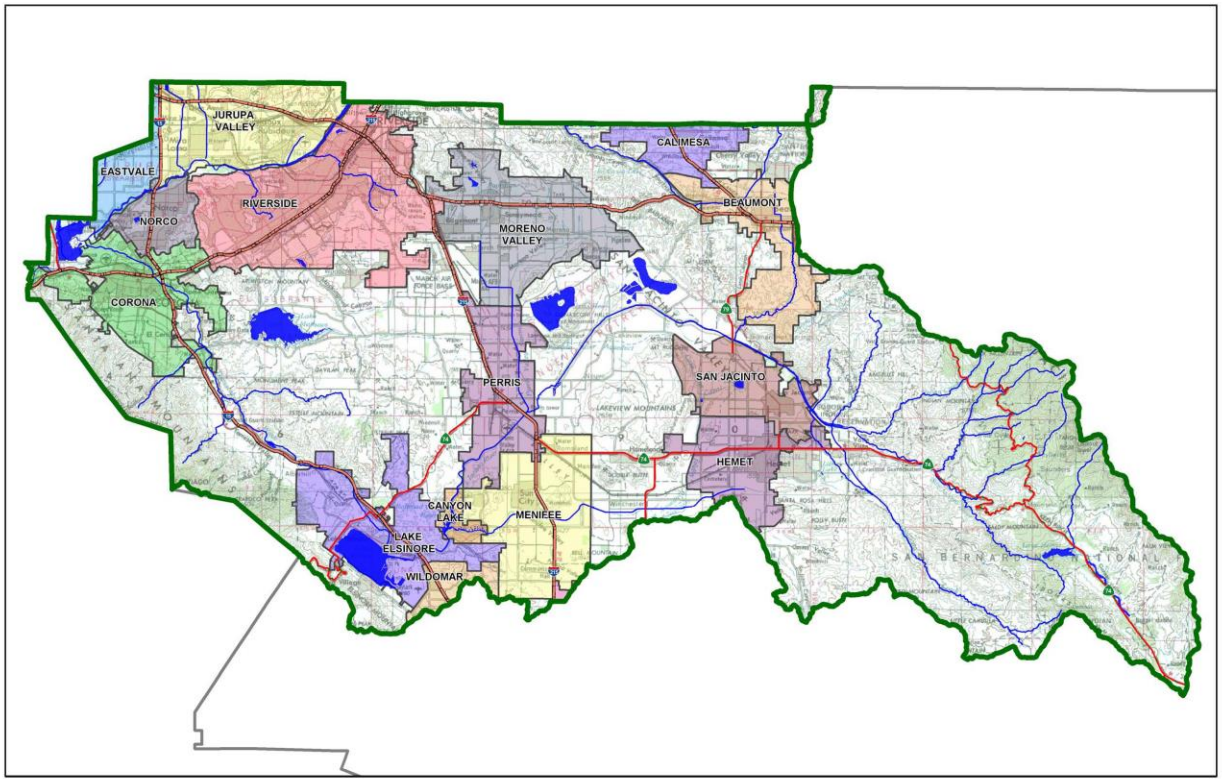
Project Specific Water Quality Management Plan

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

Project Title: National Tube Supply Industrial Warehouse, Hemet – Wentworth Dr.

Development No: Entitlements for 5.76 Acre Property, Hemet, APN 456-040-028 & APN 456-040-029

Design Review/Case No:



☒ **Preliminary**
☐ **Final**

Original Date Prepared: January 19, 2022

Revision Date(s): Insert text here

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

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OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for National Tube Supply by David Evans and Associates, Inc. for Entitlements for a 5.76 acre Property in the City of Hemet, APNs 456-040-028 and 456-040-029.

This WQMP is intended to comply with the requirements of City of Hemet for Hemet Water Quality Ordinance (Municipal Code Section 14-471 et. seq.) 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 City of Hemet Water Quality Ordinance (Municipal Code Section14-471 et. Seq.).

"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
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
Nicholas Zamarripa	Project Engineer
Preparer's Printed Name	Preparer's Title/Position

Preparer's Licensure: 86476

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Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Industrial
Planning Area:	
Community Name:	Hemet
Development Name:	National Tube Supply Industrial Warehouse
PROJECT LOCATION	
Latitude & Longitude (DMS): 33°44'4"; -117°00'31"	
Project Watershed and Sub-Watershed: Watershed – Santa Ana River Sub-Watershed – San Jacinto River	
Gross Acres: 5.76	
APN(s): 456-040-028, 456-040-029	
Map Book and Page No.: Map Book 456, Page 04	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Industrial
Proposed or Potential SIC Code(s)	3317, 3541
Area of Impervious Project Footprint (SF)	231,462
Total Area of proposed Impervious Surfaces within the Project Footprint (SF)/or Replacement	231,462
Does the project consist of offsite road improvements?	☐ Y ☒ N
Does the project propose to construct unpaved roads?	☐ Y ☒ N
Is the project part of a larger common plan of development (phased project)?	☐ Y ☒ N
EXISTING SITE CHARACTERISTICS	
Total area of existing Impervious Surfaces within the Project limits Footprint (SF)	0
Is the project located within any MSHCP Criteria Cell?	☐ Y ☒ N
If so, identify the Cell number:	N/A
Are there any natural hydrologic features on the project site?	☐ Y ☒ N
Is a Geotechnical Report attached?	☒ Y ☐ N
If no Geotech. Report, list the NRCS soils type(s) present on the site (A, B, C and/or D)	N/A
What is the Water Quality Design Storm Depth for the project?	0.69

Narrative: The National Tube Supply (NTS) Industrial Building project is a proposed industrial warehouse development which includes one building with an office space at the front. The project will be constructed on approximately 5.76 acres of vacant land located at the southwest corner of Wentworth Drive and Sanderson Avenue. The primary building will be used by National Tube Supply for manufacturing and distribution. Water quality mitigation for the development will be accomplished using underground infiltration storage basins.

A.1 Maps and Site Plans

Appendix 1 includes the following exhibits:

- Vicinity Map, A-1
- Regional Waters Map, A-2
- WQMP Site Plan, A-3

A.2 Identify Receiving Waters

Table A.1 Identification of Receiving Waters

Receiving Waters	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
City of Hemet Storm Channel	None	None	None
Salt Creek HU# 802.12	None	REC1-REC2-WARM-WILD	Not designated as RARE
Canyon Lake HU# 802.11 & 802.12	Pathogens, Nutrients	MUN-AGR-GWR-REC1-REC2-WARM-WILD	Not designated as RARE
San Jacinto River, Reach 1 HU# 802.32 & 802.31	None	MUN-AGR-GWR-REC1-REC2-WARM-WILD	Not designated as RARE
Lake Elsinore HU# 802.31	Nutrients, Organic Enrichment/Low Dissolved Oxygen, Sedimentation/Siltation, Unknown Toxicity, PCBs	REC1-REC2-WARM-WILD	Not designated as RARE

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)*	☐ Y	☒ N

Section B: Optimize Site Utilization (LID Principles)

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?

Existing drainage patterns were maintained through grading design as shown on the conceptual grading plan. Surface water generally flows from the east of the site to the west.

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

There is no vegetation to protect on the project site.

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

Underground infiltration BMPs will be used for the development. Infiltration capacity is preserved at the north of the site where the infiltration basins will be located.

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

To the greatest extent possible for the development. Space was designated for an infiltration basin and parking lots were designed with planting areas in-between spaces where possible.

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

The site was designed to drain to the proposed infiltration basin.

Section C: Delineate Drainage Management Areas (DMAs)

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

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)[1][2]	Area (Sq. Ft.)	DMA Type
D1	Asphalt	146,382	Drains to BMP
D2	Roofs	85,080	Drains to BMP
D3	Landscape	19,614	Drains to BMP

[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)
N/A			

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

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

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

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		Area (square feet)	Ratio
	[A]		[B]	[C] = [A] x [B]	DMA name /ID	[D]	[C]/[D]
N/A							

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

DMA Name or ID	BMP Name or ID
D1	Infiltration Basin
D2	Infiltration Basin
D3	Infiltration Basin

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

Geotechnical Report

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

Infiltration Feasibility

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

Table D.1 Infiltration Feasibility

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

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

D.2 Harvest and Use Assessment

Please check what applies*:*

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

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

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

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

Type of Landscaping (Conservation Design or Active Turf): List Landscaping 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 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: Insert Area (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: EIATIA Factor

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: Insert Areas (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)
Insert Area (acres)	Insert Area (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 shut downs or other lapses in occupancy:

Projected Number of Daily Toilet Users: Number of daily Toilet Users

Project Type: Enter 'Residential', 'Commercial', 'Industrial' or 'Schools'

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

Total Area of Impervious Surfaces: Insert Area (acres)

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

Enter your TUTIA factor: TUTIA Factor

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

Minimum number of toilet users: Required number of toilet users

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

Minimum required Toilet Users (Step 4)	**Projected number of toilet users (Step 1)**
Insert Area (acres)	Insert Area (acres)

Other Non-Potable Use Feasibility

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

N/A

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

Average Daily Demand: Projected Average Daily Use (gpd)

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

Total Area of Impervious Surfaces: Insert Area (acres)

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

Enter the factor from Table 2-4: Enter Value

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of gallons per day of non-potable use that would be required.

Minimum required use: Minimum use required (gpd)

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

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

If Irrigation, Toilet and Other Use feasibility anticipated demands are less than the applicable minimum values, Harvest and Use BMPs are not required and you should proceed to utilize LID Bioretention and Biotreatment per Section 3.4.2 of the WQMP Guidance Document.

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	
D1	☒	☐	☐	☐	☐
D2	☒	☐	☐	☐	☐
D3	☒	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

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]			
D1	*146,382*	*Asphalt*	*1*	*0.89*	*130,573*			
D2	*85,080*	*Roofs*	*1*	*0.89*	*75,891*			
D3	*19,614*	*Landscape*	*0.1*	*0.11*	*2,167*			
						Design Storm Depth (in)	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	251,076				208,631	0.69	11,996	***25,120***

[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

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 ft²)	P	N	N	N	N	N	P	P
☐ Hillside Development (>5,000 ft²)	P	N	P	P	N	P	P	P
☒ Parking Lots (>5,000 ft²)	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

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

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		*Enter BMP Name / Identifier Here*		
	[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 = Σ[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

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

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:

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.

*HCOC mitigation in Appendix 7.

Section G: Source Control BMPs

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
Landscape/Outdoor Pesticide Use	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 ensure 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. Provide IPM information to new owners, lessees, and operators.
Plazas, sidewalks, parking lots, and trash receptacle areas.		Sweep plazas, sidewalks, parking lots, and trash receptacle areas 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 a storm drain pipe or inlet.

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)
Inf. Basin	Infiltration Basin	Sheet 3 of the Conceptual Plans	33°44'4" N/117°00'31" W

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

Maintenance Mechanism: Property Owner

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

☐ Y ☒ N

See Appendix 9.

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map

National Tube Supply
Industrial Building Project

Exhibit A-1
Vicinity Map

N

0 0.5 1 Miles

Document Path: P:\N\NTSH00000001\0600INFO\GS\WQMP Exhibits\Vicinity Map.mxd
Date: 1/24/2023 Time: 9:32:51 AM User Name: Ndz

Project Site

Surface Flow

Hemet Channel

Salt Creek

Canyon Lake

Lake Elsinore

DAVID EVANS AND ASSOCIATES INC.
17542 E. 17th Street, Suite 150
Tustin, CA 92780
(714) 665-4500

0 1 2 4 6 Miles

Exhibit A-2
Regional Waters Map
National Tube Supply Industrial Building Project

P:\N\NTSH00000001\0600INFO\GS\WQMP Exhibits\Regional Waters Map.mxd

COMMERCIAL

COMMERCIAL

COMMERCIAL

WENTWORTH DRIVE

76'

38'

UNDERGROUND
INFILTRATION BASIN
V_{BMP} = 6,480 CF
$V_{PROVIDED}$ = 13,565 CF

UNDERGROUND
INFILTRATION BASIN
V_{BMP} = 5,520 CF
$V_{PROVIDED}$ = 11,555 CF

VACANT LAND
APN: 456-040-024

VACANT LAND
APN: 456-040-030

FUTURE EXPANSION
17,280 SF

OFFICE

BUILDING
85,080 SF
INCLUDES 4,800 SF OFFICE

RECEIVING

FORKLIFT TURNING

PANS

FORKLIFT TURNING

PACKAGING TABLES

PACKING TABLES & ORDER BAYS
PROCESSING

OUTSIDE GANTRY

A.T. & S.F. RAILROAD
APN: 456-040-005

50'

100'

50'

NORTH

0 30 60 Feet

LEGEND

- INDICATES ASPHALT SURFACE - DRAINS TO BMP
- INDICATES ROOF SURFACE - DRAINS TO BMP
- INDICATES LANDSCAPE SURFACE - DRAINS TO BMP
- INDICATES UNDERGROUND INFILTRATION BASIN

DMA SUMMARY

IDENTIFIER	AREA (SF)	PROPOSED SURFACE	TREATMENT
D1	146,382	ASPHALT	DRAINS TO INFILTRATION BASIN
D2	85,080	ROOFS	DRAINS TO INFILTRATION BASIN
D3	19,614	LANDSCAPE	DRAINS TO INFILTRATION BASIN

PREPARED BY:
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Ontario California 91764-5004
Phone: 909.481.57550

CITY OF HEMET
PUBLIC WORKS DEPARTMENT

CONCEPTUAL PLANS

WQMP SITE PLAN

PROJECT NO. NTSH00000001

DATE: 01/24/2023

SHEET: 1 OF 1

★ PRELIMINARY ★
SUBJECT TO REVISION

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Appendix 2: Construction Plans

Grading and Drainage Plans

CONCEPTUAL GRADING AND UTILITY PLAN

IN THE CITY OF HEMET, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

DEVELOPER:

NATIONAL TUBE SUPPLY
CONTACT: BRIAN A. KLUGE
EMAIL: BKLUGE@NATIONALTUBESUPPLY.COM
TEL: (630) 442-4249

PROJECT ARCHITECT:

SKH ARCHITECTS
4590 MACARTHUR BLVD. SUITE 500
NEWPORT BEACH, CA 92590
CONTACT: STEVE HONG
TEL:714-822-1171

CIVIL ENGINEER:

DAVID EVANS AND ASSOCIATES, INC.
4141 EAST INLAND EMPIRE, SUITE 250
ONTARIO, CA 91764
CONTACT: JODI MENSEN
TEL: (909) 912-7340

ZONING CLASSIFICATION:

SPECIFIC PLAN (SP)
GENERAL COMMERCIAL - B-P
BUSINESS PARK - C-2

LAND USE:

COMMUNITY COMMERCIAL (FAR 0.40): PER XXXX
BUSINESS PARK (FAR 6.0): PER XXX

ASSESSOR'S PARCEL NUMBER:

APN: 456-040-028, 456-040-029

GROSS LAND AREA:

THE GROSS LAND AREA UPON MAPPING CALCULATIONS IS AS FOLLOWS:

TOTAL GROSS LAND AREA - 251,076 SQ. FT / 5.76 ACRES

LOT DATA:

LOT NO.	AREA (SF)	AREA (AC)
LOT 1	251,076	5.76

BUILDING DATA:

BUILDING NO.	AREA (SF)
BUILDING 1	88,680

PARKING DATA:

THE FOLLOWING MINIMUM PARKING REQUIREMENTS ARE PER TABLE 6 OF THE GATEWAY SPECIFIC PLAN. ACCESSIBLE (ADA) PARKING REQUIREMENTS ARE PER TABLE 11B-208.2 OF THE 2019 CALIFORNIA BUILDING CODE.

LIGHT/INDUSTRAIL:	1 SPACE/400 SF OF GROSS FLOOR AREA
WAREHOUSE:	1 SPACE/1000 SF OF GROSS FLOOR AREA
OFFICES:	1 SPACE/250 SF OF GROSS FLOOR AREA
COMMERCIAL:	1 SPACE/250 SF OF GROSS FLOOR AREA

SHEET INDEX:

BUILDING SETBACKS:

THE FOLLOWING BUILDING SETBACKS ARE PER SECTION 4.10 OF THE GATEWAY SPECIFIC PLAN. SETBACKS SHALL BE FULLY LANDSCAPED.

COMMERCIAL ZONE

FRONT YARD:	15'
SIDE YARD:	30'
REAR YARD:	0'

BASIS OF BEARINGS:

THE BASIS OF BEARINGS FOR THIS SURVEY IS CENTERLINE OF SANDERSON AVENUE AS SHOWN ON RECORD OF SURVEY PARCEL MAP NO. 29806, FILED IN THE OFFICE OF THE COUNTY RECORDER OF RIVERSIDE COUNTY BOOK 200 PAGE 4/5
I.E. NORTH 00°14'54" EAST.

BENCHMARK INFORMATION:

VERTICAL CONTROL IS BASED ON COUNTY OF RIVERSIDE BENCHMARK "DVR 34": BRASS DISC IN CATCH BASIN, FLUSH, +/- 58 EAST OF PALM AVENUE, 29.5 FEET SOUTH OF ACACIA AVE, +/- 4 EAST OF POWER POLE "4003560E".

ELEVATION = 1574.49, NAVD 88

UTILITY CONTACTS:

CITY OF HEMET WATER
445 E FLORIDA AVE
HEMET, CA 92543
(951) 765-2336

CITY OF HEMET SEWER
445 E FLORIDA AVE
HEMET, CA 92543
(951) 765-2336

SOUTHERN CALIFORNIA EDISON COMPANY
1351 E. FRANCIS
ONTARIO, CALIFORNIA 91761
VAL ROSALES
(909) 930-8483

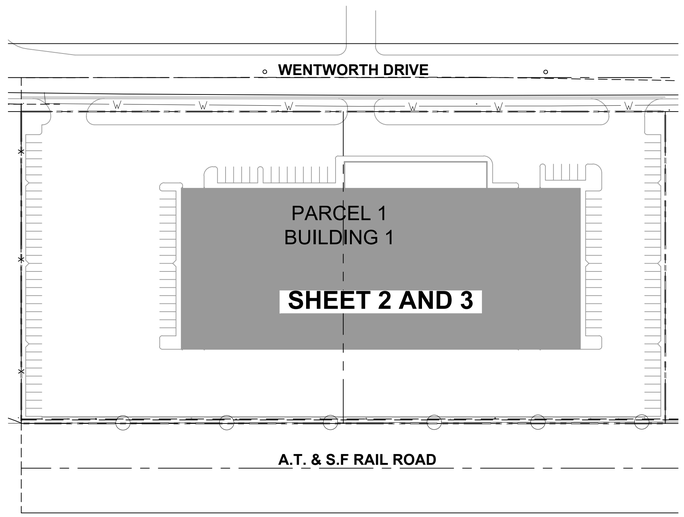
PACIFIC BELL TELEPHONE COMPANY
3939 CORONADO STREET
ANAHEIM, CALIFORNIA 92807
SHELLY BLASINGHAM
(714) 237-7126

SOUTHERN CALIFORNIA GAS COMPANY
1981 WEST LUGONIA AVENUE
REDLANDS, CALIFORNIA 92737
GERI LEE
(909) 335-7507

CHARTER COMMUNICATIONS
6680 VIEW PARK COURT
RIVERSIDE, CALIFORNIA 92503
(951) 688-9012

ABBREVIATIONS:

A.P.N.	ASSESSOR'S PARCEL NUMBER	R/W	RIGHT OF WAY
AC	ASPHALT CONCRETE	RCB	REINFORCED CONCRETE BOX
C/L	CENTERLINE	RCFCD	RIVERSIDE COUNTY FLOOD
CAB	COARSE AGGREGATE BASE	CONTROL DISTRICT	
CO	CLEANOUT	RCP	REINFORCED CONCRETE PIPE
CMP	CORRUGATED METAL PIPE	SD	STORM DRAIN
EL	ELEVATION	SDMH	STORM DRAIN MANHOLE
ESMT	EASEMENT	SF	SQUARE FOOTAGE
EX	EXISTING	SMH	SEWER MANHOLE
FF	FINISHED FLOOR	STA	STATION
FG	FINISHED GROUND	SWR	SEWER
FH	FIRE HYDRANT	TC	TOP OF CURB
FL	FLOW LINE	WTR	WATER
FS	FINISHED SURFACE		
GV	GATE VALVE		
INV	INVERT		
LAT	LATERAL		
LF	LINEAL FEET		
P/L	PROPERTY LINE		
PROP	PROPOSED		

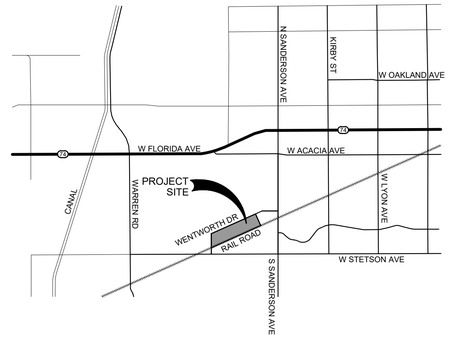


INDEX MAP
SCALE: 1"=80'

EARTHWORK

CUT: 9,300 CY
FILL: 7,050 CY
NET EXPORT: 2,250 CY

0 15 30 60
SCALE: 1" = 30'



VICINITY MAP
NOT TO SCALE

LEGEND: EXISTING IMPROVEMENTS

EXISTING PROPERTY LINE — P/L
EXISTING RIGHT OF WAY — EX. R/W
EXISTING STREET CENTERLINE
EXISTING CONTOUR — 500
EXISTING SPOT ELEVATION — ×590.2
EXISTING CURB & GUTTER
EXISTING EDGE OF PAVEMENT
EXISTING STREET SIGNAGE
EXISTING POWER POLE
EXISTING GUY WIRE
EXISTING OVERHEAD ELECTRICAL — E OH
EXISTING ELECTRICAL MANHOLE — E
EXISTING CHAIN LINK FENCE — X
EXISTING IRON FENCE
EXISTING BLOCK WALL
EXISTING STREET LIGHT
EXISTING TRAFFIC SIGNAL
EXISTING SEWER MANHOLE — S
EXISTING CURB INLET
EXISTING GRATED CURB INLET
EXISTING TREES

LEGEND: PROPOSED IMPROVEMENTS

PROPOSED RIGHT OF WAY
PROPOSED BUILDING SETBACK
PROPOSED LOT LINE
PROPOSED LATERAL & END CAP (UTILITY TYPE PER PLAN)
PROPOSED SEWER MANHOLE — S
PROPOSED SEWER SERVICE — S
PROPOSED WATER SERVICE — DW
PROPOSED FIRE SERVICE — F
PROPOSED WATER METER — WM
PROPOSED WATER RPP BACKFLOW DEVICE
PROPOSED FIRE DCDA
PROPOSED FIRE HYDRANT
PROPOSED VALVE (TYPE PER PLAN)
PROPOSED THRUST BLOCK
PROPOSED PIV
PROPOSED IRRIGATION METER
PROPOSED BLOWOFF
PROPOSED AIR VALVE
PROPOSED REDUCER

PREPARED BY:
DAVID EVANS AND ASSOCIATES INC.
4141 Inland Empire Blvd Suite 205
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Phone: 909.481.57550

CITY OF HEMET PUBLIC WORKS DEPARTMENT	PROJECT NO. NTSH00000001
CONCEPTUAL PLANS	DATE: 01/24/2023
TITLE SHEET	SHEET: 1 OF 3

★PRELIMINARY★ SUBJECT TO REVISION

COMMERCIAL

COMMERCIAL

COMMERCIAL

WENTWORTH DR.

EX. EOP

PROP CURB AND GUTTER

PROP CURB AND GUTTER

EX. R/W

VACANT LAND
APN: 456-040-024

VACANT LAND
APN: 456-040-030

FF: 1522.75'

A.T. & S.F. RAILROAD
APN: 456-040-005

EXISTING FENCE PROTECT IN PLACE

EX POWER POLE. PROTECT IN PLACE

5' POWER UTILITY EASEMENT

4' PUBLIC R/W EASEMENT

EXISTING FENCE PROTECT IN PLACE

EX POWER POLE. PROTECT IN PLACE

EX POWER POLE. PROTECT IN PLACE

5' POWER UTILITY EASEMENT

4' PUBLIC R/W EASEMENT

EX POWER POLE. PROTECT IN PLACE

SECTION A-A

SCALE 1"=20'

SECTION B-B

SCALE 1"=20'

SECTION C-C

SCALE 1"=20'

SECTION D-D

SCALE 1"=20'

SECTION E-E

WENTWORTH DRIVE
SCALE 1"=20'

SCALE: 1" = 30'

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CITY OF HEMET
PUBLIC WORKS DEPARTMENT

PROJECT NO. NTSH00000001

CONCEPTUAL PLANS

DATE: 01/24/2023

CONCEPTUAL GRADING PLAN

SHEET: 2 OF 3

★PRELIMINARY★
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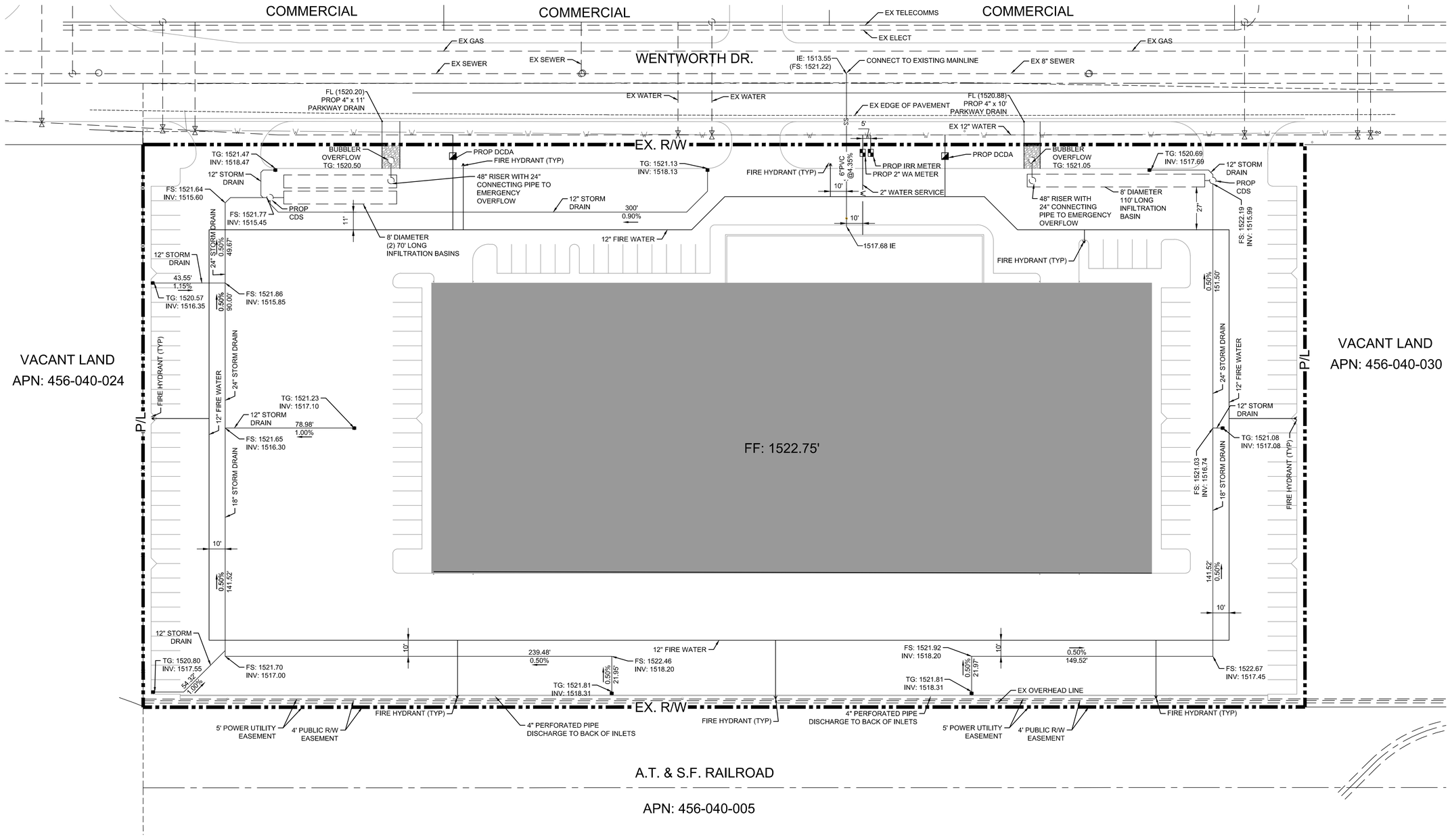

0 15 30 60

SCALE: 1" = 30'

PREPARED BY:

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CITY OF HEMET
PUBLIC WORKS DEPARTMENT

CONCEPTUAL PLANS

CONCEPTUAL UTILITY PLAN

PROJECT NO.
NTSH00000001

DATE:
01/24/2023

SHEET:
3 **OF 3**

★PRELIMINARY★
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Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

Geotechnical Engineering Investigation
Proposed Industrial Warehouse Development
Southwest Corner of S. Sanderson Avenue and
Wentworth Drive
Hemet, California

National Tube Supply
925 Central Avenue
University Park, Illinois 60484

Attn: Mr. Brain Kluge

Project Number 23487-22
September 2, 2022

NorCal Engineering

TABLE OF CONTENTS

NorCal Engineering

Soils and Geotechnical Consultants
10641 Humbolt Street Los Alamitos, CA 90720
(562) 799-9469 Fax (562) 799-9459

September 2, 2022 Project Number 23487-22

National Tube Supply
925 Central Avenue
University Park, Illinois 60484

Attn: Mr. Brian Kluge

RE: **Geotechnical Engineering Investigation** - Proposed Industrial Warehouse Development - Located near the Southwest Corner of S. Sanderson Avenue and Wentworth Drive, in the City of Hemet, California

Dear Mr. Kluge:

Pursuant to your request, this firm has performed a Geotechnical Engineering Investigation for the above referenced project in accordance with your approval of our proposal dated August 9, 2022. The purpose of this investigation is to evaluate the geotechnical conditions of the subject site and to provide recommendations for the proposed industrial warehouse development.

The scope of work included the following: 1) site reconnaissance; 2) subsurface geotechnical exploration and sampling; 3) laboratory testing; 4) soil infiltration testing; 5) engineering analysis of field and laboratory data; 6) preparation of a geotechnical engineering report. It is the opinion of this firm that the proposed development is feasible from a geotechnical standpoint provided that the recommendations presented in this report are followed in the design and construction of the project.

1.0 Project Description

It is proposed to construct an industrial warehouse development consisting of 120,000 square feet building as shown on the attached Site Plan. The proposed concrete tilt-up building will be supported by a conventional slab-on-grade foundation system with perimeter-spread footings and isolated interior footings. Other improvements will include asphalt and concrete pavement areas, hardscape and landscaping. It is assumed that the proposed grading for the development will include cut and fill procedures on the order of a few feet to achieve finished grade elevations. Final building plans shall be reviewed by this firm prior to submittal for city approval to determine the need for any additional study and revised recommendations pertinent to the proposed development, if necessary.

2.0 Site Description

The 5.8-acre subject property is located approximately 300 feet west from the southwest corner of S. Sanderson Avenue and Wentworth Drive, in the City of Riverside. The generally rectangular-shaped parcel is elongated in an east to west direction with topography of the relatively level descending gradually from a front to back direction on the order of a few feet. The site is currently an undeveloped parcel of land covered with a light vegetation growth of natural grasses and weeds.

3.0 Site Exploration

The investigation consisted of the placement of seven (7) subsurface exploratory borings by a truck mounted hollow stem auger to depths ranging between 5 and 20 feet below current ground elevations. The explorations were visually classified and logged by a field engineer with locations of the subsurface explorations shown on the attached plan. The exploratory borings revealed the existing earth materials to consist of fill and natural soil. Detailed descriptions of the subsurface conditions are listed on the boring logs in Appendix A. It should be noted that the transition from one soil type to another as shown on the boring logs is approximate and may in fact be a gradual transition. The soils encountered are described as follows:

Fill: A fill soil classifying as a brown, sandy SILT with occasional gravel was encountered across the site to depth of 1 to 1.5 feet below ground surface. These soils were noted to be soft and dry.

Natural: A natural undisturbed soil classifying as a brown, sandy SILT was encountered beneath the fill soils. The native soils were observed to be medium stiff and damp. Deeper soils encountered consisted of a fine to coarse grained, silty SAND which were noted to be medium dense to dense and moist.

The overall engineering characteristics of the earth material were relatively uniform with each excavation. Groundwater was not encountered to the depth of our borings and no caving occurred.

4.0 Laboratory Tests

Relatively undisturbed samples of the subsurface soils were obtained to perform laboratory testing and analysis for direct shear, consolidation tests, and to determine in-place moisture/densities. These relatively undisturbed ring samples were obtained by driving a thin-walled steel sampler lined with one-inch long brass rings with an inside diameter of 2.42 inches into the undisturbed soils. Bulk bag samples were obtained in the upper soils for expansion index tests and maximum density tests. All test results are included in Appendix B, unless otherwise noted.

4.1 **Field Moisture Content** (ASTM: D 2216) and the dry density of the ring samples were determined in the laboratory. This data is listed on the logs of explorations.

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

4.3 **Expansion Index tests** (ASTM: D 4829) were performed on remolded samples of the upper soils to determine expansive characteristics. Results of these tests are provided on Table II.

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

4.5 **Corrosion tests** consisting of sulfate, pH, resistivity and chloride analysis to determine potential corrosive effects of soils on concrete and underground utilities. Test results are provided on Table IV.

4.6 **R-Value test** per California Test Method 301 was performed on a representative sample, which may be anticipated to be near subgrade to determine pavement design. Results are provided within the pavement design section of the report.

4.7 **Direct Shear tests** (ASTM: D 3080) were performed on undisturbed and/or remolded samples of the subsurface soils. The test is performed under saturated conditions at loads of 1,000 lbs./sq.ft., 2,000 lbs./sq.ft., and 3,000 lbs./sq.ft. with results shown on Plate A.

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

5.0 Seismicity Evaluation

The proposed development lies outside of any Alquist Priolo Special Studies Zone and the potential for damage due to direct fault rupture is considered unlikely. The site is situated in an area of high regional seismicity and the San Jacinto fault (Anza) is located about 5 kilometers from the site. Ground shaking originating from earthquakes along other active faults in the region is expected to induce lower horizontal accelerations due to smaller anticipated earthquakes and/or greater distances to other faults.

The seismic design acceleration parameters for the project site are provided below based on the ASCE/SEI 7-22 American Society of Civil Engineers (ASCE) website, https://asce7hazardtool.online/. The ASCE/SEI 7-22 report is attached is Appendix C

Seismic Design Acceleration Parameters

Latitude	33.734
Longitude	-117.009
Site Class	D
Risk Category	II
Peak Ground Acceleration	$PGA_M = 0.75$
Adjusted Maximum Acceleration	$S_{MS} = 2.14$ $S_{M1} = 1.87$
Design Spectral Response Acceleration Parameters	$S_{DS} = 1.43$ $S_{D1} = 1.25$
Mapped Spectral Response Acceleration	$S_S = 2.04$ $S_1 = 0.71$

Use of these values is dependent on the latest requirements of the ASCE, 11-4.8, Exception 2 that requires the value of the seismic response coefficient C_s be determined by Equation 12.8.2 for values of $T \leq 1.5T_s$ and taken as equal to 1.5 times the value computed in accordance with either 12.8-3 for $T_L \geq T \geq 1.5T_s$ or Equation 12.8-4 for $T > T_L$. Computations and verification of these conditions is referred to the structural engineer.

6.0 Liquefaction Evaluation

The site is expected to experience ground shaking and earthquake activity that is typical of the Southern California area. It is during severe shaking that loose, granular soils below the groundwater table can liquefy. Based on review of the *County of Riverside– Liquefaction Zone Map (September 2019)*, the site is situated in an area of moderate liquefaction susceptibility. Our analysis indicates the potential for liquefaction at this site to be very low due to the dense subsurface soils and depth of groundwater in excess of 150 feet based on review of nearby monitoring wells. Thus, design of the proposed construction in conformance with the latest Building Code provisions for earthquake design is expected to provide mitigation of ground shaking hazards that are typical in Southern California.

7.0 Infiltration Characteristics

Infiltration tests within the site were performed to provide preliminary infiltration rates for the purpose of planning and design of an on-site water disposal system field testing in accordance with the Riverside County – Low Impact Development BMP Design Handbook Appendix A – Infiltration Testing Manual. A truck mounted Simco 2800 Drill Rig equipped with a hollow stem auger was used to excavate the exploratory borings (B-1 and B-2) to depths of 5 and 10 feet below existing ground surface within the proposed infiltration areas.

The borings consisted of six-inch diameter test holes. A three-inch diameter perforated PVC casing with solid end cap was installed in the borings and then surrounded with gravel materials to prevent caving. The infiltration holes were carefully filled with clean water and refilled after two initial readings. Based upon the initial rates of infiltration at each location, test measurements were measured at selected maximum intervals thereafter. Measurements were obtained by using an electronic tape measure with 1/16-inch divisions and timed with a stopwatch. Field data sheets are provided in Appendix D.

Based upon the results of our testing, the soils encountered in the planned on-site drainage disposal system area exhibit the following field infiltration rates calculated using the Porchet Method (aka Inverse Borehole Method). The drainage disposal system shall utilize design infiltration rates based on the safety factor required by the county standard.

Boring/Test No.	Depth	Soil Classification	Field Infiltration Rate
B-1/TH-1	5'	Silty SAND	7.3 in/hr
B-2/TH-2	10'	Silty SAND	12.5 in/hr

Groundwater was not encountered to a depth of 20 feet below existing ground surface based on the logs of our exploratory borings. A nearby groundwater monitoring well located approximately 500 feet south from the subject site noted a groundwater depth of 173 feet below ground surface last measured in April 2022.

All systems must meet the latest county specifications and the California Regional Water Quality Control Board (CRWQCB) requirements. It is recommended that foundations shall be setback a minimum distance of 10 feet from the drainage disposal system and the bottom of footing shall be a minimum of 10 feet from the expected zone of saturation. The boundary of the zone of saturation may be assumed to project downward from the top of the permeable portion of the disposal system at an inclination of 1 to 1 or flatter, as determined by the geotechnical engineer.

8.0 Conclusions and Recommendations

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

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

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

8.1 Site Grading Recommendations

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

8.1.1 Removal and Recompaction Recommendations

All disturbed soils and/or fill (about 1 to 1.5 feet below ground surface) shall be removed to competent native material, the exposed surface scarified to a depth of 12 inches, brought to within 2% of optimum moisture content and compacted to a minimum of 90% of the laboratory standard (ASTM: D 1557) prior to placement of any additional compacted fill soils, foundations, slabs-on-grade and pavement. Grading shall extend a minimum of five horizontal feet outside the edges of foundations or equidistant to the depth of fill placed, whichever is greater.

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

Any imported fill material should be preferably soil similar to the upper soils encountered at the subject site. All soils shall be approved by this firm prior to importing at the site and will be subjected to additional laboratory testing to assure concurrence with the recommendations stated in this report.

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

Care should be taken to provide or maintain adequate lateral support for all adjacent improvements and structures at all times during the grading operations and construction phase. Adequate drainage away from the structures, pavement and slopes should be provided at all times.

8.1.2 Fill Blanket Recommendations

Due to the potential for differential settlement of foundations placed on compacted fill and native materials, it is recommended that all foundations including floor slab areas be underlain by a uniform compacted fill blanket at least two feet in thickness. This fill blanket shall extend a minimum of five horizontal feet outside the edges of foundations or equidistant to the depth of fill placed, whichever is greater.

8.2 Shrinkage and Subsidence

Results of our in-place density tests reveal that the soil shrinkage will be less than 5 to 15% due to excavation and recompaction, based upon the assumption that the fill is compacted to 92% of the maximum dry density per ASTM standards. Subsidence should be 0.2 feet die to earthwork operations. The volume change does not include any allowance for vegetation or organic stripping, removal of subsurface improvements, or topographic approximations. Although these values are only approximate, they represent our best estimate of lost yardage, which will likely occur during grading. If more accurate shrinkage and subsidence factors are needed, it is recommended that field testing the actual equipment and grading techniques should be conducted.

8.3 Temporary Excavations

Temporary unsurcharged excavations in the existing site materials may be made at vertical inclinations up to 4 feet in height unless cohesionless soils are encountered. In areas where soils with little or no binder are encountered, where adverse geological conditions are exposed, or where excavations are adjacent to existing structures, shoring or flatter excavations may be required. The temporary cut slope gradients given above do not preclude local raveling and sloughing. Additional recommendations regarding specific excavations may be provided once typical detail sections are made available.

All excavations shall be made in accordance with the requirements of the soils engineer, CAL-OSHA and other public agencies having jurisdiction. Care should be taken to provide or maintain adequate lateral support for all adjacent improvements and structures at all times during the grading operations and construction phase. Additional recommendations regarding specific excavations may be calculated once typical detail sections are made available.

8.4 Foundation Design

All foundations may be designed utilizing the following allowable bearing capacities for an embedded depth of 18 inches into approved engineered fill with the corresponding widths:

Allowable Bearing Capacity (psf)		
Width (feet)	Continuous Foundation	Isolated Foundation
1.5	2000	2500
2.0	2075	2575
4.0	2375	2875
6.0	2500	3000

The bearing value may be increased by 500 psf for each additional foot of depth in excess of the 18-inch minimum depth, up to a maximum of 4,000 psf. A one-third increase may be used when considering short-term loading and seismic forces.

All foundations for minor structures (site walls, trash enclosure, etc) may be designed utilizing an allowable bearing capacity of 1,500 psf and embedded into competent native soils. A modulus of subgrade reaction (k) of 150 pci may be used for design of slabs placed on engineered fill soils supporting sustained concentrated loads. A representative of this firm shall inspect all foundation excavations prior to pouring concrete.

8.5 Settlement Analysis

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

8.6 Lateral Resistance

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

Coefficient of Friction - 0.40

Equivalent Passive Fluid Pressure = 250 lbs./cu.ft.

Maximum Passive Pressure = 2,500 lbs./cu.ft.

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

8.7 Retaining Wall Design Parameters

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

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

Any applicable short-term construction surcharges and seismic forces should be added to the above lateral pressure values. An equivalent fluid pressure of 45 pcf may be utilized for the restrained wall condition with a level grade behind the wall.

The seismic-induced lateral soil pressure for walls greater than 6 feet may be computed using a triangular pressure distribution with the maximum value at the top of the wall. The maximum lateral pressure of (20 pcf) H where H is the height of the retained soils above the wall footing should be used in final design of retaining walls. Sliding resistance values and passive fluid pressure values may be increased by 1/3 during short-term wind and seismic loading conditions.

All walls shall be waterproofed as needed and protected from hydrostatic pressure by a reliable permanent subdrain system. The granular backfill to be utilized immediately adjacent to retaining walls shall consist of an approved select granular soil with a sand equivalency greater than 30. This backfill zone of free draining material shall consist of a wedge beginning a minimum of one horizontal foot from the base of the wall extending upward at an inclination of no less than ¾ to 1 (horizontal to vertical).

8.8 **Slab Design**

All concrete slabs shall be a minimum of six inches in thickness in the proposed warehouse areas and four inches in office and hardscape and placed on approved subgrade soils. Additional reinforcement requirements and an increase in thickness of the slabs-on-grade may be necessary based upon proposed loading conditions in the structures and should be evaluated further by the project engineers and/or architect. All subgrade soils shall be moisture conditioned to over optimum moisture content to a depth one foot.

A vapor retarder (10-mil minimum thickness) should be utilized in areas which would be sensitive to the infiltration of moisture. This retarder shall meet requirements of ASTM E 96, *Water Vapor Transmission of Materials* and ASTM E 1745, *Standard Specification for Water Vapor Retarders used in Contact with Soil or Granular Fill Under Concrete Slabs.* The vapor retarder shall be installed in accordance with procedures stated in ASTM E 1643, *Standard practice for Installation of Water Vapor Retarders used in Contact with Earth or Granular Fill Under Concrete Slabs.*

The moisture retarder may be placed directly upon compacted subgrade soils conditioned to near optimum moisture levels, although one to two inches of sand beneath the membrane is desirable. The subgrade upon which the retarder is placed shall be smooth and free of rocks, gravel or other protrusions which may damage the retarder. Use of sand above the retarder is under the purview of the structural engineer; if sand is used over the retarder, it should be placed in a dry condition.

8.9 **Pavement Section Design**

The table on the following page provides a preliminary pavement design based upon an R-Value of 30 for the subgrade soils for the proposed pavement areas. Final pavement design may need to be based on R-Value testing of the subgrade soils near the conclusion of site grading to assure that these soils are consistent with those assumed in this preliminary design.

The recommendations are based upon estimated traffic loads. Client should submit any other anticipated traffic loadings to the geotechnical engineer, if necessary, so that pavement sections may be reviewed to determine adequacy to support the proposed loadings.

Type of Traffic	Traffic Index	Asphalt (in.)	Base Material (in.)
Automobile Parking Stalls	4.0	3.0	4.0
Light Vehicle Circulation Areas	6.0	3.5	8.5
Heavy Truck Access Areas	7.0	4.0	11.0

Any concrete slab-on-grade in pavement areas shall be a minimum of seven inches in thickness and may be placed on approved subgrade soils. All pavement areas shall have positive drainage toward an approved outlet from the site. Drain lines behind curbs and/or adjacent to landscape areas should be considered by client and the appropriate design engineers to prevent water from infiltrating beneath pavement. If such infiltration occurs, damage to pavement, curbs and flow lines, especially on sites with expansive soils, may occur during the life of the project.

Any approved base material shall consist of a Class II aggregate or equivalent and should be compacted to a minimum of 95% relative compaction. All pavement materials shall conform to the requirements set forth by the City of Hemet. The base material; and asphaltic concrete should be tested prior to delivery to the site and during placement to determine conformance with the project specifications. A pavement engineer shall designate the specific asphalt mix design to meet the required project specifications.

8.10 **Utility Trench and Excavation Backfill**

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

8.11 **Corrosion Design Criteria**

Representative samples of the surficial soils, typical of the subgrade soils expected to be encountered within foundation excavations and underground utilities were tested for corrosion potential. The minimum resistivity value obtained for the samples tested is representative of an environment that may be severely corrosive to metals. The soil pH value was considered mildly alkaline and may not have a significant effect on soil corrosivity. Consideration should be given to corrosion protection systems for buried metal such as protective coatings, wrappings or the use of PVC where permitted by local building codes.

According to Table 4.3.1 of ACI 318 Building Code and Commentary, these contents revealed negligible sulfate concentrations. Therefore, a Type II cement according to latest CBC specifications may be utilized for building foundations at this time. It is recommended that additional sulfate tests be performed at the completion of site grading to assure that the as graded conditions are consistent with the recommendations stated in this design. Corrosion test results may be found on the attached Table IV.

8.12 **Expansive Soil**

If expansive soils are encountered, special attention should be given to the project design and maintenance. The attached *Expansive Soil Guidelines* should be reviewed by the engineers, architects, owner, maintenance personnel and other interested parties and considered during the design of the project and future property maintenance.

9.0 Closure

The recommendations and conclusions contained in this report are based upon the soil conditions uncovered in our test excavations. No warranty of the soil condition between our excavations is implied. NorCal Engineering should be notified for possible further recommendations if unexpected to unfavorable conditions are encountered during construction phase.

It is the responsibility of the owner to ensure that all information within this report is submitted to the Architect and appropriate Engineers for the project. A preconstruction conference should be held between the developer, general contractor, grading contractor, city inspector, architect, and geotechnical engineer to clarify any questions relating to the grading operations and subsequent construction. Our representative should be present during the grading operations and construction phase to certify that such recommendations are complied within the field.

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

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

Respectfully submitted,
NORCAL ENGINEERING

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

REGISTERED PROFESSIONAL ENGINEER
KEITH D. TUCKER
No. 841
Exp. 12/31/2022
GEOTECHNICAL
STATE OF CALIFORNIA

Scott D. Spensiero
Project Manager

References

1. American Society of Civil Engineers (ASCE) website, https://asce7hazardtool.online/

2. California Building Code, 2019.

3. California Department of Conservation, California Geological Survey, 2007, Fault-Rupture Hazard Zones in California; Special Publication 42.

4. California Department of Water Resources, Internet Website, http://www.water.ca.gov/waterdatalibrary/index.cfm.

5. California Division of Mines and Geology, 2008, Guidelines for Evaluating and Mitigating Seismic Hazards in California: Special Publication 117A.

6. California Geological Survey, 2001 Preliminary Geologic Map of the Winchester 7.5 Quadrangle, Riverside County, California by Douglas M. Morton, Open File Report 3-188.

7. Riverside County Mapping and Spatial Data Portal – Liquefaction Zones September 2019.

8. Riverside County – Low Impact Development BMP Design Handbook (revised 9/2011) Appendix A – Infiltration Testing Manual.

SPECIFICATIONS FOR PLACEMENT OF COMPACTED FILL

Excavation

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

In any area where a transition between fill and native soil or between bedrock and soil are encountered, additional excavation beneath foundations and slabs will be necessary in order to provide uniform support and avoid differential settlement of the structure.

Material for Fill

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

Placement of Compacted Fill Soils

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

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

Grading Observations

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

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

EXPANSIVE SOIL GUIDELINES

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

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

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

Classification of Expansive Soil*

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

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

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

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

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

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

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

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

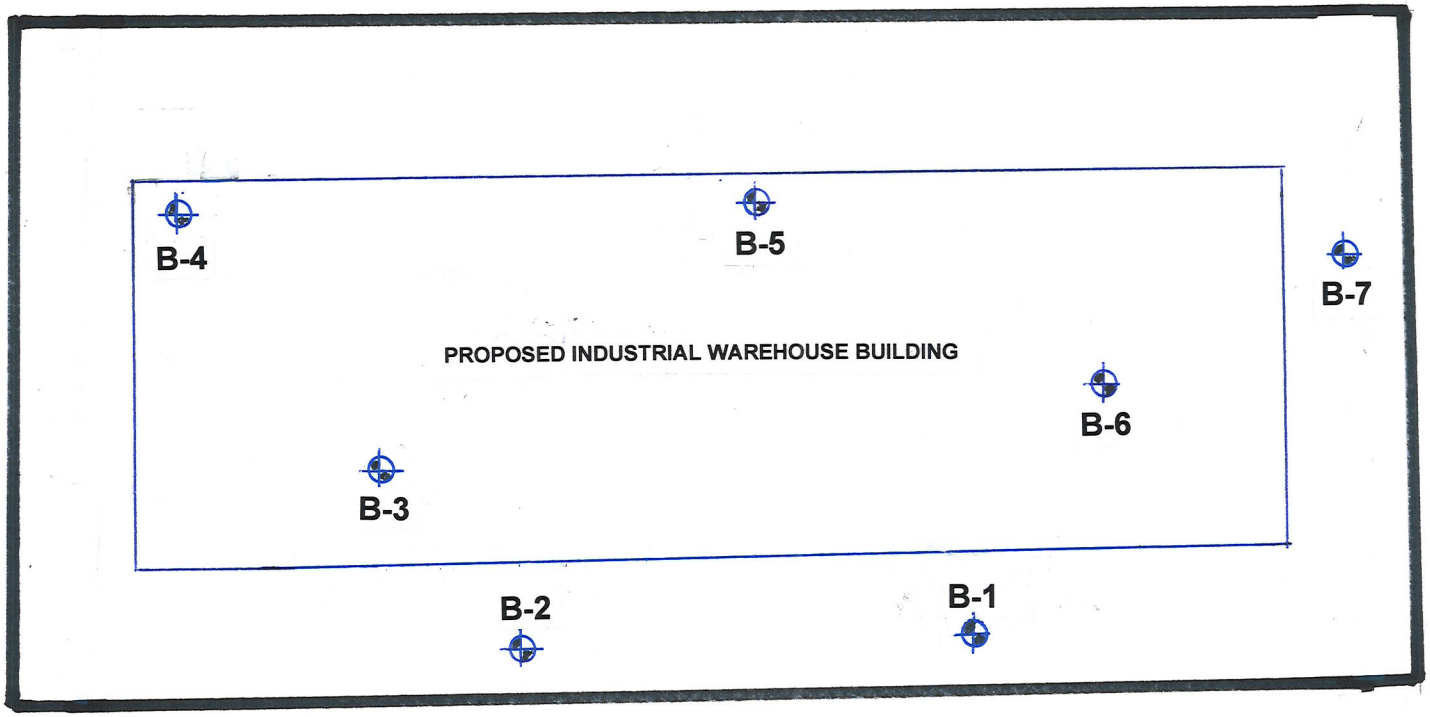
- Planting schemes for landscaping around structures and pavement should be analyzed carefully. Plants (including sod) requiring high amounts of water may result in excessive wetting of soils. Trees and large shrubs may actually extract moisture from the expansive soils, thus causing contraction of the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

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

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

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

WENTWORTH DRIVE



NORTH

1 INCH = 100 FEET

NorCal Engineering
SOILS AND GEOTECHNICAL CONSULTANTS

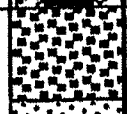
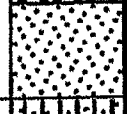
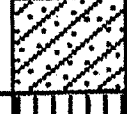
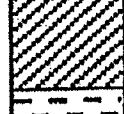
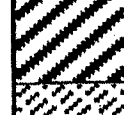
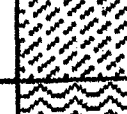
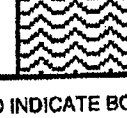
PROJECT: **23487-22**

DATE: **SEPTEMBER 2022**

SITE PLAN

List of Appendices
(in order of appearance)

Appendix A
Log of Excavations

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

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

UNIFIED SOIL CLASSIFICATION SYSTEM

KEY:

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

COMPONENT PROPORTIONS

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

COMPONENT DEFINITIONS

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

MOISTURE CONTENT

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

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N -VALUE

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

National Tube Supply
23487-22

Log of Boring B-1

Boring Location: SWC of S. Sanderson & Wentworth, Hemet

Date of Drilling: 8/23/2022 | Groundwater Depth: None Encountered

Drilling Method: Simco 2800 HS

Hammer Weight: 140 lbs. | Drop: 30"

Surface Elevation:

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Sandy SILT Brown, soft, dry					
		NATURAL Sandy SILT Brown, medium stiff, damp					
5		Silty (fine to medium grained) SAND Brown, medium dense to dense, moist					
		Boring completed at depth of 5'					
10							
15							
20							
25							
30							
35							

GWT not encountered

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\123487-22.log Date: 8/30/2022

NorCal Engineering

National Tube Supply
23487-22

Log of Boring B-2

Boring Location: SWC of S. Sanderson & Wentworth, Hemet

Date of Drilling: 8/23/2022 | **Groundwater Depth:** None Encountered

Drilling Method: Simco 2800 HS

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

Surface Elevation:

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Sandy SILT Brown, soft, dry					
		NATURAL Sandy SILT Brown, medium stiff, damp					
5		GWT not encountered					
		Silty (fine to coarse grained) SAND Brown, medium dense to dense, damp					
10		Boring completed at depth of 10'					
15							
20							
25							
30							
35							

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\23487-22.log Date: 8/30/2022

NorCal Engineering

National Tube Supply
23487-22

Log of Boring B-3

Boring Location: SWC of S. Sanderson & Wentworth, Hemet

Date of Drilling: 8/23/2022 | Groundwater Depth: None Encountered

Drilling Method: Simco 2800 HS

Hammer Weight: 140 lbs. | Drop: 30"

Surface Elevation:

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Sandy SILT Brown, soft, dry					
		NATURAL Sandy SILT Brown, stiff to medium stiff, damp		9/13	5.1	99.2	
5				4/5	5.8	96.1	
		Silty (fine to coarse grained) SAND Brown, medium dense to dense, damp; with occasional gravel					
10				7/11	3.9	107.7	
15				22/32	3.6	111.9	
20				12/15	2.2	105.9	
		Boring completed at depth of 21'					
25							
30							
35							

GWT not encountered

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\23487-22.log Date: 8/30/2022

NorCal Engineering

National Tube Supply
23487-22

Log of Boring B-4

Boring Location: SWC of S. Sanderson & Wentworth, Hemet

Date of Drilling: 8/23/2022 | **Groundwater Depth:** None Encountered

Drilling Method: Simco 2800 HS

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

Surface Elevation:

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Sandy SILT Brown, soft, dry					
		NATURAL Sandy SILT Brown, medium stiff, damp	■	6/6	6.9	98.1	
5		Silty (fine to coarse grained) SAND Brown, medium dense to dense, moist; with occasional gravel	■	7/10	6.1	105.1	
10		Boring completed at depth of 10'					
15							
20							
25							
30							
35							

GWT not encountered

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\23487-22.log Date: 8/30/2022

NorCal Engineering

National Tube Supply
23487-22

Log of Boring B-5

Boring Location: SWC of S. Sanderson & Wentworth, Hemet

Date of Drilling: 8/23/2022 | **Groundwater Depth:** None Encountered

Drilling Method: Simco 2800 HS

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

Surface Elevation:

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Sandy SILT Brown, soft, dry; with concrete and asphalt fragments and gravel					
		NATURAL Sandy SILT Brown, medium stiff, damp to moist	■	7/7	7.9	97.7	
5		Silty (fine to medium grained) SAND Brown, medium dense to dense, moist to damp	■	8/10	8.6	105.1	
10			■	12/15	2.6	109.3	
15			■	14/16	2.1	108.1	
20		Boring completed at depth of 20'					
25							
30							
35							

GWT not encountered

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\23487-22.log Date: 8/30/2022

NorCal Engineering

National Tube Supply
23487-22

Log of Boring B-6

Boring Location: SWC of S. Sanderson & Wentworth, Hemet

Date of Drilling: 8/23/2022 | Groundwater Depth: None Encountered

Drilling Method: Simco 2800 HS

Hammer Weight: 140 lbs. | Drop: 30"

Surface Elevation:

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Sandy SILT Brown, soft, dry					
		NATURAL Sandy SILT Brown, medium stiff, damp	■	10/11	4.9	101.7	
5			■	4/8	2.7	99.8	
		Silty (fine to medium grained) SAND Brown, medium dense to dense, moist					
10		Boring completed at depth of 10'					
15							
20							
25							
30							
35							

GWT not encountered

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\23487-22.log Date: 8/30/2022

NorCal Engineering

National Tube Supply
23487-22

Log of Boring B-7

Boring Location: SWC of S. Sanderson & Wentworth, Hemet

Date of Drilling: 8/23/2022 | Groundwater Depth: None Encountered

Drilling Method: Simco 2800 HS

Hammer Weight: 140 lbs. | Drop: 30"

Surface Elevation:

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Sandy SILT Brown, soft, dry NATURAL Sandy SILT Brown, medium stiff, damp					
5		Silty (fine to medium grained) SAND Brown, medium dense to dense, damp; with occasional gravel	■	5/7	5.0	98.1	
10		Boring completed at depth of 10'	■	7/11	2.6	106.5	
15							
20							
25							
30							
35							

GWT not encountered

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\23487-22.log Date: 8/30/2022

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Appendix B
Laboratory Tests

TABLE I
MAXIMUM DENSITY TESTS

Sample	Classification	Optimum Moisture (%)	Maximum Dry Density (lbs/cu.ft)
B-3 @ 2'	Sandy SILT	11.0	124.0

TABLE II
EXPANSION TESTS

Sample	Classification	Expansion Index
B-3 @ 2'	Sandy SILT	7

TABLE III
ATTERBERG LIMITS

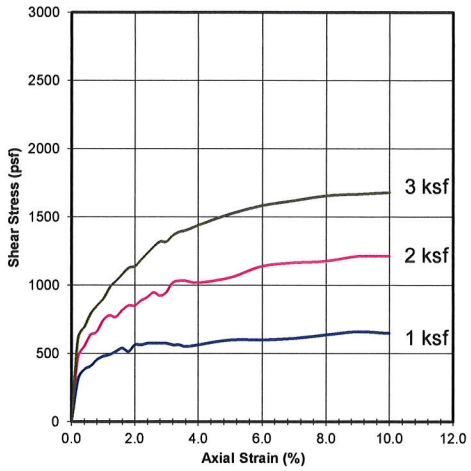
Sample	Liquid Limit	Plastic Limit	Plasticity Index
B-3 @ 5'	21	18	3

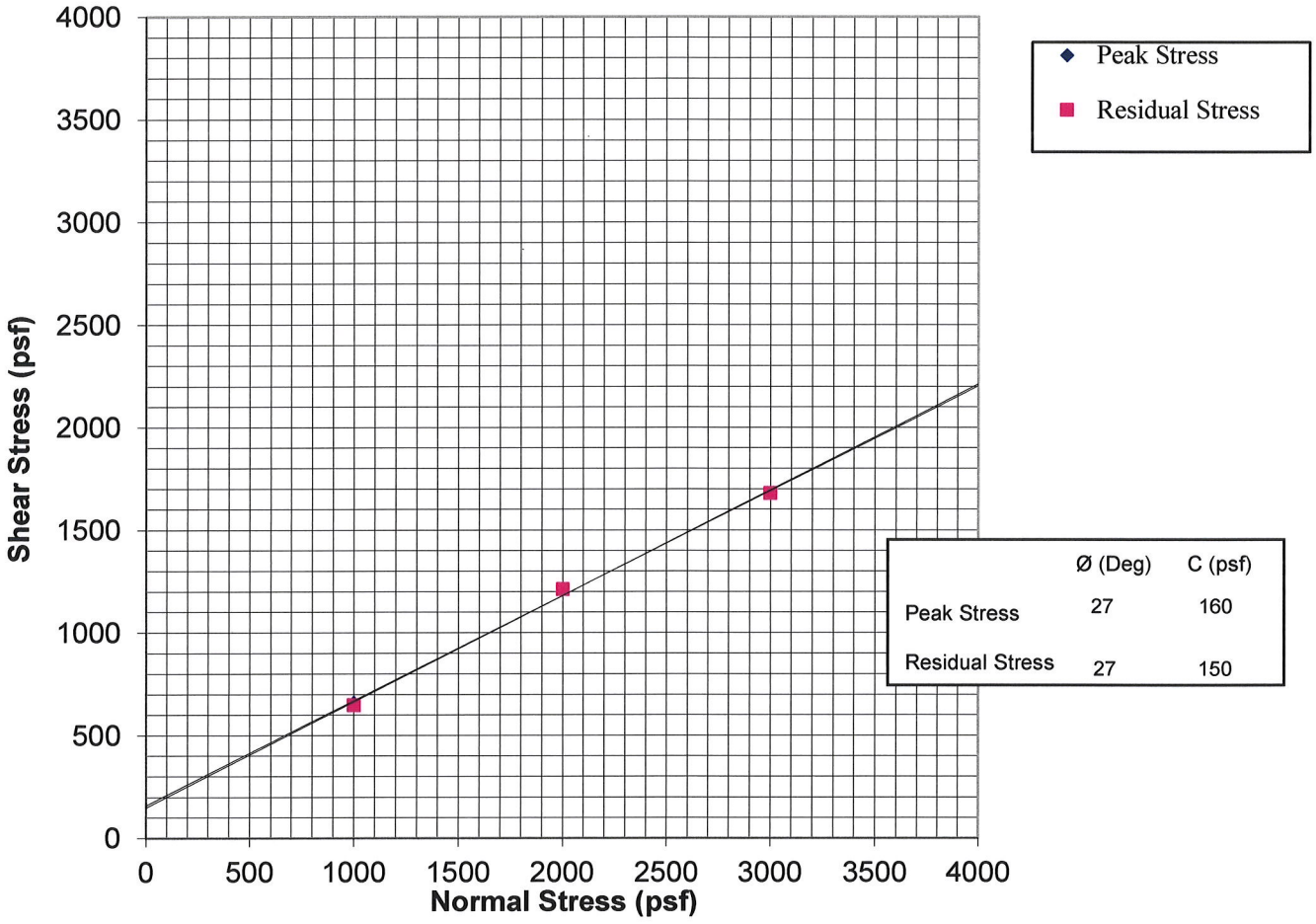
TABLE IV
CORROSION TESTS

Sample	pH	Electrical Resistivity	Sulfate (%)	Chloride (ppm)
B-3 @ 2'	7.2	2,855	0.006	190

% by weight
ppm – mg/kg

Sample No.		B3@2'		
Sample Type:		Undisturbed-Saturated		
Soil Description:		Sandy Silt		
		1	2	3
Normal Stress	(psf)	1000	2000	3000
Peak Stress	(psf)	660	1212	1680
Displacement	(in.)	0.225	0.225	0.250
Residual Stress	(psf)	648	1212	1680
Displacement	(in.)	0.250	0.250	0.250
Initial Dry Density	(pcf)	99.2	99.2	99.2
Initial Water Content	(%)	5.1	5.1	5.1
Strain Rate	(in./min.)	0.020	0.020	0.020





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SOILS AND GEOTECHNICAL CONSULTANTS

National Tube Supply

PROJECT NUMBER: 23487-22 DATE: 9/2/2022

DIRECT SHEAR TEST

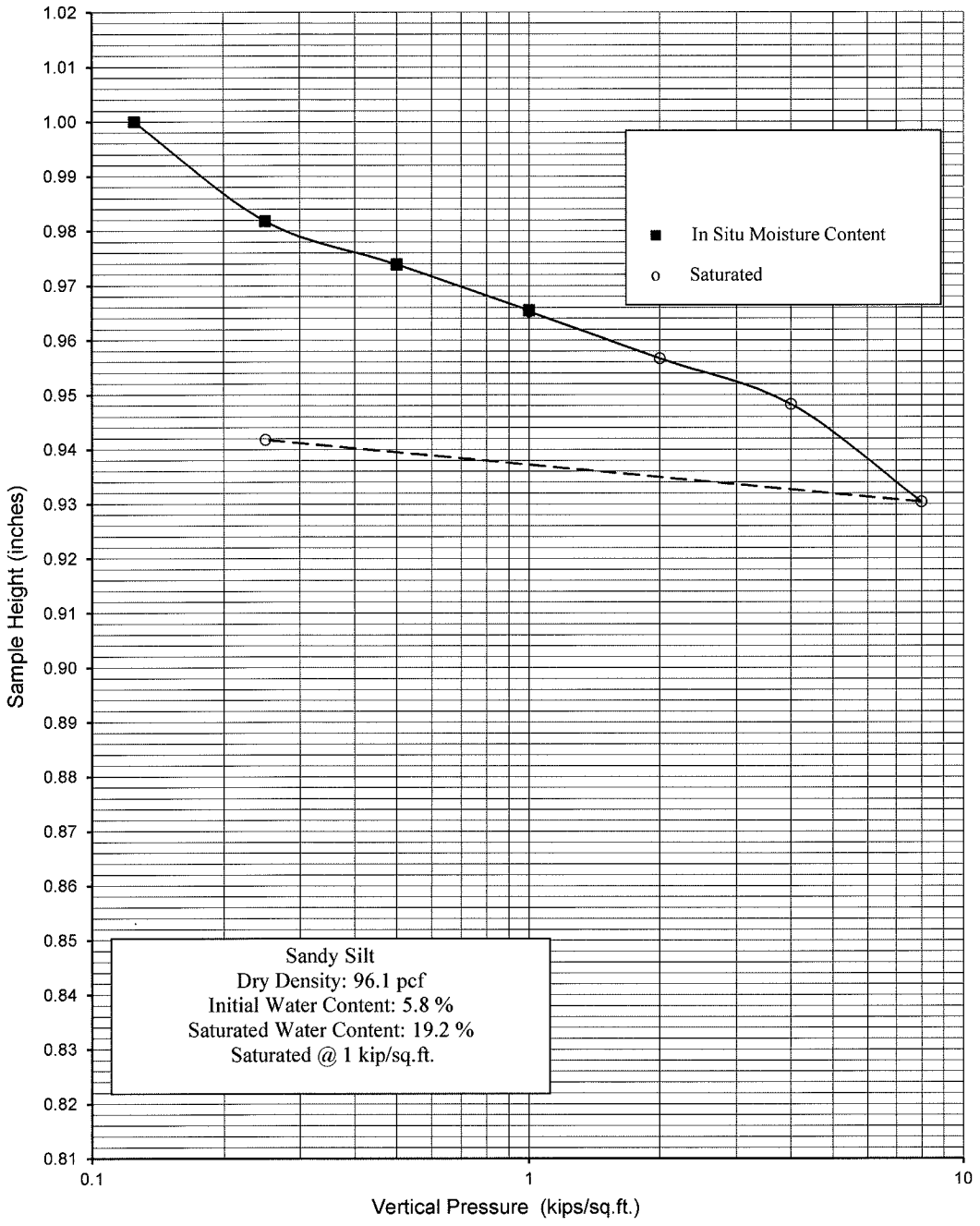
ASTM D3080

Plate A

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)	Saturated
0.125	**1.0000**	**0.0**	
0.25	**0.9818**	**1.8**	
0.5	**0.9739**	**2.6**	
1	**0.9655**	**3.5**	
1	**0.9653**	**3.5**	S
2	**0.9567**	**4.3**	
4	**0.9483**	**5.2**	
8	**0.9304**	**7.0**	
0.25	**0.9418**	**5.8**	

Date Tested: **8/29/2022**
Sample No.: **B3**
Depth: **5'**

Sample No.	B3	Depth	5'	Date	9/2/2022



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PROJECT NUMBER: 23487-22 | DATE: 9/2/2022

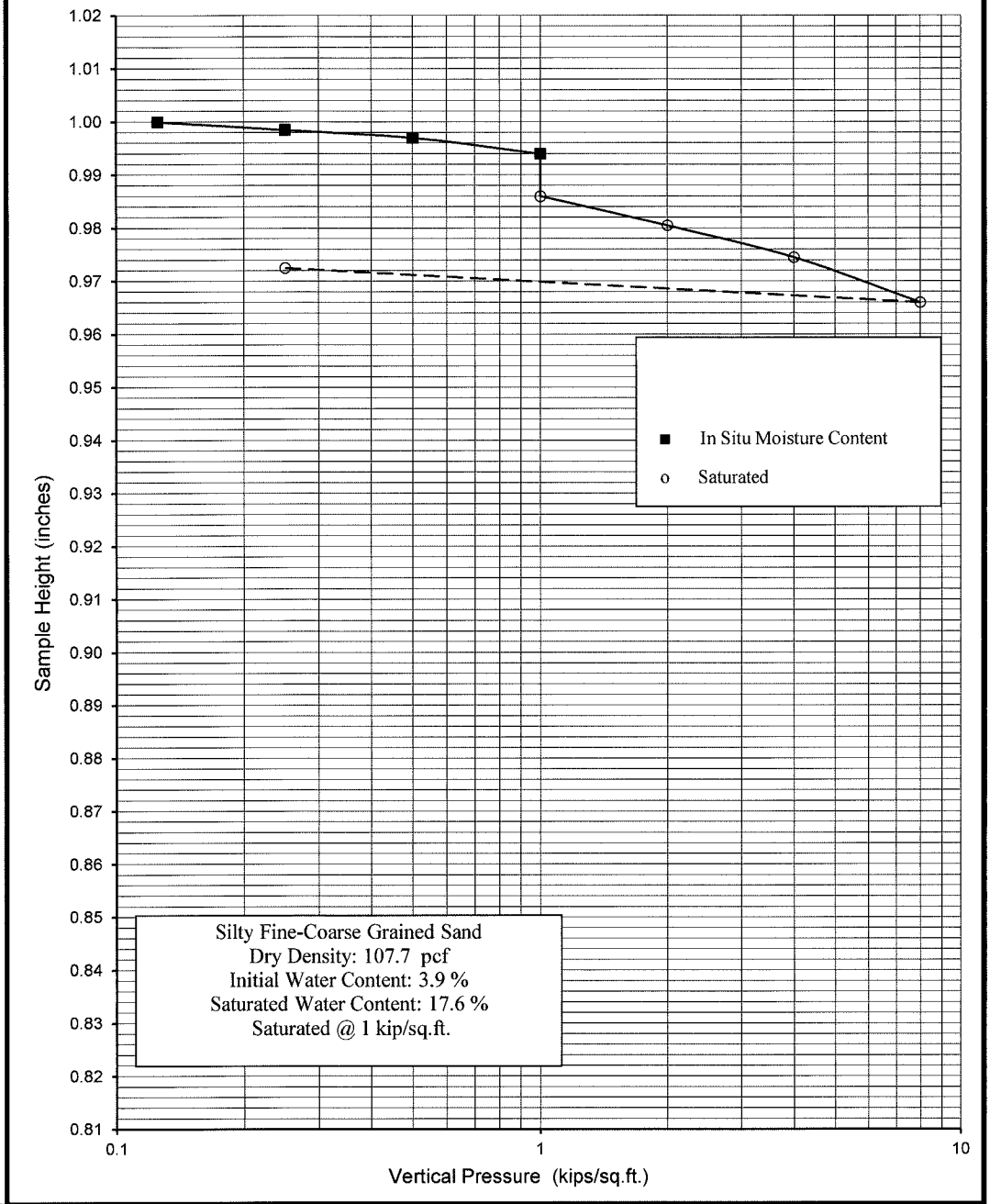
CONSOLIDATION TEST

ASTM D2435

Plate B

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)		Sample No. B3	Depth 10'	Date 9/2/2022
0.125	1.0000	0.0				
0.25	0.9985	0.2				
0.5	0.9970	0.3				
1	0.9940	0.6				
1	0.9860	1.4	Saturated			
2	0.9805	2.0				
4	0.9745	2.6				
8	0.9660	3.4				
0.25	0.9725	2.8				

Date Tested: 8/29/2022
Sample: B3
Depth: 10'



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SOILS AND GEOTECHNICAL CONSULTANTS

National Tube Supply

PROJECT NUMBER: 23487-22 DATE: 9/2/2022

CONSOLIDATION TEST

ASTM D2435

Plate C

Appendix C
Seismic Design Report

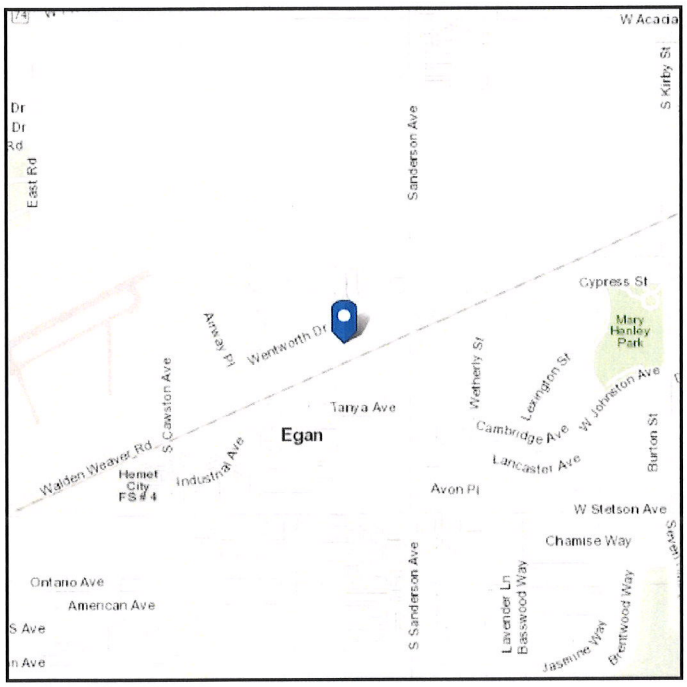
NorCal Engineering

ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-22
Risk Category: II
Soil Class: D - Stiff Soil

Elevation: 1522.49 ft (NAVD 88)
Latitude: 33.73426
Longitude: -117.009117



ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

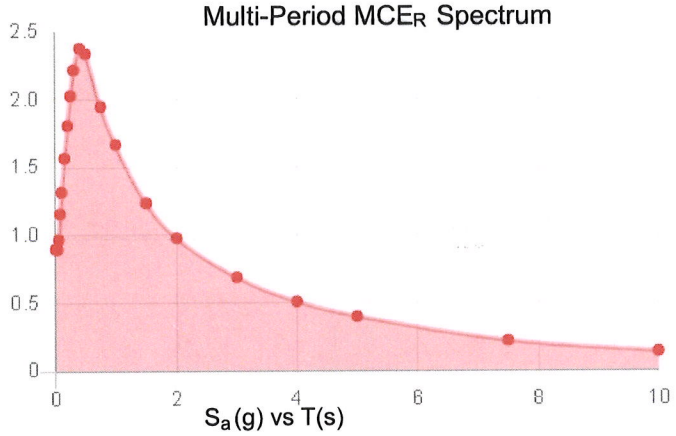
Seismic

Site Soil Class:

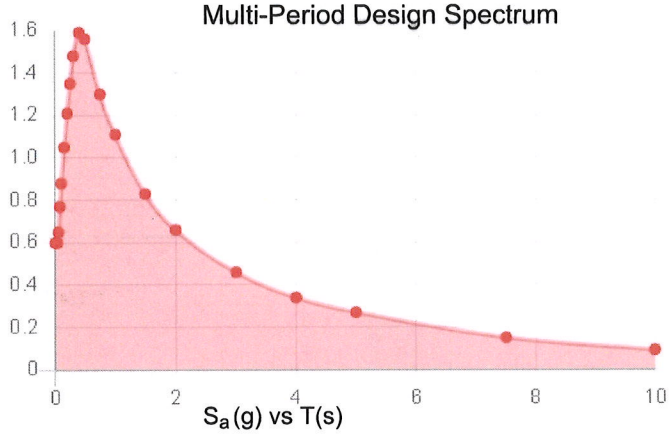
Results:

PGA_M :	0.75	T_L :	8
S_{MS} :	2.14	S_S :	2.04
S_{M1} :	1.87	S_1 :	0.71
S_{DS} :	1.43	S_{DC} :	
S_{D1} :	1.25	V_{S30} :	260

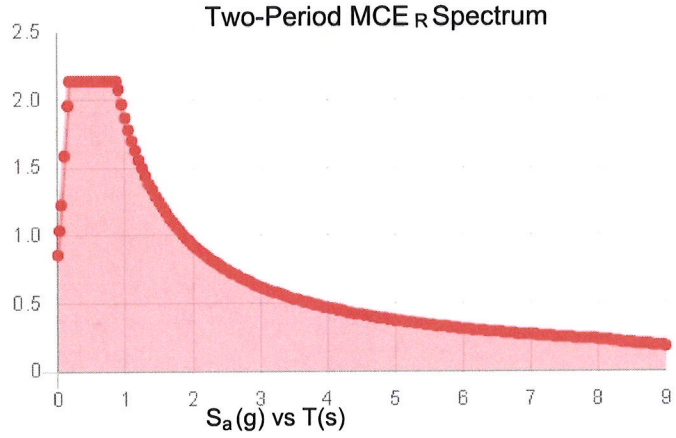
Multi-Period MCE_R Spectrum



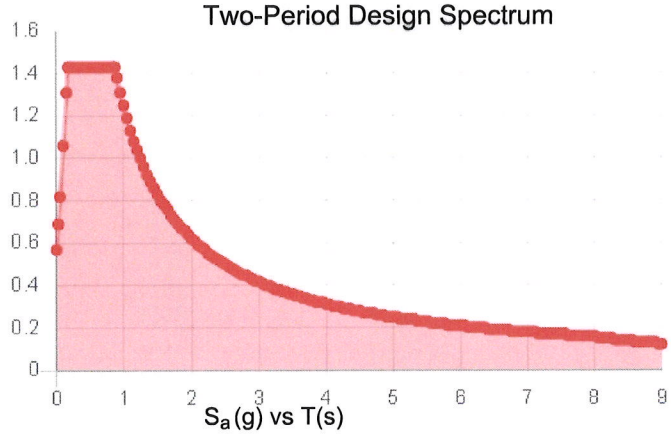
Multi-Period Design Spectrum



Two-Period MCE_R Spectrum



Two-Period Design Spectrum



MCE_R Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Design Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Data Accessed: Thu Aug 25 2022

Date Source:
USGS Seismic Design Maps based on ASCE/SEI 7-22 and ASCE/SEI 7-22 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-22 Ch. 21 are available from USGS.

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

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Appendix D
Soil Infiltration Data

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PERCOLATION TEST DATA

Client: Kluge Consulting LLC	**Date:** 8/23/2022
Project No.: 23487-22	**Tested By:** J.S.
Test Hole: 1	**USCS Soil Classification:**
Depth of Test Hole: 5' (60")	**Sides (if rectangular):**
Diameter of Test Hole: 6"	**Length:**
Sandy Soil Criteria Test*:	**Width:**

TRIAL NO.	START TIME	STOP TIME	TIME INTERVAL (MIN)	INITIAL DEPTH TO WATER (IN)	FINAL DEPTH TO WATER (IN)	CHANGE IN WATER LEVEL (IN)	GREATER THAN OR EQUAL TO 6"
1	7:54	8:10	16.0	44.0	60.0	16.0	Y
2	8:10	8:31	21.0	44.0	60.0	16.0	Y

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

TRIAL NO	START TIME	STOP TIME	ΔT TIME INTERVAL (MIN)	Do INITIAL DEPTH TO WATER (IN)	Df FINAL DEPTH TO WATER (IN)	ΔD CHANGE IN WATER LEVEL (IN)	PERCOLATION RATE (MIN/IN)
1	8:31	8:41	10	45.0	55.0	10.0	
2	8:41	8:51	10	45.0	55.5	10.5	
3	8:51	9:01	10	45.0	54.5	9.5	
4	9:01	9:11	10	45.0	54.5	9.5	
5	9:11	9:21	10	45.0	54.5	9.5	
6	9:21	9:31	10	45.0	54.5	9.5	

COMMENTS:

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

PERCOLATION TEST DATA

Client: Kluge Consulting LLC	**Date:** 8/23/2022
Project No.: 23487-22	**Tested By:** J.S.
Test Hole: 2	**USCS Soil Classification:**
Depth of Test Hole: 10' (120")	**Sides (if rectangular):**
Diameter of Test Hole: 6"	**Length:**
Sandy Soil Criteria Test*:	**Width:**

TRIAL NO.	START TIME	STOP TIME	TIME INTERVAL (MIN)	INITIAL DEPTH TO WATER (IN)	FINAL DEPTH TO WATER (IN)	CHANGE IN WATER LEVEL (IN)	GREATER THAN OR EQUAL TO 6"
1	8:15	8:18	3	103.0	120.0	17.0	Y
2	8:18	8:27	9	103.0	120.0	17.0	Y

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

TRIAL NO	START TIME	STOP TIME	ΔT TIME INTERVAL (MIN)	Do INITIAL DEPTH TO WATER (IN)	Df FINAL DEPTH TO WATER (IN)	ΔD CHANGE IN WATER LEVEL (IN)	PERCOLATION RATE (MIN/IN)
1	8:27	8:37	10	105.0	119.0	14.0	
2	8:37	8:47	10	105.0	119.0	14.0	
3	8:47	8:57	10	105.0	118.5	13.5	
4	8:57	9:07	10	105.0	118.0	13.0	
5	9:07	9:17	10	105.0	118.5	13.5	
6	9:17	9:27	10	105.0	118.5	13.5	

COMMENTS:

SOIL PERMEABILITY CALCS ⇒ PORCHET METHOD

Location:	B-1	B-2
• Depth =	5.0'	10.0'
• Hole Dia. =	6"	6"
• Drop = ΔH	9.5"	13.5"
• Time = Δt Interval	10 min	10 min
• Average Head = H_{ave}	10.25"	8.25"
• Infiltration Rate = I_t	7.3 in/hr	12.5 in/hr

$$\text{Infiltration Rate} = I_t = \frac{\Delta H}{\Delta t} \frac{(60 \cdot r)}{(r + 2\,H_{ave})}$$ where r = hole radius

r = 3 in

KEITH D. TUCKER
Consulting Engineer

DATE 2022

Appendix 4: Historical Site Conditions

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

Not available at this time

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

Not Applicable

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: David Evans and Associates — Date: 1/24/2023

Designed by: N Zamarripa — Case No:

Company Project Number/Name: National Tube Supply Industrial Building

BMP Identification

BMP NAME / ID: Infiltration Basin

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}= 0.69 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)*
D1	*146382*	*Concrete or Asphalt*	*1*	*0.89*	*130572.7*			
D2	*85080*	*Roofs*	*1*	*0.89*	*75891.4*			
D3	*19614*	*Ornamental Landscaping*	*0.1*	*0.11*	*2166.5*			
	251076	***Total***			**208630.6**	**0.69**	***11996.3***	***25120***

Notes:

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

U n i t H y d r o g r a p h A n a l y s i s

Study date 01/24/23 File: NTSHemetUHEx2242.out

++

Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6385

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

National Tube Supply - Hemet
Existing Condition 2-Year, 24-Hour Unit Hydrograph
N Zamarripa 01-24-2023

Drainage Area = 5.76(Ac.) = 0.009 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 5.76(Ac.) = 0.009 Sq. Mi.
Length along longest watercourse = 800.00(Ft.)
Length along longest watercourse measured to centroid = 400.00(Ft.)
Length along longest watercourse = 0.152 Mi.
Length along longest watercourse measured to centroid = 0.076 Mi.
Difference in elevation = 2.00(Ft.)
Slope along watercourse = 13.2000 Ft./Mi.
Average Manning's 'N' = 0.025
Lag time = 0.067 Hr.
Lag time = 4.04 Min.
25% of lag time = 1.01 Min.
40% of lag time = 1.62 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]
        5.76            1.80                  10.37

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
        5.76            4.50                  25.92

STORM EVENT (YEAR) =    2.00
Area Averaged 2-Year Rainfall =    1.800(In)
Area Averaged 100-Year Rainfall =    4.500(In)

Point rain (area averaged) =    1.800(In)
Areal adjustment factor =  100.00 %
Adjusted average point rain =    1.800(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
     0.170           86.00         0.000
     5.100           93.00         0.000
     0.490           78.00         0.000
 Total Area Entered =      5.76(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
86.0  86.0      0.176     0.000        0.176       0.030      0.005
93.0  93.0      0.091     0.000        0.091       0.885      0.081
78.0  78.0      0.268     0.000        0.268       0.085      0.023
                                                 Sum (F) =   0.109
Area averaged mean soil loss (F) (In/Hr) =  0.109
Minimum soil loss rate ((In/Hr)) =  0.054
(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   Time % of lag   Distribution   Unit Hydrograph
    (hrs)                          Graph %            (CFS)
------------------------------------------------------------------------
    1   0.083        123.829         26.298             1.527
    2   0.167        247.657         48.582             2.820
    3   0.250        371.486         12.983             0.754
    4   0.333        495.315          5.850             0.340
```

5	0.417	619.144	3.262		0.189
6	0.500	742.972	1.820		0.106
7	0.583	866.801	1.205		0.070
			Sum = 100.000	Sum=	5.805

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	0.014	(0.192)	0.013	0.001
2	0.17	0.07	0.014	(0.192)	0.013	0.001
3	0.25	0.07	0.014	(0.191)	0.013	0.001
4	0.33	0.10	0.022	(0.190)	0.019	0.002
5	0.42	0.10	0.022	(0.189)	0.019	0.002
6	0.50	0.10	0.022	(0.189)	0.019	0.002
7	0.58	0.10	0.022	(0.188)	0.019	0.002
8	0.67	0.10	0.022	(0.187)	0.019	0.002
9	0.75	0.10	0.022	(0.186)	0.019	0.002
10	0.83	0.13	0.029	(0.186)	0.026	0.003
11	0.92	0.13	0.029	(0.185)	0.026	0.003
12	1.00	0.13	0.029	(0.184)	0.026	0.003
13	1.08	0.10	0.022	(0.184)	0.019	0.002
14	1.17	0.10	0.022	(0.183)	0.019	0.002
15	1.25	0.10	0.022	(0.182)	0.019	0.002
16	1.33	0.10	0.022	(0.181)	0.019	0.002
17	1.42	0.10	0.022	(0.181)	0.019	0.002
18	1.50	0.10	0.022	(0.180)	0.019	0.002
19	1.58	0.10	0.022	(0.179)	0.019	0.002
20	1.67	0.10	0.022	(0.178)	0.019	0.002
21	1.75	0.10	0.022	(0.178)	0.019	0.002
22	1.83	0.13	0.029	(0.177)	0.026	0.003
23	1.92	0.13	0.029	(0.176)	0.026	0.003
24	2.00	0.13	0.029	(0.176)	0.026	0.003
25	2.08	0.13	0.029	(0.175)	0.026	0.003
26	2.17	0.13	0.029	(0.174)	0.026	0.003
27	2.25	0.13	0.029	(0.174)	0.026	0.003
28	2.33	0.13	0.029	(0.173)	0.026	0.003
29	2.42	0.13	0.029	(0.172)	0.026	0.003
30	2.50	0.13	0.029	(0.171)	0.026	0.003
31	2.58	0.17	0.036	(0.171)	0.032	0.004
32	2.67	0.17	0.036	(0.170)	0.032	0.004
33	2.75	0.17	0.036	(0.169)	0.032	0.004
34	2.83	0.17	0.036	(0.169)	0.032	0.004
35	2.92	0.17	0.036	(0.168)	0.032	0.004
36	3.00	0.17	0.036	(0.167)	0.032	0.004
37	3.08	0.17	0.036	(0.167)	0.032	0.004
38	3.17	0.17	0.036	(0.166)	0.032	0.004

39	3.25	0.17	0.036	(0.165)	0.032	0.004
40	3.33	0.17	0.036	(0.164)	0.032	0.004
41	3.42	0.17	0.036	(0.164)	0.032	0.004
42	3.50	0.17	0.036	(0.163)	0.032	0.004
43	3.58	0.17	0.036	(0.162)	0.032	0.004
44	3.67	0.17	0.036	(0.162)	0.032	0.004
45	3.75	0.17	0.036	(0.161)	0.032	0.004
46	3.83	0.20	0.043	(0.160)	0.039	0.004
47	3.92	0.20	0.043	(0.160)	0.039	0.004
48	4.00	0.20	0.043	(0.159)	0.039	0.004
49	4.08	0.20	0.043	(0.158)	0.039	0.004
50	4.17	0.20	0.043	(0.158)	0.039	0.004
51	4.25	0.20	0.043	(0.157)	0.039	0.004
52	4.33	0.23	0.050	(0.156)	0.045	0.005
53	4.42	0.23	0.050	(0.156)	0.045	0.005
54	4.50	0.23	0.050	(0.155)	0.045	0.005
55	4.58	0.23	0.050	(0.154)	0.045	0.005
56	4.67	0.23	0.050	(0.154)	0.045	0.005
57	4.75	0.23	0.050	(0.153)	0.045	0.005
58	4.83	0.27	0.058	(0.152)	0.052	0.006
59	4.92	0.27	0.058	(0.152)	0.052	0.006
60	5.00	0.27	0.058	(0.151)	0.052	0.006
61	5.08	0.20	0.043	(0.150)	0.039	0.004
62	5.17	0.20	0.043	(0.150)	0.039	0.004
63	5.25	0.20	0.043	(0.149)	0.039	0.004
64	5.33	0.23	0.050	(0.148)	0.045	0.005
65	5.42	0.23	0.050	(0.148)	0.045	0.005
66	5.50	0.23	0.050	(0.147)	0.045	0.005
67	5.58	0.27	0.058	(0.146)	0.052	0.006
68	5.67	0.27	0.058	(0.146)	0.052	0.006
69	5.75	0.27	0.058	(0.145)	0.052	0.006
70	5.83	0.27	0.058	(0.145)	0.052	0.006
71	5.92	0.27	0.058	(0.144)	0.052	0.006
72	6.00	0.27	0.058	(0.143)	0.052	0.006
73	6.08	0.30	0.065	(0.143)	0.058	0.006
74	6.17	0.30	0.065	(0.142)	0.058	0.006
75	6.25	0.30	0.065	(0.141)	0.058	0.006
76	6.33	0.30	0.065	(0.141)	0.058	0.006
77	6.42	0.30	0.065	(0.140)	0.058	0.006
78	6.50	0.30	0.065	(0.139)	0.058	0.006
79	6.58	0.33	0.072	(0.139)	0.065	0.007
80	6.67	0.33	0.072	(0.138)	0.065	0.007
81	6.75	0.33	0.072	(0.138)	0.065	0.007
82	6.83	0.33	0.072	(0.137)	0.065	0.007
83	6.92	0.33	0.072	(0.136)	0.065	0.007
84	7.00	0.33	0.072	(0.136)	0.065	0.007
85	7.08	0.33	0.072	(0.135)	0.065	0.007
86	7.17	0.33	0.072	(0.134)	0.065	0.007
87	7.25	0.33	0.072	(0.134)	0.065	0.007
88	7.33	0.37	0.079	(0.133)	0.071	0.008

89	7.42	0.37	0.079	(	0.133)	0.071		0.008
90	7.50	0.37	0.079	(	0.132)	0.071		0.008
91	7.58	0.40	0.086	(	0.131)	0.078		0.009
92	7.67	0.40	0.086	(	0.131)	0.078		0.009
93	7.75	0.40	0.086	(	0.130)	0.078		0.009
94	7.83	0.43	0.094	(	0.130)	0.084		0.009
95	7.92	0.43	0.094	(	0.129)	0.084		0.009
96	8.00	0.43	0.094	(	0.128)	0.084		0.009
97	8.08	0.50	0.108	(	0.128)	0.097		0.011
98	8.17	0.50	0.108	(	0.127)	0.097		0.011
99	8.25	0.50	0.108	(	0.127)	0.097		0.011
100	8.33	0.50	0.108	(	0.126)	0.097		0.011
101	8.42	0.50	0.108	(	0.125)	0.097		0.011
102	8.50	0.50	0.108	(	0.125)	0.097		0.011
103	8.58	0.53	0.115	(	0.124)	0.104		0.012
104	8.67	0.53	0.115	(	0.124)	0.104		0.012
105	8.75	0.53	0.115	(	0.123)	0.104		0.012
106	8.83	0.57	0.122	(	0.123)	0.110		0.012
107	8.92	0.57	0.122	(	0.122)	0.110		0.012
108	9.00	0.57	0.122	(	0.121)	0.110		0.012
109	9.08	0.63	0.137		0.121	(	0.123)	0.016
110	9.17	0.63	0.137		0.120	(	0.123)	0.017
111	9.25	0.63	0.137		0.120	(	0.123)	0.017
112	9.33	0.67	0.144		0.119	(	0.130)	0.025
113	9.42	0.67	0.144		0.119	(	0.130)	0.025
114	9.50	0.67	0.144		0.118	(	0.130)	0.026
115	9.58	0.70	0.151		0.117	(	0.136)	0.034
116	9.67	0.70	0.151		0.117	(	0.136)	0.034
117	9.75	0.70	0.151		0.116	(	0.136)	0.035
118	9.83	0.73	0.158		0.116	(	0.143)	0.043
119	9.92	0.73	0.158		0.115	(	0.143)	0.043
120	10.00	0.73	0.158		0.115	(	0.143)	0.044
121	10.08	0.50	0.108	(	0.114)	0.097		0.011
122	10.17	0.50	0.108	(	0.113)	0.097		0.011
123	10.25	0.50	0.108	(	0.113)	0.097		0.011
124	10.33	0.50	0.108	(	0.112)	0.097		0.011
125	10.42	0.50	0.108	(	0.112)	0.097		0.011
126	10.50	0.50	0.108	(	0.111)	0.097		0.011
127	10.58	0.67	0.144		0.111	(	0.130)	0.033
128	10.67	0.67	0.144		0.110	(	0.130)	0.034
129	10.75	0.67	0.144		0.110	(	0.130)	0.034
130	10.83	0.67	0.144		0.109	(	0.130)	0.035
131	10.92	0.67	0.144		0.109	(	0.130)	0.035
132	11.00	0.67	0.144		0.108	(	0.130)	0.036
133	11.08	0.63	0.137		0.108	(	0.123)	0.029
134	11.17	0.63	0.137		0.107	(	0.123)	0.030
135	11.25	0.63	0.137		0.106	(	0.123)	0.030
136	11.33	0.63	0.137		0.106	(	0.123)	0.031
137	11.42	0.63	0.137		0.105	(	0.123)	0.031
138	11.50	0.63	0.137		0.105	(	0.123)	0.032

139	11.58	0.57	0.122	0.104	(	0.110)	0.018
140	11.67	0.57	0.122	0.104	(	0.110)	0.019
141	11.75	0.57	0.122	0.103	(	0.110)	0.019
142	11.83	0.60	0.130	0.103	(	0.117)	0.027
143	11.92	0.60	0.130	0.102	(	0.117)	0.027
144	12.00	0.60	0.130	0.102	(	0.117)	0.028
145	12.08	0.83	0.180	0.101	(	0.162)	0.079
146	12.17	0.83	0.180	0.101	(	0.162)	0.079
147	12.25	0.83	0.180	0.100	(	0.162)	0.080
148	12.33	0.87	0.187	0.100	(	0.168)	0.087
149	12.42	0.87	0.187	0.099	(	0.168)	0.088
150	12.50	0.87	0.187	0.099	(	0.168)	0.088
151	12.58	0.93	0.202	0.098	(	0.181)	0.103
152	12.67	0.93	0.202	0.098	(	0.181)	0.104
153	12.75	0.93	0.202	0.097	(	0.181)	0.104
154	12.83	0.97	0.209	0.097	(	0.188)	0.112
155	12.92	0.97	0.209	0.096	(	0.188)	0.112
156	13.00	0.97	0.209	0.096	(	0.188)	0.113
157	13.08	1.13	0.245	0.095	(	0.220)	0.149
158	13.17	1.13	0.245	0.095	(	0.220)	0.150
159	13.25	1.13	0.245	0.094	(	0.220)	0.150
160	13.33	1.13	0.245	0.094	(	0.220)	0.151
161	13.42	1.13	0.245	0.093	(	0.220)	0.151
162	13.50	1.13	0.245	0.093	(	0.220)	0.152
163	13.58	0.77	0.166	0.092	(	0.149)	0.073
164	13.67	0.77	0.166	0.092	(	0.149)	0.074
165	13.75	0.77	0.166	0.092	(	0.149)	0.074
166	13.83	0.77	0.166	0.091	(	0.149)	0.075
167	13.92	0.77	0.166	0.091	(	0.149)	0.075
168	14.00	0.77	0.166	0.090	(	0.149)	0.075
169	14.08	0.90	0.194	0.090	(	0.175)	0.105
170	14.17	0.90	0.194	0.089	(	0.175)	0.105
171	14.25	0.90	0.194	0.089	(	0.175)	0.106
172	14.33	0.87	0.187	0.088	(	0.168)	0.099
173	14.42	0.87	0.187	0.088	(	0.168)	0.099
174	14.50	0.87	0.187	0.087	(	0.168)	0.100
175	14.58	0.87	0.187	0.087	(	0.168)	0.100
176	14.67	0.87	0.187	0.087	(	0.168)	0.101
177	14.75	0.87	0.187	0.086	(	0.168)	0.101
178	14.83	0.83	0.180	0.086	(	0.162)	0.094
179	14.92	0.83	0.180	0.085	(	0.162)	0.095
180	15.00	0.83	0.180	0.085	(	0.162)	0.095
181	15.08	0.80	0.173	0.084	(	0.156)	0.088
182	15.17	0.80	0.173	0.084	(	0.156)	0.089
183	15.25	0.80	0.173	0.083	(	0.156)	0.089
184	15.33	0.77	0.166	0.083	(	0.149)	0.083
185	15.42	0.77	0.166	0.083	(	0.149)	0.083
186	15.50	0.77	0.166	0.082	(	0.149)	0.083
187	15.58	0.63	0.137	0.082	(	0.123)	0.055
188	15.67	0.63	0.137	0.081	(	0.123)	0.055

189	15.75	0.63	0.137	0.081	(0.123)	0.056
190	15.83	0.63	0.137	0.081	(0.123)	0.056
191	15.92	0.63	0.137	0.080	(0.123)	0.057
192	16.00	0.63	0.137	0.080	(0.123)	0.057
193	16.08	0.13	0.029	(0.079)	0.026	0.003
194	16.17	0.13	0.029	(0.079)	0.026	0.003
195	16.25	0.13	0.029	(0.078)	0.026	0.003
196	16.33	0.13	0.029	(0.078)	0.026	0.003
197	16.42	0.13	0.029	(0.078)	0.026	0.003
198	16.50	0.13	0.029	(0.077)	0.026	0.003
199	16.58	0.10	0.022	(0.077)	0.019	0.002
200	16.67	0.10	0.022	(0.076)	0.019	0.002
201	16.75	0.10	0.022	(0.076)	0.019	0.002
202	16.83	0.10	0.022	(0.076)	0.019	0.002
203	16.92	0.10	0.022	(0.075)	0.019	0.002
204	17.00	0.10	0.022	(0.075)	0.019	0.002
205	17.08	0.17	0.036	(0.075)	0.032	0.004
206	17.17	0.17	0.036	(0.074)	0.032	0.004
207	17.25	0.17	0.036	(0.074)	0.032	0.004
208	17.33	0.17	0.036	(0.073)	0.032	0.004
209	17.42	0.17	0.036	(0.073)	0.032	0.004
210	17.50	0.17	0.036	(0.073)	0.032	0.004
211	17.58	0.17	0.036	(0.072)	0.032	0.004
212	17.67	0.17	0.036	(0.072)	0.032	0.004
213	17.75	0.17	0.036	(0.072)	0.032	0.004
214	17.83	0.13	0.029	(0.071)	0.026	0.003
215	17.92	0.13	0.029	(0.071)	0.026	0.003
216	18.00	0.13	0.029	(0.071)	0.026	0.003
217	18.08	0.13	0.029	(0.070)	0.026	0.003
218	18.17	0.13	0.029	(0.070)	0.026	0.003
219	18.25	0.13	0.029	(0.070)	0.026	0.003
220	18.33	0.13	0.029	(0.069)	0.026	0.003
221	18.42	0.13	0.029	(0.069)	0.026	0.003
222	18.50	0.13	0.029	(0.069)	0.026	0.003
223	18.58	0.10	0.022	(0.068)	0.019	0.002
224	18.67	0.10	0.022	(0.068)	0.019	0.002
225	18.75	0.10	0.022	(0.068)	0.019	0.002
226	18.83	0.07	0.014	(0.067)	0.013	0.001
227	18.92	0.07	0.014	(0.067)	0.013	0.001
228	19.00	0.07	0.014	(0.067)	0.013	0.001
229	19.08	0.10	0.022	(0.066)	0.019	0.002
230	19.17	0.10	0.022	(0.066)	0.019	0.002
231	19.25	0.10	0.022	(0.066)	0.019	0.002
232	19.33	0.13	0.029	(0.065)	0.026	0.003
233	19.42	0.13	0.029	(0.065)	0.026	0.003
234	19.50	0.13	0.029	(0.065)	0.026	0.003
235	19.58	0.10	0.022	(0.064)	0.019	0.002
236	19.67	0.10	0.022	(0.064)	0.019	0.002
237	19.75	0.10	0.022	(0.064)	0.019	0.002
238	19.83	0.07	0.014	(0.064)	0.013	0.001

239	19.92	0.07	0.014	(0.063)	0.013	0.001
240	20.00	0.07	0.014	(0.063)	0.013	0.001
241	20.08	0.10	0.022	(0.063)	0.019	0.002
242	20.17	0.10	0.022	(0.062)	0.019	0.002
243	20.25	0.10	0.022	(0.062)	0.019	0.002
244	20.33	0.10	0.022	(0.062)	0.019	0.002
245	20.42	0.10	0.022	(0.062)	0.019	0.002
246	20.50	0.10	0.022	(0.061)	0.019	0.002
247	20.58	0.10	0.022	(0.061)	0.019	0.002
248	20.67	0.10	0.022	(0.061)	0.019	0.002
249	20.75	0.10	0.022	(0.061)	0.019	0.002
250	20.83	0.07	0.014	(0.060)	0.013	0.001
251	20.92	0.07	0.014	(0.060)	0.013	0.001
252	21.00	0.07	0.014	(0.060)	0.013	0.001
253	21.08	0.10	0.022	(0.060)	0.019	0.002
254	21.17	0.10	0.022	(0.059)	0.019	0.002
255	21.25	0.10	0.022	(0.059)	0.019	0.002
256	21.33	0.07	0.014	(0.059)	0.013	0.001
257	21.42	0.07	0.014	(0.059)	0.013	0.001
258	21.50	0.07	0.014	(0.059)	0.013	0.001
259	21.58	0.10	0.022	(0.058)	0.019	0.002
260	21.67	0.10	0.022	(0.058)	0.019	0.002
261	21.75	0.10	0.022	(0.058)	0.019	0.002
262	21.83	0.07	0.014	(0.058)	0.013	0.001
263	21.92	0.07	0.014	(0.057)	0.013	0.001
264	22.00	0.07	0.014	(0.057)	0.013	0.001
265	22.08	0.10	0.022	(0.057)	0.019	0.002
266	22.17	0.10	0.022	(0.057)	0.019	0.002
267	22.25	0.10	0.022	(0.057)	0.019	0.002
268	22.33	0.07	0.014	(0.057)	0.013	0.001
269	22.42	0.07	0.014	(0.056)	0.013	0.001
270	22.50	0.07	0.014	(0.056)	0.013	0.001
271	22.58	0.07	0.014	(0.056)	0.013	0.001
272	22.67	0.07	0.014	(0.056)	0.013	0.001
273	22.75	0.07	0.014	(0.056)	0.013	0.001
274	22.83	0.07	0.014	(0.056)	0.013	0.001
275	22.92	0.07	0.014	(0.055)	0.013	0.001
276	23.00	0.07	0.014	(0.055)	0.013	0.001
277	23.08	0.07	0.014	(0.055)	0.013	0.001
278	23.17	0.07	0.014	(0.055)	0.013	0.001
279	23.25	0.07	0.014	(0.055)	0.013	0.001
280	23.33	0.07	0.014	(0.055)	0.013	0.001
281	23.42	0.07	0.014	(0.055)	0.013	0.001
282	23.50	0.07	0.014	(0.055)	0.013	0.001
283	23.58	0.07	0.014	(0.055)	0.013	0.001
284	23.67	0.07	0.014	(0.054)	0.013	0.001
285	23.75	0.07	0.014	(0.054)	0.013	0.001
286	23.83	0.07	0.014	(0.054)	0.013	0.001
287	23.92	0.07	0.014	(0.054)	0.013	0.001
288	24.00	0.07	0.014	(0.054)	0.013	0.001

(Loss Rate Not Used)

Sum = 100.0 Sum = 6.3

Flood volume = Effective rainfall 0.52(In)

times area 5.8(Ac.)/[(In)/(Ft.)] = 0.3(Ac.Ft)

Total soil loss = 1.28(In)

Total soil loss = 0.612(Ac.Ft)

Total rainfall = 1.80(In)

Flood volume = 10960.3 Cubic Feet

Total soil loss = 26675.1 Cubic Feet

Peak flow rate of this hydrograph = 0.876(CFS)

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24 - H O U R S T O R M

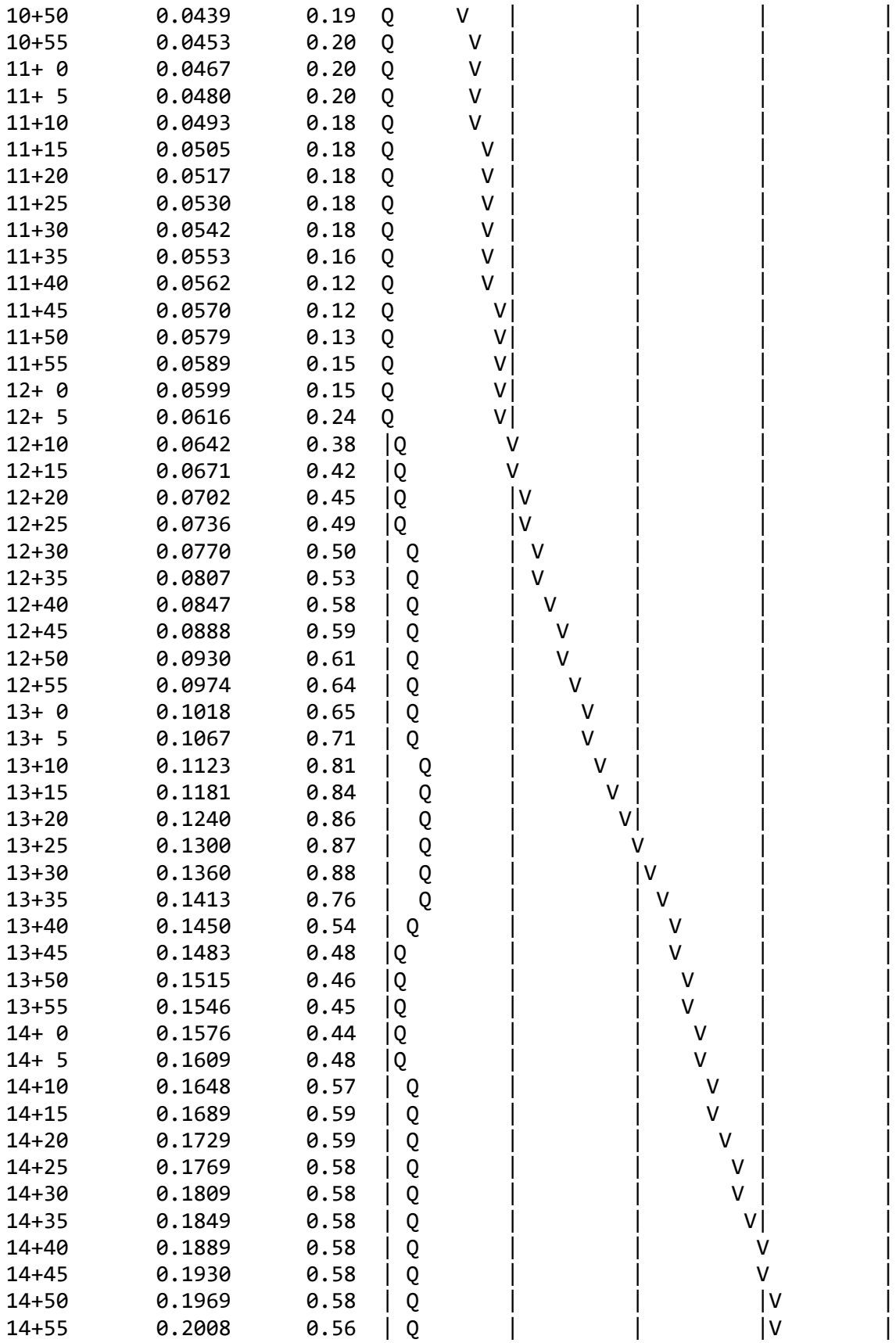
R u n o f f H y d r o g r a p h

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	0.0002	0.01	Q				
0+30	0.0003	0.01	Q				
0+35	0.0004	0.01	Q				
0+40	0.0005	0.01	Q				
0+45	0.0006	0.01	Q				
0+50	0.0007	0.01	Q				
0+55	0.0008	0.02	Q				
1+ 0	0.0009	0.02	Q				
1+ 5	0.0010	0.02	Q				
1+10	0.0011	0.01	Q				
1+15	0.0012	0.01	Q				
1+20	0.0013	0.01	Q				
1+25	0.0014	0.01	Q				
1+30	0.0015	0.01	Q				
1+35	0.0015	0.01	Q				
1+40	0.0016	0.01	Q				
1+45	0.0017	0.01	Q				
1+50	0.0018	0.01	Q				
1+55	0.0019	0.02	Q				
2+ 0	0.0020	0.02	Q				
2+ 5	0.0021	0.02	Q				
2+10	0.0023	0.02	Q				
2+15	0.0024	0.02	Q				
2+20	0.0025	0.02	Q				
2+25	0.0026	0.02	Q				

2+30	0.0027	0.02	Q				
2+35	0.0028	0.02	Q				
2+40	0.0030	0.02	Q				
2+45	0.0031	0.02	Q				
2+50	0.0033	0.02	Q				
2+55	0.0034	0.02	Q				
3+ 0	0.0035	0.02	Q				
3+ 5	0.0037	0.02	Q				
3+10	0.0038	0.02	Q				
3+15	0.0040	0.02	Q				
3+20	0.0041	0.02	Q				
3+25	0.0043	0.02	Q				
3+30	0.0044	0.02	Q				
3+35	0.0045	0.02	Q				
3+40	0.0047	0.02	Q				
3+45	0.0048	0.02	Q				
3+50	0.0050	0.02	Q				
3+55	0.0052	0.02	Q				
4+ 0	0.0053	0.02	Q				
4+ 5	0.0055	0.02	Q				
4+10	0.0057	0.02	Q				
4+15	0.0058	0.03	Q				
4+20	0.0060	0.03	Q				
4+25	0.0062	0.03	Q				
4+30	0.0064	0.03	QV				
4+35	0.0066	0.03	QV				
4+40	0.0068	0.03	QV				
4+45	0.0070	0.03	QV				
4+50	0.0072	0.03	QV				
4+55	0.0074	0.03	QV				
5+ 0	0.0077	0.03	QV				
5+ 5	0.0079	0.03	QV				
5+10	0.0081	0.03	QV				
5+15	0.0083	0.03	QV				
5+20	0.0084	0.03	QV				
5+25	0.0086	0.03	QV				
5+30	0.0088	0.03	QV				
5+35	0.0090	0.03	QV				
5+40	0.0093	0.03	QV				
5+45	0.0095	0.03	QV				
5+50	0.0097	0.03	QV				
5+55	0.0099	0.03	QV				
6+ 0	0.0102	0.03	QV				
6+ 5	0.0104	0.03	QV				
6+10	0.0107	0.04	QV				
6+15	0.0109	0.04	QV				
6+20	0.0112	0.04	QV				
6+25	0.0114	0.04	QV				
6+30	0.0117	0.04	QV				
6+35	0.0120	0.04	QV				

6+40	0.0122	0.04	QV	|	|	|	|
6+45	0.0125	0.04	QV	|	|	|	|
6+50	0.0128	0.04	Q V	|	|	|	|
6+55	0.0131	0.04	Q V	|	|	|	|
7+ 0	0.0134	0.04	Q V	|	|	|	|
7+ 5	0.0137	0.04	Q V	|	|	|	|
7+10	0.0140	0.04	Q V	|	|	|	|
7+15	0.0143	0.04	Q V	|	|	|	|
7+20	0.0145	0.04	Q V	|	|	|	|
7+25	0.0149	0.04	Q V	|	|	|	|
7+30	0.0152	0.05	Q V	|	|	|	|
7+35	0.0155	0.05	Q V	|	|	|	|
7+40	0.0158	0.05	Q V	|	|	|	|
7+45	0.0162	0.05	Q V	|	|	|	|
7+50	0.0165	0.05	Q V	|	|	|	|
7+55	0.0169	0.05	Q V	|	|	|	|
8+ 0	0.0173	0.05	Q V	|	|	|	|
8+ 5	0.0176	0.06	Q V	|	|	|	|
8+10	0.0181	0.06	Q V	|	|	|	|
8+15	0.0185	0.06	Q V	|	|	|	|
8+20	0.0189	0.06	Q V	|	|	|	|
8+25	0.0193	0.06	Q V	|	|	|	|
8+30	0.0198	0.06	Q V	|	|	|	|
8+35	0.0202	0.06	Q V	|	|	|	|
8+40	0.0207	0.07	Q V	|	|	|	|
8+45	0.0211	0.07	Q V	|	|	|	|
8+50	0.0216	0.07	Q V	|	|	|	|
8+55	0.0221	0.07	Q V	|	|	|	|
9+ 0	0.0226	0.07	Q V	|	|	|	|
9+ 5	0.0231	0.08	Q V	|	|	|	|
9+10	0.0237	0.09	Q V	|	|	|	|
9+15	0.0243	0.09	Q V	|	|	|	|
9+20	0.0251	0.11	Q V	|	|	|	|
9+25	0.0260	0.13	Q V	|	|	|	|
9+30	0.0270	0.14	Q V	|	|	|	|
9+35	0.0281	0.16	Q V	|	|	|	|
9+40	0.0293	0.18	Q V	|	|	|	|
9+45	0.0307	0.19	Q V	|	|	|	|
9+50	0.0321	0.21	Q V	|	|	|	|
9+55	0.0337	0.24	Q V	|	|	|	|
10+ 0	0.0354	0.24	Q V	|	|	|	|
10+ 5	0.0368	0.20	Q V	|	|	|	|
10+10	0.0376	0.11	Q V	|	|	|	|
10+15	0.0381	0.09	Q V	|	|	|	|
10+20	0.0387	0.07	Q V	|	|	|	|
10+25	0.0391	0.07	Q V	|	|	|	|
10+30	0.0396	0.07	Q V	|	|	|	|
10+35	0.0402	0.10	Q V	|	|	|	|
10+40	0.0414	0.16	Q V	|	|	|	|
10+45	0.0426	0.18	Q V	|	|	|	|



```
15+ 0       0.2046      0.56  | Q       |         |         | V       |
15+ 5       0.2083      0.54  | Q       |         |         |  V      |
15+10       0.2120      0.53  | Q       |         |         |  V      |
15+15       0.2155      0.52  | Q       |         |         |   V     |
15+20       0.2191      0.51  | Q       |         |         |   V     |
15+25       0.2224      0.49  |Q        |         |         |    V    |
15+30       0.2258      0.49  |Q        |         |         |    V    |
15+35       0.2288      0.44  |Q        |         |         |     V   |
15+40       0.2313      0.36  |Q        |         |         |     V   |
15+45       0.2337      0.34  |Q        |         |         |      V  |
15+50       0.2360      0.33  |Q        |         |         |      V  |
15+55       0.2383      0.33  |Q        |         |         |      V  |
16+ 0       0.2406      0.33  |Q        |         |         |       V |
16+ 5       0.2423      0.25  Q         |         |         |       V |
16+10       0.2429      0.10  Q         |         |         |       V |
16+15       0.2433      0.05  Q         |         |         |       V |
16+20       0.2435      0.04  Q         |         |         |       V |
16+25       0.2437      0.03  Q         |         |         |       V |
16+30       0.2439      0.02  Q         |         |         |       V |
16+35       0.2440      0.02  Q         |         |         |       V |
16+40       0.2441      0.01  Q         |         |         |       V |
16+45       0.2442      0.01  Q         |         |         |       V |
16+50       0.2443      0.01  Q         |         |         |       V |
16+55       0.2443      0.01  Q         |         |         |       V |
17+ 0       0.2444      0.01  Q         |         |         |       V |
17+ 5       0.2445      0.01  Q         |         |         |       V |
17+10       0.2447      0.02  Q         |         |         |       V |
17+15       0.2448      0.02  Q         |         |         |       V |
17+20       0.2449      0.02  Q         |         |         |       V |
17+25       0.2451      0.02  Q         |         |         |       V |
17+30       0.2452      0.02  Q         |         |         |       V |
17+35       0.2454      0.02  Q         |         |         |        V|
17+40       0.2455      0.02  Q         |         |         |        V|
17+45       0.2457      0.02  Q         |         |         |        V|
17+50       0.2458      0.02  Q         |         |         |        V|
17+55       0.2459      0.02  Q         |         |         |        V|
18+ 0       0.2460      0.02  Q         |         |         |        V|
18+ 5       0.2461      0.02  Q         |         |         |        V|
18+10       0.2463      0.02  Q         |         |         |        V|
18+15       0.2464      0.02  Q         |         |         |        V|
18+20       0.2465      0.02  Q         |         |         |        V|
18+25       0.2466      0.02  Q         |         |         |        V|
18+30       0.2467      0.02  Q         |         |         |        V|
18+35       0.2468      0.02  Q         |         |         |        V|
18+40       0.2469      0.01  Q         |         |         |        V|
18+45       0.2470      0.01  Q         |         |         |        V|
18+50       0.2471      0.01  Q         |         |         |        V|
18+55       0.2472      0.01  Q         |         |         |        V|
19+ 0       0.2472      0.01  Q         |         |         |        V|
19+ 5       0.2473      0.01  Q         |         |         |        V|
```

19+10	0.2474	0.01	Q	|	|	|	V|
19+15	0.2475	0.01	Q	|	|	|	V|
19+20	0.2475	0.01	Q	|	|	|	V|
19+25	0.2477	0.02	Q	|	|	|	V|
19+30	0.2478	0.02	Q	|	|	|	V|
19+35	0.2479	0.02	Q	|	|	|	V|
19+40	0.2480	0.01	Q	|	|	|	V|
19+45	0.2481	0.01	Q	|	|	|	V|
19+50	0.2481	0.01	Q	|	|	|	V|
19+55	0.2482	0.01	Q	|	|	|	V|
20+ 0	0.2483	0.01	Q	|	|	|	V|
20+ 5	0.2483	0.01	Q	|	|	|	V|
20+10	0.2484	0.01	Q	|	|	|	V|
20+15	0.2485	0.01	Q	|	|	|	V|
20+20	0.2486	0.01	Q	|	|	|	V|
20+25	0.2487	0.01	Q	|	|	|	V|
20+30	0.2487	0.01	Q	|	|	|	V|
20+35	0.2488	0.01	Q	|	|	|	V|
20+40	0.2489	0.01	Q	|	|	|	V|
20+45	0.2490	0.01	Q	|	|	|	V|
20+50	0.2491	0.01	Q	|	|	|	V|
20+55	0.2491	0.01	Q	|	|	|	V|
21+ 0	0.2492	0.01	Q	|	|	|	V|
21+ 5	0.2493	0.01	Q	|	|	|	V|
21+10	0.2494	0.01	Q	|	|	|	V|
21+15	0.2494	0.01	Q	|	|	|	V|
21+20	0.2495	0.01	Q	|	|	|	V|
21+25	0.2496	0.01	Q	|	|	|	V|
21+30	0.2496	0.01	Q	|	|	|	V|
21+35	0.2497	0.01	Q	|	|	|	V|
21+40	0.2498	0.01	Q	|	|	|	V|
21+45	0.2499	0.01	Q	|	|	|	V|
21+50	0.2499	0.01	Q	|	|	|	V|
21+55	0.2500	0.01	Q	|	|	|	V|
22+ 0	0.2501	0.01	Q	|	|	|	V|
22+ 5	0.2501	0.01	Q	|	|	|	V|
22+10	0.2502	0.01	Q	|	|	|	V|
22+15	0.2503	0.01	Q	|	|	|	V|
22+20	0.2504	0.01	Q	|	|	|	V|
22+25	0.2504	0.01	Q	|	|	|	V|
22+30	0.2505	0.01	Q	|	|	|	V|
22+35	0.2506	0.01	Q	|	|	|	V|
22+40	0.2506	0.01	Q	|	|	|	V|
22+45	0.2507	0.01	Q	|	|	|	V|
22+50	0.2507	0.01	Q	|	|	|	V|
22+55	0.2508	0.01	Q	|	|	|	V|
23+ 0	0.2509	0.01	Q	|	|	|	V|
23+ 5	0.2509	0.01	Q	|	|	|	V|
23+10	0.2510	0.01	Q	|	|	|	V|
23+15	0.2510	0.01	Q	|	|	|	V|

23+20	0.2511	0.01	Q	|	|	|	V|
23+25	0.2511	0.01	Q	|	|	|	V|
23+30	0.2512	0.01	Q	|	|	|	V|
23+35	0.2513	0.01	Q	|	|	|	V|
23+40	0.2513	0.01	Q	|	|	|	V|
23+45	0.2514	0.01	Q	|	|	|	V|
23+50	0.2514	0.01	Q	|	|	|	V|
23+55	0.2515	0.01	Q	|	|	|	V|
24+ 0	0.2515	0.01	Q	|	|	|	V|
24+ 5	0.2516	0.01	Q	|	|	|	V|
24+10	0.2516	0.00	Q	|	|	|	V|
24+15	0.2516	0.00	Q	|	|	|	V|
24+20	0.2516	0.00	Q	|	|	|	V|
24+25	0.2516	0.00	Q	|	|	|	V|
24+30	0.2516	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

Study date 01/24/23 File: NTSHemetUHPr2242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6385

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

National Tube Supply - Hemet
Proposed Condition 2-Year, 24-Hour UH (Area 1)
N Zamarripa 01-24-2023

Drainage Area = 3.13(Ac.) = 0.005 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.13(Ac.) = 0.005 Sq. Mi.
Length along longest watercourse = 586.00(Ft.)
Length along longest watercourse measured to centroid = 404.00(Ft.)
Length along longest watercourse = 0.111 Mi.
Length along longest watercourse measured to centroid = 0.077 Mi.
Difference in elevation = 2.86(Ft.)
Slope along watercourse = 25.7693 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.032 Hr.
Lag time = 1.90 Min.
25% of lag time = 0.48 Min.
40% of lag time = 0.76 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]
        3.13            1.80                  5.63

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
        3.13            4.50                 14.08

STORM EVENT (YEAR) =    2.00
Area Averaged 2-Year Rainfall =    1.800(In)
Area Averaged 100-Year Rainfall =    4.500(In)

Point rain (area averaged) =    1.800(In)
Areal adjustment factor =  100.00 %
Adjusted average point rain =    1.800(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
     0.170           98.00         0.950
     2.960           98.00         0.950
 Total Area Entered =      3.13(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
98.0  98.0      0.026     0.950        0.004       0.054      0.000
98.0  98.0      0.026     0.950        0.004       0.946      0.004
                                                 Sum (F) =   0.004
Area averaged mean soil loss (F) (In/Hr) =  0.004
Minimum soil loss rate ((In/Hr)) =  0.002
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.100
------------------------------------------------------------------------

               U n i t  H y d r o g r a p h
                       VALLEY S-Curve
-------------------------------------------------------------------
               Unit Hydrograph Data
-------------------------------------------------------------------
Unit time period   Time % of lag   Distribution   Unit Hydrograph
    (hrs)                          Graph %            (CFS)
-------------------------------------------------------------------
    1   0.083        262.786         52.510              1.656
    2   0.167        525.571         39.275              1.239
    3   0.250        788.357          6.621              0.209
    4   0.333       1051.142          1.595              0.050
                              Sum = 100.000   Sum=       3.154
-------------------------------------------------------------------
```

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	0.014	(0.007)	0.001	0.013
2	0.17	0.07	0.014	(0.007)	0.001	0.013
3	0.25	0.07	0.014	(0.007)	0.001	0.013
4	0.33	0.10	0.022	(0.007)	0.002	0.019
5	0.42	0.10	0.022	(0.007)	0.002	0.019
6	0.50	0.10	0.022	(0.007)	0.002	0.019
7	0.58	0.10	0.022	(0.007)	0.002	0.019
8	0.67	0.10	0.022	(0.007)	0.002	0.019
9	0.75	0.10	0.022	(0.006)	0.002	0.019
10	0.83	0.13	0.029	(0.006)	0.003	0.026
11	0.92	0.13	0.029	(0.006)	0.003	0.026
12	1.00	0.13	0.029	(0.006)	0.003	0.026
13	1.08	0.10	0.022	(0.006)	0.002	0.019
14	1.17	0.10	0.022	(0.006)	0.002	0.019
15	1.25	0.10	0.022	(0.006)	0.002	0.019
16	1.33	0.10	0.022	(0.006)	0.002	0.019
17	1.42	0.10	0.022	(0.006)	0.002	0.019
18	1.50	0.10	0.022	(0.006)	0.002	0.019
19	1.58	0.10	0.022	(0.006)	0.002	0.019
20	1.67	0.10	0.022	(0.006)	0.002	0.019
21	1.75	0.10	0.022	(0.006)	0.002	0.019
22	1.83	0.13	0.029	(0.006)	0.003	0.026
23	1.92	0.13	0.029	(0.006)	0.003	0.026
24	2.00	0.13	0.029	(0.006)	0.003	0.026
25	2.08	0.13	0.029	(0.006)	0.003	0.026
26	2.17	0.13	0.029	(0.006)	0.003	0.026
27	2.25	0.13	0.029	(0.006)	0.003	0.026
28	2.33	0.13	0.029	(0.006)	0.003	0.026
29	2.42	0.13	0.029	(0.006)	0.003	0.026
30	2.50	0.13	0.029	(0.006)	0.003	0.026
31	2.58	0.17	0.036	(0.006)	0.004	0.032
32	2.67	0.17	0.036	(0.006)	0.004	0.032
33	2.75	0.17	0.036	(0.006)	0.004	0.032
34	2.83	0.17	0.036	(0.006)	0.004	0.032
35	2.92	0.17	0.036	(0.006)	0.004	0.032
36	3.00	0.17	0.036	(0.006)	0.004	0.032
37	3.08	0.17	0.036	(0.006)	0.004	0.032
38	3.17	0.17	0.036	(0.006)	0.004	0.032
39	3.25	0.17	0.036	(0.006)	0.004	0.032
40	3.33	0.17	0.036	(0.006)	0.004	0.032
41	3.42	0.17	0.036	(0.006)	0.004	0.032
42	3.50	0.17	0.036	(0.006)	0.004	0.032
43	3.58	0.17	0.036	(0.006)	0.004	0.032

44	3.67	0.17	0.036	(0.006)	0.004	0.032
45	3.75	0.17	0.036	(0.006)	0.004	0.032
46	3.83	0.20	0.043	(0.006)	0.004	0.039
47	3.92	0.20	0.043	(0.006)	0.004	0.039
48	4.00	0.20	0.043	(0.006)	0.004	0.039
49	4.08	0.20	0.043	(0.006)	0.004	0.039
50	4.17	0.20	0.043	(0.005)	0.004	0.039
51	4.25	0.20	0.043	(0.005)	0.004	0.039
52	4.33	0.23	0.050	(0.005)	0.005	0.045
53	4.42	0.23	0.050	(0.005)	0.005	0.045
54	4.50	0.23	0.050	(0.005)	0.005	0.045
55	4.58	0.23	0.050	(0.005)	0.005	0.045
56	4.67	0.23	0.050	(0.005)	0.005	0.045
57	4.75	0.23	0.050	(0.005)	0.005	0.045
58	4.83	0.27	0.058	0.005	(0.006)	0.052
59	4.92	0.27	0.058	0.005	(0.006)	0.052
60	5.00	0.27	0.058	0.005	(0.006)	0.052
61	5.08	0.20	0.043	(0.005)	0.004	0.039
62	5.17	0.20	0.043	(0.005)	0.004	0.039
63	5.25	0.20	0.043	(0.005)	0.004	0.039
64	5.33	0.23	0.050	(0.005)	0.005	0.045
65	5.42	0.23	0.050	(0.005)	0.005	0.045
66	5.50	0.23	0.050	(0.005)	0.005	0.045
67	5.58	0.27	0.058	0.005	(0.006)	0.053
68	5.67	0.27	0.058	0.005	(0.006)	0.053
69	5.75	0.27	0.058	0.005	(0.006)	0.053
70	5.83	0.27	0.058	0.005	(0.006)	0.053
71	5.92	0.27	0.058	0.005	(0.006)	0.053
72	6.00	0.27	0.058	0.005	(0.006)	0.053
73	6.08	0.30	0.065	0.005	(0.006)	0.060
74	6.17	0.30	0.065	0.005	(0.006)	0.060
75	6.25	0.30	0.065	0.005	(0.006)	0.060
76	6.33	0.30	0.065	0.005	(0.006)	0.060
77	6.42	0.30	0.065	0.005	(0.006)	0.060
78	6.50	0.30	0.065	0.005	(0.006)	0.060
79	6.58	0.33	0.072	0.005	(0.007)	0.067
80	6.67	0.33	0.072	0.005	(0.007)	0.067
81	6.75	0.33	0.072	0.005	(0.007)	0.067
82	6.83	0.33	0.072	0.005	(0.007)	0.067
83	6.92	0.33	0.072	0.005	(0.007)	0.067
84	7.00	0.33	0.072	0.005	(0.007)	0.067
85	7.08	0.33	0.072	0.005	(0.007)	0.067
86	7.17	0.33	0.072	0.005	(0.007)	0.067
87	7.25	0.33	0.072	0.005	(0.007)	0.067
88	7.33	0.37	0.079	0.005	(0.008)	0.075
89	7.42	0.37	0.079	0.005	(0.008)	0.075
90	7.50	0.37	0.079	0.005	(0.008)	0.075
91	7.58	0.40	0.086	0.005	(0.009)	0.082
92	7.67	0.40	0.086	0.005	(0.009)	0.082
93	7.75	0.40	0.086	0.005	(0.009)	0.082

94	7.83	0.43	0.094	0.005	(	0.009)	0.089
95	7.92	0.43	0.094	0.004	(	0.009)	0.089
96	8.00	0.43	0.094	0.004	(	0.009)	0.089
97	8.08	0.50	0.108	0.004	(	0.011)	0.104
98	8.17	0.50	0.108	0.004	(	0.011)	0.104
99	8.25	0.50	0.108	0.004	(	0.011)	0.104
100	8.33	0.50	0.108	0.004	(	0.011)	0.104
101	8.42	0.50	0.108	0.004	(	0.011)	0.104
102	8.50	0.50	0.108	0.004	(	0.011)	0.104
103	8.58	0.53	0.115	0.004	(	0.012)	0.111
104	8.67	0.53	0.115	0.004	(	0.012)	0.111
105	8.75	0.53	0.115	0.004	(	0.012)	0.111
106	8.83	0.57	0.122	0.004	(	0.012)	0.118
107	8.92	0.57	0.122	0.004	(	0.012)	0.118
108	9.00	0.57	0.122	0.004	(	0.012)	0.118
109	9.08	0.63	0.137	0.004	(	0.014)	0.133
110	9.17	0.63	0.137	0.004	(	0.014)	0.133
111	9.25	0.63	0.137	0.004	(	0.014)	0.133
112	9.33	0.67	0.144	0.004	(	0.014)	0.140
113	9.42	0.67	0.144	0.004	(	0.014)	0.140
114	9.50	0.67	0.144	0.004	(	0.014)	0.140
115	9.58	0.70	0.151	0.004	(	0.015)	0.147
116	9.67	0.70	0.151	0.004	(	0.015)	0.147
117	9.75	0.70	0.151	0.004	(	0.015)	0.147
118	9.83	0.73	0.158	0.004	(	0.016)	0.154
119	9.92	0.73	0.158	0.004	(	0.016)	0.154
120	10.00	0.73	0.158	0.004	(	0.016)	0.154
121	10.08	0.50	0.108	0.004	(	0.011)	0.104
122	10.17	0.50	0.108	0.004	(	0.011)	0.104
123	10.25	0.50	0.108	0.004	(	0.011)	0.104
124	10.33	0.50	0.108	0.004	(	0.011)	0.104
125	10.42	0.50	0.108	0.004	(	0.011)	0.104
126	10.50	0.50	0.108	0.004	(	0.011)	0.104
127	10.58	0.67	0.144	0.004	(	0.014)	0.140
128	10.67	0.67	0.144	0.004	(	0.014)	0.140
129	10.75	0.67	0.144	0.004	(	0.014)	0.140
130	10.83	0.67	0.144	0.004	(	0.014)	0.140
131	10.92	0.67	0.144	0.004	(	0.014)	0.140
132	11.00	0.67	0.144	0.004	(	0.014)	0.140
133	11.08	0.63	0.137	0.004	(	0.014)	0.133
134	11.17	0.63	0.137	0.004	(	0.014)	0.133
135	11.25	0.63	0.137	0.004	(	0.014)	0.133
136	11.33	0.63	0.137	0.004	(	0.014)	0.133
137	11.42	0.63	0.137	0.004	(	0.014)	0.133
138	11.50	0.63	0.137	0.004	(	0.014)	0.133
139	11.58	0.57	0.122	0.004	(	0.012)	0.119
140	11.67	0.57	0.122	0.004	(	0.012)	0.119
141	11.75	0.57	0.122	0.004	(	0.012)	0.119
142	11.83	0.60	0.130	0.004	(	0.013)	0.126
143	11.92	0.60	0.130	0.004	(	0.013)	0.126

144	12.00	0.60	0.130	0.004	(	0.013)	0.126
145	12.08	0.83	0.180	0.004	(	0.018)	0.176
146	12.17	0.83	0.180	0.004	(	0.018)	0.176
147	12.25	0.83	0.180	0.003	(	0.018)	0.177
148	12.33	0.87	0.187	0.003	(	0.019)	0.184
149	12.42	0.87	0.187	0.003	(	0.019)	0.184
150	12.50	0.87	0.187	0.003	(	0.019)	0.184
151	12.58	0.93	0.202	0.003	(	0.020)	0.198
152	12.67	0.93	0.202	0.003	(	0.020)	0.198
153	12.75	0.93	0.202	0.003	(	0.020)	0.198
154	12.83	0.97	0.209	0.003	(	0.021)	0.205
155	12.92	0.97	0.209	0.003	(	0.021)	0.205
156	13.00	0.97	0.209	0.003	(	0.021)	0.205
157	13.08	1.13	0.245	0.003	(	0.024)	0.241
158	13.17	1.13	0.245	0.003	(	0.024)	0.242
159	13.25	1.13	0.245	0.003	(	0.024)	0.242
160	13.33	1.13	0.245	0.003	(	0.024)	0.242
161	13.42	1.13	0.245	0.003	(	0.024)	0.242
162	13.50	1.13	0.245	0.003	(	0.024)	0.242
163	13.58	0.77	0.166	0.003	(	0.017)	0.162
164	13.67	0.77	0.166	0.003	(	0.017)	0.162
165	13.75	0.77	0.166	0.003	(	0.017)	0.162
166	13.83	0.77	0.166	0.003	(	0.017)	0.162
167	13.92	0.77	0.166	0.003	(	0.017)	0.162
168	14.00	0.77	0.166	0.003	(	0.017)	0.162
169	14.08	0.90	0.194	0.003	(	0.019)	0.191
170	14.17	0.90	0.194	0.003	(	0.019)	0.191
171	14.25	0.90	0.194	0.003	(	0.019)	0.191
172	14.33	0.87	0.187	0.003	(	0.019)	0.184
173	14.42	0.87	0.187	0.003	(	0.019)	0.184
174	14.50	0.87	0.187	0.003	(	0.019)	0.184
175	14.58	0.87	0.187	0.003	(	0.019)	0.184
176	14.67	0.87	0.187	0.003	(	0.019)	0.184
177	14.75	0.87	0.187	0.003	(	0.019)	0.184
178	14.83	0.83	0.180	0.003	(	0.018)	0.177
179	14.92	0.83	0.180	0.003	(	0.018)	0.177
180	15.00	0.83	0.180	0.003	(	0.018)	0.177
181	15.08	0.80	0.173	0.003	(	0.017)	0.170
182	15.17	0.80	0.173	0.003	(	0.017)	0.170
183	15.25	0.80	0.173	0.003	(	0.017)	0.170
184	15.33	0.77	0.166	0.003	(	0.017)	0.163
185	15.42	0.77	0.166	0.003	(	0.017)	0.163
186	15.50	0.77	0.166	0.003	(	0.017)	0.163
187	15.58	0.63	0.137	0.003	(	0.014)	0.134
188	15.67	0.63	0.137	0.003	(	0.014)	0.134
189	15.75	0.63	0.137	0.003	(	0.014)	0.134
190	15.83	0.63	0.137	0.003	(	0.014)	0.134
191	15.92	0.63	0.137	0.003	(	0.014)	0.134
192	16.00	0.63	0.137	0.003	(	0.014)	0.134
193	16.08	0.13	0.029	0.003	(	0.003)	0.026

194	16.17	0.13	0.029	0.003	(0.003)	0.026
195	16.25	0.13	0.029	0.003	(0.003)	0.026
196	16.33	0.13	0.029	0.003	(0.003)	0.026
197	16.42	0.13	0.029	0.003	(0.003)	0.026
198	16.50	0.13	0.029	0.003	(0.003)	0.026
199	16.58	0.10	0.022	(0.003)	0.002	0.019
200	16.67	0.10	0.022	(0.003)	0.002	0.019
201	16.75	0.10	0.022	(0.003)	0.002	0.019
202	16.83	0.10	0.022	(0.003)	0.002	0.019
203	16.92	0.10	0.022	(0.003)	0.002	0.019
204	17.00	0.10	0.022	(0.003)	0.002	0.019
205	17.08	0.17	0.036	0.003	(0.004)	0.033
206	17.17	0.17	0.036	0.003	(0.004)	0.033
207	17.25	0.17	0.036	0.003	(0.004)	0.033
208	17.33	0.17	0.036	0.003	(0.004)	0.033
209	17.42	0.17	0.036	0.003	(0.004)	0.033
210	17.50	0.17	0.036	0.003	(0.004)	0.033
211	17.58	0.17	0.036	0.003	(0.004)	0.033
212	17.67	0.17	0.036	0.003	(0.004)	0.033
213	17.75	0.17	0.036	0.002	(0.004)	0.034
214	17.83	0.13	0.029	0.002	(0.003)	0.026
215	17.92	0.13	0.029	0.002	(0.003)	0.026
216	18.00	0.13	0.029	0.002	(0.003)	0.026
217	18.08	0.13	0.029	0.002	(0.003)	0.026
218	18.17	0.13	0.029	0.002	(0.003)	0.026
219	18.25	0.13	0.029	0.002	(0.003)	0.026
220	18.33	0.13	0.029	0.002	(0.003)	0.026
221	18.42	0.13	0.029	0.002	(0.003)	0.026
222	18.50	0.13	0.029	0.002	(0.003)	0.026
223	18.58	0.10	0.022	(0.002)	0.002	0.019
224	18.67	0.10	0.022	(0.002)	0.002	0.019
225	18.75	0.10	0.022	(0.002)	0.002	0.019
226	18.83	0.07	0.014	(0.002)	0.001	0.013
227	18.92	0.07	0.014	(0.002)	0.001	0.013
228	19.00	0.07	0.014	(0.002)	0.001	0.013
229	19.08	0.10	0.022	(0.002)	0.002	0.019
230	19.17	0.10	0.022	(0.002)	0.002	0.019
231	19.25	0.10	0.022	(0.002)	0.002	0.019
232	19.33	0.13	0.029	0.002	(0.003)	0.027
233	19.42	0.13	0.029	0.002	(0.003)	0.027
234	19.50	0.13	0.029	0.002	(0.003)	0.027
235	19.58	0.10	0.022	(0.002)	0.002	0.019
236	19.67	0.10	0.022	(0.002)	0.002	0.019
237	19.75	0.10	0.022	(0.002)	0.002	0.019
238	19.83	0.07	0.014	(0.002)	0.001	0.013
239	19.92	0.07	0.014	(0.002)	0.001	0.013
240	20.00	0.07	0.014	(0.002)	0.001	0.013
241	20.08	0.10	0.022	(0.002)	0.002	0.019
242	20.17	0.10	0.022	(0.002)	0.002	0.019
243	20.25	0.10	0.022	(0.002)	0.002	0.019

244	20.33	0.10	0.022	0.002	(0.002)		0.019
245	20.42	0.10	0.022	0.002	(0.002)		0.019
246	20.50	0.10	0.022	0.002	(0.002)		0.019
247	20.58	0.10	0.022	0.002	(0.002)		0.019
248	20.67	0.10	0.022	0.002	(0.002)		0.019
249	20.75	0.10	0.022	0.002	(0.002)		0.019
250	20.83	0.07	0.014	(0.002)		0.001	0.013
251	20.92	0.07	0.014	(0.002)		0.001	0.013
252	21.00	0.07	0.014	(0.002)		0.001	0.013
253	21.08	0.10	0.022	0.002	(0.002)		0.020
254	21.17	0.10	0.022	0.002	(0.002)		0.020
255	21.25	0.10	0.022	0.002	(0.002)		0.020
256	21.33	0.07	0.014	(0.002)		0.001	0.013
257	21.42	0.07	0.014	(0.002)		0.001	0.013
258	21.50	0.07	0.014	(0.002)		0.001	0.013
259	21.58	0.10	0.022	0.002	(0.002)		0.020
260	21.67	0.10	0.022	0.002	(0.002)		0.020
261	21.75	0.10	0.022	0.002	(0.002)		0.020
262	21.83	0.07	0.014	(0.002)		0.001	0.013
263	21.92	0.07	0.014	(0.002)		0.001	0.013
264	22.00	0.07	0.014	(0.002)		0.001	0.013
265	22.08	0.10	0.022	0.002	(0.002)		0.020
266	22.17	0.10	0.022	0.002	(0.002)		0.020
267	22.25	0.10	0.022	0.002	(0.002)		0.020
268	22.33	0.07	0.014	(0.002)		0.001	0.013
269	22.42	0.07	0.014	(0.002)		0.001	0.013
270	22.50	0.07	0.014	(0.002)		0.001	0.013
271	22.58	0.07	0.014	(0.002)		0.001	0.013
272	22.67	0.07	0.014	(0.002)		0.001	0.013
273	22.75	0.07	0.014	(0.002)		0.001	0.013
274	22.83	0.07	0.014	(0.002)		0.001	0.013
275	22.92	0.07	0.014	(0.002)		0.001	0.013
276	23.00	0.07	0.014	(0.002)		0.001	0.013
277	23.08	0.07	0.014	(0.002)		0.001	0.013
278	23.17	0.07	0.014	(0.002)		0.001	0.013
279	23.25	0.07	0.014	(0.002)		0.001	0.013
280	23.33	0.07	0.014	(0.002)		0.001	0.013
281	23.42	0.07	0.014	(0.002)		0.001	0.013
282	23.50	0.07	0.014	(0.002)		0.001	0.013
283	23.58	0.07	0.014	(0.002)		0.001	0.013
284	23.67	0.07	0.014	(0.002)		0.001	0.013
285	23.75	0.07	0.014	(0.002)		0.001	0.013
286	23.83	0.07	0.014	(0.002)		0.001	0.013
287	23.92	0.07	0.014	(0.002)		0.001	0.013
288	24.00	0.07	0.014	(0.002)		0.001	0.013
		(Loss Rate Not Used)					
Sum =		100.0				Sum =	20.7

Flood volume = Effective rainfall 1.73(In)
times area 3.1(Ac.)/[(In)/(Ft.)] = 0.4(Ac.Ft)
Total soil loss = 0.07(In)

Total soil loss = 0.020(Ac.Ft)
Total rainfall = 1.80(In)
Flood volume = 19600.0 Cubic Feet
Total soil loss = 851.3 Cubic Feet

Peak flow rate of this hydrograph = 0.762(CFS)

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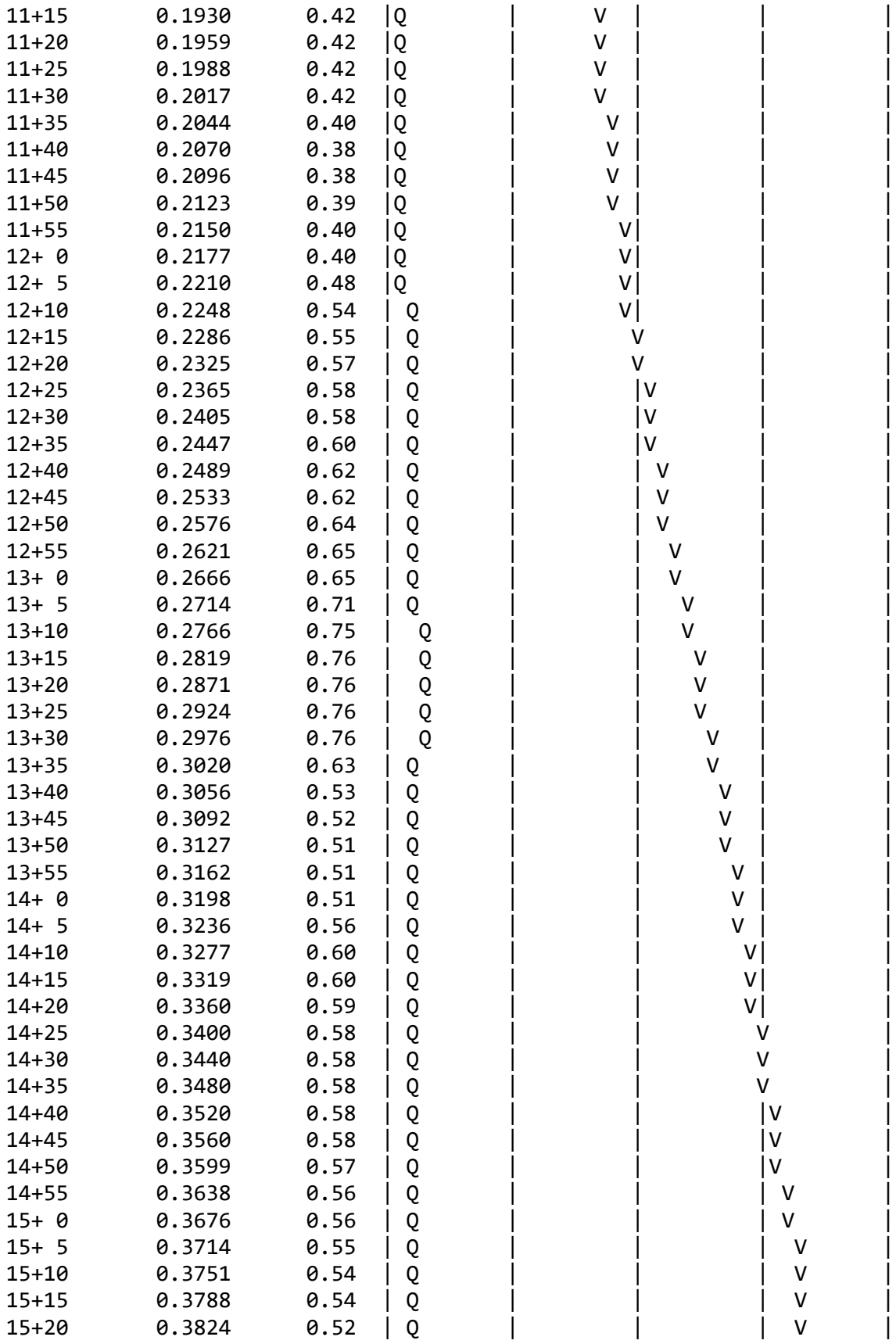
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

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	0.02	Q				
0+10	0.0004	0.04	Q				
0+15	0.0007	0.04	Q				
0+20	0.0010	0.05	Q				
0+25	0.0015	0.06	Q				
0+30	0.0019	0.06	Q				
0+35	0.0023	0.06	Q				
0+40	0.0027	0.06	Q				
0+45	0.0031	0.06	Q				
0+50	0.0036	0.07	Q				
0+55	0.0042	0.08	Q				
1+ 0	0.0047	0.08	Q				
1+ 5	0.0052	0.07	Q				
1+10	0.0057	0.06	Q				
1+15	0.0061	0.06	Q				
1+20	0.0065	0.06	Q				
1+25	0.0069	0.06	Q				
1+30	0.0074	0.06	Q				
1+35	0.0078	0.06	Q				
1+40	0.0082	0.06	Q				
1+45	0.0086	0.06	Q				
1+50	0.0091	0.07	Q				
1+55	0.0097	0.08	Q				
2+ 0	0.0102	0.08	Q				
2+ 5	0.0108	0.08	Q				
2+10	0.0114	0.08	QV				
2+15	0.0119	0.08	QV				
2+20	0.0125	0.08	QV				
2+25	0.0131	0.08	QV				
2+30	0.0136	0.08	QV				
2+35	0.0143	0.09	QV				
2+40	0.0150	0.10	QV				
2+45	0.0157	0.10	QV				
2+50	0.0164	0.10	QV				

2+55	0.0171	0.10	QV	|	|	|	|
3+ 0	0.0178	0.10	QV	|	|	|	|
3+ 5	0.0185	0.10	QV	|	|	|	|
3+10	0.0192	0.10	QV	|	|	|	|
3+15	0.0199	0.10	QV	|	|	|	|
3+20	0.0206	0.10	QV	|	|	|	|
3+25	0.0213	0.10	QV	|	|	|	|
3+30	0.0220	0.10	QV	|	|	|	|
3+35	0.0227	0.10	Q V	|	|	|	|
3+40	0.0234	0.10	Q V	|	|	|	|
3+45	0.0241	0.10	Q V	|	|	|	|
3+50	0.0249	0.11	Q V	|	|	|	|
3+55	0.0257	0.12	Q V	|	|	|	|
4+ 0	0.0266	0.12	Q V	|	|	|	|
4+ 5	0.0274	0.12	Q V	|	|	|	|
4+10	0.0282	0.12	Q V	|	|	|	|
4+15	0.0291	0.12	Q V	|	|	|	|
4+20	0.0300	0.13	Q V	|	|	|	|
4+25	0.0310	0.14	Q V	|	|	|	|
4+30	0.0320	0.14	Q V	|	|	|	|
4+35	0.0330	0.14	Q V	|	|	|	|
4+40	0.0339	0.14	Q V	|	|	|	|
4+45	0.0349	0.14	Q V	|	|	|	|
4+50	0.0360	0.15	Q V	|	|	|	|
4+55	0.0371	0.16	Q V	|	|	|	|
5+ 0	0.0383	0.16	Q V	|	|	|	|
5+ 5	0.0392	0.14	Q V	|	|	|	|
5+10	0.0401	0.13	Q V	|	|	|	|
5+15	0.0410	0.12	Q V	|	|	|	|
5+20	0.0419	0.13	Q V	|	|	|	|
5+25	0.0429	0.14	Q V	|	|	|	|
5+30	0.0438	0.14	Q V	|	|	|	|
5+35	0.0449	0.16	Q V	|	|	|	|
5+40	0.0460	0.16	Q V	|	|	|	|
5+45	0.0472	0.17	Q V	|	|	|	|
5+50	0.0483	0.17	Q V	|	|	|	|
5+55	0.0495	0.17	Q V	|	|	|	|
6+ 0	0.0506	0.17	Q V	|	|	|	|
6+ 5	0.0518	0.18	Q V	|	|	|	|
6+10	0.0531	0.19	Q V	|	|	|	|
6+15	0.0544	0.19	Q V	|	|	|	|
6+20	0.0557	0.19	Q V	|	|	|	|
6+25	0.0570	0.19	Q V	|	|	|	|
6+30	0.0583	0.19	Q V	|	|	|	|
6+35	0.0597	0.20	Q V	|	|	|	|
6+40	0.0612	0.21	Q V	|	|	|	|
6+45	0.0626	0.21	Q V	|	|	|	|
6+50	0.0641	0.21	Q V	|	|	|	|
6+55	0.0655	0.21	Q V	|	|	|	|
7+ 0	0.0670	0.21	Q V	|	|	|	|

```
 7+ 5       0.0685      0.21  Q     V   |          |          |          |
 7+10       0.0699      0.21  Q     V   |          |          |          |
 7+15       0.0714      0.21  Q     V   |          |          |          |
 7+20       0.0729      0.22  Q     V   |          |          |          |
 7+25       0.0745      0.23  Q     V   |          |          |          |
 7+30       0.0762      0.24  Q     V   |          |          |          |
 7+35       0.0779      0.25  Q     V   |          |          |          |
 7+40       0.0796      0.26  |Q     V  |          |          |          |
 7+45       0.0814      0.26  |Q     V  |          |          |          |
 7+50       0.0833      0.27  |Q     V  |          |          |          |
 7+55       0.0852      0.28  |Q     V  |          |          |          |
 8+ 0       0.0871      0.28  |Q     V  |          |          |          |
 8+ 5       0.0892      0.31  |Q     V  |          |          |          |
 8+10       0.0915      0.32  |Q      V |          |          |          |
 8+15       0.0937      0.33  |Q      V |          |          |          |
 8+20       0.0960      0.33  |Q      V |          |          |          |
 8+25       0.0982      0.33  |Q      V |          |          |          |
 8+30       0.1005      0.33  |Q      V |          |          |          |
 8+35       0.1028      0.34  |Q       V|          |          |          |
 8+40       0.1052      0.35  |Q       V|          |          |          |
 8+45       0.1076      0.35  |Q       V|          |          |          |
 8+50       0.1101      0.36  |Q       V|          |          |          |
 8+55       0.1126      0.37  |Q        V          |          |          |
 9+ 0       0.1152      0.37  |Q        V          |          |          |
 9+ 5       0.1179      0.40  |Q        V          |          |          |
 9+10       0.1208      0.41  |Q        V          |          |          |
 9+15       0.1237      0.42  |Q        V          |          |          |
 9+20       0.1266      0.43  |Q        |V         |          |          |
 9+25       0.1297      0.44  |Q        |V         |          |          |
 9+30       0.1327      0.44  |Q        |V         |          |          |
 9+35       0.1358      0.45  |Q        | V        |          |          |
 9+40       0.1390      0.46  |Q        | V        |          |          |
 9+45       0.1422      0.46  |Q        | V        |          |          |
 9+50       0.1455      0.48  |Q        | V        |          |          |
 9+55       0.1488      0.49  |Q        |  V       |          |          |
10+ 0       0.1522      0.49  |Q        |  V       |          |          |
10+ 5       0.1550      0.40  |Q        |  V       |          |          |
10+10       0.1573      0.34  |Q        |  V       |          |          |
10+15       0.1596      0.33  |Q        |   V      |          |          |
10+20       0.1619      0.33  |Q        |   V      |          |          |
10+25       0.1641      0.33  |Q        |   V      |          |          |
10+30       0.1664      0.33  |Q        |   V      |          |          |
10+35       0.1691      0.39  |Q        |    V     |          |          |
10+40       0.1721      0.43  |Q        |    V     |          |          |
10+45       0.1751      0.44  |Q        |    V     |          |          |
10+50       0.1781      0.44  |Q        |    V     |          |          |
10+55       0.1812      0.44  |Q        |     V    |          |          |
11+ 0       0.1842      0.44  |Q        |     V    |          |          |
11+ 5       0.1872      0.43  |Q        |     V    |          |          |
11+10       0.1901      0.42  |Q        |     V    |          |          |
```



```
15+25       0.3860      0.52  | Q       |         |         |   V     |
15+30       0.3895      0.51  | Q       |         |         |   V     |
15+35       0.3927      0.47  |Q        |         |         |   V     |
15+40       0.3957      0.43  |Q        |         |         |    V    |
15+45       0.3986      0.42  |Q        |         |         |    V    |
15+50       0.4015      0.42  |Q        |         |         |    V    |
15+55       0.4044      0.42  |Q        |         |         |    V    |
16+ 0       0.4073      0.42  |Q        |         |         |     V   |
16+ 5       0.4090      0.24  Q         |         |         |     V   |
16+10       0.4098      0.11  Q         |         |         |     V   |
16+15       0.4104      0.09  Q         |         |         |     V   |
16+20       0.4109      0.08  Q         |         |         |     V   |
16+25       0.4115      0.08  Q         |         |         |     V   |
16+30       0.4121      0.08  Q         |         |         |     V   |
16+35       0.4126      0.07  Q         |         |         |     V   |
16+40       0.4130      0.06  Q         |         |         |     V   |
16+45       0.4134      0.06  Q         |         |         |     V   |
16+50       0.4138      0.06  Q         |         |         |     V   |
16+55       0.4143      0.06  Q         |         |         |     V   |
17+ 0       0.4147      0.06  Q         |         |         |     V   |
17+ 5       0.4153      0.08  Q         |         |         |     V   |
17+10       0.4160      0.10  Q         |         |         |     V   |
17+15       0.4167      0.10  Q         |         |         |      V  |
17+20       0.4174      0.11  Q         |         |         |      V  |
17+25       0.4182      0.11  Q         |         |         |      V  |
17+30       0.4189      0.11  Q         |         |         |      V  |
17+35       0.4196      0.11  Q         |         |         |      V  |
17+40       0.4203      0.11  Q         |         |         |      V  |
17+45       0.4211      0.11  Q         |         |         |      V  |
17+50       0.4217      0.09  Q         |         |         |      V  |
17+55       0.4223      0.08  Q         |         |         |      V  |
18+ 0       0.4229      0.08  Q         |         |         |      V  |
18+ 5       0.4234      0.08  Q         |         |         |      V  |
18+10       0.4240      0.08  Q         |         |         |      V  |
18+15       0.4246      0.08  Q         |         |         |      V  |
18+20       0.4252      0.08  Q         |         |         |      V  |
18+25       0.4257      0.08  Q         |         |         |      V  |
18+30       0.4263      0.08  Q         |         |         |      V  |
18+35       0.4268      0.07  Q         |         |         |      V  |
18+40       0.4272      0.06  Q         |         |         |      V  |
18+45       0.4277      0.06  Q         |         |         |       V |
18+50       0.4280      0.05  Q         |         |         |       V |
18+55       0.4283      0.04  Q         |         |         |       V |
19+ 0       0.4286      0.04  Q         |         |         |       V |
19+ 5       0.4289      0.05  Q         |         |         |       V |
19+10       0.4294      0.06  Q         |         |         |       V |
19+15       0.4298      0.06  Q         |         |         |       V |
19+20       0.4303      0.07  Q         |         |         |       V |
19+25       0.4308      0.08  Q         |         |         |       V |
19+30       0.4314      0.08  Q         |         |         |       V |
```

19+35	0.4319	0.07	Q	|	|	|	V |
19+40	0.4324	0.06	Q	|	|	|	V |
19+45	0.4328	0.06	Q	|	|	|	V |
19+50	0.4331	0.05	Q	|	|	|	V |
19+55	0.4334	0.04	Q	|	|	|	V |
20+ 0	0.4337	0.04	Q	|	|	|	V |
20+ 5	0.4341	0.05	Q	|	|	|	V |
20+10	0.4345	0.06	Q	|	|	|	V |
20+15	0.4349	0.06	Q	|	|	|	V |
20+20	0.4353	0.06	Q	|	|	|	V |
20+25	0.4357	0.06	Q	|	|	|	V |
20+30	0.4362	0.06	Q	|	|	|	V |
20+35	0.4366	0.06	Q	|	|	|	V |
20+40	0.4370	0.06	Q	|	|	|	V |
20+45	0.4374	0.06	Q	|	|	|	V |
20+50	0.4378	0.05	Q	|	|	|	V |
20+55	0.4381	0.04	Q	|	|	|	V |
21+ 0	0.4384	0.04	Q	|	|	|	V |
21+ 5	0.4387	0.05	Q	|	|	|	V|
21+10	0.4391	0.06	Q	|	|	|	V|
21+15	0.4395	0.06	Q	|	|	|	V|
21+20	0.4399	0.05	Q	|	|	|	V|
21+25	0.4402	0.04	Q	|	|	|	V|
21+30	0.4405	0.04	Q	|	|	|	V|
21+35	0.4408	0.05	Q	|	|	|	V|
21+40	0.4412	0.06	Q	|	|	|	V|
21+45	0.4417	0.06	Q	|	|	|	V|
21+50	0.4420	0.05	Q	|	|	|	V|
21+55	0.4423	0.04	Q	|	|	|	V|
22+ 0	0.4426	0.04	Q	|	|	|	V|
22+ 5	0.4430	0.05	Q	|	|	|	V|
22+10	0.4434	0.06	Q	|	|	|	V|
22+15	0.4438	0.06	Q	|	|	|	V|
22+20	0.4441	0.05	Q	|	|	|	V|
22+25	0.4444	0.04	Q	|	|	|	V|
22+30	0.4447	0.04	Q	|	|	|	V|
22+35	0.4450	0.04	Q	|	|	|	V|
22+40	0.4453	0.04	Q	|	|	|	V|
22+45	0.4456	0.04	Q	|	|	|	V|
22+50	0.4458	0.04	Q	|	|	|	V|
22+55	0.4461	0.04	Q	|	|	|	V|
23+ 0	0.4464	0.04	Q	|	|	|	V|
23+ 5	0.4467	0.04	Q	|	|	|	V|
23+10	0.4470	0.04	Q	|	|	|	V|
23+15	0.4473	0.04	Q	|	|	|	V|
23+20	0.4475	0.04	Q	|	|	|	V|
23+25	0.4478	0.04	Q	|	|	|	V|
23+30	0.4481	0.04	Q	|	|	|	V|
23+35	0.4484	0.04	Q	|	|	|	V|
23+40	0.4487	0.04	Q	|	|	|	V|

23+45	0.4489	0.04	Q	|	|	|	V|
23+50	0.4492	0.04	Q	|	|	|	V|
23+55	0.4495	0.04	Q	|	|	|	V|
24+ 0	0.4498	0.04	Q	|	|	|	V|
24+ 5	0.4499	0.02	Q	|	|	|	V|
24+10	0.4499	0.00	Q	|	|	|	V|
24+15	0.4500	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

Study date 01/24/23 File: NTSHemetUHPr22242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6385

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

National Tube Supply - Hemet
Proposed Condition 2-Year, 24-Hour UH (Area 2)
N Zamarripa 01-24-2023

Drainage Area = 2.63(Ac.) = 0.004 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 2.63(Ac.) = 0.004 Sq. Mi.
Length along longest watercourse = 473.00(Ft.)
Length along longest watercourse measured to centroid = 314.00(Ft.)
Length along longest watercourse = 0.090 Mi.
Length along longest watercourse measured to centroid = 0.059 Mi.
Difference in elevation = 2.32(Ft.)
Slope along watercourse = 25.8977 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.027 Hr.
Lag time = 1.59 Min.
25% of lag time = 0.40 Min.
40% of lag time = 0.64 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]
        2.63            1.80                  4.73

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
        2.63            4.50                 11.83

STORM EVENT (YEAR) =    2.00
Area Averaged 2-Year Rainfall =    1.800(In)
Area Averaged 100-Year Rainfall =    4.500(In)

Point rain (area averaged) =    1.800(In)
Areal adjustment factor =  100.00 %
Adjusted average point rain =    1.800(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
     0.490           98.00         0.950
     2.140           98.00         0.950
 Total Area Entered =      2.63(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
98.0  98.0      0.026     0.950        0.004       0.186      0.001
98.0  98.0      0.026     0.950        0.004       0.814      0.003
                                                 Sum (F) =   0.004
Area averaged mean soil loss (F) (In/Hr) =  0.004
Minimum soil loss rate ((In/Hr)) =  0.002
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.100
------------------------------------------------------------------------

               U n i t  H y d r o g r a p h
                       VALLEY S-Curve
------------------------------------------------------------------
               Unit Hydrograph Data
------------------------------------------------------------------------
Unit time period   Time % of lag   Distribution   Unit Hydrograph
    (hrs)                          Graph %            (CFS)
------------------------------------------------------------------------
    1   0.083        314.020         58.075              1.539
    2   0.167        628.040         36.370              0.964
    3   0.250        942.060          5.555              0.147
                              Sum = 100.000   Sum=       2.651
------------------------------------------------------------------------
```

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	0.014	(0.007)	0.001	0.013
2	0.17	0.07	0.014	(0.007)	0.001	0.013
3	0.25	0.07	0.014	(0.007)	0.001	0.013
4	0.33	0.10	0.022	(0.007)	0.002	0.019
5	0.42	0.10	0.022	(0.007)	0.002	0.019
6	0.50	0.10	0.022	(0.007)	0.002	0.019
7	0.58	0.10	0.022	(0.007)	0.002	0.019
8	0.67	0.10	0.022	(0.007)	0.002	0.019
9	0.75	0.10	0.022	(0.006)	0.002	0.019
10	0.83	0.13	0.029	(0.006)	0.003	0.026
11	0.92	0.13	0.029	(0.006)	0.003	0.026
12	1.00	0.13	0.029	(0.006)	0.003	0.026
13	1.08	0.10	0.022	(0.006)	0.002	0.019
14	1.17	0.10	0.022	(0.006)	0.002	0.019
15	1.25	0.10	0.022	(0.006)	0.002	0.019
16	1.33	0.10	0.022	(0.006)	0.002	0.019
17	1.42	0.10	0.022	(0.006)	0.002	0.019
18	1.50	0.10	0.022	(0.006)	0.002	0.019
19	1.58	0.10	0.022	(0.006)	0.002	0.019
20	1.67	0.10	0.022	(0.006)	0.002	0.019
21	1.75	0.10	0.022	(0.006)	0.002	0.019
22	1.83	0.13	0.029	(0.006)	0.003	0.026
23	1.92	0.13	0.029	(0.006)	0.003	0.026
24	2.00	0.13	0.029	(0.006)	0.003	0.026
25	2.08	0.13	0.029	(0.006)	0.003	0.026
26	2.17	0.13	0.029	(0.006)	0.003	0.026
27	2.25	0.13	0.029	(0.006)	0.003	0.026
28	2.33	0.13	0.029	(0.006)	0.003	0.026
29	2.42	0.13	0.029	(0.006)	0.003	0.026
30	2.50	0.13	0.029	(0.006)	0.003	0.026
31	2.58	0.17	0.036	(0.006)	0.004	0.032
32	2.67	0.17	0.036	(0.006)	0.004	0.032
33	2.75	0.17	0.036	(0.006)	0.004	0.032
34	2.83	0.17	0.036	(0.006)	0.004	0.032
35	2.92	0.17	0.036	(0.006)	0.004	0.032
36	3.00	0.17	0.036	(0.006)	0.004	0.032
37	3.08	0.17	0.036	(0.006)	0.004	0.032
38	3.17	0.17	0.036	(0.006)	0.004	0.032
39	3.25	0.17	0.036	(0.006)	0.004	0.032
40	3.33	0.17	0.036	(0.006)	0.004	0.032
41	3.42	0.17	0.036	(0.006)	0.004	0.032
42	3.50	0.17	0.036	(0.006)	0.004	0.032
43	3.58	0.17	0.036	(0.006)	0.004	0.032
44	3.67	0.17	0.036	(0.006)	0.004	0.032

45	3.75	0.17	0.036	(0.006)	0.004	0.032
46	3.83	0.20	0.043	(0.006)	0.004	0.039
47	3.92	0.20	0.043	(0.006)	0.004	0.039
48	4.00	0.20	0.043	(0.006)	0.004	0.039
49	4.08	0.20	0.043	(0.006)	0.004	0.039
50	4.17	0.20	0.043	(0.005)	0.004	0.039
51	4.25	0.20	0.043	(0.005)	0.004	0.039
52	4.33	0.23	0.050	(0.005)	0.005	0.045
53	4.42	0.23	0.050	(0.005)	0.005	0.045
54	4.50	0.23	0.050	(0.005)	0.005	0.045
55	4.58	0.23	0.050	(0.005)	0.005	0.045
56	4.67	0.23	0.050	(0.005)	0.005	0.045
57	4.75	0.23	0.050	(0.005)	0.005	0.045
58	4.83	0.27	0.058	0.005	(0.006)	0.052
59	4.92	0.27	0.058	0.005	(0.006)	0.052
60	5.00	0.27	0.058	0.005	(0.006)	0.052
61	5.08	0.20	0.043	(0.005)	0.004	0.039
62	5.17	0.20	0.043	(0.005)	0.004	0.039
63	5.25	0.20	0.043	(0.005)	0.004	0.039
64	5.33	0.23	0.050	(0.005)	0.005	0.045
65	5.42	0.23	0.050	(0.005)	0.005	0.045
66	5.50	0.23	0.050	(0.005)	0.005	0.045
67	5.58	0.27	0.058	0.005	(0.006)	0.053
68	5.67	0.27	0.058	0.005	(0.006)	0.053
69	5.75	0.27	0.058	0.005	(0.006)	0.053
70	5.83	0.27	0.058	0.005	(0.006)	0.053
71	5.92	0.27	0.058	0.005	(0.006)	0.053
72	6.00	0.27	0.058	0.005	(0.006)	0.053
73	6.08	0.30	0.065	0.005	(0.006)	0.060
74	6.17	0.30	0.065	0.005	(0.006)	0.060
75	6.25	0.30	0.065	0.005	(0.006)	0.060
76	6.33	0.30	0.065	0.005	(0.006)	0.060
77	6.42	0.30	0.065	0.005	(0.006)	0.060
78	6.50	0.30	0.065	0.005	(0.006)	0.060
79	6.58	0.33	0.072	0.005	(0.007)	0.067
80	6.67	0.33	0.072	0.005	(0.007)	0.067
81	6.75	0.33	0.072	0.005	(0.007)	0.067
82	6.83	0.33	0.072	0.005	(0.007)	0.067
83	6.92	0.33	0.072	0.005	(0.007)	0.067
84	7.00	0.33	0.072	0.005	(0.007)	0.067
85	7.08	0.33	0.072	0.005	(0.007)	0.067
86	7.17	0.33	0.072	0.005	(0.007)	0.067
87	7.25	0.33	0.072	0.005	(0.007)	0.067
88	7.33	0.37	0.079	0.005	(0.008)	0.075
89	7.42	0.37	0.079	0.005	(0.008)	0.075
90	7.50	0.37	0.079	0.005	(0.008)	0.075
91	7.58	0.40	0.086	0.005	(0.009)	0.082
92	7.67	0.40	0.086	0.005	(0.009)	0.082
93	7.75	0.40	0.086	0.005	(0.009)	0.082
94	7.83	0.43	0.094	0.005	(0.009)	0.089

95	7.92	0.43	0.094	0.004	(	0.009)	0.089
96	8.00	0.43	0.094	0.004	(	0.009)	0.089
97	8.08	0.50	0.108	0.004	(	0.011)	0.104
98	8.17	0.50	0.108	0.004	(	0.011)	0.104
99	8.25	0.50	0.108	0.004	(	0.011)	0.104
100	8.33	0.50	0.108	0.004	(	0.011)	0.104
101	8.42	0.50	0.108	0.004	(	0.011)	0.104
102	8.50	0.50	0.108	0.004	(	0.011)	0.104
103	8.58	0.53	0.115	0.004	(	0.012)	0.111
104	8.67	0.53	0.115	0.004	(	0.012)	0.111
105	8.75	0.53	0.115	0.004	(	0.012)	0.111
106	8.83	0.57	0.122	0.004	(	0.012)	0.118
107	8.92	0.57	0.122	0.004	(	0.012)	0.118
108	9.00	0.57	0.122	0.004	(	0.012)	0.118
109	9.08	0.63	0.137	0.004	(	0.014)	0.133
110	9.17	0.63	0.137	0.004	(	0.014)	0.133
111	9.25	0.63	0.137	0.004	(	0.014)	0.133
112	9.33	0.67	0.144	0.004	(	0.014)	0.140
113	9.42	0.67	0.144	0.004	(	0.014)	0.140
114	9.50	0.67	0.144	0.004	(	0.014)	0.140
115	9.58	0.70	0.151	0.004	(	0.015)	0.147
116	9.67	0.70	0.151	0.004	(	0.015)	0.147
117	9.75	0.70	0.151	0.004	(	0.015)	0.147
118	9.83	0.73	0.158	0.004	(	0.016)	0.154
119	9.92	0.73	0.158	0.004	(	0.016)	0.154
120	10.00	0.73	0.158	0.004	(	0.016)	0.154
121	10.08	0.50	0.108	0.004	(	0.011)	0.104
122	10.17	0.50	0.108	0.004	(	0.011)	0.104
123	10.25	0.50	0.108	0.004	(	0.011)	0.104
124	10.33	0.50	0.108	0.004	(	0.011)	0.104
125	10.42	0.50	0.108	0.004	(	0.011)	0.104
126	10.50	0.50	0.108	0.004	(	0.011)	0.104
127	10.58	0.67	0.144	0.004	(	0.014)	0.140
128	10.67	0.67	0.144	0.004	(	0.014)	0.140
129	10.75	0.67	0.144	0.004	(	0.014)	0.140
130	10.83	0.67	0.144	0.004	(	0.014)	0.140
131	10.92	0.67	0.144	0.004	(	0.014)	0.140
132	11.00	0.67	0.144	0.004	(	0.014)	0.140
133	11.08	0.63	0.137	0.004	(	0.014)	0.133
134	11.17	0.63	0.137	0.004	(	0.014)	0.133
135	11.25	0.63	0.137	0.004	(	0.014)	0.133
136	11.33	0.63	0.137	0.004	(	0.014)	0.133
137	11.42	0.63	0.137	0.004	(	0.014)	0.133
138	11.50	0.63	0.137	0.004	(	0.014)	0.133
139	11.58	0.57	0.122	0.004	(	0.012)	0.119
140	11.67	0.57	0.122	0.004	(	0.012)	0.119
141	11.75	0.57	0.122	0.004	(	0.012)	0.119
142	11.83	0.60	0.130	0.004	(	0.013)	0.126
143	11.92	0.60	0.130	0.004	(	0.013)	0.126
144	12.00	0.60	0.130	0.004	(	0.013)	0.126

145	12.08	0.83	0.180	0.004	(	0.018)	0.176
146	12.17	0.83	0.180	0.004	(	0.018)	0.176
147	12.25	0.83	0.180	0.003	(	0.018)	0.177
148	12.33	0.87	0.187	0.003	(	0.019)	0.184
149	12.42	0.87	0.187	0.003	(	0.019)	0.184
150	12.50	0.87	0.187	0.003	(	0.019)	0.184
151	12.58	0.93	0.202	0.003	(	0.020)	0.198
152	12.67	0.93	0.202	0.003	(	0.020)	0.198
153	12.75	0.93	0.202	0.003	(	0.020)	0.198
154	12.83	0.97	0.209	0.003	(	0.021)	0.205
155	12.92	0.97	0.209	0.003	(	0.021)	0.205
156	13.00	0.97	0.209	0.003	(	0.021)	0.205
157	13.08	1.13	0.245	0.003	(	0.024)	0.241
158	13.17	1.13	0.245	0.003	(	0.024)	0.242
159	13.25	1.13	0.245	0.003	(	0.024)	0.242
160	13.33	1.13	0.245	0.003	(	0.024)	0.242
161	13.42	1.13	0.245	0.003	(	0.024)	0.242
162	13.50	1.13	0.245	0.003	(	0.024)	0.242
163	13.58	0.77	0.166	0.003	(	0.017)	0.162
164	13.67	0.77	0.166	0.003	(	0.017)	0.162
165	13.75	0.77	0.166	0.003	(	0.017)	0.162
166	13.83	0.77	0.166	0.003	(	0.017)	0.162
167	13.92	0.77	0.166	0.003	(	0.017)	0.162
168	14.00	0.77	0.166	0.003	(	0.017)	0.162
169	14.08	0.90	0.194	0.003	(	0.019)	0.191
170	14.17	0.90	0.194	0.003	(	0.019)	0.191
171	14.25	0.90	0.194	0.003	(	0.019)	0.191
172	14.33	0.87	0.187	0.003	(	0.019)	0.184
173	14.42	0.87	0.187	0.003	(	0.019)	0.184
174	14.50	0.87	0.187	0.003	(	0.019)	0.184
175	14.58	0.87	0.187	0.003	(	0.019)	0.184
176	14.67	0.87	0.187	0.003	(	0.019)	0.184
177	14.75	0.87	0.187	0.003	(	0.019)	0.184
178	14.83	0.83	0.180	0.003	(	0.018)	0.177
179	14.92	0.83	0.180	0.003	(	0.018)	0.177
180	15.00	0.83	0.180	0.003	(	0.018)	0.177
181	15.08	0.80	0.173	0.003	(	0.017)	0.170
182	15.17	0.80	0.173	0.003	(	0.017)	0.170
183	15.25	0.80	0.173	0.003	(	0.017)	0.170
184	15.33	0.77	0.166	0.003	(	0.017)	0.163
185	15.42	0.77	0.166	0.003	(	0.017)	0.163
186	15.50	0.77	0.166	0.003	(	0.017)	0.163
187	15.58	0.63	0.137	0.003	(	0.014)	0.134
188	15.67	0.63	0.137	0.003	(	0.014)	0.134
189	15.75	0.63	0.137	0.003	(	0.014)	0.134
190	15.83	0.63	0.137	0.003	(	0.014)	0.134
191	15.92	0.63	0.137	0.003	(	0.014)	0.134
192	16.00	0.63	0.137	0.003	(	0.014)	0.134
193	16.08	0.13	0.029	0.003	(	0.003)	0.026
194	16.17	0.13	0.029	0.003	(	0.003)	0.026

195	16.25	0.13	0.029	0.003	(0.003)	0.026
196	16.33	0.13	0.029	0.003	(0.003)	0.026
197	16.42	0.13	0.029	0.003	(0.003)	0.026
198	16.50	0.13	0.029	0.003	(0.003)	0.026
199	16.58	0.10	0.022	(0.003)	0.002	0.019
200	16.67	0.10	0.022	(0.003)	0.002	0.019
201	16.75	0.10	0.022	(0.003)	0.002	0.019
202	16.83	0.10	0.022	(0.003)	0.002	0.019
203	16.92	0.10	0.022	(0.003)	0.002	0.019
204	17.00	0.10	0.022	(0.003)	0.002	0.019
205	17.08	0.17	0.036	0.003	(0.004)	0.033
206	17.17	0.17	0.036	0.003	(0.004)	0.033
207	17.25	0.17	0.036	0.003	(0.004)	0.033
208	17.33	0.17	0.036	0.003	(0.004)	0.033
209	17.42	0.17	0.036	0.003	(0.004)	0.033
210	17.50	0.17	0.036	0.003	(0.004)	0.033
211	17.58	0.17	0.036	0.003	(0.004)	0.033
212	17.67	0.17	0.036	0.003	(0.004)	0.033
213	17.75	0.17	0.036	0.002	(0.004)	0.034
214	17.83	0.13	0.029	0.002	(0.003)	0.026
215	17.92	0.13	0.029	0.002	(0.003)	0.026
216	18.00	0.13	0.029	0.002	(0.003)	0.026
217	18.08	0.13	0.029	0.002	(0.003)	0.026
218	18.17	0.13	0.029	0.002	(0.003)	0.026
219	18.25	0.13	0.029	0.002	(0.003)	0.026
220	18.33	0.13	0.029	0.002	(0.003)	0.026
221	18.42	0.13	0.029	0.002	(0.003)	0.026
222	18.50	0.13	0.029	0.002	(0.003)	0.026
223	18.58	0.10	0.022	(0.002)	0.002	0.019
224	18.67	0.10	0.022	(0.002)	0.002	0.019
225	18.75	0.10	0.022	(0.002)	0.002	0.019
226	18.83	0.07	0.014	(0.002)	0.001	0.013
227	18.92	0.07	0.014	(0.002)	0.001	0.013
228	19.00	0.07	0.014	(0.002)	0.001	0.013
229	19.08	0.10	0.022	(0.002)	0.002	0.019
230	19.17	0.10	0.022	(0.002)	0.002	0.019
231	19.25	0.10	0.022	(0.002)	0.002	0.019
232	19.33	0.13	0.029	0.002	(0.003)	0.027
233	19.42	0.13	0.029	0.002	(0.003)	0.027
234	19.50	0.13	0.029	0.002	(0.003)	0.027
235	19.58	0.10	0.022	(0.002)	0.002	0.019
236	19.67	0.10	0.022	(0.002)	0.002	0.019
237	19.75	0.10	0.022	(0.002)	0.002	0.019
238	19.83	0.07	0.014	(0.002)	0.001	0.013
239	19.92	0.07	0.014	(0.002)	0.001	0.013
240	20.00	0.07	0.014	(0.002)	0.001	0.013
241	20.08	0.10	0.022	(0.002)	0.002	0.019
242	20.17	0.10	0.022	(0.002)	0.002	0.019
243	20.25	0.10	0.022	(0.002)	0.002	0.019
244	20.33	0.10	0.022	0.002	(0.002)	0.019

245	20.42	0.10	0.022		0.002	(0.002)		0.019
246	20.50	0.10	0.022		0.002	(0.002)		0.019
247	20.58	0.10	0.022		0.002	(0.002)		0.019
248	20.67	0.10	0.022		0.002	(0.002)		0.019
249	20.75	0.10	0.022		0.002	(0.002)		0.019
250	20.83	0.07	0.014	(0.002)		0.001		0.013
251	20.92	0.07	0.014	(0.002)		0.001		0.013
252	21.00	0.07	0.014	(0.002)		0.001		0.013
253	21.08	0.10	0.022		0.002	(0.002)		0.020
254	21.17	0.10	0.022		0.002	(0.002)		0.020
255	21.25	0.10	0.022		0.002	(0.002)		0.020
256	21.33	0.07	0.014	(0.002)		0.001		0.013
257	21.42	0.07	0.014	(0.002)		0.001		0.013
258	21.50	0.07	0.014	(0.002)		0.001		0.013
259	21.58	0.10	0.022		0.002	(0.002)		0.020
260	21.67	0.10	0.022		0.002	(0.002)		0.020
261	21.75	0.10	0.022		0.002	(0.002)		0.020
262	21.83	0.07	0.014	(0.002)		0.001		0.013
263	21.92	0.07	0.014	(0.002)		0.001		0.013
264	22.00	0.07	0.014	(0.002)		0.001		0.013
265	22.08	0.10	0.022		0.002	(0.002)		0.020
266	22.17	0.10	0.022		0.002	(0.002)		0.020
267	22.25	0.10	0.022		0.002	(0.002)		0.020
268	22.33	0.07	0.014	(0.002)		0.001		0.013
269	22.42	0.07	0.014	(0.002)		0.001		0.013
270	22.50	0.07	0.014	(0.002)		0.001		0.013
271	22.58	0.07	0.014	(0.002)		0.001		0.013
272	22.67	0.07	0.014	(0.002)		0.001		0.013
273	22.75	0.07	0.014	(0.002)		0.001		0.013
274	22.83	0.07	0.014	(0.002)		0.001		0.013
275	22.92	0.07	0.014	(0.002)		0.001		0.013
276	23.00	0.07	0.014	(0.002)		0.001		0.013
277	23.08	0.07	0.014	(0.002)		0.001		0.013
278	23.17	0.07	0.014	(0.002)		0.001		0.013
279	23.25	0.07	0.014	(0.002)		0.001		0.013
280	23.33	0.07	0.014	(0.002)		0.001		0.013
281	23.42	0.07	0.014	(0.002)		0.001		0.013
282	23.50	0.07	0.014	(0.002)		0.001		0.013
283	23.58	0.07	0.014	(0.002)		0.001		0.013
284	23.67	0.07	0.014	(0.002)		0.001		0.013
285	23.75	0.07	0.014	(0.002)		0.001		0.013
286	23.83	0.07	0.014	(0.002)		0.001		0.013
287	23.92	0.07	0.014	(0.002)		0.001		0.013
288	24.00	0.07	0.014	(0.002)		0.001		0.013

(Loss Rate Not Used)

Sum = 100.0 Sum = 20.7

Flood volume = Effective rainfall 1.73(In)
times area 2.6(Ac.)/[(In)/(Ft.)] = 0.4(Ac.Ft)
Total soil loss = 0.07(In)
Total soil loss = 0.016(Ac.Ft)

19,600 CF+16,469 CF - 10,960 CF (exist. condition) = 25,109 CF of storage needed to mitigate 2-year, 24-hour storm event

$V_{Provided}$ = 25,120 in basin storage check

Total rainfall = 1.80(In)
Flood volume = 16469.0 Cubic Feet
Total soil loss = 715.3 Cubic Feet

Peak flow rate of this hydrograph = 0.641(CFS)

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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	0.02	Q				
0+10	0.0004	0.03	Q				
0+15	0.0006	0.03	Q				
0+20	0.0009	0.04	Q				
0+25	0.0013	0.05	Q				
0+30	0.0016	0.05	Q				
0+35	0.0020	0.05	Q				
0+40	0.0023	0.05	Q				
0+45	0.0027	0.05	Q				
0+50	0.0031	0.06	Q				
0+55	0.0036	0.07	Q				
1+ 0	0.0040	0.07	Q				
1+ 5	0.0044	0.06	Q				
1+10	0.0048	0.05	Q				
1+15	0.0052	0.05	Q				
1+20	0.0055	0.05	Q				
1+25	0.0059	0.05	Q				
1+30	0.0062	0.05	Q				
1+35	0.0066	0.05	Q				
1+40	0.0069	0.05	Q				
1+45	0.0073	0.05	Q				
1+50	0.0077	0.06	Q				
1+55	0.0082	0.07	Q				
2+ 0	0.0087	0.07	Q				
2+ 5	0.0091	0.07	Q				
2+10	0.0096	0.07	QV				
2+15	0.0101	0.07	QV				
2+20	0.0105	0.07	QV				
2+25	0.0110	0.07	QV				
2+30	0.0115	0.07	QV				
2+35	0.0120	0.08	QV				
2+40	0.0126	0.08	QV				
2+45	0.0132	0.09	QV				
2+50	0.0138	0.09	QV				
2+55	0.0144	0.09	QV				

3+ 0	0.0150	0.09	QV	|	|	|	|
3+ 5	0.0156	0.09	QV	|	|	|	|
3+10	0.0162	0.09	QV	|	|	|	|
3+15	0.0168	0.09	QV	|	|	|	|
3+20	0.0174	0.09	QV	|	|	|	|
3+25	0.0179	0.09	QV	|	|	|	|
3+30	0.0185	0.09	QV	|	|	|	|
3+35	0.0191	0.09	Q V	|	|	|	|
3+40	0.0197	0.09	Q V	|	|	|	|
3+45	0.0203	0.09	Q V	|	|	|	|
3+50	0.0210	0.10	Q V	|	|	|	|
3+55	0.0217	0.10	Q V	|	|	|	|
4+ 0	0.0224	0.10	Q V	|	|	|	|
4+ 5	0.0231	0.10	Q V	|	|	|	|
4+10	0.0238	0.10	Q V	|	|	|	|
4+15	0.0245	0.10	Q V	|	|	|	|
4+20	0.0253	0.11	Q V	|	|	|	|
4+25	0.0261	0.12	Q V	|	|	|	|
4+30	0.0269	0.12	Q V	|	|	|	|
4+35	0.0278	0.12	Q V	|	|	|	|
4+40	0.0286	0.12	Q V	|	|	|	|
4+45	0.0294	0.12	Q V	|	|	|	|
4+50	0.0303	0.13	Q V	|	|	|	|
4+55	0.0313	0.14	Q V	|	|	|	|
5+ 0	0.0322	0.14	Q V	|	|	|	|
5+ 5	0.0331	0.12	Q V	|	|	|	|
5+10	0.0338	0.11	Q V	|	|	|	|
5+15	0.0345	0.10	Q V	|	|	|	|
5+20	0.0353	0.11	Q V	|	|	|	|
5+25	0.0361	0.12	Q V	|	|	|	|
5+30	0.0369	0.12	Q V	|	|	|	|
5+35	0.0378	0.13	Q V	|	|	|	|
5+40	0.0388	0.14	Q V	|	|	|	|
5+45	0.0397	0.14	Q V	|	|	|	|
5+50	0.0407	0.14	Q V	|	|	|	|
5+55	0.0417	0.14	Q V	|	|	|	|
6+ 0	0.0426	0.14	Q V	|	|	|	|
6+ 5	0.0436	0.15	Q V	|	|	|	|
6+10	0.0447	0.16	Q V	|	|	|	|
6+15	0.0458	0.16	Q V	|	|	|	|
6+20	0.0469	0.16	Q V	|	|	|	|
6+25	0.0480	0.16	Q V	|	|	|	|
6+30	0.0491	0.16	Q V	|	|	|	|
6+35	0.0503	0.17	Q V	|	|	|	|
6+40	0.0515	0.18	Q V	|	|	|	|
6+45	0.0527	0.18	Q V	|	|	|	|
6+50	0.0540	0.18	Q V	|	|	|	|
6+55	0.0552	0.18	Q V	|	|	|	|
7+ 0	0.0564	0.18	Q V	|	|	|	|
7+ 5	0.0576	0.18	Q V	|	|	|	|

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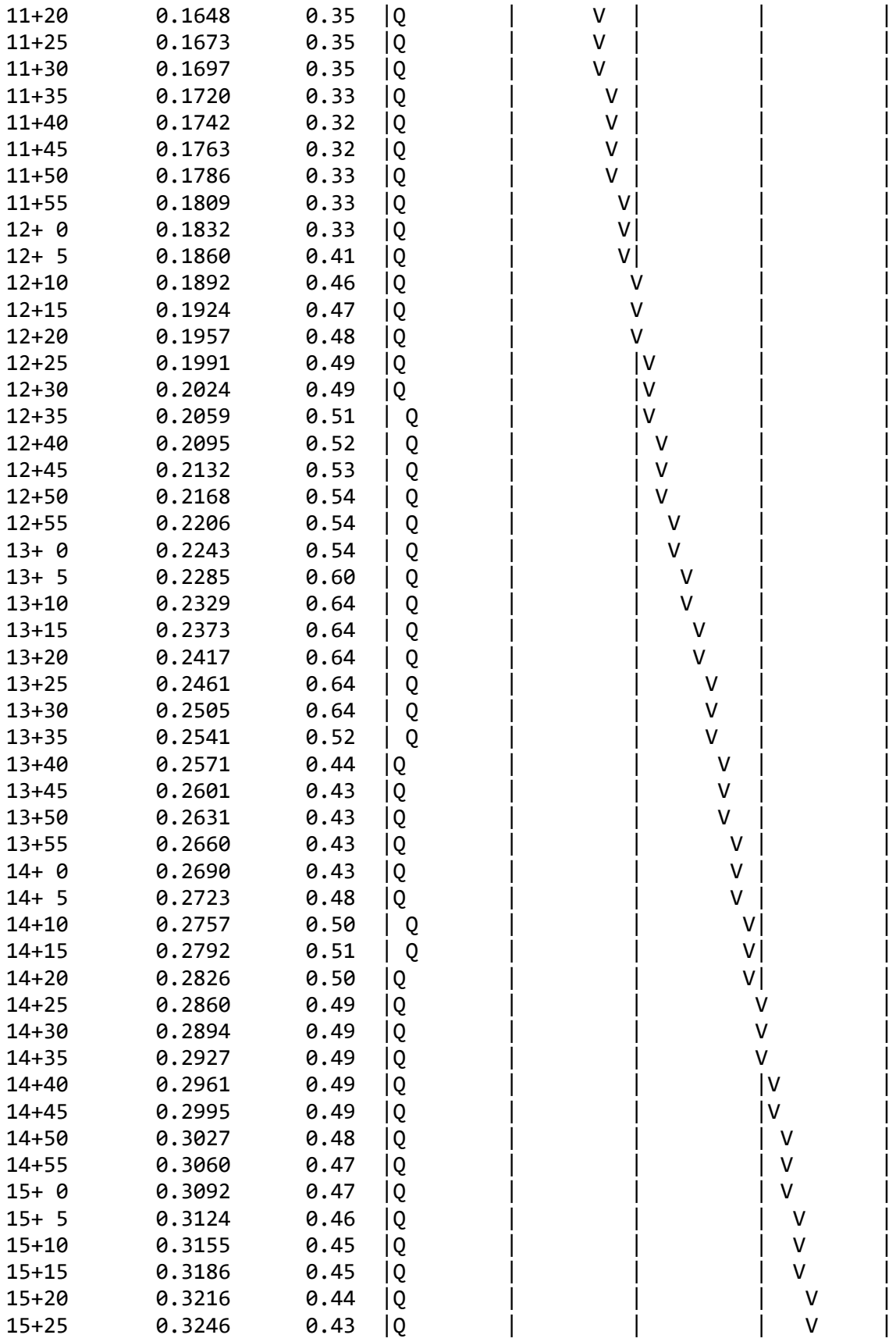
 7+10       0.0589      0.18  Q     V   |           |           |           |
 7+15       0.0601      0.18  Q     V   |           |           |           |
 7+20       0.0614      0.19  Q     V   |           |           |           |
 7+25       0.0628      0.20  Q     V   |           |           |           |
 7+30       0.0641      0.20  Q     V   |           |           |           |
 7+35       0.0656      0.21  Q     V   |           |           |           |
 7+40       0.0671      0.22  Q      V  |           |           |           |
 7+45       0.0685      0.22  Q      V  |           |           |           |
 7+50       0.0701      0.23  Q      V  |           |           |           |
 7+55       0.0717      0.24  Q      V  |           |           |           |
 8+ 0       0.0734      0.24  Q      V  |           |           |           |
 8+ 5       0.0752      0.26  |Q     V  |           |           |           |
 8+10       0.0770      0.27  |Q      V |           |           |           |
 8+15       0.0789      0.27  |Q      V |           |           |           |
 8+20       0.0808      0.27  |Q      V |           |           |           |
 8+25       0.0827      0.27  |Q      V |           |           |           |
 8+30       0.0846      0.27  |Q      V |           |           |           |
 8+35       0.0866      0.29  |Q       V|           |           |           |
 8+40       0.0886      0.29  |Q       V|           |           |           |
 8+45       0.0906      0.29  |Q       V|           |           |           |
 8+50       0.0927      0.31  |Q       V|           |           |           |
 8+55       0.0949      0.31  |Q        V           |           |           |
 9+ 0       0.0970      0.31  |Q        V           |           |           |
 9+ 5       0.0993      0.34  |Q        V           |           |           |
 9+10       0.1017      0.35  |Q        V           |           |           |
 9+15       0.1042      0.35  |Q         |V          |           |           |
 9+20       0.1067      0.36  |Q         |V          |           |           |
 9+25       0.1092      0.37  |Q         |V          |           |           |
 9+30       0.1118      0.37  |Q         |V          |           |           |
 9+35       0.1144      0.38  |Q         | V         |           |           |
 9+40       0.1171      0.39  |Q         | V         |           |           |
 9+45       0.1198      0.39  |Q         | V         |           |           |
 9+50       0.1225      0.40  |Q         | V         |           |           |
 9+55       0.1253      0.41  |Q         |  V        |           |           |
10+ 0       0.1282      0.41  |Q         |  V        |           |           |
10+ 5       0.1304      0.33  |Q         |  V        |           |           |
10+10       0.1324      0.28  |Q         |   V       |           |           |
10+15       0.1343      0.28  |Q         |   V       |           |           |
10+20       0.1362      0.28  |Q         |   V       |           |           |
10+25       0.1381      0.28  |Q         |   V       |           |           |
10+30       0.1400      0.28  |Q         |   V       |           |           |
10+35       0.1423      0.33  |Q         |    V      |           |           |
10+40       0.1448      0.37  |Q         |    V      |           |           |
10+45       0.1474      0.37  |Q         |    V      |           |           |
10+50       0.1499      0.37  |Q         |    V      |           |           |
10+55       0.1525      0.37  |Q         |     V     |           |           |
11+ 0       0.1551      0.37  |Q         |     V     |           |           |
11+ 5       0.1575      0.36  |Q         |     V     |           |           |
11+10       0.1600      0.35  |Q         |     V     |           |           |
11+15       0.1624      0.35  |Q         |      V    |           |           |
```



15+30	0.3276	0.43	|Q	|	|	|	V |
15+35	0.3302	0.39	|Q	|	|	|	V |
15+40	0.3327	0.36	|Q	|	|	|	V |
15+45	0.3352	0.36	|Q	|	|	|	V |
15+50	0.3376	0.36	|Q	|	|	|	V |
15+55	0.3401	0.36	|Q	|	|	|	V |
16+ 0	0.3425	0.36	|Q	|	|	|	V |
16+ 5	0.3438	0.19	Q	|	|	|	V |
16+10	0.3444	0.08	Q	|	|	|	V |
16+15	0.3449	0.07	Q	|	|	|	V |
16+20	0.3453	0.07	Q	|	|	|	V |
16+25	0.3458	0.07	Q	|	|	|	V |
16+30	0.3463	0.07	Q	|	|	|	V |
16+35	0.3467	0.06	Q	|	|	|	V |
16+40	0.3471	0.05	Q	|	|	|	V |
16+45	0.3474	0.05	Q	|	|	|	V |
16+50	0.3478	0.05	Q	|	|	|	V |
16+55	0.3481	0.05	Q	|	|	|	V |
17+ 0	0.3485	0.05	Q	|	|	|	V |
17+ 5	0.3490	0.07	Q	|	|	|	V |
17+10	0.3496	0.09	Q	|	|	|	V |
17+15	0.3502	0.09	Q	|	|	|	V |
17+20	0.3508	0.09	Q	|	|	|	V |
17+25	0.3514	0.09	Q	|	|	|	V |
17+30	0.3520	0.09	Q	|	|	|	V |
17+35	0.3526	0.09	Q	|	|	|	V |
17+40	0.3533	0.09	Q	|	|	|	V |
17+45	0.3539	0.09	Q	|	|	|	V |
17+50	0.3544	0.08	Q	|	|	|	V |
17+55	0.3549	0.07	Q	|	|	|	V |
18+ 0	0.3554	0.07	Q	|	|	|	V |
18+ 5	0.3558	0.07	Q	|	|	|	V |
18+10	0.3563	0.07	Q	|	|	|	V |
18+15	0.3568	0.07	Q	|	|	|	V |
18+20	0.3573	0.07	Q	|	|	|	V |
18+25	0.3578	0.07	Q	|	|	|	V |
18+30	0.3583	0.07	Q	|	|	|	V |
18+35	0.3587	0.06	Q	|	|	|	V |
18+40	0.3590	0.05	Q	|	|	|	V |
18+45	0.3594	0.05	Q	|	|	|	V |
18+50	0.3597	0.04	Q	|	|	|	V |
18+55	0.3599	0.04	Q	|	|	|	V |
19+ 0	0.3602	0.03	Q	|	|	|	V |
19+ 5	0.3605	0.04	Q	|	|	|	V |
19+10	0.3608	0.05	Q	|	|	|	V |
19+15	0.3612	0.05	Q	|	|	|	V |
19+20	0.3616	0.06	Q	|	|	|	V |
19+25	0.3621	0.07	Q	|	|	|	V |
19+30	0.3626	0.07	Q	|	|	|	V |
19+35	0.3630	0.06	Q	|	|	|	V |

19+40	0.3633	0.05	Q	|	|	|	V |
19+45	0.3637	0.05	Q	|	|	|	V |
19+50	0.3640	0.04	Q	|	|	|	V |
19+55	0.3642	0.04	Q	|	|	|	V |
20+ 0	0.3644	0.03	Q	|	|	|	V |
20+ 5	0.3648	0.04	Q	|	|	|	V |
20+10	0.3651	0.05	Q	|	|	|	V |
20+15	0.3655	0.05	Q	|	|	|	V |
20+20	0.3658	0.05	Q	|	|	|	V |
20+25	0.3662	0.05	Q	|	|	|	V |
20+30	0.3665	0.05	Q	|	|	|	V |
20+35	0.3669	0.05	Q	|	|	|	V |
20+40	0.3672	0.05	Q	|	|	|	V |
20+45	0.3676	0.05	Q	|	|	|	V |
20+50	0.3679	0.04	Q	|	|	|	V |
20+55	0.3681	0.04	Q	|	|	|	V |
21+ 0	0.3684	0.03	Q	|	|	|	V |
21+ 5	0.3687	0.04	Q	|	|	|	V|
21+10	0.3690	0.05	Q	|	|	|	V|
21+15	0.3694	0.05	Q	|	|	|	V|
21+20	0.3697	0.04	Q	|	|	|	V|
21+25	0.3699	0.04	Q	|	|	|	V|
21+30	0.3701	0.03	Q	|	|	|	V|
21+35	0.3704	0.04	Q	|	|	|	V|
21+40	0.3708	0.05	Q	|	|	|	V|
21+45	0.3712	0.05	Q	|	|	|	V|
21+50	0.3714	0.04	Q	|	|	|	V|
21+55	0.3717	0.04	Q	|	|	|	V|
22+ 0	0.3719	0.03	Q	|	|	|	V|
22+ 5	0.3722	0.04	Q	|	|	|	V|
22+10	0.3726	0.05	Q	|	|	|	V|
22+15	0.3729	0.05	Q	|	|	|	V|
22+20	0.3732	0.04	Q	|	|	|	V|
22+25	0.3735	0.04	Q	|	|	|	V|
22+30	0.3737	0.03	Q	|	|	|	V|
22+35	0.3739	0.03	Q	|	|	|	V|
22+40	0.3742	0.03	Q	|	|	|	V|
22+45	0.3744	0.03	Q	|	|	|	V|
22+50	0.3747	0.03	Q	|	|	|	V|
22+55	0.3749	0.03	Q	|	|	|	V|
23+ 0	0.3751	0.03	Q	|	|	|	V|
23+ 5	0.3754	0.03	Q	|	|	|	V|
23+10	0.3756	0.03	Q	|	|	|	V|
23+15	0.3758	0.03	Q	|	|	|	V|
23+20	0.3761	0.03	Q	|	|	|	V|
23+25	0.3763	0.03	Q	|	|	|	V|
23+30	0.3765	0.03	Q	|	|	|	V|
23+35	0.3768	0.03	Q	|	|	|	V|
23+40	0.3770	0.03	Q	|	|	|	V|
23+45	0.3773	0.03	Q	|	|	|	V|

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   23+50       0.3775      0.03  Q         |         |         |        V|
   23+55       0.3777      0.03  Q         |         |         |        V|
   24+ 0       0.3780      0.03  Q         |         |         |        V|
   24+ 5       0.3781      0.01  Q         |         |         |        V|
   24+10       0.3781      0.00  Q         |         |         |         V
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Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section G of the WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table G.1on page 23 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ A. **On-site storm drain inlets**	☒ **Locations of inlets.**	☒ **Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.**	☒ **Maintain and periodically repaint or replace inlet markings.** ☒ **Provide stormwater pollution prevention information to new site owners, lessees, or operators.** ☒ **See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** ☒ **Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."**
☐ B. **Interior floor drains and elevator shaft sump pumps**		☐ **State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.**	☐ **Inspect and maintain drains to prevent blockages and overflow.**
☐ C. **Interior parking garages**		☐ **State that parking garage floor drains will be plumbed to the sanitary sewer.**	☐ **Inspect and maintain drains to prevent blockages and overflow.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☐ D1. **Need for future indoor & structural pest control**		☐ **Note building design features that discourage entry of pests.**	☐ **Provide Integrated Pest Management information to owners, lessees, and operators.**
☒ D2. **Landscape/ Outdoor Pesticide Use**	☐ **Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained.** ☐ **Show self-retaining landscape areas, if any.** ☒ **Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)**	**State that final landscape plans will accomplish all of the following.** ☐ **Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.** ☒ **Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.** ☒ **Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.** ☐ **Consider using pest-resistant plants, especially adjacent to hardscape.** **To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.**	☒ **Maintain landscaping using minimum or no pesticides.** ☐ **See applicable operational BMPs in "What you should know for…..Landscape and Gardening"** at http://rcflood.org/stormwater/**Error! Hyperlink reference not valid.** ☒ **Provide IPM information to new owners, lessees and operators.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☐ E. **Pools, spas, ponds, decorative fountains, and other water features.**	☐ **Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)**	**If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.**	☐ **See applicable operational BMPs in** "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/
☐ F. **Food service**	☐ **For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment.** ☐ **On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.**	☐ **Describe the location and features of the designated cleaning area.** ☐ **Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.**	☐ **See the brochure, "**The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/ **Provide this brochure to new site owners, lessees, and operators.**
☒ G. **Refuse areas**	☒ **Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas.** ☒ **If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area.** ☐ **Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.**	☐ **State how site refuse will be handled and provide supporting detail to what is shown on plans.** ☒ **State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.**	☒ **State how the following will be implemented:** **Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at** www.cabmphandbooks.com

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
☒ H. **Industrial processes.**	☒ **Show process area.**	☒ **If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."**	☒ **See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ I. **Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)**	❑ **Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area.** ❑ **Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults.** ❑ **Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.**	**Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.** **Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for:** ▪ **Hazardous Waste Generation** ▪ **Hazardous Materials Release Response and Inventory** ▪ **California Accidental Release (CalARP)** ▪ **Aboveground Storage Tank** ▪ **Uniform Fire Code Article 80 Section 103(b) & (c) 1991** ▪ **Underground Storage Tank** **www.cchealth.org/groups/hazmat/**	❑ **See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ J. **Vehicle and Equipment Cleaning**	❑ **Show on drawings as appropriate:** **(1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses.** **(2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use).** **(3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer.** **(4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.**	❑ **If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.**	**Describe operational measures to implement the following (if applicable):** ❑ **Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system.** Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/ ❑ **Car dealerships and similar may rinse cars with water only.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ K. **Vehicle/Equipment Repair and Maintenance**	❑ **Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater.** ❑ **Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas.** ❑ **Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.**	❑ **State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area.** ❑ **State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.** ❑ **State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.**	**In the Stormwater Control Plan, note that all of the following restrictions apply to use the site:** ❑ **No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains.** ❑ **No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately.** ❑ **No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.** Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations". Brochure can be found at http://rcflood.org/stormwater/ Refer to Outdoor Cleaning Activities and Professional Mobile Service Providers for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ L. **Fuel Dispensing Areas**	❑ **Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable.** ❑ **Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.**		❑ **The property owner shall dry sweep the fueling area routinely.** ❑ **See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

[6] **The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ M. **Loading Docks**	☒ **Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer.** ☐ **Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation.** ☒ **Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.**		☐ **Move loaded and unloaded items indoors as soon as possible.** ☒ **See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ N. **Fire Sprinkler Test Water**		❑ **Provide a means to drain fire sprinkler test water to the sanitary sewer.**	❑ **See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**
O. **Miscellaneous Drain or Wash Water or Other Sources** ❑ **Boiler drain lines** ❑ **Condensate drain lines** ❑ **Rooftop equipment** ❑ **Drainage sumps** ❑ **Roofing, gutters, and trim.** ❑ **Other sources**		❑ **Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system.** ❑ **Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system.** ❑ **Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment.** ❑ **Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.** ❑ **Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.** **Include controls for other sources as specified by local reviewer.**	

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ P. **Plazas, sidewalks, and parking lots.**			☒ **Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.**

Appendix 9: O&M

Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

OPERATION AND MAINTENANCE PLAN

I. Introduction

The National Tube Supply development project is a proposal to develop approximately 5.76 acres of vacant land located at the southwest corner of Wentworth Drive and Sanderson Avenue into an industrial distribution center. The proposed project is largely impervious with small landscape areas, all of which will be tributary to a flood control and BMP underground storage basin on-site. Water quality mitigation for the impervious surfaces will be accomplished utilizing an underground infiltration basin due to the acceptable natural infiltration rate of the soil. Stormwater runoff will be routed through the on-site storm drain systems with the intent that all runoff will be detained on-site. Any overflows from storm events larger than the design events will discharge to Wentworth Drive where the flows will be conveyed west as is the case with the local area drainage currently. Those flows will eventually join the Hemet Storm Channel.

II. Responsibility for Maintenance

Initial and ultimate responsibility for maintenance of the infiltration trench BMP will rest with the property owner. Owner information is as follows:

National Tube Supply
925 Central Avenue,
University Park, IL 92614
(630) 442-4249
Attn: Brian Kluge

Funding for maintenance will be provided by the owner.

III. Summary of Drainage Management Areas and Stormwater BMPs

1. Drainage Areas: The WQMP site map (Exhibit A-3) shows the site areas tributary to the infiltration basin BMP. Pervious and impervious areas are color coded by DMA designation.

2. Structural Post Construction BMPs: An Underground Infiltration basin has been designed to provide for V_{BMP} for the pervious and impervious surfaces. See the project grading plan in Appendix 2. Runoff enters the basin through surface flow and on-site storm drain systems. Flows that exceed the capacity of the basin will discharge to the adjacent street to the north (Wentworth Drive).

IV. Stormwater BMP Design Documentation

An infiltration basin was designed to provide for V_{BMP} as specified in the WQMP. The construction drawing for the grading is included in Appendix 2.

V. Maintenance Schedule

MAINTENANCE SCHEDULE

BMP/Source Control	Inspection Interval/Activity	Maintenance Activity/Reference
Landscape (Self-Retaining)	Weekly	Weekly Clean area of debris, mow or trim as applicable. Remove all clippings or trimmings from the planter areas. Replace bark if applicable. See SC-73 in Appendix 10 for detailed protocols.
Parking Lot/Sidewalks	Site Walk Daily	Weekly, or as dictated by the daily visual inspections. Pick up debris and litter. Capture debris before it enters the infiltration trenches during washing. See SC-71 in Appendix 10.
Infiltration Basin	Weekly: Look for erosion, standing water and dead vegetation After storm event: Inspect areas for ponding Annually: Inspect outlets to basins, connector pipes and inlets on the site	Weekly: Remove trash and debris. Maintain vegetation (see SC-73, Appendix 10) and remove clippings. Replace damaged grass and/or plants. Repair basin cover as necessary. Clean storm drain pipe inlets and outlets to restore functionality in each storm drain line tributary to the infiltration basin. Clean vegetation from, in and around the storm drain overflows.

If drainage in the basin is not achieved within 72 hours, sediment in the basin shall be removed and any debris removed.

The employee charged with inspection and the landscape contractor retained to provide maintenance services shall be made familiar with the project specific WQMP. Inspection and maintenance of the source control/BMPs shall start upon completion of the project.

VI. Source Control

1. Landscaping: Landscaping shall be designed to minimize irrigation and runoff. Depressed landscape areas shall include plants that are tolerant of saturated soil conditions. Maintain landscaping using minimum or no pesticides. See CASQA Fact Sheet SC-73 in Appendix 10.

2. Parking Lots/Sidewalks: Sweep parking lots and sidewalks weekly to prevent accumulation of litter and debris. Collect debris from washing/power washing before it discharges to the infiltration trench. See CASQA Fact Sheet SC-71 in Appendix 10.

3. Ensure all trash receptacles and dumpster areas are covered and protected at all times from the elements.

Appendix 10: Educational Materials

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

3.1 INFILTRATION BASIN

Type of BMP	LID - Infiltration
Treatment Mechanisms	Infiltration, Evapotranspiration (when vegetated), Evaporation, and Sedimentation
Maximum Treatment Area	50 acres
Other Names	Bioinfiltration Basin

Description

An Infiltration Basin is a flat earthen basin designed to capture the design capture volume, V_{BMP}. The stormwater infiltrates through the bottom of the basin into the underlying soil over a 72 hour drawdown period. Flows exceeding V_{BMP} must discharge to a downstream conveyance system. Trash and sediment accumulate within the forebay as stormwater passes into the basin. Infiltration basins are highly effective in removing all targeted pollutants from stormwater runoff.

Figure 1 – Infiltration Basin

See Appendix A, and Appendix C, Section 1 of *Basin Guidelines*, for additional requirements.

Siting Considerations

The use of infiltration basins may be restricted by concerns over ground water contamination, soil permeability, and clogging at the site. See the applicable WQMP for any specific feasibility considerations for using infiltration BMPs. Where this BMP is being used, the soil beneath the basin must be thoroughly evaluated in a geotechnical report since the underlying soils are critical to the basin's long term performance. To protect the basin from erosion, the sides and bottom of the basin must be vegetated, preferably with native or low water use plant species.

In addition, these basins may not be appropriate for the following site conditions:

- Industrial sites or locations where spills of toxic materials may occur
- Sites with very low soil infiltration rates
- Sites with high groundwater tables or excessively high soil infiltration rates, where pollutants can affect ground water quality
- Sites with unstabilized soil or construction activity upstream
- On steeply sloping terrain
- Infiltration basins located in a fill condition should refer to Appendix A of this Handbook for details on special requirements/restrictions

Setbacks

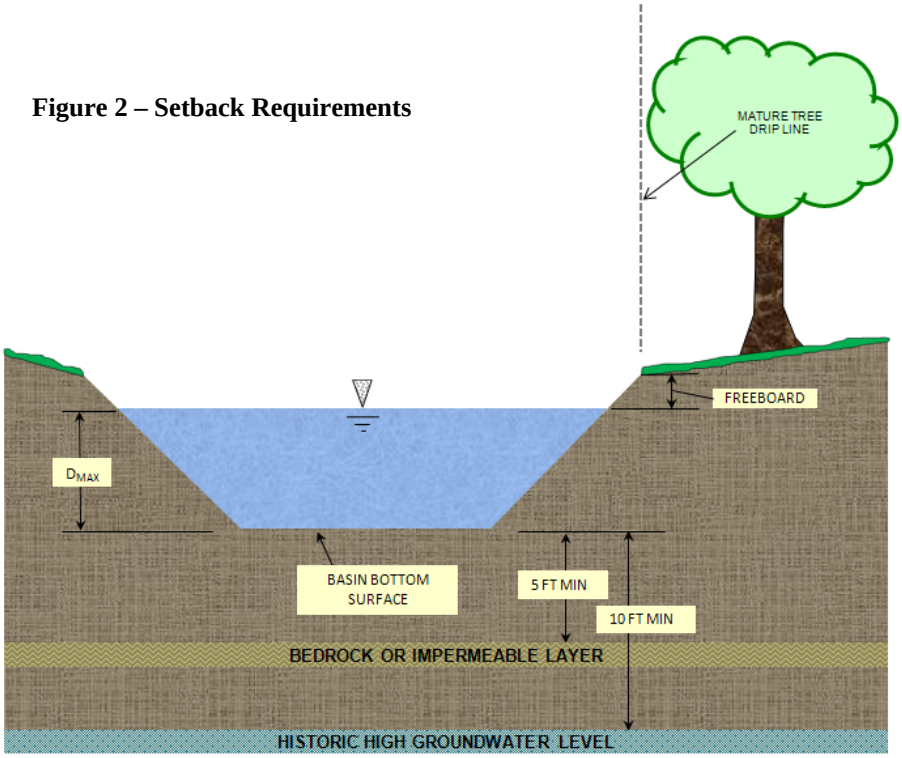
Always consult your geotechnical engineer for site specific recommendations regarding setbacks for infiltration trenches. Recommended setbacks are needed to protect buildings, existing trees, walls, onsite or nearby wells, streams, and tanks. Setbacks should be considered early in the design process since they can affect where infiltration facilities may be placed and how deep they are allowed to be. For instance, depth setbacks can dictate fairly shallow facilities that will have a larger footprint and, in some cases, may make an infiltration basin infeasible. In that instance, another BMP must be selected.

Infiltration basins typically must be set back:

- 10 feet from the historic high groundwater (measured vertically from the bottom of the basin, as shown in Figure 2)
- 5 feet from bedrock or impermeable surface layer (measured vertically from the bottom of the basin, as shown in Figure 2)
- From all existing mature tree drip lines as indicated in Figure 2 (to protect their root structure)
- 100 feet horizontally from wells, tanks or springs

Setbacks to walls and foundations must be included as part of the Geotechnical Report. All other setbacks shall be in accordance with applicable standards of the District's *Basin Guidelines* (Appendix C).

Figure 2 – Setback Requirements



Forebay

A concrete forebay shall be provided to reduce sediment clogging and to reduce erosion. The forebay shall have a design volume of at least 0.5% V_{BMP} and a minimum 1 foot high concrete splashwall / berm. Full height notch-type weir(s), offset from the line of flow from the basin inlet to prevent short circuiting, shall be used to outlet the forebay. It is recommended that two weirs be used and that they be located on opposite sides of the forebay (see Figure 2).

Overflow

Flows exceeding V_{BMP} must discharge to an acceptable downstream conveyance system. Where an adequate outlet is present, an overflow structure may be used. Where an embankment is present, an emergency spillway may be used instead. Overflows must be placed just above the design water surface for V_{BMP} and be near the outlet of the system. The overflow structure shall be similar to the District's Standard Drawing CB 110. Additional details may be found in the District's *Basin Guidelines* (Appendix C).

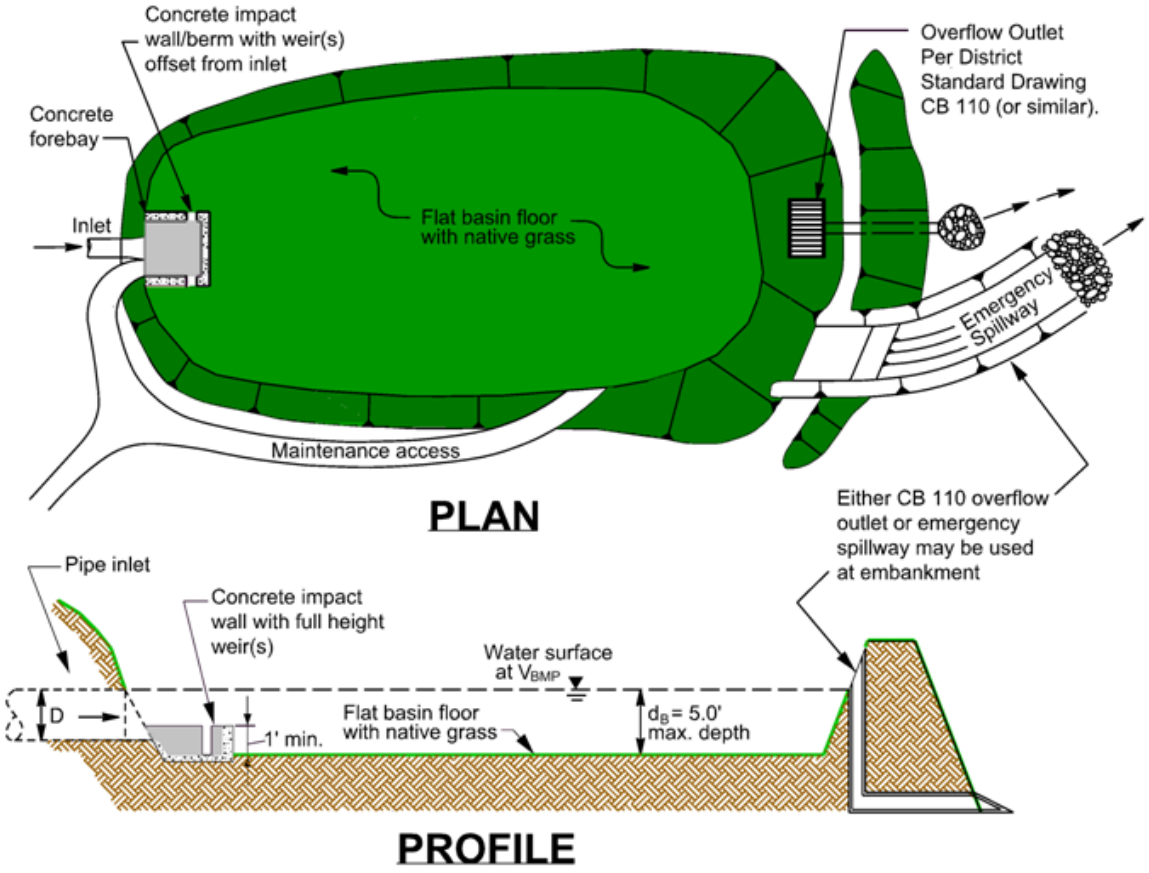


Figure 3 – Infiltration Basin

Landscaping Requirements

Basin vegetation provides erosion protection, improves sediment removal and assists in allowing infiltration to occur. The basin surface and side slopes shall be planted with native grasses. Proper landscape management is also required to ensure that the vegetation does not contribute to water pollution through pesticides, herbicides, or fertilizers. Landscaping shall be in accordance with County of Riverside Ordinance 859 and the District's *Basin Guidelines* (Appendix C), or other guidelines issued by the Engineering Authority.

Maintenance

Normal maintenance of an infiltration basin includes the maintenance of landscaping, debris and trash removal from the surface of the basin, and tending to problems associated with standing water (vectors, odors, etc.). Significant ponding, especially more than 72 hours after an event, may indicate that the basin surface is no longer providing sufficient infiltration and requires aeration. See the District's *Basin Guidelines* (Appendix C) for additional requirements (i.e., fencing, maintenance access, etc.).

Table 1 - Inspection and Maintenance

Schedule	Inspection and Maintenance Activity
Ongoing including just before annual storm seasons and following rainfall events.	• Maintain vegetation as needed. Use of fertilizers, pesticides and herbicides should be strenuously avoided to ensure they don't contribute to water pollution. If appropriate native plant selections and other IPM methods are used, such products shouldn't be needed. If such projects are used, o Products shall be applied in accordance with their labeling, especially in relation to application to water, and in areas subjected to flooding. o Fertilizers should not be applied within 15 days before, after, or during the rain season. • Remove debris and litter from the entire basin to minimize clogging and improve aesthetics. • Check for obvious problems and repair as needed. Address odor, insects, and overgrowth issues associated with stagnant or standing water in the basin bottom. There should be no long-term ponding water. • Check for erosion and sediment laden areas in the basin. Repair as needed. Clean forebay if needed. • Revegetate side slopes where needed.
Annually. If possible, schedule these inspections within 72 hours after a significant rainfall.	• Inspection of hydraulic and structural facilities. Examine the inlet for blockage, the embankment and spillway integrity, as well as damage to any structural element. • Check for erosion, slumping and overgrowth. Repair as needed. • Check basin depth for sediment build up and reduced total capacity. Scrape bottom as needed and remove sediment. Restore to original cross-section and infiltration rate. Replant basin vegetation. • Verify the basin bottom is allowing acceptable infiltration. Use a disc or other method to aerate basin bottom only if there is actual significant loss of infiltrative capacity, rather than on a routine basis[1]. • No water should be present 72 hours after an event. No long term standing water should be present at all. No algae formation should be visible. Correct problem as needed.

1. **CA Stormwater BMP Handbook for New Development and Significant Redevelopment**

Table 2 - Design and Sizing Criteria for Infiltration Basins

Design Parameter	Infiltration Basin
Design Volume	V_{BMP}
Forebay Volume	0.5% V_{BMP}
Drawdown time (maximum)	72 hours
Maximum tributary area	50 acres [2]
Minimum infiltration rate	Must be sufficient to drain the basin within the required Drawdown time over the life of the BMP. The WQMP may include specific requirements for minimum tested infiltration rates.
Maximum Depth	5 feet
Spillway erosion control	Energy dissipators to reduce velocities[1]
Basin Slope	0%
Freeboard (minimum)	1 foot [1]
Historic High Groundwater Setback (max)	10 feet
Bedrock/impermeable layer setback (max)	5 feet
Tree setbacks	Mature tree drip line must not overhang the basin
Set back from wells, tanks or springs	100 feet
Set back from foundations	As recommended in Geotechnical Report

1. **Ventura County's Technical Guidance Manual for Stormwater Quality Control Measures**
2. **CA Stormwater BMP Handbook for New Development and Significant Redevelopment**

Note: The information contained in this BMP Factsheet is intended to be a summary of design considerations and requirements. Additional information which applies to all detention basins may be found in the District's Basin Guidelines (Appendix C). In addition, information herein may be superseded by other guidelines issued by the co-permittee.

INFILTRATION BASIN SIZING PROCEDURE

1. Find the Design Volume, V_{BMP}.
   a) Enter the Tributary Area, $A_{T.}$
   b) Enter the Design Volume, V_{BMP}, determined from Section 2.1 of this Handbook.
2. Determine the Maximum Depth.
   a) Enter the infiltration rate. The infiltration rate shall be established as described in Appendix A: "Infiltration Testing".
   b) Enter the design Factor of Safety from Table 1 in Appendix A: "Infiltration Testing".
   c) The spreadsheet will determine D_1, the maximum allowable depth of the basin based on the infiltration rate along with the maximum drawdown time (72 hours) and the Factor of Safety.

$$D_1 = [(t) \times (I)] / 12s$$

Where I = site infiltration rate (in/hr)
s = safety factor
t = drawdown time (maximum 72 hours)

d) Enter the depth of freeboard.

e) Enter the depth to the historic high groundwater level measured from the top of the basin.

f) Enter the depth to the top of bedrock or other impermeable layer measured from the finished grade.

g) The spreadsheet will determine D_2, the total basin depth (including freeboard, if used) of the basin, based on restrictions to the depth by groundwater and an impermeable layer.

D_2 = Depth to groundwater – (10 + freeboard) (ft);

or

D_2 = Depth to impermeable layer – (5 + freeboard) (ft)

Whichever is least.

h) The spreadsheet will determine the maximum allowable effective depth of basin, D_{MAX}, based on the smallest value between D_1 and D_2. D_{MAX} is the maximum depth of water only and does not include freeboard. D_{MAX} shall not exceed 5 feet.

3. Basin Geometry

a) Enter the basin side slopes, z (no steeper than 4:1).

b) Enter the proposed basin depth, d_B excluding freeboard.

c) The spreadsheet will determine the minimum required surface area of the basin:

$$A_s = V_{BMP} / d_B$$

Where A_s = minimum area required (ft^2)
V_{BMP} = volume of the infiltration basin (ft^3)
d_B= proposed depth not to exceed maximum allowable depth, D_{MAX} (ft)

d) Enter the proposed bottom surface area. This area shall not be less than the minimum required surface area.

4. Forebay

A concrete forebay with a design volume of at least 0.5% V_{BMP} and a minimum 1 foot high concrete splashwall shall be provided. Full-height rectangular weir(s) shall be used to outlet the forebay. The weir(s) must be offset from the line of flow from the basin inlet. It is recommended that two weirs be used and that they be located on opposite sides of the forebay (see Figure 2).

a) The spreadsheet will determine the minimum required forebay volume based on 0.5% V_{BMP}.

b) Enter the proposed depth of the forebay berm/splashwall (1foot minimum).

c) The spreadsheet will determine the minimum required forebay surface area.

d) Enter the width of rectangular weir to be used (minimum 1.5 inches). Weir width should be established based on a 5 minute drawdown time.

Efficient Irrigation SD-12

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Designing New Installations

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

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

- 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

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

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

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

Redeveloping Existing Installations

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

Additional Information

Maintenance Considerations

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

Placement

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

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

Supplemental Information

Examples

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

Other Resources

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

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

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

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

Maintenance Bays & Docks SD-31

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

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

Designing New Installations

Designs of maintenance bays should consider the following:

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

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

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

- Loading dock areas should be covered, or drainage should be designed to preclude urban run-on and runoff.
- Direct connections into storm drains from depressed loading docks (truck wells) are prohibited.
- Below-grade loading docks from grocery stores and warehouse/distribution centers of fresh food items should drain through water quality inlets, or to an engineered infiltration system, or an equally effective alternative. Pre-treatment may also be required.
- Other features may be comparable and equally effective.

Redeveloping Existing Installations

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

Additional Information

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

Other Resources

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

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

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

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

Trash Storage Areas SD-32

Description

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

Approach

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

Design Objectives

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

Suitable Applications

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

Design Considerations

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.
- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

- 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.

Plaza and Sidewalk Cleaning SC-71

Objectives

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

Targeted Constituents

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

Description

Pollutants on sidewalks and other pedestrian traffic areas and plazas are typically due to littering and vehicle use. This fact sheet describes good housekeeping practices that can be incorporated into the municipality's existing cleaning and maintenance program.

Approach

Pollution Prevention

- Use dry cleaning methods whenever practical for surface cleaning activities.
- Use the least toxic materials available (e.g. water based paints, gels or sprays for graffiti removal).

Suggested Protocols

Surface Cleaning

- Regularly broom (dry) sweep sidewalk, plaza and parking lot areas to minimize cleaning with water.
- Dry cleanup first (sweep, collect, and dispose of debris and trash) when cleaning sidewalks or plazas, then wash with or without soap.
- Block the storm drain or contain runoff when cleaning with water. Discharge wash water to landscaping or collect water and pump to a tank or discharge to sanitary sewer if allowed. (Permission may be required from local sanitation district.)

- Block the storm drain or contain runoff when washing parking areas, driveways or drive-throughs. Use absorbents to pick up oil; then dry sweep. Clean with or without soap. Collect water and pump to a tank or discharge to sanitary sewer if allowed. Street Repair and Maintenance.

Graffiti Removal

- Avoid graffiti abatement activities during rain events.
- Implement the procedures under Painting and Paint Removal in SC-70 Roads, Streets, and Highway Operation and Maintenance fact sheet when graffiti is removed by painting over.
- Direct runoff from sand blasting and high pressure washing (with no cleaning agents) into a dirt or landscaped area after treating with an appropriate filtering device.
- Plug nearby storm drain inlets and vacuum/pump wash water to the sanitary sewer if authorized to do so if a graffiti abatement method generates wash water containing a cleaning compound (such as high pressure washing with a cleaning compound). Ensure that a non-hazardous cleaning compound is used or dispose as hazardous waste, as appropriate.

Surface Removal and Repair

- Schedule surface removal activities for dry weather if possible.
- Avoid creating excess dust when breaking asphalt or concrete.
- Take measures to protect nearby storm drain inlets prior to breaking up asphalt or concrete (e.g. place hay bales or sand bags around inlets). Clean afterwards by sweeping up as much material as possible.
- Designate an area for clean up and proper disposal of excess materials.
- Remove and recycle as much of the broken pavement as possible to avoid contact with rainfall and stormwater runoff.
- When making saw cuts in pavement, use as little water as possible. Cover each storm drain inlet completely with filter fabric during the sawing operation and contain the slurry by placing straw bales, sandbags, or gravel dams around the inlets. After the liquid drains or evaporates, shovel or vacuum the slurry residue from the pavement or gutter and remove from site.
- Always dry sweep first to clean up tracked dirt. Use a street sweeper or vacuum truck. Do not dump vacuumed liquid in storm drains. Once dry sweeping is complete, the area may be hosed down if needed. Wash water should be directed to landscaping or collected and pumped to the sanitary sewer if allowed.

Concrete Installation and Repair

- Schedule asphalt and concrete activities for dry weather.

- Take measures to protect any nearby storm drain inlets and adjacent watercourses, prior to breaking up asphalt or concrete (e.g. place san bags around inlets or work areas).
- Limit the amount of fresh concrete or cement mortar mixed, mix only what is needed for the job.
- Store concrete materials under cover, away from drainage areas. Secure bags of cement after they are open. Be sure to keep wind-blown cement powder away from streets, gutters, storm drains, rainfall, and runoff.
- Return leftover materials to the transit mixer. Dispose of small amounts of hardened excess concrete, grout, and mortar in the trash.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile, or dispose in the trash.
- Protect applications of fresh concrete from rainfall and runoff until the material has dried.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- Wash concrete trucks off site or in designated areas on site designed to preclude discharge of wash water to drainage system.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide litter receptacles in busy, high pedestrian traffic areas of the community, at recreational facilities, and at community events.
- Cover litter receptacles and clean out frequently to prevent leaking/spillage or overflow.
- Clean parking lots on a regular basis with a street sweeper.

Training

- Provide regular training to field employees and/or contractors regarding surface cleaning and proper operation of equipment.
- Train employee and contractors in proper techniques for spill containment and cleanup.
- Use a training log or similar method to document training.

Spill Response and Prevention

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

Other Considerations

- Limitations related to sweeping activities at large parking facilities may include current sweeper technology to remove oil and grease.
- Surface cleaning activities that require discharges to the local sewering agency will require coordination with the agency.
- Arrangements for disposal of the swept material collected must be made, as well as accurate tracking of the areas swept and the frequency of sweeping.

Requirements

Costs

- The largest expenditures for sweeping and cleaning of sidewalks, plazas, and parking lots are in staffing and equipment. Sweeping of these areas should be incorporated into street sweeping programs to reduce costs.

Maintenance

Not applicable

Supplemental Information

Further Detail of the BMP

Community education, such as informing residents about their options for recycling and waste disposal, as well as the consequences of littering, can instill a sense of citizen responsibility and potentially reduce the amount of maintenance required by the municipality.

Additional BMPs that should be considered for parking lot areas include:

- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low concentrations.
- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.
- Structural BMPs such as storm drain inlet filters can be very effective in reducing the amount of pollutants discharged from parking facilities during periods of rain.

References and Resources

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

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.

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

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

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

Santa Clara Valley Urban Runoff Pollution Prevention Program. Maintenance Best Management Practices for the Construction Industry. Brochures: Landscaping, Gardening, and Pool; Roadwork and Paving; and Fresh Concrete and Mortar Application. June 2001.

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Plan. 2001. Municipal Activities Model Program Guidance. November.

Landscape Maintenance SC-73

Objectives

- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

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

Description

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

Approach

Pollution Prevention

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

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

Suggested Protocols

Mowing, Trimming, and Weeding

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

Planting

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

Waste Management

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

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

Irrigation

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

Fertilizer and Pesticide Management

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

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

Inspection

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

Training

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

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

Spill Response and Prevention

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

Other Considerations

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

Requirements

Costs

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

Maintenance

Not applicable

Supplemental Information

Further Detail of the BMP

Waste Management

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

Contractors and Other Pesticide Users

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

References and Resources

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

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

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

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

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

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

Drainage System Maintenance SC-74

Photo Credit: Geoff Brosseau

Objectives

- Contain
- Educate
- Reduce/Minimize

Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff that may contain certain pollutants. Maintaining catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis will remove pollutants, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

Targeted Constituents

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

Approach

Suggested Protocols

Catch Basins/Inlet Structures

- Municipal staff should regularly inspect facilities to ensure 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 SC-75 Waste Handling and Disposal).
- Clean catch basins, storm drain inlets, and other conveyance structures in high pollutant load areas just 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.
- Record the amount of waste collected.
- 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 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 of. Do not dewater near a storm drain or stream.
- Except for small communities with relatively few catch basins that may be cleaned manually, most municipalities will require mechanical cleaners such as eductors, vacuums, or bucket loaders.

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 flushed effluent and pump to the sanitary sewer for treatment.

Pump Stations

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.
- Do not allow discharge from cleaning a storm drain pump station or other facility to reach the storm drain system.
- Conduct quarterly routine maintenance at each pump station.
- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.
- Sample collected sediments to determine if landfill disposal is possible, or illegal discharges in the watershed are occurring.

Open Channel

- Consider modification of storm channel characteristics to improve channel hydraulics, to increase pollutant removals, and to 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

- During routine maintenance of conveyance system and drainage structures field staff should look for evidence of illegal discharges or illicit connections:
  - 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 up gradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
  - Once the origin of flow is established, require illicit discharger to eliminate the discharge.
- 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.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Illegal Dumping

- Regularly inspect and clean up hot spots and other storm drainage areas 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.

- The State Department of Fish and Game has a hotline for reporting violations called Cal TIP (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.

Training

- Train crews in proper maintenance activities, including record keeping and disposal.
- Only properly trained individuals are allowed to handle hazardous materials/wastes.
- Train municipal employees from all departments (public works, utilities, street cleaning, parks and recreation, industrial waste inspection, hazardous waste inspection, sewer maintenance) to recognize and report illegal dumping.
- Train municipal employees and educate businesses, contractors, and the general public in proper and consistent methods for disposal.
- Train municipal staff regarding non-stormwater discharges (See SC-10 Non-Stormwater Discharges).

Spill Response and Prevention

- Refer to SC-11, 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

- Cleanup 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 disposal of flushed effluent to sanitary sewer may be prohibited in some areas.
- Regulations may include adoption of substantial penalties for illegal dumping and disposal.
- Municipal codes should include sections prohibiting the discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.
- Private property access rights may be needed to track illegal discharges up gradient.

- Requirements of municipal ordinance authority for suspected source verification testing for illicit connections necessary for guaranteed rights of entry.

Requirements

Costs

- An aggressive catch basin cleaning program could require a significant capital and O&M budget. A careful study of cleaning effectiveness should be undertaken before increased cleaning is implemented. Catch basin cleaning costs are less expensive if vacuum street sweepers are available; cleaning catch basins manually can cost approximately twice as much as cleaning the basins with a vacuum attached to a sweeper.

- 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. Encouraging reporting of illicit discharges by employees can offset costs by saving expense on inspectors and directing resources more efficiently. Some programs have used funds available from "environmental fees" or special assessment districts to fund their illicit connection elimination programs.

Maintenance

- Two-person teams may be required to clean catch basins with vactor trucks.

- Identifying illicit discharges requires teams of at least two people (volunteers can be used), plus administrative personnel, depending on the complexity of the storm sewer system.

- Arrangements must be made for proper disposal of collected wastes.

- Requires technical staff to detect and investigate illegal dumping violations, and to coordinate public education.

Supplemental Information

Further Detail of the BMP

Storm Drain flushing

Sanitary sewer flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in sanitary sewer systems. The same principles that make sanitary sewer flushing effective can be used to flush storm drains. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as to an open channel, to another point where flushing will be initiated, or over to the sanitary sewer and on to the treatment facilities, thus preventing re-suspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. The 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, releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce the impacts of stormwater pollution, a second inflatable device, placed well downstream, may be used to re-collect 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 re-collect 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 percent for organics and 55-65 percent 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 drain flushing.

Flow Management

Flow management has been one of the principal motivations for designing urban stream corridors in the past. Such needs may or may not be compatible with the stormwater quality goals in the stream corridor.

Downstream flood peaks can be suppressed by reducing through flow velocity. This can be accomplished by reducing gradient with grade control structures or increasing roughness with boulders, dense vegetation, or complex banks forms. Reducing velocity correspondingly increases flood height, so all such measures have a natural association with floodplain open space. Flood elevations laterally adjacent to the stream can be lowered by increasing through flow velocity.

However, increasing velocity increases flooding downstream and inherently conflicts with channel stability and human safety. Where topography permits, another way to lower flood elevation is to lower the level of the floodway with drop structures into a large but subtly excavated bowl where flood flows we allowed to spread out.

Stream Corridor Planning

Urban streams receive and convey stormwater flows from developed or developing watersheds. Planning of stream corridors thus interacts with urban stormwater management programs. If local programs are intended to control or protect downstream environments by managing flows delivered to the channels, then it is logical that such programs should be supplemented by management of the materials, forms, and uses of the downstream riparian corridor. Any proposal for steam alteration or management should be investigated for its potential flow and stability effects on upstream, downstream, and laterally adjacent areas. The timing and rate of flow from various tributaries can combine in complex ways to alter flood hazards. Each section of channel is unique, influenced by its own distribution of roughness elements, management activities, and stream responses.

Flexibility to adapt to stream features and behaviors as they evolve must be included in stream reclamation planning. The amenity and ecology of streams may be enhanced through the landscape design options of 1) corridor reservation, 2) bank treatment, 3) geomorphic restoration, and 4) grade control.

Corridor reservation - Reserving stream corridors and valleys to accommodate natural stream meandering, aggradation, degradation, and over bank flows allows streams to find their own form and generate less ongoing erosion. In California, open stream corridors in recent urban developments have produced recreational open space, irrigation of streamside plantings, and the aesthetic amenity of flowing water.

Bank treatment - The use of armoring, vegetative cover, and flow deflection may be used to influence a channel's form, stability, and biotic habitat. To prevent bank erosion, armoring can be done with rigid construction materials, such as concrete, masonry, wood planks and logs, riprap, and gabions. Concrete linings have been criticized because of their lack of provision of biotic habitat. In contrast, riprap and gabions make relatively porous and flexible linings. Boulders, placed in the bed reduce velocity and erosive power.

Riparian vegetation can stabilize the banks of streams that are at or near a condition of equilibrium. Binding networks of roots increase bank shear strength. During flood flows, resilient vegetation is forced into erosion-inhibiting mats. The roughness of vegetation leads to lower velocity, further reducing erosive effects. Structural flow deflection can protect banks from erosion or alter fish habitat. By concentrating flow, a deflector causes a pool to be scoured in the bed.

Geomorphic restoration – Restoration refers to alteration of disturbed streams so their form and behavior emulate those of undisturbed streams. Natural meanders are retained, with grading to gentle slopes on the inside of curves to allow point bars and riffle-pool sequences to develop. Trees are retained to provide scenic quality, biotic productivity, and roots for bank stabilization, supplemented by plantings where necessary.

A restorative approach can be successful where the stream is already approaching equilibrium. However, if upstream urbanization continues new flow regimes will be generated that could disrupt the equilibrium of the treated system.

Grade Control - A grade control structure is a level shelf of a permanent material, such as stone, masonry, or concrete, over which stream water flows. A grade control structure is called a sill, weir, or drop structure, depending on the relation of its invert elevation to upstream and downstream channels.

A sill is installed at the preexisting channel bed elevation to prevent upstream migration of nick points. It establishes a firm base level below which the upstream channel can not erode.

A weir or check dam is installed with invert above the preexisting bed elevation. A weir raises the local base level of the stream and causes aggradation upstream. The gradient, velocity, and erosive potential of the stream channel are reduced. A drop structure lowers the downstream invert below its preexisting elevation, reducing downstream gradient and velocity. Weirs and drop structure control erosion by dissipating energy and reducing slope velocity.

When carefully applied, grade control structures can be highly versatile in establishing human and environmental benefits in stabilized channels. To be successful, application of grade control structures should be guided by analysis of the stream system both upstream and downstream from the area to he reclaimed.

Examples

The California Department of Water Resources began the Urban Stream Restoration Program in 1985. The program provides grant funds to municipalities and community groups to implement stream restoration projects. The projects reduce damages from streambank aid watershed instability arid floods while restoring streams' aesthetic, recreational, and fish and wildlife values.

In Buena Vista Park, upper floodway slopes are gentle and grassed to achieve continuity of usable park land across the channel of small boulders at the base of the slopes.

The San Diego River is a large, vegetative lined channel, which was planted in a variety of species to support riparian wildlife while stabilizing the steep banks of the floodway.

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