023	0.003
31	2.58	0.17	0.032	(0.501)	0.029	0.003
32	2.67	0.17	0.032	(0.499)	0.029	0.003
33	2.75	0.17	0.032	(0.497)	0.029	0.003
34	2.83	0.17	0.032	(0.495)	0.029	0.003
35	2.92	0.17	0.032	(0.493)	0.029	0.003
36	3.00	0.17	0.032	(0.491)	0.029	0.003
37	3.08	0.17	0.032	(0.489)	0.029	0.003
38	3.17	0.17	0.032	(0.487)	0.029	0.003
39	3.25	0.17	0.032	(0.485)	0.029	0.003
40	3.33	0.17	0.032	(0.482)	0.029	0.003
41	3.42	0.17	0.032	(0.480)	0.029	0.003
42	3.50	0.17	0.032	(0.478)	0.029	0.003
43	3.58	0.17	0.032	(0.476)	0.029	0.003
44	3.67	0.17	0.032	(0.474)	0.029	0.003

45	3.75	0.17	0.032	(0.472)	0.029	0.003
46	3.83	0.20	0.038	(0.470)	0.035	0.004
47	3.92	0.20	0.038	(0.468)	0.035	0.004
48	4.00	0.20	0.038	(0.466)	0.035	0.004
49	4.08	0.20	0.038	(0.465)	0.035	0.004
50	4.17	0.20	0.038	(0.463)	0.035	0.004
51	4.25	0.20	0.038	(0.461)	0.035	0.004
52	4.33	0.23	0.045	(0.459)	0.040	0.004
53	4.42	0.23	0.045	(0.457)	0.040	0.004
54	4.50	0.23	0.045	(0.455)	0.040	0.004
55	4.58	0.23	0.045	(0.453)	0.040	0.004
56	4.67	0.23	0.045	(0.451)	0.040	0.004
57	4.75	0.23	0.045	(0.449)	0.040	0.004
58	4.83	0.27	0.051	(0.447)	0.046	0.005
59	4.92	0.27	0.051	(0.445)	0.046	0.005
60	5.00	0.27	0.051	(0.443)	0.046	0.005
61	5.08	0.20	0.038	(0.441)	0.035	0.004
62	5.17	0.20	0.038	(0.439)	0.035	0.004
63	5.25	0.20	0.038	(0.437)	0.035	0.004
64	5.33	0.23	0.045	(0.435)	0.040	0.004
65	5.42	0.23	0.045	(0.433)	0.040	0.004
66	5.50	0.23	0.045	(0.432)	0.040	0.004
67	5.58	0.27	0.051	(0.430)	0.046	0.005
68	5.67	0.27	0.051	(0.428)	0.046	0.005
69	5.75	0.27	0.051	(0.426)	0.046	0.005
70	5.83	0.27	0.051	(0.424)	0.046	0.005
71	5.92	0.27	0.051	(0.422)	0.046	0.005
72	6.00	0.27	0.051	(0.420)	0.046	0.005
73	6.08	0.30	0.058	(0.418)	0.052	0.006
74	6.17	0.30	0.058	(0.417)	0.052	0.006
75	6.25	0.30	0.058	(0.415)	0.052	0.006
76	6.33	0.30	0.058	(0.413)	0.052	0.006
77	6.42	0.30	0.058	(0.411)	0.052	0.006
78	6.50	0.30	0.058	(0.409)	0.052	0.006
79	6.58	0.33	0.064	(0.407)	0.058	0.006
80	6.67	0.33	0.064	(0.405)	0.058	0.006
81	6.75	0.33	0.064	(0.404)	0.058	0.006
82	6.83	0.33	0.064	(0.402)	0.058	0.006
83	6.92	0.33	0.064	(0.400)	0.058	0.006
84	7.00	0.33	0.064	(0.398)	0.058	0.006
85	7.08	0.33	0.064	(0.396)	0.058	0.006
86	7.17	0.33	0.064	(0.395)	0.058	0.006
87	7.25	0.33	0.064	(0.393)	0.058	0.006
88	7.33	0.37	0.070	(0.391)	0.063	0.007
89	7.42	0.37	0.070	(0.389)	0.063	0.007
90	7.50	0.37	0.070	(0.387)	0.063	0.007
91	7.58	0.40	0.077	(0.386)	0.069	0.008
92	7.67	0.40	0.077	(0.384)	0.069	0.008
93	7.75	0.40	0.077	(0.382)	0.069	0.008
94	7.83	0.43	0.083	(0.380)	0.075	0.008

95	7.92	0.43	0.083	(0.379)	0.075	0.008
96	8.00	0.43	0.083	(0.377)	0.075	0.008
97	8.08	0.50	0.096	(0.375)	0.086	0.010
98	8.17	0.50	0.096	(0.373)	0.086	0.010
99	8.25	0.50	0.096	(0.372)	0.086	0.010
100	8.33	0.50	0.096	(0.370)	0.086	0.010
101	8.42	0.50	0.096	(0.368)	0.086	0.010
102	8.50	0.50	0.096	(0.366)	0.086	0.010
103	8.58	0.53	0.102	(0.365)	0.092	0.010
104	8.67	0.53	0.102	(0.363)	0.092	0.010
105	8.75	0.53	0.102	(0.361)	0.092	0.010
106	8.83	0.57	0.109	(0.360)	0.098	0.011
107	8.92	0.57	0.109	(0.358)	0.098	0.011
108	9.00	0.57	0.109	(0.356)	0.098	0.011
109	9.08	0.63	0.122	(0.354)	0.109	0.012
110	9.17	0.63	0.122	(0.353)	0.109	0.012
111	9.25	0.63	0.122	(0.351)	0.109	0.012
112	9.33	0.67	0.128	(0.349)	0.115	0.013
113	9.42	0.67	0.128	(0.348)	0.115	0.013
114	9.50	0.67	0.128	(0.346)	0.115	0.013
115	9.58	0.70	0.134	(0.344)	0.121	0.013
116	9.67	0.70	0.134	(0.343)	0.121	0.013
117	9.75	0.70	0.134	(0.341)	0.121	0.013
118	9.83	0.73	0.141	(0.340)	0.127	0.014
119	9.92	0.73	0.141	(0.338)	0.127	0.014
120	10.00	0.73	0.141	(0.336)	0.127	0.014
121	10.08	0.50	0.096	(0.335)	0.086	0.010
122	10.17	0.50	0.096	(0.333)	0.086	0.010
123	10.25	0.50	0.096	(0.331)	0.086	0.010
124	10.33	0.50	0.096	(0.330)	0.086	0.010
125	10.42	0.50	0.096	(0.328)	0.086	0.010
126	10.50	0.50	0.096	(0.327)	0.086	0.010
127	10.58	0.67	0.128	(0.325)	0.115	0.013
128	10.67	0.67	0.128	(0.323)	0.115	0.013
129	10.75	0.67	0.128	(0.322)	0.115	0.013
130	10.83	0.67	0.128	(0.320)	0.115	0.013
131	10.92	0.67	0.128	(0.319)	0.115	0.013
132	11.00	0.67	0.128	(0.317)	0.115	0.013
133	11.08	0.63	0.122	(0.316)	0.109	0.012
134	11.17	0.63	0.122	(0.314)	0.109	0.012
135	11.25	0.63	0.122	(0.312)	0.109	0.012
136	11.33	0.63	0.122	(0.311)	0.109	0.012
137	11.42	0.63	0.122	(0.309)	0.109	0.012
138	11.50	0.63	0.122	(0.308)	0.109	0.012
139	11.58	0.57	0.109	(0.306)	0.098	0.011
140	11.67	0.57	0.109	(0.305)	0.098	0.011
141	11.75	0.57	0.109	(0.303)	0.098	0.011
142	11.83	0.60	0.115	(0.302)	0.104	0.012
143	11.92	0.60	0.115	(0.300)	0.104	0.012
144	12.00	0.60	0.115	(0.299)	0.104	0.012

145	12.08	0.83	0.160	(0.297)	0.144	0.016
146	12.17	0.83	0.160	(0.296)	0.144	0.016
147	12.25	0.83	0.160	(0.294)	0.144	0.016
148	12.33	0.87	0.166	(0.293)	0.150	0.017
149	12.42	0.87	0.166	(0.291)	0.150	0.017
150	12.50	0.87	0.166	(0.290)	0.150	0.017
151	12.58	0.93	0.179	(0.288)	0.161	0.018
152	12.67	0.93	0.179	(0.287)	0.161	0.018
153	12.75	0.93	0.179	(0.285)	0.161	0.018
154	12.83	0.97	0.186	(0.284)	0.167	0.019
155	12.92	0.97	0.186	(0.283)	0.167	0.019
156	13.00	0.97	0.186	(0.281)	0.167	0.019
157	13.08	1.13	0.218	(0.280)	0.196	0.022
158	13.17	1.13	0.218	(0.278)	0.196	0.022
159	13.25	1.13	0.218	(0.277)	0.196	0.022
160	13.33	1.13	0.218	(0.276)	0.196	0.022
161	13.42	1.13	0.218	(0.274)	0.196	0.022
162	13.50	1.13	0.218	(0.273)	0.196	0.022
163	13.58	0.77	0.147	(0.271)	0.132	0.015
164	13.67	0.77	0.147	(0.270)	0.132	0.015
165	13.75	0.77	0.147	(0.269)	0.132	0.015
166	13.83	0.77	0.147	(0.267)	0.132	0.015
167	13.92	0.77	0.147	(0.266)	0.132	0.015
168	14.00	0.77	0.147	(0.264)	0.132	0.015
169	14.08	0.90	0.173	(0.263)	0.156	0.017
170	14.17	0.90	0.173	(0.262)	0.156	0.017
171	14.25	0.90	0.173	(0.260)	0.156	0.017
172	14.33	0.87	0.166	(0.259)	0.150	0.017
173	14.42	0.87	0.166	(0.258)	0.150	0.017
174	14.50	0.87	0.166	(0.256)	0.150	0.017
175	14.58	0.87	0.166	(0.255)	0.150	0.017
176	14.67	0.87	0.166	(0.254)	0.150	0.017
177	14.75	0.87	0.166	(0.253)	0.150	0.017
178	14.83	0.83	0.160	(0.251)	0.144	0.016
179	14.92	0.83	0.160	(0.250)	0.144	0.016
180	15.00	0.83	0.160	(0.249)	0.144	0.016
181	15.08	0.80	0.154	(0.247)	0.138	0.015
182	15.17	0.80	0.154	(0.246)	0.138	0.015
183	15.25	0.80	0.154	(0.245)	0.138	0.015
184	15.33	0.77	0.147	(0.244)	0.132	0.015
185	15.42	0.77	0.147	(0.242)	0.132	0.015
186	15.50	0.77	0.147	(0.241)	0.132	0.015
187	15.58	0.63	0.122	(0.240)	0.109	0.012
188	15.67	0.63	0.122	(0.239)	0.109	0.012
189	15.75	0.63	0.122	(0.237)	0.109	0.012
190	15.83	0.63	0.122	(0.236)	0.109	0.012
191	15.92	0.63	0.122	(0.235)	0.109	0.012
192	16.00	0.63	0.122	(0.234)	0.109	0.012
193	16.08	0.13	0.026	(0.233)	0.023	0.003
194	16.17	0.13	0.026	(0.231)	0.023	0.003

195	16.25	0.13	0.026	(0.230)	0.023	0.003
196	16.33	0.13	0.026	(0.229)	0.023	0.003
197	16.42	0.13	0.026	(0.228)	0.023	0.003
198	16.50	0.13	0.026	(0.227)	0.023	0.003
199	16.58	0.10	0.019	(0.226)	0.017	0.002
200	16.67	0.10	0.019	(0.224)	0.017	0.002
201	16.75	0.10	0.019	(0.223)	0.017	0.002
202	16.83	0.10	0.019	(0.222)	0.017	0.002
203	16.92	0.10	0.019	(0.221)	0.017	0.002
204	17.00	0.10	0.019	(0.220)	0.017	0.002
205	17.08	0.17	0.032	(0.219)	0.029	0.003
206	17.17	0.17	0.032	(0.218)	0.029	0.003
207	17.25	0.17	0.032	(0.217)	0.029	0.003
208	17.33	0.17	0.032	(0.216)	0.029	0.003
209	17.42	0.17	0.032	(0.214)	0.029	0.003
210	17.50	0.17	0.032	(0.213)	0.029	0.003
211	17.58	0.17	0.032	(0.212)	0.029	0.003
212	17.67	0.17	0.032	(0.211)	0.029	0.003
213	17.75	0.17	0.032	(0.210)	0.029	0.003
214	17.83	0.13	0.026	(0.209)	0.023	0.003
215	17.92	0.13	0.026	(0.208)	0.023	0.003
216	18.00	0.13	0.026	(0.207)	0.023	0.003
217	18.08	0.13	0.026	(0.206)	0.023	0.003
218	18.17	0.13	0.026	(0.205)	0.023	0.003
219	18.25	0.13	0.026	(0.204)	0.023	0.003
220	18.33	0.13	0.026	(0.203)	0.023	0.003
221	18.42	0.13	0.026	(0.202)	0.023	0.003
222	18.50	0.13	0.026	(0.201)	0.023	0.003
223	18.58	0.10	0.019	(0.200)	0.017	0.002
224	18.67	0.10	0.019	(0.199)	0.017	0.002
225	18.75	0.10	0.019	(0.198)	0.017	0.002
226	18.83	0.07	0.013	(0.197)	0.012	0.001
227	18.92	0.07	0.013	(0.196)	0.012	0.001
228	19.00	0.07	0.013	(0.195)	0.012	0.001
229	19.08	0.10	0.019	(0.194)	0.017	0.002
230	19.17	0.10	0.019	(0.194)	0.017	0.002
231	19.25	0.10	0.019	(0.193)	0.017	0.002
232	19.33	0.13	0.026	(0.192)	0.023	0.003
233	19.42	0.13	0.026	(0.191)	0.023	0.003
234	19.50	0.13	0.026	(0.190)	0.023	0.003
235	19.58	0.10	0.019	(0.189)	0.017	0.002
236	19.67	0.10	0.019	(0.188)	0.017	0.002
237	19.75	0.10	0.019	(0.187)	0.017	0.002
238	19.83	0.07	0.013	(0.187)	0.012	0.001
239	19.92	0.07	0.013	(0.186)	0.012	0.001
240	20.00	0.07	0.013	(0.185)	0.012	0.001
241	20.08	0.10	0.019	(0.184)	0.017	0.002
242	20.17	0.10	0.019	(0.183)	0.017	0.002
243	20.25	0.10	0.019	(0.182)	0.017	0.002
244	20.33	0.10	0.019	(0.182)	0.017	0.002

245	20.42	0.10	0.019	(0.181)	0.017	0.002
246	20.50	0.10	0.019	(0.180)	0.017	0.002
247	20.58	0.10	0.019	(0.179)	0.017	0.002
248	20.67	0.10	0.019	(0.179)	0.017	0.002
249	20.75	0.10	0.019	(0.178)	0.017	0.002
250	20.83	0.07	0.013	(0.177)	0.012	0.001
251	20.92	0.07	0.013	(0.176)	0.012	0.001
252	21.00	0.07	0.013	(0.176)	0.012	0.001
253	21.08	0.10	0.019	(0.175)	0.017	0.002
254	21.17	0.10	0.019	(0.174)	0.017	0.002
255	21.25	0.10	0.019	(0.174)	0.017	0.002
256	21.33	0.07	0.013	(0.173)	0.012	0.001
257	21.42	0.07	0.013	(0.172)	0.012	0.001
258	21.50	0.07	0.013	(0.172)	0.012	0.001
259	21.58	0.10	0.019	(0.171)	0.017	0.002
260	21.67	0.10	0.019	(0.170)	0.017	0.002
261	21.75	0.10	0.019	(0.170)	0.017	0.002
262	21.83	0.07	0.013	(0.169)	0.012	0.001
263	21.92	0.07	0.013	(0.169)	0.012	0.001
264	22.00	0.07	0.013	(0.168)	0.012	0.001
265	22.08	0.10	0.019	(0.168)	0.017	0.002
266	22.17	0.10	0.019	(0.167)	0.017	0.002
267	22.25	0.10	0.019	(0.166)	0.017	0.002
268	22.33	0.07	0.013	(0.166)	0.012	0.001
269	22.42	0.07	0.013	(0.165)	0.012	0.001
270	22.50	0.07	0.013	(0.165)	0.012	0.001
271	22.58	0.07	0.013	(0.164)	0.012	0.001
272	22.67	0.07	0.013	(0.164)	0.012	0.001
273	22.75	0.07	0.013	(0.164)	0.012	0.001
274	22.83	0.07	0.013	(0.163)	0.012	0.001
275	22.92	0.07	0.013	(0.163)	0.012	0.001
276	23.00	0.07	0.013	(0.162)	0.012	0.001
277	23.08	0.07	0.013	(0.162)	0.012	0.001
278	23.17	0.07	0.013	(0.162)	0.012	0.001
279	23.25	0.07	0.013	(0.161)	0.012	0.001
280	23.33	0.07	0.013	(0.161)	0.012	0.001
281	23.42	0.07	0.013	(0.161)	0.012	0.001
282	23.50	0.07	0.013	(0.160)	0.012	0.001
283	23.58	0.07	0.013	(0.160)	0.012	0.001
284	23.67	0.07	0.013	(0.160)	0.012	0.001
285	23.75	0.07	0.013	(0.160)	0.012	0.001
286	23.83	0.07	0.013	(0.159)	0.012	0.001
287	23.92	0.07	0.013	(0.159)	0.012	0.001
288	24.00	0.07	0.013	(0.159)	0.012	0.001

(Loss Rate Not Used)

Sum = 100.0 Sum = 1.9

Flood volume = Effective rainfall 0.16(In)
times area 9.6(Ac.)/[(In)/(Ft.)] = 0.1(Ac.Ft)
Total soil loss = 1.44(In)
Total soil loss = 1.148(Ac.Ft)

```
Total rainfall =      1.60(In)
Flood volume =        5558.2 Cubic Feet
Total soil loss =       50023.4 Cubic Feet
--------------------------------------------------------------------
 Peak flow rate of this hydrograph =      0.210(CFS)
--------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                   24 - H O U R   S T O R M
              R u n o f f    H y d r o g r a p h
--------------------------------------------------------------------
            Hydrograph in   5   Minute intervals ((CFS))

--------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5       5.0       7.5      10.0
--------------------------------------------------------------------
  0+ 5       0.0000      0.00  Q         |         |         |         |
  0+10       0.0001      0.01  Q         |         |         |         |
  0+15       0.0002      0.01  Q         |         |         |         |
  0+20       0.0003      0.01  Q         |         |         |         |
  0+25       0.0004      0.02  Q         |         |         |         |
  0+30       0.0005      0.02  Q         |         |         |         |
  0+35       0.0007      0.02  Q         |         |         |         |
  0+40       0.0008      0.02  Q         |         |         |         |
  0+45       0.0009      0.02  Q         |         |         |         |
  0+50       0.0011      0.02  Q         |         |         |         |
  0+55       0.0012      0.02  Q         |         |         |         |
  1+ 0       0.0014      0.02  Q         |         |         |         |
  1+ 5       0.0015      0.02  Q         |         |         |         |
  1+10       0.0017      0.02  Q         |         |         |         |
  1+15       0.0018      0.02  Q         |         |         |         |
  1+20       0.0019      0.02  Q         |         |         |         |
  1+25       0.0021      0.02  Q         |         |         |         |
  1+30       0.0022      0.02  Q         |         |         |         |
  1+35       0.0023      0.02  Q         |         |         |         |
  1+40       0.0024      0.02  Q         |         |         |         |
  1+45       0.0026      0.02  Q         |         |         |         |
  1+50       0.0027      0.02  Q         |         |         |         |
  1+55       0.0029      0.02  Q         |         |         |         |
  2+ 0       0.0030      0.02  Q         |         |         |         |
  2+ 5       0.0032      0.02  QV        |         |         |         |
  2+10       0.0034      0.02  QV        |         |         |         |
  2+15       0.0036      0.02  QV        |         |         |         |
  2+20       0.0037      0.02  QV        |         |         |         |
  2+25       0.0039      0.02  QV        |         |         |         |
  2+30       0.0041      0.02  QV        |         |         |         |
  2+35       0.0043      0.03  QV        |         |         |         |
  2+40       0.0045      0.03  QV        |         |         |         |
  2+45       0.0047      0.03  QV        |         |         |         |
  2+50       0.0049      0.03  QV        |         |         |         |
  2+55       0.0051      0.03  QV        |         |         |         |
```

```
3+ 0       0.0053      0.03  QV        |         |         |         |
3+ 5       0.0055      0.03  QV        |         |         |         |
3+10       0.0057      0.03  QV        |         |         |         |
3+15       0.0059      0.03  QV        |         |         |         |
3+20       0.0062      0.03  QV        |         |         |         |
3+25       0.0064      0.03  QV        |         |         |         |
3+30       0.0066      0.03  Q V       |         |         |         |
3+35       0.0068      0.03  Q V       |         |         |         |
3+40       0.0070      0.03  Q V       |         |         |         |
3+45       0.0072      0.03  Q V       |         |         |         |
3+50       0.0074      0.03  Q V       |         |         |         |
3+55       0.0077      0.04  Q V       |         |         |         |
4+ 0       0.0079      0.04  Q V       |         |         |         |
4+ 5       0.0082      0.04  Q V       |         |         |         |
4+10       0.0085      0.04  Q V       |         |         |         |
4+15       0.0087      0.04  Q V       |         |         |         |
4+20       0.0090      0.04  Q V       |         |         |         |
4+25       0.0093      0.04  Q V       |         |         |         |
4+30       0.0096      0.04  Q  V      |         |         |         |
4+35       0.0099      0.04  Q  V      |         |         |         |
4+40       0.0102      0.04  Q  V      |         |         |         |
4+45       0.0105      0.04  Q  V      |         |         |         |
4+50       0.0108      0.05  Q  V      |         |         |         |
4+55       0.0111      0.05  Q  V      |         |         |         |
5+ 0       0.0114      0.05  Q  V      |         |         |         |
5+ 5       0.0118      0.04  Q  V      |         |         |         |
5+10       0.0120      0.04  Q  V      |         |         |         |
5+15       0.0123      0.04  Q  V      |         |         |         |
5+20       0.0126      0.04  Q  V      |         |         |         |
5+25       0.0128      0.04  Q   V     |         |         |         |
5+30       0.0131      0.04  Q   V     |         |         |         |
5+35       0.0135      0.05  Q   V     |         |         |         |
5+40       0.0138      0.05  Q   V     |         |         |         |
5+45       0.0141      0.05  Q   V     |         |         |         |
5+50       0.0145      0.05  Q   V     |         |         |         |
5+55       0.0148      0.05  Q   V     |         |         |         |
6+ 0       0.0151      0.05  Q   V     |         |         |         |
6+ 5       0.0155      0.05  Q   V     |         |         |         |
6+10       0.0159      0.05  Q   V     |         |         |         |
6+15       0.0163      0.06  Q    V    |         |         |         |
6+20       0.0166      0.06  Q    V    |         |         |         |
6+25       0.0170      0.06  Q    V    |         |         |         |
6+30       0.0174      0.06  Q    V    |         |         |         |
6+35       0.0178      0.06  Q    V    |         |         |         |
6+40       0.0182      0.06  Q    V    |         |         |         |
6+45       0.0186      0.06  Q    V    |         |         |         |
6+50       0.0191      0.06  Q    V    |         |         |         |
6+55       0.0195      0.06  Q     V   |         |         |         |
7+ 0       0.0199      0.06  Q     V   |         |         |         |
7+ 5       0.0203      0.06  Q     V   |         |         |         |
```

```
 7+10       0.0208      0.06  Q     V   |         |         |         |
 7+15       0.0212      0.06  Q     V   |         |         |         |
 7+20       0.0216      0.06  Q     V   |         |         |         |
 7+25       0.0221      0.07  Q     V   |         |         |         |
 7+30       0.0226      0.07  Q      V  |         |         |         |
 7+35       0.0230      0.07  Q      V  |         |         |         |
 7+40       0.0236      0.07  Q      V  |         |         |         |
 7+45       0.0241      0.07  Q      V  |         |         |         |
 7+50       0.0246      0.08  Q      V  |         |         |         |
 7+55       0.0251      0.08  Q      V  |         |         |         |
 8+ 0       0.0257      0.08  Q       V |         |         |         |
 8+ 5       0.0263      0.08  Q       V |         |         |         |
 8+10       0.0269      0.09  Q       V |         |         |         |
 8+15       0.0275      0.09  Q       V |         |         |         |
 8+20       0.0282      0.09  Q       V |         |         |         |
 8+25       0.0288      0.09  Q        V|         |         |         |
 8+30       0.0294      0.09  Q        V|         |         |         |
 8+35       0.0301      0.10  Q        V|         |         |         |
 8+40       0.0308      0.10  Q        V|         |         |         |
 8+45       0.0314      0.10  Q        V|         |         |         |
 8+50       0.0321      0.10  Q         V         |         |         |
 8+55       0.0329      0.10  Q         V         |         |         |
 9+ 0       0.0336      0.10  Q         V         |         |         |
 9+ 5       0.0343      0.11  Q         V         |         |         |
 9+10       0.0351      0.12  Q         |V        |         |         |
 9+15       0.0359      0.12  Q         |V        |         |         |
 9+20       0.0368      0.12  Q         |V        |         |         |
 9+25       0.0376      0.12  Q         |V        |         |         |
 9+30       0.0384      0.12  Q         | V       |         |         |
 9+35       0.0393      0.13  Q         | V       |         |         |
 9+40       0.0402      0.13  Q         | V       |         |         |
 9+45       0.0411      0.13  Q         | V       |         |         |
 9+50       0.0420      0.13  Q         |  V      |         |         |
 9+55       0.0429      0.13  Q         |  V      |         |         |
10+ 0       0.0439      0.14  Q         |  V      |         |         |
10+ 5       0.0447      0.12  Q         |   V     |         |         |
10+10       0.0454      0.10  Q         |   V     |         |         |
10+15       0.0460      0.10  Q         |   V     |         |         |
10+20       0.0467      0.09  Q         |   V     |         |         |
10+25       0.0473      0.09  Q         |   V     |         |         |
10+30       0.0479      0.09  Q         |    V    |         |         |
10+35       0.0487      0.10  Q         |    V    |         |         |
10+40       0.0495      0.12  Q         |    V    |         |         |
10+45       0.0503      0.12  Q         |    V    |         |         |
10+50       0.0512      0.12  Q         |     V   |         |         |
10+55       0.0520      0.12  Q         |     V   |         |         |
11+ 0       0.0529      0.12  Q         |     V   |         |         |
11+ 5       0.0537      0.12  Q         |     V   |         |         |
11+10       0.0545      0.12  Q         |      V  |         |         |
11+15       0.0553      0.12  Q         |      V  |         |         |
```

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11+20       0.0561      0.12  Q         |      V  |         |         |
11+25       0.0569      0.12  Q         |      V  |         |         |
11+30       0.0577      0.12  Q         |       V |         |         |
11+35       0.0585      0.11  Q         |       V |         |         |
11+40       0.0593      0.11  Q         |       V |         |         |
11+45       0.0600      0.11  Q         |       V |         |         |
11+50       0.0607      0.11  Q         |        V|         |         |
11+55       0.0615      0.11  Q         |        V|         |         |
12+ 0       0.0622      0.11  Q         |        V|         |         |
12+ 5       0.0631      0.13  Q         |        V|         |         |
12+10       0.0641      0.15  Q         |         V         |         |
12+15       0.0652      0.15  Q         |         V         |         |
12+20       0.0663      0.16  Q         |         V         |         |
12+25       0.0674      0.16  Q         |         |V        |         |
12+30       0.0685      0.16  Q         |         |V        |         |
12+35       0.0696      0.17  Q         |         |V        |         |
12+40       0.0708      0.17  Q         |         | V       |         |
12+45       0.0720      0.17  Q         |         | V       |         |
12+50       0.0732      0.18  Q         |         | V       |         |
12+55       0.0744      0.18  Q         |         |  V      |         |
13+ 0       0.0756      0.18  Q         |         |  V      |         |
13+ 5       0.0769      0.19  Q         |         |   V     |         |
13+10       0.0784      0.20  Q         |         |   V     |         |
13+15       0.0798      0.21  Q         |         |    V    |         |
13+20       0.0812      0.21  Q         |         |    V    |         |
13+25       0.0827      0.21  Q         |         |    V    |         |
13+30       0.0841      0.21  Q         |         |     V   |         |
13+35       0.0854      0.18  Q         |         |     V   |         |
13+40       0.0864      0.15  Q         |         |      V  |         |
13+45       0.0874      0.15  Q         |         |      V  |         |
13+50       0.0884      0.14  Q         |         |      V  |         |
13+55       0.0894      0.14  Q         |         |       V |         |
14+ 0       0.0904      0.14  Q         |         |       V |         |
14+ 5       0.0914      0.15  Q         |         |       V |         |
14+10       0.0926      0.16  Q         |         |        V|         |
14+15       0.0937      0.17  Q         |         |        V|         |
14+20       0.0948      0.16  Q         |         |        V|         |
14+25       0.0959      0.16  Q         |         |         V         |
14+30       0.0970      0.16  Q         |         |         V         |
14+35       0.0982      0.16  Q         |         |         V         |
14+40       0.0993      0.16  Q         |         |         |V        |
14+45       0.1004      0.16  Q         |         |         |V        |
14+50       0.1015      0.16  Q         |         |         |V        |
14+55       0.1025      0.16  Q         |         |         | V       |
15+ 0       0.1036      0.15  Q         |         |         | V       |
15+ 5       0.1046      0.15  Q         |         |         | V       |
15+10       0.1057      0.15  Q         |         |         |  V      |
15+15       0.1067      0.15  Q         |         |         |  V      |
15+20       0.1077      0.15  Q         |         |         |  V      |
15+25       0.1087      0.14  Q         |         |         |   V     |
```

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15+30       0.1097      0.14  Q         |         |         |   V     |
15+35       0.1106      0.13  Q         |         |         |   V     |
15+40       0.1114      0.12  Q         |         |         |   V     |
15+45       0.1122      0.12  Q         |         |         |    V    |
15+50       0.1130      0.12  Q         |         |         |    V    |
15+55       0.1138      0.12  Q         |         |         |    V    |
16+ 0       0.1147      0.12  Q         |         |         |    V    |
16+ 5       0.1152      0.08  Q         |         |         |     V   |
16+10       0.1155      0.04  Q         |         |         |     V   |
16+15       0.1157      0.03  Q         |         |         |     V   |
16+20       0.1159      0.03  Q         |         |         |     V   |
16+25       0.1161      0.02  Q         |         |         |     V   |
16+30       0.1162      0.02  Q         |         |         |     V   |
16+35       0.1164      0.02  Q         |         |         |     V   |
16+40       0.1165      0.02  Q         |         |         |     V   |
16+45       0.1166      0.02  Q         |         |         |     V   |
16+50       0.1168      0.02  Q         |         |         |     V   |
16+55       0.1169      0.02  Q         |         |         |     V   |
17+ 0       0.1170      0.02  Q         |         |         |     V   |
17+ 5       0.1172      0.02  Q         |         |         |     V   |
17+10       0.1174      0.03  Q         |         |         |     V   |
17+15       0.1176      0.03  Q         |         |         |     V   |
17+20       0.1178      0.03  Q         |         |         |     V   |
17+25       0.1180      0.03  Q         |         |         |     V   |
17+30       0.1182      0.03  Q         |         |         |      V  |
17+35       0.1184      0.03  Q         |         |         |      V  |
17+40       0.1187      0.03  Q         |         |         |      V  |
17+45       0.1189      0.03  Q         |         |         |      V  |
17+50       0.1191      0.03  Q         |         |         |      V  |
17+55       0.1192      0.03  Q         |         |         |      V  |
18+ 0       0.1194      0.03  Q         |         |         |      V  |
18+ 5       0.1196      0.02  Q         |         |         |      V  |
18+10       0.1198      0.02  Q         |         |         |      V  |
18+15       0.1199      0.02  Q         |         |         |      V  |
18+20       0.1201      0.02  Q         |         |         |      V  |
18+25       0.1203      0.02  Q         |         |         |      V  |
18+30       0.1204      0.02  Q         |         |         |      V  |
18+35       0.1206      0.02  Q         |         |         |      V  |
18+40       0.1207      0.02  Q         |         |         |      V  |
18+45       0.1209      0.02  Q         |         |         |      V  |
18+50       0.1210      0.02  Q         |         |         |      V  |
18+55       0.1211      0.01  Q         |         |         |      V  |
19+ 0       0.1211      0.01  Q         |         |         |      V  |
19+ 5       0.1212      0.01  Q         |         |         |       V |
19+10       0.1214      0.02  Q         |         |         |       V |
19+15       0.1215      0.02  Q         |         |         |       V |
19+20       0.1216      0.02  Q         |         |         |       V |
19+25       0.1218      0.02  Q         |         |         |       V |
19+30       0.1220      0.02  Q         |         |         |       V |
19+35       0.1221      0.02  Q         |         |         |       V |
```

19+40	0.1223	0.02	Q	V
19+45	0.1224	0.02	Q	V
19+50	0.1225	0.02	Q	V
19+55	0.1226	0.01	Q	V
20+ 0	0.1227	0.01	Q	V
20+ 5	0.1228	0.01	Q	V
20+10	0.1229	0.02	Q	V
20+15	0.1230	0.02	Q	V
20+20	0.1231	0.02	Q	V
20+25	0.1233	0.02	Q	V
20+30	0.1234	0.02	Q	V
20+35	0.1235	0.02	Q	V
20+40	0.1237	0.02	Q	V
20+45	0.1238	0.02	Q	V
20+50	0.1239	0.02	Q	V
20+55	0.1240	0.01	Q	V
21+ 0	0.1241	0.01	Q	V
21+ 5	0.1242	0.01	Q	V
21+10	0.1243	0.02	Q	V
21+15	0.1244	0.02	Q	V
21+20	0.1245	0.02	Q	V
21+25	0.1246	0.01	Q	V
21+30	0.1247	0.01	Q	V
21+35	0.1248	0.01	Q	V
21+40	0.1249	0.02	Q	V
21+45	0.1251	0.02	Q	V
21+50	0.1252	0.02	Q	V
21+55	0.1253	0.01	Q	V
22+ 0	0.1254	0.01	Q	V
22+ 5	0.1255	0.01	Q	V
22+10	0.1256	0.02	Q	V
22+15	0.1257	0.02	Q	V
22+20	0.1258	0.02	Q	V
22+25	0.1259	0.01	Q	V
22+30	0.1260	0.01	Q	V
22+35	0.1261	0.01	Q	V
22+40	0.1262	0.01	Q	V
22+45	0.1262	0.01	Q	V
22+50	0.1263	0.01	Q	V
22+55	0.1264	0.01	Q	V
23+ 0	0.1265	0.01	Q	V
23+ 5	0.1266	0.01	Q	V
23+10	0.1267	0.01	Q	V
23+15	0.1268	0.01	Q	V
23+20	0.1268	0.01	Q	V
23+25	0.1269	0.01	Q	V
23+30	0.1270	0.01	Q	V
23+35	0.1271	0.01	Q	V
23+40	0.1272	0.01	Q	V
23+45	0.1273	0.01	Q	V

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   23+50        0.1274      0.01  Q          |          |          |        V|
   23+55        0.1274      0.01  Q          |          |          |        V|
   24+ 0        0.1275      0.01  Q          |          |          |        V|
   24+ 5        0.1276      0.01  Q          |          |          |        V|
   24+10        0.1276      0.00  Q          |          |          |        V|
   24+15        0.1276      0.00  Q          |          |          |        V|
   24+20        0.1276      0.00  Q          |          |          |         V
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U n i t   H y d r o g r a p h   A n a l y s i s

Study date 01/11/22 File: 100YRPRE242242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6215

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

100YRPRE242

Drainage Area = 9.57(Ac.) = 0.015 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 9.57(Ac.) = 0.015 Sq. Mi.
Length along longest watercourse = 1318.88(Ft.)
Length along longest watercourse measured to centroid = 656.30(Ft.)
Length along longest watercourse = 0.250 Mi.
Length along longest watercourse measured to centroid = 0.124 Mi.
Difference in elevation = 10.01(Ft.)
Slope along watercourse = 40.0740 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.095 Hr.
Lag time = 5.73 Min.
25% of lag time = 1.43 Min.
40% of lag time = 2.29 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.57	1.60	15.31

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.57	4.00	38.28

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 1.600(In)
Area Averaged 100-Year Rainfall = 4.000(In)

Point rain (area averaged) = 1.600(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 1.600(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.570	78.00	0.050

Total Area Entered = 9.57(Ac.)

RI AMC2	RI AMC-1	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
78.0	60.6	0.464	0.050	0.443	1.000	0.443
					Sum (F) =	0.443

Area averaged mean soil loss (F) (In/Hr) = 0.443
Minimum soil loss rate ((In/Hr)) = 0.221
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	87.308	15.387	1.484
2	0.167	174.616	46.516	4.486
3	0.250	261.925	18.021	1.738
4	0.333	349.233	7.796	0.752
5	0.417	436.541	4.576	0.441
6	0.500	523.849	2.883	0.278
7	0.583	611.157	2.019	0.195
8	0.667	698.466	1.317	0.127

9	0.750	785.774	0.908	0.088
10	0.833	873.082	0.579	0.056
			Sum = 100.000	Sum= 9.645

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Loss rate(In./Hr) Low	Effective (In/Hr)
1	0.08	0.07	0.013	(0.785)	0.012	0.001
2	0.17	0.07	0.013	(0.782)	0.012	0.001
3	0.25	0.07	0.013	(0.779)	0.012	0.001
4	0.33	0.10	0.019	(0.776)	0.017	0.002
5	0.42	0.10	0.019	(0.773)	0.017	0.002
6	0.50	0.10	0.019	(0.770)	0.017	0.002
7	0.58	0.10	0.019	(0.767)	0.017	0.002
8	0.67	0.10	0.019	(0.764)	0.017	0.002
9	0.75	0.10	0.019	(0.761)	0.017	0.002
10	0.83	0.13	0.026	(0.758)	0.023	0.003
11	0.92	0.13	0.026	(0.755)	0.023	0.003
12	1.00	0.13	0.026	(0.752)	0.023	0.003
13	1.08	0.10	0.019	(0.749)	0.017	0.002
14	1.17	0.10	0.019	(0.746)	0.017	0.002
15	1.25	0.10	0.019	(0.743)	0.017	0.002
16	1.33	0.10	0.019	(0.740)	0.017	0.002
17	1.42	0.10	0.019	(0.737)	0.017	0.002
18	1.50	0.10	0.019	(0.734)	0.017	0.002
19	1.58	0.10	0.019	(0.731)	0.017	0.002
20	1.67	0.10	0.019	(0.728)	0.017	0.002
21	1.75	0.10	0.019	(0.725)	0.017	0.002
22	1.83	0.13	0.026	(0.722)	0.023	0.003
23	1.92	0.13	0.026	(0.719)	0.023	0.003
24	2.00	0.13	0.026	(0.716)	0.023	0.003
25	2.08	0.13	0.026	(0.714)	0.023	0.003
26	2.17	0.13	0.026	(0.711)	0.023	0.003
27	2.25	0.13	0.026	(0.708)	0.023	0.003
28	2.33	0.13	0.026	(0.705)	0.023	0.003
29	2.42	0.13	0.026	(0.702)	0.023	0.003
30	2.50	0.13	0.026	(0.699)	0.023	0.003
31	2.58	0.17	0.032	(0.696)	0.029	0.003
32	2.67	0.17	0.032	(0.693)	0.029	0.003
33	2.75	0.17	0.032	(0.691)	0.029	0.003
34	2.83	0.17	0.032	(0.688)	0.029	0.003
35	2.92	0.17	0.032	(0.685)	0.029	0.003
36	3.00	0.17	0.032	(0.682)	0.029	0.003
37	3.08	0.17	0.032	(0.679)	0.029	0.003
38	3.17	0.17	0.032	(0.676)	0.029	0.003
39	3.25	0.17	0.032	(0.674)	0.029	0.003

40	3.33	0.17	0.032	(0.671)	0.029	0.003
41	3.42	0.17	0.032	(0.668)	0.029	0.003
42	3.50	0.17	0.032	(0.665)	0.029	0.003
43	3.58	0.17	0.032	(0.662)	0.029	0.003
44	3.67	0.17	0.032	(0.660)	0.029	0.003
45	3.75	0.17	0.032	(0.657)	0.029	0.003
46	3.83	0.20	0.038	(0.654)	0.035	0.004
47	3.92	0.20	0.038	(0.651)	0.035	0.004
48	4.00	0.20	0.038	(0.649)	0.035	0.004
49	4.08	0.20	0.038	(0.646)	0.035	0.004
50	4.17	0.20	0.038	(0.643)	0.035	0.004
51	4.25	0.20	0.038	(0.640)	0.035	0.004
52	4.33	0.23	0.045	(0.638)	0.040	0.004
53	4.42	0.23	0.045	(0.635)	0.040	0.004
54	4.50	0.23	0.045	(0.632)	0.040	0.004
55	4.58	0.23	0.045	(0.629)	0.040	0.004
56	4.67	0.23	0.045	(0.627)	0.040	0.004
57	4.75	0.23	0.045	(0.624)	0.040	0.004
58	4.83	0.27	0.051	(0.621)	0.046	0.005
59	4.92	0.27	0.051	(0.619)	0.046	0.005
60	5.00	0.27	0.051	(0.616)	0.046	0.005
61	5.08	0.20	0.038	(0.613)	0.035	0.004
62	5.17	0.20	0.038	(0.611)	0.035	0.004
63	5.25	0.20	0.038	(0.608)	0.035	0.004
64	5.33	0.23	0.045	(0.605)	0.040	0.004
65	5.42	0.23	0.045	(0.603)	0.040	0.004
66	5.50	0.23	0.045	(0.600)	0.040	0.004
67	5.58	0.27	0.051	(0.597)	0.046	0.005
68	5.67	0.27	0.051	(0.595)	0.046	0.005
69	5.75	0.27	0.051	(0.592)	0.046	0.005
70	5.83	0.27	0.051	(0.590)	0.046	0.005
71	5.92	0.27	0.051	(0.587)	0.046	0.005
72	6.00	0.27	0.051	(0.584)	0.046	0.005
73	6.08	0.30	0.058	(0.582)	0.052	0.006
74	6.17	0.30	0.058	(0.579)	0.052	0.006
75	6.25	0.30	0.058	(0.577)	0.052	0.006
76	6.33	0.30	0.058	(0.574)	0.052	0.006
77	6.42	0.30	0.058	(0.571)	0.052	0.006
78	6.50	0.30	0.058	(0.569)	0.052	0.006
79	6.58	0.33	0.064	(0.566)	0.058	0.006
80	6.67	0.33	0.064	(0.564)	0.058	0.006
81	6.75	0.33	0.064	(0.561)	0.058	0.006
82	6.83	0.33	0.064	(0.559)	0.058	0.006
83	6.92	0.33	0.064	(0.556)	0.058	0.006
84	7.00	0.33	0.064	(0.554)	0.058	0.006
85	7.08	0.33	0.064	(0.551)	0.058	0.006
86	7.17	0.33	0.064	(0.549)	0.058	0.006
87	7.25	0.33	0.064	(0.546)	0.058	0.006
88	7.33	0.37	0.070	(0.544)	0.063	0.007
89	7.42	0.37	0.070	(0.541)	0.063	0.007

90	7.50	0.37	0.070	(0.539)	0.063	0.007
91	7.58	0.40	0.077	(0.536)	0.069	0.008
92	7.67	0.40	0.077	(0.534)	0.069	0.008
93	7.75	0.40	0.077	(0.531)	0.069	0.008
94	7.83	0.43	0.083	(0.529)	0.075	0.008
95	7.92	0.43	0.083	(0.526)	0.075	0.008
96	8.00	0.43	0.083	(0.524)	0.075	0.008
97	8.08	0.50	0.096	(0.521)	0.086	0.010
98	8.17	0.50	0.096	(0.519)	0.086	0.010
99	8.25	0.50	0.096	(0.517)	0.086	0.010
100	8.33	0.50	0.096	(0.514)	0.086	0.010
101	8.42	0.50	0.096	(0.512)	0.086	0.010
102	8.50	0.50	0.096	(0.509)	0.086	0.010
103	8.58	0.53	0.102	(0.507)	0.092	0.010
104	8.67	0.53	0.102	(0.505)	0.092	0.010
105	8.75	0.53	0.102	(0.502)	0.092	0.010
106	8.83	0.57	0.109	(0.500)	0.098	0.011
107	8.92	0.57	0.109	(0.498)	0.098	0.011
108	9.00	0.57	0.109	(0.495)	0.098	0.011
109	9.08	0.63	0.122	(0.493)	0.109	0.012
110	9.17	0.63	0.122	(0.490)	0.109	0.012
111	9.25	0.63	0.122	(0.488)	0.109	0.012
112	9.33	0.67	0.128	(0.486)	0.115	0.013
113	9.42	0.67	0.128	(0.483)	0.115	0.013
114	9.50	0.67	0.128	(0.481)	0.115	0.013
115	9.58	0.70	0.134	(0.479)	0.121	0.013
116	9.67	0.70	0.134	(0.477)	0.121	0.013
117	9.75	0.70	0.134	(0.474)	0.121	0.013
118	9.83	0.73	0.141	(0.472)	0.127	0.014
119	9.92	0.73	0.141	(0.470)	0.127	0.014
120	10.00	0.73	0.141	(0.467)	0.127	0.014
121	10.08	0.50	0.096	(0.465)	0.086	0.010
122	10.17	0.50	0.096	(0.463)	0.086	0.010
123	10.25	0.50	0.096	(0.461)	0.086	0.010
124	10.33	0.50	0.096	(0.458)	0.086	0.010
125	10.42	0.50	0.096	(0.456)	0.086	0.010
126	10.50	0.50	0.096	(0.454)	0.086	0.010
127	10.58	0.67	0.128	(0.452)	0.115	0.013
128	10.67	0.67	0.128	(0.450)	0.115	0.013
129	10.75	0.67	0.128	(0.447)	0.115	0.013
130	10.83	0.67	0.128	(0.445)	0.115	0.013
131	10.92	0.67	0.128	(0.443)	0.115	0.013
132	11.00	0.67	0.128	(0.441)	0.115	0.013
133	11.08	0.63	0.122	(0.439)	0.109	0.012
134	11.17	0.63	0.122	(0.436)	0.109	0.012
135	11.25	0.63	0.122	(0.434)	0.109	0.012
136	11.33	0.63	0.122	(0.432)	0.109	0.012
137	11.42	0.63	0.122	(0.430)	0.109	0.012
138	11.50	0.63	0.122	(0.428)	0.109	0.012
139	11.58	0.57	0.109	(0.426)	0.098	0.011

140	11.67	0.57	0.109	(0.424)	0.098	0.011
141	11.75	0.57	0.109	(0.422)	0.098	0.011
142	11.83	0.60	0.115	(0.419)	0.104	0.012
143	11.92	0.60	0.115	(0.417)	0.104	0.012
144	12.00	0.60	0.115	(0.415)	0.104	0.012
145	12.08	0.83	0.160	(0.413)	0.144	0.016
146	12.17	0.83	0.160	(0.411)	0.144	0.016
147	12.25	0.83	0.160	(0.409)	0.144	0.016
148	12.33	0.87	0.166	(0.407)	0.150	0.017
149	12.42	0.87	0.166	(0.405)	0.150	0.017
150	12.50	0.87	0.166	(0.403)	0.150	0.017
151	12.58	0.93	0.179	(0.401)	0.161	0.018
152	12.67	0.93	0.179	(0.399)	0.161	0.018
153	12.75	0.93	0.179	(0.397)	0.161	0.018
154	12.83	0.97	0.186	(0.395)	0.167	0.019
155	12.92	0.97	0.186	(0.393)	0.167	0.019
156	13.00	0.97	0.186	(0.391)	0.167	0.019
157	13.08	1.13	0.218	(0.389)	0.196	0.022
158	13.17	1.13	0.218	(0.387)	0.196	0.022
159	13.25	1.13	0.218	(0.385)	0.196	0.022
160	13.33	1.13	0.218	(0.383)	0.196	0.022
161	13.42	1.13	0.218	(0.381)	0.196	0.022
162	13.50	1.13	0.218	(0.379)	0.196	0.022
163	13.58	0.77	0.147	(0.377)	0.132	0.015
164	13.67	0.77	0.147	(0.375)	0.132	0.015
165	13.75	0.77	0.147	(0.373)	0.132	0.015
166	13.83	0.77	0.147	(0.371)	0.132	0.015
167	13.92	0.77	0.147	(0.370)	0.132	0.015
168	14.00	0.77	0.147	(0.368)	0.132	0.015
169	14.08	0.90	0.173	(0.366)	0.156	0.017
170	14.17	0.90	0.173	(0.364)	0.156	0.017
171	14.25	0.90	0.173	(0.362)	0.156	0.017
172	14.33	0.87	0.166	(0.360)	0.150	0.017
173	14.42	0.87	0.166	(0.358)	0.150	0.017
174	14.50	0.87	0.166	(0.357)	0.150	0.017
175	14.58	0.87	0.166	(0.355)	0.150	0.017
176	14.67	0.87	0.166	(0.353)	0.150	0.017
177	14.75	0.87	0.166	(0.351)	0.150	0.017
178	14.83	0.83	0.160	(0.349)	0.144	0.016
179	14.92	0.83	0.160	(0.348)	0.144	0.016
180	15.00	0.83	0.160	(0.346)	0.144	0.016
181	15.08	0.80	0.154	(0.344)	0.138	0.015
182	15.17	0.80	0.154	(0.342)	0.138	0.015
183	15.25	0.80	0.154	(0.340)	0.138	0.015
184	15.33	0.77	0.147	(0.339)	0.132	0.015
185	15.42	0.77	0.147	(0.337)	0.132	0.015
186	15.50	0.77	0.147	(0.335)	0.132	0.015
187	15.58	0.63	0.122	(0.334)	0.109	0.012
188	15.67	0.63	0.122	(0.332)	0.109	0.012
189	15.75	0.63	0.122	(0.330)	0.109	0.012

190	15.83	0.63	0.122	(0.328)	0.109	0.012
191	15.92	0.63	0.122	(0.327)	0.109	0.012
192	16.00	0.63	0.122	(0.325)	0.109	0.012
193	16.08	0.13	0.026	(0.323)	0.023	0.003
194	16.17	0.13	0.026	(0.322)	0.023	0.003
195	16.25	0.13	0.026	(0.320)	0.023	0.003
196	16.33	0.13	0.026	(0.318)	0.023	0.003
197	16.42	0.13	0.026	(0.317)	0.023	0.003
198	16.50	0.13	0.026	(0.315)	0.023	0.003
199	16.58	0.10	0.019	(0.314)	0.017	0.002
200	16.67	0.10	0.019	(0.312)	0.017	0.002
201	16.75	0.10	0.019	(0.310)	0.017	0.002
202	16.83	0.10	0.019	(0.309)	0.017	0.002
203	16.92	0.10	0.019	(0.307)	0.017	0.002
204	17.00	0.10	0.019	(0.306)	0.017	0.002
205	17.08	0.17	0.032	(0.304)	0.029	0.003
206	17.17	0.17	0.032	(0.303)	0.029	0.003
207	17.25	0.17	0.032	(0.301)	0.029	0.003
208	17.33	0.17	0.032	(0.300)	0.029	0.003
209	17.42	0.17	0.032	(0.298)	0.029	0.003
210	17.50	0.17	0.032	(0.297)	0.029	0.003
211	17.58	0.17	0.032	(0.295)	0.029	0.003
212	17.67	0.17	0.032	(0.294)	0.029	0.003
213	17.75	0.17	0.032	(0.292)	0.029	0.003
214	17.83	0.13	0.026	(0.291)	0.023	0.003
215	17.92	0.13	0.026	(0.289)	0.023	0.003
216	18.00	0.13	0.026	(0.288)	0.023	0.003
217	18.08	0.13	0.026	(0.287)	0.023	0.003
218	18.17	0.13	0.026	(0.285)	0.023	0.003
219	18.25	0.13	0.026	(0.284)	0.023	0.003
220	18.33	0.13	0.026	(0.282)	0.023	0.003
221	18.42	0.13	0.026	(0.281)	0.023	0.003
222	18.50	0.13	0.026	(0.280)	0.023	0.003
223	18.58	0.10	0.019	(0.278)	0.017	0.002
224	18.67	0.10	0.019	(0.277)	0.017	0.002
225	18.75	0.10	0.019	(0.276)	0.017	0.002
226	18.83	0.07	0.013	(0.274)	0.012	0.001
227	18.92	0.07	0.013	(0.273)	0.012	0.001
228	19.00	0.07	0.013	(0.272)	0.012	0.001
229	19.08	0.10	0.019	(0.270)	0.017	0.002
230	19.17	0.10	0.019	(0.269)	0.017	0.002
231	19.25	0.10	0.019	(0.268)	0.017	0.002
232	19.33	0.13	0.026	(0.267)	0.023	0.003
233	19.42	0.13	0.026	(0.265)	0.023	0.003
234	19.50	0.13	0.026	(0.264)	0.023	0.003
235	19.58	0.10	0.019	(0.263)	0.017	0.002
236	19.67	0.10	0.019	(0.262)	0.017	0.002
237	19.75	0.10	0.019	(0.261)	0.017	0.002
238	19.83	0.07	0.013	(0.259)	0.012	0.001
239	19.92	0.07	0.013	(0.258)	0.012	0.001

240	20.00	0.07	0.013	(0.257)	0.012	0.001
241	20.08	0.10	0.019	(0.256)	0.017	0.002
242	20.17	0.10	0.019	(0.255)	0.017	0.002
243	20.25	0.10	0.019	(0.254)	0.017	0.002
244	20.33	0.10	0.019	(0.253)	0.017	0.002
245	20.42	0.10	0.019	(0.252)	0.017	0.002
246	20.50	0.10	0.019	(0.250)	0.017	0.002
247	20.58	0.10	0.019	(0.249)	0.017	0.002
248	20.67	0.10	0.019	(0.248)	0.017	0.002
249	20.75	0.10	0.019	(0.247)	0.017	0.002
250	20.83	0.07	0.013	(0.246)	0.012	0.001
251	20.92	0.07	0.013	(0.245)	0.012	0.001
252	21.00	0.07	0.013	(0.244)	0.012	0.001
253	21.08	0.10	0.019	(0.243)	0.017	0.002
254	21.17	0.10	0.019	(0.242)	0.017	0.002
255	21.25	0.10	0.019	(0.241)	0.017	0.002
256	21.33	0.07	0.013	(0.241)	0.012	0.001
257	21.42	0.07	0.013	(0.240)	0.012	0.001
258	21.50	0.07	0.013	(0.239)	0.012	0.001
259	21.58	0.10	0.019	(0.238)	0.017	0.002
260	21.67	0.10	0.019	(0.237)	0.017	0.002
261	21.75	0.10	0.019	(0.236)	0.017	0.002
262	21.83	0.07	0.013	(0.235)	0.012	0.001
263	21.92	0.07	0.013	(0.235)	0.012	0.001
264	22.00	0.07	0.013	(0.234)	0.012	0.001
265	22.08	0.10	0.019	(0.233)	0.017	0.002
266	22.17	0.10	0.019	(0.232)	0.017	0.002
267	22.25	0.10	0.019	(0.231)	0.017	0.002
268	22.33	0.07	0.013	(0.231)	0.012	0.001
269	22.42	0.07	0.013	(0.230)	0.012	0.001
270	22.50	0.07	0.013	(0.229)	0.012	0.001
271	22.58	0.07	0.013	(0.229)	0.012	0.001
272	22.67	0.07	0.013	(0.228)	0.012	0.001
273	22.75	0.07	0.013	(0.227)	0.012	0.001
274	22.83	0.07	0.013	(0.227)	0.012	0.001
275	22.92	0.07	0.013	(0.226)	0.012	0.001
276	23.00	0.07	0.013	(0.226)	0.012	0.001
277	23.08	0.07	0.013	(0.225)	0.012	0.001
278	23.17	0.07	0.013	(0.225)	0.012	0.001
279	23.25	0.07	0.013	(0.224)	0.012	0.001
280	23.33	0.07	0.013	(0.224)	0.012	0.001
281	23.42	0.07	0.013	(0.223)	0.012	0.001
282	23.50	0.07	0.013	(0.223)	0.012	0.001
283	23.58	0.07	0.013	(0.223)	0.012	0.001
284	23.67	0.07	0.013	(0.222)	0.012	0.001
285	23.75	0.07	0.013	(0.222)	0.012	0.001
286	23.83	0.07	0.013	(0.222)	0.012	0.001
287	23.92	0.07	0.013	(0.221)	0.012	0.001
288	24.00	0.07	0.013	(0.221)	0.012	0.001

(Loss Rate Not Used)

```
   Sum =     100.0                                  Sum =     1.9
      Flood volume = Effective rainfall      0.16(In)
       times area       9.6(Ac.)/[(In)/(Ft.)] =       0.1(Ac.Ft)
      Total soil loss =      1.44(In)
      Total soil loss =     1.148(Ac.Ft)
      Total rainfall =      1.60(In)
      Flood volume =        5558.2 Cubic Feet
      Total soil loss =       50023.4 Cubic Feet
      --------------------------------------------------------------------
       Peak flow rate of this hydrograph =      0.208(CFS)
      --------------------------------------------------------------------
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                         24 - H O U R    S T O R M
                    R u n o f f     H y d r o g r a p h
      --------------------------------------------------------------------
                 Hydrograph in   5   Minute intervals ((CFS))

      --------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5       5.0       7.5      10.0
-----------------------------------------------------------------------
  0+ 5      0.0000      0.00  Q         |         |         |         |
  0+10      0.0001      0.01  Q         |         |         |         |
  0+15      0.0001      0.01  Q         |         |         |         |
  0+20      0.0002      0.01  Q         |         |         |         |
  0+25      0.0003      0.02  Q         |         |         |         |
  0+30      0.0004      0.02  Q         |         |         |         |
  0+35      0.0006      0.02  Q         |         |         |         |
  0+40      0.0007      0.02  Q         |         |         |         |
  0+45      0.0008      0.02  Q         |         |         |         |
  0+50      0.0009      0.02  Q         |         |         |         |
  0+55      0.0011      0.02  Q         |         |         |         |
  1+ 0      0.0013      0.02  Q         |         |         |         |
  1+ 5      0.0014      0.02  Q         |         |         |         |
  1+10      0.0015      0.02  Q         |         |         |         |
  1+15      0.0017      0.02  Q         |         |         |         |
  1+20      0.0018      0.02  Q         |         |         |         |
  1+25      0.0019      0.02  Q         |         |         |         |
  1+30      0.0021      0.02  Q         |         |         |         |
  1+35      0.0022      0.02  Q         |         |         |         |
  1+40      0.0023      0.02  Q         |         |         |         |
  1+45      0.0025      0.02  Q         |         |         |         |
  1+50      0.0026      0.02  Q         |         |         |         |
  1+55      0.0027      0.02  Q         |         |         |         |
  2+ 0      0.0029      0.02  Q         |         |         |         |
  2+ 5      0.0031      0.02  Q         |         |         |         |
  2+10      0.0032      0.02  QV        |         |         |         |
  2+15      0.0034      0.02  QV        |         |         |         |
  2+20      0.0036      0.02  QV        |         |         |         |
  2+25      0.0037      0.02  QV        |         |         |         |
  2+30      0.0039      0.02  QV        |         |         |         |
```

```
2+35       0.0041      0.03  QV        |         |         |         |
2+40       0.0043      0.03  QV        |         |         |         |
2+45       0.0045      0.03  QV        |         |         |         |
2+50       0.0047      0.03  QV        |         |         |         |
2+55       0.0049      0.03  QV        |         |         |         |
3+ 0       0.0051      0.03  QV        |         |         |         |
3+ 5       0.0053      0.03  QV        |         |         |         |
3+10       0.0055      0.03  QV        |         |         |         |
3+15       0.0058      0.03  QV        |         |         |         |
3+20       0.0060      0.03  QV        |         |         |         |
3+25       0.0062      0.03  QV        |         |         |         |
3+30       0.0064      0.03  Q V       |         |         |         |
3+35       0.0066      0.03  Q V       |         |         |         |
3+40       0.0068      0.03  Q V       |         |         |         |
3+45       0.0070      0.03  Q V       |         |         |         |
3+50       0.0073      0.03  Q V       |         |         |         |
3+55       0.0075      0.03  Q V       |         |         |         |
4+ 0       0.0077      0.04  Q V       |         |         |         |
4+ 5       0.0080      0.04  Q V       |         |         |         |
4+10       0.0082      0.04  Q V       |         |         |         |
4+15       0.0085      0.04  Q V       |         |         |         |
4+20       0.0088      0.04  Q V       |         |         |         |
4+25       0.0090      0.04  Q V       |         |         |         |
4+30       0.0093      0.04  Q V       |         |         |         |
4+35       0.0096      0.04  Q  V      |         |         |         |
4+40       0.0099      0.04  Q  V      |         |         |         |
4+45       0.0102      0.04  Q  V      |         |         |         |
4+50       0.0105      0.04  Q  V      |         |         |         |
4+55       0.0108      0.05  Q  V      |         |         |         |
5+ 0       0.0112      0.05  Q  V      |         |         |         |
5+ 5       0.0115      0.05  Q  V      |         |         |         |
5+10       0.0118      0.04  Q  V      |         |         |         |
5+15       0.0120      0.04  Q  V      |         |         |         |
5+20       0.0123      0.04  Q  V      |         |         |         |
5+25       0.0126      0.04  Q  V      |         |         |         |
5+30       0.0129      0.04  Q   V     |         |         |         |
5+35       0.0132      0.04  Q   V     |         |         |         |
5+40       0.0135      0.05  Q   V     |         |         |         |
5+45       0.0138      0.05  Q   V     |         |         |         |
5+50       0.0142      0.05  Q   V     |         |         |         |
5+55       0.0145      0.05  Q   V     |         |         |         |
6+ 0       0.0149      0.05  Q   V     |         |         |         |
6+ 5       0.0152      0.05  Q   V     |         |         |         |
6+10       0.0156      0.05  Q   V     |         |         |         |
6+15       0.0159      0.05  Q   V     |         |         |         |
6+20       0.0163      0.05  Q    V    |         |         |         |
6+25       0.0167      0.06  Q    V    |         |         |         |
6+30       0.0171      0.06  Q    V    |         |         |         |
6+35       0.0175      0.06  Q    V    |         |         |         |
6+40       0.0179      0.06  Q    V    |         |         |         |
```

```
 6+45       0.0183      0.06  Q    V    |         |         |         |
 6+50       0.0187      0.06  Q    V    |         |         |         |
 6+55       0.0191      0.06  Q    V    |         |         |         |
 7+ 0       0.0196      0.06  Q     V   |         |         |         |
 7+ 5       0.0200      0.06  Q     V   |         |         |         |
 7+10       0.0204      0.06  Q     V   |         |         |         |
 7+15       0.0208      0.06  Q     V   |         |         |         |
 7+20       0.0213      0.06  Q     V   |         |         |         |
 7+25       0.0217      0.07  Q     V   |         |         |         |
 7+30       0.0222      0.07  Q     V   |         |         |         |
 7+35       0.0226      0.07  Q      V  |         |         |         |
 7+40       0.0231      0.07  Q      V  |         |         |         |
 7+45       0.0236      0.07  Q      V  |         |         |         |
 7+50       0.0241      0.07  Q      V  |         |         |         |
 7+55       0.0247      0.08  Q      V  |         |         |         |
 8+ 0       0.0252      0.08  Q      V  |         |         |         |
 8+ 5       0.0258      0.08  Q       V |         |         |         |
 8+10       0.0264      0.09  Q       V |         |         |         |
 8+15       0.0270      0.09  Q       V |         |         |         |
 8+20       0.0276      0.09  Q       V |         |         |         |
 8+25       0.0283      0.09  Q       V |         |         |         |
 8+30       0.0289      0.09  Q        V|         |         |         |
 8+35       0.0295      0.09  Q        V|         |         |         |
 8+40       0.0302      0.10  Q        V|         |         |         |
 8+45       0.0309      0.10  Q        V|         |         |         |
 8+50       0.0315      0.10  Q        V|         |         |         |
 8+55       0.0323      0.10  Q         V         |         |         |
 9+ 0       0.0330      0.10  Q         V         |         |         |
 9+ 5       0.0337      0.11  Q         V         |         |         |
 9+10       0.0345      0.11  Q         V         |         |         |
 9+15       0.0353      0.11  Q         |V        |         |         |
 9+20       0.0361      0.12  Q         |V        |         |         |
 9+25       0.0369      0.12  Q         |V        |         |         |
 9+30       0.0377      0.12  Q         |V        |         |         |
 9+35       0.0386      0.12  Q         | V       |         |         |
 9+40       0.0394      0.13  Q         | V       |         |         |
 9+45       0.0403      0.13  Q         | V       |         |         |
 9+50       0.0412      0.13  Q         | V       |         |         |
 9+55       0.0421      0.13  Q         |  V      |         |         |
10+ 0       0.0431      0.13  Q         |  V      |         |         |
10+ 5       0.0439      0.13  Q         |  V      |         |         |
10+10       0.0447      0.11  Q         |   V     |         |         |
10+15       0.0454      0.10  Q         |   V     |         |         |
10+20       0.0461      0.10  Q         |   V     |         |         |
10+25       0.0467      0.10  Q         |   V     |         |         |
10+30       0.0474      0.09  Q         |   V     |         |         |
10+35       0.0481      0.10  Q         |    V    |         |         |
10+40       0.0488      0.11  Q         |    V    |         |         |
10+45       0.0496      0.12  Q         |    V    |         |         |
10+50       0.0505      0.12  Q         |    V    |         |         |
```

```
10+55       0.0513      0.12  Q         |     V   |         |         |
11+ 0       0.0521      0.12  Q         |     V   |         |         |
11+ 5       0.0530      0.12  Q         |     V   |         |         |
11+10       0.0538      0.12  Q         |     V   |         |         |
11+15       0.0546      0.12  Q         |      V  |         |         |
11+20       0.0554      0.12  Q         |      V  |         |         |
11+25       0.0562      0.12  Q         |      V  |         |         |
11+30       0.0570      0.12  Q         |      V  |         |         |
11+35       0.0578      0.12  Q         |       V |         |         |
11+40       0.0586      0.11  Q         |       V |         |         |
11+45       0.0593      0.11  Q         |       V |         |         |
11+50       0.0601      0.11  Q         |       V |         |         |
11+55       0.0608      0.11  Q         |        V|         |         |
12+ 0       0.0616      0.11  Q         |        V|         |         |
12+ 5       0.0624      0.12  Q         |        V|         |         |
12+10       0.0634      0.14  Q         |        V|         |         |
12+15       0.0644      0.15  Q         |         V         |         |
12+20       0.0654      0.15  Q         |         V         |         |
12+25       0.0665      0.15  Q         |         V         |         |
12+30       0.0675      0.16  Q         |         |V        |         |
12+35       0.0686      0.16  Q         |         |V        |         |
12+40       0.0698      0.17  Q         |         |V        |         |
12+45       0.0710      0.17  Q         |         | V       |         |
12+50       0.0721      0.17  Q         |         | V       |         |
12+55       0.0734      0.18  Q         |         | V       |         |
13+ 0       0.0746      0.18  Q         |         |  V      |         |
13+ 5       0.0758      0.18  Q         |         |  V      |         |
13+10       0.0772      0.20  Q         |         |   V     |         |
13+15       0.0786      0.20  Q         |         |   V     |         |
13+20       0.0800      0.21  Q         |         |    V    |         |
13+25       0.0814      0.21  Q         |         |    V    |         |
13+30       0.0829      0.21  Q         |         |    V    |         |
13+35       0.0842      0.20  Q         |         |     V   |         |
13+40       0.0854      0.17  Q         |         |     V   |         |
13+45       0.0865      0.16  Q         |         |      V  |         |
13+50       0.0875      0.15  Q         |         |      V  |         |
13+55       0.0885      0.15  Q         |         |      V  |         |
14+ 0       0.0895      0.15  Q         |         |       V |         |
14+ 5       0.0905      0.15  Q         |         |       V |         |
14+10       0.0916      0.16  Q         |         |       V |         |
14+15       0.0927      0.16  Q         |         |        V|         |
14+20       0.0939      0.16  Q         |         |        V|         |
14+25       0.0950      0.16  Q         |         |        V|         |
14+30       0.0961      0.16  Q         |         |         V         |
14+35       0.0972      0.16  Q         |         |         V         |
14+40       0.0983      0.16  Q         |         |         V         |
14+45       0.0994      0.16  Q         |         |         |V        |
14+50       0.1005      0.16  Q         |         |         |V        |
14+55       0.1016      0.16  Q         |         |         |V        |
15+ 0       0.1027      0.16  Q         |         |         | V       |
```

```
15+ 5       0.1037      0.15  Q          |         |         |V        |
15+10       0.1048      0.15  Q          |         |         |V        |
15+15       0.1058      0.15  Q          |         |         | V       |
15+20       0.1068      0.15  Q          |         |         | V       |
15+25       0.1078      0.14  Q          |         |         | V       |
15+30       0.1088      0.14  Q          |         |         |  V      |
15+35       0.1098      0.14  Q          |         |         |  V      |
15+40       0.1106      0.13  Q          |         |         |  V      |
15+45       0.1115      0.12  Q          |         |         |  V      |
15+50       0.1123      0.12  Q          |         |         |   V     |
15+55       0.1131      0.12  Q          |         |         |   V     |
16+ 0       0.1139      0.12  Q          |         |         |   V     |
16+ 5       0.1147      0.10  Q          |         |         |   V     |
16+10       0.1151      0.06  Q          |         |         |    V    |
16+15       0.1154      0.04  Q          |         |         |    V    |
16+20       0.1156      0.04  Q          |         |         |    V    |
16+25       0.1158      0.03  Q          |         |         |    V    |
16+30       0.1160      0.03  Q          |         |         |    V    |
16+35       0.1162      0.03  Q          |         |         |    V    |
16+40       0.1164      0.02  Q          |         |         |    V    |
16+45       0.1165      0.02  Q          |         |         |    V    |
16+50       0.1167      0.02  Q          |         |         |    V    |
16+55       0.1168      0.02  Q          |         |         |    V    |
17+ 0       0.1169      0.02  Q          |         |         |    V    |
17+ 5       0.1171      0.02  Q          |         |         |    V    |
17+10       0.1172      0.03  Q          |         |         |    V    |
17+15       0.1174      0.03  Q          |         |         |    V    |
17+20       0.1176      0.03  Q          |         |         |    V    |
17+25       0.1178      0.03  Q          |         |         |    V    |
17+30       0.1180      0.03  Q          |         |         |     V   |
17+35       0.1183      0.03  Q          |         |         |     V   |
17+40       0.1185      0.03  Q          |         |         |     V   |
17+45       0.1187      0.03  Q          |         |         |     V   |
17+50       0.1189      0.03  Q          |         |         |     V   |
17+55       0.1191      0.03  Q          |         |         |     V   |
18+ 0       0.1193      0.03  Q          |         |         |     V   |
18+ 5       0.1194      0.03  Q          |         |         |     V   |
18+10       0.1196      0.03  Q          |         |         |     V   |
18+15       0.1198      0.03  Q          |         |         |     V   |
18+20       0.1199      0.02  Q          |         |         |     V   |
18+25       0.1201      0.02  Q          |         |         |     V   |
18+30       0.1203      0.02  Q          |         |         |     V   |
18+35       0.1204      0.02  Q          |         |         |     V   |
18+40       0.1206      0.02  Q          |         |         |     V   |
18+45       0.1207      0.02  Q          |         |         |     V   |
18+50       0.1209      0.02  Q          |         |         |     V   |
18+55       0.1210      0.02  Q          |         |         |     V   |
19+ 0       0.1211      0.01  Q          |         |         |     V   |
19+ 5       0.1212      0.01  Q          |         |         |     V   |
19+10       0.1213      0.02  Q          |         |         |      V  |
```

```
19+15        0.1214       0.02  Q          |          |          |        V |
19+20        0.1215       0.02  Q          |          |          |        V |
19+25        0.1217       0.02  Q          |          |          |        V |
19+30        0.1218       0.02  Q          |          |          |        V |
19+35        0.1220       0.02  Q          |          |          |        V |
19+40        0.1221       0.02  Q          |          |          |        V |
19+45        0.1223       0.02  Q          |          |          |        V |
19+50        0.1224       0.02  Q          |          |          |        V |
19+55        0.1225       0.02  Q          |          |          |        V |
20+ 0        0.1226       0.01  Q          |          |          |        V |
20+ 5        0.1227       0.01  Q          |          |          |        V |
20+10        0.1228       0.02  Q          |          |          |        V |
20+15        0.1229       0.02  Q          |          |          |        V |
20+20        0.1230       0.02  Q          |          |          |        V |
20+25        0.1232       0.02  Q          |          |          |        V |
20+30        0.1233       0.02  Q          |          |          |        V |
20+35        0.1234       0.02  Q          |          |          |        V |
20+40        0.1235       0.02  Q          |          |          |        V |
20+45        0.1237       0.02  Q          |          |          |        V |
20+50        0.1238       0.02  Q          |          |          |        V |
20+55        0.1239       0.01  Q          |          |          |        V |
21+ 0        0.1240       0.01  Q          |          |          |        V |
21+ 5        0.1241       0.01  Q          |          |          |        V |
21+10        0.1242       0.02  Q          |          |          |        V |
21+15        0.1243       0.02  Q          |          |          |        V |
21+20        0.1244       0.02  Q          |          |          |         V|
21+25        0.1245       0.01  Q          |          |          |         V|
21+30        0.1246       0.01  Q          |          |          |         V|
21+35        0.1247       0.01  Q          |          |          |         V|
21+40        0.1248       0.02  Q          |          |          |         V|
21+45        0.1250       0.02  Q          |          |          |         V|
21+50        0.1251       0.02  Q          |          |          |         V|
21+55        0.1252       0.01  Q          |          |          |         V|
22+ 0        0.1253       0.01  Q          |          |          |         V|
22+ 5        0.1254       0.01  Q          |          |          |         V|
22+10        0.1255       0.02  Q          |          |          |         V|
22+15        0.1256       0.02  Q          |          |          |         V|
22+20        0.1257       0.02  Q          |          |          |         V|
22+25        0.1258       0.01  Q          |          |          |         V|
22+30        0.1259       0.01  Q          |          |          |         V|
22+35        0.1260       0.01  Q          |          |          |         V|
22+40        0.1261       0.01  Q          |          |          |         V|
22+45        0.1262       0.01  Q          |          |          |         V|
22+50        0.1263       0.01  Q          |          |          |         V|
22+55        0.1263       0.01  Q          |          |          |         V|
23+ 0        0.1264       0.01  Q          |          |          |         V|
23+ 5        0.1265       0.01  Q          |          |          |         V|
23+10        0.1266       0.01  Q          |          |          |         V|
23+15        0.1267       0.01  Q          |          |          |         V|
23+20        0.1268       0.01  Q          |          |          |         V|
```

```
   23+25        0.1269      0.01  Q           |           |           |         V|
   23+30        0.1269      0.01  Q           |           |           |         V|
   23+35        0.1270      0.01  Q           |           |           |         V|
   23+40        0.1271      0.01  Q           |           |           |         V|
   23+45        0.1272      0.01  Q           |           |           |         V|
   23+50        0.1273      0.01  Q           |           |           |         V|
   23+55        0.1274      0.01  Q           |           |           |         V|
   24+ 0        0.1275      0.01  Q           |           |           |         V|
   24+ 5        0.1275      0.01  Q           |           |           |         V|
   24+10        0.1276      0.00  Q           |           |           |         V|
   24+15        0.1276      0.00  Q           |           |           |         V|
   24+20        0.1276      0.00  Q           |           |           |         V|
   24+25        0.1276      0.00  Q           |           |           |         V|
   24+30        0.1276      0.00  Q           |           |           |         V|
   24+35        0.1276      0.00  Q           |           |           |         V|
   24+40        0.1276      0.00  Q           |           |           |         V|
   24+45        0.1276      0.00  Q           |           |           |         V|
-----------------------------------------------------------------------------------
```

```
        U n i t   H y d r o g r a p h   A n a l y s i s

        Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1
                Study date  01/11/22 File: 100YRPOST245245.out


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------------------------------------------------------------------------

Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978


Program License Serial Number 6215

---------------------------------------------------------------------
 English (in-lb) Input Units Used
 English Rainfall Data (Inches) Input Values Used

 English Units used in output format



---------------------------------------------------------------------
100YRPOST245



--------------------------------------------------------------------
Drainage Area =       9.57(Ac.)  =      0.015 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =       9.57(Ac.)  =
0.015 Sq. Mi.
Length along longest watercourse =    1318.88(Ft.)
Length along longest watercourse measured to centroid =     656.30(Ft.)
Length along longest watercourse =      0.250 Mi.
Length along longest watercourse measured to centroid =      0.124 Mi.
Difference in elevation =      10.01(Ft.)
Slope along watercourse =     40.0740 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.048 Hr.
Lag time =     2.86 Min.
25% of lag time =     0.72 Min.
40% of lag time =     1.15 Min.
Unit time =     5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow =     0.00(CFS)

2 YEAR Area rainfall data:
```

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.57	1.60	15.31

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.57	4.00	38.28

STORM EVENT (YEAR) = 5.00
Area Averaged 2-Year Rainfall = 1.600(In)
Area Averaged 100-Year Rainfall = 4.000(In)

Point rain (area averaged) = 2.162(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.162(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.570	56.00	0.610

Total Area Entered = 9.57(Ac.)

RI AMC2	RI AMC-1	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
56.0	36.0	0.706	0.610	0.318	1.000	0.318
					Sum (F) =	0.318

Area averaged mean soil loss (F) (In/Hr) = 0.318
Minimum soil loss rate ((In/Hr)) = 0.159
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	174.616	38.645	3.727
2	0.167	349.233	45.177	4.357
3	0.250	523.849	9.915	0.956
4	0.333	698.466	4.119	0.397
5	0.417	873.082	2.145	0.207
			Sum = 100.000	Sum= 9.645

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.017	(0.564)	0.016	0.002
2	0.17	0.07	0.017	(0.562)	0.016	0.002
3	0.25	0.07	0.017	(0.560)	0.016	0.002
4	0.33	0.10	0.026	(0.558)	0.023	0.003
5	0.42	0.10	0.026	(0.556)	0.023	0.003
6	0.50	0.10	0.026	(0.554)	0.023	0.003
7	0.58	0.10	0.026	(0.551)	0.023	0.003
8	0.67	0.10	0.026	(0.549)	0.023	0.003
9	0.75	0.10	0.026	(0.547)	0.023	0.003
10	0.83	0.13	0.035	(0.545)	0.031	0.003
11	0.92	0.13	0.035	(0.543)	0.031	0.003
12	1.00	0.13	0.035	(0.541)	0.031	0.003
13	1.08	0.10	0.026	(0.539)	0.023	0.003
14	1.17	0.10	0.026	(0.536)	0.023	0.003
15	1.25	0.10	0.026	(0.534)	0.023	0.003
16	1.33	0.10	0.026	(0.532)	0.023	0.003
17	1.42	0.10	0.026	(0.530)	0.023	0.003
18	1.50	0.10	0.026	(0.528)	0.023	0.003
19	1.58	0.10	0.026	(0.526)	0.023	0.003
20	1.67	0.10	0.026	(0.524)	0.023	0.003
21	1.75	0.10	0.026	(0.522)	0.023	0.003
22	1.83	0.13	0.035	(0.519)	0.031	0.003
23	1.92	0.13	0.035	(0.517)	0.031	0.003
24	2.00	0.13	0.035	(0.515)	0.031	0.003
25	2.08	0.13	0.035	(0.513)	0.031	0.003
26	2.17	0.13	0.035	(0.511)	0.031	0.003
27	2.25	0.13	0.035	(0.509)	0.031	0.003
28	2.33	0.13	0.035	(0.507)	0.031	0.003
29	2.42	0.13	0.035	(0.505)	0.031	0.003
30	2.50	0.13	0.035	(0.503)	0.031	0.003
31	2.58	0.17	0.043	(0.501)	0.039	0.004
32	2.67	0.17	0.043	(0.499)	0.039	0.004
33	2.75	0.17	0.043	(0.497)	0.039	0.004
34	2.83	0.17	0.043	(0.495)	0.039	0.004
35	2.92	0.17	0.043	(0.493)	0.039	0.004
36	3.00	0.17	0.043	(0.491)	0.039	0.004
37	3.08	0.17	0.043	(0.489)	0.039	0.004
38	3.17	0.17	0.043	(0.487)	0.039	0.004
39	3.25	0.17	0.043	(0.485)	0.039	0.004
40	3.33	0.17	0.043	(0.482)	0.039	0.004
41	3.42	0.17	0.043	(0.480)	0.039	0.004
42	3.50	0.17	0.043	(0.478)	0.039	0.004
43	3.58	0.17	0.043	(0.476)	0.039	0.004
44	3.67	0.17	0.043	(0.474)	0.039	0.004

45	3.75	0.17	0.043	(0.472)	0.039	0.004
46	3.83	0.20	0.052	(0.470)	0.047	0.005
47	3.92	0.20	0.052	(0.468)	0.047	0.005
48	4.00	0.20	0.052	(0.466)	0.047	0.005
49	4.08	0.20	0.052	(0.465)	0.047	0.005
50	4.17	0.20	0.052	(0.463)	0.047	0.005
51	4.25	0.20	0.052	(0.461)	0.047	0.005
52	4.33	0.23	0.061	(0.459)	0.054	0.006
53	4.42	0.23	0.061	(0.457)	0.054	0.006
54	4.50	0.23	0.061	(0.455)	0.054	0.006
55	4.58	0.23	0.061	(0.453)	0.054	0.006
56	4.67	0.23	0.061	(0.451)	0.054	0.006
57	4.75	0.23	0.061	(0.449)	0.054	0.006
58	4.83	0.27	0.069	(0.447)	0.062	0.007
59	4.92	0.27	0.069	(0.445)	0.062	0.007
60	5.00	0.27	0.069	(0.443)	0.062	0.007
61	5.08	0.20	0.052	(0.441)	0.047	0.005
62	5.17	0.20	0.052	(0.439)	0.047	0.005
63	5.25	0.20	0.052	(0.437)	0.047	0.005
64	5.33	0.23	0.061	(0.435)	0.054	0.006
65	5.42	0.23	0.061	(0.433)	0.054	0.006
66	5.50	0.23	0.061	(0.432)	0.054	0.006
67	5.58	0.27	0.069	(0.430)	0.062	0.007
68	5.67	0.27	0.069	(0.428)	0.062	0.007
69	5.75	0.27	0.069	(0.426)	0.062	0.007
70	5.83	0.27	0.069	(0.424)	0.062	0.007
71	5.92	0.27	0.069	(0.422)	0.062	0.007
72	6.00	0.27	0.069	(0.420)	0.062	0.007
73	6.08	0.30	0.078	(0.418)	0.070	0.008
74	6.17	0.30	0.078	(0.417)	0.070	0.008
75	6.25	0.30	0.078	(0.415)	0.070	0.008
76	6.33	0.30	0.078	(0.413)	0.070	0.008
77	6.42	0.30	0.078	(0.411)	0.070	0.008
78	6.50	0.30	0.078	(0.409)	0.070	0.008
79	6.58	0.33	0.086	(0.407)	0.078	0.009
80	6.67	0.33	0.086	(0.405)	0.078	0.009
81	6.75	0.33	0.086	(0.404)	0.078	0.009
82	6.83	0.33	0.086	(0.402)	0.078	0.009
83	6.92	0.33	0.086	(0.400)	0.078	0.009
84	7.00	0.33	0.086	(0.398)	0.078	0.009
85	7.08	0.33	0.086	(0.396)	0.078	0.009
86	7.17	0.33	0.086	(0.395)	0.078	0.009
87	7.25	0.33	0.086	(0.393)	0.078	0.009
88	7.33	0.37	0.095	(0.391)	0.086	0.010
89	7.42	0.37	0.095	(0.389)	0.086	0.010
90	7.50	0.37	0.095	(0.387)	0.086	0.010
91	7.58	0.40	0.104	(0.386)	0.093	0.010
92	7.67	0.40	0.104	(0.384)	0.093	0.010
93	7.75	0.40	0.104	(0.382)	0.093	0.010
94	7.83	0.43	0.112	(0.380)	0.101	0.011

95	7.92	0.43	0.112	(0.379)	0.101	0.011
96	8.00	0.43	0.112	(0.377)	0.101	0.011
97	8.08	0.50	0.130	(0.375)	0.117	0.013
98	8.17	0.50	0.130	(0.373)	0.117	0.013
99	8.25	0.50	0.130	(0.372)	0.117	0.013
100	8.33	0.50	0.130	(0.370)	0.117	0.013
101	8.42	0.50	0.130	(0.368)	0.117	0.013
102	8.50	0.50	0.130	(0.366)	0.117	0.013
103	8.58	0.53	0.138	(0.365)	0.125	0.014
104	8.67	0.53	0.138	(0.363)	0.125	0.014
105	8.75	0.53	0.138	(0.361)	0.125	0.014
106	8.83	0.57	0.147	(0.360)	0.132	0.015
107	8.92	0.57	0.147	(0.358)	0.132	0.015
108	9.00	0.57	0.147	(0.356)	0.132	0.015
109	9.08	0.63	0.164	(0.354)	0.148	0.016
110	9.17	0.63	0.164	(0.353)	0.148	0.016
111	9.25	0.63	0.164	(0.351)	0.148	0.016
112	9.33	0.67	0.173	(0.349)	0.156	0.017
113	9.42	0.67	0.173	(0.348)	0.156	0.017
114	9.50	0.67	0.173	(0.346)	0.156	0.017
115	9.58	0.70	0.182	(0.344)	0.163	0.018
116	9.67	0.70	0.182	(0.343)	0.163	0.018
117	9.75	0.70	0.182	(0.341)	0.163	0.018
118	9.83	0.73	0.190	(0.340)	0.171	0.019
119	9.92	0.73	0.190	(0.338)	0.171	0.019
120	10.00	0.73	0.190	(0.336)	0.171	0.019
121	10.08	0.50	0.130	(0.335)	0.117	0.013
122	10.17	0.50	0.130	(0.333)	0.117	0.013
123	10.25	0.50	0.130	(0.331)	0.117	0.013
124	10.33	0.50	0.130	(0.330)	0.117	0.013
125	10.42	0.50	0.130	(0.328)	0.117	0.013
126	10.50	0.50	0.130	(0.327)	0.117	0.013
127	10.58	0.67	0.173	(0.325)	0.156	0.017
128	10.67	0.67	0.173	(0.323)	0.156	0.017
129	10.75	0.67	0.173	(0.322)	0.156	0.017
130	10.83	0.67	0.173	(0.320)	0.156	0.017
131	10.92	0.67	0.173	(0.319)	0.156	0.017
132	11.00	0.67	0.173	(0.317)	0.156	0.017
133	11.08	0.63	0.164	(0.316)	0.148	0.016
134	11.17	0.63	0.164	(0.314)	0.148	0.016
135	11.25	0.63	0.164	(0.312)	0.148	0.016
136	11.33	0.63	0.164	(0.311)	0.148	0.016
137	11.42	0.63	0.164	(0.309)	0.148	0.016
138	11.50	0.63	0.164	(0.308)	0.148	0.016
139	11.58	0.57	0.147	(0.306)	0.132	0.015
140	11.67	0.57	0.147	(0.305)	0.132	0.015
141	11.75	0.57	0.147	(0.303)	0.132	0.015
142	11.83	0.60	0.156	(0.302)	0.140	0.016
143	11.92	0.60	0.156	(0.300)	0.140	0.016
144	12.00	0.60	0.156	(0.299)	0.140	0.016

145	12.08	0.83	0.216	(0.297)	0.195	0.022
146	12.17	0.83	0.216	(0.296)	0.195	0.022
147	12.25	0.83	0.216	(0.294)	0.195	0.022
148	12.33	0.87	0.225	(0.293)	0.202	0.022
149	12.42	0.87	0.225	(0.291)	0.202	0.022
150	12.50	0.87	0.225	(0.290)	0.202	0.022
151	12.58	0.93	0.242	(0.288)	0.218	0.024
152	12.67	0.93	0.242	(0.287)	0.218	0.024
153	12.75	0.93	0.242	(0.285)	0.218	0.024
154	12.83	0.97	0.251	(0.284)	0.226	0.025
155	12.92	0.97	0.251	(0.283)	0.226	0.025
156	13.00	0.97	0.251	(0.281)	0.226	0.025
157	13.08	1.13	0.294	(0.280)	0.265	0.029
158	13.17	1.13	0.294	(0.278)	0.265	0.029
159	13.25	1.13	0.294	(0.277)	0.265	0.029
160	13.33	1.13	0.294	(0.276)	0.265	0.029
161	13.42	1.13	0.294	(0.274)	0.265	0.029
162	13.50	1.13	0.294	(0.273)	0.265	0.029
163	13.58	0.77	0.199	(0.271)	0.179	0.020
164	13.67	0.77	0.199	(0.270)	0.179	0.020
165	13.75	0.77	0.199	(0.269)	0.179	0.020
166	13.83	0.77	0.199	(0.267)	0.179	0.020
167	13.92	0.77	0.199	(0.266)	0.179	0.020
168	14.00	0.77	0.199	(0.264)	0.179	0.020
169	14.08	0.90	0.234	(0.263)	0.210	0.023
170	14.17	0.90	0.234	(0.262)	0.210	0.023
171	14.25	0.90	0.234	(0.260)	0.210	0.023
172	14.33	0.87	0.225	(0.259)	0.202	0.022
173	14.42	0.87	0.225	(0.258)	0.202	0.022
174	14.50	0.87	0.225	(0.256)	0.202	0.022
175	14.58	0.87	0.225	(0.255)	0.202	0.022
176	14.67	0.87	0.225	(0.254)	0.202	0.022
177	14.75	0.87	0.225	(0.253)	0.202	0.022
178	14.83	0.83	0.216	(0.251)	0.195	0.022
179	14.92	0.83	0.216	(0.250)	0.195	0.022
180	15.00	0.83	0.216	(0.249)	0.195	0.022
181	15.08	0.80	0.208	(0.247)	0.187	0.021
182	15.17	0.80	0.208	(0.246)	0.187	0.021
183	15.25	0.80	0.208	(0.245)	0.187	0.021
184	15.33	0.77	0.199	(0.244)	0.179	0.020
185	15.42	0.77	0.199	(0.242)	0.179	0.020
186	15.50	0.77	0.199	(0.241)	0.179	0.020
187	15.58	0.63	0.164	(0.240)	0.148	0.016
188	15.67	0.63	0.164	(0.239)	0.148	0.016
189	15.75	0.63	0.164	(0.237)	0.148	0.016
190	15.83	0.63	0.164	(0.236)	0.148	0.016
191	15.92	0.63	0.164	(0.235)	0.148	0.016
192	16.00	0.63	0.164	(0.234)	0.148	0.016
193	16.08	0.13	0.035	(0.233)	0.031	0.003
194	16.17	0.13	0.035	(0.231)	0.031	0.003

195	16.25	0.13	0.035	(0.230)	0.031	0.003
196	16.33	0.13	0.035	(0.229)	0.031	0.003
197	16.42	0.13	0.035	(0.228)	0.031	0.003
198	16.50	0.13	0.035	(0.227)	0.031	0.003
199	16.58	0.10	0.026	(0.226)	0.023	0.003
200	16.67	0.10	0.026	(0.224)	0.023	0.003
201	16.75	0.10	0.026	(0.223)	0.023	0.003
202	16.83	0.10	0.026	(0.222)	0.023	0.003
203	16.92	0.10	0.026	(0.221)	0.023	0.003
204	17.00	0.10	0.026	(0.220)	0.023	0.003
205	17.08	0.17	0.043	(0.219)	0.039	0.004
206	17.17	0.17	0.043	(0.218)	0.039	0.004
207	17.25	0.17	0.043	(0.217)	0.039	0.004
208	17.33	0.17	0.043	(0.216)	0.039	0.004
209	17.42	0.17	0.043	(0.214)	0.039	0.004
210	17.50	0.17	0.043	(0.213)	0.039	0.004
211	17.58	0.17	0.043	(0.212)	0.039	0.004
212	17.67	0.17	0.043	(0.211)	0.039	0.004
213	17.75	0.17	0.043	(0.210)	0.039	0.004
214	17.83	0.13	0.035	(0.209)	0.031	0.003
215	17.92	0.13	0.035	(0.208)	0.031	0.003
216	18.00	0.13	0.035	(0.207)	0.031	0.003
217	18.08	0.13	0.035	(0.206)	0.031	0.003
218	18.17	0.13	0.035	(0.205)	0.031	0.003
219	18.25	0.13	0.035	(0.204)	0.031	0.003
220	18.33	0.13	0.035	(0.203)	0.031	0.003
221	18.42	0.13	0.035	(0.202)	0.031	0.003
222	18.50	0.13	0.035	(0.201)	0.031	0.003
223	18.58	0.10	0.026	(0.200)	0.023	0.003
224	18.67	0.10	0.026	(0.199)	0.023	0.003
225	18.75	0.10	0.026	(0.198)	0.023	0.003
226	18.83	0.07	0.017	(0.197)	0.016	0.002
227	18.92	0.07	0.017	(0.196)	0.016	0.002
228	19.00	0.07	0.017	(0.195)	0.016	0.002
229	19.08	0.10	0.026	(0.194)	0.023	0.003
230	19.17	0.10	0.026	(0.194)	0.023	0.003
231	19.25	0.10	0.026	(0.193)	0.023	0.003
232	19.33	0.13	0.035	(0.192)	0.031	0.003
233	19.42	0.13	0.035	(0.191)	0.031	0.003
234	19.50	0.13	0.035	(0.190)	0.031	0.003
235	19.58	0.10	0.026	(0.189)	0.023	0.003
236	19.67	0.10	0.026	(0.188)	0.023	0.003
237	19.75	0.10	0.026	(0.187)	0.023	0.003
238	19.83	0.07	0.017	(0.187)	0.016	0.002
239	19.92	0.07	0.017	(0.186)	0.016	0.002
240	20.00	0.07	0.017	(0.185)	0.016	0.002
241	20.08	0.10	0.026	(0.184)	0.023	0.003
242	20.17	0.10	0.026	(0.183)	0.023	0.003
243	20.25	0.10	0.026	(0.182)	0.023	0.003
244	20.33	0.10	0.026	(0.182)	0.023	0.003

245	20.42	0.10	0.026	(0.181)	0.023	0.003
246	20.50	0.10	0.026	(0.180)	0.023	0.003
247	20.58	0.10	0.026	(0.179)	0.023	0.003
248	20.67	0.10	0.026	(0.179)	0.023	0.003
249	20.75	0.10	0.026	(0.178)	0.023	0.003
250	20.83	0.07	0.017	(0.177)	0.016	0.002
251	20.92	0.07	0.017	(0.176)	0.016	0.002
252	21.00	0.07	0.017	(0.176)	0.016	0.002
253	21.08	0.10	0.026	(0.175)	0.023	0.003
254	21.17	0.10	0.026	(0.174)	0.023	0.003
255	21.25	0.10	0.026	(0.174)	0.023	0.003
256	21.33	0.07	0.017	(0.173)	0.016	0.002
257	21.42	0.07	0.017	(0.172)	0.016	0.002
258	21.50	0.07	0.017	(0.172)	0.016	0.002
259	21.58	0.10	0.026	(0.171)	0.023	0.003
260	21.67	0.10	0.026	(0.170)	0.023	0.003
261	21.75	0.10	0.026	(0.170)	0.023	0.003
262	21.83	0.07	0.017	(0.169)	0.016	0.002
263	21.92	0.07	0.017	(0.169)	0.016	0.002
264	22.00	0.07	0.017	(0.168)	0.016	0.002
265	22.08	0.10	0.026	(0.168)	0.023	0.003
266	22.17	0.10	0.026	(0.167)	0.023	0.003
267	22.25	0.10	0.026	(0.166)	0.023	0.003
268	22.33	0.07	0.017	(0.166)	0.016	0.002
269	22.42	0.07	0.017	(0.165)	0.016	0.002
270	22.50	0.07	0.017	(0.165)	0.016	0.002
271	22.58	0.07	0.017	(0.164)	0.016	0.002
272	22.67	0.07	0.017	(0.164)	0.016	0.002
273	22.75	0.07	0.017	(0.164)	0.016	0.002
274	22.83	0.07	0.017	(0.163)	0.016	0.002
275	22.92	0.07	0.017	(0.163)	0.016	0.002
276	23.00	0.07	0.017	(0.162)	0.016	0.002
277	23.08	0.07	0.017	(0.162)	0.016	0.002
278	23.17	0.07	0.017	(0.162)	0.016	0.002
279	23.25	0.07	0.017	(0.161)	0.016	0.002
280	23.33	0.07	0.017	(0.161)	0.016	0.002
281	23.42	0.07	0.017	(0.161)	0.016	0.002
282	23.50	0.07	0.017	(0.160)	0.016	0.002
283	23.58	0.07	0.017	(0.160)	0.016	0.002
284	23.67	0.07	0.017	(0.160)	0.016	0.002
285	23.75	0.07	0.017	(0.160)	0.016	0.002
286	23.83	0.07	0.017	(0.159)	0.016	0.002
287	23.92	0.07	0.017	(0.159)	0.016	0.002
288	24.00	0.07	0.017	(0.159)	0.016	0.002

(Loss Rate Not Used)

Sum = 100.0 Sum = 2.6

Flood volume = Effective rainfall 0.22(In)

times area 9.6(Ac.)/[(In)/(Ft.)] = 0.2(Ac.Ft)

Total soil loss = 1.95(In)

Total soil loss = 1.552(Ac.Ft)

```
      Total rainfall =       2.16(In)
      Flood volume =         7510.9 Cubic Feet
      Total soil loss =        67598.4 Cubic Feet
      --------------------------------------------------------------------
       Peak flow rate of this hydrograph =      0.284(CFS)
      --------------------------------------------------------------------
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                         24 - H O U R    S T O R M
                      R u n o f f     H y d r o g r a p h
      --------------------------------------------------------------------
                  Hydrograph in   5   Minute intervals ((CFS))

      --------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5       5.0       7.5      10.0
-----------------------------------------------------------------------
  0+ 5       0.0000      0.01  Q         |         |         |         |
  0+10       0.0001      0.01  Q         |         |         |         |
  0+15       0.0002      0.02  Q         |         |         |         |
  0+20       0.0004      0.02  Q         |         |         |         |
  0+25       0.0005      0.02  Q         |         |         |         |
  0+30       0.0007      0.02  Q         |         |         |         |
  0+35       0.0009      0.02  Q         |         |         |         |
  0+40       0.0011      0.03  Q         |         |         |         |
  0+45       0.0012      0.03  Q         |         |         |         |
  0+50       0.0014      0.03  Q         |         |         |         |
  0+55       0.0016      0.03  Q         |         |         |         |
  1+ 0       0.0019      0.03  Q         |         |         |         |
  1+ 5       0.0021      0.03  Q         |         |         |         |
  1+10       0.0023      0.03  Q         |         |         |         |
  1+15       0.0024      0.03  Q         |         |         |         |
  1+20       0.0026      0.03  Q         |         |         |         |
  1+25       0.0028      0.03  Q         |         |         |         |
  1+30       0.0030      0.03  Q         |         |         |         |
  1+35       0.0031      0.03  Q         |         |         |         |
  1+40       0.0033      0.03  Q         |         |         |         |
  1+45       0.0035      0.03  Q         |         |         |         |
  1+50       0.0037      0.03  Q         |         |         |         |
  1+55       0.0039      0.03  Q         |         |         |         |
  2+ 0       0.0041      0.03  Q         |         |         |         |
  2+ 5       0.0043      0.03  QV        |         |         |         |
  2+10       0.0046      0.03  QV        |         |         |         |
  2+15       0.0048      0.03  QV        |         |         |         |
  2+20       0.0050      0.03  QV        |         |         |         |
  2+25       0.0053      0.03  QV        |         |         |         |
  2+30       0.0055      0.03  QV        |         |         |         |
  2+35       0.0057      0.04  QV        |         |         |         |
  2+40       0.0060      0.04  QV        |         |         |         |
  2+45       0.0063      0.04  QV        |         |         |         |
  2+50       0.0066      0.04  QV        |         |         |         |
  2+55       0.0069      0.04  QV        |         |         |         |
```

```
3+ 0       0.0072      0.04  QV        |         |         |         |
3+ 5       0.0075      0.04  QV        |         |         |         |
3+10       0.0077      0.04  QV        |         |         |         |
3+15       0.0080      0.04  QV        |         |         |         |
3+20       0.0083      0.04  QV        |         |         |         |
3+25       0.0086      0.04  QV        |         |         |         |
3+30       0.0089      0.04  Q V       |         |         |         |
3+35       0.0092      0.04  Q V       |         |         |         |
3+40       0.0095      0.04  Q V       |         |         |         |
3+45       0.0098      0.04  Q V       |         |         |         |
3+50       0.0101      0.04  Q V       |         |         |         |
3+55       0.0104      0.05  Q V       |         |         |         |
4+ 0       0.0107      0.05  Q V       |         |         |         |
4+ 5       0.0111      0.05  Q V       |         |         |         |
4+10       0.0114      0.05  Q V       |         |         |         |
4+15       0.0118      0.05  Q V       |         |         |         |
4+20       0.0121      0.05  Q V       |         |         |         |
4+25       0.0125      0.06  Q V       |         |         |         |
4+30       0.0129      0.06  Q  V      |         |         |         |
4+35       0.0133      0.06  Q  V      |         |         |         |
4+40       0.0137      0.06  Q  V      |         |         |         |
4+45       0.0141      0.06  Q  V      |         |         |         |
4+50       0.0146      0.06  Q  V      |         |         |         |
4+55       0.0150      0.07  Q  V      |         |         |         |
5+ 0       0.0155      0.07  Q  V      |         |         |         |
5+ 5       0.0159      0.06  Q  V      |         |         |         |
5+10       0.0162      0.05  Q  V      |         |         |         |
5+15       0.0166      0.05  Q  V      |         |         |         |
5+20       0.0170      0.05  Q  V      |         |         |         |
5+25       0.0174      0.06  Q   V     |         |         |         |
5+30       0.0178      0.06  Q   V     |         |         |         |
5+35       0.0182      0.06  Q   V     |         |         |         |
5+40       0.0186      0.07  Q   V     |         |         |         |
5+45       0.0191      0.07  Q   V     |         |         |         |
5+50       0.0195      0.07  Q   V     |         |         |         |
5+55       0.0200      0.07  Q   V     |         |         |         |
6+ 0       0.0205      0.07  Q   V     |         |         |         |
6+ 5       0.0210      0.07  Q   V     |         |         |         |
6+10       0.0215      0.07  Q   V     |         |         |         |
6+15       0.0220      0.07  Q    V    |         |         |         |
6+20       0.0225      0.07  Q    V    |         |         |         |
6+25       0.0230      0.08  Q    V    |         |         |         |
6+30       0.0235      0.08  Q    V    |         |         |         |
6+35       0.0241      0.08  Q    V    |         |         |         |
6+40       0.0246      0.08  Q    V    |         |         |         |
6+45       0.0252      0.08  Q    V    |         |         |         |
6+50       0.0258      0.08  Q    V    |         |         |         |
6+55       0.0263      0.08  Q     V   |         |         |         |
7+ 0       0.0269      0.08  Q     V   |         |         |         |
7+ 5       0.0275      0.08  Q     V   |         |         |         |
```

```
 7+10       0.0281      0.08  Q     V   |         |         |         |
 7+15       0.0286      0.08  Q     V   |         |         |         |
 7+20       0.0292      0.09  Q     V   |         |         |         |
 7+25       0.0299      0.09  Q     V   |         |         |         |
 7+30       0.0305      0.09  Q      V  |         |         |         |
 7+35       0.0311      0.09  Q      V  |         |         |         |
 7+40       0.0318      0.10  Q      V  |         |         |         |
 7+45       0.0325      0.10  Q      V  |         |         |         |
 7+50       0.0332      0.10  Q      V  |         |         |         |
 7+55       0.0340      0.11  Q      V  |         |         |         |
 8+ 0       0.0347      0.11  Q       V |         |         |         |
 8+ 5       0.0355      0.11  Q       V |         |         |         |
 8+10       0.0363      0.12  Q       V |         |         |         |
 8+15       0.0372      0.12  Q       V |         |         |         |
 8+20       0.0381      0.12  Q       V |         |         |         |
 8+25       0.0389      0.13  Q        V|         |         |         |
 8+30       0.0398      0.13  Q        V|         |         |         |
 8+35       0.0407      0.13  Q        V|         |         |         |
 8+40       0.0416      0.13  Q        V|         |         |         |
 8+45       0.0425      0.13  Q        V|         |         |         |
 8+50       0.0434      0.14  Q         V         |         |         |
 8+55       0.0444      0.14  Q         V         |         |         |
 9+ 0       0.0454      0.14  Q         V         |         |         |
 9+ 5       0.0464      0.15  Q         V         |         |         |
 9+10       0.0475      0.16  Q         |V        |         |         |
 9+15       0.0486      0.16  Q         |V        |         |         |
 9+20       0.0497      0.16  Q         |V        |         |         |
 9+25       0.0508      0.17  Q         |V        |         |         |
 9+30       0.0519      0.17  Q         | V       |         |         |
 9+35       0.0531      0.17  Q         | V       |         |         |
 9+40       0.0543      0.17  Q         | V       |         |         |
 9+45       0.0555      0.17  Q         | V       |         |         |
 9+50       0.0567      0.18  Q         |  V      |         |         |
 9+55       0.0580      0.18  Q         |  V      |         |         |
10+ 0       0.0593      0.18  Q         |  V      |         |         |
10+ 5       0.0604      0.16  Q         |   V     |         |         |
10+10       0.0613      0.13  Q         |   V     |         |         |
10+15       0.0622      0.13  Q         |   V     |         |         |
10+20       0.0631      0.13  Q         |   V     |         |         |
10+25       0.0639      0.13  Q         |   V     |         |         |
10+30       0.0648      0.13  Q         |    V    |         |         |
10+35       0.0658      0.14  Q         |    V    |         |         |
10+40       0.0669      0.16  Q         |    V    |         |         |
10+45       0.0680      0.16  Q         |    V    |         |         |
10+50       0.0691      0.17  Q         |     V   |         |         |
10+55       0.0703      0.17  Q         |     V   |         |         |
11+ 0       0.0714      0.17  Q         |     V   |         |         |
11+ 5       0.0726      0.16  Q         |     V   |         |         |
11+10       0.0737      0.16  Q         |      V  |         |         |
11+15       0.0748      0.16  Q         |      V  |         |         |
```

```
11+20       0.0758      0.16  Q         |      V  |         |         |
11+25       0.0769      0.16  Q         |      V  |         |         |
11+30       0.0780      0.16  Q         |       V |         |         |
11+35       0.0791      0.15  Q         |       V |         |         |
11+40       0.0801      0.14  Q         |       V |         |         |
11+45       0.0811      0.14  Q         |       V |         |         |
11+50       0.0821      0.15  Q         |        V|         |         |
11+55       0.0831      0.15  Q         |        V|         |         |
12+ 0       0.0841      0.15  Q         |        V|         |         |
12+ 5       0.0853      0.17  Q         |        V|         |         |
12+10       0.0867      0.20  Q         |         V         |         |
12+15       0.0881      0.20  Q         |         V         |         |
12+20       0.0895      0.21  Q         |         V         |         |
12+25       0.0910      0.22  Q         |         |V        |         |
12+30       0.0925      0.22  Q         |         |V        |         |
12+35       0.0941      0.22  Q         |         |V        |         |
12+40       0.0956      0.23  Q         |         | V       |         |
12+45       0.0972      0.23  Q         |         | V       |         |
12+50       0.0989      0.24  Q         |         | V       |         |
12+55       0.1005      0.24  Q         |         |  V      |         |
13+ 0       0.1022      0.24  Q         |         |  V      |         |
13+ 5       0.1040      0.26  |Q        |         |   V     |         |
13+10       0.1059      0.28  |Q        |         |   V     |         |
13+15       0.1078      0.28  |Q        |         |    V    |         |
13+20       0.1098      0.28  |Q        |         |    V    |         |
13+25       0.1117      0.28  |Q        |         |    V    |         |
13+30       0.1137      0.28  |Q        |         |     V   |         |
13+35       0.1154      0.25  Q         |         |     V   |         |
13+40       0.1168      0.21  Q         |         |      V  |         |
13+45       0.1182      0.20  Q         |         |      V  |         |
13+50       0.1195      0.19  Q         |         |      V  |         |
13+55       0.1208      0.19  Q         |         |       V |         |
14+ 0       0.1221      0.19  Q         |         |       V |         |
14+ 5       0.1236      0.20  Q         |         |       V |         |
14+10       0.1251      0.22  Q         |         |        V|         |
14+15       0.1266      0.22  Q         |         |        V|         |
14+20       0.1281      0.22  Q         |         |        V|         |
14+25       0.1296      0.22  Q         |         |         V         |
14+30       0.1311      0.22  Q         |         |         V         |
14+35       0.1326      0.22  Q         |         |         V         |
14+40       0.1341      0.22  Q         |         |         |V        |
14+45       0.1356      0.22  Q         |         |         |V        |
14+50       0.1371      0.21  Q         |         |         |V        |
14+55       0.1385      0.21  Q         |         |         | V       |
15+ 0       0.1400      0.21  Q         |         |         | V       |
15+ 5       0.1414      0.21  Q         |         |         | V       |
15+10       0.1428      0.20  Q         |         |         |  V      |
15+15       0.1442      0.20  Q         |         |         |  V      |
15+20       0.1455      0.20  Q         |         |         |  V      |
15+25       0.1469      0.19  Q         |         |         |   V     |
```

15+30	0.1482	0.19	Q			V
15+35	0.1494	0.18	Q			V
15+40	0.1505	0.16	Q			V
15+45	0.1517	0.16	Q			V
15+50	0.1528	0.16	Q			V
15+55	0.1538	0.16	Q			V
16+ 0	0.1549	0.16	Q			V
16+ 5	0.1557	0.11	Q			V
16+10	0.1561	0.05	Q			V
16+15	0.1563	0.04	Q			V
16+20	0.1566	0.04	Q			V
16+25	0.1568	0.03	Q			V
16+30	0.1571	0.03	Q			V
16+35	0.1573	0.03	Q			V
16+40	0.1574	0.03	Q			V
16+45	0.1576	0.03	Q			V
16+50	0.1578	0.03	Q			V
16+55	0.1580	0.03	Q			V
17+ 0	0.1581	0.03	Q			V
17+ 5	0.1584	0.03	Q			V
17+10	0.1586	0.04	Q			V
17+15	0.1589	0.04	Q			V
17+20	0.1592	0.04	Q			V
17+25	0.1595	0.04	Q			V
17+30	0.1598	0.04	Q			V
17+35	0.1601	0.04	Q			V
17+40	0.1603	0.04	Q			V
17+45	0.1606	0.04	Q			V
17+50	0.1609	0.04	Q			V
17+55	0.1611	0.03	Q			V
18+ 0	0.1614	0.03	Q			V
18+ 5	0.1616	0.03	Q			V
18+10	0.1618	0.03	Q			V
18+15	0.1621	0.03	Q			V
18+20	0.1623	0.03	Q			V
18+25	0.1625	0.03	Q			V
18+30	0.1627	0.03	Q			V
18+35	0.1630	0.03	Q			V
18+40	0.1631	0.03	Q			V
18+45	0.1633	0.03	Q			V
18+50	0.1635	0.02	Q			V
18+55	0.1636	0.02	Q			V
19+ 0	0.1637	0.02	Q			V
19+ 5	0.1638	0.02	Q			V
19+10	0.1640	0.02	Q			V
19+15	0.1642	0.02	Q			V
19+20	0.1644	0.03	Q			V
19+25	0.1646	0.03	Q			V
19+30	0.1648	0.03	Q			V
19+35	0.1650	0.03	Q			V

19+40	0.1652	0.03	Q				V
19+45	0.1654	0.03	Q				V
19+50	0.1655	0.02	Q				V
19+55	0.1657	0.02	Q				V
20+ 0	0.1658	0.02	Q				V
20+ 5	0.1659	0.02	Q				V
20+10	0.1661	0.02	Q				V
20+15	0.1662	0.02	Q				V
20+20	0.1664	0.02	Q				V
20+25	0.1666	0.03	Q				V
20+30	0.1668	0.03	Q				V
20+35	0.1669	0.03	Q				V
20+40	0.1671	0.03	Q				V
20+45	0.1673	0.03	Q				V
20+50	0.1674	0.02	Q				V
20+55	0.1676	0.02	Q				V
21+ 0	0.1677	0.02	Q				V
21+ 5	0.1678	0.02	Q				V
21+10	0.1680	0.02	Q				V
21+15	0.1681	0.02	Q				V
21+20	0.1683	0.02	Q				V
21+25	0.1684	0.02	Q				V
21+30	0.1685	0.02	Q				V
21+35	0.1687	0.02	Q				V
21+40	0.1688	0.02	Q				V
21+45	0.1690	0.02	Q				V
21+50	0.1692	0.02	Q				V
21+55	0.1693	0.02	Q				V
22+ 0	0.1694	0.02	Q				V
22+ 5	0.1695	0.02	Q				V
22+10	0.1697	0.02	Q				V
22+15	0.1699	0.02	Q				V
22+20	0.1700	0.02	Q				V
22+25	0.1701	0.02	Q				V
22+30	0.1703	0.02	Q				V
22+35	0.1704	0.02	Q				V
22+40	0.1705	0.02	Q				V
22+45	0.1706	0.02	Q				V
22+50	0.1707	0.02	Q				V
22+55	0.1708	0.02	Q				V
23+ 0	0.1709	0.02	Q				V
23+ 5	0.1711	0.02	Q				V
23+10	0.1712	0.02	Q				V
23+15	0.1713	0.02	Q				V
23+20	0.1714	0.02	Q				V
23+25	0.1715	0.02	Q				V
23+30	0.1716	0.02	Q				V
23+35	0.1718	0.02	Q				V
23+40	0.1719	0.02	Q				V
23+45	0.1720	0.02	Q				V

```
   23+50        0.1721      0.02  Q          |         |         |        V|
   23+55        0.1722      0.02  Q          |         |         |        V|
   24+ 0        0.1723      0.02  Q          |         |         |        V|
   24+ 5        0.1724      0.01  Q          |         |         |        V|
   24+10        0.1724      0.00  Q          |         |         |        V|
   24+15        0.1724      0.00  Q          |         |         |        V|
   24+20        0.1724      0.00  Q          |         |         |        V|
-----------------------------------------------------------------------
```

```
        U n i t   H y d r o g r a p h   A n a l y s i s

        Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1
                Study date  01/11/22 File: 100YRPRE245245.out


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------------------------------------------------------------------------

Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978


Program License Serial Number 6215

---------------------------------------------------------------------
 English (in-lb) Input Units Used
 English Rainfall Data (Inches) Input Values Used

 English Units used in output format



---------------------------------------------------------------------
100YRPRE245



--------------------------------------------------------------------
Drainage Area =       9.57(Ac.)  =      0.015 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =       9.57(Ac.)  =
0.015 Sq. Mi.
Length along longest watercourse =    1318.88(Ft.)
Length along longest watercourse measured to centroid =     656.30(Ft.)
Length along longest watercourse =     0.250 Mi.
Length along longest watercourse measured to centroid =      0.124 Mi.
Difference in elevation =      10.01(Ft.)
Slope along watercourse =     40.0740 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.095 Hr.
Lag time =     5.73 Min.
25% of lag time =     1.43 Min.
40% of lag time =     2.29 Min.
Unit time =     5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow =     0.00(CFS)

2 YEAR Area rainfall data:
```

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.57	1.60	15.31

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.57	4.00	38.28

STORM EVENT (YEAR) = 5.00
Area Averaged 2-Year Rainfall = 1.600(In)
Area Averaged 100-Year Rainfall = 4.000(In)

Point rain (area averaged) = 2.162(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.162(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.570	78.00	0.050

Total Area Entered = 9.57(Ac.)

RI AMC2	RI AMC-1	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
78.0	60.6	0.464	0.050	0.443	1.000	0.443
					Sum (F) =	0.443

Area averaged mean soil loss (F) (In/Hr) = 0.443
Minimum soil loss rate ((In/Hr)) = 0.221
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	87.308	15.387	1.484
2	0.167	174.616	46.516	4.486
3	0.250	261.925	18.021	1.738
4	0.333	349.233	7.796	0.752
5	0.417	436.541	4.576	0.441
6	0.500	523.849	2.883	0.278
7	0.583	611.157	2.019	0.195
8	0.667	698.466	1.317	0.127

9	0.750	785.774	0.908	0.088
10	0.833	873.082	0.579	0.056
			Sum = 100.000	Sum= 9.645

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Loss rate(In./Hr) Low	Effective (In/Hr)
1	0.08	0.07	0.017	(0.785)	0.016	0.002
2	0.17	0.07	0.017	(0.782)	0.016	0.002
3	0.25	0.07	0.017	(0.779)	0.016	0.002
4	0.33	0.10	0.026	(0.776)	0.023	0.003
5	0.42	0.10	0.026	(0.773)	0.023	0.003
6	0.50	0.10	0.026	(0.770)	0.023	0.003
7	0.58	0.10	0.026	(0.767)	0.023	0.003
8	0.67	0.10	0.026	(0.764)	0.023	0.003
9	0.75	0.10	0.026	(0.761)	0.023	0.003
10	0.83	0.13	0.035	(0.758)	0.031	0.003
11	0.92	0.13	0.035	(0.755)	0.031	0.003
12	1.00	0.13	0.035	(0.752)	0.031	0.003
13	1.08	0.10	0.026	(0.749)	0.023	0.003
14	1.17	0.10	0.026	(0.746)	0.023	0.003
15	1.25	0.10	0.026	(0.743)	0.023	0.003
16	1.33	0.10	0.026	(0.740)	0.023	0.003
17	1.42	0.10	0.026	(0.737)	0.023	0.003
18	1.50	0.10	0.026	(0.734)	0.023	0.003
19	1.58	0.10	0.026	(0.731)	0.023	0.003
20	1.67	0.10	0.026	(0.728)	0.023	0.003
21	1.75	0.10	0.026	(0.725)	0.023	0.003
22	1.83	0.13	0.035	(0.722)	0.031	0.003
23	1.92	0.13	0.035	(0.719)	0.031	0.003
24	2.00	0.13	0.035	(0.716)	0.031	0.003
25	2.08	0.13	0.035	(0.714)	0.031	0.003
26	2.17	0.13	0.035	(0.711)	0.031	0.003
27	2.25	0.13	0.035	(0.708)	0.031	0.003
28	2.33	0.13	0.035	(0.705)	0.031	0.003
29	2.42	0.13	0.035	(0.702)	0.031	0.003
30	2.50	0.13	0.035	(0.699)	0.031	0.003
31	2.58	0.17	0.043	(0.696)	0.039	0.004
32	2.67	0.17	0.043	(0.693)	0.039	0.004
33	2.75	0.17	0.043	(0.691)	0.039	0.004
34	2.83	0.17	0.043	(0.688)	0.039	0.004
35	2.92	0.17	0.043	(0.685)	0.039	0.004
36	3.00	0.17	0.043	(0.682)	0.039	0.004
37	3.08	0.17	0.043	(0.679)	0.039	0.004
38	3.17	0.17	0.043	(0.676)	0.039	0.004
39	3.25	0.17	0.043	(0.674)	0.039	0.004

40	3.33	0.17	0.043	(0.671)	0.039	0.004
41	3.42	0.17	0.043	(0.668)	0.039	0.004
42	3.50	0.17	0.043	(0.665)	0.039	0.004
43	3.58	0.17	0.043	(0.662)	0.039	0.004
44	3.67	0.17	0.043	(0.660)	0.039	0.004
45	3.75	0.17	0.043	(0.657)	0.039	0.004
46	3.83	0.20	0.052	(0.654)	0.047	0.005
47	3.92	0.20	0.052	(0.651)	0.047	0.005
48	4.00	0.20	0.052	(0.649)	0.047	0.005
49	4.08	0.20	0.052	(0.646)	0.047	0.005
50	4.17	0.20	0.052	(0.643)	0.047	0.005
51	4.25	0.20	0.052	(0.640)	0.047	0.005
52	4.33	0.23	0.061	(0.638)	0.054	0.006
53	4.42	0.23	0.061	(0.635)	0.054	0.006
54	4.50	0.23	0.061	(0.632)	0.054	0.006
55	4.58	0.23	0.061	(0.629)	0.054	0.006
56	4.67	0.23	0.061	(0.627)	0.054	0.006
57	4.75	0.23	0.061	(0.624)	0.054	0.006
58	4.83	0.27	0.069	(0.621)	0.062	0.007
59	4.92	0.27	0.069	(0.619)	0.062	0.007
60	5.00	0.27	0.069	(0.616)	0.062	0.007
61	5.08	0.20	0.052	(0.613)	0.047	0.005
62	5.17	0.20	0.052	(0.611)	0.047	0.005
63	5.25	0.20	0.052	(0.608)	0.047	0.005
64	5.33	0.23	0.061	(0.605)	0.054	0.006
65	5.42	0.23	0.061	(0.603)	0.054	0.006
66	5.50	0.23	0.061	(0.600)	0.054	0.006
67	5.58	0.27	0.069	(0.597)	0.062	0.007
68	5.67	0.27	0.069	(0.595)	0.062	0.007
69	5.75	0.27	0.069	(0.592)	0.062	0.007
70	5.83	0.27	0.069	(0.590)	0.062	0.007
71	5.92	0.27	0.069	(0.587)	0.062	0.007
72	6.00	0.27	0.069	(0.584)	0.062	0.007
73	6.08	0.30	0.078	(0.582)	0.070	0.008
74	6.17	0.30	0.078	(0.579)	0.070	0.008
75	6.25	0.30	0.078	(0.577)	0.070	0.008
76	6.33	0.30	0.078	(0.574)	0.070	0.008
77	6.42	0.30	0.078	(0.571)	0.070	0.008
78	6.50	0.30	0.078	(0.569)	0.070	0.008
79	6.58	0.33	0.086	(0.566)	0.078	0.009
80	6.67	0.33	0.086	(0.564)	0.078	0.009
81	6.75	0.33	0.086	(0.561)	0.078	0.009
82	6.83	0.33	0.086	(0.559)	0.078	0.009
83	6.92	0.33	0.086	(0.556)	0.078	0.009
84	7.00	0.33	0.086	(0.554)	0.078	0.009
85	7.08	0.33	0.086	(0.551)	0.078	0.009
86	7.17	0.33	0.086	(0.549)	0.078	0.009
87	7.25	0.33	0.086	(0.546)	0.078	0.009
88	7.33	0.37	0.095	(0.544)	0.086	0.010
89	7.42	0.37	0.095	(0.541)	0.086	0.010

90	7.50	0.37	0.095	(0.539)	0.086	0.010
91	7.58	0.40	0.104	(0.536)	0.093	0.010
92	7.67	0.40	0.104	(0.534)	0.093	0.010
93	7.75	0.40	0.104	(0.531)	0.093	0.010
94	7.83	0.43	0.112	(0.529)	0.101	0.011
95	7.92	0.43	0.112	(0.526)	0.101	0.011
96	8.00	0.43	0.112	(0.524)	0.101	0.011
97	8.08	0.50	0.130	(0.521)	0.117	0.013
98	8.17	0.50	0.130	(0.519)	0.117	0.013
99	8.25	0.50	0.130	(0.517)	0.117	0.013
100	8.33	0.50	0.130	(0.514)	0.117	0.013
101	8.42	0.50	0.130	(0.512)	0.117	0.013
102	8.50	0.50	0.130	(0.509)	0.117	0.013
103	8.58	0.53	0.138	(0.507)	0.125	0.014
104	8.67	0.53	0.138	(0.505)	0.125	0.014
105	8.75	0.53	0.138	(0.502)	0.125	0.014
106	8.83	0.57	0.147	(0.500)	0.132	0.015
107	8.92	0.57	0.147	(0.498)	0.132	0.015
108	9.00	0.57	0.147	(0.495)	0.132	0.015
109	9.08	0.63	0.164	(0.493)	0.148	0.016
110	9.17	0.63	0.164	(0.490)	0.148	0.016
111	9.25	0.63	0.164	(0.488)	0.148	0.016
112	9.33	0.67	0.173	(0.486)	0.156	0.017
113	9.42	0.67	0.173	(0.483)	0.156	0.017
114	9.50	0.67	0.173	(0.481)	0.156	0.017
115	9.58	0.70	0.182	(0.479)	0.163	0.018
116	9.67	0.70	0.182	(0.477)	0.163	0.018
117	9.75	0.70	0.182	(0.474)	0.163	0.018
118	9.83	0.73	0.190	(0.472)	0.171	0.019
119	9.92	0.73	0.190	(0.470)	0.171	0.019
120	10.00	0.73	0.190	(0.467)	0.171	0.019
121	10.08	0.50	0.130	(0.465)	0.117	0.013
122	10.17	0.50	0.130	(0.463)	0.117	0.013
123	10.25	0.50	0.130	(0.461)	0.117	0.013
124	10.33	0.50	0.130	(0.458)	0.117	0.013
125	10.42	0.50	0.130	(0.456)	0.117	0.013
126	10.50	0.50	0.130	(0.454)	0.117	0.013
127	10.58	0.67	0.173	(0.452)	0.156	0.017
128	10.67	0.67	0.173	(0.450)	0.156	0.017
129	10.75	0.67	0.173	(0.447)	0.156	0.017
130	10.83	0.67	0.173	(0.445)	0.156	0.017
131	10.92	0.67	0.173	(0.443)	0.156	0.017
132	11.00	0.67	0.173	(0.441)	0.156	0.017
133	11.08	0.63	0.164	(0.439)	0.148	0.016
134	11.17	0.63	0.164	(0.436)	0.148	0.016
135	11.25	0.63	0.164	(0.434)	0.148	0.016
136	11.33	0.63	0.164	(0.432)	0.148	0.016
137	11.42	0.63	0.164	(0.430)	0.148	0.016
138	11.50	0.63	0.164	(0.428)	0.148	0.016
139	11.58	0.57	0.147	(0.426)	0.132	0.015

140	11.67	0.57	0.147	(0.424)	0.132	0.015
141	11.75	0.57	0.147	(0.422)	0.132	0.015
142	11.83	0.60	0.156	(0.419)	0.140	0.016
143	11.92	0.60	0.156	(0.417)	0.140	0.016
144	12.00	0.60	0.156	(0.415)	0.140	0.016
145	12.08	0.83	0.216	(0.413)	0.195	0.022
146	12.17	0.83	0.216	(0.411)	0.195	0.022
147	12.25	0.83	0.216	(0.409)	0.195	0.022
148	12.33	0.87	0.225	(0.407)	0.202	0.022
149	12.42	0.87	0.225	(0.405)	0.202	0.022
150	12.50	0.87	0.225	(0.403)	0.202	0.022
151	12.58	0.93	0.242	(0.401)	0.218	0.024
152	12.67	0.93	0.242	(0.399)	0.218	0.024
153	12.75	0.93	0.242	(0.397)	0.218	0.024
154	12.83	0.97	0.251	(0.395)	0.226	0.025
155	12.92	0.97	0.251	(0.393)	0.226	0.025
156	13.00	0.97	0.251	(0.391)	0.226	0.025
157	13.08	1.13	0.294	(0.389)	0.265	0.029
158	13.17	1.13	0.294	(0.387)	0.265	0.029
159	13.25	1.13	0.294	(0.385)	0.265	0.029
160	13.33	1.13	0.294	(0.383)	0.265	0.029
161	13.42	1.13	0.294	(0.381)	0.265	0.029
162	13.50	1.13	0.294	(0.379)	0.265	0.029
163	13.58	0.77	0.199	(0.377)	0.179	0.020
164	13.67	0.77	0.199	(0.375)	0.179	0.020
165	13.75	0.77	0.199	(0.373)	0.179	0.020
166	13.83	0.77	0.199	(0.371)	0.179	0.020
167	13.92	0.77	0.199	(0.370)	0.179	0.020
168	14.00	0.77	0.199	(0.368)	0.179	0.020
169	14.08	0.90	0.234	(0.366)	0.210	0.023
170	14.17	0.90	0.234	(0.364)	0.210	0.023
171	14.25	0.90	0.234	(0.362)	0.210	0.023
172	14.33	0.87	0.225	(0.360)	0.202	0.022
173	14.42	0.87	0.225	(0.358)	0.202	0.022
174	14.50	0.87	0.225	(0.357)	0.202	0.022
175	14.58	0.87	0.225	(0.355)	0.202	0.022
176	14.67	0.87	0.225	(0.353)	0.202	0.022
177	14.75	0.87	0.225	(0.351)	0.202	0.022
178	14.83	0.83	0.216	(0.349)	0.195	0.022
179	14.92	0.83	0.216	(0.348)	0.195	0.022
180	15.00	0.83	0.216	(0.346)	0.195	0.022
181	15.08	0.80	0.208	(0.344)	0.187	0.021
182	15.17	0.80	0.208	(0.342)	0.187	0.021
183	15.25	0.80	0.208	(0.340)	0.187	0.021
184	15.33	0.77	0.199	(0.339)	0.179	0.020
185	15.42	0.77	0.199	(0.337)	0.179	0.020
186	15.50	0.77	0.199	(0.335)	0.179	0.020
187	15.58	0.63	0.164	(0.334)	0.148	0.016
188	15.67	0.63	0.164	(0.332)	0.148	0.016
189	15.75	0.63	0.164	(0.330)	0.148	0.016

190	15.83	0.63	0.164	(0.328)	0.148	0.016
191	15.92	0.63	0.164	(0.327)	0.148	0.016
192	16.00	0.63	0.164	(0.325)	0.148	0.016
193	16.08	0.13	0.035	(0.323)	0.031	0.003
194	16.17	0.13	0.035	(0.322)	0.031	0.003
195	16.25	0.13	0.035	(0.320)	0.031	0.003
196	16.33	0.13	0.035	(0.318)	0.031	0.003
197	16.42	0.13	0.035	(0.317)	0.031	0.003
198	16.50	0.13	0.035	(0.315)	0.031	0.003
199	16.58	0.10	0.026	(0.314)	0.023	0.003
200	16.67	0.10	0.026	(0.312)	0.023	0.003
201	16.75	0.10	0.026	(0.310)	0.023	0.003
202	16.83	0.10	0.026	(0.309)	0.023	0.003
203	16.92	0.10	0.026	(0.307)	0.023	0.003
204	17.00	0.10	0.026	(0.306)	0.023	0.003
205	17.08	0.17	0.043	(0.304)	0.039	0.004
206	17.17	0.17	0.043	(0.303)	0.039	0.004
207	17.25	0.17	0.043	(0.301)	0.039	0.004
208	17.33	0.17	0.043	(0.300)	0.039	0.004
209	17.42	0.17	0.043	(0.298)	0.039	0.004
210	17.50	0.17	0.043	(0.297)	0.039	0.004
211	17.58	0.17	0.043	(0.295)	0.039	0.004
212	17.67	0.17	0.043	(0.294)	0.039	0.004
213	17.75	0.17	0.043	(0.292)	0.039	0.004
214	17.83	0.13	0.035	(0.291)	0.031	0.003
215	17.92	0.13	0.035	(0.289)	0.031	0.003
216	18.00	0.13	0.035	(0.288)	0.031	0.003
217	18.08	0.13	0.035	(0.287)	0.031	0.003
218	18.17	0.13	0.035	(0.285)	0.031	0.003
219	18.25	0.13	0.035	(0.284)	0.031	0.003
220	18.33	0.13	0.035	(0.282)	0.031	0.003
221	18.42	0.13	0.035	(0.281)	0.031	0.003
222	18.50	0.13	0.035	(0.280)	0.031	0.003
223	18.58	0.10	0.026	(0.278)	0.023	0.003
224	18.67	0.10	0.026	(0.277)	0.023	0.003
225	18.75	0.10	0.026	(0.276)	0.023	0.003
226	18.83	0.07	0.017	(0.274)	0.016	0.002
227	18.92	0.07	0.017	(0.273)	0.016	0.002
228	19.00	0.07	0.017	(0.272)	0.016	0.002
229	19.08	0.10	0.026	(0.270)	0.023	0.003
230	19.17	0.10	0.026	(0.269)	0.023	0.003
231	19.25	0.10	0.026	(0.268)	0.023	0.003
232	19.33	0.13	0.035	(0.267)	0.031	0.003
233	19.42	0.13	0.035	(0.265)	0.031	0.003
234	19.50	0.13	0.035	(0.264)	0.031	0.003
235	19.58	0.10	0.026	(0.263)	0.023	0.003
236	19.67	0.10	0.026	(0.262)	0.023	0.003
237	19.75	0.10	0.026	(0.261)	0.023	0.003
238	19.83	0.07	0.017	(0.259)	0.016	0.002
239	19.92	0.07	0.017	(0.258)	0.016	0.002

240	20.00	0.07	0.017	(0.257)	0.016	0.002
241	20.08	0.10	0.026	(0.256)	0.023	0.003
242	20.17	0.10	0.026	(0.255)	0.023	0.003
243	20.25	0.10	0.026	(0.254)	0.023	0.003
244	20.33	0.10	0.026	(0.253)	0.023	0.003
245	20.42	0.10	0.026	(0.252)	0.023	0.003
246	20.50	0.10	0.026	(0.250)	0.023	0.003
247	20.58	0.10	0.026	(0.249)	0.023	0.003
248	20.67	0.10	0.026	(0.248)	0.023	0.003
249	20.75	0.10	0.026	(0.247)	0.023	0.003
250	20.83	0.07	0.017	(0.246)	0.016	0.002
251	20.92	0.07	0.017	(0.245)	0.016	0.002
252	21.00	0.07	0.017	(0.244)	0.016	0.002
253	21.08	0.10	0.026	(0.243)	0.023	0.003
254	21.17	0.10	0.026	(0.242)	0.023	0.003
255	21.25	0.10	0.026	(0.241)	0.023	0.003
256	21.33	0.07	0.017	(0.241)	0.016	0.002
257	21.42	0.07	0.017	(0.240)	0.016	0.002
258	21.50	0.07	0.017	(0.239)	0.016	0.002
259	21.58	0.10	0.026	(0.238)	0.023	0.003
260	21.67	0.10	0.026	(0.237)	0.023	0.003
261	21.75	0.10	0.026	(0.236)	0.023	0.003
262	21.83	0.07	0.017	(0.235)	0.016	0.002
263	21.92	0.07	0.017	(0.235)	0.016	0.002
264	22.00	0.07	0.017	(0.234)	0.016	0.002
265	22.08	0.10	0.026	(0.233)	0.023	0.003
266	22.17	0.10	0.026	(0.232)	0.023	0.003
267	22.25	0.10	0.026	(0.231)	0.023	0.003
268	22.33	0.07	0.017	(0.231)	0.016	0.002
269	22.42	0.07	0.017	(0.230)	0.016	0.002
270	22.50	0.07	0.017	(0.229)	0.016	0.002
271	22.58	0.07	0.017	(0.229)	0.016	0.002
272	22.67	0.07	0.017	(0.228)	0.016	0.002
273	22.75	0.07	0.017	(0.227)	0.016	0.002
274	22.83	0.07	0.017	(0.227)	0.016	0.002
275	22.92	0.07	0.017	(0.226)	0.016	0.002
276	23.00	0.07	0.017	(0.226)	0.016	0.002
277	23.08	0.07	0.017	(0.225)	0.016	0.002
278	23.17	0.07	0.017	(0.225)	0.016	0.002
279	23.25	0.07	0.017	(0.224)	0.016	0.002
280	23.33	0.07	0.017	(0.224)	0.016	0.002
281	23.42	0.07	0.017	(0.223)	0.016	0.002
282	23.50	0.07	0.017	(0.223)	0.016	0.002
283	23.58	0.07	0.017	(0.223)	0.016	0.002
284	23.67	0.07	0.017	(0.222)	0.016	0.002
285	23.75	0.07	0.017	(0.222)	0.016	0.002
286	23.83	0.07	0.017	(0.222)	0.016	0.002
287	23.92	0.07	0.017	(0.221)	0.016	0.002
288	24.00	0.07	0.017	(0.221)	0.016	0.002

(Loss Rate Not Used)

```
   Sum =     100.0                                   Sum =     2.6
      Flood volume = Effective rainfall      0.22(In)
       times area       9.6(Ac.)/[(In)/(Ft.)] =      0.2(Ac.Ft)
      Total soil loss =      1.95(In)
      Total soil loss =     1.552(Ac.Ft)
      Total rainfall =      2.16(In)
      Flood volume =        7510.9 Cubic Feet
      Total soil loss =       67598.4 Cubic Feet
      --------------------------------------------------------------------
       Peak flow rate of this hydrograph =      0.282(CFS)
      --------------------------------------------------------------------
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                         24 - H O U R   S T O R M
                    R u n o f f     H y d r o g r a p h
      --------------------------------------------------------------------
                 Hydrograph in   5   Minute intervals ((CFS))

      --------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5       5.0       7.5      10.0
-----------------------------------------------------------------------
  0+ 5      0.0000      0.00  Q        |         |         |         |
  0+10      0.0001      0.01  Q        |         |         |         |
  0+15      0.0002      0.01  Q        |         |         |         |
  0+20      0.0003      0.02  Q        |         |         |         |
  0+25      0.0004      0.02  Q        |         |         |         |
  0+30      0.0006      0.02  Q        |         |         |         |
  0+35      0.0007      0.02  Q        |         |         |         |
  0+40      0.0009      0.02  Q        |         |         |         |
  0+45      0.0011      0.02  Q        |         |         |         |
  0+50      0.0013      0.03  Q        |         |         |         |
  0+55      0.0015      0.03  Q        |         |         |         |
  1+ 0      0.0017      0.03  Q        |         |         |         |
  1+ 5      0.0019      0.03  Q        |         |         |         |
  1+10      0.0021      0.03  Q        |         |         |         |
  1+15      0.0023      0.03  Q        |         |         |         |
  1+20      0.0025      0.03  Q        |         |         |         |
  1+25      0.0026      0.03  Q        |         |         |         |
  1+30      0.0028      0.03  Q        |         |         |         |
  1+35      0.0030      0.03  Q        |         |         |         |
  1+40      0.0032      0.03  Q        |         |         |         |
  1+45      0.0033      0.03  Q        |         |         |         |
  1+50      0.0035      0.03  Q        |         |         |         |
  1+55      0.0037      0.03  Q        |         |         |         |
  2+ 0      0.0039      0.03  Q        |         |         |         |
  2+ 5      0.0042      0.03  Q        |         |         |         |
  2+10      0.0044      0.03  QV       |         |         |         |
  2+15      0.0046      0.03  QV       |         |         |         |
  2+20      0.0048      0.03  QV       |         |         |         |
  2+25      0.0051      0.03  QV       |         |         |         |
  2+30      0.0053      0.03  QV       |         |         |         |
```

2+35	0.0055	0.03	QV
2+40	0.0058	0.04	QV
2+45	0.0061	0.04	QV
2+50	0.0064	0.04	QV
2+55	0.0066	0.04	QV
3+ 0	0.0069	0.04	QV
3+ 5	0.0072	0.04	QV
3+10	0.0075	0.04	QV
3+15	0.0078	0.04	QV
3+20	0.0081	0.04	QV
3+25	0.0084	0.04	QV
3+30	0.0086	0.04	Q V
3+35	0.0089	0.04	Q V
3+40	0.0092	0.04	Q V
3+45	0.0095	0.04	Q V
3+50	0.0098	0.04	Q V
3+55	0.0101	0.05	Q V
4+ 0	0.0105	0.05	Q V
4+ 5	0.0108	0.05	Q V
4+10	0.0111	0.05	Q V
4+15	0.0115	0.05	Q V
4+20	0.0118	0.05	Q V
4+25	0.0122	0.06	Q V
4+30	0.0126	0.06	Q V
4+35	0.0130	0.06	Q V
4+40	0.0134	0.06	Q V
4+45	0.0138	0.06	Q V
4+50	0.0142	0.06	Q V
4+55	0.0146	0.06	Q V
5+ 0	0.0151	0.07	Q V
5+ 5	0.0155	0.06	Q V
5+10	0.0159	0.06	Q V
5+15	0.0163	0.05	Q V
5+20	0.0166	0.05	Q V
5+25	0.0170	0.06	Q V
5+30	0.0174	0.06	Q V
5+35	0.0178	0.06	Q V
5+40	0.0183	0.06	Q V
5+45	0.0187	0.06	Q V
5+50	0.0192	0.07	Q V
5+55	0.0196	0.07	Q V
6+ 0	0.0201	0.07	Q V
6+ 5	0.0205	0.07	Q V
6+10	0.0210	0.07	Q V
6+15	0.0215	0.07	Q V
6+20	0.0221	0.07	Q V
6+25	0.0226	0.07	Q V
6+30	0.0231	0.07	Q V
6+35	0.0236	0.08	Q V
6+40	0.0242	0.08	Q V

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 6+45       0.0247      0.08  Q    V    |         |         |         |
 6+50       0.0253      0.08  Q    V    |         |         |         |
 6+55       0.0259      0.08  Q    V    |         |         |         |
 7+ 0       0.0264      0.08  Q     V   |         |         |         |
 7+ 5       0.0270      0.08  Q     V   |         |         |         |
 7+10       0.0276      0.08  Q     V   |         |         |         |
 7+15       0.0281      0.08  Q     V   |         |         |         |
 7+20       0.0287      0.08  Q     V   |         |         |         |
 7+25       0.0293      0.09  Q     V   |         |         |         |
 7+30       0.0300      0.09  Q     V   |         |         |         |
 7+35       0.0306      0.09  Q      V  |         |         |         |
 7+40       0.0313      0.10  Q      V  |         |         |         |
 7+45       0.0319      0.10  Q      V  |         |         |         |
 7+50       0.0326      0.10  Q      V  |         |         |         |
 7+55       0.0333      0.10  Q      V  |         |         |         |
 8+ 0       0.0341      0.11  Q      V  |         |         |         |
 8+ 5       0.0348      0.11  Q       V |         |         |         |
 8+10       0.0356      0.12  Q       V |         |         |         |
 8+15       0.0365      0.12  Q       V |         |         |         |
 8+20       0.0373      0.12  Q       V |         |         |         |
 8+25       0.0382      0.12  Q       V |         |         |         |
 8+30       0.0390      0.12  Q        V|         |         |         |
 8+35       0.0399      0.13  Q        V|         |         |         |
 8+40       0.0408      0.13  Q        V|         |         |         |
 8+45       0.0417      0.13  Q        V|         |         |         |
 8+50       0.0426      0.13  Q        V|         |         |         |
 8+55       0.0436      0.14  Q         V         |         |         |
 9+ 0       0.0445      0.14  Q         V         |         |         |
 9+ 5       0.0455      0.14  Q         V         |         |         |
 9+10       0.0466      0.15  Q         V         |         |         |
 9+15       0.0476      0.15  Q         |V        |         |         |
 9+20       0.0487      0.16  Q         |V        |         |         |
 9+25       0.0498      0.16  Q         |V        |         |         |
 9+30       0.0510      0.16  Q         |V        |         |         |
 9+35       0.0521      0.17  Q         | V       |         |         |
 9+40       0.0533      0.17  Q         | V       |         |         |
 9+45       0.0545      0.17  Q         | V       |         |         |
 9+50       0.0557      0.18  Q         | V       |         |         |
 9+55       0.0569      0.18  Q         |  V      |         |         |
10+ 0       0.0582      0.18  Q         |  V      |         |         |
10+ 5       0.0594      0.17  Q         |  V      |         |         |
10+10       0.0604      0.15  Q         |   V     |         |         |
10+15       0.0613      0.14  Q         |   V     |         |         |
10+20       0.0622      0.13  Q         |   V     |         |         |
10+25       0.0631      0.13  Q         |   V     |         |         |
10+30       0.0640      0.13  Q         |   V     |         |         |
10+35       0.0649      0.13  Q         |    V    |         |         |
10+40       0.0660      0.15  Q         |    V    |         |         |
10+45       0.0671      0.16  Q         |    V    |         |         |
10+50       0.0682      0.16  Q         |    V    |         |         |
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10+55       0.0693      0.16  Q         |     V   |         |         |
11+ 0       0.0705      0.16  Q         |     V   |         |         |
11+ 5       0.0716      0.16  Q         |     V   |         |         |
11+10       0.0727      0.16  Q         |     V   |         |         |
11+15       0.0738      0.16  Q         |      V  |         |         |
11+20       0.0749      0.16  Q         |      V  |         |         |
11+25       0.0760      0.16  Q         |      V  |         |         |
11+30       0.0771      0.16  Q         |      V  |         |         |
11+35       0.0782      0.16  Q         |       V |         |         |
11+40       0.0792      0.15  Q         |       V |         |         |
11+45       0.0802      0.15  Q         |       V |         |         |
11+50       0.0812      0.15  Q         |       V |         |         |
11+55       0.0822      0.15  Q         |        V|         |         |
12+ 0       0.0832      0.15  Q         |        V|         |         |
12+ 5       0.0843      0.16  Q         |        V|         |         |
12+10       0.0856      0.19  Q         |        V|         |         |
12+15       0.0870      0.20  Q         |         V         |         |
12+20       0.0884      0.20  Q         |         V         |         |
12+25       0.0898      0.21  Q         |         V         |         |
12+30       0.0913      0.21  Q         |         |V        |         |
12+35       0.0928      0.22  Q         |         |V        |         |
12+40       0.0943      0.23  Q         |         |V        |         |
12+45       0.0959      0.23  Q         |         | V       |         |
12+50       0.0975      0.23  Q         |         | V       |         |
12+55       0.0991      0.24  Q         |         | V       |         |
13+ 0       0.1008      0.24  Q         |         |  V      |         |
13+ 5       0.1025      0.25  Q         |         |  V      |         |
13+10       0.1043      0.27  |Q        |         |   V     |         |
13+15       0.1062      0.27  |Q        |         |   V     |         |
13+20       0.1081      0.28  |Q        |         |    V    |         |
13+25       0.1101      0.28  |Q        |         |    V    |         |
13+30       0.1120      0.28  |Q        |         |    V    |         |
13+35       0.1138      0.27  |Q        |         |     V   |         |
13+40       0.1154      0.23  Q         |         |     V   |         |
13+45       0.1169      0.21  Q         |         |      V  |         |
13+50       0.1183      0.20  Q         |         |      V  |         |
13+55       0.1196      0.20  Q         |         |      V  |         |
14+ 0       0.1210      0.20  Q         |         |       V |         |
14+ 5       0.1223      0.20  Q         |         |       V |         |
14+10       0.1238      0.21  Q         |         |       V |         |
14+15       0.1253      0.22  Q         |         |        V|         |
14+20       0.1268      0.22  Q         |         |        V|         |
14+25       0.1283      0.22  Q         |         |        V|         |
14+30       0.1298      0.22  Q         |         |         V         |
14+35       0.1313      0.22  Q         |         |         V         |
14+40       0.1328      0.22  Q         |         |         V         |
14+45       0.1343      0.22  Q         |         |         |V        |
14+50       0.1358      0.22  Q         |         |         |V        |
14+55       0.1373      0.21  Q         |         |         |V        |
15+ 0       0.1387      0.21  Q         |         |         | V       |
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15+ 5       0.1402      0.21  Q         |         |         | V       |
15+10       0.1416      0.20  Q         |         |         | V       |
15+15       0.1430      0.20  Q         |         |         |  V      |
15+20       0.1443      0.20  Q         |         |         |  V      |
15+25       0.1457      0.20  Q         |         |         |  V      |
15+30       0.1470      0.19  Q         |         |         |   V     |
15+35       0.1483      0.19  Q         |         |         |   V     |
15+40       0.1495      0.17  Q         |         |         |   V     |
15+45       0.1506      0.17  Q         |         |         |   V     |
15+50       0.1518      0.16  Q         |         |         |    V    |
15+55       0.1529      0.16  Q         |         |         |    V    |
16+ 0       0.1540      0.16  Q         |         |         |    V    |
16+ 5       0.1549      0.14  Q         |         |         |    V    |
16+10       0.1555      0.08  Q         |         |         |     V   |
16+15       0.1559      0.06  Q         |         |         |     V   |
16+20       0.1562      0.05  Q         |         |         |     V   |
16+25       0.1565      0.04  Q         |         |         |     V   |
16+30       0.1568      0.04  Q         |         |         |     V   |
16+35       0.1571      0.04  Q         |         |         |     V   |
16+40       0.1573      0.03  Q         |         |         |     V   |
16+45       0.1575      0.03  Q         |         |         |     V   |
16+50       0.1576      0.03  Q         |         |         |     V   |
16+55       0.1578      0.03  Q         |         |         |     V   |
17+ 0       0.1580      0.03  Q         |         |         |     V   |
17+ 5       0.1582      0.03  Q         |         |         |     V   |
17+10       0.1584      0.04  Q         |         |         |     V   |
17+15       0.1587      0.04  Q         |         |         |     V   |
17+20       0.1590      0.04  Q         |         |         |     V   |
17+25       0.1592      0.04  Q         |         |         |     V   |
17+30       0.1595      0.04  Q         |         |         |      V  |
17+35       0.1598      0.04  Q         |         |         |      V  |
17+40       0.1601      0.04  Q         |         |         |      V  |
17+45       0.1604      0.04  Q         |         |         |      V  |
17+50       0.1607      0.04  Q         |         |         |      V  |
17+55       0.1609      0.04  Q         |         |         |      V  |
18+ 0       0.1612      0.04  Q         |         |         |      V  |
18+ 5       0.1614      0.03  Q         |         |         |      V  |
18+10       0.1616      0.03  Q         |         |         |      V  |
18+15       0.1619      0.03  Q         |         |         |      V  |
18+20       0.1621      0.03  Q         |         |         |      V  |
18+25       0.1623      0.03  Q         |         |         |      V  |
18+30       0.1625      0.03  Q         |         |         |      V  |
18+35       0.1628      0.03  Q         |         |         |      V  |
18+40       0.1630      0.03  Q         |         |         |      V  |
18+45       0.1631      0.03  Q         |         |         |      V  |
18+50       0.1633      0.02  Q         |         |         |      V  |
18+55       0.1635      0.02  Q         |         |         |      V  |
19+ 0       0.1636      0.02  Q         |         |         |      V  |
19+ 5       0.1637      0.02  Q         |         |         |      V  |
19+10       0.1639      0.02  Q         |         |         |       V |
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19+15        0.1640       0.02  Q         |          |          |       V |
19+20        0.1642       0.03  Q         |          |          |       V |
19+25        0.1644       0.03  Q         |          |          |       V |
19+30        0.1646       0.03  Q         |          |          |       V |
19+35        0.1648       0.03  Q         |          |          |       V |
19+40        0.1650       0.03  Q         |          |          |       V |
19+45        0.1652       0.03  Q         |          |          |       V |
19+50        0.1654       0.02  Q         |          |          |       V |
19+55        0.1655       0.02  Q         |          |          |       V |
20+ 0        0.1657       0.02  Q         |          |          |       V |
20+ 5        0.1658       0.02  Q         |          |          |       V |
20+10        0.1659       0.02  Q         |          |          |       V |
20+15        0.1661       0.02  Q         |          |          |       V |
20+20        0.1663       0.02  Q         |          |          |       V |
20+25        0.1664       0.02  Q         |          |          |       V |
20+30        0.1666       0.02  Q         |          |          |       V |
20+35        0.1668       0.02  Q         |          |          |       V |
20+40        0.1670       0.02  Q         |          |          |       V |
20+45        0.1671       0.02  Q         |          |          |       V |
20+50        0.1673       0.02  Q         |          |          |       V |
20+55        0.1674       0.02  Q         |          |          |       V |
21+ 0        0.1676       0.02  Q         |          |          |       V |
21+ 5        0.1677       0.02  Q         |          |          |       V |
21+10        0.1678       0.02  Q         |          |          |       V |
21+15        0.1680       0.02  Q         |          |          |       V |
21+20        0.1682       0.02  Q         |          |          |        V|
21+25        0.1683       0.02  Q         |          |          |        V|
21+30        0.1684       0.02  Q         |          |          |        V|
21+35        0.1686       0.02  Q         |          |          |        V|
21+40        0.1687       0.02  Q         |          |          |        V|
21+45        0.1689       0.02  Q         |          |          |        V|
21+50        0.1690       0.02  Q         |          |          |        V|
21+55        0.1692       0.02  Q         |          |          |        V|
22+ 0        0.1693       0.02  Q         |          |          |        V|
22+ 5        0.1694       0.02  Q         |          |          |        V|
22+10        0.1696       0.02  Q         |          |          |        V|
22+15        0.1697       0.02  Q         |          |          |        V|
22+20        0.1699       0.02  Q         |          |          |        V|
22+25        0.1700       0.02  Q         |          |          |        V|
22+30        0.1701       0.02  Q         |          |          |        V|
22+35        0.1703       0.02  Q         |          |          |        V|
22+40        0.1704       0.02  Q         |          |          |        V|
22+45        0.1705       0.02  Q         |          |          |        V|
22+50        0.1706       0.02  Q         |          |          |        V|
22+55        0.1707       0.02  Q         |          |          |        V|
23+ 0        0.1708       0.02  Q         |          |          |        V|
23+ 5        0.1710       0.02  Q         |          |          |        V|
23+10        0.1711       0.02  Q         |          |          |        V|
23+15        0.1712       0.02  Q         |          |          |        V|
23+20        0.1713       0.02  Q         |          |          |        V|
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   23+25        0.1714       0.02  Q          |          |          |        V|
   23+30        0.1715       0.02  Q          |          |          |        V|
   23+35        0.1717       0.02  Q          |          |          |        V|
   23+40        0.1718       0.02  Q          |          |          |        V|
   23+45        0.1719       0.02  Q          |          |          |        V|
   23+50        0.1720       0.02  Q          |          |          |        V|
   23+55        0.1721       0.02  Q          |          |          |        V|
   24+ 0        0.1722       0.02  Q          |          |          |        V|
   24+ 5        0.1723       0.01  Q          |          |          |        V|
   24+10        0.1724       0.01  Q          |          |          |        V|
   24+15        0.1724       0.00  Q          |          |          |        V|
   24+20        0.1724       0.00  Q          |          |          |        V|
   24+25        0.1724       0.00  Q          |          |          |        V|
   24+30        0.1724       0.00  Q          |          |          |        V|
   24+35        0.1724       0.00  Q          |          |          |        V|
   24+40        0.1724       0.00  Q          |          |          |        V|
   24+45        0.1724       0.00  Q          |          |          |         V
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U n i t   H y d r o g r a p h   A n a l y s i s

Study date 01/11/22 File: 100YRPOST24102410.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6215

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

100YRPOST2410

Drainage Area = 9.57(Ac.) = 0.015 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 9.57(Ac.) =
0.015 Sq. Mi.
Length along longest watercourse = 1318.88(Ft.)
Length along longest watercourse measured to centroid = 656.30(Ft.)
Length along longest watercourse = 0.250 Mi.
Length along longest watercourse measured to centroid = 0.124 Mi.
Difference in elevation = 10.01(Ft.)
Slope along watercourse = 40.0740 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.048 Hr.
Lag time = 2.86 Min.
25% of lag time = 0.72 Min.
40% of lag time = 1.15 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.57	1.60	15.31

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.57	4.00	38.28

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 1.600(In)
Area Averaged 100-Year Rainfall = 4.000(In)

Point rain (area averaged) = 2.587(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.587(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.570	56.00	0.610

Total Area Entered = 9.57(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
56.0	56.0	0.511	0.610	0.230	1.000	0.230
					Sum (F) =	0.230

Area averaged mean soil loss (F) (In/Hr) = 0.230
Minimum soil loss rate ((In/Hr)) = 0.115
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	174.616	38.645	3.727
2	0.167	349.233	45.177	4.357
3	0.250	523.849	9.915	0.956
4	0.333	698.466	4.119	0.397
5	0.417	873.082	2.145	0.207
			Sum = 100.000	Sum= 9.645

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.021	(0.408)	0.019	0.002
2	0.17	0.07	0.021	(0.407)	0.019	0.002
3	0.25	0.07	0.021	(0.405)	0.019	0.002
4	0.33	0.10	0.031	(0.404)	0.028	0.003
5	0.42	0.10	0.031	(0.402)	0.028	0.003
6	0.50	0.10	0.031	(0.401)	0.028	0.003
7	0.58	0.10	0.031	(0.399)	0.028	0.003
8	0.67	0.10	0.031	(0.397)	0.028	0.003
9	0.75	0.10	0.031	(0.396)	0.028	0.003
10	0.83	0.13	0.041	(0.394)	0.037	0.004
11	0.92	0.13	0.041	(0.393)	0.037	0.004
12	1.00	0.13	0.041	(0.391)	0.037	0.004
13	1.08	0.10	0.031	(0.390)	0.028	0.003
14	1.17	0.10	0.031	(0.388)	0.028	0.003
15	1.25	0.10	0.031	(0.387)	0.028	0.003
16	1.33	0.10	0.031	(0.385)	0.028	0.003
17	1.42	0.10	0.031	(0.383)	0.028	0.003
18	1.50	0.10	0.031	(0.382)	0.028	0.003
19	1.58	0.10	0.031	(0.380)	0.028	0.003
20	1.67	0.10	0.031	(0.379)	0.028	0.003
21	1.75	0.10	0.031	(0.377)	0.028	0.003
22	1.83	0.13	0.041	(0.376)	0.037	0.004
23	1.92	0.13	0.041	(0.374)	0.037	0.004
24	2.00	0.13	0.041	(0.373)	0.037	0.004
25	2.08	0.13	0.041	(0.371)	0.037	0.004
26	2.17	0.13	0.041	(0.370)	0.037	0.004
27	2.25	0.13	0.041	(0.368)	0.037	0.004
28	2.33	0.13	0.041	(0.367)	0.037	0.004
29	2.42	0.13	0.041	(0.365)	0.037	0.004
30	2.50	0.13	0.041	(0.364)	0.037	0.004
31	2.58	0.17	0.052	(0.362)	0.047	0.005
32	2.67	0.17	0.052	(0.361)	0.047	0.005
33	2.75	0.17	0.052	(0.359)	0.047	0.005
34	2.83	0.17	0.052	(0.358)	0.047	0.005
35	2.92	0.17	0.052	(0.356)	0.047	0.005
36	3.00	0.17	0.052	(0.355)	0.047	0.005
37	3.08	0.17	0.052	(0.353)	0.047	0.005
38	3.17	0.17	0.052	(0.352)	0.047	0.005
39	3.25	0.17	0.052	(0.351)	0.047	0.005
40	3.33	0.17	0.052	(0.349)	0.047	0.005
41	3.42	0.17	0.052	(0.348)	0.047	0.005
42	3.50	0.17	0.052	(0.346)	0.047	0.005
43	3.58	0.17	0.052	(0.345)	0.047	0.005
44	3.67	0.17	0.052	(0.343)	0.047	0.005

45	3.75	0.17	0.052	(0.342)	0.047	0.005
46	3.83	0.20	0.062	(0.340)	0.056	0.006
47	3.92	0.20	0.062	(0.339)	0.056	0.006
48	4.00	0.20	0.062	(0.338)	0.056	0.006
49	4.08	0.20	0.062	(0.336)	0.056	0.006
50	4.17	0.20	0.062	(0.335)	0.056	0.006
51	4.25	0.20	0.062	(0.333)	0.056	0.006
52	4.33	0.23	0.072	(0.332)	0.065	0.007
53	4.42	0.23	0.072	(0.330)	0.065	0.007
54	4.50	0.23	0.072	(0.329)	0.065	0.007
55	4.58	0.23	0.072	(0.328)	0.065	0.007
56	4.67	0.23	0.072	(0.326)	0.065	0.007
57	4.75	0.23	0.072	(0.325)	0.065	0.007
58	4.83	0.27	0.083	(0.323)	0.075	0.008
59	4.92	0.27	0.083	(0.322)	0.075	0.008
60	5.00	0.27	0.083	(0.321)	0.075	0.008
61	5.08	0.20	0.062	(0.319)	0.056	0.006
62	5.17	0.20	0.062	(0.318)	0.056	0.006
63	5.25	0.20	0.062	(0.316)	0.056	0.006
64	5.33	0.23	0.072	(0.315)	0.065	0.007
65	5.42	0.23	0.072	(0.314)	0.065	0.007
66	5.50	0.23	0.072	(0.312)	0.065	0.007
67	5.58	0.27	0.083	(0.311)	0.075	0.008
68	5.67	0.27	0.083	(0.310)	0.075	0.008
69	5.75	0.27	0.083	(0.308)	0.075	0.008
70	5.83	0.27	0.083	(0.307)	0.075	0.008
71	5.92	0.27	0.083	(0.305)	0.075	0.008
72	6.00	0.27	0.083	(0.304)	0.075	0.008
73	6.08	0.30	0.093	(0.303)	0.084	0.009
74	6.17	0.30	0.093	(0.301)	0.084	0.009
75	6.25	0.30	0.093	(0.300)	0.084	0.009
76	6.33	0.30	0.093	(0.299)	0.084	0.009
77	6.42	0.30	0.093	(0.297)	0.084	0.009
78	6.50	0.30	0.093	(0.296)	0.084	0.009
79	6.58	0.33	0.103	(0.295)	0.093	0.010
80	6.67	0.33	0.103	(0.293)	0.093	0.010
81	6.75	0.33	0.103	(0.292)	0.093	0.010
82	6.83	0.33	0.103	(0.291)	0.093	0.010
83	6.92	0.33	0.103	(0.289)	0.093	0.010
84	7.00	0.33	0.103	(0.288)	0.093	0.010
85	7.08	0.33	0.103	(0.287)	0.093	0.010
86	7.17	0.33	0.103	(0.285)	0.093	0.010
87	7.25	0.33	0.103	(0.284)	0.093	0.010
88	7.33	0.37	0.114	(0.283)	0.102	0.011
89	7.42	0.37	0.114	(0.282)	0.102	0.011
90	7.50	0.37	0.114	(0.280)	0.102	0.011
91	7.58	0.40	0.124	(0.279)	0.112	0.012
92	7.67	0.40	0.124	(0.278)	0.112	0.012
93	7.75	0.40	0.124	(0.276)	0.112	0.012
94	7.83	0.43	0.135	(0.275)	0.121	0.013

95	7.92	0.43	0.135	(0.274)	0.121	0.013
96	8.00	0.43	0.135	(0.273)	0.121	0.013
97	8.08	0.50	0.155	(0.271)	0.140	0.016
98	8.17	0.50	0.155	(0.270)	0.140	0.016
99	8.25	0.50	0.155	(0.269)	0.140	0.016
100	8.33	0.50	0.155	(0.268)	0.140	0.016
101	8.42	0.50	0.155	(0.266)	0.140	0.016
102	8.50	0.50	0.155	(0.265)	0.140	0.016
103	8.58	0.53	0.166	(0.264)	0.149	0.017
104	8.67	0.53	0.166	(0.263)	0.149	0.017
105	8.75	0.53	0.166	(0.261)	0.149	0.017
106	8.83	0.57	0.176	(0.260)	0.158	0.018
107	8.92	0.57	0.176	(0.259)	0.158	0.018
108	9.00	0.57	0.176	(0.258)	0.158	0.018
109	9.08	0.63	0.197	(0.256)	0.177	0.020
110	9.17	0.63	0.197	(0.255)	0.177	0.020
111	9.25	0.63	0.197	(0.254)	0.177	0.020
112	9.33	0.67	0.207	(0.253)	0.186	0.021
113	9.42	0.67	0.207	(0.252)	0.186	0.021
114	9.50	0.67	0.207	(0.250)	0.186	0.021
115	9.58	0.70	0.217	(0.249)	0.196	0.022
116	9.67	0.70	0.217	(0.248)	0.196	0.022
117	9.75	0.70	0.217	(0.247)	0.196	0.022
118	9.83	0.73	0.228	(0.246)	0.205	0.023
119	9.92	0.73	0.228	(0.244)	0.205	0.023
120	10.00	0.73	0.228	(0.243)	0.205	0.023
121	10.08	0.50	0.155	(0.242)	0.140	0.016
122	10.17	0.50	0.155	(0.241)	0.140	0.016
123	10.25	0.50	0.155	(0.240)	0.140	0.016
124	10.33	0.50	0.155	(0.239)	0.140	0.016
125	10.42	0.50	0.155	(0.237)	0.140	0.016
126	10.50	0.50	0.155	(0.236)	0.140	0.016
127	10.58	0.67	0.207	(0.235)	0.186	0.021
128	10.67	0.67	0.207	(0.234)	0.186	0.021
129	10.75	0.67	0.207	(0.233)	0.186	0.021
130	10.83	0.67	0.207	(0.232)	0.186	0.021
131	10.92	0.67	0.207	(0.231)	0.186	0.021
132	11.00	0.67	0.207	(0.229)	0.186	0.021
133	11.08	0.63	0.197	(0.228)	0.177	0.020
134	11.17	0.63	0.197	(0.227)	0.177	0.020
135	11.25	0.63	0.197	(0.226)	0.177	0.020
136	11.33	0.63	0.197	(0.225)	0.177	0.020
137	11.42	0.63	0.197	(0.224)	0.177	0.020
138	11.50	0.63	0.197	(0.223)	0.177	0.020
139	11.58	0.57	0.176	(0.222)	0.158	0.018
140	11.67	0.57	0.176	(0.220)	0.158	0.018
141	11.75	0.57	0.176	(0.219)	0.158	0.018
142	11.83	0.60	0.186	(0.218)	0.168	0.019
143	11.92	0.60	0.186	(0.217)	0.168	0.019
144	12.00	0.60	0.186	(0.216)	0.168	0.019

145	12.08	0.83	0.259	0.215	(0.233)	0.044
146	12.17	0.83	0.259	0.214	(0.233)	0.045
147	12.25	0.83	0.259	0.213	(0.233)	0.046
148	12.33	0.87	0.269	0.212	(0.242)	0.057
149	12.42	0.87	0.269	0.211	(0.242)	0.058
150	12.50	0.87	0.269	0.210	(0.242)	0.059
151	12.58	0.93	0.290	0.209	(0.261)	0.081
152	12.67	0.93	0.290	0.208	(0.261)	0.082
153	12.75	0.93	0.290	0.207	(0.261)	0.083
154	12.83	0.97	0.300	0.206	(0.270)	0.095
155	12.92	0.97	0.300	0.204	(0.270)	0.096
156	13.00	0.97	0.300	0.203	(0.270)	0.097
157	13.08	1.13	0.352	0.202	(0.317)	0.149
158	13.17	1.13	0.352	0.201	(0.317)	0.150
159	13.25	1.13	0.352	0.200	(0.317)	0.152
160	13.33	1.13	0.352	0.199	(0.317)	0.153
161	13.42	1.13	0.352	0.198	(0.317)	0.154
162	13.50	1.13	0.352	0.197	(0.317)	0.155
163	13.58	0.77	0.238	0.196	(0.214)	0.042
164	13.67	0.77	0.238	0.195	(0.214)	0.043
165	13.75	0.77	0.238	0.194	(0.214)	0.044
166	13.83	0.77	0.238	0.193	(0.214)	0.045
167	13.92	0.77	0.238	0.192	(0.214)	0.046
168	14.00	0.77	0.238	0.191	(0.214)	0.047
169	14.08	0.90	0.279	0.190	(0.251)	0.089
170	14.17	0.90	0.279	0.189	(0.251)	0.090
171	14.25	0.90	0.279	0.188	(0.251)	0.091
172	14.33	0.87	0.269	0.187	(0.242)	0.082
173	14.42	0.87	0.269	0.187	(0.242)	0.083
174	14.50	0.87	0.269	0.186	(0.242)	0.084
175	14.58	0.87	0.269	0.185	(0.242)	0.084
176	14.67	0.87	0.269	0.184	(0.242)	0.085
177	14.75	0.87	0.269	0.183	(0.242)	0.086
178	14.83	0.83	0.259	0.182	(0.233)	0.077
179	14.92	0.83	0.259	0.181	(0.233)	0.078
180	15.00	0.83	0.259	0.180	(0.233)	0.079
181	15.08	0.80	0.248	0.179	(0.224)	0.069
182	15.17	0.80	0.248	0.178	(0.224)	0.070
183	15.25	0.80	0.248	0.177	(0.224)	0.071
184	15.33	0.77	0.238	0.176	(0.214)	0.062
185	15.42	0.77	0.238	0.175	(0.214)	0.063
186	15.50	0.77	0.238	0.174	(0.214)	0.064
187	15.58	0.63	0.197	0.174	(0.177)	0.023
188	15.67	0.63	0.197	0.173	(0.177)	0.024
189	15.75	0.63	0.197	0.172	(0.177)	0.025
190	15.83	0.63	0.197	0.171	(0.177)	0.026
191	15.92	0.63	0.197	0.170	(0.177)	0.027
192	16.00	0.63	0.197	0.169	(0.177)	0.027
193	16.08	0.13	0.041	(0.168)	0.037	0.004
194	16.17	0.13	0.041	(0.167)	0.037	0.004

195	16.25	0.13	0.041	(0.167)	0.037	0.004
196	16.33	0.13	0.041	(0.166)	0.037	0.004
197	16.42	0.13	0.041	(0.165)	0.037	0.004
198	16.50	0.13	0.041	(0.164)	0.037	0.004
199	16.58	0.10	0.031	(0.163)	0.028	0.003
200	16.67	0.10	0.031	(0.162)	0.028	0.003
201	16.75	0.10	0.031	(0.162)	0.028	0.003
202	16.83	0.10	0.031	(0.161)	0.028	0.003
203	16.92	0.10	0.031	(0.160)	0.028	0.003
204	17.00	0.10	0.031	(0.159)	0.028	0.003
205	17.08	0.17	0.052	(0.158)	0.047	0.005
206	17.17	0.17	0.052	(0.158)	0.047	0.005
207	17.25	0.17	0.052	(0.157)	0.047	0.005
208	17.33	0.17	0.052	(0.156)	0.047	0.005
209	17.42	0.17	0.052	(0.155)	0.047	0.005
210	17.50	0.17	0.052	(0.154)	0.047	0.005
211	17.58	0.17	0.052	(0.154)	0.047	0.005
212	17.67	0.17	0.052	(0.153)	0.047	0.005
213	17.75	0.17	0.052	(0.152)	0.047	0.005
214	17.83	0.13	0.041	(0.151)	0.037	0.004
215	17.92	0.13	0.041	(0.151)	0.037	0.004
216	18.00	0.13	0.041	(0.150)	0.037	0.004
217	18.08	0.13	0.041	(0.149)	0.037	0.004
218	18.17	0.13	0.041	(0.148)	0.037	0.004
219	18.25	0.13	0.041	(0.148)	0.037	0.004
220	18.33	0.13	0.041	(0.147)	0.037	0.004
221	18.42	0.13	0.041	(0.146)	0.037	0.004
222	18.50	0.13	0.041	(0.145)	0.037	0.004
223	18.58	0.10	0.031	(0.145)	0.028	0.003
224	18.67	0.10	0.031	(0.144)	0.028	0.003
225	18.75	0.10	0.031	(0.143)	0.028	0.003
226	18.83	0.07	0.021	(0.143)	0.019	0.002
227	18.92	0.07	0.021	(0.142)	0.019	0.002
228	19.00	0.07	0.021	(0.141)	0.019	0.002
229	19.08	0.10	0.031	(0.141)	0.028	0.003
230	19.17	0.10	0.031	(0.140)	0.028	0.003
231	19.25	0.10	0.031	(0.139)	0.028	0.003
232	19.33	0.13	0.041	(0.139)	0.037	0.004
233	19.42	0.13	0.041	(0.138)	0.037	0.004
234	19.50	0.13	0.041	(0.137)	0.037	0.004
235	19.58	0.10	0.031	(0.137)	0.028	0.003
236	19.67	0.10	0.031	(0.136)	0.028	0.003
237	19.75	0.10	0.031	(0.136)	0.028	0.003
238	19.83	0.07	0.021	(0.135)	0.019	0.002
239	19.92	0.07	0.021	(0.134)	0.019	0.002
240	20.00	0.07	0.021	(0.134)	0.019	0.002
241	20.08	0.10	0.031	(0.133)	0.028	0.003
242	20.17	0.10	0.031	(0.133)	0.028	0.003
243	20.25	0.10	0.031	(0.132)	0.028	0.003
244	20.33	0.10	0.031	(0.131)	0.028	0.003

245	20.42	0.10	0.031	(0.131)	0.028	0.003
246	20.50	0.10	0.031	(0.130)	0.028	0.003
247	20.58	0.10	0.031	(0.130)	0.028	0.003
248	20.67	0.10	0.031	(0.129)	0.028	0.003
249	20.75	0.10	0.031	(0.129)	0.028	0.003
250	20.83	0.07	0.021	(0.128)	0.019	0.002
251	20.92	0.07	0.021	(0.128)	0.019	0.002
252	21.00	0.07	0.021	(0.127)	0.019	0.002
253	21.08	0.10	0.031	(0.127)	0.028	0.003
254	21.17	0.10	0.031	(0.126)	0.028	0.003
255	21.25	0.10	0.031	(0.126)	0.028	0.003
256	21.33	0.07	0.021	(0.125)	0.019	0.002
257	21.42	0.07	0.021	(0.125)	0.019	0.002
258	21.50	0.07	0.021	(0.124)	0.019	0.002
259	21.58	0.10	0.031	(0.124)	0.028	0.003
260	21.67	0.10	0.031	(0.123)	0.028	0.003
261	21.75	0.10	0.031	(0.123)	0.028	0.003
262	21.83	0.07	0.021	(0.122)	0.019	0.002
263	21.92	0.07	0.021	(0.122)	0.019	0.002
264	22.00	0.07	0.021	(0.122)	0.019	0.002
265	22.08	0.10	0.031	(0.121)	0.028	0.003
266	22.17	0.10	0.031	(0.121)	0.028	0.003
267	22.25	0.10	0.031	(0.120)	0.028	0.003
268	22.33	0.07	0.021	(0.120)	0.019	0.002
269	22.42	0.07	0.021	(0.120)	0.019	0.002
270	22.50	0.07	0.021	(0.119)	0.019	0.002
271	22.58	0.07	0.021	(0.119)	0.019	0.002
272	22.67	0.07	0.021	(0.119)	0.019	0.002
273	22.75	0.07	0.021	(0.118)	0.019	0.002
274	22.83	0.07	0.021	(0.118)	0.019	0.002
275	22.92	0.07	0.021	(0.118)	0.019	0.002
276	23.00	0.07	0.021	(0.117)	0.019	0.002
277	23.08	0.07	0.021	(0.117)	0.019	0.002
278	23.17	0.07	0.021	(0.117)	0.019	0.002
279	23.25	0.07	0.021	(0.117)	0.019	0.002
280	23.33	0.07	0.021	(0.116)	0.019	0.002
281	23.42	0.07	0.021	(0.116)	0.019	0.002
282	23.50	0.07	0.021	(0.116)	0.019	0.002
283	23.58	0.07	0.021	(0.116)	0.019	0.002
284	23.67	0.07	0.021	(0.116)	0.019	0.002
285	23.75	0.07	0.021	(0.116)	0.019	0.002
286	23.83	0.07	0.021	(0.115)	0.019	0.002
287	23.92	0.07	0.021	(0.115)	0.019	0.002
288	24.00	0.07	0.021	(0.115)	0.019	0.002

(Loss Rate Not Used)

Sum = 100.0 Sum = 5.4

Flood volume = Effective rainfall 0.45(In)
times area 9.6(Ac.)/[(In)/(Ft.)] = 0.4(Ac.Ft)
Total soil loss = 2.14(In)
Total soil loss = 1.704(Ac.Ft)

```
      Total rainfall =      2.59(In)
      Flood volume =       15653.0 Cubic Feet
      Total soil loss =       74228.5 Cubic Feet
      --------------------------------------------------------------------
       Peak flow rate of this hydrograph =      1.483(CFS)
      --------------------------------------------------------------------
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                         24 - H O U R    S T O R M
                    R u n o f f     H y d r o g r a p h
      --------------------------------------------------------------------
                  Hydrograph in   5   Minute intervals ((CFS))

      --------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5       5.0       7.5      10.0
-----------------------------------------------------------------------
  0+ 5       0.0001      0.01  Q         |         |         |         |
  0+10       0.0002      0.02  Q         |         |         |         |
  0+15       0.0003      0.02  Q         |         |         |         |
  0+20       0.0005      0.02  Q         |         |         |         |
  0+25       0.0007      0.03  Q         |         |         |         |
  0+30       0.0009      0.03  Q         |         |         |         |
  0+35       0.0011      0.03  Q         |         |         |         |
  0+40       0.0013      0.03  Q         |         |         |         |
  0+45       0.0015      0.03  Q         |         |         |         |
  0+50       0.0017      0.03  Q         |         |         |         |
  0+55       0.0020      0.04  Q         |         |         |         |
  1+ 0       0.0022      0.04  Q         |         |         |         |
  1+ 5       0.0025      0.04  Q         |         |         |         |
  1+10       0.0027      0.03  Q         |         |         |         |
  1+15       0.0029      0.03  Q         |         |         |         |
  1+20       0.0031      0.03  Q         |         |         |         |
  1+25       0.0033      0.03  Q         |         |         |         |
  1+30       0.0035      0.03  Q         |         |         |         |
  1+35       0.0037      0.03  Q         |         |         |         |
  1+40       0.0039      0.03  Q         |         |         |         |
  1+45       0.0042      0.03  Q         |         |         |         |
  1+50       0.0044      0.03  Q         |         |         |         |
  1+55       0.0047      0.04  Q         |         |         |         |
  2+ 0       0.0049      0.04  Q         |         |         |         |
  2+ 5       0.0052      0.04  Q         |         |         |         |
  2+10       0.0055      0.04  Q         |         |         |         |
  2+15       0.0057      0.04  Q         |         |         |         |
  2+20       0.0060      0.04  Q         |         |         |         |
  2+25       0.0063      0.04  Q         |         |         |         |
  2+30       0.0066      0.04  Q         |         |         |         |
  2+35       0.0069      0.04  Q         |         |         |         |
  2+40       0.0072      0.05  Q         |         |         |         |
  2+45       0.0075      0.05  Q         |         |         |         |
  2+50       0.0079      0.05  Q         |         |         |         |
  2+55       0.0082      0.05  Q         |         |         |         |
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 3+ 0        0.0086       0.05  Q         |         |         |         |
 3+ 5        0.0089       0.05  Q         |         |         |         |
 3+10        0.0093       0.05  QV        |         |         |         |
 3+15        0.0096       0.05  QV        |         |         |         |
 3+20        0.0100       0.05  QV        |         |         |         |
 3+25        0.0103       0.05  QV        |         |         |         |
 3+30        0.0106       0.05  QV        |         |         |         |
 3+35        0.0110       0.05  QV        |         |         |         |
 3+40        0.0113       0.05  QV        |         |         |         |
 3+45        0.0117       0.05  QV        |         |         |         |
 3+50        0.0120       0.05  QV        |         |         |         |
 3+55        0.0124       0.06  QV        |         |         |         |
 4+ 0        0.0129       0.06  QV        |         |         |         |
 4+ 5        0.0133       0.06  QV        |         |         |         |
 4+10        0.0137       0.06  QV        |         |         |         |
 4+15        0.0141       0.06  QV        |         |         |         |
 4+20        0.0145       0.06  QV        |         |         |         |
 4+25        0.0150       0.07  QV        |         |         |         |
 4+30        0.0155       0.07  QV        |         |         |         |
 4+35        0.0160       0.07  QV        |         |         |         |
 4+40        0.0164       0.07  QV        |         |         |         |
 4+45        0.0169       0.07  QV        |         |         |         |
 4+50        0.0174       0.07  QV        |         |         |         |
 4+55        0.0180       0.08  QV        |         |         |         |
 5+ 0        0.0185       0.08  Q V       |         |         |         |
 5+ 5        0.0190       0.07  Q V       |         |         |         |
 5+10        0.0194       0.06  Q V       |         |         |         |
 5+15        0.0199       0.06  Q V       |         |         |         |
 5+20        0.0203       0.06  Q V       |         |         |         |
 5+25        0.0208       0.07  Q V       |         |         |         |
 5+30        0.0213       0.07  Q V       |         |         |         |
 5+35        0.0218       0.07  Q V       |         |         |         |
 5+40        0.0223       0.08  Q V       |         |         |         |
 5+45        0.0228       0.08  Q V       |         |         |         |
 5+50        0.0234       0.08  Q V       |         |         |         |
 5+55        0.0239       0.08  Q V       |         |         |         |
 6+ 0        0.0245       0.08  Q V       |         |         |         |
 6+ 5        0.0251       0.08  Q V       |         |         |         |
 6+10        0.0257       0.09  Q V       |         |         |         |
 6+15        0.0263       0.09  Q V       |         |         |         |
 6+20        0.0269       0.09  Q V       |         |         |         |
 6+25        0.0275       0.09  Q  V      |         |         |         |
 6+30        0.0281       0.09  Q  V      |         |         |         |
 6+35        0.0288       0.09  Q  V      |         |         |         |
 6+40        0.0295       0.10  Q  V      |         |         |         |
 6+45        0.0302       0.10  Q  V      |         |         |         |
 6+50        0.0308       0.10  Q  V      |         |         |         |
 6+55        0.0315       0.10  Q  V      |         |         |         |
 7+ 0        0.0322       0.10  Q  V      |         |         |         |
 7+ 5        0.0329       0.10  Q  V      |         |         |         |
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 7+10       0.0336      0.10  Q  V      |         |         |         |
 7+15       0.0343      0.10  Q  V      |         |         |         |
 7+20       0.0350      0.10  Q  V      |         |         |         |
 7+25       0.0357      0.11  Q  V      |         |         |         |
 7+30       0.0365      0.11  Q   V     |         |         |         |
 7+35       0.0373      0.11  Q   V     |         |         |         |
 7+40       0.0381      0.12  Q   V     |         |         |         |
 7+45       0.0389      0.12  Q   V     |         |         |         |
 7+50       0.0398      0.12  Q   V     |         |         |         |
 7+55       0.0406      0.13  Q   V     |         |         |         |
 8+ 0       0.0415      0.13  Q   V     |         |         |         |
 8+ 5       0.0425      0.14  Q   V     |         |         |         |
 8+10       0.0435      0.15  Q   V     |         |         |         |
 8+15       0.0445      0.15  Q   V     |         |         |         |
 8+20       0.0455      0.15  Q    V    |         |         |         |
 8+25       0.0466      0.15  Q    V    |         |         |         |
 8+30       0.0476      0.15  Q    V    |         |         |         |
 8+35       0.0487      0.15  Q    V    |         |         |         |
 8+40       0.0498      0.16  Q    V    |         |         |         |
 8+45       0.0508      0.16  Q    V    |         |         |         |
 8+50       0.0520      0.16  Q    V    |         |         |         |
 8+55       0.0531      0.17  Q    V    |         |         |         |
 9+ 0       0.0543      0.17  Q     V   |         |         |         |
 9+ 5       0.0555      0.18  Q     V   |         |         |         |
 9+10       0.0568      0.19  Q     V   |         |         |         |
 9+15       0.0581      0.19  Q     V   |         |         |         |
 9+20       0.0594      0.19  Q     V   |         |         |         |
 9+25       0.0608      0.20  Q     V   |         |         |         |
 9+30       0.0622      0.20  Q     V   |         |         |         |
 9+35       0.0636      0.20  Q      V  |         |         |         |
 9+40       0.0650      0.21  Q      V  |         |         |         |
 9+45       0.0664      0.21  Q      V  |         |         |         |
 9+50       0.0679      0.21  Q      V  |         |         |         |
 9+55       0.0694      0.22  Q      V  |         |         |         |
10+ 0       0.0709      0.22  Q      V  |         |         |         |
10+ 5       0.0722      0.19  Q       V |         |         |         |
10+10       0.0734      0.16  Q       V |         |         |         |
10+15       0.0744      0.15  Q       V |         |         |         |
10+20       0.0755      0.15  Q       V |         |         |         |
10+25       0.0765      0.15  Q       V |         |         |         |
10+30       0.0775      0.15  Q       V |         |         |         |
10+35       0.0787      0.17  Q       V |         |         |         |
10+40       0.0800      0.19  Q       V |         |         |         |
10+45       0.0814      0.20  Q        V|         |         |         |
10+50       0.0827      0.20  Q        V|         |         |         |
10+55       0.0841      0.20  Q        V|         |         |         |
11+ 0       0.0855      0.20  Q        V|         |         |         |
11+ 5       0.0868      0.20  Q        V|         |         |         |
11+10       0.0881      0.19  Q        V|         |         |         |
11+15       0.0895      0.19  Q        V|         |         |         |
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11+20       0.0908      0.19  Q         V         |         |         |
11+25       0.0921      0.19  Q         V         |         |         |
11+30       0.0934      0.19  Q         V         |         |         |
11+35       0.0946      0.18  Q         V         |         |         |
11+40       0.0958      0.17  Q         V         |         |         |
11+45       0.0970      0.17  Q         V         |         |         |
11+50       0.0982      0.17  Q         V         |         |         |
11+55       0.0994      0.18  Q         |V        |         |         |
12+ 0       0.1007      0.18  Q         |V        |         |         |
12+ 5       0.1025      0.27  |Q        |V        |         |         |
12+10       0.1052      0.39  |Q        |V        |         |         |
12+15       0.1081      0.42  |Q        | V       |         |         |
12+20       0.1114      0.48  |Q        | V       |         |         |
12+25       0.1151      0.54  | Q       | V       |         |         |
12+30       0.1189      0.56  | Q       |  V      |         |         |
12+35       0.1234      0.65  | Q       |  V      |         |         |
12+40       0.1286      0.75  |  Q      |   V     |         |         |
12+45       0.1340      0.78  |  Q      |   V     |         |         |
12+50       0.1397      0.84  |  Q      |    V    |         |         |
12+55       0.1459      0.90  |  Q      |     V   |         |         |
13+ 0       0.1523      0.92  |  Q      |     V   |         |         |
13+ 5       0.1600      1.13  |   Q     |      V  |         |         |
13+10       0.1694      1.36  |    Q    |       V |         |         |
13+15       0.1792      1.42  |    Q    |        V|         |         |
13+20       0.1892      1.45  |    Q    |         |V        |         |
13+25       0.1993      1.47  |    Q    |         | V       |         |
13+30       0.2095      1.48  |    Q    |         |  V      |         |
13+35       0.2169      1.07  |   Q     |         |   V     |         |
13+40       0.2209      0.58  | Q       |         |   V     |         |
13+45       0.2242      0.48  |Q        |         |   V     |         |
13+50       0.2273      0.45  |Q        |         |    V    |         |
13+55       0.2303      0.43  |Q        |         |    V    |         |
14+ 0       0.2333      0.44  |Q        |         |    V    |         |
14+ 5       0.2375      0.61  | Q       |         |     V   |         |
14+10       0.2430      0.80  |  Q      |         |      V  |         |
14+15       0.2488      0.84  |  Q      |         |      V  |         |
14+20       0.2545      0.83  |  Q      |         |       V |         |
14+25       0.2601      0.80  |  Q      |         |       V |         |
14+30       0.2656      0.80  |  Q      |         |        V|         |
14+35       0.2712      0.81  |  Q      |         |         V         |
14+40       0.2768      0.82  |  Q      |         |         V         |
14+45       0.2825      0.83  |  Q      |         |         |V        |
14+50       0.2880      0.80  |  Q      |         |         | V       |
14+55       0.2932      0.76  |  Q      |         |         | V       |
15+ 0       0.2985      0.76  |  Q      |         |         |  V      |
15+ 5       0.3034      0.73  | Q       |         |         |  V      |
15+10       0.3082      0.69  | Q       |         |         |   V     |
15+15       0.3129      0.69  | Q       |         |         |   V     |
15+20       0.3174      0.65  | Q       |         |         |    V    |
15+25       0.3216      0.61  | Q       |         |         |    V    |
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15+30       0.3258      0.61  | Q       |         |         |     V   |
15+35       0.3290      0.46  |Q        |         |         |     V   |
15+40       0.3310      0.29  |Q        |         |         |     V   |
15+45       0.3328      0.26  |Q        |         |         |      V  |
15+50       0.3345      0.25  Q         |         |         |      V  |
15+55       0.3362      0.25  Q         |         |         |      V  |
16+ 0       0.3380      0.26  |Q        |         |         |      V  |
16+ 5       0.3392      0.18  Q         |         |         |      V  |
16+10       0.3397      0.08  Q         |         |         |      V  |
16+15       0.3401      0.05  Q         |         |         |      V  |
16+20       0.3404      0.04  Q         |         |         |      V  |
16+25       0.3407      0.04  Q         |         |         |      V  |
16+30       0.3409      0.04  Q         |         |         |      V  |
16+35       0.3412      0.04  Q         |         |         |      V  |
16+40       0.3414      0.03  Q         |         |         |       V |
16+45       0.3416      0.03  Q         |         |         |       V |
16+50       0.3418      0.03  Q         |         |         |       V |
16+55       0.3420      0.03  Q         |         |         |       V |
17+ 0       0.3422      0.03  Q         |         |         |       V |
17+ 5       0.3425      0.04  Q         |         |         |       V |
17+10       0.3428      0.05  Q         |         |         |       V |
17+15       0.3432      0.05  Q         |         |         |       V |
17+20       0.3435      0.05  Q         |         |         |       V |
17+25       0.3438      0.05  Q         |         |         |       V |
17+30       0.3442      0.05  Q         |         |         |       V |
17+35       0.3445      0.05  Q         |         |         |       V |
17+40       0.3449      0.05  Q         |         |         |       V |
17+45       0.3452      0.05  Q         |         |         |       V |
17+50       0.3455      0.05  Q         |         |         |       V |
17+55       0.3458      0.04  Q         |         |         |       V |
18+ 0       0.3461      0.04  Q         |         |         |       V |
18+ 5       0.3464      0.04  Q         |         |         |       V |
18+10       0.3467      0.04  Q         |         |         |       V |
18+15       0.3469      0.04  Q         |         |         |       V |
18+20       0.3472      0.04  Q         |         |         |       V |
18+25       0.3475      0.04  Q         |         |         |       V |
18+30       0.3478      0.04  Q         |         |         |       V |
18+35       0.3480      0.04  Q         |         |         |       V |
18+40       0.3482      0.03  Q         |         |         |       V |
18+45       0.3484      0.03  Q         |         |         |       V |
18+50       0.3486      0.03  Q         |         |         |       V |
18+55       0.3488      0.02  Q         |         |         |       V |
19+ 0       0.3489      0.02  Q         |         |         |       V |
19+ 5       0.3491      0.02  Q         |         |         |       V |
19+10       0.3493      0.03  Q         |         |         |       V |
19+15       0.3495      0.03  Q         |         |         |       V |
19+20       0.3497      0.03  Q         |         |         |       V |
19+25       0.3500      0.04  Q         |         |         |       V |
19+30       0.3502      0.04  Q         |         |         |       V |
19+35       0.3505      0.04  Q         |         |         |        V|
```

19+40	0.3507	0.03	Q	|	|	|	V|
19+45	0.3509	0.03	Q	|	|	|	V|
19+50	0.3511	0.03	Q	|	|	|	V|
19+55	0.3512	0.02	Q	|	|	|	V|
20+ 0	0.3514	0.02	Q	|	|	|	V|
20+ 5	0.3515	0.02	Q	|	|	|	V|
20+10	0.3517	0.03	Q	|	|	|	V|
20+15	0.3519	0.03	Q	|	|	|	V|
20+20	0.3522	0.03	Q	|	|	|	V|
20+25	0.3524	0.03	Q	|	|	|	V|
20+30	0.3526	0.03	Q	|	|	|	V|
20+35	0.3528	0.03	Q	|	|	|	V|
20+40	0.3530	0.03	Q	|	|	|	V|
20+45	0.3532	0.03	Q	|	|	|	V|
20+50	0.3534	0.03	Q	|	|	|	V|
20+55	0.3535	0.02	Q	|	|	|	V|
21+ 0	0.3537	0.02	Q	|	|	|	V|
21+ 5	0.3538	0.02	Q	|	|	|	V|
21+10	0.3540	0.03	Q	|	|	|	V|
21+15	0.3542	0.03	Q	|	|	|	V|
21+20	0.3544	0.03	Q	|	|	|	V|
21+25	0.3545	0.02	Q	|	|	|	V|
21+30	0.3547	0.02	Q	|	|	|	V|
21+35	0.3548	0.02	Q	|	|	|	V|
21+40	0.3550	0.03	Q	|	|	|	V|
21+45	0.3552	0.03	Q	|	|	|	V|
21+50	0.3554	0.03	Q	|	|	|	V|
21+55	0.3556	0.02	Q	|	|	|	V|
22+ 0	0.3557	0.02	Q	|	|	|	V|
22+ 5	0.3559	0.02	Q	|	|	|	V|
22+10	0.3561	0.03	Q	|	|	|	V|
22+15	0.3563	0.03	Q	|	|	|	V|
22+20	0.3565	0.03	Q	|	|	|	V|
22+25	0.3566	0.02	Q	|	|	|	V|
22+30	0.3567	0.02	Q	|	|	|	V|
22+35	0.3569	0.02	Q	|	|	|	V|
22+40	0.3570	0.02	Q	|	|	|	V|
22+45	0.3572	0.02	Q	|	|	|	V|
22+50	0.3573	0.02	Q	|	|	|	V|
22+55	0.3574	0.02	Q	|	|	|	V|
23+ 0	0.3576	0.02	Q	|	|	|	V|
23+ 5	0.3577	0.02	Q	|	|	|	V|
23+10	0.3578	0.02	Q	|	|	|	V|
23+15	0.3580	0.02	Q	|	|	|	V|
23+20	0.3581	0.02	Q	|	|	|	V|
23+25	0.3583	0.02	Q	|	|	|	V|
23+30	0.3584	0.02	Q	|	|	|	V|
23+35	0.3585	0.02	Q	|	|	|	V|
23+40	0.3587	0.02	Q	|	|	|	V|
23+45	0.3588	0.02	Q	|	|	|	V|

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   23+50       0.3590      0.02  Q         |         |         |       V|
   23+55       0.3591      0.02  Q         |         |         |       V|
   24+ 0       0.3592      0.02  Q         |         |         |       V|
   24+ 5       0.3593      0.01  Q         |         |         |       V|
   24+10       0.3593      0.00  Q         |         |         |       V|
   24+15       0.3593      0.00  Q         |         |         |       V|
   24+20       0.3593      0.00  Q         |         |         |        V
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U n i t   H y d r o g r a p h   A n a l y s i s

Study date 01/11/22 File: 100YRPRE24102410.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6215

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

100YRPRE2410

Drainage Area = 9.57(Ac.) = 0.015 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 9.57(Ac.) = 0.015 Sq. Mi.
Length along longest watercourse = 1318.88(Ft.)
Length along longest watercourse measured to centroid = 656.30(Ft.)
Length along longest watercourse = 0.250 Mi.
Length along longest watercourse measured to centroid = 0.124 Mi.
Difference in elevation = 10.01(Ft.)
Slope along watercourse = 40.0740 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.095 Hr.
Lag time = 5.73 Min.
25% of lag time = 1.43 Min.
40% of lag time = 2.29 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.57	1.60	15.31

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.57	4.00	38.28

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 1.600(In)
Area Averaged 100-Year Rainfall = 4.000(In)

Point rain (area averaged) = 2.587(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.587(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.570	78.00	0.050

Total Area Entered = 9.57(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
78.0	78.0	0.268	0.050	0.256	1.000	0.256
					Sum (F) =	0.256

Area averaged mean soil loss (F) (In/Hr) = 0.256
Minimum soil loss rate ((In/Hr)) = 0.128
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

	Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	87.308	15.387	1.484
2	0.167	174.616	46.516	4.486
3	0.250	261.925	18.021	1.738
4	0.333	349.233	7.796	0.752
5	0.417	436.541	4.576	0.441
6	0.500	523.849	2.883	0.278
7	0.583	611.157	2.019	0.195
8	0.667	698.466	1.317	0.127

9	0.750	785.774	0.908	0.088
10	0.833	873.082	0.579	0.056
			Sum = 100.000	Sum= 9.645

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Loss rate(In./Hr) Low	Effective (In/Hr)
1	0.08	0.07	0.021	(0.453)	0.019	0.002
2	0.17	0.07	0.021	(0.451)	0.019	0.002
3	0.25	0.07	0.021	(0.450)	0.019	0.002
4	0.33	0.10	0.031	(0.448)	0.028	0.003
5	0.42	0.10	0.031	(0.446)	0.028	0.003
6	0.50	0.10	0.031	(0.444)	0.028	0.003
7	0.58	0.10	0.031	(0.443)	0.028	0.003
8	0.67	0.10	0.031	(0.441)	0.028	0.003
9	0.75	0.10	0.031	(0.439)	0.028	0.003
10	0.83	0.13	0.041	(0.437)	0.037	0.004
11	0.92	0.13	0.041	(0.436)	0.037	0.004
12	1.00	0.13	0.041	(0.434)	0.037	0.004
13	1.08	0.10	0.031	(0.432)	0.028	0.003
14	1.17	0.10	0.031	(0.431)	0.028	0.003
15	1.25	0.10	0.031	(0.429)	0.028	0.003
16	1.33	0.10	0.031	(0.427)	0.028	0.003
17	1.42	0.10	0.031	(0.425)	0.028	0.003
18	1.50	0.10	0.031	(0.424)	0.028	0.003
19	1.58	0.10	0.031	(0.422)	0.028	0.003
20	1.67	0.10	0.031	(0.420)	0.028	0.003
21	1.75	0.10	0.031	(0.419)	0.028	0.003
22	1.83	0.13	0.041	(0.417)	0.037	0.004
23	1.92	0.13	0.041	(0.415)	0.037	0.004
24	2.00	0.13	0.041	(0.414)	0.037	0.004
25	2.08	0.13	0.041	(0.412)	0.037	0.004
26	2.17	0.13	0.041	(0.410)	0.037	0.004
27	2.25	0.13	0.041	(0.409)	0.037	0.004
28	2.33	0.13	0.041	(0.407)	0.037	0.004
29	2.42	0.13	0.041	(0.405)	0.037	0.004
30	2.50	0.13	0.041	(0.404)	0.037	0.004
31	2.58	0.17	0.052	(0.402)	0.047	0.005
32	2.67	0.17	0.052	(0.400)	0.047	0.005
33	2.75	0.17	0.052	(0.399)	0.047	0.005
34	2.83	0.17	0.052	(0.397)	0.047	0.005
35	2.92	0.17	0.052	(0.395)	0.047	0.005
36	3.00	0.17	0.052	(0.394)	0.047	0.005
37	3.08	0.17	0.052	(0.392)	0.047	0.005
38	3.17	0.17	0.052	(0.390)	0.047	0.005
39	3.25	0.17	0.052	(0.389)	0.047	0.005

40	3.33	0.17	0.052	(0.387)	0.047	0.005
41	3.42	0.17	0.052	(0.386)	0.047	0.005
42	3.50	0.17	0.052	(0.384)	0.047	0.005
43	3.58	0.17	0.052	(0.382)	0.047	0.005
44	3.67	0.17	0.052	(0.381)	0.047	0.005
45	3.75	0.17	0.052	(0.379)	0.047	0.005
46	3.83	0.20	0.062	(0.378)	0.056	0.006
47	3.92	0.20	0.062	(0.376)	0.056	0.006
48	4.00	0.20	0.062	(0.374)	0.056	0.006
49	4.08	0.20	0.062	(0.373)	0.056	0.006
50	4.17	0.20	0.062	(0.371)	0.056	0.006
51	4.25	0.20	0.062	(0.370)	0.056	0.006
52	4.33	0.23	0.072	(0.368)	0.065	0.007
53	4.42	0.23	0.072	(0.367)	0.065	0.007
54	4.50	0.23	0.072	(0.365)	0.065	0.007
55	4.58	0.23	0.072	(0.363)	0.065	0.007
56	4.67	0.23	0.072	(0.362)	0.065	0.007
57	4.75	0.23	0.072	(0.360)	0.065	0.007
58	4.83	0.27	0.083	(0.359)	0.075	0.008
59	4.92	0.27	0.083	(0.357)	0.075	0.008
60	5.00	0.27	0.083	(0.356)	0.075	0.008
61	5.08	0.20	0.062	(0.354)	0.056	0.006
62	5.17	0.20	0.062	(0.353)	0.056	0.006
63	5.25	0.20	0.062	(0.351)	0.056	0.006
64	5.33	0.23	0.072	(0.349)	0.065	0.007
65	5.42	0.23	0.072	(0.348)	0.065	0.007
66	5.50	0.23	0.072	(0.346)	0.065	0.007
67	5.58	0.27	0.083	(0.345)	0.075	0.008
68	5.67	0.27	0.083	(0.343)	0.075	0.008
69	5.75	0.27	0.083	(0.342)	0.075	0.008
70	5.83	0.27	0.083	(0.340)	0.075	0.008
71	5.92	0.27	0.083	(0.339)	0.075	0.008
72	6.00	0.27	0.083	(0.337)	0.075	0.008
73	6.08	0.30	0.093	(0.336)	0.084	0.009
74	6.17	0.30	0.093	(0.334)	0.084	0.009
75	6.25	0.30	0.093	(0.333)	0.084	0.009
76	6.33	0.30	0.093	(0.331)	0.084	0.009
77	6.42	0.30	0.093	(0.330)	0.084	0.009
78	6.50	0.30	0.093	(0.328)	0.084	0.009
79	6.58	0.33	0.103	(0.327)	0.093	0.010
80	6.67	0.33	0.103	(0.325)	0.093	0.010
81	6.75	0.33	0.103	(0.324)	0.093	0.010
82	6.83	0.33	0.103	(0.323)	0.093	0.010
83	6.92	0.33	0.103	(0.321)	0.093	0.010
84	7.00	0.33	0.103	(0.320)	0.093	0.010
85	7.08	0.33	0.103	(0.318)	0.093	0.010
86	7.17	0.33	0.103	(0.317)	0.093	0.010
87	7.25	0.33	0.103	(0.315)	0.093	0.010
88	7.33	0.37	0.114	(0.314)	0.102	0.011
89	7.42	0.37	0.114	(0.312)	0.102	0.011

90	7.50	0.37	0.114	(0.311)	0.102	0.011
91	7.58	0.40	0.124	(0.310)	0.112	0.012
92	7.67	0.40	0.124	(0.308)	0.112	0.012
93	7.75	0.40	0.124	(0.307)	0.112	0.012
94	7.83	0.43	0.135	(0.305)	0.121	0.013
95	7.92	0.43	0.135	(0.304)	0.121	0.013
96	8.00	0.43	0.135	(0.302)	0.121	0.013
97	8.08	0.50	0.155	(0.301)	0.140	0.016
98	8.17	0.50	0.155	(0.300)	0.140	0.016
99	8.25	0.50	0.155	(0.298)	0.140	0.016
100	8.33	0.50	0.155	(0.297)	0.140	0.016
101	8.42	0.50	0.155	(0.295)	0.140	0.016
102	8.50	0.50	0.155	(0.294)	0.140	0.016
103	8.58	0.53	0.166	(0.293)	0.149	0.017
104	8.67	0.53	0.166	(0.291)	0.149	0.017
105	8.75	0.53	0.166	(0.290)	0.149	0.017
106	8.83	0.57	0.176	(0.289)	0.158	0.018
107	8.92	0.57	0.176	(0.287)	0.158	0.018
108	9.00	0.57	0.176	(0.286)	0.158	0.018
109	9.08	0.63	0.197	(0.285)	0.177	0.020
110	9.17	0.63	0.197	(0.283)	0.177	0.020
111	9.25	0.63	0.197	(0.282)	0.177	0.020
112	9.33	0.67	0.207	(0.280)	0.186	0.021
113	9.42	0.67	0.207	(0.279)	0.186	0.021
114	9.50	0.67	0.207	(0.278)	0.186	0.021
115	9.58	0.70	0.217	(0.276)	0.196	0.022
116	9.67	0.70	0.217	(0.275)	0.196	0.022
117	9.75	0.70	0.217	(0.274)	0.196	0.022
118	9.83	0.73	0.228	(0.272)	0.205	0.023
119	9.92	0.73	0.228	(0.271)	0.205	0.023
120	10.00	0.73	0.228	(0.270)	0.205	0.023
121	10.08	0.50	0.155	(0.269)	0.140	0.016
122	10.17	0.50	0.155	(0.267)	0.140	0.016
123	10.25	0.50	0.155	(0.266)	0.140	0.016
124	10.33	0.50	0.155	(0.265)	0.140	0.016
125	10.42	0.50	0.155	(0.263)	0.140	0.016
126	10.50	0.50	0.155	(0.262)	0.140	0.016
127	10.58	0.67	0.207	(0.261)	0.186	0.021
128	10.67	0.67	0.207	(0.260)	0.186	0.021
129	10.75	0.67	0.207	(0.258)	0.186	0.021
130	10.83	0.67	0.207	(0.257)	0.186	0.021
131	10.92	0.67	0.207	(0.256)	0.186	0.021
132	11.00	0.67	0.207	(0.254)	0.186	0.021
133	11.08	0.63	0.197	(0.253)	0.177	0.020
134	11.17	0.63	0.197	(0.252)	0.177	0.020
135	11.25	0.63	0.197	(0.251)	0.177	0.020
136	11.33	0.63	0.197	(0.250)	0.177	0.020
137	11.42	0.63	0.197	(0.248)	0.177	0.020
138	11.50	0.63	0.197	(0.247)	0.177	0.020
139	11.58	0.57	0.176	(0.246)	0.158	0.018

140	11.67	0.57	0.176	(0.245)	0.158	0.018
141	11.75	0.57	0.176	(0.243)	0.158	0.018
142	11.83	0.60	0.186	(0.242)	0.168	0.019
143	11.92	0.60	0.186	(0.241)	0.168	0.019
144	12.00	0.60	0.186	(0.240)	0.168	0.019
145	12.08	0.83	0.259	(0.239)	0.233	0.026
146	12.17	0.83	0.259	(0.237)	0.233	0.026
147	12.25	0.83	0.259	(0.236)	0.233	0.026
148	12.33	0.87	0.269	0.235	(0.242)	0.034
149	12.42	0.87	0.269	0.234	(0.242)	0.035
150	12.50	0.87	0.269	0.233	(0.242)	0.036
151	12.58	0.93	0.290	0.231	(0.261)	0.058
152	12.67	0.93	0.290	0.230	(0.261)	0.059
153	12.75	0.93	0.290	0.229	(0.261)	0.061
154	12.83	0.97	0.300	0.228	(0.270)	0.072
155	12.92	0.97	0.300	0.227	(0.270)	0.073
156	13.00	0.97	0.300	0.226	(0.270)	0.074
157	13.08	1.13	0.352	0.225	(0.317)	0.127
158	13.17	1.13	0.352	0.223	(0.317)	0.128
159	13.25	1.13	0.352	0.222	(0.317)	0.130
160	13.33	1.13	0.352	0.221	(0.317)	0.131
161	13.42	1.13	0.352	0.220	(0.317)	0.132
162	13.50	1.13	0.352	0.219	(0.317)	0.133
163	13.58	0.77	0.238	(0.218)	0.214	0.024
164	13.67	0.77	0.238	(0.217)	0.214	0.024
165	13.75	0.77	0.238	(0.216)	0.214	0.024
166	13.83	0.77	0.238	(0.214)	0.214	0.024
167	13.92	0.77	0.238	0.213	(0.214)	0.025
168	14.00	0.77	0.238	0.212	(0.214)	0.026
169	14.08	0.90	0.279	0.211	(0.251)	0.068
170	14.17	0.90	0.279	0.210	(0.251)	0.069
171	14.25	0.90	0.279	0.209	(0.251)	0.070
172	14.33	0.87	0.269	0.208	(0.242)	0.061
173	14.42	0.87	0.269	0.207	(0.242)	0.062
174	14.50	0.87	0.269	0.206	(0.242)	0.063
175	14.58	0.87	0.269	0.205	(0.242)	0.064
176	14.67	0.87	0.269	0.204	(0.242)	0.065
177	14.75	0.87	0.269	0.203	(0.242)	0.066
178	14.83	0.83	0.259	0.202	(0.233)	0.057
179	14.92	0.83	0.259	0.201	(0.233)	0.058
180	15.00	0.83	0.259	0.200	(0.233)	0.059
181	15.08	0.80	0.248	0.199	(0.224)	0.050
182	15.17	0.80	0.248	0.198	(0.224)	0.051
183	15.25	0.80	0.248	0.197	(0.224)	0.052
184	15.33	0.77	0.238	0.196	(0.214)	0.042
185	15.42	0.77	0.238	0.195	(0.214)	0.043
186	15.50	0.77	0.238	0.194	(0.214)	0.044
187	15.58	0.63	0.197	(0.193)	0.177	0.020
188	15.67	0.63	0.197	(0.192)	0.177	0.020
189	15.75	0.63	0.197	(0.191)	0.177	0.020

190	15.83	0.63	0.197	(0.190)	0.177	0.020
191	15.92	0.63	0.197	(0.189)	0.177	0.020
192	16.00	0.63	0.197	(0.188)	0.177	0.020
193	16.08	0.13	0.041	(0.187)	0.037	0.004
194	16.17	0.13	0.041	(0.186)	0.037	0.004
195	16.25	0.13	0.041	(0.185)	0.037	0.004
196	16.33	0.13	0.041	(0.184)	0.037	0.004
197	16.42	0.13	0.041	(0.183)	0.037	0.004
198	16.50	0.13	0.041	(0.182)	0.037	0.004
199	16.58	0.10	0.031	(0.181)	0.028	0.003
200	16.67	0.10	0.031	(0.180)	0.028	0.003
201	16.75	0.10	0.031	(0.179)	0.028	0.003
202	16.83	0.10	0.031	(0.178)	0.028	0.003
203	16.92	0.10	0.031	(0.177)	0.028	0.003
204	17.00	0.10	0.031	(0.177)	0.028	0.003
205	17.08	0.17	0.052	(0.176)	0.047	0.005
206	17.17	0.17	0.052	(0.175)	0.047	0.005
207	17.25	0.17	0.052	(0.174)	0.047	0.005
208	17.33	0.17	0.052	(0.173)	0.047	0.005
209	17.42	0.17	0.052	(0.172)	0.047	0.005
210	17.50	0.17	0.052	(0.171)	0.047	0.005
211	17.58	0.17	0.052	(0.170)	0.047	0.005
212	17.67	0.17	0.052	(0.170)	0.047	0.005
213	17.75	0.17	0.052	(0.169)	0.047	0.005
214	17.83	0.13	0.041	(0.168)	0.037	0.004
215	17.92	0.13	0.041	(0.167)	0.037	0.004
216	18.00	0.13	0.041	(0.166)	0.037	0.004
217	18.08	0.13	0.041	(0.165)	0.037	0.004
218	18.17	0.13	0.041	(0.165)	0.037	0.004
219	18.25	0.13	0.041	(0.164)	0.037	0.004
220	18.33	0.13	0.041	(0.163)	0.037	0.004
221	18.42	0.13	0.041	(0.162)	0.037	0.004
222	18.50	0.13	0.041	(0.161)	0.037	0.004
223	18.58	0.10	0.031	(0.161)	0.028	0.003
224	18.67	0.10	0.031	(0.160)	0.028	0.003
225	18.75	0.10	0.031	(0.159)	0.028	0.003
226	18.83	0.07	0.021	(0.158)	0.019	0.002
227	18.92	0.07	0.021	(0.158)	0.019	0.002
228	19.00	0.07	0.021	(0.157)	0.019	0.002
229	19.08	0.10	0.031	(0.156)	0.028	0.003
230	19.17	0.10	0.031	(0.155)	0.028	0.003
231	19.25	0.10	0.031	(0.155)	0.028	0.003
232	19.33	0.13	0.041	(0.154)	0.037	0.004
233	19.42	0.13	0.041	(0.153)	0.037	0.004
234	19.50	0.13	0.041	(0.152)	0.037	0.004
235	19.58	0.10	0.031	(0.152)	0.028	0.003
236	19.67	0.10	0.031	(0.151)	0.028	0.003
237	19.75	0.10	0.031	(0.150)	0.028	0.003
238	19.83	0.07	0.021	(0.150)	0.019	0.002
239	19.92	0.07	0.021	(0.149)	0.019	0.002

240	20.00	0.07	0.021	(0.148)	0.019	0.002
241	20.08	0.10	0.031	(0.148)	0.028	0.003
242	20.17	0.10	0.031	(0.147)	0.028	0.003
243	20.25	0.10	0.031	(0.146)	0.028	0.003
244	20.33	0.10	0.031	(0.146)	0.028	0.003
245	20.42	0.10	0.031	(0.145)	0.028	0.003
246	20.50	0.10	0.031	(0.145)	0.028	0.003
247	20.58	0.10	0.031	(0.144)	0.028	0.003
248	20.67	0.10	0.031	(0.143)	0.028	0.003
249	20.75	0.10	0.031	(0.143)	0.028	0.003
250	20.83	0.07	0.021	(0.142)	0.019	0.002
251	20.92	0.07	0.021	(0.142)	0.019	0.002
252	21.00	0.07	0.021	(0.141)	0.019	0.002
253	21.08	0.10	0.031	(0.140)	0.028	0.003
254	21.17	0.10	0.031	(0.140)	0.028	0.003
255	21.25	0.10	0.031	(0.139)	0.028	0.003
256	21.33	0.07	0.021	(0.139)	0.019	0.002
257	21.42	0.07	0.021	(0.138)	0.019	0.002
258	21.50	0.07	0.021	(0.138)	0.019	0.002
259	21.58	0.10	0.031	(0.137)	0.028	0.003
260	21.67	0.10	0.031	(0.137)	0.028	0.003
261	21.75	0.10	0.031	(0.136)	0.028	0.003
262	21.83	0.07	0.021	(0.136)	0.019	0.002
263	21.92	0.07	0.021	(0.135)	0.019	0.002
264	22.00	0.07	0.021	(0.135)	0.019	0.002
265	22.08	0.10	0.031	(0.134)	0.028	0.003
266	22.17	0.10	0.031	(0.134)	0.028	0.003
267	22.25	0.10	0.031	(0.134)	0.028	0.003
268	22.33	0.07	0.021	(0.133)	0.019	0.002
269	22.42	0.07	0.021	(0.133)	0.019	0.002
270	22.50	0.07	0.021	(0.132)	0.019	0.002
271	22.58	0.07	0.021	(0.132)	0.019	0.002
272	22.67	0.07	0.021	(0.132)	0.019	0.002
273	22.75	0.07	0.021	(0.131)	0.019	0.002
274	22.83	0.07	0.021	(0.131)	0.019	0.002
275	22.92	0.07	0.021	(0.131)	0.019	0.002
276	23.00	0.07	0.021	(0.130)	0.019	0.002
277	23.08	0.07	0.021	(0.130)	0.019	0.002
278	23.17	0.07	0.021	(0.130)	0.019	0.002
279	23.25	0.07	0.021	(0.129)	0.019	0.002
280	23.33	0.07	0.021	(0.129)	0.019	0.002
281	23.42	0.07	0.021	(0.129)	0.019	0.002
282	23.50	0.07	0.021	(0.129)	0.019	0.002
283	23.58	0.07	0.021	(0.128)	0.019	0.002
284	23.67	0.07	0.021	(0.128)	0.019	0.002
285	23.75	0.07	0.021	(0.128)	0.019	0.002
286	23.83	0.07	0.021	(0.128)	0.019	0.002
287	23.92	0.07	0.021	(0.128)	0.019	0.002
288	24.00	0.07	0.021	(0.128)	0.019	0.002

(Loss Rate Not Used)

```
 Sum =     100.0                                   Sum =     4.5
    Flood volume = Effective rainfall      0.38(In)
     times area       9.6(Ac.)/[(In)/(Ft.)] =      0.3(Ac.Ft)
    Total soil loss =      2.21(In)
    Total soil loss =     1.764(Ac.Ft)
    Total rainfall =      2.59(In)
    Flood volume =       13035.6 Cubic Feet
    Total soil loss =       76845.9 Cubic Feet
    --------------------------------------------------------------------
     Peak flow rate of this hydrograph =      1.240(CFS)
    --------------------------------------------------------------------
    ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                       24 - H O U R    S T O R M
                  R u n o f f     H y d r o g r a p h
    --------------------------------------------------------------------
               Hydrograph in   5   Minute intervals ((CFS))

    --------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5       5.0       7.5      10.0
-----------------------------------------------------------------------
  0+ 5      0.0000      0.00  Q         |         |         |         |
  0+10      0.0001      0.01  Q         |         |         |         |
  0+15      0.0002      0.02  Q         |         |         |         |
  0+20      0.0003      0.02  Q         |         |         |         |
  0+25      0.0005      0.02  Q         |         |         |         |
  0+30      0.0007      0.03  Q         |         |         |         |
  0+35      0.0009      0.03  Q         |         |         |         |
  0+40      0.0011      0.03  Q         |         |         |         |
  0+45      0.0013      0.03  Q         |         |         |         |
  0+50      0.0015      0.03  Q         |         |         |         |
  0+55      0.0018      0.04  Q         |         |         |         |
  1+ 0      0.0020      0.04  Q         |         |         |         |
  1+ 5      0.0023      0.04  Q         |         |         |         |
  1+10      0.0025      0.03  Q         |         |         |         |
  1+15      0.0027      0.03  Q         |         |         |         |
  1+20      0.0029      0.03  Q         |         |         |         |
  1+25      0.0031      0.03  Q         |         |         |         |
  1+30      0.0034      0.03  Q         |         |         |         |
  1+35      0.0036      0.03  Q         |         |         |         |
  1+40      0.0038      0.03  Q         |         |         |         |
  1+45      0.0040      0.03  Q         |         |         |         |
  1+50      0.0042      0.03  Q         |         |         |         |
  1+55      0.0044      0.04  Q         |         |         |         |
  2+ 0      0.0047      0.04  Q         |         |         |         |
  2+ 5      0.0050      0.04  Q         |         |         |         |
  2+10      0.0052      0.04  Q         |         |         |         |
  2+15      0.0055      0.04  Q         |         |         |         |
  2+20      0.0058      0.04  Q         |         |         |         |
  2+25      0.0061      0.04  Q         |         |         |         |
  2+30      0.0063      0.04  Q         |         |         |         |
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2+35	0.0066	0.04	Q
2+40	0.0069	0.05	Q
2+45	0.0073	0.05	Q
2+50	0.0076	0.05	QV
2+55	0.0079	0.05	QV
3+ 0	0.0083	0.05	QV
3+ 5	0.0086	0.05	QV
3+10	0.0090	0.05	QV
3+15	0.0093	0.05	QV
3+20	0.0097	0.05	QV
3+25	0.0100	0.05	QV
3+30	0.0103	0.05	QV
3+35	0.0107	0.05	QV
3+40	0.0110	0.05	QV
3+45	0.0114	0.05	QV
3+50	0.0117	0.05	QV
3+55	0.0121	0.06	QV
4+ 0	0.0125	0.06	QV
4+ 5	0.0129	0.06	QV
4+10	0.0133	0.06	QV
4+15	0.0137	0.06	QV
4+20	0.0142	0.06	QV
4+25	0.0146	0.07	QV
4+30	0.0151	0.07	Q V
4+35	0.0156	0.07	Q V
4+40	0.0160	0.07	Q V
4+45	0.0165	0.07	Q V
4+50	0.0170	0.07	Q V
4+55	0.0175	0.08	Q V
5+ 0	0.0181	0.08	Q V
5+ 5	0.0186	0.08	Q V
5+10	0.0190	0.07	Q V
5+15	0.0195	0.06	Q V
5+20	0.0199	0.06	Q V
5+25	0.0204	0.07	Q V
5+30	0.0208	0.07	Q V
5+35	0.0213	0.07	Q V
5+40	0.0219	0.08	Q V
5+45	0.0224	0.08	Q V
5+50	0.0229	0.08	Q V
5+55	0.0235	0.08	Q V
6+ 0	0.0240	0.08	Q V
6+ 5	0.0246	0.08	Q V
6+10	0.0252	0.09	Q V
6+15	0.0258	0.09	Q V
6+20	0.0264	0.09	Q V
6+25	0.0270	0.09	Q V
6+30	0.0276	0.09	Q V
6+35	0.0282	0.09	Q V
6+40	0.0289	0.10	Q V

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 6+45       0.0296      0.10  Q  V      |         |         |         |
 6+50       0.0303      0.10  Q   V     |         |         |         |
 6+55       0.0309      0.10  Q   V     |         |         |         |
 7+ 0       0.0316      0.10  Q   V     |         |         |         |
 7+ 5       0.0323      0.10  Q   V     |         |         |         |
 7+10       0.0330      0.10  Q   V     |         |         |         |
 7+15       0.0337      0.10  Q   V     |         |         |         |
 7+20       0.0344      0.10  Q   V     |         |         |         |
 7+25       0.0351      0.11  Q   V     |         |         |         |
 7+30       0.0359      0.11  Q   V     |         |         |         |
 7+35       0.0366      0.11  Q   V     |         |         |         |
 7+40       0.0374      0.12  Q    V    |         |         |         |
 7+45       0.0382      0.12  Q    V    |         |         |         |
 7+50       0.0390      0.12  Q    V    |         |         |         |
 7+55       0.0399      0.13  Q    V    |         |         |         |
 8+ 0       0.0408      0.13  Q    V    |         |         |         |
 8+ 5       0.0417      0.13  Q    V    |         |         |         |
 8+10       0.0427      0.14  Q    V    |         |         |         |
 8+15       0.0437      0.15  Q    V    |         |         |         |
 8+20       0.0447      0.15  Q    V    |         |         |         |
 8+25       0.0457      0.15  Q     V   |         |         |         |
 8+30       0.0467      0.15  Q     V   |         |         |         |
 8+35       0.0478      0.15  Q     V   |         |         |         |
 8+40       0.0488      0.16  Q     V   |         |         |         |
 8+45       0.0499      0.16  Q     V   |         |         |         |
 8+50       0.0510      0.16  Q     V   |         |         |         |
 8+55       0.0522      0.17  Q     V   |         |         |         |
 9+ 0       0.0533      0.17  Q      V  |         |         |         |
 9+ 5       0.0545      0.17  Q      V  |         |         |         |
 9+10       0.0557      0.18  Q      V  |         |         |         |
 9+15       0.0570      0.19  Q      V  |         |         |         |
 9+20       0.0583      0.19  Q      V  |         |         |         |
 9+25       0.0596      0.19  Q      V  |         |         |         |
 9+30       0.0610      0.20  Q       V |         |         |         |
 9+35       0.0624      0.20  Q       V |         |         |         |
 9+40       0.0638      0.20  Q       V |         |         |         |
 9+45       0.0652      0.21  Q       V |         |         |         |
 9+50       0.0667      0.21  Q       V |         |         |         |
 9+55       0.0681      0.21  Q        V|         |         |         |
10+ 0       0.0696      0.22  Q        V|         |         |         |
10+ 5       0.0711      0.21  Q        V|         |         |         |
10+10       0.0723      0.18  Q        V|         |         |         |
10+15       0.0734      0.16  Q        V|         |         |         |
10+20       0.0745      0.16  Q        V|         |         |         |
10+25       0.0756      0.16  Q         V         |         |         |
10+30       0.0766      0.15  Q         V         |         |         |
10+35       0.0777      0.16  Q         V         |         |         |
10+40       0.0790      0.18  Q         V         |         |         |
10+45       0.0803      0.19  Q         V         |         |         |
10+50       0.0816      0.19  Q         V         |         |         |
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10+55       0.0829      0.20  Q         |V        |         |         |
11+ 0       0.0843      0.20  Q         |V        |         |         |
11+ 5       0.0857      0.20  Q         |V        |         |         |
11+10       0.0870      0.19  Q         |V        |         |         |
11+15       0.0883      0.19  Q         |V        |         |         |
11+20       0.0896      0.19  Q         |V        |         |         |
11+25       0.0909      0.19  Q         | V       |         |         |
11+30       0.0922      0.19  Q         | V       |         |         |
11+35       0.0935      0.19  Q         | V       |         |         |
11+40       0.0948      0.18  Q         | V       |         |         |
11+45       0.0960      0.17  Q         | V       |         |         |
11+50       0.0972      0.17  Q         | V       |         |         |
11+55       0.0984      0.18  Q         |  V      |         |         |
12+ 0       0.0996      0.18  Q         |  V      |         |         |
12+ 5       0.1009      0.19  Q         |  V      |         |         |
12+10       0.1024      0.22  Q         |  V      |         |         |
12+15       0.1041      0.24  Q         |  V      |         |         |
12+20       0.1058      0.25  |Q        |   V     |         |         |
12+25       0.1078      0.29  |Q        |   V     |         |         |
12+30       0.1100      0.32  |Q        |   V     |         |         |
12+35       0.1126      0.37  |Q        |    V    |         |         |
12+40       0.1158      0.47  |Q        |    V    |         |         |
12+45       0.1194      0.52  | Q       |    V    |         |         |
12+50       0.1233      0.57  | Q       |     V   |         |         |
12+55       0.1277      0.63  | Q       |      V  |         |         |
13+ 0       0.1323      0.67  | Q       |      V  |         |         |
13+ 5       0.1376      0.77  |  Q      |       V |         |         |
13+10       0.1446      1.02  |   Q     |        V|         |         |
13+15       0.1524      1.13  |   Q     |         V         |         |
13+20       0.1605      1.18  |   Q     |         |V        |         |
13+25       0.1688      1.21  |   Q     |         | V       |         |
13+30       0.1774      1.24  |   Q     |         |  V      |         |
13+35       0.1849      1.10  |   Q     |         |   V     |         |
13+40       0.1892      0.62  | Q       |         |    V    |         |
13+45       0.1922      0.44  |Q        |         |    V    |         |
13+50       0.1946      0.36  |Q        |         |     V   |         |
13+55       0.1968      0.31  |Q        |         |     V   |         |
14+ 0       0.1988      0.29  |Q        |         |     V   |         |
14+ 5       0.2011      0.34  |Q        |         |     V   |         |
14+10       0.2046      0.52  | Q       |         |      V  |         |
14+15       0.2087      0.59  | Q       |         |      V  |         |
14+20       0.2129      0.61  | Q       |         |       V |         |
14+25       0.2169      0.59  | Q       |         |       V |         |
14+30       0.2210      0.59  | Q       |         |        V|         |
14+35       0.2252      0.60  | Q       |         |         V         |
14+40       0.2294      0.61  | Q       |         |         V         |
14+45       0.2337      0.63  | Q       |         |         |V        |
14+50       0.2380      0.62  | Q       |         |         |V        |
14+55       0.2420      0.58  | Q       |         |         | V       |
15+ 0       0.2460      0.57  | Q       |         |         | V       |
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15+ 5       0.2498      0.56  | Q       |         |         |  V      |
15+10       0.2534      0.52  | Q       |         |         |  V      |
15+15       0.2569      0.51  | Q       |         |         |   V     |
15+20       0.2603      0.49  |Q        |         |         |   V     |
15+25       0.2634      0.45  |Q        |         |         |    V    |
15+30       0.2664      0.44  |Q        |         |         |    V    |
15+35       0.2692      0.40  |Q        |         |         |    V    |
15+40       0.2711      0.29  |Q        |         |         |     V   |
15+45       0.2728      0.24  Q         |         |         |     V   |
15+50       0.2743      0.22  Q         |         |         |     V   |
15+55       0.2757      0.21  Q         |         |         |     V   |
16+ 0       0.2771      0.20  Q         |         |         |      V  |
16+ 5       0.2783      0.17  Q         |         |         |      V  |
16+10       0.2790      0.10  Q         |         |         |      V  |
16+15       0.2795      0.07  Q         |         |         |      V  |
16+20       0.2799      0.06  Q         |         |         |      V  |
16+25       0.2802      0.05  Q         |         |         |      V  |
16+30       0.2806      0.05  Q         |         |         |      V  |
16+35       0.2809      0.04  Q         |         |         |      V  |
16+40       0.2811      0.04  Q         |         |         |      V  |
16+45       0.2813      0.03  Q         |         |         |      V  |
16+50       0.2816      0.03  Q         |         |         |      V  |
16+55       0.2818      0.03  Q         |         |         |      V  |
17+ 0       0.2820      0.03  Q         |         |         |      V  |
17+ 5       0.2822      0.03  Q         |         |         |      V  |
17+10       0.2825      0.04  Q         |         |         |      V  |
17+15       0.2828      0.05  Q         |         |         |      V  |
17+20       0.2831      0.05  Q         |         |         |      V  |
17+25       0.2835      0.05  Q         |         |         |      V  |
17+30       0.2838      0.05  Q         |         |         |      V  |
17+35       0.2842      0.05  Q         |         |         |      V  |
17+40       0.2845      0.05  Q         |         |         |       V |
17+45       0.2848      0.05  Q         |         |         |       V |
17+50       0.2852      0.05  Q         |         |         |       V |
17+55       0.2855      0.04  Q         |         |         |       V |
18+ 0       0.2858      0.04  Q         |         |         |       V |
18+ 5       0.2860      0.04  Q         |         |         |       V |
18+10       0.2863      0.04  Q         |         |         |       V |
18+15       0.2866      0.04  Q         |         |         |       V |
18+20       0.2869      0.04  Q         |         |         |       V |
18+25       0.2872      0.04  Q         |         |         |       V |
18+30       0.2874      0.04  Q         |         |         |       V |
18+35       0.2877      0.04  Q         |         |         |       V |
18+40       0.2879      0.03  Q         |         |         |       V |
18+45       0.2882      0.03  Q         |         |         |       V |
18+50       0.2884      0.03  Q         |         |         |       V |
18+55       0.2885      0.02  Q         |         |         |       V |
19+ 0       0.2887      0.02  Q         |         |         |       V |
19+ 5       0.2888      0.02  Q         |         |         |       V |
19+10       0.2890      0.03  Q         |         |         |       V |
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19+15	0.2892	0.03	Q				V
19+20	0.2894	0.03	Q				V
19+25	0.2897	0.04	Q				V
19+30	0.2899	0.04	Q				V
19+35	0.2902	0.04	Q				V
19+40	0.2904	0.03	Q				V
19+45	0.2906	0.03	Q				V
19+50	0.2908	0.03	Q				V
19+55	0.2910	0.02	Q				V
20+ 0	0.2912	0.02	Q				V
20+ 5	0.2913	0.02	Q				V
20+10	0.2915	0.03	Q				V
20+15	0.2917	0.03	Q				V
20+20	0.2919	0.03	Q				V
20+25	0.2921	0.03	Q				V
20+30	0.2923	0.03	Q				V
20+35	0.2925	0.03	Q				V
20+40	0.2927	0.03	Q				V
20+45	0.2929	0.03	Q				V
20+50	0.2931	0.03	Q				V
20+55	0.2933	0.02	Q				V
21+ 0	0.2934	0.02	Q				V
21+ 5	0.2936	0.02	Q				V
21+10	0.2938	0.03	Q				V
21+15	0.2940	0.03	Q				V
21+20	0.2942	0.03	Q				V
21+25	0.2943	0.02	Q				V
21+30	0.2945	0.02	Q				V
21+35	0.2946	0.02	Q				V
21+40	0.2948	0.03	Q				V
21+45	0.2950	0.03	Q				V
21+50	0.2952	0.03	Q				V
21+55	0.2953	0.02	Q				V
22+ 0	0.2955	0.02	Q				V
22+ 5	0.2956	0.02	Q				V
22+10	0.2958	0.03	Q				V
22+15	0.2960	0.03	Q				V
22+20	0.2962	0.03	Q				V
22+25	0.2964	0.02	Q				V
22+30	0.2965	0.02	Q				V
22+35	0.2967	0.02	Q				V
22+40	0.2968	0.02	Q				V
22+45	0.2970	0.02	Q				V
22+50	0.2971	0.02	Q				V
22+55	0.2972	0.02	Q				V
23+ 0	0.2974	0.02	Q				V
23+ 5	0.2975	0.02	Q				V
23+10	0.2976	0.02	Q				V
23+15	0.2978	0.02	Q				V
23+20	0.2979	0.02	Q				V

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   23+25       0.2981      0.02  Q         |         |         |       V|
   23+30       0.2982      0.02  Q         |         |         |       V|
   23+35       0.2983      0.02  Q         |         |         |       V|
   23+40       0.2985      0.02  Q         |         |         |       V|
   23+45       0.2986      0.02  Q         |         |         |       V|
   23+50       0.2987      0.02  Q         |         |         |       V|
   23+55       0.2989      0.02  Q         |         |         |       V|
   24+ 0       0.2990      0.02  Q         |         |         |       V|
   24+ 5       0.2991      0.02  Q         |         |         |       V|
   24+10       0.2992      0.01  Q         |         |         |       V|
   24+15       0.2992      0.00  Q         |         |         |       V|
   24+20       0.2992      0.00  Q         |         |         |       V|
   24+25       0.2992      0.00  Q         |         |         |       V|
   24+30       0.2993      0.00  Q         |         |         |       V|
   24+35       0.2993      0.00  Q         |         |         |       V|
   24+40       0.2993      0.00  Q         |         |         |       V|
   24+45       0.2993      0.00  Q         |         |         |       V|
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U n i t   H y d r o g r a p h   A n a l y s i s

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Study date 12/21/21 File: 100YRPOST2410024100.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6215

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

100YRPOST24100

Drainage Area = 9.57(Ac.) = 0.015 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 9.57(Ac.) =
0.015 Sq. Mi.
Length along longest watercourse = 1318.88(Ft.)
Length along longest watercourse measured to centroid = 656.30(Ft.)
Length along longest watercourse = 0.250 Mi.
Length along longest watercourse measured to centroid = 0.124 Mi.
Difference in elevation = 10.01(Ft.)
Slope along watercourse = 40.0740 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.048 Hr.
Lag time = 2.86 Min.
25% of lag time = 0.72 Min.
40% of lag time = 1.15 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.57	1.60	15.31

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.57	4.00	38.28

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.600(In)
Area Averaged 100-Year Rainfall = 4.000(In)

Point rain (area averaged) = 4.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 4.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.570	56.00	0.610

Total Area Entered = 9.57(Ac.)

RI AMC2	RI AMC-3	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
56.0	74.8	0.305	0.610	0.138	1.000	0.138
					Sum (F) =	0.138

Area averaged mean soil loss (F) (In/Hr) = 0.138
Minimum soil loss rate ((In/Hr)) = 0.069
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.050

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	174.616	38.645	3.727
2	0.167	349.233	45.177	4.357
3	0.250	523.849	9.915	0.956
4	0.333	698.466	4.119	0.397
5	0.417	873.082	2.145	0.207
			Sum = 100.000	Sum= 9.645

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.032	(0.244)	0.002	0.030
2	0.17	0.07	0.032	(0.243)	0.002	0.030
3	0.25	0.07	0.032	(0.242)	0.002	0.030
4	0.33	0.10	0.048	(0.241)	0.002	0.046
5	0.42	0.10	0.048	(0.240)	0.002	0.046
6	0.50	0.10	0.048	(0.239)	0.002	0.046
7	0.58	0.10	0.048	(0.238)	0.002	0.046
8	0.67	0.10	0.048	(0.238)	0.002	0.046
9	0.75	0.10	0.048	(0.237)	0.002	0.046
10	0.83	0.13	0.064	(0.236)	0.003	0.061
11	0.92	0.13	0.064	(0.235)	0.003	0.061
12	1.00	0.13	0.064	(0.234)	0.003	0.061
13	1.08	0.10	0.048	(0.233)	0.002	0.046
14	1.17	0.10	0.048	(0.232)	0.002	0.046
15	1.25	0.10	0.048	(0.231)	0.002	0.046
16	1.33	0.10	0.048	(0.230)	0.002	0.046
17	1.42	0.10	0.048	(0.229)	0.002	0.046
18	1.50	0.10	0.048	(0.228)	0.002	0.046
19	1.58	0.10	0.048	(0.227)	0.002	0.046
20	1.67	0.10	0.048	(0.227)	0.002	0.046
21	1.75	0.10	0.048	(0.226)	0.002	0.046
22	1.83	0.13	0.064	(0.225)	0.003	0.061
23	1.92	0.13	0.064	(0.224)	0.003	0.061
24	2.00	0.13	0.064	(0.223)	0.003	0.061
25	2.08	0.13	0.064	(0.222)	0.003	0.061
26	2.17	0.13	0.064	(0.221)	0.003	0.061
27	2.25	0.13	0.064	(0.220)	0.003	0.061
28	2.33	0.13	0.064	(0.219)	0.003	0.061
29	2.42	0.13	0.064	(0.218)	0.003	0.061
30	2.50	0.13	0.064	(0.218)	0.003	0.061
31	2.58	0.17	0.080	(0.217)	0.004	0.076
32	2.67	0.17	0.080	(0.216)	0.004	0.076
33	2.75	0.17	0.080	(0.215)	0.004	0.076
34	2.83	0.17	0.080	(0.214)	0.004	0.076
35	2.92	0.17	0.080	(0.213)	0.004	0.076
36	3.00	0.17	0.080	(0.212)	0.004	0.076
37	3.08	0.17	0.080	(0.211)	0.004	0.076
38	3.17	0.17	0.080	(0.210)	0.004	0.076
39	3.25	0.17	0.080	(0.210)	0.004	0.076
40	3.33	0.17	0.080	(0.209)	0.004	0.076
41	3.42	0.17	0.080	(0.208)	0.004	0.076
42	3.50	0.17	0.080	(0.207)	0.004	0.076
43	3.58	0.17	0.080	(0.206)	0.004	0.076
44	3.67	0.17	0.080	(0.205)	0.004	0.076

45	3.75	0.17	0.080	(0.204)	0.004	0.076
46	3.83	0.20	0.096	(0.203)	0.005	0.091
47	3.92	0.20	0.096	(0.203)	0.005	0.091
48	4.00	0.20	0.096	(0.202)	0.005	0.091
49	4.08	0.20	0.096	(0.201)	0.005	0.091
50	4.17	0.20	0.096	(0.200)	0.005	0.091
51	4.25	0.20	0.096	(0.199)	0.005	0.091
52	4.33	0.23	0.112	(0.198)	0.006	0.106
53	4.42	0.23	0.112	(0.198)	0.006	0.106
54	4.50	0.23	0.112	(0.197)	0.006	0.106
55	4.58	0.23	0.112	(0.196)	0.006	0.106
56	4.67	0.23	0.112	(0.195)	0.006	0.106
57	4.75	0.23	0.112	(0.194)	0.006	0.106
58	4.83	0.27	0.128	(0.193)	0.006	0.122
59	4.92	0.27	0.128	(0.192)	0.006	0.122
60	5.00	0.27	0.128	(0.192)	0.006	0.122
61	5.08	0.20	0.096	(0.191)	0.005	0.091
62	5.17	0.20	0.096	(0.190)	0.005	0.091
63	5.25	0.20	0.096	(0.189)	0.005	0.091
64	5.33	0.23	0.112	(0.188)	0.006	0.106
65	5.42	0.23	0.112	(0.187)	0.006	0.106
66	5.50	0.23	0.112	(0.187)	0.006	0.106
67	5.58	0.27	0.128	(0.186)	0.006	0.122
68	5.67	0.27	0.128	(0.185)	0.006	0.122
69	5.75	0.27	0.128	(0.184)	0.006	0.122
70	5.83	0.27	0.128	(0.183)	0.006	0.122
71	5.92	0.27	0.128	(0.183)	0.006	0.122
72	6.00	0.27	0.128	(0.182)	0.006	0.122
73	6.08	0.30	0.144	(0.181)	0.007	0.137
74	6.17	0.30	0.144	(0.180)	0.007	0.137
75	6.25	0.30	0.144	(0.179)	0.007	0.137
76	6.33	0.30	0.144	(0.179)	0.007	0.137
77	6.42	0.30	0.144	(0.178)	0.007	0.137
78	6.50	0.30	0.144	(0.177)	0.007	0.137
79	6.58	0.33	0.160	(0.176)	0.008	0.152
80	6.67	0.33	0.160	(0.175)	0.008	0.152
81	6.75	0.33	0.160	(0.175)	0.008	0.152
82	6.83	0.33	0.160	(0.174)	0.008	0.152
83	6.92	0.33	0.160	(0.173)	0.008	0.152
84	7.00	0.33	0.160	(0.172)	0.008	0.152
85	7.08	0.33	0.160	(0.171)	0.008	0.152
86	7.17	0.33	0.160	(0.171)	0.008	0.152
87	7.25	0.33	0.160	(0.170)	0.008	0.152
88	7.33	0.37	0.176	(0.169)	0.009	0.167
89	7.42	0.37	0.176	(0.168)	0.009	0.167
90	7.50	0.37	0.176	(0.168)	0.009	0.167
91	7.58	0.40	0.192	(0.167)	0.010	0.182
92	7.67	0.40	0.192	(0.166)	0.010	0.182
93	7.75	0.40	0.192	(0.165)	0.010	0.182
94	7.83	0.43	0.208	(0.165)	0.010	0.198

95	7.92	0.43	0.208	(0.164)	0.010	0.198
96	8.00	0.43	0.208	(0.163)	0.010	0.198
97	8.08	0.50	0.240	(0.162)	0.012	0.228
98	8.17	0.50	0.240	(0.161)	0.012	0.228
99	8.25	0.50	0.240	(0.161)	0.012	0.228
100	8.33	0.50	0.240	(0.160)	0.012	0.228
101	8.42	0.50	0.240	(0.159)	0.012	0.228
102	8.50	0.50	0.240	(0.158)	0.012	0.228
103	8.58	0.53	0.256	(0.158)	0.013	0.243
104	8.67	0.53	0.256	(0.157)	0.013	0.243
105	8.75	0.53	0.256	(0.156)	0.013	0.243
106	8.83	0.57	0.272	(0.156)	0.014	0.258
107	8.92	0.57	0.272	(0.155)	0.014	0.258
108	9.00	0.57	0.272	(0.154)	0.014	0.258
109	9.08	0.63	0.304	(0.153)	0.015	0.289
110	9.17	0.63	0.304	(0.153)	0.015	0.289
111	9.25	0.63	0.304	(0.152)	0.015	0.289
112	9.33	0.67	0.320	(0.151)	0.016	0.304
113	9.42	0.67	0.320	(0.150)	0.016	0.304
114	9.50	0.67	0.320	(0.150)	0.016	0.304
115	9.58	0.70	0.336	(0.149)	0.017	0.319
116	9.67	0.70	0.336	(0.148)	0.017	0.319
117	9.75	0.70	0.336	(0.148)	0.017	0.319
118	9.83	0.73	0.352	(0.147)	0.018	0.334
119	9.92	0.73	0.352	(0.146)	0.018	0.334
120	10.00	0.73	0.352	(0.145)	0.018	0.334
121	10.08	0.50	0.240	(0.145)	0.012	0.228
122	10.17	0.50	0.240	(0.144)	0.012	0.228
123	10.25	0.50	0.240	(0.143)	0.012	0.228
124	10.33	0.50	0.240	(0.143)	0.012	0.228
125	10.42	0.50	0.240	(0.142)	0.012	0.228
126	10.50	0.50	0.240	(0.141)	0.012	0.228
127	10.58	0.67	0.320	(0.141)	0.016	0.304
128	10.67	0.67	0.320	(0.140)	0.016	0.304
129	10.75	0.67	0.320	(0.139)	0.016	0.304
130	10.83	0.67	0.320	(0.139)	0.016	0.304
131	10.92	0.67	0.320	(0.138)	0.016	0.304
132	11.00	0.67	0.320	(0.137)	0.016	0.304
133	11.08	0.63	0.304	(0.136)	0.015	0.289
134	11.17	0.63	0.304	(0.136)	0.015	0.289
135	11.25	0.63	0.304	(0.135)	0.015	0.289
136	11.33	0.63	0.304	(0.134)	0.015	0.289
137	11.42	0.63	0.304	(0.134)	0.015	0.289
138	11.50	0.63	0.304	(0.133)	0.015	0.289
139	11.58	0.57	0.272	(0.132)	0.014	0.258
140	11.67	0.57	0.272	(0.132)	0.014	0.258
141	11.75	0.57	0.272	(0.131)	0.014	0.258
142	11.83	0.60	0.288	(0.131)	0.014	0.274
143	11.92	0.60	0.288	(0.130)	0.014	0.274
144	12.00	0.60	0.288	(0.129)	0.014	0.274

145	12.08	0.83	0.400	(0.129)	0.020	0.380
146	12.17	0.83	0.400	(0.128)	0.020	0.380
147	12.25	0.83	0.400	(0.127)	0.020	0.380
148	12.33	0.87	0.416	(0.127)	0.021	0.395
149	12.42	0.87	0.416	(0.126)	0.021	0.395
150	12.50	0.87	0.416	(0.125)	0.021	0.395
151	12.58	0.93	0.448	(0.125)	0.022	0.426
152	12.67	0.93	0.448	(0.124)	0.022	0.426
153	12.75	0.93	0.448	(0.123)	0.022	0.426
154	12.83	0.97	0.464	(0.123)	0.023	0.441
155	12.92	0.97	0.464	(0.122)	0.023	0.441
156	13.00	0.97	0.464	(0.122)	0.023	0.441
157	13.08	1.13	0.544	(0.121)	0.027	0.517
158	13.17	1.13	0.544	(0.120)	0.027	0.517
159	13.25	1.13	0.544	(0.120)	0.027	0.517
160	13.33	1.13	0.544	(0.119)	0.027	0.517
161	13.42	1.13	0.544	(0.119)	0.027	0.517
162	13.50	1.13	0.544	(0.118)	0.027	0.517
163	13.58	0.77	0.368	(0.117)	0.018	0.350
164	13.67	0.77	0.368	(0.117)	0.018	0.350
165	13.75	0.77	0.368	(0.116)	0.018	0.350
166	13.83	0.77	0.368	(0.116)	0.018	0.350
167	13.92	0.77	0.368	(0.115)	0.018	0.350
168	14.00	0.77	0.368	(0.114)	0.018	0.350
169	14.08	0.90	0.432	(0.114)	0.022	0.410
170	14.17	0.90	0.432	(0.113)	0.022	0.410
171	14.25	0.90	0.432	(0.113)	0.022	0.410
172	14.33	0.87	0.416	(0.112)	0.021	0.395
173	14.42	0.87	0.416	(0.112)	0.021	0.395
174	14.50	0.87	0.416	(0.111)	0.021	0.395
175	14.58	0.87	0.416	(0.110)	0.021	0.395
176	14.67	0.87	0.416	(0.110)	0.021	0.395
177	14.75	0.87	0.416	(0.109)	0.021	0.395
178	14.83	0.83	0.400	(0.109)	0.020	0.380
179	14.92	0.83	0.400	(0.108)	0.020	0.380
180	15.00	0.83	0.400	(0.108)	0.020	0.380
181	15.08	0.80	0.384	(0.107)	0.019	0.365
182	15.17	0.80	0.384	(0.106)	0.019	0.365
183	15.25	0.80	0.384	(0.106)	0.019	0.365
184	15.33	0.77	0.368	(0.105)	0.018	0.350
185	15.42	0.77	0.368	(0.105)	0.018	0.350
186	15.50	0.77	0.368	(0.104)	0.018	0.350
187	15.58	0.63	0.304	(0.104)	0.015	0.289
188	15.67	0.63	0.304	(0.103)	0.015	0.289
189	15.75	0.63	0.304	(0.103)	0.015	0.289
190	15.83	0.63	0.304	(0.102)	0.015	0.289
191	15.92	0.63	0.304	(0.102)	0.015	0.289
192	16.00	0.63	0.304	(0.101)	0.015	0.289
193	16.08	0.13	0.064	(0.101)	0.003	0.061
194	16.17	0.13	0.064	(0.100)	0.003	0.061

195	16.25	0.13	0.064	(0.100)	0.003	0.061
196	16.33	0.13	0.064	(0.099)	0.003	0.061
197	16.42	0.13	0.064	(0.099)	0.003	0.061
198	16.50	0.13	0.064	(0.098)	0.003	0.061
199	16.58	0.10	0.048	(0.098)	0.002	0.046
200	16.67	0.10	0.048	(0.097)	0.002	0.046
201	16.75	0.10	0.048	(0.097)	0.002	0.046
202	16.83	0.10	0.048	(0.096)	0.002	0.046
203	16.92	0.10	0.048	(0.096)	0.002	0.046
204	17.00	0.10	0.048	(0.095)	0.002	0.046
205	17.08	0.17	0.080	(0.095)	0.004	0.076
206	17.17	0.17	0.080	(0.094)	0.004	0.076
207	17.25	0.17	0.080	(0.094)	0.004	0.076
208	17.33	0.17	0.080	(0.093)	0.004	0.076
209	17.42	0.17	0.080	(0.093)	0.004	0.076
210	17.50	0.17	0.080	(0.092)	0.004	0.076
211	17.58	0.17	0.080	(0.092)	0.004	0.076
212	17.67	0.17	0.080	(0.091)	0.004	0.076
213	17.75	0.17	0.080	(0.091)	0.004	0.076
214	17.83	0.13	0.064	(0.090)	0.003	0.061
215	17.92	0.13	0.064	(0.090)	0.003	0.061
216	18.00	0.13	0.064	(0.090)	0.003	0.061
217	18.08	0.13	0.064	(0.089)	0.003	0.061
218	18.17	0.13	0.064	(0.089)	0.003	0.061
219	18.25	0.13	0.064	(0.088)	0.003	0.061
220	18.33	0.13	0.064	(0.088)	0.003	0.061
221	18.42	0.13	0.064	(0.087)	0.003	0.061
222	18.50	0.13	0.064	(0.087)	0.003	0.061
223	18.58	0.10	0.048	(0.087)	0.002	0.046
224	18.67	0.10	0.048	(0.086)	0.002	0.046
225	18.75	0.10	0.048	(0.086)	0.002	0.046
226	18.83	0.07	0.032	(0.085)	0.002	0.030
227	18.92	0.07	0.032	(0.085)	0.002	0.030
228	19.00	0.07	0.032	(0.085)	0.002	0.030
229	19.08	0.10	0.048	(0.084)	0.002	0.046
230	19.17	0.10	0.048	(0.084)	0.002	0.046
231	19.25	0.10	0.048	(0.083)	0.002	0.046
232	19.33	0.13	0.064	(0.083)	0.003	0.061
233	19.42	0.13	0.064	(0.083)	0.003	0.061
234	19.50	0.13	0.064	(0.082)	0.003	0.061
235	19.58	0.10	0.048	(0.082)	0.002	0.046
236	19.67	0.10	0.048	(0.081)	0.002	0.046
237	19.75	0.10	0.048	(0.081)	0.002	0.046
238	19.83	0.07	0.032	(0.081)	0.002	0.030
239	19.92	0.07	0.032	(0.080)	0.002	0.030
240	20.00	0.07	0.032	(0.080)	0.002	0.030
241	20.08	0.10	0.048	(0.080)	0.002	0.046
242	20.17	0.10	0.048	(0.079)	0.002	0.046
243	20.25	0.10	0.048	(0.079)	0.002	0.046
244	20.33	0.10	0.048	(0.079)	0.002	0.046

245	20.42	0.10	0.048	(0.078)	0.002	0.046
246	20.50	0.10	0.048	(0.078)	0.002	0.046
247	20.58	0.10	0.048	(0.078)	0.002	0.046
248	20.67	0.10	0.048	(0.077)	0.002	0.046
249	20.75	0.10	0.048	(0.077)	0.002	0.046
250	20.83	0.07	0.032	(0.077)	0.002	0.030
251	20.92	0.07	0.032	(0.076)	0.002	0.030
252	21.00	0.07	0.032	(0.076)	0.002	0.030
253	21.08	0.10	0.048	(0.076)	0.002	0.046
254	21.17	0.10	0.048	(0.075)	0.002	0.046
255	21.25	0.10	0.048	(0.075)	0.002	0.046
256	21.33	0.07	0.032	(0.075)	0.002	0.030
257	21.42	0.07	0.032	(0.075)	0.002	0.030
258	21.50	0.07	0.032	(0.074)	0.002	0.030
259	21.58	0.10	0.048	(0.074)	0.002	0.046
260	21.67	0.10	0.048	(0.074)	0.002	0.046
261	21.75	0.10	0.048	(0.073)	0.002	0.046
262	21.83	0.07	0.032	(0.073)	0.002	0.030
263	21.92	0.07	0.032	(0.073)	0.002	0.030
264	22.00	0.07	0.032	(0.073)	0.002	0.030
265	22.08	0.10	0.048	(0.072)	0.002	0.046
266	22.17	0.10	0.048	(0.072)	0.002	0.046
267	22.25	0.10	0.048	(0.072)	0.002	0.046
268	22.33	0.07	0.032	(0.072)	0.002	0.030
269	22.42	0.07	0.032	(0.072)	0.002	0.030
270	22.50	0.07	0.032	(0.071)	0.002	0.030
271	22.58	0.07	0.032	(0.071)	0.002	0.030
272	22.67	0.07	0.032	(0.071)	0.002	0.030
273	22.75	0.07	0.032	(0.071)	0.002	0.030
274	22.83	0.07	0.032	(0.071)	0.002	0.030
275	22.92	0.07	0.032	(0.070)	0.002	0.030
276	23.00	0.07	0.032	(0.070)	0.002	0.030
277	23.08	0.07	0.032	(0.070)	0.002	0.030
278	23.17	0.07	0.032	(0.070)	0.002	0.030
279	23.25	0.07	0.032	(0.070)	0.002	0.030
280	23.33	0.07	0.032	(0.070)	0.002	0.030
281	23.42	0.07	0.032	(0.069)	0.002	0.030
282	23.50	0.07	0.032	(0.069)	0.002	0.030
283	23.58	0.07	0.032	(0.069)	0.002	0.030
284	23.67	0.07	0.032	(0.069)	0.002	0.030
285	23.75	0.07	0.032	(0.069)	0.002	0.030
286	23.83	0.07	0.032	(0.069)	0.002	0.030
287	23.92	0.07	0.032	(0.069)	0.002	0.030
288	24.00	0.07	0.032	(0.069)	0.002	0.030

(Loss Rate Not Used)

Sum = 100.0 Sum = 45.6

Flood volume = Effective rainfall 3.80(In)
times area 9.6(Ac.)/[(In)/(Ft.)] = 3.0(Ac.Ft)
Total soil loss = 0.20(In)
Total soil loss = 0.159(Ac.Ft)

```
      Total rainfall =      4.00(In)
      Flood volume =      132006.1 Cubic Feet
      Total soil loss =       6947.7 Cubic Feet
      --------------------------------------------------------------------
       Peak flow rate of this hydrograph =      4.987(CFS)
      --------------------------------------------------------------------
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          24 - H O U R    S T O R M
                     R u n o f f      H y d r o g r a p h
      --------------------------------------------------------------------
                  Hydrograph in   5   Minute intervals ((CFS))

      --------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5       5.0       7.5      10.0
-----------------------------------------------------------------------
  0+ 5       0.0008      0.11  Q         |         |         |         |
  0+10       0.0025      0.25  Q         |         |         |         |
  0+15       0.0044      0.27  VQ        |         |         |         |
  0+20       0.0067      0.34  VQ        |         |         |         |
  0+25       0.0096      0.42  VQ        |         |         |         |
  0+30       0.0126      0.43  VQ        |         |         |         |
  0+35       0.0156      0.44  VQ        |         |         |         |
  0+40       0.0186      0.44  VQ        |         |         |         |
  0+45       0.0216      0.44  VQ        |         |         |         |
  0+50       0.0251      0.50  VQ        |         |         |         |
  0+55       0.0289      0.56  V Q       |         |         |         |
  1+ 0       0.0329      0.58  V Q       |         |         |         |
  1+ 5       0.0365      0.53  V Q       |         |         |         |
  1+10       0.0397      0.46  VQ        |         |         |         |
  1+15       0.0428      0.45  VQ        |         |         |         |
  1+20       0.0459      0.44  VQ        |         |         |         |
  1+25       0.0489      0.44  VQ        |         |         |         |
  1+30       0.0519      0.44  VQ        |         |         |         |
  1+35       0.0550      0.44  VQ        |         |         |         |
  1+40       0.0580      0.44  VQ        |         |         |         |
  1+45       0.0610      0.44  VQ        |         |         |         |
  1+50       0.0645      0.50  VQ        |         |         |         |
  1+55       0.0683      0.56  V Q       |         |         |         |
  2+ 0       0.0723      0.58  V Q       |         |         |         |
  2+ 5       0.0763      0.58  |VQ       |         |         |         |
  2+10       0.0804      0.59  |VQ       |         |         |         |
  2+15       0.0844      0.59  |VQ       |         |         |         |
  2+20       0.0885      0.59  |VQ       |         |         |         |
  2+25       0.0925      0.59  |VQ       |         |         |         |
  2+30       0.0965      0.59  |VQ       |         |         |         |
  2+35       0.1010      0.64  |VQ       |         |         |         |
  2+40       0.1059      0.71  |VQ       |         |         |         |
  2+45       0.1108      0.72  |VQ       |         |         |         |
  2+50       0.1159      0.73  |VQ       |         |         |         |
  2+55       0.1209      0.73  |VQ       |         |         |         |
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3+ 0       0.1260      0.73  |VQ       |         |         |         |
3+ 5       0.1310      0.73  |VQ       |         |         |         |
3+10       0.1361      0.73  |VQ       |         |         |         |
3+15       0.1411      0.73  |VQ       |         |         |         |
3+20       0.1462      0.73  |VQ       |         |         |         |
3+25       0.1512      0.73  |VQ       |         |         |         |
3+30       0.1563      0.73  | Q       |         |         |         |
3+35       0.1613      0.73  | Q       |         |         |         |
3+40       0.1664      0.73  | Q       |         |         |         |
3+45       0.1714      0.73  | Q       |         |         |         |
3+50       0.1769      0.79  | VQ      |         |         |         |
3+55       0.1828      0.86  | VQ      |         |         |         |
4+ 0       0.1888      0.87  | VQ      |         |         |         |
4+ 5       0.1948      0.88  | VQ      |         |         |         |
4+10       0.2009      0.88  | VQ      |         |         |         |
4+15       0.2069      0.88  | VQ      |         |         |         |
4+20       0.2134      0.94  | VQ      |         |         |         |
4+25       0.2203      1.00  | V Q     |         |         |         |
4+30       0.2273      1.02  |  VQ     |         |         |         |
4+35       0.2343      1.02  |  VQ     |         |         |         |
4+40       0.2414      1.03  |  VQ     |         |         |         |
4+45       0.2485      1.03  |  VQ     |         |         |         |
4+50       0.2559      1.08  |  VQ     |         |         |         |
4+55       0.2639      1.15  |  VQ     |         |         |         |
5+ 0       0.2719      1.16  |  VQ     |         |         |         |
5+ 5       0.2792      1.06  |  VQ     |         |         |         |
5+10       0.2855      0.93  |  Q      |         |         |         |
5+15       0.2917      0.90  |  Q      |         |         |         |
5+20       0.2982      0.94  |  Q      |         |         |         |
5+25       0.3051      1.00  |   Q     |         |         |         |
5+30       0.3121      1.02  |   Q     |         |         |         |
5+35       0.3196      1.08  |   Q     |         |         |         |
5+40       0.3275      1.15  |   Q     |         |         |         |
5+45       0.3355      1.16  |   Q     |         |         |         |
5+50       0.3436      1.17  |   Q     |         |         |         |
5+55       0.3517      1.17  |   Q     |         |         |         |
6+ 0       0.3597      1.17  |   Q     |         |         |         |
6+ 5       0.3682      1.23  |   Q     |         |         |         |
6+10       0.3771      1.30  |   VQ    |         |         |         |
6+15       0.3862      1.31  |    Q    |         |         |         |
6+20       0.3952      1.32  |    Q    |         |         |         |
6+25       0.4043      1.32  |    Q    |         |         |         |
6+30       0.4134      1.32  |    Q    |         |         |         |
6+35       0.4229      1.38  |    Q    |         |         |         |
6+40       0.4328      1.44  |    Q    |         |         |         |
6+45       0.4429      1.46  |    Q    |         |         |         |
6+50       0.4530      1.46  |    Q    |         |         |         |
6+55       0.4631      1.47  |    QV   |         |         |         |
7+ 0       0.4732      1.47  |    QV   |         |         |         |
7+ 5       0.4833      1.47  |    QV   |         |         |         |
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 7+10       0.4934      1.47  |    QV   |         |         |         |
 7+15       0.5035      1.47  |    QV   |         |         |         |
 7+20       0.5140      1.52  |     Q   |         |         |         |
 7+25       0.5249      1.59  |     Q   |         |         |         |
 7+30       0.5360      1.60  |     QV  |         |         |         |
 7+35       0.5474      1.67  |     QV  |         |         |         |
 7+40       0.5594      1.74  |     QV  |         |         |         |
 7+45       0.5714      1.75  |      Q  |         |         |         |
 7+50       0.5839      1.81  |      Q  |         |         |         |
 7+55       0.5969      1.88  |      Q  |         |         |         |
 8+ 0       0.6100      1.90  |      QV |         |         |         |
 8+ 5       0.6239      2.02  |       Q |         |         |         |
 8+10       0.6387      2.15  |       Q |         |         |         |
 8+15       0.6537      2.18  |       Q |         |         |         |
 8+20       0.6688      2.19  |       Q |         |         |         |
 8+25       0.6840      2.20  |       QV|         |         |         |
 8+30       0.6991      2.20  |       QV|         |         |         |
 8+35       0.7147      2.26  |        Q|         |         |         |
 8+40       0.7307      2.32  |        Q|         |         |         |
 8+45       0.7468      2.34  |        Q|         |         |         |
 8+50       0.7633      2.40  |        QV         |         |         |
 8+55       0.7803      2.47  |        QV         |         |         |
 9+ 0       0.7974      2.48  |        QV         |         |         |
 9+ 5       0.8154      2.60  |         Q         |         |         |
 9+10       0.8342      2.74  |         QV        |         |         |
 9+15       0.8533      2.77  |         |Q        |         |         |
 9+20       0.8728      2.84  |         |Q        |         |         |
 9+25       0.8929      2.91  |         |Q        |         |         |
 9+30       0.9130      2.92  |         |QV       |         |         |
 9+35       0.9336      2.99  |         |QV       |         |         |
 9+40       0.9546      3.06  |         | Q       |         |         |
 9+45       0.9758      3.07  |         | Q       |         |         |
 9+50       0.9974      3.13  |         | QV      |         |         |
 9+55       1.0194      3.20  |         | QV      |         |         |
10+ 0       1.0416      3.22  |         | QV      |         |         |
10+ 5       1.0610      2.83  |         |Q  V     |         |         |
10+10       1.0773      2.37  |        Q|   V     |         |         |
10+15       1.0929      2.26  |        Q|   V     |         |         |
10+20       1.1082      2.22  |       Q |   V     |         |         |
10+25       1.1234      2.20  |       Q |   V     |         |         |
10+30       1.1385      2.20  |       Q |    V    |         |         |
10+35       1.1557      2.48  |        Q|    V    |         |         |
10+40       1.1750      2.81  |         |Q   V    |         |         |
10+45       1.1949      2.89  |         |Q   V    |         |         |
10+50       1.2150      2.92  |         |Q    V   |         |         |
10+55       1.2352      2.93  |         |Q    V   |         |         |
11+ 0       1.2554      2.93  |         |Q    V   |         |         |
11+ 5       1.2752      2.88  |         |Q    V   |         |         |
11+10       1.2946      2.81  |         |Q     V  |         |         |
11+15       1.3138      2.80  |         |Q     V  |         |         |
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11+20       1.3331      2.79  |         |Q     V  |         |         |
11+25       1.3523      2.79  |         |Q     V  |         |         |
11+30       1.3714      2.79  |         |Q      V |         |         |
11+35       1.3899      2.67  |         Q       V |         |         |
11+40       1.4074      2.54  |         Q       V |         |         |
11+45       1.4247      2.51  |         Q       V |         |         |
11+50       1.4423      2.56  |         Q        V|         |         |
11+55       1.4603      2.62  |         Q        V|         |         |
12+ 0       1.4784      2.63  |         Q        V|         |         |
12+ 5       1.4993      3.03  |         | Q      V|         |         |
12+10       1.5234      3.50  |         |   Q     V         |         |
12+15       1.5482      3.60  |         |   Q     V         |         |
12+20       1.5737      3.70  |         |   Q     V         |         |
12+25       1.5998      3.79  |         |    Q    |V        |         |
12+30       1.6260      3.80  |         |    Q    |V        |         |
12+35       1.6530      3.92  |         |    Q    |V        |         |
12+40       1.6810      4.06  |         |     Q   | V       |         |
12+45       1.7091      4.09  |         |     Q   | V       |         |
12+50       1.7378      4.16  |         |     Q   | V       |         |
12+55       1.7669      4.23  |         |     Q   |  V      |         |
13+ 0       1.7961      4.24  |         |     Q   |  V      |         |
13+ 5       1.8274      4.53  |         |       Q |   V     |         |
13+10       1.8609      4.87  |         |        Q|   V     |         |
13+15       1.8949      4.94  |         |        Q|    V    |         |
13+20       1.9292      4.97  |         |        Q|    V    |         |
13+25       1.9635      4.99  |         |        Q|    V    |         |
13+30       1.9978      4.99  |         |        Q|     V   |         |
13+35       2.0279      4.36  |         |      Q  |     V   |         |
13+40       2.0529      3.63  |         |   Q     |      V  |         |
13+45       2.0769      3.47  |         |  Q      |      V  |         |
13+50       2.1003      3.41  |         |  Q      |      V  |         |
13+55       2.1236      3.37  |         |  Q      |       V |         |
14+ 0       2.1468      3.37  |         |  Q      |       V |         |
14+ 5       2.1716      3.60  |         |   Q     |       V |         |
14+10       2.1982      3.87  |         |    Q    |        V|         |
14+15       2.2252      3.92  |         |    Q    |        V|         |
14+20       2.2520      3.89  |         |    Q    |        V|         |
14+25       2.2785      3.84  |         |    Q    |         V         |
14+30       2.3048      3.82  |         |    Q    |         V         |
14+35       2.3311      3.82  |         |    Q    |         V         |
14+40       2.3573      3.81  |         |    Q    |         |V        |
14+45       2.3836      3.81  |         |    Q    |         |V        |
14+50       2.4095      3.76  |         |    Q    |         |V        |
14+55       2.4349      3.69  |         |   Q     |         | V       |
15+ 0       2.4602      3.68  |         |   Q     |         | V       |
15+ 5       2.4851      3.61  |         |   Q     |         | V       |
15+10       2.5095      3.54  |         |   Q     |         |  V      |
15+15       2.5338      3.53  |         |   Q     |         |  V      |
15+20       2.5577      3.47  |         |  Q      |         |  V      |
15+25       2.5811      3.40  |         |  Q      |         |   V     |
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15+30       2.6044      3.38  |         |  Q      |         |   V     |
15+35       2.6261      3.15  |         | Q       |         |   V     |
15+40       2.6459      2.88  |         |Q        |         |   V     |
15+45       2.6654      2.82  |         |Q        |         |    V    |
15+50       2.6846      2.80  |         |Q        |         |    V    |
15+55       2.7038      2.79  |         |Q        |         |    V    |
16+ 0       2.7230      2.79  |         |Q        |         |    V    |
16+ 5       2.7364      1.94  |      Q  |         |         |     V   |
16+10       2.7429      0.94  |  Q      |         |         |     V   |
16+15       2.7478      0.72  | Q       |         |         |     V   |
16+20       2.7522      0.63  | Q       |         |         |     V   |
16+25       2.7563      0.59  | Q       |         |         |     V   |
16+30       2.7603      0.59  | Q       |         |         |     V   |
16+35       2.7639      0.53  | Q       |         |         |     V   |
16+40       2.7671      0.46  |Q        |         |         |     V   |
16+45       2.7702      0.45  |Q        |         |         |     V   |
16+50       2.7733      0.44  |Q        |         |         |     V   |
16+55       2.7763      0.44  |Q        |         |         |     V   |
17+ 0       2.7793      0.44  |Q        |         |         |     V   |
17+ 5       2.7832      0.55  | Q       |         |         |     V   |
17+10       2.7879      0.69  | Q       |         |         |     V   |
17+15       2.7928      0.71  | Q       |         |         |     V   |
17+20       2.7978      0.73  | Q       |         |         |     V   |
17+25       2.8029      0.73  | Q       |         |         |     V   |
17+30       2.8079      0.73  | Q       |         |         |      V  |
17+35       2.8130      0.73  | Q       |         |         |      V  |
17+40       2.8180      0.73  | Q       |         |         |      V  |
17+45       2.8231      0.73  | Q       |         |         |      V  |
17+50       2.8277      0.68  | Q       |         |         |      V  |
17+55       2.8319      0.61  | Q       |         |         |      V  |
18+ 0       2.8360      0.60  | Q       |         |         |      V  |
18+ 5       2.8401      0.59  | Q       |         |         |      V  |
18+10       2.8441      0.59  | Q       |         |         |      V  |
18+15       2.8482      0.59  | Q       |         |         |      V  |
18+20       2.8522      0.59  | Q       |         |         |      V  |
18+25       2.8563      0.59  | Q       |         |         |      V  |
18+30       2.8603      0.59  | Q       |         |         |      V  |
18+35       2.8639      0.53  | Q       |         |         |      V  |
18+40       2.8671      0.46  |Q        |         |         |      V  |
18+45       2.8702      0.45  |Q        |         |         |      V  |
18+50       2.8729      0.39  |Q        |         |         |      V  |
18+55       2.8751      0.32  |Q        |         |         |      V  |
19+ 0       2.8772      0.30  |Q        |         |         |      V  |
19+ 5       2.8796      0.35  |Q        |         |         |       V |
19+10       2.8825      0.42  |Q        |         |         |       V |
19+15       2.8854      0.43  |Q        |         |         |       V |
19+20       2.8888      0.49  |Q        |         |         |       V |
19+25       2.8927      0.56  | Q       |         |         |       V |
19+30       2.8967      0.58  | Q       |         |         |       V |
19+35       2.9003      0.53  | Q       |         |         |       V |
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19+40	2.9035	0.46	Q			V
19+45	2.9066	0.45	Q			V
19+50	2.9093	0.39	Q			V
19+55	2.9114	0.32	Q			V
20+ 0	2.9135	0.30	Q			V
20+ 5	2.9160	0.35	Q			V
20+10	2.9188	0.42	Q			V
20+15	2.9218	0.43	Q			V
20+20	2.9248	0.44	Q			V
20+25	2.9278	0.44	Q			V
20+30	2.9309	0.44	Q			V
20+35	2.9339	0.44	Q			V
20+40	2.9369	0.44	Q			V
20+45	2.9400	0.44	Q			V
20+50	2.9426	0.38	Q			V
20+55	2.9448	0.32	Q			V
21+ 0	2.9469	0.30	Q			V
21+ 5	2.9493	0.35	Q			V
21+10	2.9522	0.42	Q			V
21+15	2.9551	0.43	Q			V
21+20	2.9577	0.38	Q			V
21+25	2.9599	0.32	Q			V
21+30	2.9620	0.30	Q			V
21+35	2.9644	0.35	Q			V
21+40	2.9673	0.42	Q			V
21+45	2.9703	0.43	Q			V
21+50	2.9729	0.38	Q			V
21+55	2.9751	0.32	Q			V
22+ 0	2.9772	0.30	Q			V
22+ 5	2.9796	0.35	Q			V
22+10	2.9825	0.42	Q			V
22+15	2.9854	0.43	Q			V
22+20	2.9881	0.38	Q			V
22+25	2.9902	0.32	Q			V
22+30	2.9923	0.30	Q			V
22+35	2.9944	0.30	Q			V
22+40	2.9964	0.29	Q			V
22+45	2.9984	0.29	Q			V
22+50	3.0004	0.29	Q			V
22+55	3.0024	0.29	Q			V
23+ 0	3.0045	0.29	Q			V
23+ 5	3.0065	0.29	Q			V
23+10	3.0085	0.29	Q			V
23+15	3.0105	0.29	Q			V
23+20	3.0125	0.29	Q			V
23+25	3.0146	0.29	Q			V
23+30	3.0166	0.29	Q			V
23+35	3.0186	0.29	Q			V
23+40	3.0206	0.29	Q			V
23+45	3.0226	0.29	Q			V

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    23+50       3.0247      0.29  |Q         |         |         |        V|
    23+55       3.0267      0.29  |Q         |         |         |        V|
    24+ 0       3.0287      0.29  |Q         |         |         |        V|
    24+ 5       3.0299      0.18  Q          |         |         |        V|
    24+10       3.0303      0.05  Q          |         |         |        V|
    24+15       3.0304      0.02  Q          |         |         |        V|
    24+20       3.0304      0.01  Q          |         |         |         V
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        U n i t   H y d r o g r a p h   A n a l y s i s

        Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1
                Study date  12/21/21 File: 100YRPRE2410024100.out


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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978


Program License Serial Number 6215

---------------------------------------------------------------------
 English (in-lb) Input Units Used
 English Rainfall Data (Inches) Input Values Used

 English Units used in output format



---------------------------------------------------------------------
100YRPRE24100



--------------------------------------------------------------------
Drainage Area =       9.57(Ac.)  =      0.015 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =       9.57(Ac.)  =
0.015 Sq. Mi.
Length along longest watercourse =    1318.88(Ft.)
Length along longest watercourse measured to centroid =     656.30(Ft.)
Length along longest watercourse =      0.250 Mi.
Length along longest watercourse measured to centroid =      0.124 Mi.
Difference in elevation =      10.01(Ft.)
Slope along watercourse =     40.0740 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.095 Hr.
Lag time =     5.73 Min.
25% of lag time =     1.43 Min.
40% of lag time =     2.29 Min.
Unit time =     5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow =     0.00(CFS)

2 YEAR Area rainfall data:
```

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.57	1.60	15.31

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.57	4.00	38.28

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.600(In)
Area Averaged 100-Year Rainfall = 4.000(In)

Point rain (area averaged) = 4.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 4.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.570	78.00	0.050

Total Area Entered = 9.57(Ac.)

RI AMC2	RI AMC-3	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
78.0	89.8	0.132	0.050	0.126	1.000	0.126
					Sum (F) =	0.126

Area averaged mean soil loss (F) (In/Hr) = 0.126
Minimum soil loss rate ((In/Hr)) = 0.063
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

U n i t   H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	87.308	15.387	1.484
2	0.167	174.616	46.516	4.486
3	0.250	261.925	18.021	1.738
4	0.333	349.233	7.796	0.752
5	0.417	436.541	4.576	0.441
6	0.500	523.849	2.883	0.278
7	0.583	611.157	2.019	0.195
8	0.667	698.466	1.317	0.127

9	0.750	785.774	0.908	0.088
10	0.833	873.082	0.579	0.056
			Sum = 100.000	Sum= 9.645

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Loss rate(In./Hr) Low	Effective (In/Hr)
1	0.08	0.07	0.032	(0.224)	0.029	0.003
2	0.17	0.07	0.032	(0.223)	0.029	0.003
3	0.25	0.07	0.032	(0.222)	0.029	0.003
4	0.33	0.10	0.048	(0.221)	0.043	0.005
5	0.42	0.10	0.048	(0.220)	0.043	0.005
6	0.50	0.10	0.048	(0.220)	0.043	0.005
7	0.58	0.10	0.048	(0.219)	0.043	0.005
8	0.67	0.10	0.048	(0.218)	0.043	0.005
9	0.75	0.10	0.048	(0.217)	0.043	0.005
10	0.83	0.13	0.064	(0.216)	0.058	0.006
11	0.92	0.13	0.064	(0.215)	0.058	0.006
12	1.00	0.13	0.064	(0.215)	0.058	0.006
13	1.08	0.10	0.048	(0.214)	0.043	0.005
14	1.17	0.10	0.048	(0.213)	0.043	0.005
15	1.25	0.10	0.048	(0.212)	0.043	0.005
16	1.33	0.10	0.048	(0.211)	0.043	0.005
17	1.42	0.10	0.048	(0.210)	0.043	0.005
18	1.50	0.10	0.048	(0.209)	0.043	0.005
19	1.58	0.10	0.048	(0.209)	0.043	0.005
20	1.67	0.10	0.048	(0.208)	0.043	0.005
21	1.75	0.10	0.048	(0.207)	0.043	0.005
22	1.83	0.13	0.064	(0.206)	0.058	0.006
23	1.92	0.13	0.064	(0.205)	0.058	0.006
24	2.00	0.13	0.064	(0.204)	0.058	0.006
25	2.08	0.13	0.064	(0.204)	0.058	0.006
26	2.17	0.13	0.064	(0.203)	0.058	0.006
27	2.25	0.13	0.064	(0.202)	0.058	0.006
28	2.33	0.13	0.064	(0.201)	0.058	0.006
29	2.42	0.13	0.064	(0.200)	0.058	0.006
30	2.50	0.13	0.064	(0.200)	0.058	0.006
31	2.58	0.17	0.080	(0.199)	0.072	0.008
32	2.67	0.17	0.080	(0.198)	0.072	0.008
33	2.75	0.17	0.080	(0.197)	0.072	0.008
34	2.83	0.17	0.080	(0.196)	0.072	0.008
35	2.92	0.17	0.080	(0.195)	0.072	0.008
36	3.00	0.17	0.080	(0.195)	0.072	0.008
37	3.08	0.17	0.080	(0.194)	0.072	0.008
38	3.17	0.17	0.080	(0.193)	0.072	0.008
39	3.25	0.17	0.080	(0.192)	0.072	0.008

40	3.33	0.17	0.080	(0.191)	0.072	0.008
41	3.42	0.17	0.080	(0.191)	0.072	0.008
42	3.50	0.17	0.080	(0.190)	0.072	0.008
43	3.58	0.17	0.080	(0.189)	0.072	0.008
44	3.67	0.17	0.080	(0.188)	0.072	0.008
45	3.75	0.17	0.080	(0.187)	0.072	0.008
46	3.83	0.20	0.096	(0.187)	0.086	0.010
47	3.92	0.20	0.096	(0.186)	0.086	0.010
48	4.00	0.20	0.096	(0.185)	0.086	0.010
49	4.08	0.20	0.096	(0.184)	0.086	0.010
50	4.17	0.20	0.096	(0.184)	0.086	0.010
51	4.25	0.20	0.096	(0.183)	0.086	0.010
52	4.33	0.23	0.112	(0.182)	0.101	0.011
53	4.42	0.23	0.112	(0.181)	0.101	0.011
54	4.50	0.23	0.112	(0.180)	0.101	0.011
55	4.58	0.23	0.112	(0.180)	0.101	0.011
56	4.67	0.23	0.112	(0.179)	0.101	0.011
57	4.75	0.23	0.112	(0.178)	0.101	0.011
58	4.83	0.27	0.128	(0.177)	0.115	0.013
59	4.92	0.27	0.128	(0.177)	0.115	0.013
60	5.00	0.27	0.128	(0.176)	0.115	0.013
61	5.08	0.20	0.096	(0.175)	0.086	0.010
62	5.17	0.20	0.096	(0.174)	0.086	0.010
63	5.25	0.20	0.096	(0.174)	0.086	0.010
64	5.33	0.23	0.112	(0.173)	0.101	0.011
65	5.42	0.23	0.112	(0.172)	0.101	0.011
66	5.50	0.23	0.112	(0.171)	0.101	0.011
67	5.58	0.27	0.128	(0.170)	0.115	0.013
68	5.67	0.27	0.128	(0.170)	0.115	0.013
69	5.75	0.27	0.128	(0.169)	0.115	0.013
70	5.83	0.27	0.128	(0.168)	0.115	0.013
71	5.92	0.27	0.128	(0.167)	0.115	0.013
72	6.00	0.27	0.128	(0.167)	0.115	0.013
73	6.08	0.30	0.144	(0.166)	0.130	0.014
74	6.17	0.30	0.144	(0.165)	0.130	0.014
75	6.25	0.30	0.144	(0.165)	0.130	0.014
76	6.33	0.30	0.144	(0.164)	0.130	0.014
77	6.42	0.30	0.144	(0.163)	0.130	0.014
78	6.50	0.30	0.144	(0.162)	0.130	0.014
79	6.58	0.33	0.160	(0.162)	0.144	0.016
80	6.67	0.33	0.160	(0.161)	0.144	0.016
81	6.75	0.33	0.160	(0.160)	0.144	0.016
82	6.83	0.33	0.160	(0.159)	0.144	0.016
83	6.92	0.33	0.160	(0.159)	0.144	0.016
84	7.00	0.33	0.160	(0.158)	0.144	0.016
85	7.08	0.33	0.160	(0.157)	0.144	0.016
86	7.17	0.33	0.160	(0.157)	0.144	0.016
87	7.25	0.33	0.160	(0.156)	0.144	0.016
88	7.33	0.37	0.176	0.155	(0.158)	0.021
89	7.42	0.37	0.176	0.154	(0.158)	0.022

90	7.50	0.37	0.176	0.154	(0.158)	0.022
91	7.58	0.40	0.192	0.153	(0.173)	0.039
92	7.67	0.40	0.192	0.152	(0.173)	0.040
93	7.75	0.40	0.192	0.152	(0.173)	0.040
94	7.83	0.43	0.208	0.151	(0.187)	0.057
95	7.92	0.43	0.208	0.150	(0.187)	0.058
96	8.00	0.43	0.208	0.150	(0.187)	0.058
97	8.08	0.50	0.240	0.149	(0.216)	0.091
98	8.17	0.50	0.240	0.148	(0.216)	0.092
99	8.25	0.50	0.240	0.147	(0.216)	0.093
100	8.33	0.50	0.240	0.147	(0.216)	0.093
101	8.42	0.50	0.240	0.146	(0.216)	0.094
102	8.50	0.50	0.240	0.145	(0.216)	0.095
103	8.58	0.53	0.256	0.145	(0.230)	0.111
104	8.67	0.53	0.256	0.144	(0.230)	0.112
105	8.75	0.53	0.256	0.143	(0.230)	0.113
106	8.83	0.57	0.272	0.143	(0.245)	0.129
107	8.92	0.57	0.272	0.142	(0.245)	0.130
108	9.00	0.57	0.272	0.141	(0.245)	0.131
109	9.08	0.63	0.304	0.141	(0.274)	0.163
110	9.17	0.63	0.304	0.140	(0.274)	0.164
111	9.25	0.63	0.304	0.139	(0.274)	0.165
112	9.33	0.67	0.320	0.139	(0.288)	0.181
113	9.42	0.67	0.320	0.138	(0.288)	0.182
114	9.50	0.67	0.320	0.137	(0.288)	0.183
115	9.58	0.70	0.336	0.137	(0.302)	0.199
116	9.67	0.70	0.336	0.136	(0.302)	0.200
117	9.75	0.70	0.336	0.135	(0.302)	0.201
118	9.83	0.73	0.352	0.135	(0.317)	0.217
119	9.92	0.73	0.352	0.134	(0.317)	0.218
120	10.00	0.73	0.352	0.133	(0.317)	0.219
121	10.08	0.50	0.240	0.133	(0.216)	0.107
122	10.17	0.50	0.240	0.132	(0.216)	0.108
123	10.25	0.50	0.240	0.131	(0.216)	0.109
124	10.33	0.50	0.240	0.131	(0.216)	0.109
125	10.42	0.50	0.240	0.130	(0.216)	0.110
126	10.50	0.50	0.240	0.130	(0.216)	0.110
127	10.58	0.67	0.320	0.129	(0.288)	0.191
128	10.67	0.67	0.320	0.128	(0.288)	0.192
129	10.75	0.67	0.320	0.128	(0.288)	0.192
130	10.83	0.67	0.320	0.127	(0.288)	0.193
131	10.92	0.67	0.320	0.126	(0.288)	0.194
132	11.00	0.67	0.320	0.126	(0.288)	0.194
133	11.08	0.63	0.304	0.125	(0.274)	0.179
134	11.17	0.63	0.304	0.125	(0.274)	0.179
135	11.25	0.63	0.304	0.124	(0.274)	0.180
136	11.33	0.63	0.304	0.123	(0.274)	0.181
137	11.42	0.63	0.304	0.123	(0.274)	0.181
138	11.50	0.63	0.304	0.122	(0.274)	0.182
139	11.58	0.57	0.272	0.122	(0.245)	0.150

140	11.67	0.57	0.272	0.121	(0.245)	0.151
141	11.75	0.57	0.272	0.120	(0.245)	0.152
142	11.83	0.60	0.288	0.120	(0.259)	0.168
143	11.92	0.60	0.288	0.119	(0.259)	0.169
144	12.00	0.60	0.288	0.119	(0.259)	0.169
145	12.08	0.83	0.400	0.118	(0.360)	0.282
146	12.17	0.83	0.400	0.117	(0.360)	0.283
147	12.25	0.83	0.400	0.117	(0.360)	0.283
148	12.33	0.87	0.416	0.116	(0.374)	0.300
149	12.42	0.87	0.416	0.116	(0.374)	0.300
150	12.50	0.87	0.416	0.115	(0.374)	0.301
151	12.58	0.93	0.448	0.114	(0.403)	0.334
152	12.67	0.93	0.448	0.114	(0.403)	0.334
153	12.75	0.93	0.448	0.113	(0.403)	0.335
154	12.83	0.97	0.464	0.113	(0.418)	0.351
155	12.92	0.97	0.464	0.112	(0.418)	0.352
156	13.00	0.97	0.464	0.112	(0.418)	0.352
157	13.08	1.13	0.544	0.111	(0.490)	0.433
158	13.17	1.13	0.544	0.110	(0.490)	0.434
159	13.25	1.13	0.544	0.110	(0.490)	0.434
160	13.33	1.13	0.544	0.109	(0.490)	0.435
161	13.42	1.13	0.544	0.109	(0.490)	0.435
162	13.50	1.13	0.544	0.108	(0.490)	0.436
163	13.58	0.77	0.368	0.108	(0.331)	0.260
164	13.67	0.77	0.368	0.107	(0.331)	0.261
165	13.75	0.77	0.368	0.107	(0.331)	0.261
166	13.83	0.77	0.368	0.106	(0.331)	0.262
167	13.92	0.77	0.368	0.105	(0.331)	0.263
168	14.00	0.77	0.368	0.105	(0.331)	0.263
169	14.08	0.90	0.432	0.104	(0.389)	0.328
170	14.17	0.90	0.432	0.104	(0.389)	0.328
171	14.25	0.90	0.432	0.103	(0.389)	0.329
172	14.33	0.87	0.416	0.103	(0.374)	0.313
173	14.42	0.87	0.416	0.102	(0.374)	0.314
174	14.50	0.87	0.416	0.102	(0.374)	0.314
175	14.58	0.87	0.416	0.101	(0.374)	0.315
176	14.67	0.87	0.416	0.101	(0.374)	0.315
177	14.75	0.87	0.416	0.100	(0.374)	0.316
178	14.83	0.83	0.400	0.100	(0.360)	0.300
179	14.92	0.83	0.400	0.099	(0.360)	0.301
180	15.00	0.83	0.400	0.099	(0.360)	0.301
181	15.08	0.80	0.384	0.098	(0.346)	0.286
182	15.17	0.80	0.384	0.098	(0.346)	0.286
183	15.25	0.80	0.384	0.097	(0.346)	0.287
184	15.33	0.77	0.368	0.097	(0.331)	0.271
185	15.42	0.77	0.368	0.096	(0.331)	0.272
186	15.50	0.77	0.368	0.096	(0.331)	0.272
187	15.58	0.63	0.304	0.095	(0.274)	0.209
188	15.67	0.63	0.304	0.095	(0.274)	0.209
189	15.75	0.63	0.304	0.094	(0.274)	0.210

190	15.83	0.63	0.304	0.094	(0.274)	0.210
191	15.92	0.63	0.304	0.093	(0.274)	0.211
192	16.00	0.63	0.304	0.093	(0.274)	0.211
193	16.08	0.13	0.064	(0.092)	0.058	0.006
194	16.17	0.13	0.064	(0.092)	0.058	0.006
195	16.25	0.13	0.064	(0.091)	0.058	0.006
196	16.33	0.13	0.064	(0.091)	0.058	0.006
197	16.42	0.13	0.064	(0.090)	0.058	0.006
198	16.50	0.13	0.064	(0.090)	0.058	0.006
199	16.58	0.10	0.048	(0.090)	0.043	0.005
200	16.67	0.10	0.048	(0.089)	0.043	0.005
201	16.75	0.10	0.048	(0.089)	0.043	0.005
202	16.83	0.10	0.048	(0.088)	0.043	0.005
203	16.92	0.10	0.048	(0.088)	0.043	0.005
204	17.00	0.10	0.048	(0.087)	0.043	0.005
205	17.08	0.17	0.080	(0.087)	0.072	0.008
206	17.17	0.17	0.080	(0.086)	0.072	0.008
207	17.25	0.17	0.080	(0.086)	0.072	0.008
208	17.33	0.17	0.080	(0.086)	0.072	0.008
209	17.42	0.17	0.080	(0.085)	0.072	0.008
210	17.50	0.17	0.080	(0.085)	0.072	0.008
211	17.58	0.17	0.080	(0.084)	0.072	0.008
212	17.67	0.17	0.080	(0.084)	0.072	0.008
213	17.75	0.17	0.080	(0.083)	0.072	0.008
214	17.83	0.13	0.064	(0.083)	0.058	0.006
215	17.92	0.13	0.064	(0.083)	0.058	0.006
216	18.00	0.13	0.064	(0.082)	0.058	0.006
217	18.08	0.13	0.064	(0.082)	0.058	0.006
218	18.17	0.13	0.064	(0.081)	0.058	0.006
219	18.25	0.13	0.064	(0.081)	0.058	0.006
220	18.33	0.13	0.064	(0.081)	0.058	0.006
221	18.42	0.13	0.064	(0.080)	0.058	0.006
222	18.50	0.13	0.064	(0.080)	0.058	0.006
223	18.58	0.10	0.048	(0.079)	0.043	0.005
224	18.67	0.10	0.048	(0.079)	0.043	0.005
225	18.75	0.10	0.048	(0.079)	0.043	0.005
226	18.83	0.07	0.032	(0.078)	0.029	0.003
227	18.92	0.07	0.032	(0.078)	0.029	0.003
228	19.00	0.07	0.032	(0.078)	0.029	0.003
229	19.08	0.10	0.048	(0.077)	0.043	0.005
230	19.17	0.10	0.048	(0.077)	0.043	0.005
231	19.25	0.10	0.048	(0.076)	0.043	0.005
232	19.33	0.13	0.064	(0.076)	0.058	0.006
233	19.42	0.13	0.064	(0.076)	0.058	0.006
234	19.50	0.13	0.064	(0.075)	0.058	0.006
235	19.58	0.10	0.048	(0.075)	0.043	0.005
236	19.67	0.10	0.048	(0.075)	0.043	0.005
237	19.75	0.10	0.048	(0.074)	0.043	0.005
238	19.83	0.07	0.032	(0.074)	0.029	0.003
239	19.92	0.07	0.032	(0.074)	0.029	0.003

240	20.00	0.07	0.032	(0.073)	0.029	0.003
241	20.08	0.10	0.048	(0.073)	0.043	0.005
242	20.17	0.10	0.048	(0.073)	0.043	0.005
243	20.25	0.10	0.048	(0.072)	0.043	0.005
244	20.33	0.10	0.048	(0.072)	0.043	0.005
245	20.42	0.10	0.048	(0.072)	0.043	0.005
246	20.50	0.10	0.048	(0.071)	0.043	0.005
247	20.58	0.10	0.048	(0.071)	0.043	0.005
248	20.67	0.10	0.048	(0.071)	0.043	0.005
249	20.75	0.10	0.048	(0.071)	0.043	0.005
250	20.83	0.07	0.032	(0.070)	0.029	0.003
251	20.92	0.07	0.032	(0.070)	0.029	0.003
252	21.00	0.07	0.032	(0.070)	0.029	0.003
253	21.08	0.10	0.048	(0.069)	0.043	0.005
254	21.17	0.10	0.048	(0.069)	0.043	0.005
255	21.25	0.10	0.048	(0.069)	0.043	0.005
256	21.33	0.07	0.032	(0.069)	0.029	0.003
257	21.42	0.07	0.032	(0.068)	0.029	0.003
258	21.50	0.07	0.032	(0.068)	0.029	0.003
259	21.58	0.10	0.048	(0.068)	0.043	0.005
260	21.67	0.10	0.048	(0.068)	0.043	0.005
261	21.75	0.10	0.048	(0.067)	0.043	0.005
262	21.83	0.07	0.032	(0.067)	0.029	0.003
263	21.92	0.07	0.032	(0.067)	0.029	0.003
264	22.00	0.07	0.032	(0.067)	0.029	0.003
265	22.08	0.10	0.048	(0.066)	0.043	0.005
266	22.17	0.10	0.048	(0.066)	0.043	0.005
267	22.25	0.10	0.048	(0.066)	0.043	0.005
268	22.33	0.07	0.032	(0.066)	0.029	0.003
269	22.42	0.07	0.032	(0.066)	0.029	0.003
270	22.50	0.07	0.032	(0.065)	0.029	0.003
271	22.58	0.07	0.032	(0.065)	0.029	0.003
272	22.67	0.07	0.032	(0.065)	0.029	0.003
273	22.75	0.07	0.032	(0.065)	0.029	0.003
274	22.83	0.07	0.032	(0.065)	0.029	0.003
275	22.92	0.07	0.032	(0.065)	0.029	0.003
276	23.00	0.07	0.032	(0.064)	0.029	0.003
277	23.08	0.07	0.032	(0.064)	0.029	0.003
278	23.17	0.07	0.032	(0.064)	0.029	0.003
279	23.25	0.07	0.032	(0.064)	0.029	0.003
280	23.33	0.07	0.032	(0.064)	0.029	0.003
281	23.42	0.07	0.032	(0.064)	0.029	0.003
282	23.50	0.07	0.032	(0.064)	0.029	0.003
283	23.58	0.07	0.032	(0.064)	0.029	0.003
284	23.67	0.07	0.032	(0.063)	0.029	0.003
285	23.75	0.07	0.032	(0.063)	0.029	0.003
286	23.83	0.07	0.032	(0.063)	0.029	0.003
287	23.92	0.07	0.032	(0.063)	0.029	0.003
288	24.00	0.07	0.032	(0.063)	0.029	0.003

(Loss Rate Not Used)

```
  Sum =     100.0                                  Sum =    23.7
     Flood volume = Effective rainfall      1.98(In)
      times area       9.6(Ac.)/[(In)/(Ft.)] =      1.6(Ac.Ft)
     Total soil loss =      2.02(In)
     Total soil loss =     1.612(Ac.Ft)
     Total rainfall =     4.00(In)
     Flood volume =      68747.9 Cubic Feet
     Total soil loss =      70205.9 Cubic Feet
     --------------------------------------------------------------------
      Peak flow rate of this hydrograph =      4.158(CFS)
     --------------------------------------------------------------------
     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                        24 - H O U R   S T O R M
                   R u n o f f     H y d r o g r a p h
     --------------------------------------------------------------------
                Hydrograph in   5   Minute intervals ((CFS))

     --------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5       5.0       7.5      10.0
-----------------------------------------------------------------------
  0+ 5       0.0000      0.00  Q         |         |         |         |
  0+10       0.0002      0.02  Q         |         |         |         |
  0+15       0.0003      0.02  Q         |         |         |         |
  0+20       0.0005      0.03  Q         |         |         |         |
  0+25       0.0008      0.04  Q         |         |         |         |
  0+30       0.0011      0.04  Q         |         |         |         |
  0+35       0.0014      0.04  Q         |         |         |         |
  0+40       0.0017      0.04  Q         |         |         |         |
  0+45       0.0020      0.05  Q         |         |         |         |
  0+50       0.0023      0.05  Q         |         |         |         |
  0+55       0.0027      0.06  Q         |         |         |         |
  1+ 0       0.0031      0.06  Q         |         |         |         |
  1+ 5       0.0035      0.06  Q         |         |         |         |
  1+10       0.0039      0.05  Q         |         |         |         |
  1+15       0.0042      0.05  Q         |         |         |         |
  1+20       0.0045      0.05  Q         |         |         |         |
  1+25       0.0049      0.05  Q         |         |         |         |
  1+30       0.0052      0.05  Q         |         |         |         |
  1+35       0.0055      0.05  Q         |         |         |         |
  1+40       0.0058      0.05  Q         |         |         |         |
  1+45       0.0061      0.05  Q         |         |         |         |
  1+50       0.0065      0.05  Q         |         |         |         |
  1+55       0.0069      0.06  Q         |         |         |         |
  2+ 0       0.0073      0.06  Q         |         |         |         |
  2+ 5       0.0077      0.06  Q         |         |         |         |
  2+10       0.0081      0.06  Q         |         |         |         |
  2+15       0.0085      0.06  Q         |         |         |         |
  2+20       0.0089      0.06  Q         |         |         |         |
  2+25       0.0094      0.06  Q         |         |         |         |
  2+30       0.0098      0.06  Q         |         |         |         |
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2+35	0.0102	0.06	Q	|	|	|	|	
2+40	0.0107	0.07	Q	|	|	|	|	
2+45	0.0112	0.07	Q	|	|	|	|	
2+50	0.0118	0.08	Q	|	|	|	|	
2+55	0.0123	0.08	Q	|	|	|	|	
3+ 0	0.0128	0.08	Q	|	|	|	|	
3+ 5	0.0133	0.08	Q	|	|	|	|	
3+10	0.0139	0.08	Q	|	|	|	|	
3+15	0.0144	0.08	Q	|	|	|	|	
3+20	0.0149	0.08	Q	|	|	|	|	
3+25	0.0155	0.08	Q	|	|	|	|	
3+30	0.0160	0.08	Q	|	|	|	|	
3+35	0.0165	0.08	Q	|	|	|	|	
3+40	0.0171	0.08	Q	|	|	|	|	
3+45	0.0176	0.08	Q	|	|	|	|	
3+50	0.0181	0.08	Q	|	|	|	|	
3+55	0.0187	0.09	Q	|	|	|	|	
4+ 0	0.0193	0.09	Q	|	|	|	|	
4+ 5	0.0200	0.09	Q	|	|	|	|	
4+10	0.0206	0.09	Q	|	|	|	|	
4+15	0.0212	0.09	Q	|	|	|	|	
4+20	0.0219	0.09	Q	|	|	|	|	
4+25	0.0226	0.10	Q	|	|	|	|	
4+30	0.0233	0.10	Q	|	|	|	|	
4+35	0.0240	0.11	Q	|	|	|	|	
4+40	0.0248	0.11	Q	|	|	|	|	
4+45	0.0255	0.11	Q	|	|	|	|	
4+50	0.0263	0.11	Q	|	|	|	|	
4+55	0.0271	0.12	Q	|	|	|	|	
5+ 0	0.0279	0.12	Q	|	|	|	|	
5+ 5	0.0287	0.12	Q	|	|	|	|	
5+10	0.0294	0.10	Q	|	|	|	|	
5+15	0.0301	0.10	Q	|	|	|	|	
5+20	0.0308	0.10	Q	|	|	|	|	
5+25	0.0315	0.10	Q	|	|	|	|	
5+30	0.0322	0.11	Q	|	|	|	|	
5+35	0.0330	0.11	Q	|	|	|	|	
5+40	0.0338	0.12	Q	|	|	|	|	
5+45	0.0346	0.12	Q	|	|	|	|	
5+50	0.0355	0.12	Q	|	|	|	|	
5+55	0.0363	0.12	Q	|	|	|	|	
6+ 0	0.0371	0.12	Q	|	|	|	|	
6+ 5	0.0380	0.13	Q	|	|	|	|	
6+10	0.0389	0.13	Q	|	|	|	|	
6+15	0.0399	0.14	QV	|	|	|	|	
6+20	0.0408	0.14	QV	|	|	|	|	
6+25	0.0417	0.14	QV	|	|	|	|	
6+30	0.0427	0.14	QV	|	|	|	|	
6+35	0.0437	0.14	QV	|	|	|	|	
6+40	0.0447	0.15	QV	|	|	|	|	

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 6+45       0.0457      0.15  QV        |         |         |         |
 6+50       0.0468      0.15  QV        |         |         |         |
 6+55       0.0478      0.15  QV        |         |         |         |
 7+ 0       0.0489      0.15  QV        |         |         |         |
 7+ 5       0.0500      0.15  QV        |         |         |         |
 7+10       0.0510      0.15  QV        |         |         |         |
 7+15       0.0521      0.15  QV        |         |         |         |
 7+20       0.0532      0.16  QV        |         |         |         |
 7+25       0.0545      0.18  QV        |         |         |         |
 7+30       0.0558      0.20  QV        |         |         |         |
 7+35       0.0574      0.23  QV        |         |         |         |
 7+40       0.0595      0.31  |Q        |         |         |         |
 7+45       0.0619      0.35  |Q        |         |         |         |
 7+50       0.0646      0.39  |Q        |         |         |         |
 7+55       0.0679      0.47  |Q        |         |         |         |
 8+ 0       0.0714      0.51  |VQ       |         |         |         |
 8+ 5       0.0754      0.58  |VQ       |         |         |         |
 8+10       0.0805      0.74  | Q       |         |         |         |
 8+15       0.0861      0.81  | VQ      |         |         |         |
 8+20       0.0920      0.85  | VQ      |         |         |         |
 8+25       0.0979      0.87  | VQ      |         |         |         |
 8+30       0.1040      0.89  | VQ      |         |         |         |
 8+35       0.1104      0.92  | VQ      |         |         |         |
 8+40       0.1173      1.01  | V Q     |         |         |         |
 8+45       0.1245      1.04  |  VQ     |         |         |         |
 8+50       0.1320      1.09  |  VQ     |         |         |         |
 8+55       0.1401      1.17  |  VQ     |         |         |         |
 9+ 0       0.1484      1.21  |  VQ     |         |         |         |
 9+ 5       0.1572      1.28  |  V Q    |         |         |         |
 9+10       0.1672      1.44  |   VQ    |         |         |         |
 9+15       0.1775      1.51  |   V Q   |         |         |         |
 9+20       0.1883      1.57  |   V Q   |         |         |         |
 9+25       0.1998      1.66  |    VQ   |         |         |         |
 9+30       0.2115      1.70  |    VQ   |         |         |         |
 9+35       0.2236      1.75  |    V Q  |         |         |         |
 9+40       0.2363      1.84  |    V Q  |         |         |         |
 9+45       0.2493      1.89  |     VQ  |         |         |         |
 9+50       0.2626      1.93  |     VQ  |         |         |         |
 9+55       0.2765      2.02  |      VQ |         |         |         |
10+ 0       0.2907      2.06  |      VQ |         |         |         |
10+ 5       0.3039      1.92  |      Q  |         |         |         |
10+10       0.3137      1.43  |    Q V  |         |         |         |
10+15       0.3223      1.25  |   Q   V |         |         |         |
10+20       0.3303      1.17  |   Q   V |         |         |         |
10+25       0.3381      1.13  |   Q   V |         |         |         |
10+30       0.3457      1.11  |   Q   V |         |         |         |
10+35       0.3541      1.21  |   Q   V |         |         |         |
10+40       0.3648      1.56  |     Q  V|         |         |         |
10+45       0.3765      1.70  |     Q  V|         |         |         |
10+50       0.3886      1.76  |      Q V|         |         |         |
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10+55       0.4010      1.80  |      Q  V         |         |         |
11+ 0       0.4136      1.83  |      Q  V         |         |         |
11+ 5       0.4261      1.82  |      Q  V         |         |         |
11+10       0.4383      1.77  |      Q  |V        |         |         |
11+15       0.4504      1.75  |      Q  |V        |         |         |
11+20       0.4624      1.75  |      Q  |V        |         |         |
11+25       0.4745      1.75  |      Q  | V       |         |         |
11+30       0.4866      1.75  |      Q  | V       |         |         |
11+35       0.4983      1.71  |     Q   | V       |         |         |
11+40       0.5091      1.57  |     Q   | V       |         |         |
11+45       0.5196      1.52  |     Q   |  V      |         |         |
11+50       0.5301      1.52  |     Q   |  V      |         |         |
11+55       0.5410      1.58  |     Q   |  V      |         |         |
12+ 0       0.5521      1.61  |     Q   |  V      |         |         |
12+ 5       0.5644      1.79  |      Q  |   V     |         |         |
12+10       0.5802      2.30  |        Q|   V     |         |         |
12+15       0.5974      2.50  |         Q    V    |         |         |
12+20       0.6154      2.62  |         Q    V    |         |         |
12+25       0.6343      2.74  |         Q     V   |         |         |
12+30       0.6537      2.81  |         |Q    V   |         |         |
12+35       0.6737      2.90  |         |Q     V  |         |         |
12+40       0.6948      3.07  |         | Q    V  |         |         |
12+45       0.7165      3.14  |         | Q     V |         |         |
12+50       0.7385      3.21  |         | Q     V |         |         |
12+55       0.7613      3.30  |         |  Q     V|         |         |
13+ 0       0.7843      3.34  |         |  Q     V|         |         |
13+ 5       0.8083      3.49  |         |  Q      V         |         |
13+10       0.8349      3.86  |         |    Q    |V        |         |
13+15       0.8626      4.02  |         |     Q   |V        |         |
13+20       0.8907      4.09  |         |     Q   | V       |         |
13+25       0.9192      4.13  |         |     Q   |  V      |         |
13+30       0.9478      4.16  |         |     Q   |   V     |         |
13+35       0.9748      3.92  |         |    Q    |   V     |         |
13+40       0.9964      3.14  |         | Q       |    V    |         |
13+45       1.0161      2.85  |         |Q        |    V    |         |
13+50       1.0349      2.73  |         Q         |     V   |         |
13+55       1.0531      2.66  |         Q         |     V   |         |
14+ 0       1.0711      2.61  |         Q         |      V  |         |
14+ 5       1.0896      2.68  |         Q         |      V  |         |
14+10       1.1099      2.95  |         |Q        |       V |         |
14+15       1.1309      3.05  |         | Q       |       V |         |
14+20       1.1520      3.07  |         | Q       |        V|         |
14+25       1.1729      3.03  |         | Q       |        V|         |
14+30       1.1937      3.02  |         | Q       |         V         |
14+35       1.2146      3.03  |         | Q       |         V         |
14+40       1.2355      3.04  |         | Q       |         |V        |
14+45       1.2564      3.04  |         | Q       |         |V        |
14+50       1.2773      3.02  |         | Q       |         | V       |
14+55       1.2976      2.96  |         |Q        |         | V       |
15+ 0       1.3178      2.93  |         |Q        |         |  V      |
```

```
15+ 5       1.3378      2.90  |         |Q        |         |  V      |
15+10       1.3572      2.83  |         |Q        |         |   V     |
15+15       1.3765      2.80  |         |Q        |         |   V     |
15+20       1.3955      2.76  |         |Q        |         |    V    |
15+25       1.4140      2.69  |         Q         |         |    V    |
15+30       1.4323      2.66  |         Q         |         |     V   |
15+35       1.4499      2.55  |         Q         |         |     V   |
15+40       1.4655      2.26  |        Q|         |         |      V  |
15+45       1.4803      2.15  |       Q |         |         |      V  |
15+50       1.4948      2.10  |       Q |         |         |      V  |
15+55       1.5091      2.08  |       Q |         |         |       V |
16+ 0       1.5233      2.06  |       Q |         |         |       V |
16+ 5       1.5353      1.75  |     Q   |         |         |       V |
16+10       1.5410      0.82  |  Q      |         |         |        V|
16+15       1.5441      0.46  |Q        |         |         |        V|
16+20       1.5462      0.30  |Q        |         |         |        V|
16+25       1.5477      0.21  Q         |         |         |        V|
16+30       1.5488      0.16  Q         |         |         |        V|
16+35       1.5496      0.11  Q         |         |         |        V|
16+40       1.5501      0.08  Q         |         |         |        V|
16+45       1.5505      0.06  Q         |         |         |        V|
16+50       1.5509      0.05  Q         |         |         |        V|
16+55       1.5512      0.05  Q         |         |         |        V|
17+ 0       1.5515      0.05  Q         |         |         |        V|
17+ 5       1.5519      0.05  Q         |         |         |        V|
17+10       1.5523      0.07  Q         |         |         |        V|
17+15       1.5528      0.07  Q         |         |         |        V|
17+20       1.5533      0.07  Q         |         |         |        V|
17+25       1.5538      0.07  Q         |         |         |        V|
17+30       1.5544      0.08  Q         |         |         |        V|
17+35       1.5549      0.08  Q         |         |         |        V|
17+40       1.5554      0.08  Q         |         |         |        V|
17+45       1.5559      0.08  Q         |         |         |        V|
17+50       1.5565      0.07  Q         |         |         |        V|
17+55       1.5569      0.07  Q         |         |         |        V|
18+ 0       1.5574      0.06  Q         |         |         |        V|
18+ 5       1.5578      0.06  Q         |         |         |        V|
18+10       1.5582      0.06  Q         |         |         |        V|
18+15       1.5587      0.06  Q         |         |         |        V|
18+20       1.5591      0.06  Q         |         |         |        V|
18+25       1.5595      0.06  Q         |         |         |        V|
18+30       1.5600      0.06  Q         |         |         |        V|
18+35       1.5604      0.06  Q         |         |         |        V|
18+40       1.5607      0.05  Q         |         |         |        V|
18+45       1.5611      0.05  Q         |         |         |        V|
18+50       1.5614      0.05  Q         |         |         |        V|
18+55       1.5616      0.04  Q         |         |         |        V|
19+ 0       1.5619      0.03  Q         |         |         |        V|
19+ 5       1.5621      0.04  Q         |         |         |        V|
19+10       1.5624      0.04  Q         |         |         |        V|
```

19+15	1.5627	0.04	Q	|	|	|	V|
19+20	1.5630	0.05	Q	|	|	|	V|
19+25	1.5634	0.05	Q	|	|	|	V|
19+30	1.5638	0.06	Q	|	|	|	V|
19+35	1.5642	0.06	Q	|	|	|	V|
19+40	1.5646	0.05	Q	|	|	|	V|
19+45	1.5649	0.05	Q	|	|	|	V|
19+50	1.5652	0.05	Q	|	|	|	V|
19+55	1.5655	0.04	Q	|	|	|	V|
20+ 0	1.5657	0.03	Q	|	|	|	V|
20+ 5	1.5660	0.04	Q	|	|	|	V|
20+10	1.5662	0.04	Q	|	|	|	V|
20+15	1.5665	0.04	Q	|	|	|	V|
20+20	1.5669	0.04	Q	|	|	|	V|
20+25	1.5672	0.05	Q	|	|	|	V|
20+30	1.5675	0.05	Q	|	|	|	V|
20+35	1.5678	0.05	Q	|	|	|	V|
20+40	1.5681	0.05	Q	|	|	|	V|
20+45	1.5684	0.05	Q	|	|	|	V|
20+50	1.5687	0.04	Q	|	|	|	V|
20+55	1.5690	0.04	Q	|	|	|	V|
21+ 0	1.5692	0.03	Q	|	|	|	V|
21+ 5	1.5695	0.04	Q	|	|	|	V|
21+10	1.5698	0.04	Q	|	|	|	V|
21+15	1.5701	0.04	Q	|	|	|	V|
21+20	1.5703	0.04	Q	|	|	|	V|
21+25	1.5706	0.04	Q	|	|	|	V|
21+30	1.5708	0.03	Q	|	|	|	V|
21+35	1.5711	0.03	Q	|	|	|	V|
21+40	1.5713	0.04	Q	|	|	|	V|
21+45	1.5716	0.04	Q	|	|	|	V|
21+50	1.5719	0.04	Q	|	|	|	V|
21+55	1.5722	0.04	Q	|	|	|	V|
22+ 0	1.5724	0.03	Q	|	|	|	V|
22+ 5	1.5727	0.03	Q	|	|	|	V|
22+10	1.5729	0.04	Q	|	|	|	V|
22+15	1.5732	0.04	Q	|	|	|	V|
22+20	1.5735	0.04	Q	|	|	|	V|
22+25	1.5738	0.04	Q	|	|	|	V|
22+30	1.5740	0.03	Q	|	|	|	V|
22+35	1.5742	0.03	Q	|	|	|	V|
22+40	1.5745	0.03	Q	|	|	|	V|
22+45	1.5747	0.03	Q	|	|	|	V|
22+50	1.5749	0.03	Q	|	|	|	V|
22+55	1.5751	0.03	Q	|	|	|	V|
23+ 0	1.5753	0.03	Q	|	|	|	V|
23+ 5	1.5755	0.03	Q	|	|	|	V|
23+10	1.5757	0.03	Q	|	|	|	V|
23+15	1.5760	0.03	Q	|	|	|	V|
23+20	1.5762	0.03	Q	|	|	|	V|

```
   23+25        1.5764       0.03  Q          |         |         |        V|
   23+30        1.5766       0.03  Q          |         |         |        V|
   23+35        1.5768       0.03  Q          |         |         |        V|
   23+40        1.5770       0.03  Q          |         |         |        V|
   23+45        1.5772       0.03  Q          |         |         |        V|
   23+50        1.5774       0.03  Q          |         |         |        V|
   23+55        1.5777       0.03  Q          |         |         |        V|
   24+ 0        1.5779       0.03  Q          |         |         |        V|
   24+ 5        1.5780       0.03  Q          |         |         |        V|
   24+10        1.5781       0.01  Q          |         |         |        V|
   24+15        1.5782       0.01  Q          |         |         |        V|
   24+20        1.5782       0.00  Q          |         |         |        V|
   24+25        1.5782       0.00  Q          |         |         |        V|
   24+30        1.5782       0.00  Q          |         |         |        V|
   24+35        1.5782       0.00  Q          |         |         |        V|
   24+40        1.5782       0.00  Q          |         |         |        V|
   24+45        1.5782       0.00  Q          |         |         |         V
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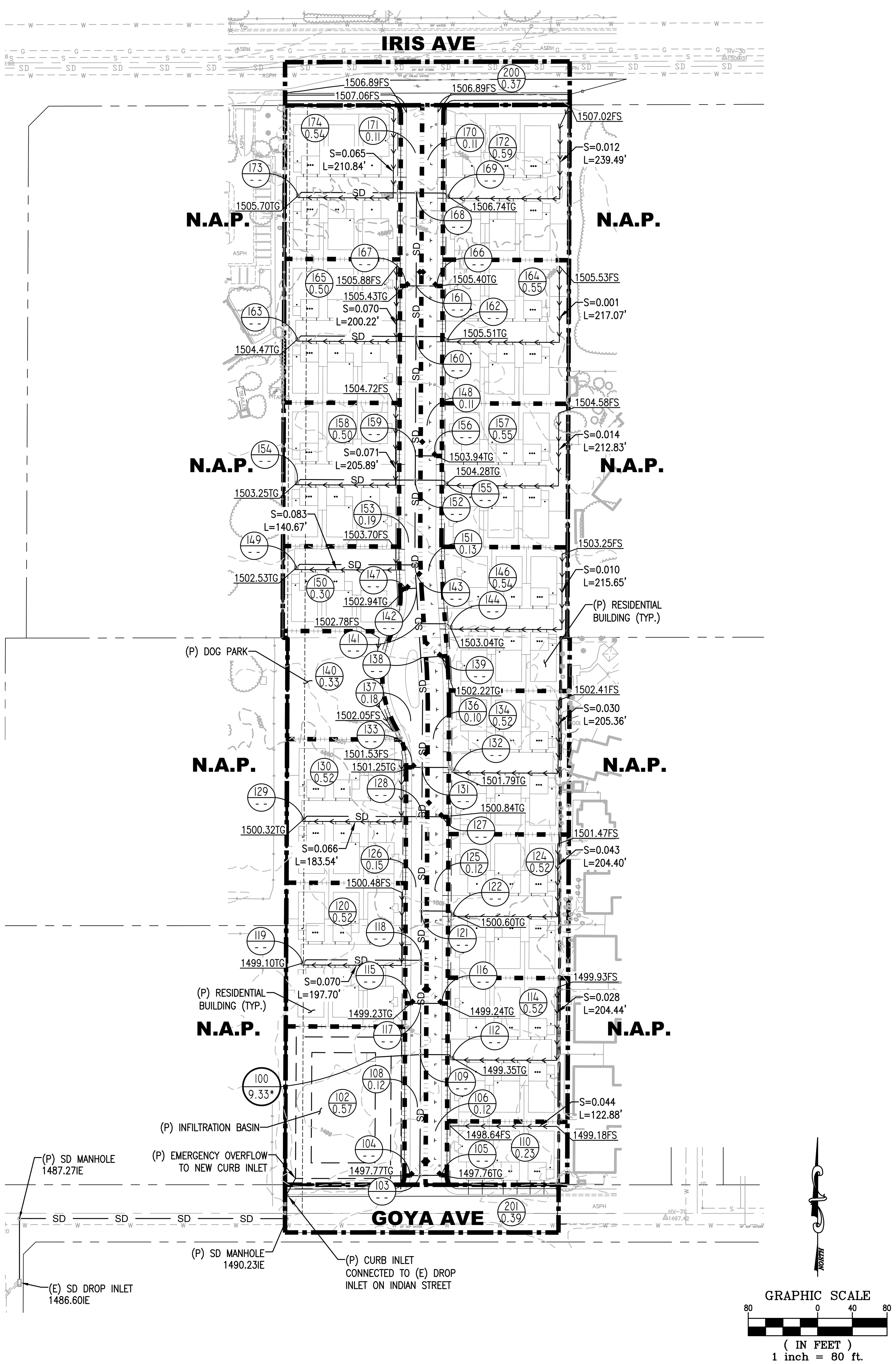
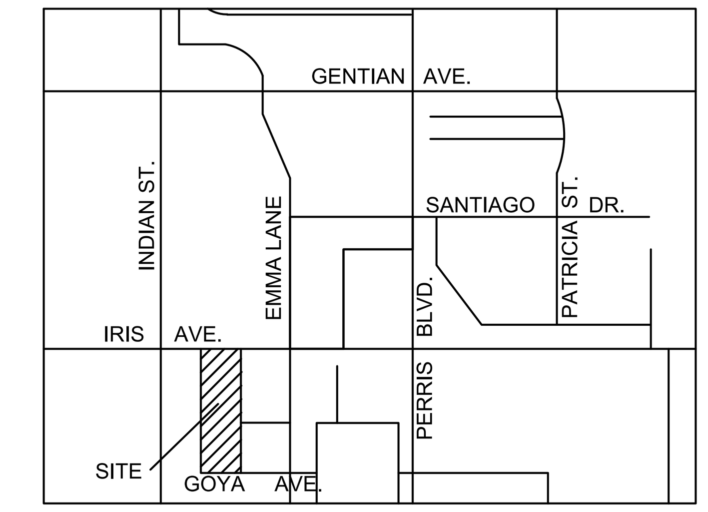
APPENDIX C.3

Basin Sizing Calculations per Hydraflow Hydrographs Extension for Autodesk Civil 3D

APPENDIX D

Hydrology Maps





SITE LOCATION MAP

NOT TO SCALE

LEGEND

- 100 / 6.65* — MAJOR WATERSHED NODE; AREA IN ACRES; * DENOTES TOTAL AREA
- 1.09 / 1.24 — SUBAREA WATERSHED NODE; AREA IN ACRES
- HYDROLOGIC MAJOR WATERSHED BOUNDARY
- HYDROLOGIC SUBAREA WATERSHED BOUNDARY
- FLOWLINE
- STORM PIPE FLOW DIRECTION
- 1310 — PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- 1310 — EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR

AREA QUANTITIES

PROJECT AREA:	±406,223 SQ. FT. (9.33 AC)
ANALYZED DRAINAGE AREA:	±406,223 SQ. FT. (9.33 AC)

UNDERGROUND SERVICE ALERT

CALL BEFORE YOU DIG

CALL:TOLL FREE

1-800-227-2600

TWO WORKING DAYS BEFORE YOU DIG

PEN22-XXXX/XXXX

LST22-XXXXX

NOTE:

WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR A GRADING PERMIT HAS BEEN ISSUED.

THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE DESIGN HEREON. IN THE EVENT OF DISCREPANCIES ARISING AFTER CITY APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE CITY.

MARK	BY	DATE	REVISIONS	APPR.	DATE
	DESIGNER				CITY

SEAL-ENGINEER

JOB NO. 20200259.0

GreenbergFarrow

30 Executive Park, Suite 100
Irvine, CA 92614
t: 949 296 0450 f: 949 296 0479

PREPARED BY:

BAHAREH SEHATZADEH RCE C89859, EXP. 06/30/2023 DATE

BENCHMARK

CITY OF MORENO VALLEY

PATTON SOUTH OF IRIS

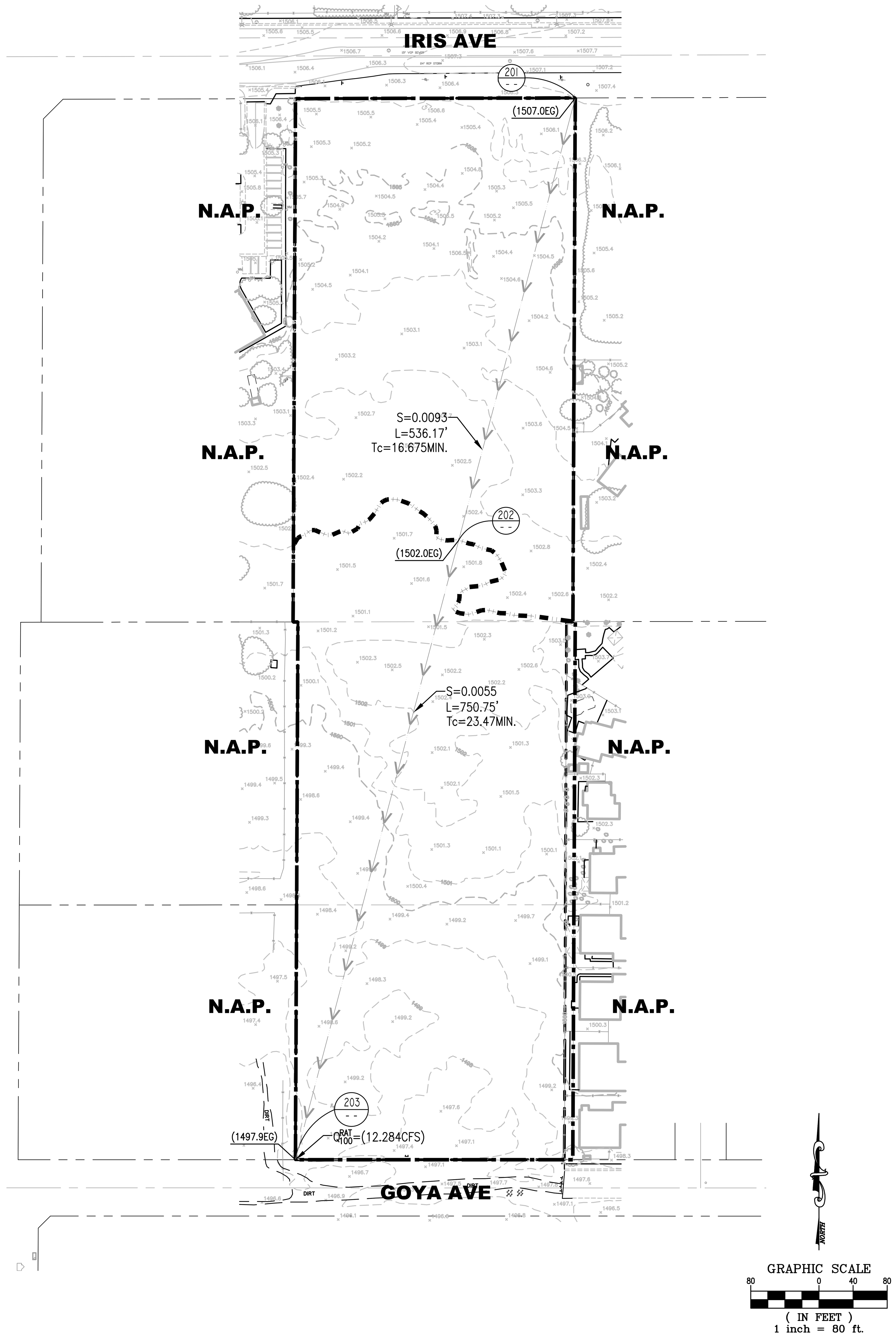
POST-DEVELOPED HYDROLOGY MAP

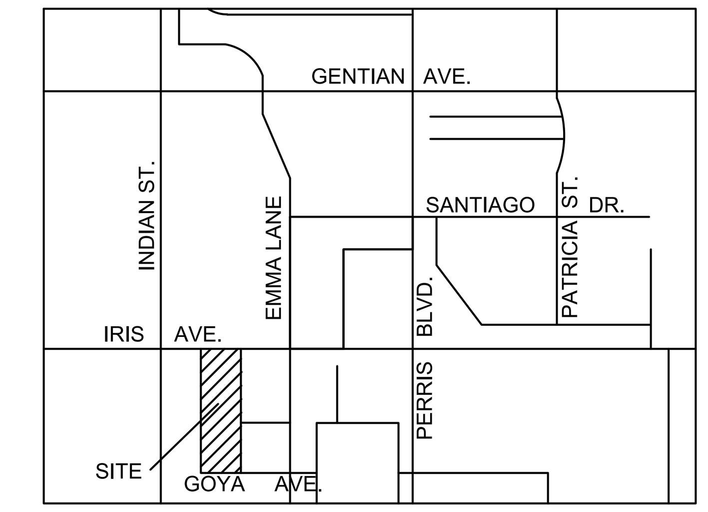
INITIAL DESIGN DATE: 04/12/22

FOR: W.O. CITY FILE NO.

SHEET NO. HYD-01

OF 2 SHEET





SITE LOCATION MAP

NOT TO SCALE

LEGEND

100 / 6.65*	MAJOR WATERSHED NODE; AREA IN ACRES; * DENOTES TOTAL AREA
1.09 / 1.24	SUBAREA WATERSHED NODE; AREA IN ACRES
	HYDROLOGIC MAJOR WATERSHED BOUNDARY
	HYDROLOGIC SUBAREA WATERSHED BOUNDARY
--1310--	EXISTING MAJOR CONTOUR
	EXISTING MINOR CONTOUR

UNDERGROUND SERVICE ALERT
CALL BEFORE YOU DIG
CALL:TOLL FREE
1-800-227-2600
TWO WORKING DAYS BEFORE YOU DIG

PEN22-XXXX/XXXX
LST22-XXXXX

NOTE:
WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR A GRADING PERMIT HAS BEEN ISSUED.
THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE DESIGN HEREON. IN THE EVENT OF DISCREPANCIES ARISING AFTER CITY APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE CITY.

MARK	BY	DATE	REVISIONS	APPR.	DATE
	DESIGNER				CITY

SEAL-ENGINEER

JOB NO. 20200259.0

GreenbergFarrow
30 Executive Park, Suite 100
Irvine, CA 92614
t: 949 296 0450 f: 949 296 0479

PREPARED BY:
BAHAREH SEHATZADEH RCE C89859, EXP. 06/30/2023 DATE

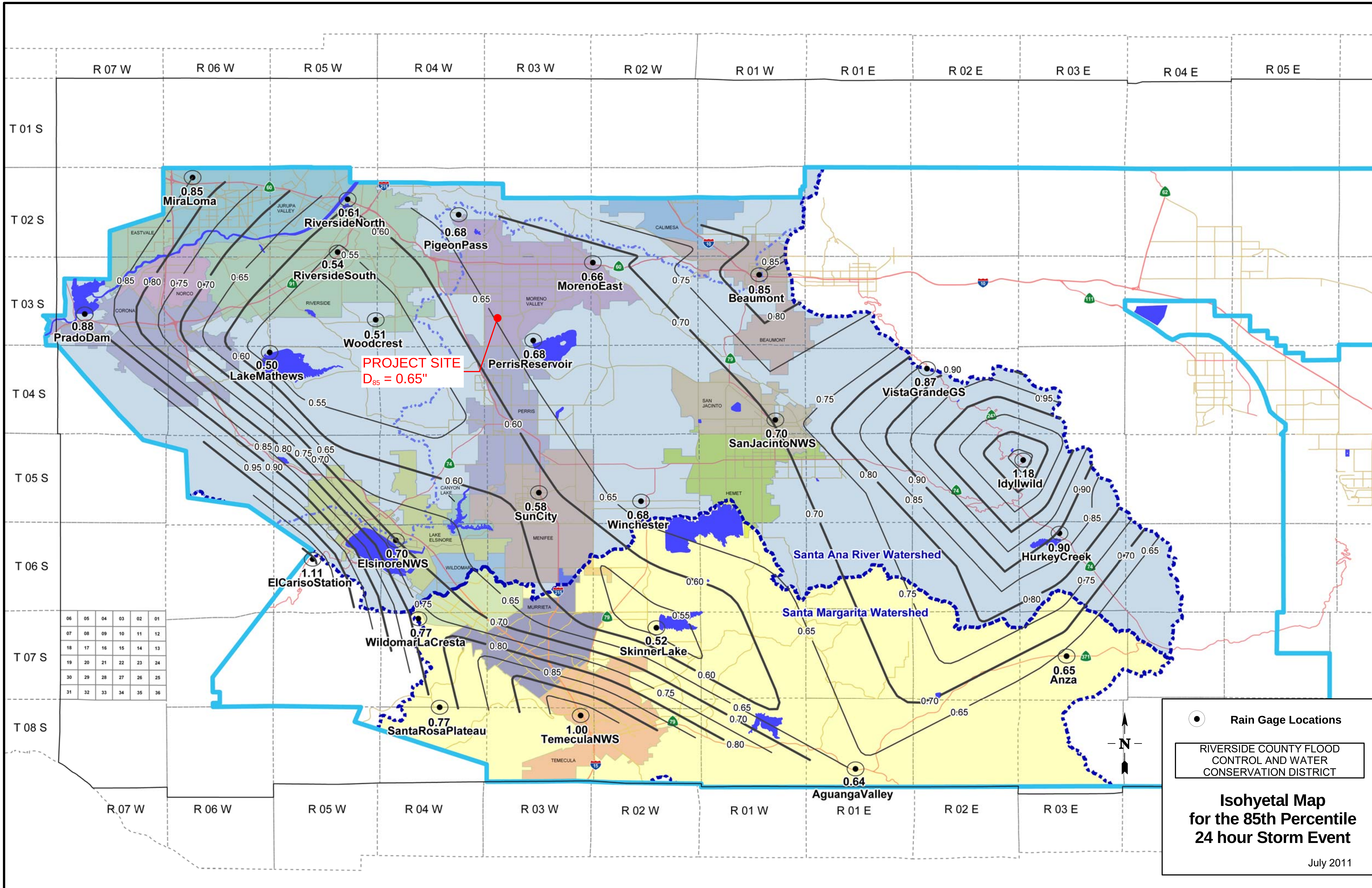
BENCHMARK

CITY OF MORENO VALLEY
PATTON SOUTH OF IRIS
PRE-DEVELOPED HYDROLOGY MAP
INITIAL DESIGN DATE: 04/12/22
FOR: W.O. CITY FILE NO.

SHEET NO.
HYD-02
OF 2 SHEET

APPENDIX E

BMP Sizing Calculations



PROJECT SITE
D_{85} = 0.65"
Rain Gage Locations
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
Isohyetal Map for the 85th Percentile 24 hour Storm Event
July 2011
Santa Ana River Watershed
Santa Margarita Watershed
0.85 MiraLoma
0.61 RiversideNorth
0.54 RiversideSouth
0.68 PigeonPass
0.66 MorenoEast
0.85 Beaumont
0.88 PradoDam
0.51 Woodcrest
0.68 PerrisReservoir
0.50 LakeMathews
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
R 07 W
R 06 W
R 05 W
R 04 W
R 03 W
R 02 W
R 01 W
R 01 E
R 02 E
R 03 E
R 04 E
R 05 E
T 01 S
T 02 S
T 03 S
T 04 S
T 05 S
T 06 S
T 07 S
T 08 S
N

APPENDIX F

HCOC Applicability Map

HCOC Applicability Map

Hydromodification Susceptibility Documentation Report and Mapping
Riverside County Flood Control and Water Conservation District

Map 2