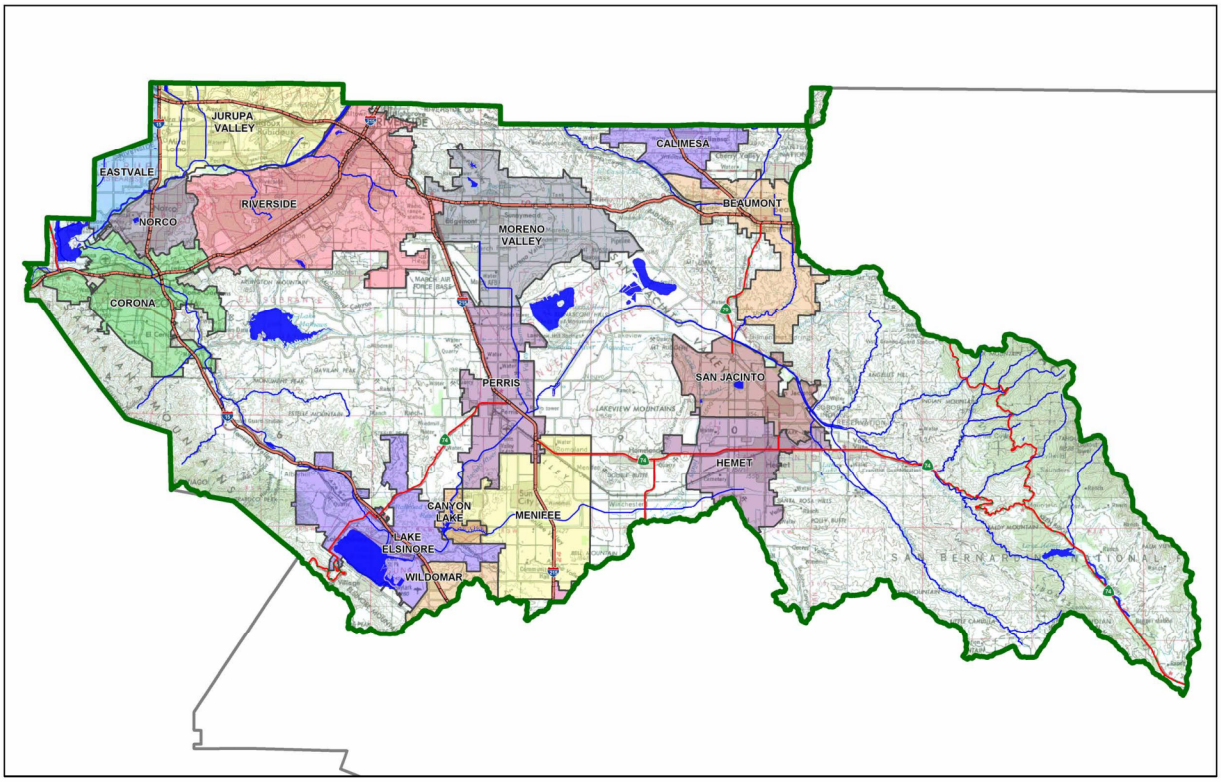
Project Specific Water Quality Management Plan

*Project located within the **Santa Ana Watershed** Region of Riverside County*

Project Title: Highland Grove IV Tract 38927

Development No:

Design Review/Case No: TTM38927



Contact Information:
Prepared for:
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☒ **Preliminary**
☐ **Final**

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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) for the TTM 38927 Project has been prepared for **PULTE HOME CORPORATION**, and prepared by Adkan Engineers, Richard Reaves, Senior Project Manager.

This WQMP is intended to comply with the requirements of the unincorporated area of the County of Riverside which includes the requirement for the preparation and implementation of a Project-Specific WQMP.

The undersigned, while owning the property/project described in the preceding paragraph, shall be responsible for the implementation and funding of this WQMP and will ensure that this WQMP is amended as appropriate to reflect up-to-date conditions on the site. In addition, the property owner accepts responsibility for interim operation and maintenance of Stormwater BMPs until such time as this responsibility is formally transferred to a subsequent owner. This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party (or parties) having responsibility for implementing portions of this WQMP. At least one copy of this WQMP will be maintained at the project site or project office in perpetuity. The undersigned is authorized to certify and to approve implementation of this WQMP. The undersigned is aware that implementation of this WQMP is enforceable under the County of Riverside Water Quality Ordinance.

"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."

Signature	Date
Owner	President

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
Mitch Adkison	Project Manager
Preparer's Printed Name	Preparer's Title/Position

Preparer's Licensure:

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Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Residential
Planning Area:	Lake Matthews/Woodcrest Area Plan
Community Name:	Highland Grove IV
Development Name:	TTM 38927
PROJECT LOCATION	
Latitude & Longitude (DMS): 33° 51' 31.68'' N, 117° 25' 40.44'' W	
Project Watershed and Sub-Watershed: Temescal Creek Reach 1 to Santa Ana River Reach 3 – Via Arlington Channel	
APN(s): 270-070-001, 270-160-004, 270-060-009, 270-060-005, 270-070-002, 270-060-016	
Map Book and Page No.: TB Page: 745 – Grid: B7	
*Note: Project drains to Temescal Creek Reach 1B to Temescal Creek Reach 1A.	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	R-1-10,000
Proposed or Potential SIC Code(s)	1521 SFR
Area of Impervious Project Footprint (SF)	1,301,022 SF
Total Area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	1,301,022 SF
Does the project consist of offsite road improvements?	☒ Y ☐ N
Does the project propose to construct unpaved roads?	☐ Y ☒ N
Is the project part of a larger common plan of development (phased project)?	☒ Y ☐ N
EXISTING SITE CHARACTERISTICS	
Total area of existing Impervious Surfaces within the project limits (SF)	283,188
Is the project located within any MSHCP Criteria Cell?	☐ Y ☒ N
If so, identify the Cell number:	
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)	
What is the Water Quality Design Storm Depth for the project?	0.51

A.1 Maps and Site Plans

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

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

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

A.2 Identify Receiving Waters

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

Table A.1 Identification of Receiving Waters

Receiving Waters	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
On-site Storm Drain System	N/A	N/A	Start
Temescal Creek – Reach 1 Via Arlington Channel	N/A	N/A	7.0 mi
Santa Ana River – Reach 3	Copper, Lead, Indicator Bacteria	Warm Fresh Water Habitat, Water Contact Recreation	RARE
Prado Basin	Ph	Warm Fresh Water Habitat	RARE
Additional Downstream Reaches to Pacific Ocean (outside of "proximate" project influence) ***Note: Project drains to Temescal Creek Reach 1B to Temescal Creek Reach 1A.**			

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

Table A.2 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Wildlife, 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

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

Section B: Optimize Site Utilization (LID Principles)

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

Site Optimization

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

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

Yes, the site historic existing drainage patterns will be preserved. All proposed runoff from the site will drain into one major drainage area at the North end of the site.

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

Yes, the surrounding existing vegetation as seen on the WQMP site map has been identified and protected as open space areas. It is an inherent design concept seen throughout the Master Planned Community in an effort to preserve open space and sensitive plant habitats.

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

Yes, a large amount of natural open space areas have primarily been preserved. As such, the natural infiltration characteristics and capacity of these areas is considered preserved.

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

Yes, within the development envelope, street widths were minimized to the acceptable County standards and many of the sidewalks are reduced in width based on a planted parkway between the sidewalk and curb face (sidewalks without landscaped parkways and adjacent to curbs are wider for public safety purposes). Additionally, landscaped parkways between the sidewalks and curb allows for runoff across the sidewalks to be slowed and partially infiltrated when introduced to vegetated landscaped parkways.

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

Yes, homes drain to side yard swales, sidewalks have green belt parkways between them and the street, and over 92 percent of the site drains to biotreatment BMP's prior to discharge from the site. Including various pervious areas throughout the site allows for the overarching water quality concept to "slow" the flows, "spread" them out and "soak" them in.

Section C: Delineate Drainage Management Areas (DMAs)

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

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)[1]	Area (Sq. Ft.)	DMA Type
D 1.1	Concrete & Asphalt	907,783	D
D 1.2	Mixed Surface Types	2,163,061	D
D 1.3	Landscape	145,626	D
D 1.4	Natural (C Soil)	86,685	D
D 2.1	Concrete & Asphalt	186,148	D
D 2.2	Mixed Surface Types	457,172	D
D 2.3	Landscape	40,031	D
D 2.4	Natural (C Soil)	149,516	D

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

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

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
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	Runoff factor	Product	DMA name /ID	Area (square feet)	Ratio
	[A]		[B]	[C] = [A] x [B]		[D]	[C]/[D]
N/A							

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

DMA Name or ID	BMP Name or ID
D 1.1	Extended Detention Basin A
D 1.2	Extended Detention Basin A
D 1.3	Extended Detention Basin A
D 1.4	Extended Detention Basin A
D 2.1	Extended Detention Basin B
D 2.2	Extended Detention Basin B
D 2.3	Extended Detention Basin B
D 2.4	Extended Detention Basin B

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

Section D: Implement LID BMPs

D.1 Infiltration Applicability

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

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

Geotechnical Report

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

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

Infiltration Feasibility

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

Table D.1 Infiltration Feasibility

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

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

D.2 Harvest and Use Assessment

Please check what applies*:*

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

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

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

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

Reclaimed water will be used in the park sites and landscaped areas which lessen the demand for harvest rainwater, therefore harvest and use will not be used on this project.

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 Committee 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	
D 1.1	☐	☐	☐	☒	☐
D 1.2	☐	☐	☐	☒	☐
D 1.3	☐	☐	☐	☒	☐
D 1.4	☐	☐	☐	☒	☐
D 2.1	☐	☐	☐	☒	☐
D 2.2	☐	☐	☐	☒	☐
D 2.3	☐	☐	☐	☒	☐
D 2.4	☐	☐	☐	☒	☐

It should be noted that biotreatment is being utilized in lieu of bioretention because of the overall acreage of the project. Bioretention would typically be utilized in area where infiltration is not feasible, however bioretention DMA's are limited to 10 acres for their effectivity. Additionally, the HCOC's required for the project require mitigation of the 100 year storm events (1, 3, 6, and 24 hour) as required by Riverside County Flood Control to eliminate any potential impacts to the downstream Harrison Dam. Utilizing a bioretention system as a detention facility for a project with a large tributary drainage acreage requires ponding in excess of 6" and results in increased maintenance and concerns of damage to the bioretention facilities given the large storm volumes and flow rates expected. Extended Detention Basins (EDBS), utilizing biotreatment are being proposed for this project as the most effective BMP available for treatment given the inability to infiltrate, having DMA's in excess of 10 acres, being able to utilizing the BMP to mitigate the HCOC's, and to reduce the overall number of BMP's in turn reducing overall maintenance and repair costs burdened by CFD for the perpetuity of the project.

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 Committee. Utilize the worksheets found in the LID BMP Design Handbook or consult with your Committee 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	***Extended Detention Basin A***		
	[A]		[B]	[C]	[A] x [C]			
D 1.1	*907,783*	*Concrete/Asphalt*	*1*	*0.89*	*809,742.4*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
D 1.2	*2,163,061*	*Mixed Surface Types*	*.55*	*0.37*	*805,739.7*			
D 1.3	*145,626*	*Ornamental Landscaping*	*0.1*	*0.11*	*16,085.6*			
D 1.4	*86,685*	*Natural (C Soil)*	*0.3*	*0.23*	*19,518.5*			
	3,303,155	***Total***			**1,651,086.2**	**0.51**	***70,171.2***	***67,527***

Table D.4 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	***Extended Detention Basin B***		
	[A]		[B]	[C]	[A] x [C]			
D 2.1	*186,251*	*Concrete/Asphalt*	*1*	*0.89*	*166,044.0*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
D 2.2	*457.172*	*Mixed Surface Types*	*.55*	*0.37*	*170,296.5*			
D 2.3	*40,031*	*Ornamental Landscaping*	*0.1*	*0.11*	*4,421.7*			
D 2.4	*149,516*	*Natural (C Soil)*	*0.1*	*0.11*	*33,665.9*			
	832,867	***Total***			**374,428.1**	**0.51**	***15,913.2***	***264,104***

[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 Committee). Check one of the following Boxes:

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

- *Or* -

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

E.1 Identify Pollutants of Concern

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

Table E.1 Potential Pollutants by Land Use Type

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

P = Potential
N = Not Potential
(1) A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected
(2) A potential Pollutant if the project includes uncovered parking areas; otherwise not expected
(3) A potential Pollutant is land use involving animal waste
(4) Specifically petroleum hydrocarbons
(5) Specifically solvents
(6) Bacterial indicators are routinely detected in pavement runoff

E.2 Treatment Control BMP Selection

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

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

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

Table E.2 Treatment Control BMP Selection

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

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

Section F: Hydromodification

F.1 Hydrologic Conditions of Concern (HCOC) Analysis

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

HCOC EXEMPTION 1: The Priority Development Project disturbs less than one acre. The Committee 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.

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

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

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

F.2 HCOC Mitigation

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

a. Additional LID BMPS are implemented onsite or offsite to mitigate potential erosion or habitat impacts as a result of HCOCs. This can be conducted by an evaluation of site-specific conditions utilizing accepted

professional methodologies published by entities such as the California Stormwater Quality Association (CASQA), the Southern California Coastal Water Research Project (SCCRWP), or other Co-Permittee approved methodologies for site-specific HCOC analysis.

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

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

Condition C is being met. The project site is mimicking the pre-development hydrograph with the post-development hydrograph. It should be noted the project site has the inability to infiltrate given the soil condition being dense and mostly of granitic bedrock. Given the lack infiltration, excess volume generated by the additional impervious area will be released downstream and cannot be contained on-site. Prior to the release of the excess volume the expected storm flows will be detained within the proposed extended detention basin and release at a rate that does not exceed the pre-development condition. Concerns raised by Riverside County Flood Control of the downstream facilities require the mitigation of the 2-,5-,10-, and 100-year storm events for the 1-,3-,6- and 24-year hour durations. The post-development flow rates were mitigated to not exceed the pre-development flow rate. The results of the 2-year storm event are shown below, hydrographs and detention routings are shown within Appendix 7. The remaining storms can be found in the project hydrology study.

Table F.1 Hydrologic Conditions of Concern Summary

DMA	Existing Runoff Volume (ac.ft.)	Proposed Runoff Volume (ac.ft.)	Volume Difference (ac.ft.)	Existing Runoff Flow Rate (cfs)	Proposed Runoff Volume (ac.ft.)	Incremental Increase Mitigated?
DMA 1 (EDB A) 2yr24hr	1.158	5.673	4.515	2.4	2.3	Yes
DMA 2 (EDB B) 2yr24hr	0.292	1.398	1.106	0.6	0.6	Yes

Section G: Source Control BMPs

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

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

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

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

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

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
• On-site storm drain-inlets	Locations of inlets Mark all inlets with the words "Only Rain Down the Storm Drain" or similar.	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. 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."
Landscape/outdoor pesticide use	Landscaping plans to include: preservation of native trees, design for minimal irrigation, fertilizers & pesticides	Maintenance staff education and prohibitions
Sidewalks & Streets	N/A	Sweep regularly and prevent litter from accumulating (no cleaning agents or degreasers discharging to storm drain system).

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)
EDB A	Extended Detention Basin A	TTM 38927
EDB B	Extended Detention Basin B	TTM 38927

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

Section I: Operation, Maintenance and Funding

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

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

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

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

Maintenance Mechanism:

Community Facilities District (Operated by Riverside County Transportation Department)

Riverside County Flood Control District

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

☐ Y ☒ N

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

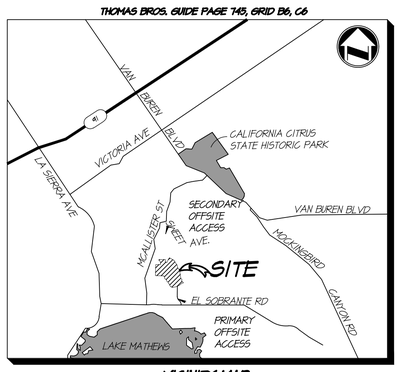
Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map

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

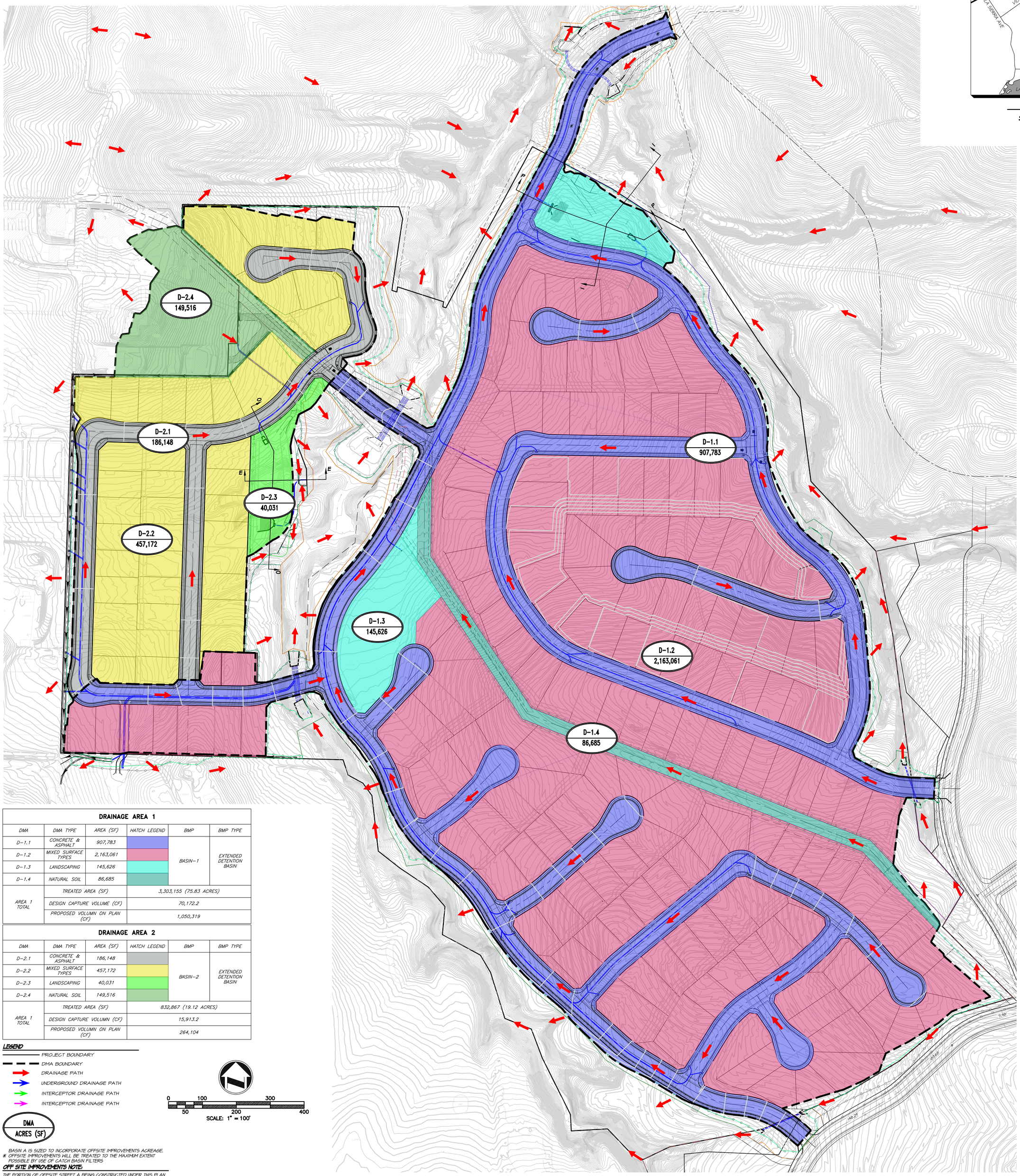
TTM 38927
BMP MAP
HIGHLAND GROVE IV

THOMAS BROS. GUIDE PAGE 745, GRID B6, C6



VICINITY MAP
(NTS)

SEC.32 NE T.3S. R.5W



DRAINAGE AREA 1					
DMA	DMA TYPE	AREA (SF)	HATCH LEGEND	BMP	BMP TYPE
D-1.1	CONCRETE & ASPHALT	907,783		BASIN-1	EXTENDED DETENTION BASIN
D-1.2	MIXED SURFACE TYPES	2,163,061			
D-1.3	LANDSCAPING	145,626			
D-1.4	NATURAL SOIL	86,685			
AREA 1 TOTAL	TREATED AREA (SF)	3,303,155 (75.83 ACRES)			
	DESIGN CAPTURE VOLUME (CF)	70,172.2			
	PROPOSED VOLUMN ON PLAN (CF)	1,050,319			

DRAINAGE AREA 2					
DMA	DMA TYPE	AREA (SF)	HATCH LEGEND	BMP	BMP TYPE
D-2.1	CONCRETE & ASPHALT	186,148		BASIN-2	EXTENDED DETENTION BASIN
D-2.2	MIXED SURFACE TYPES	457,172			
D-2.3	LANDSCAPING	40,031			
D-2.4	NATURAL SOIL	149,516			
AREA 1 TOTAL	TREATED AREA (SF)	832,867 (19.12 ACRES)			
	DESIGN CAPTURE VOLUMN (CF)	15,913.2			
	PROPOSED VOLUMN ON PLAN (CF)	264,104			

LEGEND

- PROJECT BOUNDARY
- DMA BOUNDARY
- DRAINAGE PATH
- UNDERGROUND DRAINAGE PATH
- INTERCEPTOR DRAINAGE PATH
- INTERCEPTOR DRAINAGE PATH

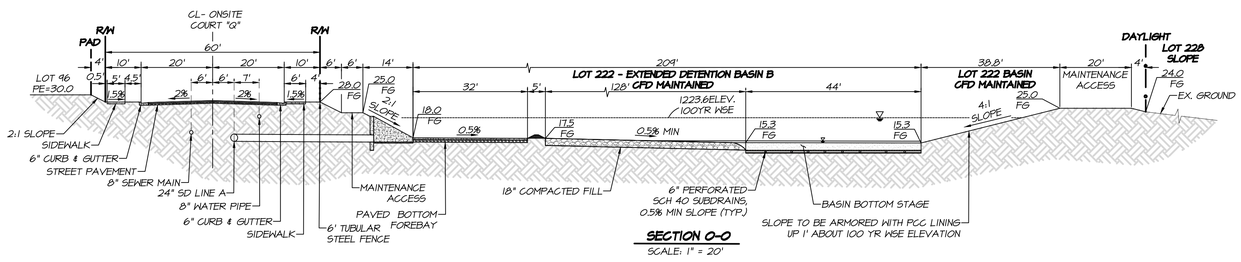
DMA
ACRES (SF)

0 100 300
50 200 400
SCALE: 1" = 100'

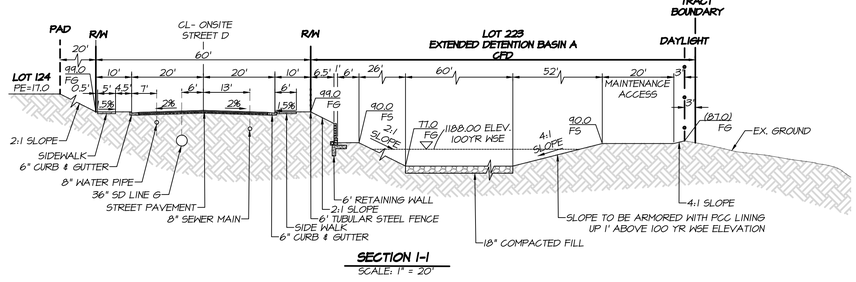
BASIN A IS SIZED TO INCORPORATE OFFSITE IMPROVEMENTS ACREAGE.
* OFFSITE IMPROVEMENTS WILL BE TREATED TO THE MAXIMUM EXTENT POSSIBLE BY USE OF CATCH BASIN FILTERS

OFF SITE IMPROVEMENTS NOTE:

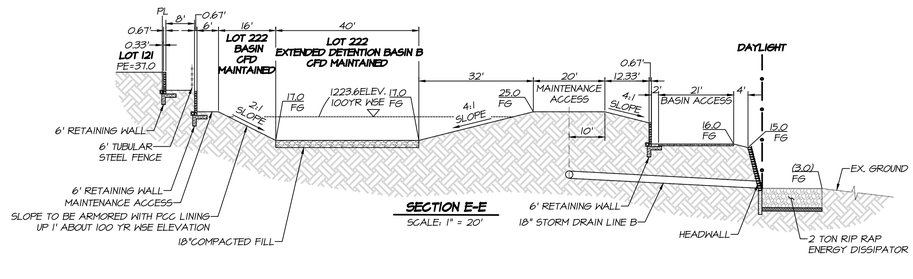
THE PORTION OF OFFSITE STREET A BEING CONSTRUCTED UNDER THIS PLAN HAS BEEN INCLUDED IN THE WQMP CALCULATIONS. ALL REMAINING OFFSITE STREETS ARE BEING CONSTRUCTED UNDER TRACT 38605 AND WILL BE IN PLACE PRIOR TO THE DEVELOPMENT OF THIS TRACT.



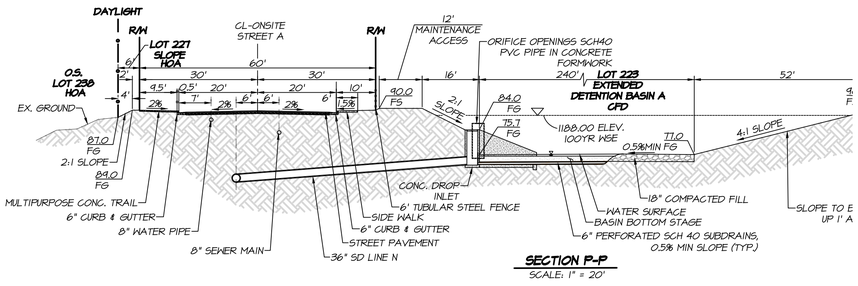
SECTION O-O
SCALE: 1" = 20'



SECTION I-I
SCALE: 1" = 20'



SECTION E-E
SCALE: 1" = 20'



SECTION P-P
SCALE: 1" = 20'

TENTATIVE TRACT MAP 38427
BMP MAP
PREPARATION DATE: AUGUST 2024
REVISION DATE: APRIL 2025

PLAN PREPARED BY:
adkan ENGINEERS
Civil Engineering Surveying Planning
6879 Airport Drive, Riverside, CA 92504
Tel:(951) 688-0241 · Fax:(951) 688-0599

R 07 W | R 06 W | R 05 W | R 04 W | R 03 W | R 02 W | R 01 W | R 01 E | R 02 E | R 03 E | R 04 E | R 05 E

T 01 S | T 02 S | T 03 S | T 04 S | T 05 S | T 06 S | T 07 S | T 08 S

PROJECT SITE = 0.55

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

Santa Ana River Watershed

Santa Margarita Watershed

Rain Gage Locations

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

Isohyetal Map for the 85th Percentile 24 hour Storm Event

July 2011

RECEIVING WATERS MAP

Lake Evans

Santa Ana River, Reach 3

Anza Park Drain

La Sierra Channel

Temescal Creek, Reach 1

Arlington Channel

Site

Mockingbird Reservoir

Lake Matthews

Sycamore Creek

Main St

215 Fwy

60/215 Fwy

3rd St

University Ave

14th St

RCC

Chicago Ave

UCR

Jurupa Ave

Central Ave

Arlington Ave

Madison St

La Sierra Ave

Magnolia Ave

91 Fwy

Tyler St

La Sierra Univ

Victoria Ave

Adams St

Washington St

Sycamore Canyon Park

60 Fwy

Alessandro Blvd

Trautwein Rd

215 Fwy

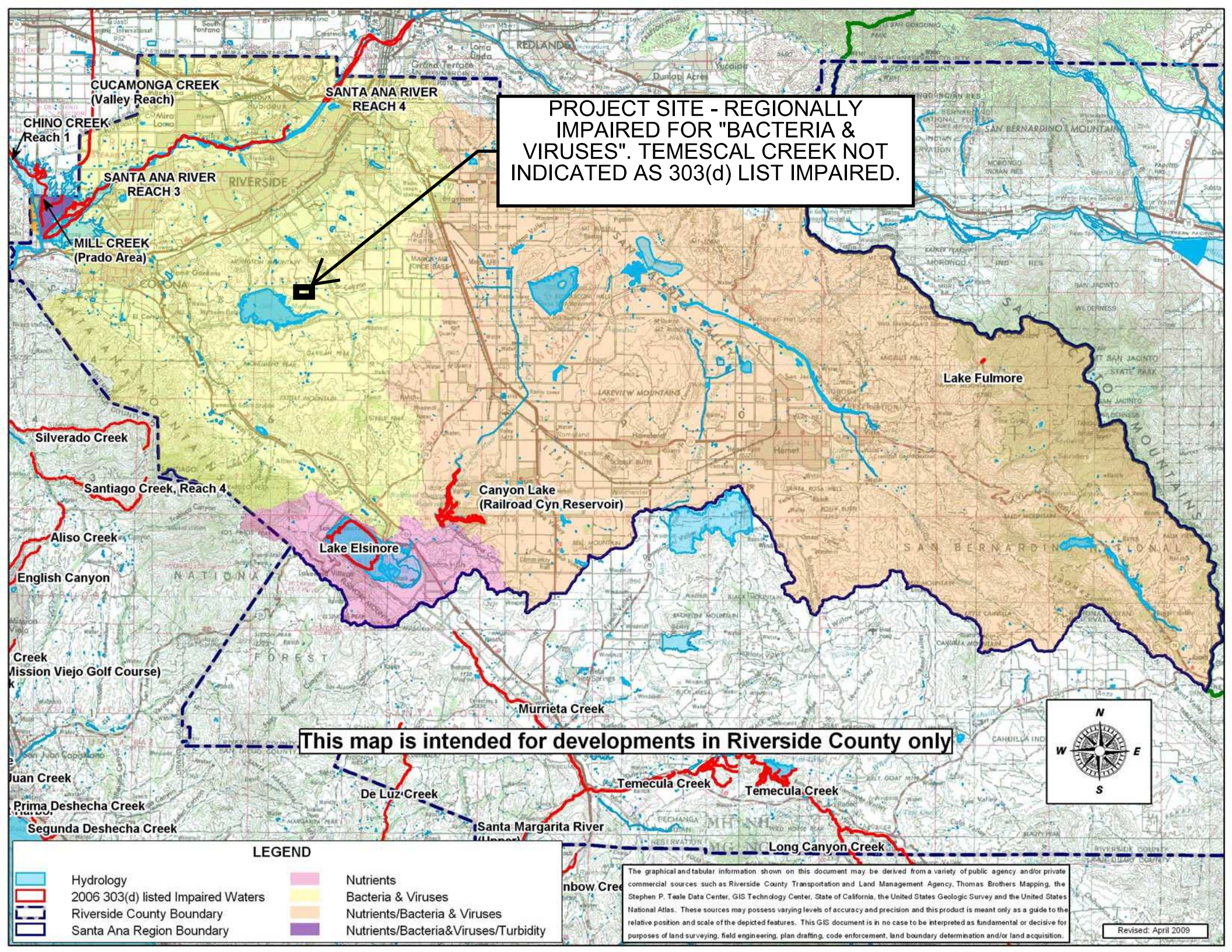
Van Buren Blvd

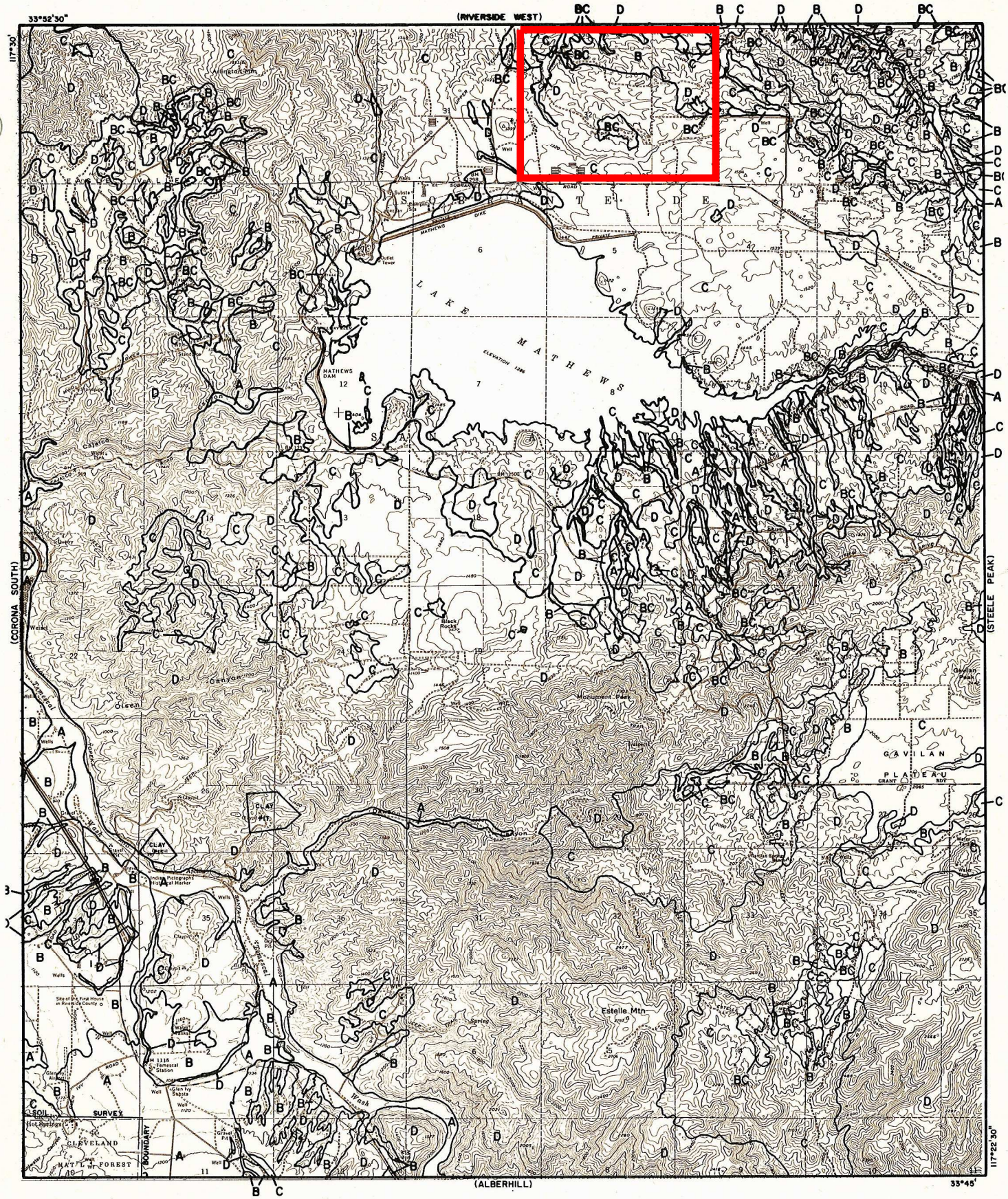
N

LEGEND

- Lake Evans to Santa Ana River, Reach 3
- Tequesquite Arroyo (Sycamore Creek) to Santa Ana River, Reach 3
- Anza Park Drain to Santa Ana River, Reach 3
- Santa Ana River, Reach 3
- Mockingbird Reservoir to Temescal Creek, Reach 1 to Santa Ana River, Reach 3 - via Arlington Channel
- Temescal Creek, Reach 1 to Santa Ana River, Reach 3 - via Arlington Channel
- Temescal Creek, Reach 1 to Santa Ana River, Reach 3 - via La Sierra Channel to Arlington Channel
- Outside City Limits
- San Jacinto Watershed

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PROJECT SITE - REGIONALLY IMPAIRED FOR "BACTERIA & VIRUSES". TEMESCAL CREEK NOT INDICATED AS 303(d) LIST IMPAIRED.
CUCAMONGA CREEK (Valley Reach)
SANTA ANA RIVER REACH 4
CHINO CREEK Reach 1
SANTA ANA RIVER REACH 3
MILL CREEK (Prado Area)
Lake Fulmore
Silverado Creek
Santiago Creek, Reach 4
Canyon Lake (Railroad Cyn Reservoir)
Aliso Creek
Lake Elsinore
English Canyon
Murrieta Creek
This map is intended for developments in Riverside County only
Temecula Creek
Temecula Creek
De Luz Creek
Prima Deshecha Creek
Segunda Deshecha Creek
Santa Margarita River
Long Canyon Creek
N
W
E
S
LEGEND
Hydrology
2006 303(d) listed Impaired Waters
Riverside County Boundary
Santa Ana Region Boundary
Nutrients
Bacteria & Viruses
Nutrients/Bacteria & Viruses
Nutrients/Bacteria&Viruses/Turbidity
The graphical and tabular information shown on this document may be derived from a variety of public agency and/or private commercial sources such as Riverside County Transportation and Land Management Agency, Thomas Brothers Mapping, the Stephen P. Teale Data Center, GIS Technology Center, State of California, the United States Geologic Survey and the United States National Atlas. These sources may possess varying levels of accuracy and precision and this product is meant only as a guide to the relative position and scale of the depicted features. This GIS document is in no case to be interpreted as fundamental or decisive for purposes of land surveying, field engineering, plan drafting, code enforcement, land boundary determination and/or land acquisition.
Revised: April 2009



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC&WCD

HYDROLOGY MANUAL

N

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR LAKE MATHEWS

PLATE C-1.28


Riverside Fwy
91
Indiana Ave
Magnolia Ave
Tyler St
Victoria Ave
Van Buren Boulevard
Mockingbird Reservoir
Van Buren Blvd
McAllister Pkwy
McAllister St
Mockingbird Canyon Rd
SITE
El Sobrante Rd
Lake Mathews
Cajalco Rd

Appendix 2: Construction Plans

Grading and Drainage Plans

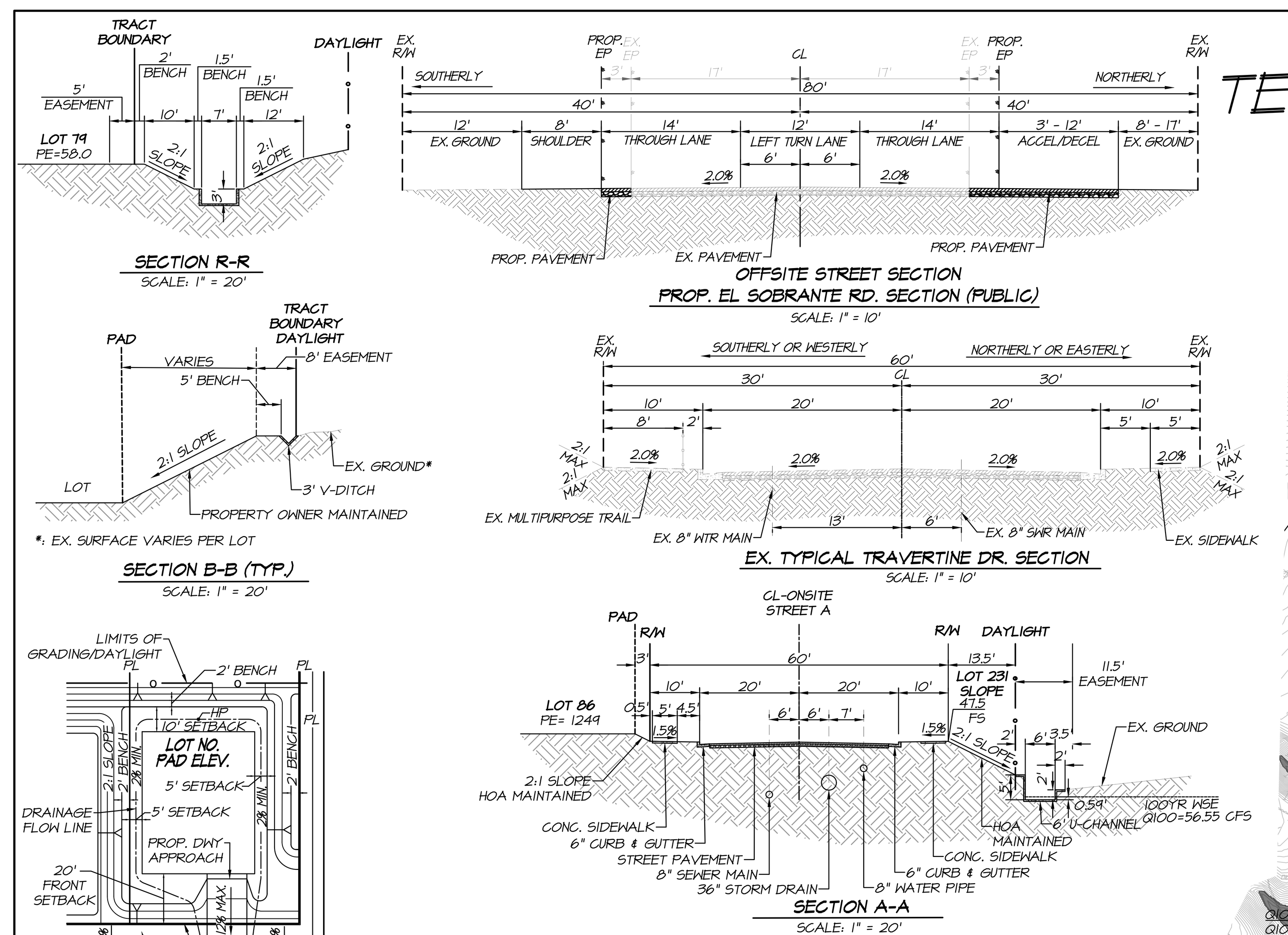
Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

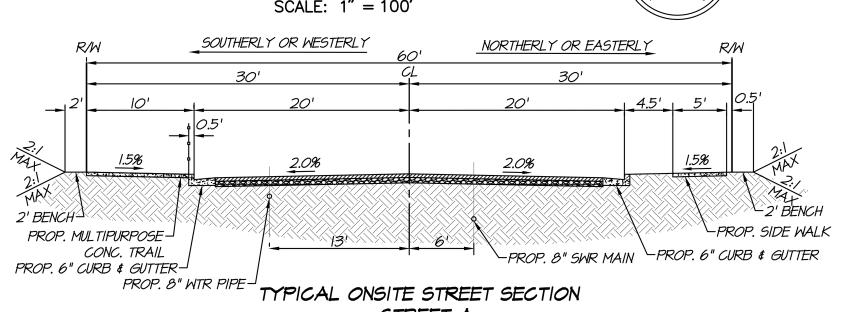
IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

TENTATIVE TRACT MAP 38927

SCHEDULE "A"







TYPICAL ONSITE STREET SECTION
STREET A
SCALE: 1" = 10'

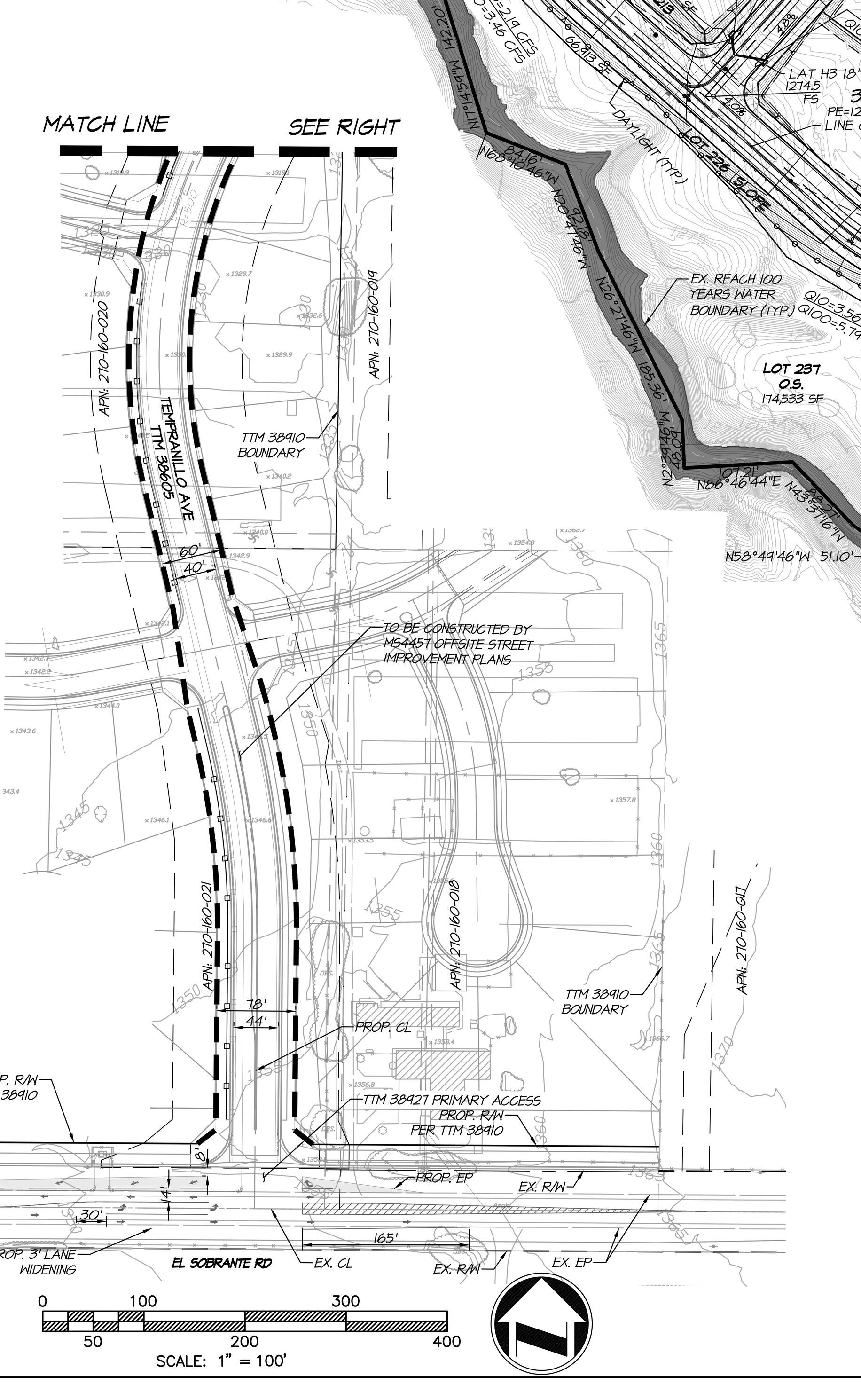
LOTS MATRIX TABLE

LOTS #	PAD SIZE (S.F.)	LOT SIZE (S.F.)
1	10,215	11,639
2	11,728	12,429
3	10,679	11,134
4	8,021	10,791
5	15,451	18,696
6	9,880	18,336
7	8,799	12,890
8	9,027	13,700
9	8,880	10,564
10	9,529	10,587
11	9,816	10,199
12	9,589	14,495
13	8,734	11,304
14	13,817	21,425
15	8,157	11,889
16	8,006	11,629
17	8,000	12,341
18	9,863	14,690
19	8,186	12,789
20	8,065	11,811
21	8,012	11,286
22	8,036	11,411
23	11,635	12,729
24	9,402	10,690
25	8,228	10,192
26	8,536	10,588
27	8,127	10,338
28	8,730	10,745
29	8,214	10,026
30	9,309	11,208
31	12,465	21,057
32	8,696	13,992
33	8,317	12,433
34	8,379	12,753
35	8,164	13,162
36	8,026	12,305
37	8,019	14,485
38	10,366	10,982
39	8,188	10,264
40	8,167	10,352
41	8,564	10,399
42	8,669	10,359
43	8,826	10,056
44	9,190	10,444
45	8,211	12,109
46	8,293	12,407
47	8,013	11,178
48	8,014	11,178
49	8,289	11,019
50	8,441	12,986
51	13,233	20,470
52	11,244	13,303
53	9,796	11,396
54	9,034	10,047

55	9,062	10,708
56	8,785	10,718
57	9,076	11,124
58	8,550	10,670
59	9,720	13,799
60	9,427	13,666
61	9,257	12,255
62	9,781	16,740
63	14,296	22,274
64	12,224	15,320
65	9,705	10,802
66	9,662	11,357
67	9,938	12,527
68	9,395	15,375
69	9,563	14,984
70	9,910	14,952
71	13,702	24,254
72	8,374	10,551
73	8,044	10,115
74	8,287	10,185
75	8,229	11,769
76	8,150	16,314
77	8,522	10,337
78	8,570	14,709
79	11,819	10,059
80	13,071	11,523
81	8,036	10,112
82	8,071	10,062
83	8,144	10,062
84	8,305	10,062
85	8,405	10,062
86	8,010	10,062
87	8,017	10,062
88	8,068	10,062
89	8,234	10,648
90	14,128	12,887
91	12,984	11,069
92	8,409	10,869
93	8,085	10,175
94	8,519	11,063
95	8,507	10,007
96	8,160	15,579
97	14,633	11,759
98	14,144	15,225
99	11,994	11,939
100	9,329	13,075
101	11,848	25,765
102	13,734	14,401
103	9,952	14,812
104	9,367	14,493
105	8,067	10,128
106	8,972	10,035
107	9,232	10,035
108	9,419	10,035
109	9,721	10,035
110	9,476	10,035

111	9,323	10,035
112	9,727	10,035
113	10,201	10,035
114	8,991	10,306
115	8,130	10,010
116	8,069	10,010
117	8,112	10,010
118	8,070	10,010
119	8,648	10,010
120	8,814	10,010
121	9,019	10,010
122	8,511	10,305
123	8,680	10,155
124	8,258	10,232
125	8,123	10,244
126	10,252	11,042
127	17,392	21,185
128	8,076	10,645
129	8,060	11,367
130	8,239	12,946
131	8,461	13,470
132	10,355	15,711
133	13,809	20,928
134	10,059	10,700
135	9,551	10,330
136	9,822	10,289
137	9,503	10,248
138	9,712	10,207
139	9,455	10,165
140	9,686	10,089
141	10,111	10,502
142	9,023	10,512
143	8,076	12,025
144	8,089	10,543
145	9,443	11,173
146	9,237	11,066
147	8,074	10,528
148	8,072	10,059
149	8,313	10,432
150	8,088	10,341
151	8,610	14,323
152	9,604	14,520
153	8,609	12,214
154	8,659	12,437
155	8,555	12,021
156	8,818	12,081
157	8,462	12,142
158	8,616	12,203
159	8,653	12,263
160	8,447	12,320
161	8,638	12,270
162	8,761	12,010
163	8,410	11,534
164	8,060	11,586
165	8,003	16,783
166	12,155	12,551

167	9,193	10,036
168	9,087	10,124
169	9,277	10,125
170	9,087	10,125
171	9,277	10,125
172	9,084	10,125
173	9,233	10,125
174	8,916	10,125
175	8,644	10,125
176	9,030	11,354
177	8,733	12,000
178	9,794	13,718
179	8,886	14,110
180	8,030	13,234
181	9,937	12,504
182	8,604	10,954
183	8,061	13,125
184	8,051	13,125
185	8,340	13,125
186	8,059	13,125
187	8,576	13,125
188	8,141	13,129
189	11,783	17,953
190	9,121	10,144
191	10,208	10,662
192	12,068	12,864
193	10,775	11,501
194	10,135	10,924
195	9,631	10,312
196	11,703	11,696
197	16,639	16,321
198	12,875	14,452
199	9,482	12,968
200	8,775	12,237
201	8,479	12,400
202	8,352	12,400
203	8,048	12,397
204	8,028	13,957
205	8,006	15,148
206	9,767	16,278



PROPERTY OWNERS / APPLICANT

270-070-001, 270-160-004, 270-060-009, 270-060-005
RJ El SOBRANTE
PO BOX 9,
SAN JUAN CAPISTRANO, CA 92693

270-070-002
MDC CARDEY LLC
28935 SAN TIMOTEO CANYON RD,
REDLANDS, CA 92373

270-060-016
IRONCLAD HOLDING LLC
17863 GRANDIS CT,
RIVERSIDE, CA 92503

REPRESENTATIVE/ENGINEER

adkan ENGINEERS
6879 AIRPORT DRIVE
RIVERSIDE, CA. 92504
951-688-0241

ASSESSORS PARCEL NUMBERS

270-070-001, 270-160-004, 270-060-009
270-060-005, 270-070-002, 270-060-016

UTILITY PURVEYORS

WATER:	W.M.W.D.
SEWER:	W.M.W.D.
GAS:	SOUTHERN CALIFORNIA GAS COMPANY
ELECTRICITY:	SOUTHERN CALIFORNIA EDISON
TELEPHONE:	SBC
SCHOOL:	RIVERSIDE UNIFIED SCHOOL DISTRICT
CATV:	CHARTER CABLE
SOLID WASTE:	WASTE MANAGEMENT

PROJECT DENSITY TABLE

PROJECT AREA:	4,861,186.0	111.6 AC.

ZONING/LAND USE

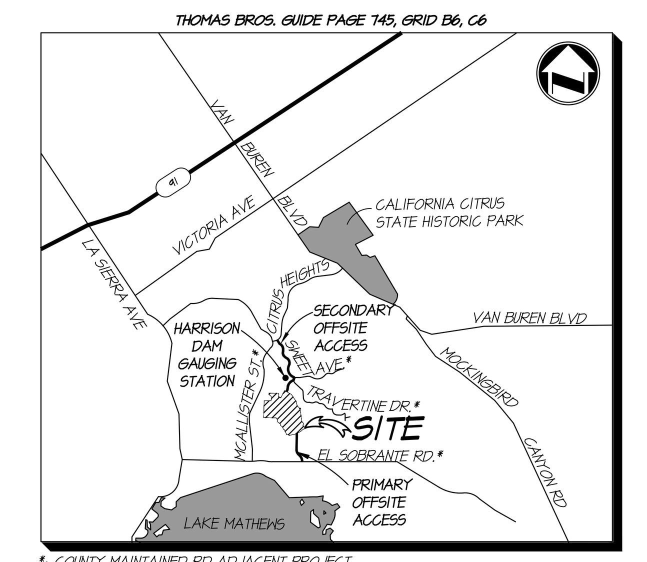
EXISTING ZONING:	A-1-10
PROPOSED ZONING:	R-1-10,000
EXISTING LANDUSE:	RC-VLDR & RC-LDR,

LEGEND

PROPERTY BOUNDARY
PROP. CURB & GUTTER
PROP. SWR MAIN & MH
PROP. WTR MAIN
PROP. SD PIPE
FLOW LINE
DG TRAIL FENCE
DAY LIGHT
SIGHT DISTANCE
TUBULAR STEEL FENCE

TC	TOP OF CURB
FL	FLOWLINE
FS	FINISHED SURFACE
PE	PAD ELEVATION
CB	CATCH BASIN
EP	EDGE PAVEMENT

THOMAS BROS. GUIDE PAGE 745, GRID B6, C6



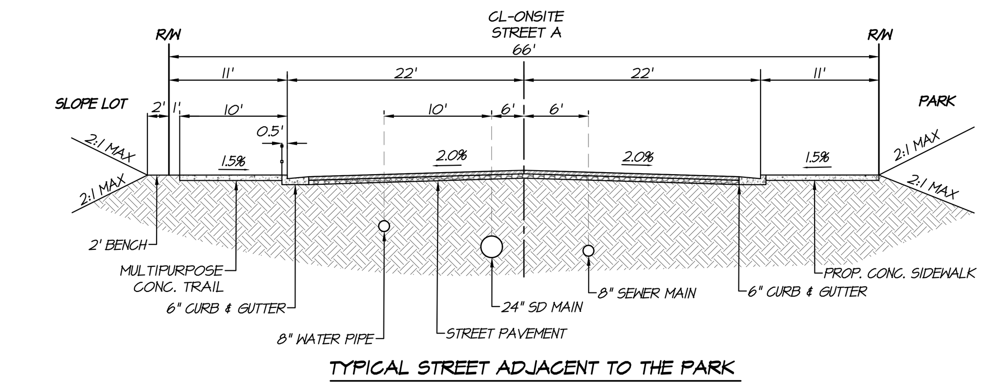
*: COUNTY MAINTAINED RD ADJACENT PROJECT

VICINITY MAP
(N.T.S.)

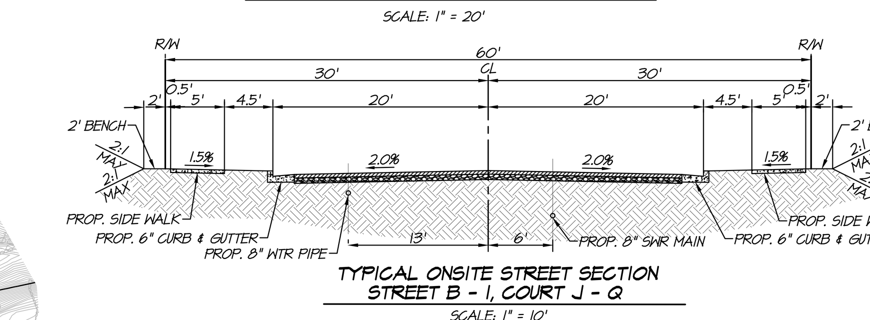
SEC.32 NE T.3S. R.5W

PROJECT NOTES

1. ALL IMPROVEMENTS SHALL BE PER SCHEDULE "A" SUBDIVISION ORDINANCE 460.
2. THOMAS BROS. COORDINATES: PG. 745 GRIDS B-6, C-6.
3. ALL CUT SLOPES WILL BE 2:1 MAX EXCEPT SHOWN, UNLESS OTHERWISE SPECIFIED AND APPROVED BY SOILS ENGINEER, AND FILL SLOPES 2:1 MAX.
4. NOT IN A FLOOD ZONE.
5. NOT SUBJECT TO LIQUEFACTION OR OTHER GEOLOGIC HAZARDS. SAID PROPERTY IS NOT IN ANY SPECIAL STUDIES ZONES.
6. SETBACKS OF SLOPES TO PROPERTY LINES SHALL CONFORM TO THE GREENTREE RANCH SPECIFIC PLAN STANDARD.
7. EXISTING CONTOUR LINES PER AERIAL PHOTOGRAMETRY, PREPARED BY INLAND AERIAL SURVEYS, INC. PERFORMED ON AUGUST 7, 2015.
8. THE SUBDIVIDER RESERVES THE RIGHT TO FILE MULTIPLE FINAL MAPS, PER SEC. 66456.1 OF THE STATE MAP ACT.
9. NO HAZARDOUS MATERIALS STORED ONSITE.
10. BUILDING SETBACKS OF PROPOSED RESIDENTIAL UNITS WILL CONFORM TO THE SETBACK REQUIREMENTS OF THE GREENTREE RANCH SPECIFIC PLAN.
11. THE HEIGHT OF PROPOSED RESIDENTIAL STRUCTURES WILL VARY DEPENDING ON WHETHER SAID HOUSING UNIT IS ONE OR TWO STORIES TALL - AND NOT IN EXCESS OF RESIDENTIAL ZONING STANDARDS.
12. TOTAL NUMBER OF LOTS: 206 RESIDENTIAL
    TOTAL GROSS ACREAGE: 111.6 ACRES
    TOTAL NET ACREAGE: 111.6 ACRES
    MIN. LOT SIZE: 10,000 SF.
    MIN. PAD SIZE: 8,000 SF.
    TOTAL NUMBER OF PARK AREAS: 1 (1.9± AC.)
    TOTAL HOA/CFD MAINTAINED SLOPES/BASIN: 27 (14.2± AC.)
    TOTAL NUMBER OF OPEN SPACE LOTS: 7 (14.0± AC.)
    PERMANENT DISTURBED ACREAGE (ONSITE): 99.21 AC.
    PERMANENT DISTURBED ACREAGE (OFFSITE): 2.50 AC.
13. LOT DIMENSIONS SHOWN HEREON INCLUDE DIMENSIONS TO STREET R/W
14. PROPERTY DOES NOT LIE WITHIN A COUNTY SERVICE AREA.
15. ALL PROPOSED STREETS ARE TO BE PUBLICLY MAINTAINED.
16. ALL PROPOSED PRIVATE DRAINAGE EASEMENTS ARE TO BE MAINTAINED BY THE HOA.
17. ALL EXISTING POWER POLES ON PROJECT SITE ARE TO BE RELOCATED UNDERGROUND.
18. NON BUILDABLE HOA MAINTAINED LOTS ARE CREATED DUE TO AN UNDERLYING EASEMENT THAT CANNOT BE VACATED.
19. ALL BASINS ARE TO BE FENCED AND MAINTAINED BY THE HOA/CFD. SEE EXHIBIT ON SHEET 2.
20. ALL TRAILS ARE TO BE CONSTRUCTED WITH CONCRETE SURFACE, UNLESS OTHERWISE SPECIFIED.
21. ALL EXISTING SEPTIC TANKS TO BE REMOVED PER SEPARATE PERMIT BY THE DEPARTMENT OF ENVIRONMENTAL HEALTH SEE PLAN FOR LOCATION.
22. ALL THE CUL DE SAC LENGTHS ARE NOT EXCEEDED 660'.
23. ALL THE STREET DESIGN FOLLOWED COUNTY OF RIVERSIDE STANDARDS, AND MEET THE FIRE TRUCK TURNING REQUIREMENTS.
24. ANY EXISTING WELLS, OWTS, AND/OR UST MUST BE DESTROYED UNDER PERMIT BY ENVIRONMENTAL HEALTH DEPARTMENT PRIOR TO GRADING FINAL.



TYPICAL STREET ADJACENT TO THE PARK
SCALE: 1" = 20'



TYPICAL ONSITE STREET SECTION
STREET B - I, COURT J - Q
SCALE: 1" = 10'

MAINTENANCE TABLE

LOTS #		PURPOSE	LOT SIZE (S.F.)	LOT SIZE (A.C.)	MAINTENANCE
207	15	DOWN SLOPE AT SIDE/REAR OF THE LOT ADJACENT TO THE STREET	2,165	2.8	HOA
208			3,116		
209			9,889		
210			1,338		
211			3,361		
212			4,687		
213			3,101		
214			1,922		
215			4,338		
216			3,985		
217			1,430		
218			8,411		
219			3,395		
220			47,913		
221			21,600		
222	2	BASIN	69,164	3.3	CFD
223			75,356		
224	1	PARK	82,348	1.9	HOA
225	10	SLOPE ADJACENT TO OPEN SPACE	39,412	7.6	HOA
226			66,913		
227			67,547		
228			92,626		
229			4,652		
230			13,326		
231			25,748		
232			5,497		
233			8,664		
234			6,444		
235	8	NON-DISTURBED OPEN SPACE	128,019	14.7	HOA/ CONSERVANCY
236			30,823		
237			174,533		
238			83,767		
239			108,075		
240			95,933		
241			13,042		
242			4,405		
–	17	ST A-I & CT J-Q	1,038,886	23.9	CFD

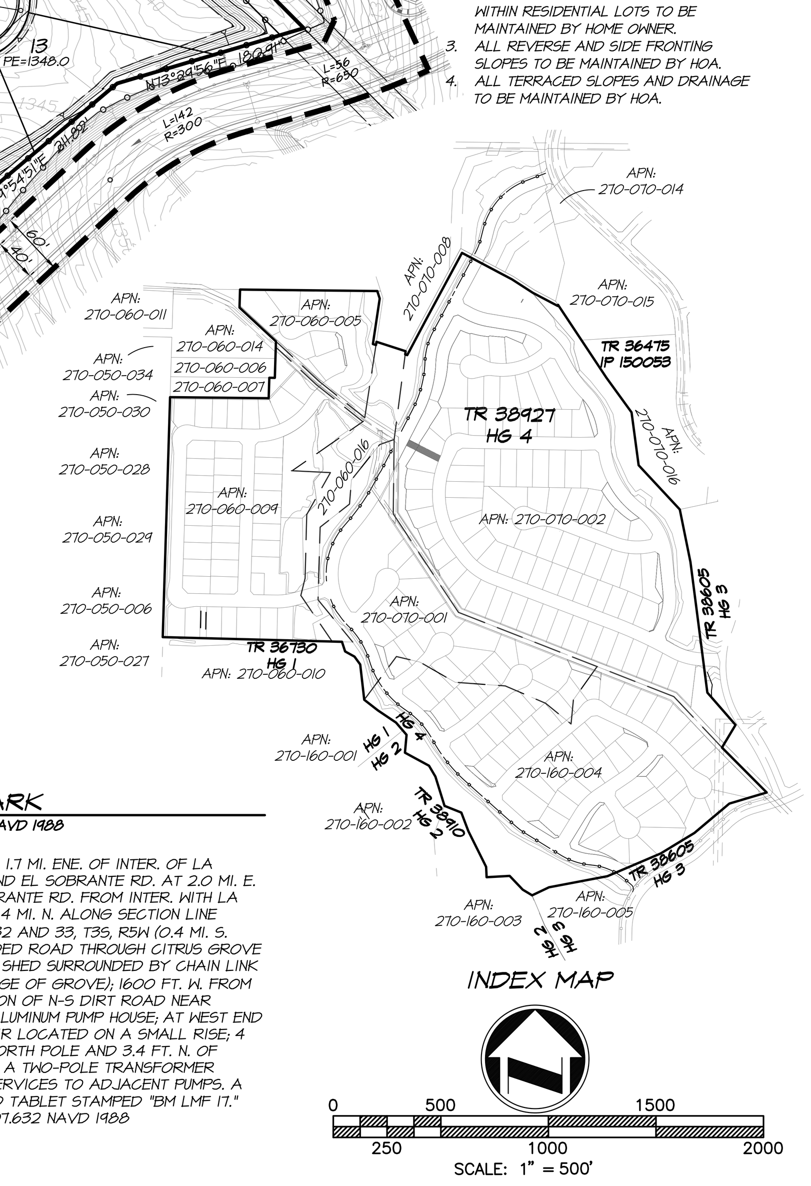
EARTHWORK QUANTITIES

CUT: 682,659 CY **FILL: 720,291 CY** NET: **11,623 CY**
STREETS: **49,255 CY** (CUT)

THE QUANTITY SHOWN ABOVE IS FOR DISCUSSION PURPOSES ONLY. 10% SHRINKAGE FACTORS ARE INCLUDED.

ENGINEER NOTE

1. THERE IS NO EX. STREET LIGHT.
2. ALL SLOPES LESS THAN 30' IN HEIGHT WITHIN RESIDENTIAL LOTS TO BE MAINTAINED BY HOME OWNER.
3. ALL REVERSE AND SIDE FRONTING SLOPES TO BE MAINTAINED BY HOA.
4. ALL TERRACED SLOPES AND DRAINAGE TO BE MAINTAINED BY HOA.



INDEX MAP
SCALE: 1" = 500'

BENCHMARK

ELEV. 1407.632 NAVD 1988

LMF-17

LAKE MATHEWS, 1.7 MI. ENE. OF INTER. OF LA SIERRA AVE. AND EL SOBRANTE RD. AT 2.0 MI. E. ALONG EL SOBRANTE RD. FROM INTER. WITH LA SIERRA AVE.; 0.4 MI. N. ALONG SECTION LINE BETWEEN SEC. 32 AND 33, T3S, R5W (0.4 MI. S. ALONG A GRADED ROAD THROUGH CITRUS GROVE FROM A METAL SHED SURROUNDED BY CHAIN LINK FENCE AT N. EDGE OF GROVE); 1600 FT. W. FROM THE INTERSECTION OF N-S DIRT ROAD NEAR CORRUGATED ALUMINUM PUMP HOUSE; AT WEST END OF A RESERVOIR LOCATED ON A SMALL RISE; 4 FT. S. OF THE NORTH POLE AND 3.4 FT. N. OF SOUTH POLE OF A TWO-POLE TRANSFORMER BRIDGE WITH SERVICES TO ADJACENT PUMPS. A STANDARD MWD TABLET STAMPED "BM LMF 17." ELEVATION: 1407.632 NAVD 1988

MATCH LINE SEE LEFT

REVISIONS			
A.Y	PLAN CHECK TWO CORRECTIONS		
A.Y	PLAN CHECK ONE CORRECTIONS		
INT.	DESCRIPTION	APPR.	DATE

COVER SHEET
PREPARATION DATE : AUGUST 2025

adkan ENGINEERS
Civil Engineering Surveying Planning
6879 Airport Drive, Riverside, CA 92504
Tel:(951) 688-0241 · Fax:(951) 688-0599

SHEET 1 OF 2



EASEMENT NOTES

△ -INDICATES EX. EASEMENT ○ -INDICATES PROP. EASEMENT

1. AN EASEMENT FOR ROADWAY ALONG EXTERIOR TRACT BOUNDARY, RECORDED FEBRUARY 23, 2013, AS INSTRUMENT NO. 2023-53066.
2. AN EASEMENT FOR ROADWAY AND INCIDENTAL PURPOSES, RECORDED MARCH 24, 1958 AS INSTRUMENT NO. 21198 IN BOOK 2242, PAGE 325 OF OFFICIAL RECORDS.
3. AN EASEMENT FOR ROADWAY AND INCIDENTAL PURPOSES, RECORDED JUNE 25, 1958 AS INSTRUMENT NO. 45219 IN BOOK 2291, PAGE 386 OF OFFICIAL RECORDS.
4. AN EASEMENT FOR ROADWAY AND INCIDENTAL PURPOSES, RECORDED JUNE 25, 1958 AS INSTRUMENT NO. 45220 IN BOOK 2291, PAGE 388 OF OFFICIAL RECORDS.
5. AN EASEMENT FOR ROADWAY AND INCIDENTAL PURPOSES, RECORDED FEBRUARY 24, 1954 AS INSTRUMENT NO. 15150 IN BOOK 2419, PAGE 328 OF OFFICIAL RECORDS.
6. AN EASEMENT FOR ROADWAY AND INCIDENTAL PURPOSES, RECORDED MAY 28, 1959 AS INSTRUMENT NO. 46134 OF OFFICIAL RECORDS.
7. AN EASEMENT FOR A WATER PIPE LINE, AND FOR INGRESS AND EGRESS IN CONNECTION THEREWITH AND INCIDENTAL PURPOSES, RECORDED JANUARY 21, 1963 AS INSTRUMENT NOS. 6873, 6874, 6875 AND 6876, ALL OF OFFICIAL RECORDS.
8. AN EASEMENT FOR ROADWAY AND INCIDENTAL PURPOSES, RECORDED NOVEMBER 5, 1963 AS INSTRUMENT NO. 117038 OF OFFICIAL RECORDS.
9. AN EASEMENT FOR INGRESS AND EGRESS AND INCIDENTAL PURPOSES, RECORDED JANUARY 5, 1967 AS INSTRUMENT NO. 852 OF OFFICIAL RECORDS.
10. AN EASEMENT FOR ROADWAY AND INCIDENTAL PURPOSES, RECORDED SEPTEMBER 1, 1993 AS INSTRUMENT NO. 343721 OF OFFICIAL RECORDS.
11. AN EASEMENT FOR ROADWAY AND INCIDENTAL PURPOSES, RECORDED MARCH 24, 1958 AS INSTRUMENT NO. 21198 IN BOOK 2242, PAGE 325 OF OFFICIAL RECORDS.
12. AN EASEMENT FOR ROADWAY AND INCIDENTAL PURPOSES, RECORDED JUNE 25, 1958 AS INSTRUMENT NO. 45219 IN BOOK 2291, PAGE 386 OF OFFICIAL RECORDS.
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14. AN EASEMENT FOR ROADWAY AND INCIDENTAL PURPOSES, RECORDED FEBRUARY 24, 1954 AS INSTRUMENT NO. 15150 IN BOOK 2419, PAGE 328 OF OFFICIAL RECORDS.
15. AN EASEMENT FOR ROADWAY AND INCIDENTAL PURPOSES, RECORDED MAY 28, 1959 AS INSTRUMENT NO. 46134 OF OFFICIAL RECORDS.
16. AN EASEMENT FOR ROADWAY AND INCIDENTAL PURPOSES, RECORDED APRIL 27, 1960 AS INSTRUMENT NO. 31241 OF OFFICIAL RECORDS.
17. AN EASEMENT FOR A WATER PIPE LINE AND FOR INGRESS AND EGRESS IN CONNECTION THEREWITH AND INCIDENTAL PURPOSES, RECORDED JANUARY 21, 1963 AS INSTRUMENT NOS. 6873, 6874, 6875 AND 6876, ALL OF OFFICIAL RECORDS.
18. AN EASEMENT FOR ROADWAY AND INCIDENTAL PURPOSES, RECORDED SEPTEMBER 1, 1993 AS INSTRUMENT NO. 343721 OF OFFICIAL RECORDS.
19. AN EASEMENT FOR WATER PIPE LINES AND INCIDENTAL PURPOSES, RECORDED JANUARY 21, 1963 AS INSTRUMENT NO. 6876 OF OFFICIAL RECORDS.
20. AN EASEMENT FOR A WATER PIPE LINE, AND FOR INGRESS AND EGRESS IN CONNECTION THEREWITH AND INCIDENTAL PURPOSES, RECORDED MARCH 12, 1963 AS INSTRUMENT NO. 24792 OF OFFICIAL RECORDS.
21. AN EASEMENT FOR WATER PIPE LINES AND INCIDENTAL PURPOSES, RECORDED MARCH 12, 1963 AS INSTRUMENT NO. 24792 OF OFFICIAL RECORDS.
22. AN EASEMENT FOR INGRESS AND EGRESS AND INCIDENTAL PURPOSES, RECORDED JANUARY 05, 1967 AS INSTRUMENT NO. 853 OF OFFICIAL RECORDS.
23. AN EASEMENT IN FAVOR OF SOUTHERN CALIFORNIA EDISON COMPANY FOR AERIAL AND UNDERGROUND ELECTRIC LINES AND COMMUNICATION LINES AND INCIDENTAL PURPOSES, RECORDED FEBRUARY 21, 1967 AS INSTRUMENT NO. 14787 OF OFFICIAL RECORDS.
24. AN EASEMENT IN FAVOR OF THE COUNTY OF RIVERSIDE FOR PUBLIC HIGHWAY AND PUBLIC UTILITIES AND INCIDENTAL PURPOSES, RECORDED OCTOBER 18, 1938 IN BOOK 395, PAGE 226 OF OFFICIAL RECORDS.
25. AN EASEMENT IN FAVOR OF CALIFORNIA ELECTRIC POWER COMPANY FOR POLE LINES AND INCIDENTAL PURPOSES, RECORDED JANUARY 13, 1954 AS BOOK 1543, PAGE 49 OF OFFICIAL RECORDS.
26. AN EASEMENT IN FAVOR OF EL SOBRANTE LAND AND DEVELOPMENT COMPANY, ET. AL. FOR ROAD AND PUBLIC UTILITIES AND INCIDENTAL PURPOSES, RECORDED AUGUST 16, 1956 AS INSTRUMENT NO. 57156 IN BOOK 1958, PAGE 465 OF OFFICIAL RECORDS.
27. AN EASEMENT IN FAVOR OF WESTERN MUNICIPAL WATER DISTRICT FOR A TEMPORARY PUMP STATION AND INCIDENTAL PURPOSES, RECORDED JANUARY 4, 2005 AS INSTRUMENT NO. 05-6319 OF OFFICIAL RECORDS.

(1) — PROP. 20' WIDE EASEMENT FOR ACCESS ROAD
(2) — PROP. 32' WIDE EASEMENT FOR SEWER PIPE
(3) — PROP. 30' WIDE EASEMENT FOR UNDERGROUND SD PIPE AND EMERGENCY OVERFLOW
(4) — PROP. 24' WIDE EASEMENT FOR UNDERGROUND SD PIPE
(5) — PROP. LOT EASEMENT
(6) — PROP. 5' WIDE EASEMENT FOR V-DITCH
(7) — PROP. OFF-SITE GRADING EASEMENT
(8) — PROP. OFF-SITE LANDSCAPE EASEMENT
(9) — PROP. OPEN SPACE ACCESS EASEMENT
(10) — PROP. 8' V-DITCH EASEMENT
(11) — PROP. 11.5' WIDE U-CHANNEL EASEMENT

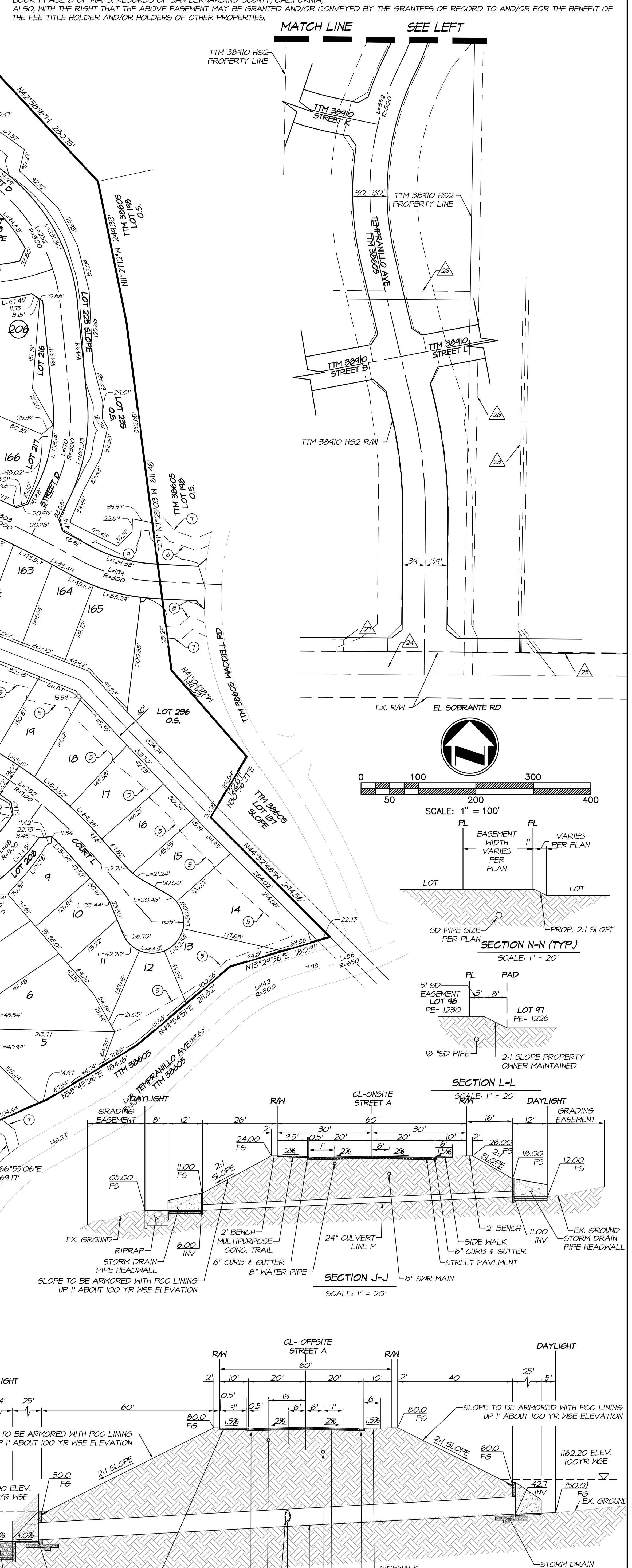
LEGAL DESCRIPTION

REAL PROPERTY IN THE UNINCORPORATED AREA OF THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

TRACT 1 (APN: 270-070-002)
PARCEL ONE:
BEING A PORTION OF SECTION 32, TOWNSHIP 3 SOUTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, AS SHOWN BY SECTIONALIZED SURVEY OF THE RANCHO EL SOBRANTE DE SAN JACINTO RECORDED IN BOOK 1 OF MAPS, AT PAGE 8, AND IN BOOK 7 OF MAPS, PAGE 10, BOTH, RECORDS OF SAN BERNARDINO COUNTY, CALIFORNIA,
PARCEL TWO:
AS EASEMENT APPURTENANT TO PARCEL ONE ABOVE FOR ROAD PURPOSES 40 FEET IN WIDTH,

TRACT 2 (APN: 270-060-016)
PARCEL 1:
PARCEL 1 AS SHOWN ON LOT LINE ADJUSTMENT NO. 4962, AS EVIDENCED BY DOCUMENT RECORDED APRIL 16, 2006 AS INSTRUMENT NO. 06-278275 OF OFFICIAL RECORDS,
PARCEL 2:
A PERPETUAL AND NONEXCLUSIVE RIGHT OF WAY AND EASEMENTS FOR VEHICULAR AND PEDESTRIAN INGRESS AND EGRESS, AND FOR THE CONSTRUCTION, INSTALLATION, USE, MAINTENANCE, REPAIR, REPLACEMENT AND RECONSTRUCTION OF, AND IMPROVEMENTS TO, AN ACCESS ROADWAY, GATED ENTRANCES, LANDSCAPING, SLOPE, UNDERGROUND LINES FOR WATER, GAS, ELECTRIC, SANITARY SEWER AND TELECOMMUNICATION SERVICES, FENCING, STORM DRAINAGE AND OUTLET FACILITIES, AND OTHER RELATED IMPROVEMENTS, APPURTENANCES AND FACILITIES REFERRED TO AS "RELATED IMPROVEMENTS," ALL AS MORE FULLY DESCRIBED IN THE ROAD AND DEVELOPMENT EASEMENT AGREEMENT RECORDED AUGUST 19, 2016 AS INSTRUMENT NO. 2016-0355981 OF OFFICIAL RECORDS.

TRACT 3 (APN'S: 270-070-001, 270-160-006, 270-160-004, 270-060-009 AND 270-060-005)
PARCEL ONE:
PORTIONS OF SECTION 32 AND 33, TOWNSHIP 3 SOUTH, RANGE 5 WEST. AS SHOWN BY SECTIONIZED SURVEY OF THE RANCHO EL SOBRANTE DE SAN JACINTO, RECORDED IN BOOK 1 OF MAPS PAGE 8, RECORDS OF SAN BERNARDINO COUNTY, CALIFORNIA,
PARCEL TWO:
A NON-EXCLUSIVE EASEMENT FOR INGRESS, EGRESS AND ROAD PURPOSES, 40 FEET IN WIDTH, LYING 20 FEET ON EACH CENTER LINE; SAID EASEMENT BEING OVER A PORTION OF THE NORTHEAST QUARTER OF SECTION OF 31, AND OVER A PORTION OF SECTION 32, TOWNSHIP 3 SOUTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, AS SHOWN BY SECTIONIZED SURVEY OF THE RANCHO EL SOBRANTE DE SAN JACINTO, RECORDED IN BOOK 1 PAGE 8 OF MAPS, RECORDS OF SAN BERNARDINO COUNTY, CALIFORNIA,
ALSO, WITH THE RIGHT THAT THE ABOVE EASEMENT MAY BE GRANTED AND/OR CONVEYED BY THE GRANTEES OF RECORD TO AND/OR FOR THE BENEFIT OF THE FEE TITLE HOLDER AND/OR HOLDERS OF OTHER PROPERTIES.



REVISIONS			
A.Y	PLAN CHECK TWO CORRECTIONS		
A.Y	PLAN CHECK ONE CORRECTIONS		
INT.	DESCRIPTION	APPR.	DATE

LOTS GEOMETRY & EASEMENT CROSS SECTIONS
PREPARATION DATE : AUGUST 2025

adkan ENGINEERS
Civil Engineering Surveying Planning
6879 Airport Drive, Riverside, CA 92504
Tel:(951) 688-0241 · Fax:(951) 688-0599

SHEET 2 OF 2

Appendix 4: Historical Site Conditions

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

Not Applicable

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

Not Applicable

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

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	ADKAN ENGINEERS	Date	8/20/2025
Designed by	Sergio Flores	Case No	TTM38927
Company Project Number/Name	HIGHLAND GROVE IV		

BMP Identification

BMP NAME / ID: EDB A

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

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

D_{85}= 0.51 inches

Drainage Management Area Tabulation

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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
D 1.1	907,783.00	Concrete or Asphalt	1	0.89	809742.4			
D 1.2	2,163,061.00	Mixed Surface Types	0.55	0.37	805739.7			
D 1.3	145,626	Ornamental Landscaping	0.1	0.11	16085.6			
D 1.4	86,685	Natural (C Soil)	0.3	0.23	19518.5			
	3303155	Total			1651086.2	0.51	70171.2	1,050,319

Notes:

Extended Detention Basin Design Procedure	BMP Subarea No. EDB A	Legend:	Required Entries / Calculated Cells

Company Name: ADKAN ENGINEERS — Date: 8/20/2025

Designed by: RICHARD REAVES — County/City Case No.: TTM38927

Design Volume

Tributary Area (BMP Subarea) — A_T = 75.83 acres

Enter $V_{BMP,}$ determined from Section 2.1 of this Handbook — V_{BMP} = 70,171 ft^3

Basin Footprint

Overall Geometry

Length at Basin Bottom Surface — Length = 255 ft

Width at Basin Bottom Surface — Width = 87 ft

Meets 1.5 : 1 requirement? ✓

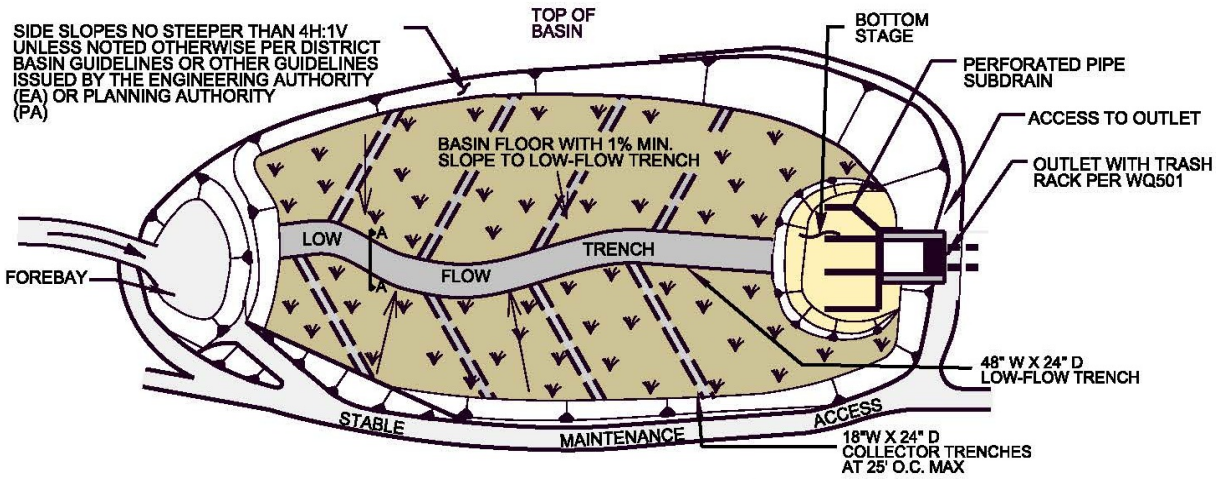
Side Slopes per "Basin Guidelines", Sect. 1.2 — z = 4 :1

Proposed Basin Depth (with no freeboard) — D_B = 5.50 ft

Depth of freeboard (if used) — D_{FB} = 1.00 ft

Minimum Required Allowance for Total Depth (including proposed basin depth, freeboard, minimum depth of bottom stage (D_{BS}=0.33') and minimum filter depth (D_{FD}=2.33')) — D_{REQ} = 9.2 ft

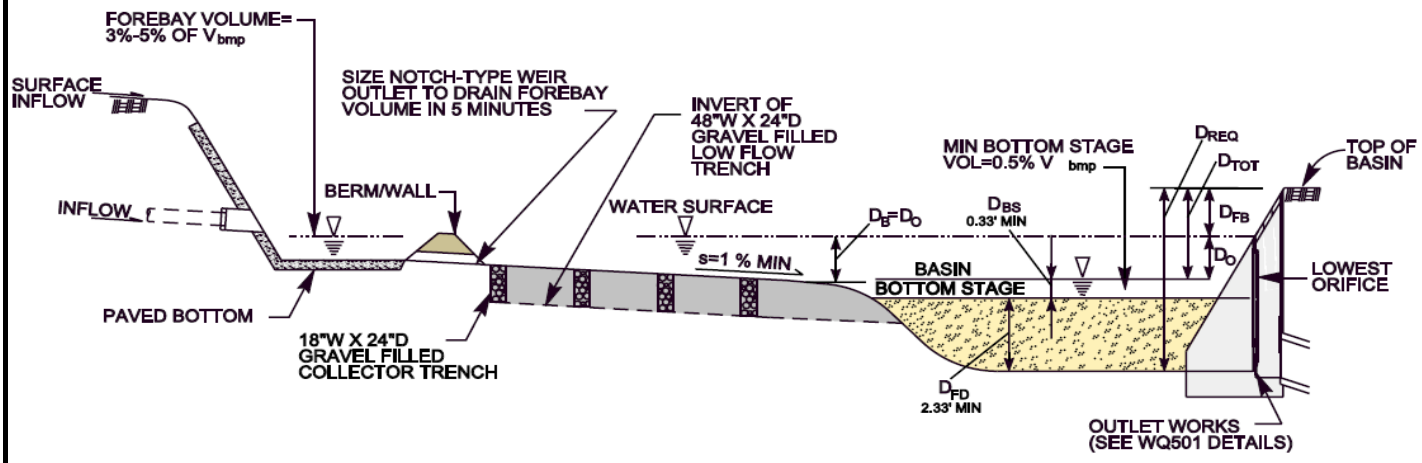
Depth from design water surface elevation to lowest orifice — D_O = 5.5 ft



Basin Design

Basin Design

Proposed Total Basin Depth (proposed depth plus freeboard)	D_{TOT} =	6.50	ft
Basin Invert Longitudinal Slope	Slope =	1.00	%
Basin Invert Transverse Slope (1% min)	Slope =	1	%
Basin Volume	V_{Basin} =	70172	ft^3



Forebay Design

Forebay Volume (3 - 5% V_{BMP})	V_{FB} =	2,106	ft^3
Forebay Depth (height of berm)	D_{FBY} =	1	ft
Minimum Forebay Surface Area	A_{FB} =	2106	ft^2
Rectangular weir (notch)	W =	12.00	in

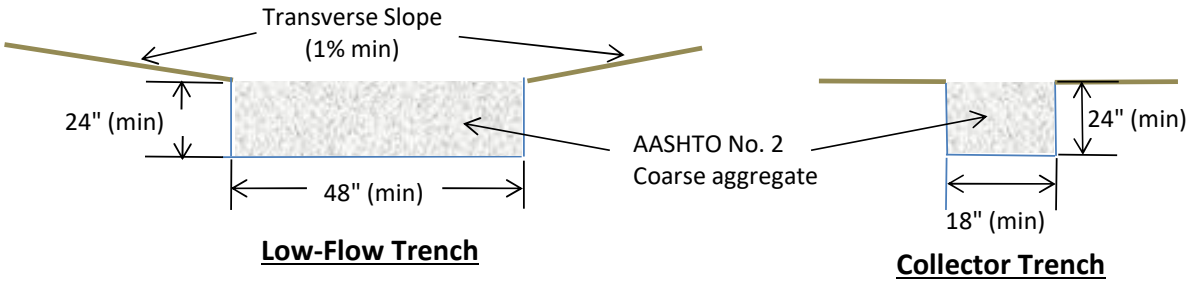
Dry Weather and Low-Flow Management

Low-Flow Trench (see graphic below)

Depth (24 inches minimum, gravel filled)	Depth =	24	inches
Width (48 inches minimum)	Width =	48	inches
Trench Invert Longitudinal Slope	Slope =	1	%

Collector Trenches (see graphic below)

Depth (24 inches minimum)	Depth =	24	inches
Width (18 inches minimum)	Width =	18	inches
Trench Invert Longitudinal Slope	Slope =	1	%
Spacing (25 feet on center maximum)	S =	25	feet



Low-Flow Trench **Collector Trench**

Bottom Stage (Sand Filter) Design

Depth of the Bottom Stage (4" minimum ponding)	D_{BS} =	4	in
Surface Area of Bottom Stage	A_{BS} =	3043	ft^2
Dry Weather Ponded Volume (above sand layer)	V_{BS} =	1014	ft^3

Is V_{BS} no less than 0.5% V_{BMP}? OK

Depth of ASTM-C33 sand (18 inch minimum)

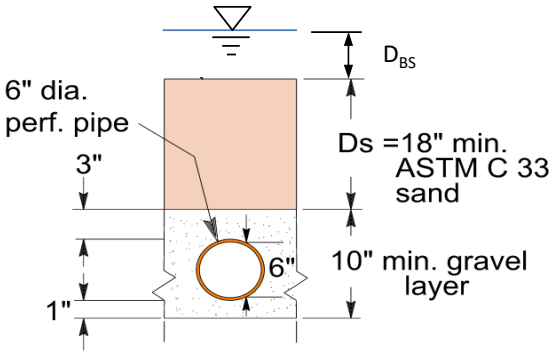
Ds = 18.4 inches

Diameter of Subdrains

ϕ = 6 in

Subdrain Spacing

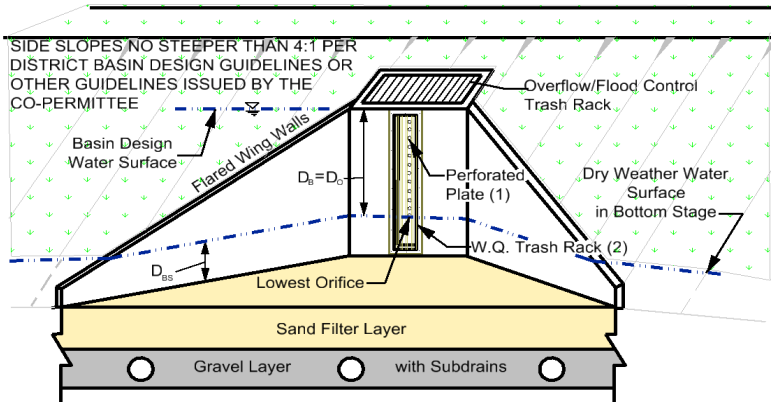
s = 6 ft. on center



Basin Outlet Design

Outlet Design

Assume an orifice area. Based on the information provided above, the spreadsheet provides discharge vs. stage data. Enter the volume vs. stage data for each interval. This information is used to route the volume through the basin. The size of the orifice is acceptable when the data shows that less than 50% of V_{BMP} has drained in 24 hours, and that 100% drawdown occurs within 72 hours.



Flow Rate, Q (cfs)

$$Q=CA[2g(H-H_o)]^{0.5}$$

Discharge Coefficient,

Default, C = 0.66

Other, C =

Orifice Area (ft^2)

Orifice Diameter, d; number of orifices per row, n; and number of orifice rows, N (from the bottom up).

d = 3.00 inches

n = 1 per row

N = 1 rows

Aeff = 0.0491 ft^2 per row

or

Aeff = 7.069 in^2 per row

From outflow hydrograph, the time where 50% of V_{BMP} has drained from the basin (24 hour minimum):

Time (50%) = 25.63 hrs

OK

From outflow hydrograph, the time where 100% V_{BMP} has drained from the basin(within 72 hours):

Time (100 %) = 71.94 hrs

OK

Headwater Elev. / Stage (ft)	Discharge (cfs)	Volume (acre-ft)	Δt (hrs.)
0	0.0000	0.0000	
0.33	0.1500	0.020	3.23
0.67	0.2123		
1.00	0.2600		
1.33	0.3002	0.192	8.29
1.67	0.3357		
2.00	0.3677		
2.33	0.3971	0.466	14.75
2.67	0.4246		
3.00	0.4503		
3.33	0.4747	0.766	20.04
3.67	0.4979		
4.00	0.5200		
4.33	0.5412	1.124	25.63
4.67	0.5617		
5.00	0.5814		
5.50	0.6004	1.638	
5.67	0.6097		
6.00			
6.33			
6.67			
7.00			
7.33			
7.67			
8.00			
8.33			
8.67			
9.00			
9.33			
9.67			
10.00			
		∑ =	71.94

Notes:

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

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

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

Company Name: ADKAN ENGINEERS — Date: 8/20/2025

Designed by: Sergio Flores — Case No: TTM38927

Company Project Number/Name: HIGHLAND GROVE IV

BMP Identification

BMP NAME / ID: EDB B

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E — D_{85}= 0.51 inches

Drainage Management Area Tabulation

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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
D 2.1	186,148.00	Concrete or Asphalt	1	0.89	166044			
D 2.2	457,172.00	Mixed Surface Types	0.55	0.37	170296.5			
D 2.3	40,031	Ornamental Landscaping	0.1	0.11	4421.7			
D 2.4	149,516	Natural (C Soil)	0.3	0.23	33665.9			
	832867	**Total**			**374428.1**	**0.51**	**15913.2**	**264,104**

Notes:

Extended Detention Basin Design Procedure	BMP Subarea No. EDB B	Legend:	Required Entries / Calculated Cells

Company Name:	ADKAN ENGINEERS	Date:	8/20/2025
Designed by:	Sergio Flores	County/City Case No.:	TTM38927

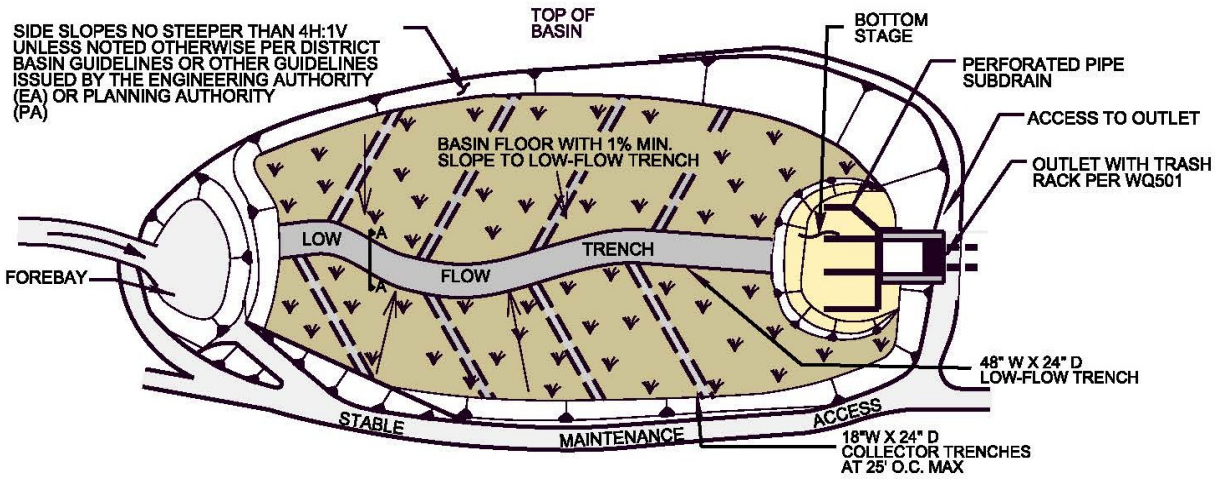
Design Volume

Tributary Area (BMP Subarea)	A_T =	19.12	acres
Enter $V_{BMP,}$ determined from Section 2.1 of this Handbook	V_{BMP}=	15,913	ft^3

Basin Footprint

Overall Geometry

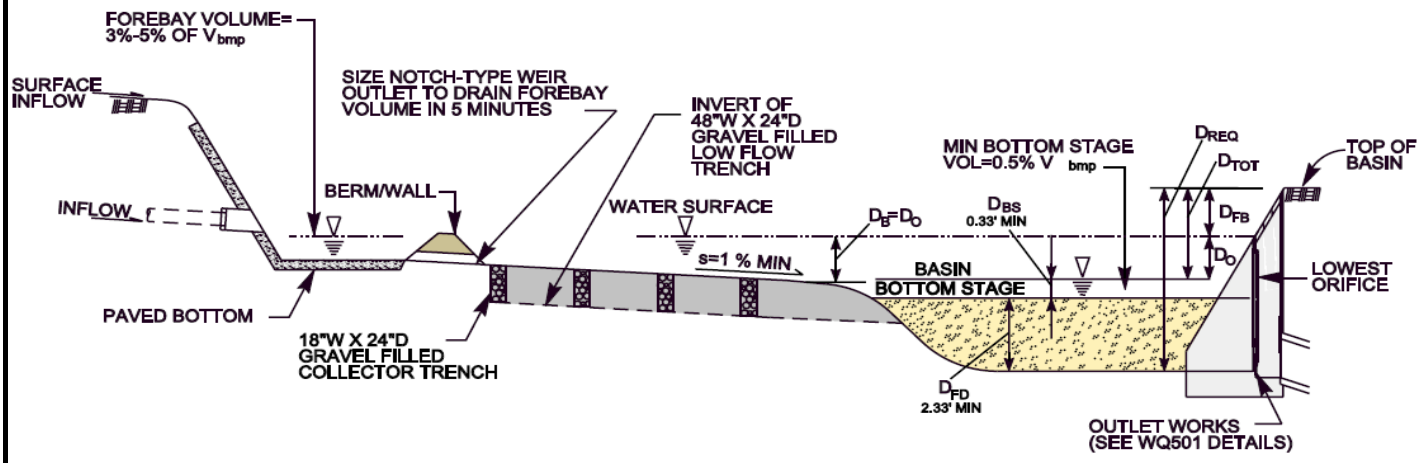
Length at Basin Bottom Surface	Length =	299	ft
Width at Basin Bottom Surface	Width =	65	ft
	Meets 1.5 : 1 requirement?	✓	
Side Slopes per "Basin Guidelines", Sect. 1.2	z =	4	:1
Proposed Basin Depth (with no freeboard)	D_B =	2.40	ft
Depth of freeboard (if used)	D_{FB} =	1.00	ft
Minimum Required Allowance for Total Depth (including proposed basin depth, freeboard, minimum depth of bottom stage (D_{BS}=0.33') and minimum filter depth (D_{FD}=2.33'))	D_{REQ} =	6.1	ft
Depth from design water surface elevation to lowest orifice	D_O =	2.4	ft



Basin Design

Basin Design

Proposed Total Basin Depth (proposed depth plus freeboard)	D_{TOT} =	3.40	ft
Basin Invert Longitudinal Slope	Slope =	1.00	%
Basin Invert Transverse Slope (1% min)	Slope =	1	%
Basin Volume	V_{Basin} =	15913	ft^3



Forebay Design

Forebay Volume (3 - 5% V_{BMP})	V_{FB} =	600	ft^3
Forebay Depth (height of berm)	D_{FBY} =	1	ft
Minimum Forebay Surface Area	A_{FB} =	600	ft^2
Rectangular weir (notch)	W =	12.00	in

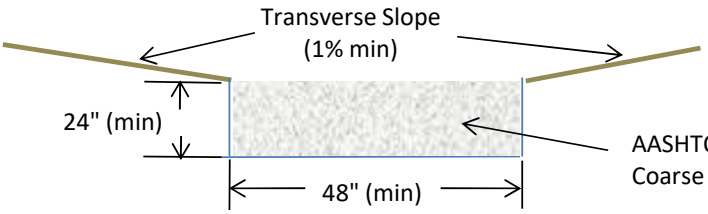
Dry Weather and Low-Flow Management

Low-Flow Trench (see graphic below)

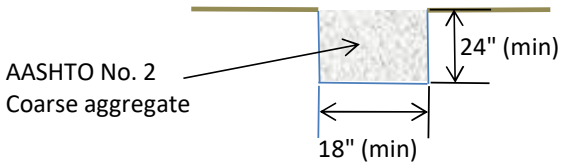
Depth (24 inches minimum, gravel filled)	Depth =	24	inches
Width (48 inches minimum)	Width =	48	inches
Trench Invert Longitudinal Slope	Slope =	1	%

Collector Trenches (see graphic below)

Depth (24 inches minimum)	Depth =	24	inches
Width (18 inches minimum)	Width =	18	inches
Trench Invert Longitudinal Slope	Slope =	1	%
Spacing (25 feet on center maximum)	S =	25	feet



Low-Flow Trench



Collector Trench

Bottom Stage (Sand Filter) Design

Depth of the Bottom Stage (4" minimum ponding)	D_{BS} =	4	in
Surface Area of Bottom Stage	A_{BS} =	1191	ft^2
Dry Weather Ponded Volume (above sand layer)	V_{BS} =	397	ft^3

Is V_{BS} no less than 0.5% V_{BMP}? OK

Depth of ASTM-C33 sand (18 inch minimum)

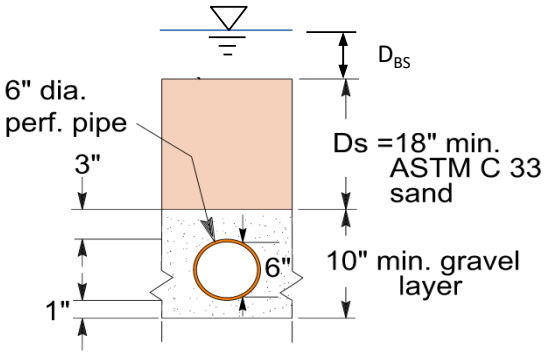
Ds = 18.4 inches

Diameter of Subdrains

ϕ = 6 in

Subdrain Spacing

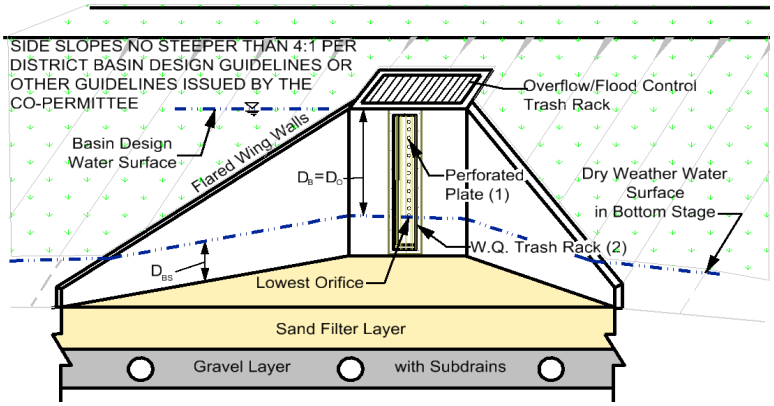
s = 6 ft. on center



Basin Outlet Design

Outlet Design

Assume an orifice area. Based on the information provided above, the spreadsheet provides discharge vs. stage data. Enter the volume vs. stage data for each interval. This information is used to route the volume through the basin. The size of the orifice is acceptable when the data shows that less than 50% of V_{BMP} has drained in 24 hours, and that 100% drawdown occurs within 72 hours.



Flow Rate, Q (cfs)

$$Q=CA[2g(H-H_o)]^{0.5}$$

Discharge Coefficient,

Default, C = 0.66

Other, C =

Orifice Area (ft^2)

Orifice Diameter, d; number of orifices per row, n; and number of orifice rows, N (from the bottom up).

d = 2.5 inches

n = 1 per row

N = 1 rows

Aeff = 0.034 ft^2 per row

or

Aeff = 4.906 in^2 per row

From outflow hydrograph, the time where 50% of V_{BMP} has drained from the basin (24 hour minimum):

Time (50%) = 31.08 hrs

OK

From outflow hydrograph, the time where 100% V_{BMP} has drained from the basin(within 72 hours):

Time (100 %) = 34.93 hrs

Headwater Elev. / Stage (ft)	Discharge (cfs)	Volume (acre-ft)	Δt (hrs.)
0	0.0000	0.0000	
0.33	0.1041		
0.67	0.1474	0.040	3.85
1.00	0.1805		
1.33	0.2083		
1.67	0.2330	0.187	10.25
2.00	0.2552		
2.33	0.2756	0.365	16.64
2.67	0.2796	0.461	4.18
3.00			
3.33			
3.67			
4.00			
4.33			
4.67			
5.00			
5.33			
5.67			
6.00			
6.33			
6.67			
7.00			
7.33			
7.67			
8.00			
8.33			
8.67			
9.00			
9.33			
9.67			
10.00			
		∑ =	34.93

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

       Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1
              Study date  10/17/24 File: exa2242.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 5006

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

 English Units used in output format



------------------------------------------------------------------------
------------------------------------------------------------------------
Drainage Area =      75.83(Ac.)  =      0.118 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      75.83(Ac.)  =      0.118 Sq. Mi.
Length along longest watercourse =    2577.00(Ft.)
Length along longest watercourse measured to centroid =    1289.00(Ft.)
Length along longest watercourse =      0.488 Mi.
Length along longest watercourse measured to centroid =      0.244 Mi.
Difference in elevation =     145.20(Ft.)
Slope along watercourse =    297.4994 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.109 Hr.
Lag time =     6.52 Min.
25% of lag time =     1.63 Min.
40% of lag time =     2.61 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]
       75.83           1.80                136.49

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       75.83           5.00                379.15

STORM EVENT (YEAR) =    2.00
Area Averaged 2-Year Rainfall =    1.800(In)
Area Averaged 100-Year Rainfall =    5.000(In)

Point rain (area averaged) =    1.800(In)
Areal adjustment factor =   99.99 %
Adjusted average point rain =    1.800(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
    75.830           91.00         0.000
 Total Area Entered =     75.83(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-1     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
91.0  79.8      0.246     0.000        0.246       1.000      0.246
                                                 Sum (F) =   0.246
Area averaged mean soil loss (F) (In/Hr) =  0.246
Minimum soil loss rate ((In/Hr)) =  0.123
(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	76.653	12.379	9.460
2	0.167	153.307	43.174	32.994
3	0.250	229.960	20.942	16.004
4	0.333	306.613	8.476	6.477
5	0.417	383.266	5.111	3.906
6	0.500	459.920	3.287	2.512
7	0.583	536.573	2.310	1.765
8	0.667	613.226	1.661	1.270
9	0.750	689.880	1.141	0.872
10	0.833	766.533	0.802	0.613
11	0.917	843.186	0.718	0.549
		Sum = 100.000	Sum=	76.422

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	(0.437)	0.013	0.001
2	0.17	0.07	0.014	(0.435)	0.013	0.001
3	0.25	0.07	0.014	(0.433)	0.013	0.001
4	0.33	0.10	0.022	(0.432)	0.019	0.002
5	0.42	0.10	0.022	(0.430)	0.019	0.002
6	0.50	0.10	0.022	(0.428)	0.019	0.002
7	0.58	0.10	0.022	(0.427)	0.019	0.002
8	0.67	0.10	0.022	(0.425)	0.019	0.002
9	0.75	0.10	0.022	(0.423)	0.019	0.002
10	0.83	0.13	0.029	(0.422)	0.026	0.003
11	0.92	0.13	0.029	(0.420)	0.026	0.003
12	1.00	0.13	0.029	(0.418)	0.026	0.003
13	1.08	0.10	0.022	(0.417)	0.019	0.002
14	1.17	0.10	0.022	(0.415)	0.019	0.002
15	1.25	0.10	0.022	(0.413)	0.019	0.002
16	1.33	0.10	0.022	(0.412)	0.019	0.002
17	1.42	0.10	0.022	(0.410)	0.019	0.002
18	1.50	0.10	0.022	(0.408)	0.019	0.002
19	1.58	0.10	0.022	(0.407)	0.019	0.002
20	1.67	0.10	0.022	(0.405)	0.019	0.002
21	1.75	0.10	0.022	(0.404)	0.019	0.002
22	1.83	0.13	0.029	(0.402)	0.026	0.003
23	1.92	0.13	0.029	(0.400)	0.026	0.003
24	2.00	0.13	0.029	(0.399)	0.026	0.003
25	2.08	0.13	0.029	(0.397)	0.026	0.003
26	2.17	0.13	0.029	(0.395)	0.026	0.003
27	2.25	0.13	0.029	(0.394)	0.026	0.003
28	2.33	0.13	0.029	(0.392)	0.026	0.003
29	2.42	0.13	0.029	(0.391)	0.026	0.003
30	2.50	0.13	0.029	(0.389)	0.026	0.003
31	2.58	0.17	0.036	(0.387)	0.032	0.004
32	2.67	0.17	0.036	(0.386)	0.032	0.004
33	2.75	0.17	0.036	(0.384)	0.032	0.004
34	2.83	0.17	0.036	(0.383)	0.032	0.004
35	2.92	0.17	0.036	(0.381)	0.032	0.004
36	3.00	0.17	0.036	(0.380)	0.032	0.004
37	3.08	0.17	0.036	(0.378)	0.032	0.004
38	3.17	0.17	0.036	(0.376)	0.032	0.004
39	3.25	0.17	0.036	(0.375)	0.032	0.004
40	3.33	0.17	0.036	(0.373)	0.032	0.004
41	3.42	0.17	0.036	(0.372)	0.032	0.004
42	3.50	0.17	0.036	(0.370)	0.032	0.004
43	3.58	0.17	0.036	(0.369)	0.032	0.004
44	3.67	0.17	0.036	(0.367)	0.032	0.004
45	3.75	0.17	0.036	(0.366)	0.032	0.004
46	3.83	0.20	0.043	(0.364)	0.039	0.004
47	3.92	0.20	0.043	(0.362)	0.039	0.004
48	4.00	0.20	0.043	(0.361)	0.039	0.004
49	4.08	0.20	0.043	(0.359)	0.039	0.004
50	4.17	0.20	0.043	(0.358)	0.039	0.004
51	4.25	0.20	0.043	(0.356)	0.039	0.004
52	4.33	0.23	0.050	(0.355)	0.045	0.005
53	4.42	0.23	0.050	(0.353)	0.045	0.005
54	4.50	0.23	0.050	(0.352)	0.045	0.005
55	4.58	0.23	0.050	(0.350)	0.045	0.005
56	4.67	0.23	0.050	(0.349)	0.045	0.005
57	4.75	0.23	0.050	(0.347)	0.045	0.005
58	4.83	0.27	0.058	(0.346)	0.052	0.006
59	4.92	0.27	0.058	(0.344)	0.052	0.006
60	5.00	0.27	0.058	(0.343)	0.052	0.006
61	5.08	0.20	0.043	(0.341)	0.039	0.004
62	5.17	0.20	0.043	(0.340)	0.039	0.004
63	5.25	0.20	0.043	(0.338)	0.039	0.004
64	5.33	0.23	0.050	(0.337)	0.045	0.005
65	5.42	0.23	0.050	(0.335)	0.045	0.005

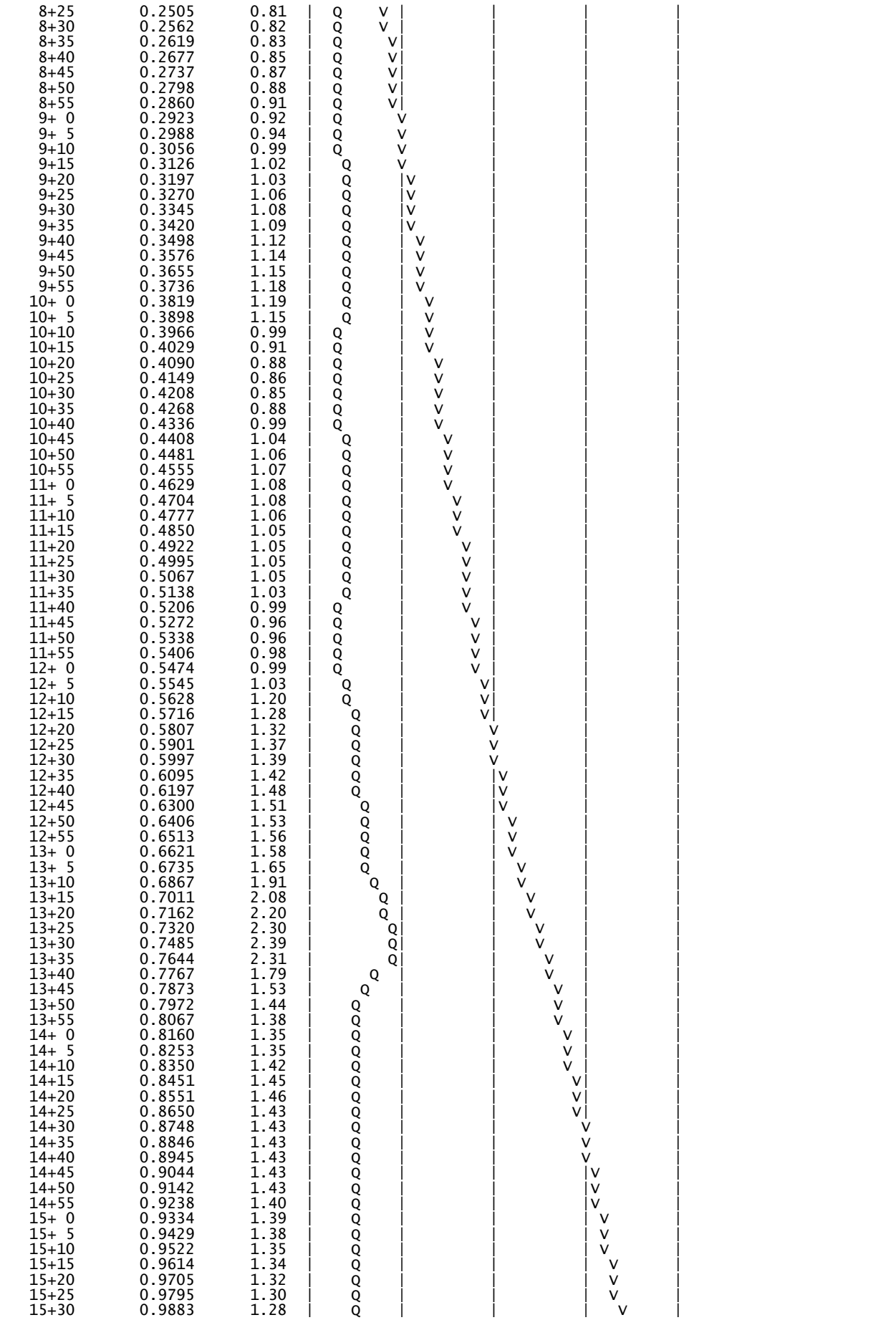
66	5.50	0.23	0.050	(0.334)	0.045	0.005
67	5.58	0.27	0.058	(0.332)	0.052	0.006
68	5.67	0.27	0.058	(0.331)	0.052	0.006
69	5.75	0.27	0.058	(0.330)	0.052	0.006
70	5.83	0.27	0.058	(0.328)	0.052	0.006
71	5.92	0.27	0.058	(0.327)	0.052	0.006
72	6.00	0.27	0.058	(0.325)	0.052	0.006
73	6.08	0.30	0.065	(0.324)	0.058	0.006
74	6.17	0.30	0.065	(0.322)	0.058	0.006
75	6.25	0.30	0.065	(0.321)	0.058	0.006
76	6.33	0.30	0.065	(0.319)	0.058	0.006
77	6.42	0.30	0.065	(0.318)	0.058	0.006
78	6.50	0.30	0.065	(0.317)	0.058	0.006
79	6.58	0.33	0.072	(0.315)	0.065	0.007
80	6.67	0.33	0.072	(0.314)	0.065	0.007
81	6.75	0.33	0.072	(0.312)	0.065	0.007
82	6.83	0.33	0.072	(0.311)	0.065	0.007
83	6.92	0.33	0.072	(0.310)	0.065	0.007
84	7.00	0.33	0.072	(0.308)	0.065	0.007
85	7.08	0.33	0.072	(0.307)	0.065	0.007
86	7.17	0.33	0.072	(0.305)	0.065	0.007
87	7.25	0.33	0.072	(0.304)	0.065	0.007
88	7.33	0.37	0.079	(0.303)	0.071	0.008
89	7.42	0.37	0.079	(0.301)	0.071	0.008
90	7.50	0.37	0.079	(0.300)	0.071	0.008
91	7.58	0.40	0.086	(0.298)	0.078	0.009
92	7.67	0.40	0.086	(0.297)	0.078	0.009
93	7.75	0.40	0.086	(0.296)	0.078	0.009
94	7.83	0.43	0.094	(0.294)	0.084	0.009
95	7.92	0.43	0.094	(0.293)	0.084	0.009
96	8.00	0.43	0.094	(0.292)	0.084	0.009
97	8.08	0.50	0.108	(0.290)	0.097	0.011
98	8.17	0.50	0.108	(0.289)	0.097	0.011
99	8.25	0.50	0.108	(0.288)	0.097	0.011
100	8.33	0.50	0.108	(0.286)	0.097	0.011
101	8.42	0.50	0.108	(0.285)	0.097	0.011
102	8.50	0.50	0.108	(0.283)	0.097	0.011
103	8.58	0.53	0.115	(0.282)	0.104	0.012
104	8.67	0.53	0.115	(0.281)	0.104	0.012
105	8.75	0.53	0.115	(0.280)	0.104	0.012
106	8.83	0.57	0.122	(0.278)	0.110	0.012
107	8.92	0.57	0.122	(0.277)	0.110	0.012
108	9.00	0.57	0.122	(0.276)	0.110	0.012
109	9.08	0.63	0.137	(0.274)	0.123	0.014
110	9.17	0.63	0.137	(0.273)	0.123	0.014
111	9.25	0.63	0.137	(0.272)	0.123	0.014
112	9.33	0.67	0.144	(0.270)	0.130	0.014
113	9.42	0.67	0.144	(0.269)	0.130	0.014
114	9.50	0.67	0.144	(0.268)	0.130	0.014
115	9.58	0.70	0.151	(0.267)	0.136	0.015
116	9.67	0.70	0.151	(0.265)	0.136	0.015
117	9.75	0.70	0.151	(0.264)	0.136	0.015
118	9.83	0.73	0.158	(0.263)	0.143	0.016
119	9.92	0.73	0.158	(0.261)	0.143	0.016
120	10.00	0.73	0.158	(0.260)	0.143	0.016
121	10.08	0.50	0.108	(0.259)	0.097	0.011
122	10.17	0.50	0.108	(0.258)	0.097	0.011
123	10.25	0.50	0.108	(0.256)	0.097	0.011
124	10.33	0.50	0.108	(0.255)	0.097	0.011
125	10.42	0.50	0.108	(0.254)	0.097	0.011
126	10.50	0.50	0.108	(0.253)	0.097	0.011
127	10.58	0.67	0.144	(0.251)	0.130	0.014
128	10.67	0.67	0.144	(0.250)	0.130	0.014
129	10.75	0.67	0.144	(0.249)	0.130	0.014
130	10.83	0.67	0.144	(0.248)	0.130	0.014
131	10.92	0.67	0.144	(0.247)	0.130	0.014
132	11.00	0.67	0.144	(0.245)	0.130	0.014
133	11.08	0.63	0.137	(0.244)	0.123	0.014
134	11.17	0.63	0.137	(0.243)	0.123	0.014
135	11.25	0.63	0.137	(0.242)	0.123	0.014
136	11.33	0.63	0.137	(0.241)	0.123	0.014
137	11.42	0.63	0.137	(0.239)	0.123	0.014
138	11.50	0.63	0.137	(0.238)	0.123	0.014
139	11.58	0.57	0.122	(0.237)	0.110	0.012
140	11.67	0.57	0.122	(0.236)	0.110	0.012
141	11.75	0.57	0.122	(0.235)	0.110	0.012
142	11.83	0.60	0.130	(0.233)	0.117	0.013
143	11.92	0.60	0.130	(0.232)	0.117	0.013
144	12.00	0.60	0.130	(0.231)	0.117	0.013
145	12.08	0.83	0.180	(0.230)	0.162	0.018
146	12.17	0.83	0.180	(0.229)	0.162	0.018
147	12.25	0.83	0.180	(0.228)	0.162	0.018
148	12.33	0.87	0.187	(0.227)	0.168	0.019
149	12.42	0.87	0.187	(0.225)	0.168	0.019
150	12.50	0.87	0.187	(0.224)	0.168	0.019
151	12.58	0.93	0.202	(0.223)	0.181	0.020

152	12.67	0.93	0.202	(	0.222)	0.181	0.020
153	12.75	0.93	0.202	(	0.221)	0.181	0.020
154	12.83	0.97	0.209	(	0.220)	0.188	0.021
155	12.92	0.97	0.209	(	0.219)	0.188	0.021
156	13.00	0.97	0.209	(	0.218)	0.188	0.021
157	13.08	1.13	0.245		0.216	(0.220)	0.028
158	13.17	1.13	0.245		0.215	(0.220)	0.029
159	13.25	1.13	0.245		0.214	(0.220)	0.031
160	13.33	1.13	0.245		0.213	(0.220)	0.032
161	13.42	1.13	0.245		0.212	(0.220)	0.033
162	13.50	1.13	0.245		0.211	(0.220)	0.034
163	13.58	0.77	0.166	(	0.210)	0.149	0.017
164	13.67	0.77	0.166	(	0.209)	0.149	0.017
165	13.75	0.77	0.166	(	0.208)	0.149	0.017
166	13.83	0.77	0.166	(	0.207)	0.149	0.017
167	13.92	0.77	0.166	(	0.206)	0.149	0.017
168	14.00	0.77	0.166	(	0.205)	0.149	0.017
169	14.08	0.90	0.194	(	0.204)	0.175	0.019
170	14.17	0.90	0.194	(	0.203)	0.175	0.019
171	14.25	0.90	0.194	(	0.202)	0.175	0.019
172	14.33	0.87	0.187	(	0.200)	0.168	0.019
173	14.42	0.87	0.187	(	0.199)	0.168	0.019
174	14.50	0.87	0.187	(	0.198)	0.168	0.019
175	14.58	0.87	0.187	(	0.197)	0.168	0.019
176	14.67	0.87	0.187	(	0.196)	0.168	0.019
177	14.75	0.87	0.187	(	0.195)	0.168	0.019
178	14.83	0.83	0.180	(	0.194)	0.162	0.018
179	14.92	0.83	0.180	(	0.193)	0.162	0.018
180	15.00	0.83	0.180	(	0.192)	0.162	0.018
181	15.08	0.80	0.173	(	0.191)	0.155	0.017
182	15.17	0.80	0.173	(	0.190)	0.155	0.017
183	15.25	0.80	0.173	(	0.189)	0.155	0.017
184	15.33	0.77	0.166	(	0.188)	0.149	0.017
185	15.42	0.77	0.166	(	0.188)	0.149	0.017
186	15.50	0.77	0.166	(	0.187)	0.149	0.017
187	15.58	0.63	0.137	(	0.186)	0.123	0.014
188	15.67	0.63	0.137	(	0.185)	0.123	0.014
189	15.75	0.63	0.137	(	0.184)	0.123	0.014
190	15.83	0.63	0.137	(	0.183)	0.123	0.014
191	15.92	0.63	0.137	(	0.182)	0.123	0.014
192	16.00	0.63	0.137	(	0.181)	0.123	0.014
193	16.08	0.13	0.029	(	0.180)	0.026	0.003
194	16.17	0.13	0.029	(	0.179)	0.026	0.003
195	16.25	0.13	0.029	(	0.178)	0.026	0.003
196	16.33	0.13	0.029	(	0.177)	0.026	0.003
197	16.42	0.13	0.029	(	0.176)	0.026	0.003
198	16.50	0.13	0.029	(	0.175)	0.026	0.003
199	16.58	0.10	0.022	(	0.175)	0.019	0.002
200	16.67	0.10	0.022	(	0.174)	0.019	0.002
201	16.75	0.10	0.022	(	0.173)	0.019	0.002
202	16.83	0.10	0.022	(	0.172)	0.019	0.002
203	16.92	0.10	0.022	(	0.171)	0.019	0.002
204	17.00	0.10	0.022	(	0.170)	0.019	0.002
205	17.08	0.17	0.036	(	0.169)	0.032	0.004
206	17.17	0.17	0.036	(	0.168)	0.032	0.004
207	17.25	0.17	0.036	(	0.168)	0.032	0.004
208	17.33	0.17	0.036	(	0.167)	0.032	0.004
209	17.42	0.17	0.036	(	0.166)	0.032	0.004
210	17.50	0.17	0.036	(	0.165)	0.032	0.004
211	17.58	0.17	0.036	(	0.164)	0.032	0.004
212	17.67	0.17	0.036	(	0.163)	0.032	0.004
213	17.75	0.17	0.036	(	0.163)	0.032	0.004
214	17.83	0.13	0.029	(	0.162)	0.026	0.003
215	17.92	0.13	0.029	(	0.161)	0.026	0.003
216	18.00	0.13	0.029	(	0.160)	0.026	0.003
217	18.08	0.13	0.029	(	0.159)	0.026	0.003
218	18.17	0.13	0.029	(	0.159)	0.026	0.003
219	18.25	0.13	0.029	(	0.158)	0.026	0.003
220	18.33	0.13	0.029	(	0.157)	0.026	0.003
221	18.42	0.13	0.029	(	0.156)	0.026	0.003
222	18.50	0.13	0.029	(	0.156)	0.026	0.003
223	18.58	0.10	0.022	(	0.155)	0.019	0.002
224	18.67	0.10	0.022	(	0.154)	0.019	0.002
225	18.75	0.10	0.022	(	0.153)	0.019	0.002
226	18.83	0.07	0.014	(	0.153)	0.013	0.001
227	18.92	0.07	0.014	(	0.152)	0.013	0.001
228	19.00	0.07	0.014	(	0.151)	0.013	0.001
229	19.08	0.10	0.022	(	0.150)	0.019	0.002
230	19.17	0.10	0.022	(	0.150)	0.019	0.002
231	19.25	0.10	0.022	(	0.149)	0.019	0.002
232	19.33	0.13	0.029	(	0.148)	0.026	0.003
233	19.42	0.13	0.029	(	0.148)	0.026	0.003
234	19.50	0.13	0.029	(	0.147)	0.026	0.003
235	19.58	0.10	0.022	(	0.146)	0.019	0.002
236	19.67	0.10	0.022	(	0.146)	0.019	0.002
237	19.75	0.10	0.022	(	0.145)	0.019	0.002

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238  19.83     0.07      0.014       (  0.144)       0.013        0.001
239  19.92     0.07      0.014       (  0.144)       0.013        0.001
240  20.00     0.07      0.014       (  0.143)       0.013        0.001
241  20.08     0.10      0.022       (  0.142)       0.019        0.002
242  20.17     0.10      0.022       (  0.142)       0.019        0.002
243  20.25     0.10      0.022       (  0.141)       0.019        0.002
244  20.33     0.10      0.022       (  0.141)       0.019        0.002
245  20.42     0.10      0.022       (  0.140)       0.019        0.002
246  20.50     0.10      0.022       (  0.139)       0.019        0.002
247  20.58     0.10      0.022       (  0.139)       0.019        0.002
248  20.67     0.10      0.022       (  0.138)       0.019        0.002
249  20.75     0.10      0.022       (  0.138)       0.019        0.002
250  20.83     0.07      0.014       (  0.137)       0.013        0.001
251  20.92     0.07      0.014       (  0.137)       0.013        0.001
252  21.00     0.07      0.014       (  0.136)       0.013        0.001
253  21.08     0.10      0.022       (  0.135)       0.019        0.002
254  21.17     0.10      0.022       (  0.135)       0.019        0.002
255  21.25     0.10      0.022       (  0.134)       0.019        0.002
256  21.33     0.07      0.014       (  0.134)       0.013        0.001
257  21.42     0.07      0.014       (  0.133)       0.013        0.001
258  21.50     0.07      0.014       (  0.133)       0.013        0.001
259  21.58     0.10      0.022       (  0.132)       0.019        0.002
260  21.67     0.10      0.022       (  0.132)       0.019        0.002
261  21.75     0.10      0.022       (  0.131)       0.019        0.002
262  21.83     0.07      0.014       (  0.131)       0.013        0.001
263  21.92     0.07      0.014       (  0.131)       0.013        0.001
264  22.00     0.07      0.014       (  0.130)       0.013        0.001
265  22.08     0.10      0.022       (  0.130)       0.019        0.002
266  22.17     0.10      0.022       (  0.129)       0.019        0.002
267  22.25     0.10      0.022       (  0.129)       0.019        0.002
268  22.33     0.07      0.014       (  0.128)       0.013        0.001
269  22.42     0.07      0.014       (  0.128)       0.013        0.001
270  22.50     0.07      0.014       (  0.128)       0.013        0.001
271  22.58     0.07      0.014       (  0.127)       0.013        0.001
272  22.67     0.07      0.014       (  0.127)       0.013        0.001
273  22.75     0.07      0.014       (  0.127)       0.013        0.001
274  22.83     0.07      0.014       (  0.126)       0.013        0.001
275  22.92     0.07      0.014       (  0.126)       0.013        0.001
276  23.00     0.07      0.014       (  0.126)       0.013        0.001
277  23.08     0.07      0.014       (  0.125)       0.013        0.001
278  23.17     0.07      0.014       (  0.125)       0.013        0.001
279  23.25     0.07      0.014       (  0.125)       0.013        0.001
280  23.33     0.07      0.014       (  0.125)       0.013        0.001
281  23.42     0.07      0.014       (  0.124)       0.013        0.001
282  23.50     0.07      0.014       (  0.124)       0.013        0.001
283  23.58     0.07      0.014       (  0.124)       0.013        0.001
284  23.67     0.07      0.014       (  0.124)       0.013        0.001
285  23.75     0.07      0.014       (  0.124)       0.013        0.001
286  23.83     0.07      0.014       (  0.123)       0.013        0.001
287  23.92     0.07      0.014       (  0.123)       0.013        0.001
288  24.00     0.07      0.014       (  0.123)       0.013        0.001
               (Loss Rate Not Used)
    Sum =     100.0                                  Sum =     2.2
      Flood volume = Effective rainfall      0.18(In)
       times area      75.8(Ac.)/[(In)/(Ft.)] =       1.2(Ac.Ft)
      Total soil loss =      1.62(In)
      Total soil loss =    10.215(Ac.Ft)
      Total rainfall =      1.80(In)
      Flood volume =       50443.2 Cubic Feet
      Total soil loss =      444956.6 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =      2.393(CFS)
      ---------------------------------------------------------------------
      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                         24 - H O U R    S T O R M
                    R u n o f f      H y d r o g r a p h
      ---------------------------------------------------------------------
                  Hydrograph in   5   Minute intervals ((CFS))

      ---------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5       5.0       7.5      10.0
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   0+ 5       0.0001      0.01  Q         |         |         |         |
   0+10       0.0005      0.06  Q         |         |         |         |
   0+15       0.0011      0.08  Q         |         |         |         |
   0+20       0.0018      0.10  Q         |         |         |         |
   0+25       0.0027      0.13  Q         |         |         |         |
   0+30       0.0037      0.14  Q         |         |         |         |
   0+35       0.0047      0.15  Q         |         |         |         |
   0+40       0.0058      0.16  Q         |         |         |         |
   0+45       0.0069      0.16  Q         |         |         |         |
   0+50       0.0081      0.17  Q         |         |         |         |
   0+55       0.0094      0.19  Q         |         |         |         |
   1+ 0       0.0108      0.21  Q         |         |         |         |
   1+ 5       0.0122      0.20  Q         |         |         |         |
   1+10       0.0135      0.18  Q         |         |         |         |
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1+15      0.0147      0.17  Q          |          |          |          |
1+20      0.0159      0.17  Q          |          |          |          |
1+25      0.0170      0.17  Q          |          |          |          |
1+30      0.0182      0.17  Q          |          |          |          |
1+35      0.0194      0.17  Q          |          |          |          |
1+40      0.0205      0.17  Q          |          |          |          |
1+45      0.0216      0.17  Q          |          |          |          |
1+50      0.0228      0.17  Q          |          |          |          |
1+55      0.0242      0.20  Q          |          |          |          |
2+ 0      0.0256      0.21  Q          |          |          |          |
2+ 5      0.0271      0.21  Q          |          |          |          |
2+10      0.0285      0.21  Q          |          |          |          |
2+15      0.0300      0.22  QV         |          |          |          |
2+20      0.0315      0.22  QV         |          |          |          |
2+25      0.0330      0.22  QV         |          |          |          |
2+30      0.0346      0.22  QV         |          |          |          |
2+35      0.0361      0.23  QV         |          |          |          |
2+40      0.0378      0.25  |Q         |          |          |          |
2+45      0.0396      0.26  |Q         |          |          |          |
2+50      0.0415      0.27  |Q         |          |          |          |
2+55      0.0433      0.27  |Q         |          |          |          |
3+ 0      0.0452      0.27  |Q         |          |          |          |
3+ 5      0.0471      0.27  |Q         |          |          |          |
3+10      0.0490      0.27  |Q         |          |          |          |
3+15      0.0509      0.27  |Q         |          |          |          |
3+20      0.0528      0.27  |Q         |          |          |          |
3+25      0.0547      0.28  |Q         |          |          |          |
3+30      0.0566      0.28  |Q         |          |          |          |
3+35      0.0584      0.28  |QV        |          |          |          |
3+40      0.0603      0.28  |QV        |          |          |          |
3+45      0.0622      0.28  |QV        |          |          |          |
3+50      0.0642      0.28  |QV        |          |          |          |
3+55      0.0663      0.31  |QV        |          |          |          |
4+ 0      0.0685      0.32  |QV        |          |          |          |
4+ 5      0.0707      0.32  |QV        |          |          |          |
4+10      0.0729      0.32  |QV        |          |          |          |
4+15      0.0752      0.33  |QV        |          |          |          |
4+20      0.0775      0.33  |QV        |          |          |          |
4+25      0.0800      0.36  |QV        |          |          |          |
4+30      0.0825      0.37  |QV        |          |          |          |
4+35      0.0851      0.38  |QV        |          |          |          |
4+40      0.0877      0.38  |Q V       |          |          |          |
4+45      0.0904      0.38  |Q V       |          |          |          |
4+50      0.0930      0.39  |Q V       |          |          |          |
4+55      0.0959      0.41  |Q V       |          |          |          |
5+ 0      0.0988      0.43  |Q V       |          |          |          |
5+ 5      0.1017      0.42  |Q V       |          |          |          |
5+10      0.1043      0.37  |Q V       |          |          |          |
5+15      0.1067      0.35  |Q V       |          |          |          |
5+20      0.1091      0.35  |Q V       |          |          |          |
5+25      0.1117      0.37  |Q V       |          |          |          |
5+30      0.1143      0.38  |Q V       |          |          |          |
5+35      0.1170      0.39  |Q  V      |          |          |          |
5+40      0.1198      0.41  |Q  V      |          |          |          |
5+45      0.1227      0.43  |Q  V      |          |          |          |
5+50      0.1257      0.43  |Q  V      |          |          |          |
5+55      0.1287      0.43  |Q  V      |          |          |          |
6+ 0      0.1317      0.44  |Q  V      |          |          |          |
6+ 5      0.1348      0.44  |Q  V      |          |          |          |
6+10      0.1380      0.47  |Q  V      |          |          |          |
6+15      0.1413      0.48  |Q  V      |          |          |          |
6+20      0.1447      0.49  |Q  V      |          |          |          |
6+25      0.1480      0.49  |Q   V     |          |          |          |
6+30      0.1514      0.49  |Q   V     |          |          |          |
6+35      0.1549      0.50  |Q   V     |          |          |          |
6+40      0.1585      0.52  | Q  V     |          |          |          |
6+45      0.1622      0.54  | Q  V     |          |          |          |
6+50      0.1659      0.54  | Q  V     |          |          |          |
6+55      0.1697      0.54  | Q  V     |          |          |          |
7+ 0      0.1734      0.55  | Q  V     |          |          |          |
7+ 5      0.1772      0.55  | Q   V    |          |          |          |
7+10      0.1810      0.55  | Q   V    |          |          |          |
7+15      0.1848      0.55  | Q   V    |          |          |          |
7+20      0.1886      0.56  | Q   V    |          |          |          |
7+25      0.1926      0.58  | Q   V    |          |          |          |
7+30      0.1967      0.59  | Q   V    |          |          |          |
7+35      0.2008      0.60  | Q   V    |          |          |          |
7+40      0.2052      0.63  | Q    V   |          |          |          |
7+45      0.2096      0.64  | Q    V   |          |          |          |
7+50      0.2141      0.66  | Q    V   |          |          |          |
7+55      0.2188      0.68  | Q    V   |          |          |          |
8+ 0      0.2237      0.70  | Q    V   |          |          |          |
8+ 5      0.2286      0.72  | Q    V   |          |          |          |
8+10      0.2339      0.77  |  Q    V  |          |          |          |
8+15      0.2394      0.80  |  Q    V  |          |          |          |
8+20      0.2449      0.81  |  Q    V  |          |          |          |
```



8+25	0.2505	0.81	Q V				
8+30	0.2562	0.82	Q V				
8+35	0.2619	0.83	Q V				
8+40	0.2677	0.85	Q V				
8+45	0.2737	0.87	Q V				
8+50	0.2798	0.88	Q V				
8+55	0.2860	0.91	Q V				
9+ 0	0.2923	0.92	Q V				
9+ 5	0.2988	0.94	Q V				
9+10	0.3056	0.99	Q V				
9+15	0.3126	1.02	Q V				
9+20	0.3197	1.03	Q V				
9+25	0.3270	1.06	Q V				
9+30	0.3345	1.08	Q V				
9+35	0.3420	1.09	Q V				
9+40	0.3498	1.12	Q V				
9+45	0.3576	1.14	Q V				
9+50	0.3655	1.15	Q V				
9+55	0.3736	1.18	Q V				
10+ 0	0.3819	1.19	Q V				
10+ 5	0.3898	1.15	Q V				
10+10	0.3966	0.99	Q V				
10+15	0.4029	0.91	Q V				
10+20	0.4090	0.88	Q V				
10+25	0.4149	0.86	Q V				
10+30	0.4208	0.85	Q V				
10+35	0.4268	0.88	Q V				
10+40	0.4336	0.99	Q V				
10+45	0.4408	1.04	Q V				
10+50	0.4481	1.06	Q V				
10+55	0.4555	1.07	Q V				
11+ 0	0.4629	1.08	Q V				
11+ 5	0.4704	1.08	Q V				
11+10	0.4777	1.06	Q V				
11+15	0.4850	1.05	Q V				
11+20	0.4922	1.05	Q V				
11+25	0.4995	1.05	Q V				
11+30	0.5067	1.05	Q V				
11+35	0.5138	1.03	Q V				
11+40	0.5206	0.99	Q V				
11+45	0.5272	0.96	Q V				
11+50	0.5338	0.96	Q V				
11+55	0.5406	0.98	Q V				
12+ 0	0.5474	0.99	Q V				
12+ 5	0.5545	1.03	Q V				
12+10	0.5628	1.20	Q V				
12+15	0.5716	1.28	Q V				
12+20	0.5807	1.32	Q V				
12+25	0.5901	1.37	Q V				
12+30	0.5997	1.39	Q V				
12+35	0.6095	1.42	Q V				
12+40	0.6197	1.48	Q V				
12+45	0.6300	1.51	Q V				
12+50	0.6406	1.53	Q V				
12+55	0.6513	1.56	Q V				
13+ 0	0.6621	1.58	Q V				
13+ 5	0.6735	1.65	Q V				
13+10	0.6867	1.91	Q V				
13+15	0.7011	2.08	Q V				
13+20	0.7162	2.20	Q V				
13+25	0.7320	2.30	Q V				
13+30	0.7485	2.39	Q V				
13+35	0.7644	2.31	Q V				
13+40	0.7767	1.79	Q V				
13+45	0.7873	1.53	Q V				
13+50	0.7972	1.44	Q V				
13+55	0.8067	1.38	Q V				
14+ 0	0.8160	1.35	Q V				
14+ 5	0.8253	1.35	Q V				
14+10	0.8350	1.42	Q V				
14+15	0.8451	1.45	Q V				
14+20	0.8551	1.46	Q V				
14+25	0.8650	1.43	Q V				
14+30	0.8748	1.43	Q V				
14+35	0.8846	1.43	Q V				
14+40	0.8945	1.43	Q V				
14+45	0.9044	1.43	Q V				
14+50	0.9142	1.43	Q V				
14+55	0.9238	1.40	Q V				
15+ 0	0.9334	1.39	Q V				
15+ 5	0.9429	1.38	Q V				
15+10	0.9522	1.35	Q V				
15+15	0.9614	1.34	Q V				
15+20	0.9705	1.32	Q V				
15+25	0.9795	1.30	Q V				
15+30	0.9883	1.28	Q V				

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15+35       0.9969      1.25  |    Q      |           |           |    V      |
15+40       1.0048      1.15  |    Q      |           |           |    V      |
15+45       1.0124      1.10  |    Q      |           |           |    V      |
15+50       1.0199      1.08  |    Q      |           |           |     V     |
15+55       1.0272      1.07  |    Q      |           |           |     V     |
16+ 0       1.0346      1.06  |    Q      |           |           |     V     |
16+ 5       1.0411      0.95  |   Q       |           |           |     V     |
16+10       1.0452      0.59  |  Q        |           |           |      V    |
16+15       1.0481      0.42  |Q          |           |           |      V    |
16+20       1.0505      0.35  |Q          |           |           |      V    |
16+25       1.0525      0.30  |Q          |           |           |      V    |
16+30       1.0544      0.27  |Q          |           |           |      V    |
16+35       1.0561      0.25  Q           |           |           |      V    |
16+40       1.0576      0.21  Q           |           |           |      V    |
16+45       1.0589      0.19  Q           |           |           |      V    |
16+50       1.0602      0.18  Q           |           |           |      V    |
16+55       1.0613      0.17  Q           |           |           |      V    |
17+ 0       1.0625      0.17  Q           |           |           |      V    |
17+ 5       1.0637      0.18  Q           |           |           |      V    |
17+10       1.0653      0.23  Q           |           |           |      V    |
17+15       1.0670      0.25  |Q          |           |           |      V    |
17+20       1.0688      0.26  |Q          |           |           |      V    |
17+25       1.0706      0.26  |Q          |           |           |      V    |
17+30       1.0725      0.27  |Q          |           |           |       V   |
17+35       1.0743      0.27  |Q          |           |           |       V   |
17+40       1.0762      0.27  |Q          |           |           |       V   |
17+45       1.0781      0.27  |Q          |           |           |       V   |
17+50       1.0799      0.27  |Q          |           |           |       V   |
17+55       1.0816      0.24  Q           |           |           |       V   |
18+ 0       1.0832      0.23  Q           |           |           |       V   |
18+ 5       1.0848      0.23  Q           |           |           |       V   |
18+10       1.0864      0.23  Q           |           |           |       V   |
18+15       1.0879      0.22  Q           |           |           |       V   |
18+20       1.0894      0.22  Q           |           |           |       V   |
18+25       1.0910      0.22  Q           |           |           |       V   |
18+30       1.0925      0.22  Q           |           |           |       V   |
18+35       1.0940      0.21  Q           |           |           |       V   |
18+40       1.0953      0.19  Q           |           |           |       V   |
18+45       1.0965      0.18  Q           |           |           |       V   |
18+50       1.0976      0.17  Q           |           |           |       V   |
18+55       1.0986      0.14  Q           |           |           |       V   |
19+ 0       1.0995      0.13  Q           |           |           |       V   |
19+ 5       1.1004      0.13  Q           |           |           |        V  |
19+10       1.1014      0.15  Q           |           |           |        V  |
19+15       1.1024      0.16  Q           |           |           |        V  |
19+20       1.1036      0.17  Q           |           |           |        V  |
19+25       1.1049      0.19  Q           |           |           |        V  |
19+30       1.1063      0.20  Q           |           |           |        V  |
19+35       1.1077      0.20  Q           |           |           |        V  |
19+40       1.1090      0.18  Q           |           |           |        V  |
19+45       1.1102      0.17  Q           |           |           |        V  |
19+50       1.1113      0.16  Q           |           |           |        V  |
19+55       1.1123      0.14  Q           |           |           |        V  |
20+ 0       1.1131      0.13  Q           |           |           |        V  |
20+ 5       1.1140      0.13  Q           |           |           |        V  |
20+10       1.1150      0.15  Q           |           |           |        V  |
20+15       1.1161      0.16  Q           |           |           |        V  |
20+20       1.1172      0.16  Q           |           |           |        V  |
20+25       1.1183      0.16  Q           |           |           |        V  |
20+30       1.1194      0.16  Q           |           |           |        V  |
20+35       1.1205      0.16  Q           |           |           |        V  |
20+40       1.1217      0.16  Q           |           |           |        V  |
20+45       1.1228      0.16  Q           |           |           |        V  |
20+50       1.1239      0.16  Q           |           |           |        V  |
20+55       1.1248      0.13  Q           |           |           |        V  |
21+ 0       1.1257      0.12  Q           |           |           |        V  |
21+ 5       1.1265      0.13  Q           |           |           |        V  |
21+10       1.1275      0.15  Q           |           |           |        V  |
21+15       1.1286      0.16  Q           |           |           |        V  |
21+20       1.1297      0.15  Q           |           |           |         V |
21+25       1.1306      0.13  Q           |           |           |         V |
21+30       1.1314      0.12  Q           |           |           |         V |
21+35       1.1322      0.12  Q           |           |           |         V |
21+40       1.1332      0.14  Q           |           |           |         V |
21+45       1.1343      0.16  Q           |           |           |         V |
21+50       1.1353      0.15  Q           |           |           |         V |
21+55       1.1362      0.13  Q           |           |           |         V |
22+ 0       1.1371      0.12  Q           |           |           |         V |
22+ 5       1.1379      0.12  Q           |           |           |         V |
22+10       1.1389      0.14  Q           |           |           |         V |
22+15       1.1400      0.16  Q           |           |           |         V |
22+20       1.1410      0.15  Q           |           |           |         V |
22+25       1.1419      0.13  Q           |           |           |         V |
22+30       1.1428      0.12  Q           |           |           |         V |
22+35       1.1436      0.12  Q           |           |           |         V |
22+40       1.1443      0.11  Q           |           |           |         V |
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   22+45       1.1451      0.11  Q          |          |          |          v|
   22+50       1.1459      0.11  Q          |          |          |          v|
   22+55       1.1467      0.11  Q          |          |          |          v|
   23+ 0       1.1474      0.11  Q          |          |          |          v|
   23+ 5       1.1482      0.11  Q          |          |          |          v|
   23+10       1.1489      0.11  Q          |          |          |          v|
   23+15       1.1497      0.11  Q          |          |          |          v|
   23+20       1.1505      0.11  Q          |          |          |          v|
   23+25       1.1512      0.11  Q          |          |          |          v|
   23+30       1.1520      0.11  Q          |          |          |          v|
   23+35       1.1527      0.11  Q          |          |          |          v|
   23+40       1.1535      0.11  Q          |          |          |          v|
   23+45       1.1543      0.11  Q          |          |          |          v|
   23+50       1.1550      0.11  Q          |          |          |          v|
   23+55       1.1558      0.11  Q          |          |          |          v|
   24+ 0       1.1565      0.11  Q          |          |          |          v|
   24+ 5       1.1572      0.10  Q          |          |          |          v|
   24+10       1.1575      0.05  Q          |          |          |          v|
   24+15       1.1577      0.03  Q          |          |          |          v|
   24+20       1.1578      0.02  Q          |          |          |          v|
   24+25       1.1579      0.01  Q          |          |          |          v|
   24+30       1.1579      0.01  Q          |          |          |          v|
   24+35       1.1580      0.00  Q          |          |          |          v|
   24+40       1.1580      0.00  Q          |          |          |          v|
   24+45       1.1580      0.00  Q          |          |          |          v|
   24+50       1.1580      0.00  Q          |          |          |          v|
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U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/17/24 File: EXB2242.out

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

Program License Serial Number 5006

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

English Units used in output format

Drainage Area = 19.12(Ac.) = 0.030 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 19.12(Ac.) = 0.030 Sq. Mi.
Length along longest watercourse = 724.00(Ft.)
Length along longest watercourse measured to centroid = 360.00(Ft.)
Length along longest watercourse = 0.137 Mi.
Length along longest watercourse measured to centroid = 0.068 Mi.
Difference in elevation = 77.00(Ft.)
Slope along watercourse = 561.5470 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.037 Hr.
Lag time = 2.20 Min.
25% of lag time = 0.55 Min.
40% of lag time = 0.88 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]
19.12	1.80	34.42

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
19.12	5.00	95.60

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 1.800(In)
Area Averaged 100-Year Rainfall = 5.000(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 %
19.120	91.00	0.000

Total Area Entered = 19.12(Ac.)

RI AMC2	RI AMC-1	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
91.0	79.8	0.246	0.000	0.246	1.000	0.246
					Sum (F) =	0.246

Area averaged mean soil loss (F) (In/Hr) = 0.246
Minimum soil loss rate ((In/Hr)) = 0.123
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)

1	0.083	227.497	47.782	9.207
2	0.167	454.994	41.494	7.996
3	0.250	682.491	7.777	1.499
4	0.333	909.988	2.947	0.568
			Sum = 100.000	Sum= 19.269

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	(0.437)	0.013	0.001
2	0.17	0.07	0.014	(0.435)	0.013	0.001
3	0.25	0.07	0.014	(0.433)	0.013	0.001
4	0.33	0.10	0.022	(0.432)	0.019	0.002
5	0.42	0.10	0.022	(0.430)	0.019	0.002
6	0.50	0.10	0.022	(0.428)	0.019	0.002
7	0.58	0.10	0.022	(0.427)	0.019	0.002
8	0.67	0.10	0.022	(0.425)	0.019	0.002
9	0.75	0.10	0.022	(0.423)	0.019	0.002
10	0.83	0.13	0.029	(0.422)	0.026	0.003
11	0.92	0.13	0.029	(0.420)	0.026	0.003
12	1.00	0.13	0.029	(0.418)	0.026	0.003
13	1.08	0.10	0.022	(0.417)	0.019	0.002
14	1.17	0.10	0.022	(0.415)	0.019	0.002
15	1.25	0.10	0.022	(0.413)	0.019	0.002
16	1.33	0.10	0.022	(0.412)	0.019	0.002
17	1.42	0.10	0.022	(0.410)	0.019	0.002
18	1.50	0.10	0.022	(0.408)	0.019	0.002
19	1.58	0.10	0.022	(0.407)	0.019	0.002
20	1.67	0.10	0.022	(0.405)	0.019	0.002
21	1.75	0.10	0.022	(0.404)	0.019	0.002
22	1.83	0.13	0.029	(0.402)	0.026	0.003
23	1.92	0.13	0.029	(0.400)	0.026	0.003
24	2.00	0.13	0.029	(0.399)	0.026	0.003
25	2.08	0.13	0.029	(0.397)	0.026	0.003
26	2.17	0.13	0.029	(0.395)	0.026	0.003
27	2.25	0.13	0.029	(0.394)	0.026	0.003
28	2.33	0.13	0.029	(0.392)	0.026	0.003
29	2.42	0.13	0.029	(0.391)	0.026	0.003
30	2.50	0.13	0.029	(0.389)	0.026	0.003
31	2.58	0.17	0.036	(0.387)	0.032	0.004
32	2.67	0.17	0.036	(0.386)	0.032	0.004
33	2.75	0.17	0.036	(0.384)	0.032	0.004
34	2.83	0.17	0.036	(0.383)	0.032	0.004
35	2.92	0.17	0.036	(0.381)	0.032	0.004
36	3.00	0.17	0.036	(0.380)	0.032	0.004
37	3.08	0.17	0.036	(0.378)	0.032	0.004
38	3.17	0.17	0.036	(0.376)	0.032	0.004
39	3.25	0.17	0.036	(0.375)	0.032	0.004
40	3.33	0.17	0.036	(0.373)	0.032	0.004
41	3.42	0.17	0.036	(0.372)	0.032	0.004
42	3.50	0.17	0.036	(0.370)	0.032	0.004
43	3.58	0.17	0.036	(0.369)	0.032	0.004
44	3.67	0.17	0.036	(0.367)	0.032	0.004
45	3.75	0.17	0.036	(0.366)	0.032	0.004
46	3.83	0.20	0.043	(0.364)	0.039	0.004
47	3.92	0.20	0.043	(0.362)	0.039	0.004
48	4.00	0.20	0.043	(0.361)	0.039	0.004
49	4.08	0.20	0.043	(0.359)	0.039	0.004
50	4.17	0.20	0.043	(0.358)	0.039	0.004
51	4.25	0.20	0.043	(0.356)	0.039	0.004
52	4.33	0.23	0.050	(0.355)	0.045	0.005
53	4.42	0.23	0.050	(0.353)	0.045	0.005
54	4.50	0.23	0.050	(0.352)	0.045	0.005
55	4.58	0.23	0.050	(0.350)	0.045	0.005
56	4.67	0.23	0.050	(0.349)	0.045	0.005
57	4.75	0.23	0.050	(0.347)	0.045	0.005
58	4.83	0.27	0.058	(0.346)	0.052	0.006
59	4.92	0.27	0.058	(0.344)	0.052	0.006
60	5.00	0.27	0.058	(0.343)	0.052	0.006
61	5.08	0.20	0.043	(0.341)	0.039	0.004
62	5.17	0.20	0.043	(0.340)	0.039	0.004
63	5.25	0.20	0.043	(0.338)	0.039	0.004
64	5.33	0.23	0.050	(0.337)	0.045	0.005
65	5.42	0.23	0.050	(0.335)	0.045	0.005
66	5.50	0.23	0.050	(0.334)	0.045	0.005
67	5.58	0.27	0.058	(0.332)	0.052	0.006
68	5.67	0.27	0.058	(0.331)	0.052	0.006
69	5.75	0.27	0.058	(0.330)	0.052	0.006
70	5.83	0.27	0.058	(0.328)	0.052	0.006
71	5.92	0.27	0.058	(0.327)	0.052	0.006
72	6.00	0.27	0.058	(0.325)	0.052	0.006

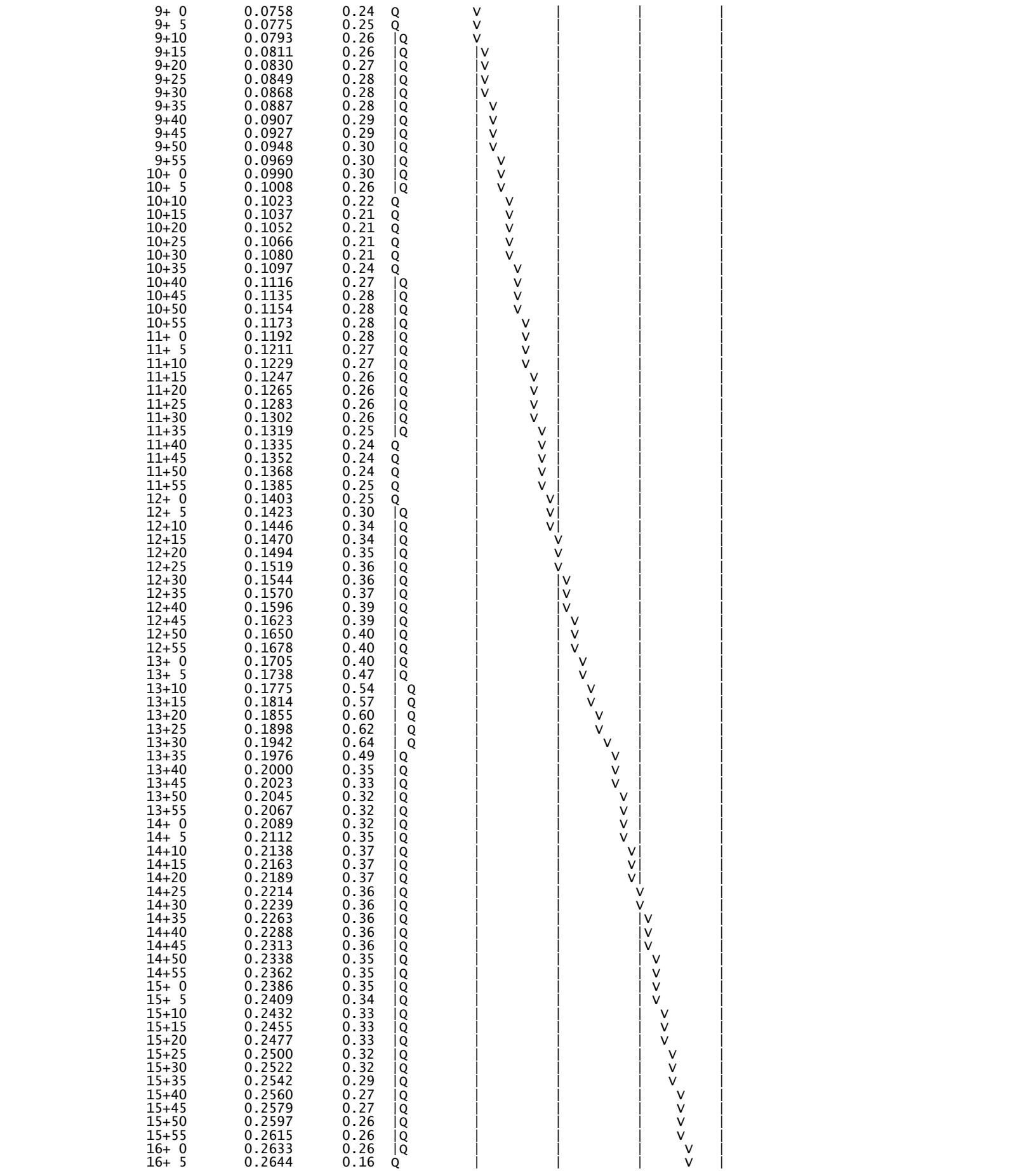
73	6.08	0.30	0.065	(0.324)	0.058	0.006
74	6.17	0.30	0.065	(0.322)	0.058	0.006
75	6.25	0.30	0.065	(0.321)	0.058	0.006
76	6.33	0.30	0.065	(0.319)	0.058	0.006
77	6.42	0.30	0.065	(0.318)	0.058	0.006
78	6.50	0.30	0.065	(0.317)	0.058	0.006
79	6.58	0.33	0.072	(0.315)	0.065	0.007
80	6.67	0.33	0.072	(0.314)	0.065	0.007
81	6.75	0.33	0.072	(0.312)	0.065	0.007
82	6.83	0.33	0.072	(0.311)	0.065	0.007
83	6.92	0.33	0.072	(0.310)	0.065	0.007
84	7.00	0.33	0.072	(0.308)	0.065	0.007
85	7.08	0.33	0.072	(0.307)	0.065	0.007
86	7.17	0.33	0.072	(0.305)	0.065	0.007
87	7.25	0.33	0.072	(0.304)	0.065	0.007
88	7.33	0.37	0.079	(0.303)	0.071	0.008
89	7.42	0.37	0.079	(0.301)	0.071	0.008
90	7.50	0.37	0.079	(0.300)	0.071	0.008
91	7.58	0.40	0.086	(0.298)	0.078	0.009
92	7.67	0.40	0.086	(0.297)	0.078	0.009
93	7.75	0.40	0.086	(0.296)	0.078	0.009
94	7.83	0.43	0.094	(0.294)	0.084	0.009
95	7.92	0.43	0.094	(0.293)	0.084	0.009
96	8.00	0.43	0.094	(0.292)	0.084	0.009
97	8.08	0.50	0.108	(0.290)	0.097	0.011
98	8.17	0.50	0.108	(0.289)	0.097	0.011
99	8.25	0.50	0.108	(0.288)	0.097	0.011
100	8.33	0.50	0.108	(0.286)	0.097	0.011
101	8.42	0.50	0.108	(0.285)	0.097	0.011
102	8.50	0.50	0.108	(0.283)	0.097	0.011
103	8.58	0.53	0.115	(0.282)	0.104	0.012
104	8.67	0.53	0.115	(0.281)	0.104	0.012
105	8.75	0.53	0.115	(0.280)	0.104	0.012
106	8.83	0.57	0.122	(0.278)	0.110	0.012
107	8.92	0.57	0.122	(0.277)	0.110	0.012
108	9.00	0.57	0.122	(0.276)	0.110	0.012
109	9.08	0.63	0.137	(0.274)	0.123	0.014
110	9.17	0.63	0.137	(0.273)	0.123	0.014
111	9.25	0.63	0.137	(0.272)	0.123	0.014
112	9.33	0.67	0.144	(0.270)	0.130	0.014
113	9.42	0.67	0.144	(0.269)	0.130	0.014
114	9.50	0.67	0.144	(0.268)	0.130	0.014
115	9.58	0.70	0.151	(0.267)	0.136	0.015
116	9.67	0.70	0.151	(0.265)	0.136	0.015
117	9.75	0.70	0.151	(0.264)	0.136	0.015
118	9.83	0.73	0.158	(0.263)	0.143	0.016
119	9.92	0.73	0.158	(0.261)	0.143	0.016
120	10.00	0.73	0.158	(0.260)	0.143	0.016
121	10.08	0.50	0.108	(0.259)	0.097	0.011
122	10.17	0.50	0.108	(0.258)	0.097	0.011
123	10.25	0.50	0.108	(0.256)	0.097	0.011
124	10.33	0.50	0.108	(0.255)	0.097	0.011
125	10.42	0.50	0.108	(0.254)	0.097	0.011
126	10.50	0.50	0.108	(0.253)	0.097	0.011
127	10.58	0.67	0.144	(0.251)	0.130	0.014
128	10.67	0.67	0.144	(0.250)	0.130	0.014
129	10.75	0.67	0.144	(0.249)	0.130	0.014
130	10.83	0.67	0.144	(0.248)	0.130	0.014
131	10.92	0.67	0.144	(0.247)	0.130	0.014
132	11.00	0.67	0.144	(0.245)	0.130	0.014
133	11.08	0.63	0.137	(0.244)	0.123	0.014
134	11.17	0.63	0.137	(0.243)	0.123	0.014
135	11.25	0.63	0.137	(0.242)	0.123	0.014
136	11.33	0.63	0.137	(0.241)	0.123	0.014
137	11.42	0.63	0.137	(0.239)	0.123	0.014
138	11.50	0.63	0.137	(0.238)	0.123	0.014
139	11.58	0.57	0.122	(0.237)	0.110	0.012
140	11.67	0.57	0.122	(0.236)	0.110	0.012
141	11.75	0.57	0.122	(0.235)	0.110	0.012
142	11.83	0.60	0.130	(0.233)	0.117	0.013
143	11.92	0.60	0.130	(0.232)	0.117	0.013
144	12.00	0.60	0.130	(0.231)	0.117	0.013
145	12.08	0.83	0.180	(0.230)	0.162	0.018
146	12.17	0.83	0.180	(0.229)	0.162	0.018
147	12.25	0.83	0.180	(0.228)	0.162	0.018
148	12.33	0.87	0.187	(0.227)	0.168	0.019
149	12.42	0.87	0.187	(0.225)	0.168	0.019
150	12.50	0.87	0.187	(0.224)	0.168	0.019
151	12.58	0.93	0.202	(0.223)	0.181	0.020
152	12.67	0.93	0.202	(0.222)	0.181	0.020
153	12.75	0.93	0.202	(0.221)	0.181	0.020
154	12.83	0.97	0.209	(0.220)	0.188	0.021
155	12.92	0.97	0.209	(0.219)	0.188	0.021
156	13.00	0.97	0.209	(0.218)	0.188	0.021
157	13.08	1.13	0.245	0.216	(0.220)	0.028
158	13.17	1.13	0.245	0.215	(0.220)	0.029

159	13.25	1.13	0.245	0.214	(0.220)	0.031
160	13.33	1.13	0.245	0.213	(0.220)	0.032
161	13.42	1.13	0.245	0.212	(0.220)	0.033
162	13.50	1.13	0.245	0.211	(0.220)	0.034
163	13.58	0.77	0.166	(0.210)	0.149	0.017
164	13.67	0.77	0.166	(0.209)	0.149	0.017
165	13.75	0.77	0.166	(0.208)	0.149	0.017
166	13.83	0.77	0.166	(0.207)	0.149	0.017
167	13.92	0.77	0.166	(0.206)	0.149	0.017
168	14.00	0.77	0.166	(0.205)	0.149	0.017
169	14.08	0.90	0.194	(0.204)	0.175	0.019
170	14.17	0.90	0.194	(0.203)	0.175	0.019
171	14.25	0.90	0.194	(0.202)	0.175	0.019
172	14.33	0.87	0.187	(0.200)	0.168	0.019
173	14.42	0.87	0.187	(0.199)	0.168	0.019
174	14.50	0.87	0.187	(0.198)	0.168	0.019
175	14.58	0.87	0.187	(0.197)	0.168	0.019
176	14.67	0.87	0.187	(0.196)	0.168	0.019
177	14.75	0.87	0.187	(0.195)	0.168	0.019
178	14.83	0.83	0.180	(0.194)	0.162	0.018
179	14.92	0.83	0.180	(0.193)	0.162	0.018
180	15.00	0.83	0.180	(0.192)	0.162	0.018
181	15.08	0.80	0.173	(0.191)	0.156	0.017
182	15.17	0.80	0.173	(0.190)	0.156	0.017
183	15.25	0.80	0.173	(0.189)	0.156	0.017
184	15.33	0.77	0.166	(0.188)	0.149	0.017
185	15.42	0.77	0.166	(0.188)	0.149	0.017
186	15.50	0.77	0.166	(0.187)	0.149	0.017
187	15.58	0.63	0.137	(0.186)	0.123	0.014
188	15.67	0.63	0.137	(0.185)	0.123	0.014
189	15.75	0.63	0.137	(0.184)	0.123	0.014
190	15.83	0.63	0.137	(0.183)	0.123	0.014
191	15.92	0.63	0.137	(0.182)	0.123	0.014
192	16.00	0.63	0.137	(0.181)	0.123	0.014
193	16.08	0.13	0.029	(0.180)	0.026	0.003
194	16.17	0.13	0.029	(0.179)	0.026	0.003
195	16.25	0.13	0.029	(0.178)	0.026	0.003
196	16.33	0.13	0.029	(0.177)	0.026	0.003
197	16.42	0.13	0.029	(0.176)	0.026	0.003
198	16.50	0.13	0.029	(0.175)	0.026	0.003
199	16.58	0.10	0.022	(0.175)	0.019	0.002
200	16.67	0.10	0.022	(0.174)	0.019	0.002
201	16.75	0.10	0.022	(0.173)	0.019	0.002
202	16.83	0.10	0.022	(0.172)	0.019	0.002
203	16.92	0.10	0.022	(0.171)	0.019	0.002
204	17.00	0.10	0.022	(0.170)	0.019	0.002
205	17.08	0.17	0.036	(0.169)	0.032	0.004
206	17.17	0.17	0.036	(0.168)	0.032	0.004
207	17.25	0.17	0.036	(0.168)	0.032	0.004
208	17.33	0.17	0.036	(0.167)	0.032	0.004
209	17.42	0.17	0.036	(0.166)	0.032	0.004
210	17.50	0.17	0.036	(0.165)	0.032	0.004
211	17.58	0.17	0.036	(0.164)	0.032	0.004
212	17.67	0.17	0.036	(0.163)	0.032	0.004
213	17.75	0.17	0.036	(0.163)	0.032	0.004
214	17.83	0.13	0.029	(0.162)	0.026	0.003
215	17.92	0.13	0.029	(0.161)	0.026	0.003
216	18.00	0.13	0.029	(0.160)	0.026	0.003
217	18.08	0.13	0.029	(0.159)	0.026	0.003
218	18.17	0.13	0.029	(0.159)	0.026	0.003
219	18.25	0.13	0.029	(0.158)	0.026	0.003
220	18.33	0.13	0.029	(0.157)	0.026	0.003
221	18.42	0.13	0.029	(0.156)	0.026	0.003
222	18.50	0.13	0.029	(0.156)	0.026	0.003
223	18.58	0.10	0.022	(0.155)	0.019	0.002
224	18.67	0.10	0.022	(0.154)	0.019	0.002
225	18.75	0.10	0.022	(0.153)	0.019	0.002
226	18.83	0.07	0.014	(0.153)	0.013	0.001
227	18.92	0.07	0.014	(0.152)	0.013	0.001
228	19.00	0.07	0.014	(0.151)	0.013	0.001
229	19.08	0.10	0.022	(0.150)	0.019	0.002
230	19.17	0.10	0.022	(0.150)	0.019	0.002
231	19.25	0.10	0.022	(0.149)	0.019	0.002
232	19.33	0.13	0.029	(0.148)	0.026	0.003
233	19.42	0.13	0.029	(0.148)	0.026	0.003
234	19.50	0.13	0.029	(0.147)	0.026	0.003
235	19.58	0.10	0.022	(0.146)	0.019	0.002
236	19.67	0.10	0.022	(0.146)	0.019	0.002
237	19.75	0.10	0.022	(0.145)	0.019	0.002
238	19.83	0.07	0.014	(0.144)	0.013	0.001
239	19.92	0.07	0.014	(0.144)	0.013	0.001
240	20.00	0.07	0.014	(0.143)	0.013	0.001
241	20.08	0.10	0.022	(0.142)	0.019	0.002
242	20.17	0.10	0.022	(0.142)	0.019	0.002
243	20.25	0.10	0.022	(0.141)	0.019	0.002
244	20.33	0.10	0.022	(0.141)	0.019	0.002

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245  20.42     0.10      0.022       (  0.140)       0.019        0.002
246  20.50     0.10      0.022       (  0.139)       0.019        0.002
247  20.58     0.10      0.022       (  0.139)       0.019        0.002
248  20.67     0.10      0.022       (  0.138)       0.019        0.002
249  20.75     0.10      0.022       (  0.138)       0.019        0.002
250  20.83     0.07      0.014       (  0.137)       0.013        0.001
251  20.92     0.07      0.014       (  0.137)       0.013        0.001
252  21.00     0.07      0.014       (  0.136)       0.013        0.001
253  21.08     0.10      0.022       (  0.135)       0.019        0.002
254  21.17     0.10      0.022       (  0.135)       0.019        0.002
255  21.25     0.10      0.022       (  0.134)       0.019        0.002
256  21.33     0.07      0.014       (  0.134)       0.013        0.001
257  21.42     0.07      0.014       (  0.133)       0.013        0.001
258  21.50     0.07      0.014       (  0.133)       0.013        0.001
259  21.58     0.10      0.022       (  0.132)       0.019        0.002
260  21.67     0.10      0.022       (  0.132)       0.019        0.002
261  21.75     0.10      0.022       (  0.131)       0.019        0.002
262  21.83     0.07      0.014       (  0.131)       0.013        0.001
263  21.92     0.07      0.014       (  0.131)       0.013        0.001
264  22.00     0.07      0.014       (  0.130)       0.013        0.001
265  22.08     0.10      0.022       (  0.130)       0.019        0.002
266  22.17     0.10      0.022       (  0.129)       0.019        0.002
267  22.25     0.10      0.022       (  0.129)       0.019        0.002
268  22.33     0.07      0.014       (  0.128)       0.013        0.001
269  22.42     0.07      0.014       (  0.128)       0.013        0.001
270  22.50     0.07      0.014       (  0.128)       0.013        0.001
271  22.58     0.07      0.014       (  0.127)       0.013        0.001
272  22.67     0.07      0.014       (  0.127)       0.013        0.001
273  22.75     0.07      0.014       (  0.127)       0.013        0.001
274  22.83     0.07      0.014       (  0.126)       0.013        0.001
275  22.92     0.07      0.014       (  0.126)       0.013        0.001
276  23.00     0.07      0.014       (  0.126)       0.013        0.001
277  23.08     0.07      0.014       (  0.125)       0.013        0.001
278  23.17     0.07      0.014       (  0.125)       0.013        0.001
279  23.25     0.07      0.014       (  0.125)       0.013        0.001
280  23.33     0.07      0.014       (  0.125)       0.013        0.001
281  23.42     0.07      0.014       (  0.124)       0.013        0.001
282  23.50     0.07      0.014       (  0.124)       0.013        0.001
283  23.58     0.07      0.014       (  0.124)       0.013        0.001
284  23.67     0.07      0.014       (  0.124)       0.013        0.001
285  23.75     0.07      0.014       (  0.124)       0.013        0.001
286  23.83     0.07      0.014       (  0.123)       0.013        0.001
287  23.92     0.07      0.014       (  0.123)       0.013        0.001
288  24.00     0.07      0.014       (  0.123)       0.013        0.001
                (Loss Rate Not Used)
    Sum =     100.0                                  Sum =      2.2
      Flood volume = Effective rainfall      0.18(In)
       times area      19.1(Ac.)/[(In)/(Ft.)] =       0.3(Ac.Ft)
      Total soil loss =      1.62(In)
      Total soil loss =     2.576(Ac.Ft)
      Total rainfall =      1.80(In)
      Flood volume =       12721.1 Cubic Feet
      Total soil loss =      112204.3 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =      0.638(CFS)
      ---------------------------------------------------------------------
      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          24 - H O U R    S T O R M
                     R u n o f f      H y d r o g r a p h
      ---------------------------------------------------------------------
                  Hydrograph in   5   Minute intervals ((CFS))

      ---------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5       5.0       7.5      10.0
 ---------------------------------------------------------------------------
   0+ 5       0.0001      0.01  Q          |         |         |         |
   0+10       0.0003      0.02  Q          |         |         |         |
   0+15       0.0004      0.03  Q          |         |         |         |
   0+20       0.0007      0.03  Q          |         |         |         |
   0+25       0.0010      0.04  Q          |         |         |         |
   0+30       0.0012      0.04  Q          |         |         |         |
   0+35       0.0015      0.04  Q          |         |         |         |
   0+40       0.0018      0.04  Q          |         |         |         |
   0+45       0.0021      0.04  Q          |         |         |         |
   0+50       0.0024      0.05  Q          |         |         |         |
   0+55       0.0028      0.05  Q          |         |         |         |
   1+ 0       0.0032      0.06  Q          |         |         |         |
   1+ 5       0.0035      0.05  Q          |         |         |         |
   1+10       0.0038      0.04  Q          |         |         |         |
   1+15       0.0041      0.04  Q          |         |         |         |
   1+20       0.0044      0.04  Q          |         |         |         |
   1+25       0.0047      0.04  Q          |         |         |         |
   1+30       0.0050      0.04  Q          |         |         |         |
   1+35       0.0053      0.04  Q          |         |         |         |
   1+40       0.0055      0.04  Q          |         |         |         |
   1+45       0.0058      0.04  Q          |         |         |         |
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1+50       0.0062      0.05  Q          |          |          |          |
1+55       0.0065      0.05  Q          |          |          |          |
2+ 0       0.0069      0.06  Q          |          |          |          |
2+ 5       0.0073      0.06  Q          |          |          |          |
2+10       0.0077      0.06  QV         |          |          |          |
2+15       0.0081      0.06  QV         |          |          |          |
2+20       0.0084      0.06  QV         |          |          |          |
2+25       0.0088      0.06  QV         |          |          |          |
2+30       0.0092      0.06  QV         |          |          |          |
2+35       0.0096      0.06  QV         |          |          |          |
2+40       0.0101      0.07  QV         |          |          |          |
2+45       0.0106      0.07  QV         |          |          |          |
2+50       0.0111      0.07  QV         |          |          |          |
2+55       0.0115      0.07  QV         |          |          |          |
3+ 0       0.0120      0.07  QV         |          |          |          |
3+ 5       0.0125      0.07  QV         |          |          |          |
3+10       0.0130      0.07  QV         |          |          |          |
3+15       0.0135      0.07  QV         |          |          |          |
3+20       0.0139      0.07  QV         |          |          |          |
3+25       0.0144      0.07  QV         |          |          |          |
3+30       0.0149      0.07  Q V        |          |          |          |
3+35       0.0154      0.07  Q V        |          |          |          |
3+40       0.0158      0.07  Q V        |          |          |          |
3+45       0.0163      0.07  Q V        |          |          |          |
3+50       0.0168      0.08  Q V        |          |          |          |
3+55       0.0174      0.08  Q V        |          |          |          |
4+ 0       0.0180      0.08  Q V        |          |          |          |
4+ 5       0.0186      0.08  Q V        |          |          |          |
4+10       0.0191      0.08  Q V        |          |          |          |
4+15       0.0197      0.08  Q V        |          |          |          |
4+20       0.0203      0.09  Q V        |          |          |          |
4+25       0.0210      0.10  Q V        |          |          |          |
4+30       0.0216      0.10  Q V        |          |          |          |
4+35       0.0223      0.10  Q  V       |          |          |          |
4+40       0.0230      0.10  Q  V       |          |          |          |
4+45       0.0236      0.10  Q  V       |          |          |          |
4+50       0.0244      0.10  Q  V       |          |          |          |
4+55       0.0251      0.11  Q  V       |          |          |          |
5+ 0       0.0259      0.11  Q  V       |          |          |          |
5+ 5       0.0266      0.10  Q  V       |          |          |          |
5+10       0.0271      0.09  Q  V       |          |          |          |
5+15       0.0277      0.08  Q  V       |          |          |          |
5+20       0.0283      0.09  Q  V       |          |          |          |
5+25       0.0290      0.10  Q  V       |          |          |          |
5+30       0.0297      0.10  Q   V      |          |          |          |
5+35       0.0304      0.10  Q   V      |          |          |          |
5+40       0.0311      0.11  Q   V      |          |          |          |
5+45       0.0319      0.11  Q   V      |          |          |          |
5+50       0.0327      0.11  Q   V      |          |          |          |
5+55       0.0334      0.11  Q   V      |          |          |          |
6+ 0       0.0342      0.11  Q   V      |          |          |          |
6+ 5       0.0350      0.12  Q   V      |          |          |          |
6+10       0.0359      0.12  Q   V      |          |          |          |
6+15       0.0367      0.12  Q    V     |          |          |          |
6+20       0.0376      0.12  Q    V     |          |          |          |
6+25       0.0384      0.12  Q    V     |          |          |          |
6+30       0.0393      0.12  Q    V     |          |          |          |
6+35       0.0402      0.13  Q    V     |          |          |          |
6+40       0.0411      0.14  Q    V     |          |          |          |
6+45       0.0421      0.14  Q    V     |          |          |          |
6+50       0.0431      0.14  Q    V     |          |          |          |
6+55       0.0440      0.14  Q     V    |          |          |          |
7+ 0       0.0450      0.14  Q     V    |          |          |          |
7+ 5       0.0459      0.14  Q     V    |          |          |          |
7+10       0.0469      0.14  Q     V    |          |          |          |
7+15       0.0478      0.14  Q     V    |          |          |          |
7+20       0.0488      0.15  Q     V    |          |          |          |
7+25       0.0499      0.15  Q     V    |          |          |          |
7+30       0.0509      0.15  Q     V    |          |          |          |
7+35       0.0520      0.16  Q      V   |          |          |          |
7+40       0.0532      0.17  Q      V   |          |          |          |
7+45       0.0543      0.17  Q      V   |          |          |          |
7+50       0.0555      0.17  Q      V   |          |          |          |
7+55       0.0567      0.18  Q      V   |          |          |          |
8+ 0       0.0580      0.18  Q      V   |          |          |          |
8+ 5       0.0593      0.19  Q       V  |          |          |          |
8+10       0.0607      0.21  Q       V  |          |          |          |
8+15       0.0621      0.21  Q       V  |          |          |          |
8+20       0.0636      0.21  Q       V  |          |          |          |
8+25       0.0650      0.21  Q       V  |          |          |          |
8+30       0.0665      0.21  Q        V |          |          |          |
8+35       0.0679      0.21  Q        V |          |          |          |
8+40       0.0694      0.22  Q        V |          |          |          |
8+45       0.0710      0.22  Q        V |          |          |          |
8+50       0.0726      0.23  Q        V |          |          |          |
8+55       0.0742      0.23  Q         V|          |          |          |
```



9+ 0	0.0758	0.24	Q	V
9+ 5	0.0775	0.25	Q	V
9+10	0.0793	0.26	|Q	V
9+15	0.0811	0.26	|Q	|V
9+20	0.0830	0.27	|Q	|V
9+25	0.0849	0.28	|Q	|V
9+30	0.0868	0.28	|Q	|V
9+35	0.0887	0.28	|Q	| V
9+40	0.0907	0.29	|Q	| V
9+45	0.0927	0.29	|Q	| V
9+50	0.0948	0.30	|Q	| V
9+55	0.0969	0.30	|Q	| V
10+ 0	0.0990	0.30	|Q	| V
10+ 5	0.1008	0.26	|Q	| V
10+10	0.1023	0.22	Q	| V
10+15	0.1037	0.21	Q	| V
10+20	0.1052	0.21	Q	| V
10+25	0.1066	0.21	Q	| V
10+30	0.1080	0.21	Q	| V
10+35	0.1097	0.24	Q	| V
10+40	0.1116	0.27	|Q	| V
10+45	0.1135	0.28	|Q	| V
10+50	0.1154	0.28	|Q	| V
10+55	0.1173	0.28	|Q	| V
11+ 0	0.1192	0.28	|Q	| V
11+ 5	0.1211	0.27	|Q	| V
11+10	0.1229	0.27	|Q	| V
11+15	0.1247	0.26	|Q	| V
11+20	0.1265	0.26	|Q	| V
11+25	0.1283	0.26	|Q	| V
11+30	0.1302	0.26	|Q	| V
11+35	0.1319	0.25	|Q	| V
11+40	0.1335	0.24	Q	| V
11+45	0.1352	0.24	Q	| V
11+50	0.1368	0.24	Q	| V
11+55	0.1385	0.25	Q	| V
12+ 0	0.1403	0.25	Q	| V|
12+ 5	0.1423	0.30	|Q	| V|
12+10	0.1446	0.34	|Q	| V|
12+15	0.1470	0.34	|Q	| V
12+20	0.1494	0.35	|Q	| V
12+25	0.1519	0.36	|Q	| V
12+30	0.1544	0.36	|Q	| |V
12+35	0.1570	0.37	|Q	| |V
12+40	0.1596	0.39	|Q	| |V
12+45	0.1623	0.39	|Q	| | V
12+50	0.1650	0.40	|Q	| | V
12+55	0.1678	0.40	|Q	| | V
13+ 0	0.1705	0.40	|Q	| | V
13+ 5	0.1738	0.47	|Q	| | V
13+10	0.1775	0.54	| Q	| | V
13+15	0.1814	0.57	| Q	| | V
13+20	0.1855	0.60	| Q	| | V
13+25	0.1898	0.62	| Q	| | V
13+30	0.1942	0.64	| Q	| | V
13+35	0.1976	0.49	|Q	| | V
13+40	0.2000	0.35	|Q	| | V
13+45	0.2023	0.33	|Q	| | V
13+50	0.2045	0.32	|Q	| | V
13+55	0.2067	0.32	|Q	| | V
14+ 0	0.2089	0.32	|Q	| | V
14+ 5	0.2112	0.35	|Q	| | V
14+10	0.2138	0.37	|Q	| | V|
14+15	0.2163	0.37	|Q	| | V|
14+20	0.2189	0.37	|Q	| | V|
14+25	0.2214	0.36	|Q	| | V
14+30	0.2239	0.36	|Q	| | V
14+35	0.2263	0.36	|Q	| | |V
14+40	0.2288	0.36	|Q	| | |V
14+45	0.2313	0.36	|Q	| | |V
14+50	0.2338	0.35	|Q	| | | V
14+55	0.2362	0.35	|Q	| | | V
15+ 0	0.2386	0.35	|Q	| | | V
15+ 5	0.2409	0.34	|Q	| | | V
15+10	0.2432	0.33	|Q	| | | V
15+15	0.2455	0.33	|Q	| | | V
15+20	0.2477	0.33	|Q	| | | V
15+25	0.2500	0.32	|Q	| | | V
15+30	0.2522	0.32	|Q	| | | V
15+35	0.2542	0.29	|Q	| | | V
15+40	0.2560	0.27	|Q	| | | V
15+45	0.2579	0.27	|Q	| | | V
15+50	0.2597	0.26	|Q	| | | V
15+55	0.2615	0.26	|Q	| | | V
16+ 0	0.2633	0.26	|Q	| | | V
16+ 5	0.2644	0.16	Q	| | | V

16+10	0.2650	0.08	Q	|	|	|	V |
16+15	0.2654	0.06	Q	|	|	|	V |
16+20	0.2658	0.06	Q	|	|	|	V |
16+25	0.2662	0.06	Q	|	|	|	V |
16+30	0.2665	0.06	Q	|	|	|	V |
16+35	0.2669	0.05	Q	|	|	|	V |
16+40	0.2672	0.04	Q	|	|	|	V |
16+45	0.2675	0.04	Q	|	|	|	V |
16+50	0.2678	0.04	Q	|	|	|	V |
16+55	0.2680	0.04	Q	|	|	|	V |
17+ 0	0.2683	0.04	Q	|	|	|	V |
17+ 5	0.2687	0.05	Q	|	|	|	V |
17+10	0.2692	0.07	Q	|	|	|	V |
17+15	0.2696	0.07	Q	|	|	|	V |
17+20	0.2701	0.07	Q	|	|	|	V |
17+25	0.2706	0.07	Q	|	|	|	V |
17+30	0.2711	0.07	Q	|	|	|	V |
17+35	0.2716	0.07	Q	|	|	|	V |
17+40	0.2720	0.07	Q	|	|	|	V |
17+45	0.2725	0.07	Q	|	|	|	V |
17+50	0.2729	0.06	Q	|	|	|	V |
17+55	0.2733	0.06	Q	|	|	|	V |
18+ 0	0.2737	0.06	Q	|	|	|	V |
18+ 5	0.2741	0.06	Q	|	|	|	V |
18+10	0.2745	0.06	Q	|	|	|	V |
18+15	0.2749	0.06	Q	|	|	|	V |
18+20	0.2752	0.06	Q	|	|	|	V |
18+25	0.2756	0.06	Q	|	|	|	V |
18+30	0.2760	0.06	Q	|	|	|	V |
18+35	0.2763	0.05	Q	|	|	|	V |
18+40	0.2766	0.04	Q	|	|	|	V |
18+45	0.2769	0.04	Q	|	|	|	V |
18+50	0.2772	0.04	Q	|	|	|	V |
18+55	0.2774	0.03	Q	|	|	|	V |
19+ 0	0.2776	0.03	Q	|	|	|	V |
19+ 5	0.2778	0.03	Q	|	|	|	V |
19+10	0.2781	0.04	Q	|	|	|	V |
19+15	0.2784	0.04	Q	|	|	|	V |
19+20	0.2787	0.05	Q	|	|	|	V |
19+25	0.2791	0.05	Q	|	|	|	V |
19+30	0.2795	0.06	Q	|	|	|	V |
19+35	0.2798	0.05	Q	|	|	|	V |
19+40	0.2801	0.04	Q	|	|	|	V |
19+45	0.2804	0.04	Q	|	|	|	V |
19+50	0.2806	0.04	Q	|	|	|	V |
19+55	0.2808	0.03	Q	|	|	|	V |
20+ 0	0.2810	0.03	Q	|	|	|	V |
20+ 5	0.2813	0.03	Q	|	|	|	V |
20+10	0.2815	0.04	Q	|	|	|	V |
20+15	0.2818	0.04	Q	|	|	|	V |
20+20	0.2821	0.04	Q	|	|	|	V |
20+25	0.2824	0.04	Q	|	|	|	V |
20+30	0.2827	0.04	Q	|	|	|	V |
20+35	0.2830	0.04	Q	|	|	|	V |
20+40	0.2832	0.04	Q	|	|	|	V |
20+45	0.2835	0.04	Q	|	|	|	V |
20+50	0.2838	0.04	Q	|	|	|	V |
20+55	0.2840	0.03	Q	|	|	|	V |
21+ 0	0.2842	0.03	Q	|	|	|	V |
21+ 5	0.2844	0.03	Q	|	|	|	V |
21+10	0.2847	0.04	Q	|	|	|	V |
21+15	0.2850	0.04	Q	|	|	|	V|
21+20	0.2852	0.04	Q	|	|	|	V|
21+25	0.2854	0.03	Q	|	|	|	V|
21+30	0.2856	0.03	Q	|	|	|	V|
21+35	0.2858	0.03	Q	|	|	|	V|
21+40	0.2861	0.04	Q	|	|	|	V|
21+45	0.2864	0.04	Q	|	|	|	V|
21+50	0.2866	0.04	Q	|	|	|	V|
21+55	0.2868	0.03	Q	|	|	|	V|
22+ 0	0.2870	0.03	Q	|	|	|	V|
22+ 5	0.2873	0.03	Q	|	|	|	V|
22+10	0.2875	0.04	Q	|	|	|	V|
22+15	0.2878	0.04	Q	|	|	|	V|
22+20	0.2881	0.04	Q	|	|	|	V|
22+25	0.2883	0.03	Q	|	|	|	V|
22+30	0.2885	0.03	Q	|	|	|	V|
22+35	0.2887	0.03	Q	|	|	|	V|
22+40	0.2889	0.03	Q	|	|	|	V|
22+45	0.2890	0.03	Q	|	|	|	V|
22+50	0.2892	0.03	Q	|	|	|	V|
22+55	0.2894	0.03	Q	|	|	|	V|
23+ 0	0.2896	0.03	Q	|	|	|	V|
23+ 5	0.2898	0.03	Q	|	|	|	V|
23+10	0.2900	0.03	Q	|	|	|	V|
23+15	0.2902	0.03	Q	|	|	|	V|

```
   23+20       0.2904      0.03  Q          |          |          |         v|
   23+25       0.2906      0.03  Q          |          |          |         v|
   23+30       0.2908      0.03  Q          |          |          |         v|
   23+35       0.2910      0.03  Q          |          |          |         v|
   23+40       0.2911      0.03  Q          |          |          |         v|
   23+45       0.2913      0.03  Q          |          |          |         v|
   23+50       0.2915      0.03  Q          |          |          |         v|
   23+55       0.2917      0.03  Q          |          |          |         v|
   24+ 0       0.2919      0.03  Q          |          |          |         v|
   24+ 5       0.2920      0.01  Q          |          |          |         v|
   24+10       0.2920      0.00  Q          |          |          |         v|
   24+15       0.2920      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

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              Study date  08/14/25 File: PROA242.out

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------------------------------------------------------------------------------

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


Program License Serial Number 5006

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

 English Units used in output format



------------------------------------------------------------------------
------------------------------------------------------------------------
Drainage Area =      75.83(Ac.)  =      0.118 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      75.83(Ac.)  =      0.118 Sq. Mi.
Length along longest watercourse =    4720.00(Ft.)
Length along longest watercourse measured to centroid =    2360.00(Ft.)
Length along longest watercourse =      0.894 Mi.
Length along longest watercourse measured to centroid =      0.447 Mi.
Difference in elevation =     166.00(Ft.)
Slope along watercourse =    185.6949 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.188 Hr.
Lag time =    11.30 Min.
25% of lag time =     2.82 Min.
40% of lag time =     4.52 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]
       75.83           1.80                136.49

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       75.83           5.00                379.15

STORM EVENT (YEAR) =    2.00
Area Averaged 2-Year Rainfall =    1.800(In)
Area Averaged 100-Year Rainfall =    5.000(In)

Point rain (area averaged) =    1.800(In)
Areal adjustment factor =   99.99 %
Adjusted average point rain =    1.800(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
    75.830           69.00         0.500
 Total Area Entered =     75.83(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
```

```
69.0  69.0      0.373     0.500        0.205       1.000      0.205
                                                  Sum (F) =   0.205
Area averaged mean soil loss (F) (In/Hr) =  0.205
Minimum soil loss rate ((In/Hr)) =  0.103
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.500
------------------------------------------------------------------------

               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         44.254          5.079             3.882
    2   0.167         88.509         21.318            16.291
    3   0.250        132.763         28.439            21.734
    4   0.333        177.017         15.372            11.747
    5   0.417        221.272          7.523             5.749
    6   0.500        265.526          5.074             3.878
    7   0.583        309.780          3.778             2.887
    8   0.667        354.034          2.830             2.163
    9   0.750        398.289          2.240             1.712
   10   0.833        442.543          1.702             1.301
   11   0.917        486.797          1.386             1.059
   12   1.000        531.052          1.242             0.949
   13   1.083        575.306          0.960             0.734
   14   1.167        619.560          0.796             0.608
   15   1.250        663.815          0.638             0.488
   16   1.333        708.069          0.484             0.370
   17   1.417        752.323          0.443             0.338
   18   1.500        796.577          0.443             0.338
   19   1.583        840.832          0.255             0.195
                                 Sum = 100.000   Sum=      76.422
------------------------------------------------------------------------

 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   Pattern   Storm Rain     Loss rate(In./Hr)     Effective
      (Hr.)  Percent   (In/Hr)         Max    |   Low         (In/Hr)
  1   0.08     0.07      0.014       (  0.363)       0.007         0.007
  2   0.17     0.07      0.014       (  0.362)       0.007         0.007
  3   0.25     0.07      0.014       (  0.361)       0.007         0.007
  4   0.33     0.10      0.022       (  0.359)       0.011         0.011
  5   0.42     0.10      0.022       (  0.358)       0.011         0.011
  6   0.50     0.10      0.022       (  0.356)       0.011         0.011
  7   0.58     0.10      0.022       (  0.355)       0.011         0.011
  8   0.67     0.10      0.022       (  0.354)       0.011         0.011
  9   0.75     0.10      0.022       (  0.352)       0.011         0.011
 10   0.83     0.13      0.029       (  0.351)       0.014         0.014
 11   0.92     0.13      0.029       (  0.350)       0.014         0.014
 12   1.00     0.13      0.029       (  0.348)       0.014         0.014
 13   1.08     0.10      0.022       (  0.347)       0.011         0.011
 14   1.17     0.10      0.022       (  0.345)       0.011         0.011
 15   1.25     0.10      0.022       (  0.344)       0.011         0.011
 16   1.33     0.10      0.022       (  0.343)       0.011         0.011
 17   1.42     0.10      0.022       (  0.341)       0.011         0.011
 18   1.50     0.10      0.022       (  0.340)       0.011         0.011
 19   1.58     0.10      0.022       (  0.339)       0.011         0.011
 20   1.67     0.10      0.022       (  0.337)       0.011         0.011
 21   1.75     0.10      0.022       (  0.336)       0.011         0.011
 22   1.83     0.13      0.029       (  0.335)       0.014         0.014
 23   1.92     0.13      0.029       (  0.333)       0.014         0.014
 24   2.00     0.13      0.029       (  0.332)       0.014         0.014
 25   2.08     0.13      0.029       (  0.330)       0.014         0.014
 26   2.17     0.13      0.029       (  0.329)       0.014         0.014
 27   2.25     0.13      0.029       (  0.328)       0.014         0.014
```

28	2.33	0.13	0.029	(0.326)	0.014	0.014
29	2.42	0.13	0.029	(0.325)	0.014	0.014
30	2.50	0.13	0.029	(0.324)	0.014	0.014
31	2.58	0.17	0.036	(0.323)	0.018	0.018
32	2.67	0.17	0.036	(0.321)	0.018	0.018
33	2.75	0.17	0.036	(0.320)	0.018	0.018
34	2.83	0.17	0.036	(0.319)	0.018	0.018
35	2.92	0.17	0.036	(0.317)	0.018	0.018
36	3.00	0.17	0.036	(0.316)	0.018	0.018
37	3.08	0.17	0.036	(0.315)	0.018	0.018
38	3.17	0.17	0.036	(0.313)	0.018	0.018
39	3.25	0.17	0.036	(0.312)	0.018	0.018
40	3.33	0.17	0.036	(0.311)	0.018	0.018
41	3.42	0.17	0.036	(0.309)	0.018	0.018
42	3.50	0.17	0.036	(0.308)	0.018	0.018
43	3.58	0.17	0.036	(0.307)	0.018	0.018
44	3.67	0.17	0.036	(0.306)	0.018	0.018
45	3.75	0.17	0.036	(0.304)	0.018	0.018
46	3.83	0.20	0.043	(0.303)	0.022	0.022
47	3.92	0.20	0.043	(0.302)	0.022	0.022
48	4.00	0.20	0.043	(0.300)	0.022	0.022
49	4.08	0.20	0.043	(0.299)	0.022	0.022
50	4.17	0.20	0.043	(0.298)	0.022	0.022
51	4.25	0.20	0.043	(0.297)	0.022	0.022
52	4.33	0.23	0.050	(0.295)	0.025	0.025
53	4.42	0.23	0.050	(0.294)	0.025	0.025
54	4.50	0.23	0.050	(0.293)	0.025	0.025
55	4.58	0.23	0.050	(0.292)	0.025	0.025
56	4.67	0.23	0.050	(0.290)	0.025	0.025
57	4.75	0.23	0.050	(0.289)	0.025	0.025
58	4.83	0.27	0.058	(0.288)	0.029	0.029
59	4.92	0.27	0.058	(0.287)	0.029	0.029
60	5.00	0.27	0.058	(0.285)	0.029	0.029
61	5.08	0.20	0.043	(0.284)	0.022	0.022
62	5.17	0.20	0.043	(0.283)	0.022	0.022
63	5.25	0.20	0.043	(0.282)	0.022	0.022
64	5.33	0.23	0.050	(0.280)	0.025	0.025
65	5.42	0.23	0.050	(0.279)	0.025	0.025
66	5.50	0.23	0.050	(0.278)	0.025	0.025
67	5.58	0.27	0.058	(0.277)	0.029	0.029
68	5.67	0.27	0.058	(0.275)	0.029	0.029
69	5.75	0.27	0.058	(0.274)	0.029	0.029
70	5.83	0.27	0.058	(0.273)	0.029	0.029
71	5.92	0.27	0.058	(0.272)	0.029	0.029
72	6.00	0.27	0.058	(0.271)	0.029	0.029
73	6.08	0.30	0.065	(0.269)	0.032	0.032
74	6.17	0.30	0.065	(0.268)	0.032	0.032
75	6.25	0.30	0.065	(0.267)	0.032	0.032
76	6.33	0.30	0.065	(0.266)	0.032	0.032
77	6.42	0.30	0.065	(0.265)	0.032	0.032
78	6.50	0.30	0.065	(0.263)	0.032	0.032
79	6.58	0.33	0.072	(0.262)	0.036	0.036
80	6.67	0.33	0.072	(0.261)	0.036	0.036
81	6.75	0.33	0.072	(0.260)	0.036	0.036
82	6.83	0.33	0.072	(0.259)	0.036	0.036
83	6.92	0.33	0.072	(0.258)	0.036	0.036
84	7.00	0.33	0.072	(0.256)	0.036	0.036
85	7.08	0.33	0.072	(0.255)	0.036	0.036
86	7.17	0.33	0.072	(0.254)	0.036	0.036
87	7.25	0.33	0.072	(0.253)	0.036	0.036
88	7.33	0.37	0.079	(0.252)	0.040	0.040
89	7.42	0.37	0.079	(0.251)	0.040	0.040
90	7.50	0.37	0.079	(0.249)	0.040	0.040
91	7.58	0.40	0.086	(0.248)	0.043	0.043
92	7.67	0.40	0.086	(0.247)	0.043	0.043
93	7.75	0.40	0.086	(0.246)	0.043	0.043
94	7.83	0.43	0.094	(0.245)	0.047	0.047
95	7.92	0.43	0.094	(0.244)	0.047	0.047
96	8.00	0.43	0.094	(0.243)	0.047	0.047
97	8.08	0.50	0.108	(0.242)	0.054	0.054
98	8.17	0.50	0.108	(0.240)	0.054	0.054

99	8.25	0.50	0.108	(0.239)	0.054	0.054
100	8.33	0.50	0.108	(0.238)	0.054	0.054
101	8.42	0.50	0.108	(0.237)	0.054	0.054
102	8.50	0.50	0.108	(0.236)	0.054	0.054
103	8.58	0.53	0.115	(0.235)	0.058	0.058
104	8.67	0.53	0.115	(0.234)	0.058	0.058
105	8.75	0.53	0.115	(0.233)	0.058	0.058
106	8.83	0.57	0.122	(0.232)	0.061	0.061
107	8.92	0.57	0.122	(0.230)	0.061	0.061
108	9.00	0.57	0.122	(0.229)	0.061	0.061
109	9.08	0.63	0.137	(0.228)	0.068	0.068
110	9.17	0.63	0.137	(0.227)	0.068	0.068
111	9.25	0.63	0.137	(0.226)	0.068	0.068
112	9.33	0.67	0.144	(0.225)	0.072	0.072
113	9.42	0.67	0.144	(0.224)	0.072	0.072
114	9.50	0.67	0.144	(0.223)	0.072	0.072
115	9.58	0.70	0.151	(0.222)	0.076	0.076
116	9.67	0.70	0.151	(0.221)	0.076	0.076
117	9.75	0.70	0.151	(0.220)	0.076	0.076
118	9.83	0.73	0.158	(0.219)	0.079	0.079
119	9.92	0.73	0.158	(0.218)	0.079	0.079
120	10.00	0.73	0.158	(0.217)	0.079	0.079
121	10.08	0.50	0.108	(0.215)	0.054	0.054
122	10.17	0.50	0.108	(0.214)	0.054	0.054
123	10.25	0.50	0.108	(0.213)	0.054	0.054
124	10.33	0.50	0.108	(0.212)	0.054	0.054
125	10.42	0.50	0.108	(0.211)	0.054	0.054
126	10.50	0.50	0.108	(0.210)	0.054	0.054
127	10.58	0.67	0.144	(0.209)	0.072	0.072
128	10.67	0.67	0.144	(0.208)	0.072	0.072
129	10.75	0.67	0.144	(0.207)	0.072	0.072
130	10.83	0.67	0.144	(0.206)	0.072	0.072
131	10.92	0.67	0.144	(0.205)	0.072	0.072
132	11.00	0.67	0.144	(0.204)	0.072	0.072
133	11.08	0.63	0.137	(0.203)	0.068	0.068
134	11.17	0.63	0.137	(0.202)	0.068	0.068
135	11.25	0.63	0.137	(0.201)	0.068	0.068
136	11.33	0.63	0.137	(0.200)	0.068	0.068
137	11.42	0.63	0.137	(0.199)	0.068	0.068
138	11.50	0.63	0.137	(0.198)	0.068	0.068
139	11.58	0.57	0.122	(0.197)	0.061	0.061
140	11.67	0.57	0.122	(0.196)	0.061	0.061
141	11.75	0.57	0.122	(0.195)	0.061	0.061
142	11.83	0.60	0.130	(0.194)	0.065	0.065
143	11.92	0.60	0.130	(0.193)	0.065	0.065
144	12.00	0.60	0.130	(0.192)	0.065	0.065
145	12.08	0.83	0.180	(0.191)	0.090	0.090
146	12.17	0.83	0.180	(0.190)	0.090	0.090
147	12.25	0.83	0.180	(0.189)	0.090	0.090
148	12.33	0.87	0.187	(0.189)	0.094	0.094
149	12.42	0.87	0.187	(0.188)	0.094	0.094
150	12.50	0.87	0.187	(0.187)	0.094	0.094
151	12.58	0.93	0.202	(0.186)	0.101	0.101
152	12.67	0.93	0.202	(0.185)	0.101	0.101
153	12.75	0.93	0.202	(0.184)	0.101	0.101
154	12.83	0.97	0.209	(0.183)	0.104	0.104
155	12.92	0.97	0.209	(0.182)	0.104	0.104
156	13.00	0.97	0.209	(0.181)	0.104	0.104
157	13.08	1.13	0.245	(0.180)	0.122	0.122
158	13.17	1.13	0.245	(0.179)	0.122	0.122
159	13.25	1.13	0.245	(0.178)	0.122	0.122
160	13.33	1.13	0.245	(0.177)	0.122	0.122
161	13.42	1.13	0.245	(0.177)	0.122	0.122
162	13.50	1.13	0.245	(0.176)	0.122	0.122
163	13.58	0.77	0.166	(0.175)	0.083	0.083
164	13.67	0.77	0.166	(0.174)	0.083	0.083
165	13.75	0.77	0.166	(0.173)	0.083	0.083
166	13.83	0.77	0.166	(0.172)	0.083	0.083
167	13.92	0.77	0.166	(0.171)	0.083	0.083
168	14.00	0.77	0.166	(0.170)	0.083	0.083
169	14.08	0.90	0.194	(0.169)	0.097	0.097

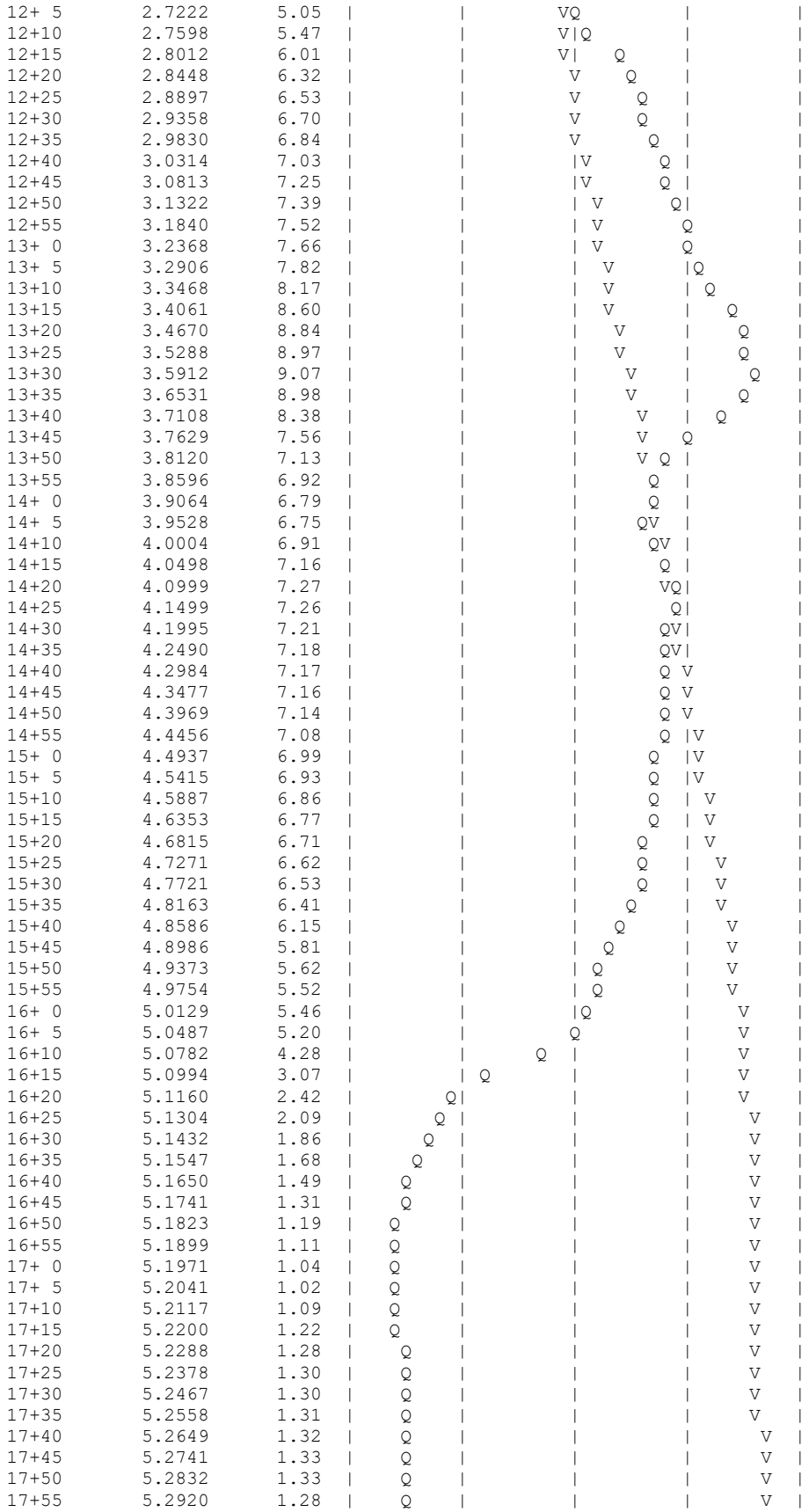
170	14.17	0.90	0.194	(0.169)	0.097	0.097
171	14.25	0.90	0.194	(0.168)	0.097	0.097
172	14.33	0.87	0.187	(0.167)	0.094	0.094
173	14.42	0.87	0.187	(0.166)	0.094	0.094
174	14.50	0.87	0.187	(0.165)	0.094	0.094
175	14.58	0.87	0.187	(0.164)	0.094	0.094
176	14.67	0.87	0.187	(0.163)	0.094	0.094
177	14.75	0.87	0.187	(0.163)	0.094	0.094
178	14.83	0.83	0.180	(0.162)	0.090	0.090
179	14.92	0.83	0.180	(0.161)	0.090	0.090
180	15.00	0.83	0.180	(0.160)	0.090	0.090
181	15.08	0.80	0.173	(0.159)	0.086	0.086
182	15.17	0.80	0.173	(0.159)	0.086	0.086
183	15.25	0.80	0.173	(0.158)	0.086	0.086
184	15.33	0.77	0.166	(0.157)	0.083	0.083
185	15.42	0.77	0.166	(0.156)	0.083	0.083
186	15.50	0.77	0.166	(0.155)	0.083	0.083
187	15.58	0.63	0.137	(0.154)	0.068	0.068
188	15.67	0.63	0.137	(0.154)	0.068	0.068
189	15.75	0.63	0.137	(0.153)	0.068	0.068
190	15.83	0.63	0.137	(0.152)	0.068	0.068
191	15.92	0.63	0.137	(0.151)	0.068	0.068
192	16.00	0.63	0.137	(0.151)	0.068	0.068
193	16.08	0.13	0.029	(0.150)	0.014	0.014
194	16.17	0.13	0.029	(0.149)	0.014	0.014
195	16.25	0.13	0.029	(0.148)	0.014	0.014
196	16.33	0.13	0.029	(0.148)	0.014	0.014
197	16.42	0.13	0.029	(0.147)	0.014	0.014
198	16.50	0.13	0.029	(0.146)	0.014	0.014
199	16.58	0.10	0.022	(0.145)	0.011	0.011
200	16.67	0.10	0.022	(0.145)	0.011	0.011
201	16.75	0.10	0.022	(0.144)	0.011	0.011
202	16.83	0.10	0.022	(0.143)	0.011	0.011
203	16.92	0.10	0.022	(0.142)	0.011	0.011
204	17.00	0.10	0.022	(0.142)	0.011	0.011
205	17.08	0.17	0.036	(0.141)	0.018	0.018
206	17.17	0.17	0.036	(0.140)	0.018	0.018
207	17.25	0.17	0.036	(0.140)	0.018	0.018
208	17.33	0.17	0.036	(0.139)	0.018	0.018
209	17.42	0.17	0.036	(0.138)	0.018	0.018
210	17.50	0.17	0.036	(0.137)	0.018	0.018
211	17.58	0.17	0.036	(0.137)	0.018	0.018
212	17.67	0.17	0.036	(0.136)	0.018	0.018
213	17.75	0.17	0.036	(0.135)	0.018	0.018
214	17.83	0.13	0.029	(0.135)	0.014	0.014
215	17.92	0.13	0.029	(0.134)	0.014	0.014
216	18.00	0.13	0.029	(0.133)	0.014	0.014
217	18.08	0.13	0.029	(0.133)	0.014	0.014
218	18.17	0.13	0.029	(0.132)	0.014	0.014
219	18.25	0.13	0.029	(0.131)	0.014	0.014
220	18.33	0.13	0.029	(0.131)	0.014	0.014
221	18.42	0.13	0.029	(0.130)	0.014	0.014
222	18.50	0.13	0.029	(0.130)	0.014	0.014
223	18.58	0.10	0.022	(0.129)	0.011	0.011
224	18.67	0.10	0.022	(0.128)	0.011	0.011
225	18.75	0.10	0.022	(0.128)	0.011	0.011
226	18.83	0.07	0.014	(0.127)	0.007	0.007
227	18.92	0.07	0.014	(0.126)	0.007	0.007
228	19.00	0.07	0.014	(0.126)	0.007	0.007
229	19.08	0.10	0.022	(0.125)	0.011	0.011
230	19.17	0.10	0.022	(0.125)	0.011	0.011
231	19.25	0.10	0.022	(0.124)	0.011	0.011
232	19.33	0.13	0.029	(0.123)	0.014	0.014
233	19.42	0.13	0.029	(0.123)	0.014	0.014
234	19.50	0.13	0.029	(0.122)	0.014	0.014
235	19.58	0.10	0.022	(0.122)	0.011	0.011
236	19.67	0.10	0.022	(0.121)	0.011	0.011
237	19.75	0.10	0.022	(0.121)	0.011	0.011
238	19.83	0.07	0.014	(0.120)	0.007	0.007
239	19.92	0.07	0.014	(0.120)	0.007	0.007
240	20.00	0.07	0.014	(0.119)	0.007	0.007

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241  20.08     0.10      0.022       (  0.119)       0.011        0.011
242  20.17     0.10      0.022       (  0.118)       0.011        0.011
243  20.25     0.10      0.022       (  0.118)       0.011        0.011
244  20.33     0.10      0.022       (  0.117)       0.011        0.011
245  20.42     0.10      0.022       (  0.116)       0.011        0.011
246  20.50     0.10      0.022       (  0.116)       0.011        0.011
247  20.58     0.10      0.022       (  0.116)       0.011        0.011
248  20.67     0.10      0.022       (  0.115)       0.011        0.011
249  20.75     0.10      0.022       (  0.115)       0.011        0.011
250  20.83     0.07      0.014       (  0.114)       0.007        0.007
251  20.92     0.07      0.014       (  0.114)       0.007        0.007
252  21.00     0.07      0.014       (  0.113)       0.007        0.007
253  21.08     0.10      0.022       (  0.113)       0.011        0.011
254  21.17     0.10      0.022       (  0.112)       0.011        0.011
255  21.25     0.10      0.022       (  0.112)       0.011        0.011
256  21.33     0.07      0.014       (  0.111)       0.007        0.007
257  21.42     0.07      0.014       (  0.111)       0.007        0.007
258  21.50     0.07      0.014       (  0.111)       0.007        0.007
259  21.58     0.10      0.022       (  0.110)       0.011        0.011
260  21.67     0.10      0.022       (  0.110)       0.011        0.011
261  21.75     0.10      0.022       (  0.109)       0.011        0.011
262  21.83     0.07      0.014       (  0.109)       0.007        0.007
263  21.92     0.07      0.014       (  0.109)       0.007        0.007
264  22.00     0.07      0.014       (  0.108)       0.007        0.007
265  22.08     0.10      0.022       (  0.108)       0.011        0.011
266  22.17     0.10      0.022       (  0.108)       0.011        0.011
267  22.25     0.10      0.022       (  0.107)       0.011        0.011
268  22.33     0.07      0.014       (  0.107)       0.007        0.007
269  22.42     0.07      0.014       (  0.107)       0.007        0.007
270  22.50     0.07      0.014       (  0.106)       0.007        0.007
271  22.58     0.07      0.014       (  0.106)       0.007        0.007
272  22.67     0.07      0.014       (  0.106)       0.007        0.007
273  22.75     0.07      0.014       (  0.105)       0.007        0.007
274  22.83     0.07      0.014       (  0.105)       0.007        0.007
275  22.92     0.07      0.014       (  0.105)       0.007        0.007
276  23.00     0.07      0.014       (  0.105)       0.007        0.007
277  23.08     0.07      0.014       (  0.104)       0.007        0.007
278  23.17     0.07      0.014       (  0.104)       0.007        0.007
279  23.25     0.07      0.014       (  0.104)       0.007        0.007
280  23.33     0.07      0.014       (  0.104)       0.007        0.007
281  23.42     0.07      0.014       (  0.103)       0.007        0.007
282  23.50     0.07      0.014       (  0.103)       0.007        0.007
283  23.58     0.07      0.014       (  0.103)       0.007        0.007
284  23.67     0.07      0.014       (  0.103)       0.007        0.007
285  23.75     0.07      0.014       (  0.103)       0.007        0.007
286  23.83     0.07      0.014       (  0.103)       0.007        0.007
287  23.92     0.07      0.014       (  0.103)       0.007        0.007
288  24.00     0.07      0.014       (  0.103)       0.007        0.007
               (Loss Rate Not Used)
    Sum =     100.0                                  Sum =    10.8
      Flood volume = Effective rainfall      0.90(In)
       times area      75.8(Ac.)/[(In)/(Ft.)] =       5.7(Ac.Ft)
      Total soil loss =      0.90(In)
      Total soil loss =     5.686(Ac.Ft)
      Total rainfall =      1.80(In)
      Flood volume =      247699.9 Cubic Feet
      Total soil loss =      247699.9 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =      9.066(CFS)
      ---------------------------------------------------------------------
      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          24 - H O U R    S T O R M
                     R u n o f f     H y d r o g r a p h
      ---------------------------------------------------------------------
                  Hydrograph in   5   Minute intervals ((CFS))

      ---------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5       5.0       7.5      10.0
 ---------------------------------------------------------------------------
   0+ 5       0.0002      0.03  Q         |         |         |         |
   0+10       0.0012      0.15  Q         |         |         |         |
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0+15      0.0033     0.30  VQ        |         |         |         |
0+20      0.0060     0.40  VQ        |         |         |         |
0+25      0.0095     0.50  V Q       |         |         |         |
0+30      0.0137     0.61  V Q       |         |         |         |
0+35      0.0183     0.67  V Q       |         |         |         |
0+40      0.0231     0.71  V Q       |         |         |         |
0+45      0.0282     0.73  V Q       |         |         |         |
0+50      0.0335     0.77  V  Q      |         |         |         |
0+55      0.0392     0.84  V  Q      |         |         |         |
1+ 0      0.0457     0.93  V  Q      |         |         |         |
1+ 5      0.0523     0.97  V  Q      |         |         |         |
1+10      0.0588     0.94  V  Q      |         |         |         |
1+15      0.0649     0.88  V  Q      |         |         |         |
1+20      0.0708     0.86  V  Q      |         |         |         |
1+25      0.0766     0.85  V  Q      |         |         |         |
1+30      0.0824     0.84  V  Q      |         |         |         |
1+35      0.0882     0.84  V  Q      |         |         |         |
1+40      0.0940     0.84  V  Q      |         |         |         |
1+45      0.0998     0.84  V  Q      |         |         |         |
1+50      0.1056     0.85  V  Q      |         |         |         |
1+55      0.1119     0.91  V  Q      |         |         |         |
2+ 0      0.1186     0.98  V  Q      |         |         |         |
2+ 5      0.1257     1.02  V   Q     |         |         |         |
2+10      0.1329     1.04  V   Q     |         |         |         |
2+15      0.1402     1.06  V   Q     |         |         |         |
2+20      0.1475     1.07  |V  Q     |         |         |         |
2+25      0.1549     1.07  |V  Q     |         |         |         |
2+30      0.1623     1.08  |V  Q     |         |         |         |
2+35      0.1699     1.10  |V  Q     |         |         |         |
2+40      0.1779     1.16  |V  Q     |         |         |         |
2+45      0.1864     1.24  |V  Q     |         |         |         |
2+50      0.1953     1.29  |V   Q    |         |         |         |
2+55      0.2043     1.31  |V   Q    |         |         |         |
3+ 0      0.2134     1.32  |V   Q    |         |         |         |
3+ 5      0.2226     1.34  |V   Q    |         |         |         |
3+10      0.2319     1.35  |V   Q    |         |         |         |
3+15      0.2412     1.35  |V   Q    |         |         |         |
3+20      0.2505     1.36  |V   Q    |         |         |         |
3+25      0.2599     1.36  |V   Q    |         |         |         |
3+30      0.2693     1.37  |V   Q    |         |         |         |
3+35      0.2787     1.37  |V   Q    |         |         |         |
3+40      0.2882     1.37  | V  Q    |         |         |         |
3+45      0.2976     1.37  | V  Q    |         |         |         |
3+50      0.3072     1.39  | V  Q    |         |         |         |
3+55      0.3171     1.45  | V  Q    |         |         |         |
4+ 0      0.3276     1.53  | V   Q   |         |         |         |
4+ 5      0.3384     1.57  | V   Q   |         |         |         |
4+10      0.3494     1.59  | V   Q   |         |         |         |
4+15      0.3604     1.60  | V   Q   |         |         |         |
4+20      0.3717     1.63  | V   Q   |         |         |         |
4+25      0.3833     1.69  | V   Q   |         |         |         |
4+30      0.3956     1.78  | V    Q  |         |         |         |
4+35      0.4082     1.83  | V    Q  |         |         |         |
4+40      0.4209     1.85  | V    Q  |         |         |         |
4+45      0.4338     1.87  |  V   Q  |         |         |         |
4+50      0.4468     1.90  |  V   Q  |         |         |         |
4+55      0.4603     1.96  |  V   Q  |         |         |         |
5+ 0      0.4745     2.05  |  V    Q |         |         |         |
5+ 5      0.4887     2.07  |  V    Q |         |         |         |
5+10      0.5024     1.98  |  V   Q  |         |         |         |
5+15      0.5150     1.84  |  V   Q  |         |         |         |
5+20      0.5273     1.78  |  V   Q  |         |         |         |
5+25      0.5398     1.81  |  V   Q  |         |         |         |
5+30      0.5527     1.87  |  V   Q  |         |         |         |
5+35      0.5658     1.91  |  V   Q  |         |         |         |
5+40      0.5795     1.98  |   V  Q  |         |         |         |
5+45      0.5937     2.06  |   V   Q |         |         |         |
5+50      0.6082     2.11  |   V   Q |         |         |         |
5+55      0.6229     2.13  |   V   Q |         |         |         |
6+ 0      0.6377     2.15  |   V   Q |         |         |         |
6+ 5      0.6527     2.17  |   V   Q |         |         |         |
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 6+10       0.6681      2.24  |   V   Q |         |         |         |
 6+15       0.6842      2.33  |   V    Q|         |         |         |
 6+20       0.7005      2.37  |   V    Q|         |         |         |
 6+25       0.7170      2.40  |    V   Q|         |         |         |
 6+30       0.7337      2.42  |    V   Q|         |         |         |
 6+35       0.7505      2.44  |    V   Q|         |         |         |
 6+40       0.7678      2.51  |    V    Q         |         |         |
 6+45       0.7857      2.60  |    V    Q         |         |         |
 6+50       0.8039      2.65  |    V    Q         |         |         |
 6+55       0.8224      2.67  |    V    Q         |         |         |
 7+ 0       0.8409      2.69  |    V    Q         |         |         |
 7+ 5       0.8595      2.71  |     V   Q         |         |         |
 7+10       0.8783      2.72  |     V   Q         |         |         |
 7+15       0.8970      2.72  |     V   Q         |         |         |
 7+20       0.9159      2.74  |     V   Q         |         |         |
 7+25       0.9353      2.81  |     V   |Q        |         |         |
 7+30       0.9552      2.89  |     V   |Q        |         |         |
 7+35       0.9755      2.95  |     V   |Q        |         |         |
 7+40       0.9964      3.03  |      V  | Q       |         |         |
 7+45       1.0179      3.13  |      V  | Q       |         |         |
 7+50       1.0399      3.19  |      V  | Q       |         |         |
 7+55       1.0625      3.28  |      V  |  Q      |         |         |
 8+ 0       1.0858      3.38  |      V  |  Q      |         |         |
 8+ 5       1.1097      3.47  |      V  |  Q      |         |         |
 8+10       1.1346      3.62  |      V  |   Q     |         |         |
 8+15       1.1608      3.80  |       V |    Q    |         |         |
 8+20       1.1877      3.90  |       V |    Q    |         |         |
 8+25       1.2149      3.96  |       V |    Q    |         |         |
 8+30       1.2424      4.00  |       V |    Q    |         |         |
 8+35       1.2702      4.04  |       V |     Q   |         |         |
 8+40       1.2986      4.12  |        V|     Q   |         |         |
 8+45       1.3276      4.22  |        V|     Q   |         |         |
 8+50       1.3572      4.29  |        V|      Q  |         |         |
 8+55       1.3873      4.38  |        V|      Q  |         |         |
 9+ 0       1.4182      4.48  |        V|      Q  |         |         |
 9+ 5       1.4496      4.57  |         V       Q |         |         |
 9+10       1.4821      4.72  |         V       Q |         |         |
 9+15       1.5159      4.90  |         V        Q|         |         |
 9+20       1.5504      5.02  |         V         Q         |         |
 9+25       1.5858      5.13  |         |V        Q         |         |
 9+30       1.6219      5.25  |         |V        |Q        |         |
 9+35       1.6587      5.34  |         |V        |Q        |         |
 9+40       1.6961      5.44  |         |V        |Q        |         |
 9+45       1.7343      5.55  |         | V       | Q       |         |
 9+50       1.7731      5.63  |         | V       | Q       |         |
 9+55       1.8125      5.72  |         | V       | Q       |         |
10+ 0       1.8527      5.83  |         |  V      |  Q      |         |
10+ 5       1.8926      5.80  |         |  V      |  Q      |         |
10+10       1.9300      5.43  |         |  V      |Q        |         |
10+15       1.9638      4.91  |         |  V     Q|         |         |
10+20       1.9957      4.63  |         |   V   Q |         |         |
10+25       2.0267      4.50  |         |   V   Q |         |         |
10+30       2.0572      4.42  |         |   V  Q  |         |         |
10+35       2.0877      4.43  |         |   V  Q  |         |         |
10+40       2.1198      4.67  |         |   V   Q |         |         |
10+45       2.1545      5.03  |         |    V    Q         |         |
10+50       2.1904      5.21  |         |    V    Q         |         |
10+55       2.2268      5.29  |         |    V    |Q        |         |
11+ 0       2.2636      5.34  |         |    V    |Q        |         |
11+ 5       2.3005      5.36  |         |     V   |Q        |         |
11+10       2.3372      5.33  |         |     V   |Q        |         |
11+15       2.3735      5.27  |         |     V   |Q        |         |
11+20       2.4096      5.24  |         |     V   Q         |         |
11+25       2.4456      5.23  |         |      V  Q         |         |
11+30       2.4816      5.23  |         |      V  Q         |         |
11+35       2.5174      5.20  |         |      V  Q         |         |
11+40       2.5524      5.08  |         |      V  Q         |         |
11+45       2.5863      4.93  |         |       VQ|         |         |
11+50       2.6198      4.86  |         |       VQ|         |         |
11+55       2.6534      4.88  |         |       VQ|         |         |
12+ 0       2.6874      4.93  |         |       VQ|         |         |
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18+ 0	5.3003	1.20	| Q |	|	|	| V |
18+ 5	5.3083	1.17	| Q |	|	|	| V |
18+10	5.3163	1.15	| Q |	|	|	| V |
18+15	5.3241	1.14	| Q |	|	|	| V |
18+20	5.3319	1.13	| Q |	|	|	| V |
18+25	5.3397	1.13	| Q |	|	|	| V |
18+30	5.3474	1.12	| Q |	|	|	| V |
18+35	5.3550	1.11	| Q |	|	|	| V |
18+40	5.3622	1.04	| Q |	|	|	| V |
18+45	5.3688	0.96	| Q |	|	|	| V |
18+50	5.3750	0.90	| Q |	|	|	| V |
18+55	5.3807	0.82	| Q |	|	|	| V |
19+ 0	5.3857	0.73	| Q |	|	|	| V |
19+ 5	5.3904	0.69	| Q |	|	|	| V |
19+10	5.3953	0.72	| Q |	|	|	| V |
19+15	5.4006	0.77	| Q |	|	|	| V |
19+20	5.4062	0.81	| Q |	|	|	| V |
19+25	5.4123	0.88	| Q |	|	|	| V |
19+30	5.4189	0.96	| Q |	|	|	| V |
19+35	5.4258	0.99	| Q |	|	|	| V |
19+40	5.4324	0.96	| Q |	|	|	| V |
19+45	5.4386	0.90	| Q |	|	|	| V |
19+50	5.4444	0.85	| Q |	|	|	| V |
19+55	5.4498	0.78	| Q |	|	|	| V |
20+ 0	5.4545	0.69	| Q |	|	|	| V |
20+ 5	5.4591	0.66	| Q |	|	|	| V |
20+10	5.4639	0.69	| Q |	|	|	| V |
20+15	5.4691	0.76	| Q |	|	|	| V |
20+20	5.4745	0.79	| Q |	|	|	| V |
20+25	5.4800	0.80	| Q |	|	|	| V |
20+30	5.4856	0.81	| Q |	|	|	| V |
20+35	5.4912	0.81	| Q |	|	|	| V |
20+40	5.4968	0.82	| Q |	|	|	| V |
20+45	5.5024	0.82	| Q |	|	|	| V |
20+50	5.5080	0.80	| Q |	|	|	| V |
20+55	5.5131	0.75	| Q |	|	|	| V |
21+ 0	5.5177	0.67	| Q |	|	|	| V |
21+ 5	5.5221	0.64	| Q |	|	|	| V |
21+10	5.5268	0.68	| Q |	|	|	| V |
21+15	5.5319	0.74	| Q |	|	|	| V |
21+20	5.5372	0.76	| Q |	|	|	| V |
21+25	5.5421	0.72	| Q |	|	|	| V |
21+30	5.5466	0.65	| Q |	|	|	| V|
21+35	5.5509	0.63	| Q |	|	|	| V|
21+40	5.5556	0.67	| Q |	|	|	| V|
21+45	5.5606	0.74	| Q |	|	|	| V|
21+50	5.5658	0.76	| Q |	|	|	| V|
21+55	5.5708	0.71	| Q |	|	|	| V|
22+ 0	5.5752	0.64	| Q |	|	|	| V|
22+ 5	5.5795	0.62	| Q |	|	|	| V|
22+10	5.5841	0.67	| Q |	|	|	| V|
22+15	5.5891	0.73	| Q |	|	|	| V|
22+20	5.5943	0.75	| Q |	|	|	| V|
22+25	5.5992	0.71	| Q |	|	|	| V|
22+30	5.6036	0.64	| Q |	|	|	| V|
22+35	5.6078	0.61	| Q |	|	|	| V|
22+40	5.6119	0.59	| Q |	|	|	| V|
22+45	5.6159	0.58	| Q |	|	|	| V|
22+50	5.6199	0.57	| Q |	|	|	| V|
22+55	5.6238	0.57	| Q |	|	|	| V|
23+ 0	5.6277	0.57	| Q |	|	|	| V|
23+ 5	5.6316	0.56	| Q |	|	|	| V|
23+10	5.6354	0.56	| Q |	|	|	| V|
23+15	5.6393	0.56	| Q |	|	|	| V|
23+20	5.6431	0.56	| Q |	|	|	| V|
23+25	5.6469	0.55	| Q |	|	|	| V|
23+30	5.6507	0.55	| Q |	|	|	| V|
23+35	5.6545	0.55	| Q |	|	|	| V|
23+40	5.6583	0.55	| Q |	|	|	| V|
23+45	5.6621	0.55	| Q |	|	|	| V|
23+50	5.6659	0.55	| Q |	|	|	| V|

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   23+55       5.6697      0.55  | Q       |         |         |        V|
   24+ 0       5.6735      0.55  | Q       |         |         |        V|
   24+ 5       5.6771      0.52  | Q       |         |         |        V|
   24+10       5.6799      0.41  |Q        |         |         |        V|
   24+15       5.6816      0.25  Q         |         |         |        V|
   24+20       5.6827      0.16  Q         |         |         |        V|
   24+25       5.6836      0.12  Q         |         |         |        V|
   24+30       5.6842      0.09  Q         |         |         |        V|
   24+35       5.6847      0.07  Q         |         |         |        V|
   24+40       5.6851      0.06  Q         |         |         |        V|
   24+45       5.6855      0.05  Q         |         |         |        V|
   24+50       5.6857      0.04  Q         |         |         |        V|
   24+55       5.6859      0.03  Q         |         |         |        V|
   25+ 0       5.6861      0.02  Q         |         |         |        V|
   25+ 5       5.6862      0.02  Q         |         |         |        V|
   25+10       5.6863      0.01  Q         |         |         |        V|
   25+15       5.6863      0.01  Q         |         |         |        V|
   25+20       5.6864      0.01  Q         |         |         |        V|
   25+25       5.6864      0.00  Q         |         |         |        V|
   25+30       5.6864      0.00  Q         |         |         |         V
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FLOOD HYDROGRAPH ROUTING PROGRAM
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Study date: 08/18/25

Program License Serial Number 5006

********** HYDROGRAPH INFORMATION **********

From study/file name: PROB12.rte
**********HYDROGRAPH DATA**********
Number of intervals = 25
Time interval = 5.0 (Min.)
Maximum/Peak flow rate = 15.579 (CFS)
Total volume = 0.534 (Ac.Ft)

Status of hydrographs being held in storage

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

****

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Process from Point/Station 0.000 to Point/Station 0.000
**** RETARDING BASIN ROUTING ****

User entry of depth-outflow-storage data

Total number of inflow hydrograph intervals = 25
Hydrograph time unit = 5.000 (Min.)
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.000	0.000	0.000	0.000
0.700	0.040	0.109	0.040	0.040
1.700	0.187	0.211	0.186	0.188
2.400	0.365	0.269	0.364	0.366
2.700	0.461	0.377	0.460	0.462
3.700	0.829	0.537	0.827	0.831
4.700	1.249	0.651	1.247	1.251
5.700	1.723	0.746	1.720	1.726
6.700	2.252	1.870	2.246	2.258
7.700	2.841	2.376	2.833	2.849
8.300	3.223	38.499	3.090	3.356
8.700	3.491	113.554	3.100	3.882
9.700	4.203	441.782	2.682	5.724

Hydrograph Detention Basin Routing

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time	Inflow	Outflow	Storage	Depth

(Hours)	(CFS)	(CFS)	(Ac.Ft)	.0	3.9	7.79	11.68	15.58	(Ft.)
0.083	0.15	0.00	0.001	O	|	|	|	|	0.01
0.167	0.82	0.01	0.004	OI	|	|	|	|	0.07
0.250	1.52	0.03	0.012	O I	|	|	|	|	0.21
0.333	1.92	0.06	0.023	O I	|	|	|	|	0.41
0.417	2.21	0.10	0.037	O I	|	|	|	|	0.65
0.500	2.52	0.12	0.052	O I	|	|	|	|	0.78
0.583	2.91	0.13	0.070	O I	|	|	|	|	0.91
0.667	3.47	0.14	0.091	O I	|	|	|	|	1.05
0.750	4.91	0.16	0.119	O	I |	|	|	|	1.24
0.833	9.20	0.20	0.166	O	|	I |	|	|	1.56
0.917	15.58	0.23	0.250	O	|	|	|	I	1.95
1.000	12.49	0.26	0.345	O	|	|	I |	|	2.32
1.083	6.68	0.32	0.409	O	| I	|	|	|	2.54
1.167	4.01	0.36	0.444	O	I |	|	|	|	2.65
1.250	2.56	0.38	0.464	O I	|	|	|	|	2.71
1.333	1.80	0.38	0.476	O I	|	|	|	|	2.74
1.417	1.30	0.39	0.484	O I	|	|	|	|	2.76
1.500	1.01	0.39	0.490	O I	|	|	|	|	2.78
1.583	0.76	0.39	0.493	OI	|	|	|	|	2.79
1.667	0.57	0.39	0.495	OI	|	|	|	|	2.79
1.750	0.42	0.39	0.496	O	|	|	|	|	2.79
1.833	0.33	0.39	0.495	O	|	|	|	|	2.79
1.917	0.26	0.39	0.495	O	|	|	|	|	2.79
2.000	0.04	0.39	0.493	O	|	|	|	|	2.79
2.083	0.01	0.39	0.491	O	|	|	|	|	2.78
2.167	0.00	0.39	0.488	O	|	|	|	|	2.77
2.250	0.00	0.39	0.485	O	|	|	|	|	2.77
2.333	0.00	0.39	0.483	O	|	|	|	|	2.76
2.417	0.00	0.39	0.480	O	|	|	|	|	2.75
2.500	0.00	0.38	0.477	O	|	|	|	|	2.74
2.583	0.00	0.38	0.475	O	|	|	|	|	2.74
2.667	0.00	0.38	0.472	O	|	|	|	|	2.73
2.750	0.00	0.38	0.469	O	|	|	|	|	2.72
2.833	0.00	0.38	0.467	O	|	|	|	|	2.72
2.917	0.00	0.38	0.464	O	|	|	|	|	2.71
3.000	0.00	0.38	0.462	O	|	|	|	|	2.70
3.083	0.00	0.37	0.459	O	|	|	|	|	2.69
3.167	0.00	0.37	0.456	O	|	|	|	|	2.69
3.250	0.00	0.37	0.454	O	|	|	|	|	2.68
3.333	0.00	0.37	0.451	O	|	|	|	|	2.67
3.417	0.00	0.36	0.449	O	|	|	|	|	2.66
3.500	0.00	0.36	0.446	O	|	|	|	|	2.65
3.583	0.00	0.36	0.444	O	|	|	|	|	2.65
3.667	0.00	0.36	0.441	O	|	|	|	|	2.64
3.750	0.00	0.35	0.439	O	|	|	|	|	2.63
3.833	0.00	0.35	0.437	O	|	|	|	|	2.62
3.917	0.00	0.35	0.434	O	|	|	|	|	2.62
4.000	0.00	0.34	0.432	O	|	|	|	|	2.61
4.083	0.00	0.34	0.429	O	|	|	|	|	2.60
4.167	0.00	0.34	0.427	O	|	|	|	|	2.59
4.250	0.00	0.34	0.425	O	|	|	|	|	2.59
4.333	0.00	0.33	0.423	O	|	|	|	|	2.58
4.417	0.00	0.33	0.420	O	|	|	|	|	2.57
4.500	0.00	0.33	0.418	O	|	|	|	|	2.57
4.583	0.00	0.33	0.416	O	|	|	|	|	2.56
4.667	0.00	0.32	0.413	O	|	|	|	|	2.55
4.750	0.00	0.32	0.411	O	|	|	|	|	2.54
4.833	0.00	0.32	0.409	O	|	|	|	|	2.54
4.917	0.00	0.32	0.407	O	|	|	|	|	2.53
5.000	0.00	0.31	0.405	O	|	|	|	|	2.52
5.083	0.00	0.31	0.403	O	|	|	|	|	2.52
5.167	0.00	0.31	0.400	O	|	|	|	|	2.51
5.250	0.00	0.31	0.398	O	|	|	|	|	2.50
5.333	0.00	0.30	0.396	O	|	|	|	|	2.50
5.417	0.00	0.30	0.394	O	|	|	|	|	2.49
5.500	0.00	0.30	0.392	O	|	|	|	|	2.48
5.583	0.00	0.30	0.390	O	|	|	|	|	2.48
5.667	0.00	0.29	0.388	O	|	|	|	|	2.47
5.750	0.00	0.29	0.386	O	|	|	|	|	2.47
5.833	0.00	0.29	0.384	O	|	|	|	|	2.46

5.917	0.00	0.29	0.382	O					2.45
6.000	0.00	0.29	0.380	O					2.45
6.083	0.00	0.28	0.378	O					2.44
6.167	0.00	0.28	0.376	O					2.43
6.250	0.00	0.28	0.374	O					2.43
6.333	0.00	0.28	0.372	O					2.42
6.417	0.00	0.27	0.370	O					2.42
6.500	0.00	0.27	0.368	O					2.41
6.583	0.00	0.27	0.367	O					2.40
6.667	0.00	0.27	0.365	O					2.40
6.750	0.00	0.27	0.363	O					2.39
6.833	0.00	0.27	0.361	O					2.38
6.917	0.00	0.27	0.359	O					2.38
7.000	0.00	0.27	0.357	O					2.37
7.083	0.00	0.27	0.355	O					2.36
7.167	0.00	0.27	0.354	O					2.36
7.250	0.00	0.26	0.352	O					2.35
7.333	0.00	0.26	0.350	O					2.34
7.417	0.00	0.26	0.348	O					2.33
7.500	0.00	0.26	0.346	O					2.33
7.583	0.00	0.26	0.345	O					2.32
7.667	0.00	0.26	0.343	O					2.31
7.750	0.00	0.26	0.341	O					2.31
7.833	0.00	0.26	0.339	O					2.30
7.917	0.00	0.26	0.337	O					2.29
8.000	0.00	0.26	0.336	O					2.28
8.083	0.00	0.26	0.334	O					2.28
8.167	0.00	0.26	0.332	O					2.27
8.250	0.00	0.26	0.330	O					2.26
8.333	0.00	0.26	0.328	O					2.26
8.417	0.00	0.26	0.327	O					2.25
8.500	0.00	0.26	0.325	O					2.24
8.583	0.00	0.26	0.323	O					2.24
8.667	0.00	0.25	0.321	O					2.23
8.750	0.00	0.25	0.320	O					2.22
8.833	0.00	0.25	0.318	O					2.21
8.917	0.00	0.25	0.316	O					2.21
9.000	0.00	0.25	0.314	O					2.20
9.083	0.00	0.25	0.313	O					2.19
9.167	0.00	0.25	0.311	O					2.19
9.250	0.00	0.25	0.309	O					2.18
9.333	0.00	0.25	0.307	O					2.17
9.417	0.00	0.25	0.306	O					2.17
9.500	0.00	0.25	0.304	O					2.16
9.583	0.00	0.25	0.302	O					2.15
9.667	0.00	0.25	0.301	O					2.15
9.750	0.00	0.25	0.299	O					2.14
9.833	0.00	0.25	0.297	O					2.13
9.917	0.00	0.25	0.296	O					2.13
10.000	0.00	0.25	0.294	O					2.12
10.083	0.00	0.25	0.292	O					2.11
10.167	0.00	0.24	0.290	O					2.11
10.250	0.00	0.24	0.289	O					2.10
10.333	0.00	0.24	0.287	O					2.09
10.417	0.00	0.24	0.285	O					2.09
10.500	0.00	0.24	0.284	O					2.08
10.583	0.00	0.24	0.282	O					2.07
10.667	0.00	0.24	0.280	O					2.07
10.750	0.00	0.24	0.279	O					2.06
10.833	0.00	0.24	0.277	O					2.05
10.917	0.00	0.24	0.275	O					2.05
11.000	0.00	0.24	0.274	O					2.04
11.083	0.00	0.24	0.272	O					2.03
11.167	0.00	0.24	0.270	O					2.03
11.250	0.00	0.24	0.269	O					2.02
11.333	0.00	0.24	0.267	O					2.02
11.417	0.00	0.24	0.266	O					2.01
11.500	0.00	0.24	0.264	O					2.00
11.583	0.00	0.24	0.262	O					2.00
11.667	0.00	0.24	0.261	O					1.99
11.750	0.00	0.23	0.259	O					1.98

11.833	0.00	0.23	0.257	O	|	|	|	|	1.98
11.917	0.00	0.23	0.256	O	|	|	|	|	1.97
12.000	0.00	0.23	0.254	O	|	|	|	|	1.96
12.083	0.00	0.23	0.253	O	|	|	|	|	1.96
12.167	0.00	0.23	0.251	O	|	|	|	|	1.95
12.250	0.00	0.23	0.249	O	|	|	|	|	1.95
12.333	0.00	0.23	0.248	O	|	|	|	|	1.94
12.417	0.00	0.23	0.246	O	|	|	|	|	1.93
12.500	0.00	0.23	0.245	O	|	|	|	|	1.93
12.583	0.00	0.23	0.243	O	|	|	|	|	1.92
12.667	0.00	0.23	0.242	O	|	|	|	|	1.91
12.750	0.00	0.23	0.240	O	|	|	|	|	1.91
12.833	0.00	0.23	0.238	O	|	|	|	|	1.90
12.917	0.00	0.23	0.237	O	|	|	|	|	1.90
13.000	0.00	0.23	0.235	O	|	|	|	|	1.89
13.083	0.00	0.23	0.234	O	|	|	|	|	1.88
13.167	0.00	0.23	0.232	O	|	|	|	|	1.88
13.250	0.00	0.23	0.231	O	|	|	|	|	1.87
13.333	0.00	0.22	0.229	O	|	|	|	|	1.87
13.417	0.00	0.22	0.228	O	|	|	|	|	1.86
13.500	0.00	0.22	0.226	O	|	|	|	|	1.85
13.583	0.00	0.22	0.224	O	|	|	|	|	1.85
13.667	0.00	0.22	0.223	O	|	|	|	|	1.84
13.750	0.00	0.22	0.221	O	|	|	|	|	1.84
13.833	0.00	0.22	0.220	O	|	|	|	|	1.83
13.917	0.00	0.22	0.218	O	|	|	|	|	1.82
14.000	0.00	0.22	0.217	O	|	|	|	|	1.82
14.083	0.00	0.22	0.215	O	|	|	|	|	1.81
14.167	0.00	0.22	0.214	O	|	|	|	|	1.81
14.250	0.00	0.22	0.212	O	|	|	|	|	1.80
14.333	0.00	0.22	0.211	O	|	|	|	|	1.79
14.417	0.00	0.22	0.209	O	|	|	|	|	1.79
14.500	0.00	0.22	0.208	O	|	|	|	|	1.78
14.583	0.00	0.22	0.206	O	|	|	|	|	1.78
14.667	0.00	0.22	0.205	O	|	|	|	|	1.77
14.750	0.00	0.22	0.203	O	|	|	|	|	1.76
14.833	0.00	0.22	0.202	O	|	|	|	|	1.76
14.917	0.00	0.22	0.200	O	|	|	|	|	1.75
15.000	0.00	0.21	0.199	O	|	|	|	|	1.75
15.083	0.00	0.21	0.197	O	|	|	|	|	1.74
15.167	0.00	0.21	0.196	O	|	|	|	|	1.73
15.250	0.00	0.21	0.194	O	|	|	|	|	1.73
15.333	0.00	0.21	0.193	O	|	|	|	|	1.72
15.417	0.00	0.21	0.191	O	|	|	|	|	1.72
15.500	0.00	0.21	0.190	O	|	|	|	|	1.71
15.583	0.00	0.21	0.189	O	|	|	|	|	1.71
15.667	0.00	0.21	0.187	O	|	|	|	|	1.70
15.750	0.00	0.21	0.186	O	|	|	|	|	1.69
15.833	0.00	0.21	0.184	O	|	|	|	|	1.68
15.917	0.00	0.21	0.183	O	|	|	|	|	1.67
16.000	0.00	0.21	0.181	O	|	|	|	|	1.66
16.083	0.00	0.21	0.180	O	|	|	|	|	1.65
16.167	0.00	0.21	0.178	O	|	|	|	|	1.64
16.250	0.00	0.20	0.177	O	|	|	|	|	1.63
16.333	0.00	0.20	0.176	O	|	|	|	|	1.62
16.417	0.00	0.20	0.174	O	|	|	|	|	1.61
16.500	0.00	0.20	0.173	O	|	|	|	|	1.60
16.583	0.00	0.20	0.171	O	|	|	|	|	1.59
16.667	0.00	0.20	0.170	O	|	|	|	|	1.59
16.750	0.00	0.20	0.169	O	|	|	|	|	1.58
16.833	0.00	0.20	0.167	O	|	|	|	|	1.57
16.917	0.00	0.20	0.166	O	|	|	|	|	1.56
17.000	0.00	0.20	0.165	O	|	|	|	|	1.55
17.083	0.00	0.19	0.163	O	|	|	|	|	1.54
17.167	0.00	0.19	0.162	O	|	|	|	|	1.53
17.250	0.00	0.19	0.161	O	|	|	|	|	1.52
17.333	0.00	0.19	0.159	O	|	|	|	|	1.51
17.417	0.00	0.19	0.158	O	|	|	|	|	1.50
17.500	0.00	0.19	0.157	O	|	|	|	|	1.49
17.583	0.00	0.19	0.155	O	|	|	|	|	1.48
17.667	0.00	0.19	0.154	O	|	|	|	|	1.48

17.750	0.00	0.19	0.153	O	|	|	|	|	1.47
17.833	0.00	0.19	0.152	O	|	|	|	|	1.46
17.917	0.00	0.19	0.150	O	|	|	|	|	1.45
18.000	0.00	0.18	0.149	O	|	|	|	|	1.44
18.083	0.00	0.18	0.148	O	|	|	|	|	1.43
18.167	0.00	0.18	0.146	O	|	|	|	|	1.42
18.250	0.00	0.18	0.145	O	|	|	|	|	1.42
18.333	0.00	0.18	0.144	O	|	|	|	|	1.41
18.417	0.00	0.18	0.143	O	|	|	|	|	1.40
18.500	0.00	0.18	0.141	O	|	|	|	|	1.39
18.583	0.00	0.18	0.140	O	|	|	|	|	1.38
18.667	0.00	0.18	0.139	O	|	|	|	|	1.37
18.750	0.00	0.18	0.138	O	|	|	|	|	1.37
18.833	0.00	0.18	0.137	O	|	|	|	|	1.36
18.917	0.00	0.18	0.135	O	|	|	|	|	1.35
19.000	0.00	0.17	0.134	O	|	|	|	|	1.34
19.083	0.00	0.17	0.133	O	|	|	|	|	1.33
19.167	0.00	0.17	0.132	O	|	|	|	|	1.32
19.250	0.00	0.17	0.131	O	|	|	|	|	1.32
19.333	0.00	0.17	0.129	O	|	|	|	|	1.31
19.417	0.00	0.17	0.128	O	|	|	|	|	1.30
19.500	0.00	0.17	0.127	O	|	|	|	|	1.29
19.583	0.00	0.17	0.126	O	|	|	|	|	1.28
19.667	0.00	0.17	0.125	O	|	|	|	|	1.28
19.750	0.00	0.17	0.124	O	|	|	|	|	1.27
19.833	0.00	0.17	0.122	O	|	|	|	|	1.26
19.917	0.00	0.17	0.121	O	|	|	|	|	1.25
20.000	0.00	0.16	0.120	O	|	|	|	|	1.25
20.083	0.00	0.16	0.119	O	|	|	|	|	1.24
20.167	0.00	0.16	0.118	O	|	|	|	|	1.23
20.250	0.00	0.16	0.117	O	|	|	|	|	1.22
20.333	0.00	0.16	0.116	O	|	|	|	|	1.21
20.417	0.00	0.16	0.115	O	|	|	|	|	1.21
20.500	0.00	0.16	0.113	O	|	|	|	|	1.20
20.583	0.00	0.16	0.112	O	|	|	|	|	1.19
20.667	0.00	0.16	0.111	O	|	|	|	|	1.18
20.750	0.00	0.16	0.110	O	|	|	|	|	1.18
20.833	0.00	0.16	0.109	O	|	|	|	|	1.17
20.917	0.00	0.16	0.108	O	|	|	|	|	1.16
21.000	0.00	0.16	0.107	O	|	|	|	|	1.16
21.083	0.00	0.15	0.106	O	|	|	|	|	1.15
21.167	0.00	0.15	0.105	O	|	|	|	|	1.14
21.250	0.00	0.15	0.104	O	|	|	|	|	1.13
21.333	0.00	0.15	0.103	O	|	|	|	|	1.13
21.417	0.00	0.15	0.102	O	|	|	|	|	1.12
21.500	0.00	0.15	0.101	O	|	|	|	|	1.11
21.583	0.00	0.15	0.100	O	|	|	|	|	1.11
21.667	0.00	0.15	0.099	O	|	|	|	|	1.10
21.750	0.00	0.15	0.097	O	|	|	|	|	1.09
21.833	0.00	0.15	0.096	O	|	|	|	|	1.08
21.917	0.00	0.15	0.095	O	|	|	|	|	1.08
22.000	0.00	0.15	0.094	O	|	|	|	|	1.07
22.083	0.00	0.15	0.093	O	|	|	|	|	1.06
22.167	0.00	0.15	0.092	O	|	|	|	|	1.06
22.250	0.00	0.14	0.091	O	|	|	|	|	1.05
22.333	0.00	0.14	0.090	O	|	|	|	|	1.04
22.417	0.00	0.14	0.089	O	|	|	|	|	1.04
22.500	0.00	0.14	0.088	O	|	|	|	|	1.03
22.583	0.00	0.14	0.087	O	|	|	|	|	1.02
22.667	0.00	0.14	0.086	O	|	|	|	|	1.02
22.750	0.00	0.14	0.086	O	|	|	|	|	1.01
22.833	0.00	0.14	0.085	O	|	|	|	|	1.00
22.917	0.00	0.14	0.084	O	|	|	|	|	1.00
23.000	0.00	0.14	0.083	O	|	|	|	|	0.99
23.083	0.00	0.14	0.082	O	|	|	|	|	0.98
23.167	0.00	0.14	0.081	O	|	|	|	|	0.98
23.250	0.00	0.14	0.080	O	|	|	|	|	0.97
23.333	0.00	0.14	0.079	O	|	|	|	|	0.96
23.417	0.00	0.14	0.078	O	|	|	|	|	0.96
23.500	0.00	0.13	0.077	O	|	|	|	|	0.95
23.583	0.00	0.13	0.076	O	|	|	|	|	0.95

23.667	0.00	0.13	0.075	O	|	|	|	|	0.94
23.750	0.00	0.13	0.074	O	|	|	|	|	0.93
23.833	0.00	0.13	0.073	O	|	|	|	|	0.93
23.917	0.00	0.13	0.072	O	|	|	|	|	0.92
24.000	0.00	0.13	0.072	O	|	|	|	|	0.91
24.083	0.00	0.13	0.071	O	|	|	|	|	0.91
24.167	0.00	0.13	0.070	O	|	|	|	|	0.90
24.250	0.00	0.13	0.069	O	|	|	|	|	0.90
24.333	0.00	0.13	0.068	O	|	|	|	|	0.89
24.417	0.00	0.13	0.067	O	|	|	|	|	0.88
24.500	0.00	0.13	0.066	O	|	|	|	|	0.88
24.583	0.00	0.13	0.065	O	|	|	|	|	0.87
24.667	0.00	0.13	0.064	O	|	|	|	|	0.87
24.750	0.00	0.13	0.064	O	|	|	|	|	0.86
24.833	0.00	0.12	0.063	O	|	|	|	|	0.85
24.917	0.00	0.12	0.062	O	|	|	|	|	0.85
25.000	0.00	0.12	0.061	O	|	|	|	|	0.84
25.083	0.00	0.12	0.060	O	|	|	|	|	0.84
25.167	0.00	0.12	0.059	O	|	|	|	|	0.83
25.250	0.00	0.12	0.058	O	|	|	|	|	0.83
25.333	0.00	0.12	0.058	O	|	|	|	|	0.82
25.417	0.00	0.12	0.057	O	|	|	|	|	0.81
25.500	0.00	0.12	0.056	O	|	|	|	|	0.81
25.583	0.00	0.12	0.055	O	|	|	|	|	0.80
25.667	0.00	0.12	0.054	O	|	|	|	|	0.80
25.750	0.00	0.12	0.053	O	|	|	|	|	0.79
25.833	0.00	0.12	0.053	O	|	|	|	|	0.79
25.917	0.00	0.12	0.052	O	|	|	|	|	0.78
26.000	0.00	0.12	0.051	O	|	|	|	|	0.78
26.083	0.00	0.12	0.050	O	|	|	|	|	0.77
26.167	0.00	0.12	0.049	O	|	|	|	|	0.76
26.250	0.00	0.12	0.049	O	|	|	|	|	0.76
26.333	0.00	0.11	0.048	O	|	|	|	|	0.75
26.417	0.00	0.11	0.047	O	|	|	|	|	0.75
26.500	0.00	0.11	0.046	O	|	|	|	|	0.74
26.583	0.00	0.11	0.046	O	|	|	|	|	0.74
26.667	0.00	0.11	0.045	O	|	|	|	|	0.73
26.750	0.00	0.11	0.044	O	|	|	|	|	0.73
26.833	0.00	0.11	0.043	O	|	|	|	|	0.72
26.917	0.00	0.11	0.042	O	|	|	|	|	0.72
27.000	0.00	0.11	0.042	O	|	|	|	|	0.71
27.083	0.00	0.11	0.041	O	|	|	|	|	0.71
27.167	0.00	0.11	0.040	O	|	|	|	|	0.70
27.250	0.00	0.11	0.039	O	|	|	|	|	0.69
27.333	0.00	0.11	0.039	O	|	|	|	|	0.68
27.417	0.00	0.10	0.038	O	|	|	|	|	0.66
27.500	0.00	0.10	0.037	O	|	|	|	|	0.65
27.583	0.00	0.10	0.037	O	|	|	|	|	0.64

Remaining water in basin = 0.04 (Ac.Ft)

**********HYDROGRAPH DATA**********

Number of intervals = 331
Time interval = 5.0 (Min.)
Maximum/Peak flow rate = 0.392 (CFS)
Total volume = 0.497 (Ac.Ft)

Status of hydrographs being held in storage

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

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Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

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

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

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

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

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

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ H. **Industrial processes.**	❑ **Show process area.**	❑ **If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."**	❑ **See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/

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

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

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

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

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

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

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

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 Maintenance and Recording Mechanisms

(Will be completed in Final WQMP)

Appendix 10: Educational Materials

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

Affidavit for NPDES Education

After the Storm (RCFC&WCD Handout)

Outdoor Cleaning Activities (RCFC & WCD Handout)

Guidelines for Maintaining Pools (RCFC & WCD Handout)

10 Ways to Save Water Outdoors (RCFC& WCD Handout)

CASQA GUIDELINES

SD-10 - Site Design & Landscape Planning

SD-11 – Roof Runoff Controls

SD-12 – Efficient Irrigation

SD-13 – Storm Drain Signage

TC-22 Extended Detention Basin

TC-32 - Bioretention

3.6 Extended Detention Basin

Type of BMP	LID - Biotreatment
Treatment Mechanisms	Sedimentation, Infiltration, Biofiltration, Evapotranspiration, and Evaporation
Minimum Tributary Drainage Area	5 acres
Other Names	Enhanced Water Quality Basin

Overview

The Extended Detention Basin (EDB) is designed to detain the design volume of stormwater, V_{BMP}, and maximize opportunities for volume losses through infiltration, evaporation, evapotranspiration and surface wetting. Additional pollutant removal is provided through sedimentation, in which pollutants can attach to sediment accumulated in the basin through the process of settling. Stormwater enters the EDB through a *forebay* where any trash, debris, and sediment accumulate for easy removal. Flows from the forebay enter the basin which is vegetated with native grasses that enhance infiltration and evapotranspiration, and which is interspersed with gravel-filled trenches that help further enhance infiltration. Water that does not get infiltrated or evapotranspired is conveyed to the *bottom stage* of the basin. At the bottom stage of the basin, low or incidental dry weather flows will be treated through a sand filter and collected in a subdrain structure. Any additional flows will be detained in the basin for an extended period by incorporating an outlet structure that is more restrictive than a traditional detention basin outlet. The restrictive outlet structure extends the drawdown time of the basin which further allows particles and associated pollutants to settle out before exiting the basin, while maximizing opportunities for additional incidental volume losses.

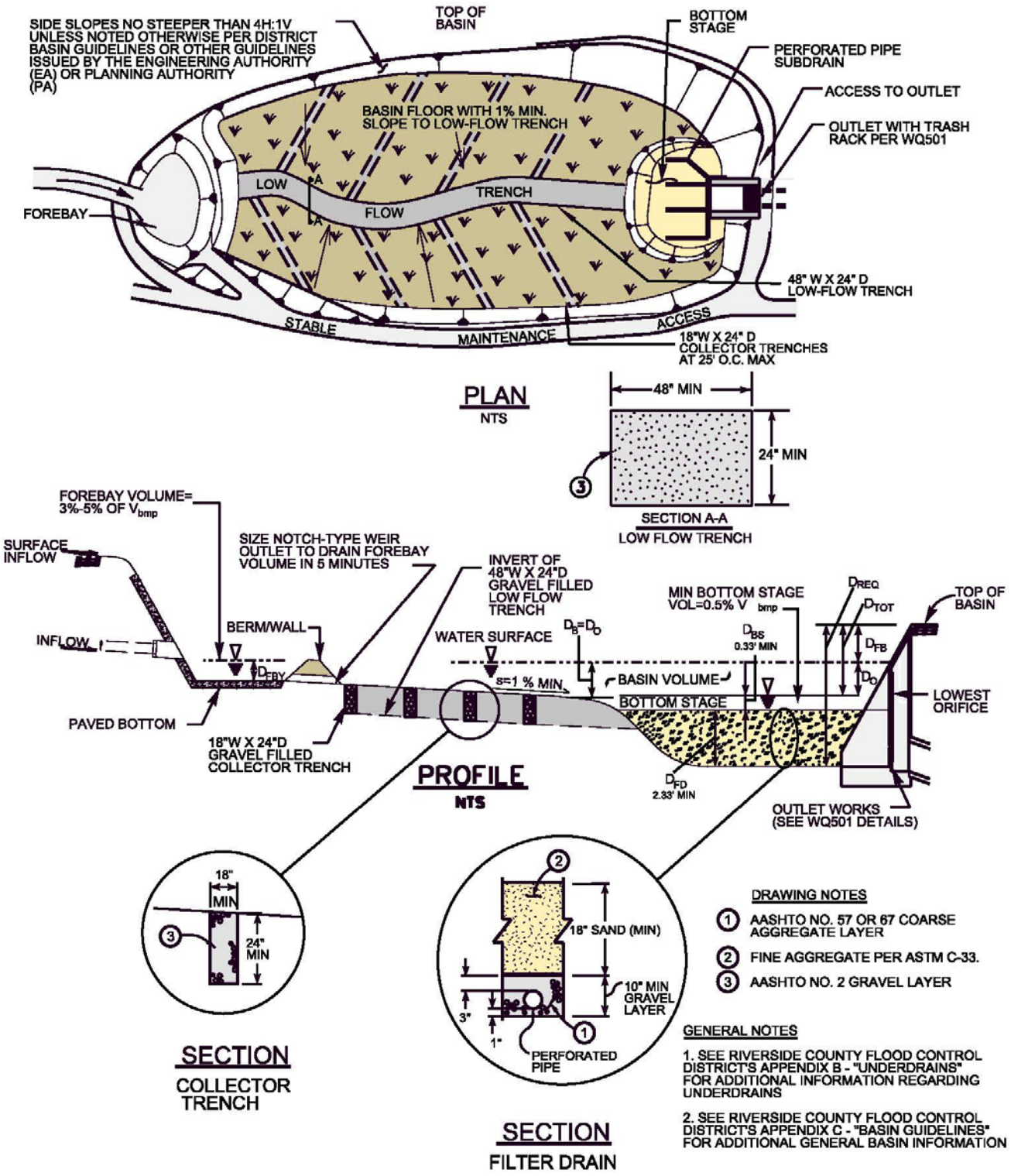


Figure 1 – Extended Detention Basin

Siting Considerations

Soils: EDBs can be used with almost all soils and geology. However, pollutant removal effectiveness is greatly improved when the underlying soil permits at least some infiltration.

Tributary Area: EDBs should only be used where the tributary drainage area is at least 5 acres, since meeting the draw-down requirements (discussed below) for smaller areas would result in very small outlet orifice diameters which would be prone to clogging.

Proximity to Receiving Waters: All site runoff must be treated to the MEP with appropriate BMPs *before* being discharged into Receiving Waters; as such the EDB cannot be constructed in-line within Receiving Waters.

Setbacks: Due to the infiltration characteristics incorporated into the EDB design, the lowest pervious point (beneath the filter drain) of the extended detention facility should be a minimum of 10' above the seasonal high groundwater table. All other setbacks shall be in accordance with applicable standards of the "Basin Guidelines" (Appendix C) or other guidelines issued by the Engineering Authority (EA).

Basin Guidelines: See Section 1 of the "Basin Guidelines" (Appendix C) for additional requirements (i.e., fencing, maintenance access, etc.) that may be required by the Engineering Authority (EA).

Landscaping Requirements

Basin vegetation provides erosion protection, enhances evapotranspiration and infiltration, and improves pollutant removal. The upper stage basin surface, berms 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 the use of pesticides, herbicides, or fertilizers. Landscaping shall be in accordance with applicable standards of the "Basin Guidelines" (Appendix C) or other guidelines issued by the EA.

Maintenance Guidelines

Schedule	Inspection and Maintenance Activity
During every scheduled maintenance check (per below), and *as needed* at other times	• Maintain vegetation as needed. Use of fertilizers, pesticides and herbicides should be strongly 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 Care should be taken to avoid contact with the low-flow or other trenches, and the media filter in the bottom stage. 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 rainy season. • No ponded water should be present for more than 72 hours to avoid nuisance or vector problems. No algae formation should be visible. Correct problems as needed.
Annually. If possible, schedule these inspections before the beginning of the rain season to allow for any repairs to occur before rains occur.	• Remove debris and litter from the entire basin • Inspect hydraulic and structural facilities. Examine the outlet for clogging, the embankment and spillway integrity, as well as damage to any structural element. • Check for erosion, slumping and overgrowth. Repair as needed. • Inspect sand media at the filter drain to verify it is allowing acceptable infiltration. **Scarify top 3 inches by raking the filter drain's sand surface annually.** • Check the media filter underdrains (via the cleanout) for damage or clogging. Repair as needed. • Remove accumulated sediment and debris from the forebay, and ensure that the notch weir is clear and will allow proper drainage. • Check gravel filled low flow and collector trenches for sediment buildup and repair as needed.
Every 5 years or sooner (depending on whether observed drain times to empty the basin are less than 72 hours).	• Remove the top 3 inches of sand from the filter drain and backfill with 3 inches of new sand to return the sand layer to its original depth. When scarification or removal of the top 3 inches of sand is no longer effective, remove and replace sand filter layer.
Whenever substantial sediment accumulation has occurred.	• Remove accumulated sediment from the bottom of the basin. Removal should extend to original basin depth.

EXTENDED DETENTION BASIN BMP FACT SHEET

Design Summary

Design Parameter	Extended Detention Basin
Drawdown time (total)	72 hours [2,3]
Minimum drawdown time for 50% V_{BMP}	24 hours [2]
Minimum tributary area	5 acres [2]
Outlet erosion control	Energy dissipaters to reduce velocities[1]
Forebay volume	3 to 5 % of V_{BMP} [3]
Basin Invert Longitudinal Slope (min.)	1%
Basin Invert Transverse (cross) Slope (min)	1%
Low-flow trench width (min.)	48 inches
Low-flow trench depth (min.)	24 inches
Slope of low-flow trench along bottom excavated Surface (max.)	1%
Slope of gravel collector trenches along bottom excavated surface (max.)	1 %
Length to width ratio (min.)	1.5:1
Basin depth (min.)	1 foot [3]
Bottom stage volume	0.5 % of V_{BMP} [3]
Bottom stage depth (min)	0.33 feet [3]
Filter drain depth (min)	2.33 feet [3]

1. **Ventura County's Technical Guidance Manual for Stormwater Quality Control Measures**
2. **CA Stormwater BMP Handbook for New Development and Significant Redevelopment**
3. **Denver, Colorado's UDFCD Drainage Criteria Manual, Volume 3**

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 "Basin Guidelines" (Appendix C). In addition, information herein may be superseded by other guidelines issued by the Engineering Authority.

Design Procedure

These steps correspond to and provide a description of the information required in the EDB Design Worksheet.

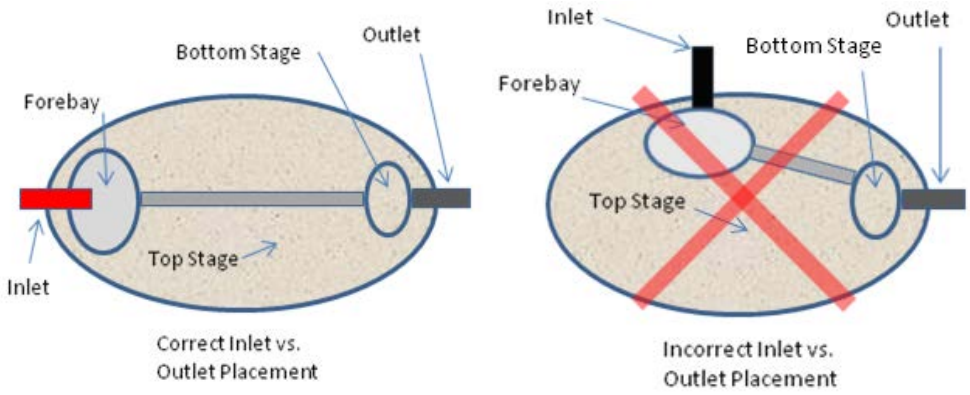
1. Find the Design Volume, V_{BMP}.

a) Enter the tributary area, A_T to the BMP. The minimum tributary area is 5 acres.

b) Enter the Design Volume, V_{BMP}, determined from Section 2.1 of this Handbook.

2. Basin Footprint

a) Enter the length and width of the EDB. The length shall be measured between the inlet to the basin and the outlet structure; and the width shall be measured at the widest point of the basin invert. The length to width ratio should be 1.5:1 or longer to prevent short-circuiting and increase the overall effectiveness of the BMP.



b) Enter the internal basin side slopes. See the "Basin Guidelines" (Appendix C) for side slope requirements. If variable internal side-slopes are used, enter the steepest slope that will be used.

c) Using Figure 1 as a guide, enter the proposed basin depth, D_B, and the freeboard depth, D_{FB}. Based on the information provided, the spreadsheet will calculate the minimum total depth required, D_{REQ}, for this BMP. D_{REQ} is the depth from the bottom of the underdrain layer in the bottom stage (see step 5c), to the top of the freeboard. This calculated minimum required depth can be used to determine if enough elevation difference is available within the design topography to allow for use of this BMP.

d) Additionally, the basin depth D_B is equal to $D_{O,}$ which is the depth from the design pond water surface elevation to the lowest orifice in the outlet structure. D_O is confirmed by the spreadsheet and is used in the Basin Outlet Design described in step 6 below. It should be noted that this lowest orifice is a critical elevation in the design of this BMP. The Volume of the Basin V_{Basin} described in step 3d) is the volume of water above this lowest orifice. This lowest-orifice also represents the dry weather ponded water surface discussed in step 5c below. Below this elevation there must be a minimum of a 4-inch drop down to the surface of the Sand Filter in the bottom stage.

3. Basin Design

a) The Total Basin Depth, D_{TOT}, is calculated automatically, and is the sum of the basin depth D_B plus the freeboard depth D_{FB}.

b) Enter the longitudinal slope of the basin invert. This slope must be at least 1% and is measured along the low flow trench between the forebay and the bottom stage. Note that the surface of the sand layer in the bottom stage must be level (see Figure 1).

c) Enter the transverse slope of the basin invert. This transverse (cross sectional) slope must be at least 1% sloped toward the low flow trench.

d) Enter the Volume of the Basin, V_{Basin}. This volume must be the actual volume of water held within the basin as substantiated by modeling or appropriate volumetric calculations, and must be equal to or greater than V_{BMP}. This volume must be held above the lowest orifice in the Basin Outlet Design described in step 6 below.

4. Forebay Design

All flows must enter the basin through the forebay. The forebay provides a location for the settlement and collection of larger particles, and any other trash or debris. A relatively smooth and level concrete bottom surface should be provided to facilitate mechanical removal of any accumulated sediment, trash and debris.



Figure 2: Forebay filled with storm water

a) Enter the Forebay Volume VFB. This volume must be from 3 to 5 percent of V_{BMP}.

b) A rock or concrete berm must be constructed to detain water before it drains into the basin. The top of the berm shall be set no higher than the invert of the inlet conveyance. Enter the Forebay Depth, D_{FBY}.

c) The spreadsheet will calculate the minimum surface area of the forebay, A_{FB}, based on the provided Forebay Volume and Depth. Ensure that the plans provide for a forbay area at least this large.

d) Although the forebay will be well submerged in the design event, a full height rectangular notch-type weir shall be constructed through the berm to prevent permanent ponding in the forebay, and allow water to slowly and fully drain to the main body of the basin. This notch should be offset from the inflow streamline to prevent low-flows from short circuiting. Enter the width, W, of this rectangular notch weir. The width shall not be less than 1.5 inches to prevent clogging. Additionally,

immediately outside the notch construct a minimum 1-foot by 1-foot gravel pad to prevent vegetative growth within the basin invert from blocking the notch.

5. Dry Weather and Low-Flow Management

The basin shall have both a low-flow gravel trench and a network of gravel collector trenches across the invert of the basin, as well as a bottom stage sand filter to treat low flows and dry weather flows (see Figure 1).

a) Low Flow Trench: The low-flow gravel trench conveys flow from the forebay to the bottom stage, while allowing for maximum incidental infiltration and volume loss. The trench shall be a minimum of 48 inches wide by 24 inches deep. This trench shall be unlined and backfilled with AASHTO No. 2 gravel (or similar) to the finished surface of the basin invert, and shall not use underdrains. The bottom excavated surface of the low-flow trench shall be 1 percent or flatter to promote infiltration.



Figure 3: Gravel filled low-flow trench

b) Collector Trenches: Gravel collector trenches beneath the top stage shall be arranged as illustrated in Figure 1 of Appendix C with minimal slope (1% maximum) along their bottom excavated surface to promote infiltration, and must extend from the low-flow trench to the toe of the basin side slopes. They shall be a minimum of 18-inches wide by 24-inches deep, unlined and backfilled with AASHTO No. 2 gravel (or similar) to the finished basin invert surface. The gravel collector trenches shall not use underdrains and shall be constructed with a maximum spacing of 25 feet, center to center. See Figure 1 of Appendix C.

c) Bottom Stage: A depressed sand filter drain area, referred to as the bottom stage, must be constructed adjacent to the outlet structure to treat any dry weather flows. To ensure that dry weather flows are treated through the sand filter and not discharged through the orifice plate, the top surface of the sand filter must be depressed at least 4 inches below the lowest orifice in the outlet structure. This depressed area will create a micro pool of water that is then filtered down through the sand filter and out through underdrains. Based on the minimum dimensions described below, the minimum depth of excavation below the lowest orifice in the outlet structure is 2.33 feet.

   i. Enter the Depth of the bottom stage, D_{BS}. As mentioned above, this depth must be at least 4 inches, and extend down below the lowest orifice in the outlet structure.

   ii. Enter the area of the bottom stage, A_{BS}.

iii. Based on the D_{BS} and A_{BS} entered, the spreadsheet will calculate V_{BS}. This volume is the volume of ponded water that will be held below the lowest orifice in the outlet structure, and above the surface of the sand filter. This volume must be at least 0.5% of V_{BMP}.

iv. Enter the thickness of the ASTM C-33 sand layer that will be provided, D_S. A minimum thickness of 18 inches is required.

v. Below the sand layer, a minimum 10-inch thick layer of gravel shall be installed with underdrains to drain the water that has been treated through the sand filter. The underdrains shall connect into the outlet structure. See Appendix B for standard underdrain construction. Enter the diameter of the underdrain pipe (minimum 6" dia.), and the spacing of the underdrains. The maximum spacing of the underdrains is 20 feet on center, however where the area of the bottom stage is particularly small (less than 500 square feet), the underdrain pipes shall be placed at no more than a 10-foot separation on center.

6. Basin Outlet Design

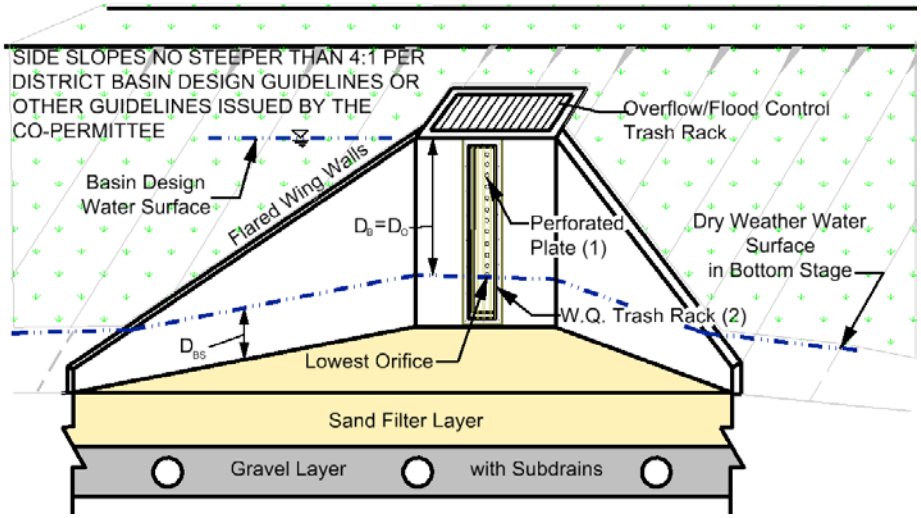


Figure 4: Basin Outlet Structure with Bottom Stage Shown

Outlet structures for publicly maintained basins shall conform to District Standard Drawings WQ501 unless approved in advance by the local Engineering Authority (EA). This standardization is to provide for efficient maintenance. The basin outlet should be sized to release the design volume, VBMP, within a 72-hour period but 50 percent of VBMP within 24 hours. This is an iterative design process where an appropriate control orifice can be selected using the following steps:

a. Develop a Stage vs. Discharge Curve for the Outlet Structure

Estimate the orifice size and outlet plate configuration (number per row, etc.). Based on D_O provided in the Basin Footprint section, the spreadsheet will automatically generate the stage vs. discharge relationship for this outlet:

$$Q = C*A*[2*g*(H-H_o)]^{0.5}$$

Where:

Q = discharge (ft^3/s)

C = orifice coefficient

A = area of the orifice (ft)

g = gravitational constant (32.2 ft2/s)

H = water surface elevation (ft)

H_o = orifice elevation (ft)

The lowest orifice shall be located with its centerline at the top of the bottom stage; at least 4 inches above the surface of the sand filter drain. To help avoid clogging, the minimum orifice diameter is limited to 3/8 inch. Since the 1/4 inch thickness of the orifice plate will be less than the orifice diameter, a value for C of 0.66 may be used. If another value for C is used, justification may be required.

b. Develop a Discharge/Volume vs. Stage Table for the Basin

Based on the shape and size of the basin, develop a relationship between the stage and the volume of water in the basin. Since the orifice spacing is 4 inches on center for the standard orifice plate, the stage intervals must also be 4 inches. Enter the basin volume at each interval starting at the centerline of the lowest orifice.

c. Route the Design Volume through the Basin

The spreadsheet assumes that the Design Volume, $V_{BMP,}$ enters the basin instantaneously and as such, no inflow/outflow hydrograph is necessary. The drawdown time for each stage becomes:

$$\Delta t = V_i/Q$$

Where:

Δt = drawdown time for each stage

V_i = the volume at each stage

Q = the flow rate corresponding to the headwater elevation at each stage.

The spreadsheet automatically determines the drawdown time from the sum of the Δt values for each stage. If the orifice size and plate configuration estimate meets the

hydraulic retention time requirements (50% of the volume empties in not less than 24 hours, 100% of the volume empties in no more than 72 hours), the outlet is correctly sized. If these requirements are not met, select a new orifice size or configuration and repeat the process starting at Step 6a.

7. Outlet Protection

To prevent the orifices from clogging, trash racks are required where perforated vertical outlet control plates are used. This allows for easier access to outlet orifices for inspection and cleaning. Trash racks shall be sized to prevent clogging of the primary water quality outlet without restricting the hydraulic capacity of the outlet control orifices. The orifice plate shall be protected with a trash rack conforming to Standard Drawing WQ501 (at end of this section) with at least six square feet of open surface area or 25 times the total orifice area, whichever is greater. The rack shall be adequately secured to prevent it from being removed or opened when maintenance is not occurring.

Overflow Structure Similar to Standard Drawing Number WQ 501
(Photo courtesy of Colorado Association of Stormwater Floodplain Managers)



Trash rack with screen



8. Overflow Outlet

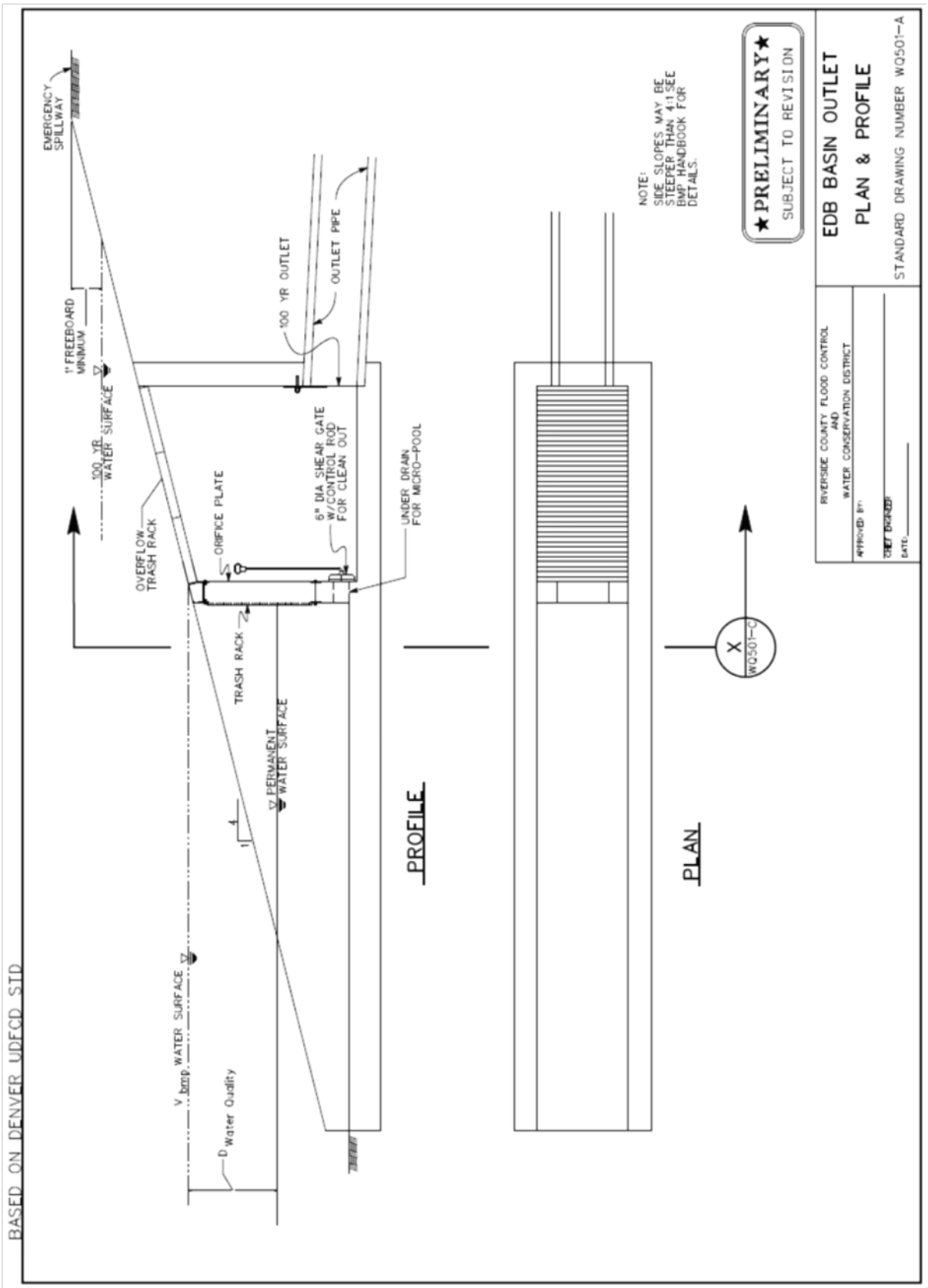
Overflow outlets for publicly maintained basins shall conform to Standard Drawing WQ501 (at end of this section) unless approved in advance by the Engineering Authority (EA).

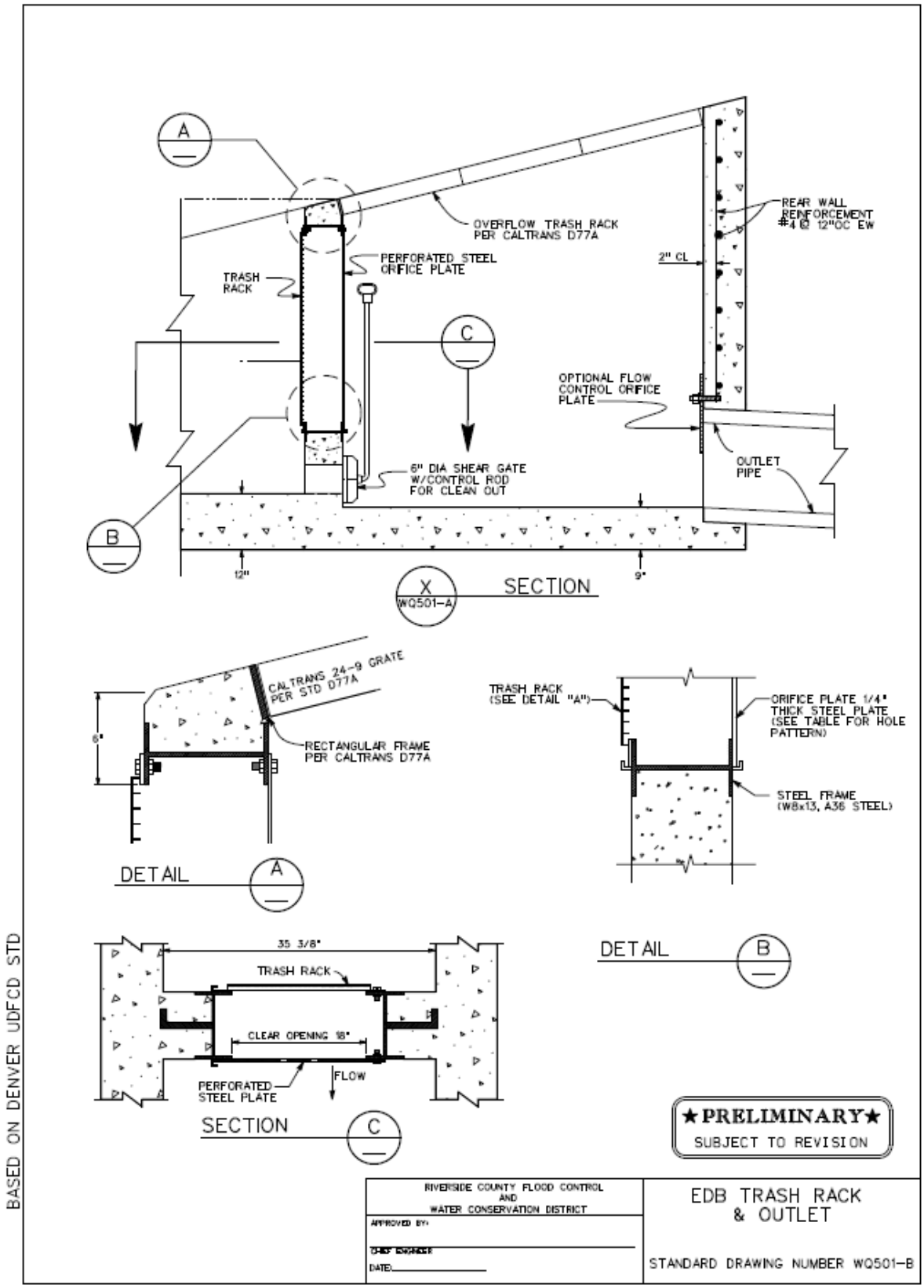
9. Embankment

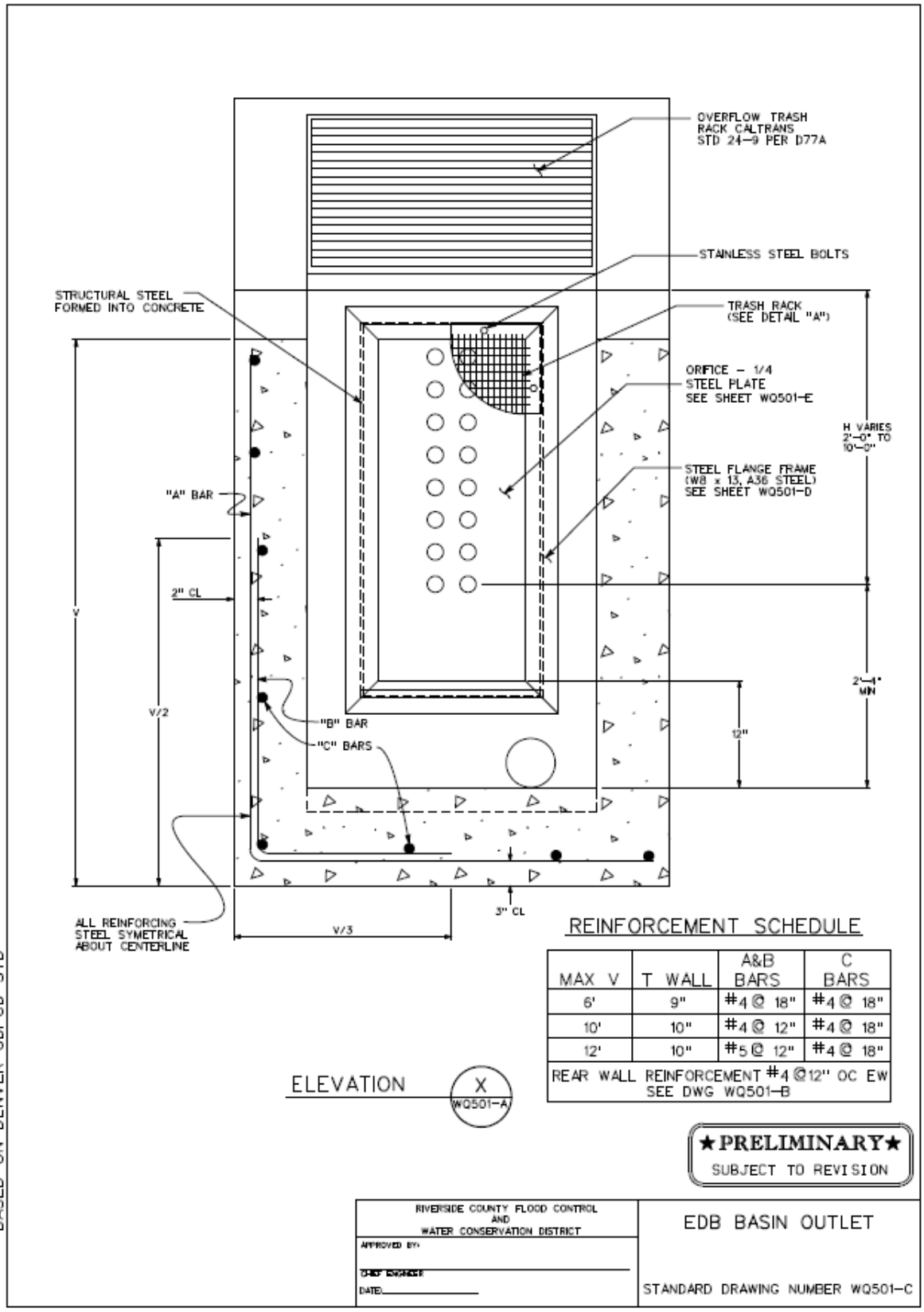
Embankments shall be designed in accordance with applicable standards of Riverside County Flood Control District's "Basin Guidelines" (Appendix C) or other guidelines issued by the Engineering Authority (EA). Where applicable, embankment designs must additionally conform to the requirements of the State of California Division of Safety of Dams.

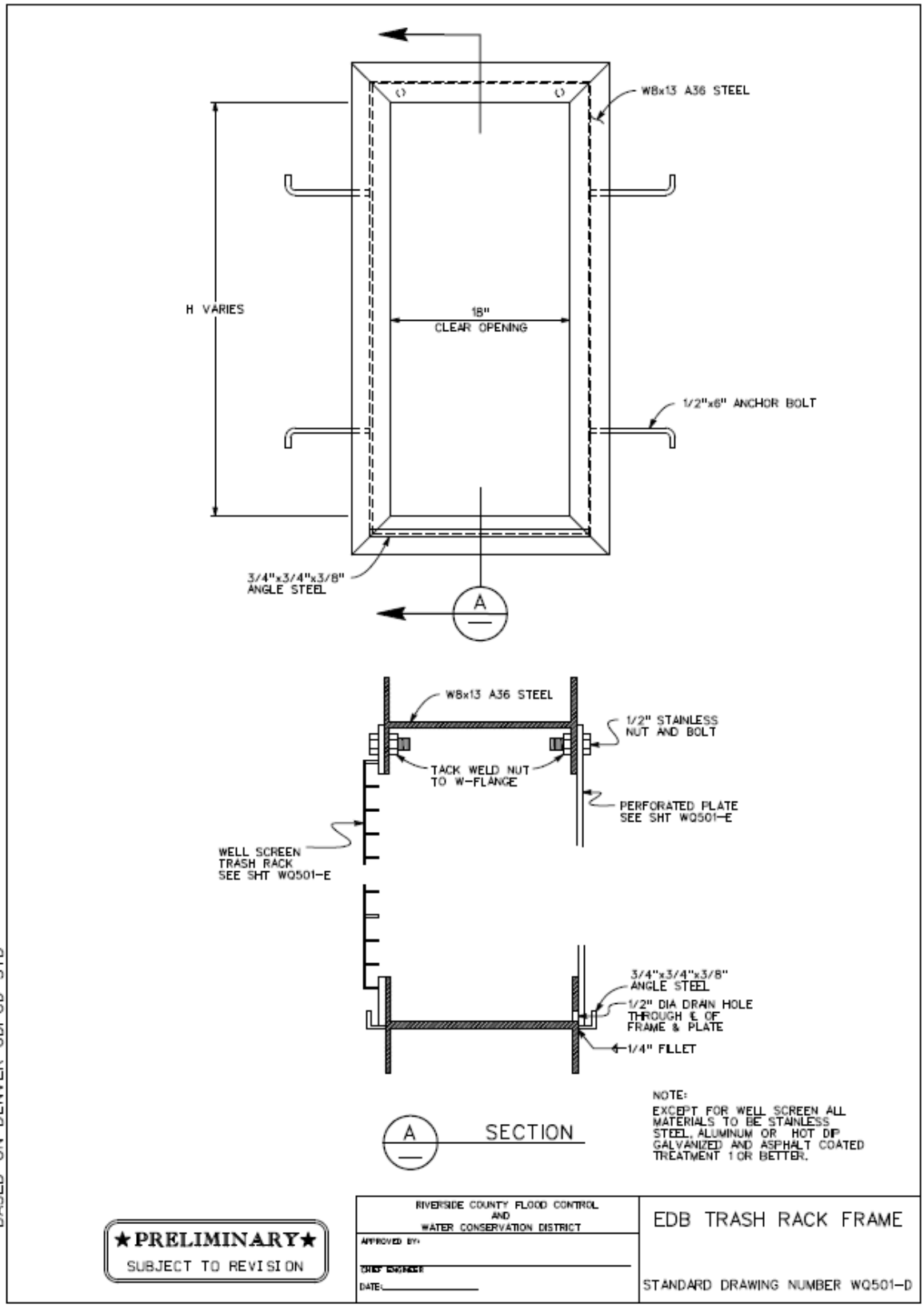
10. Spillway and Overflow Structures

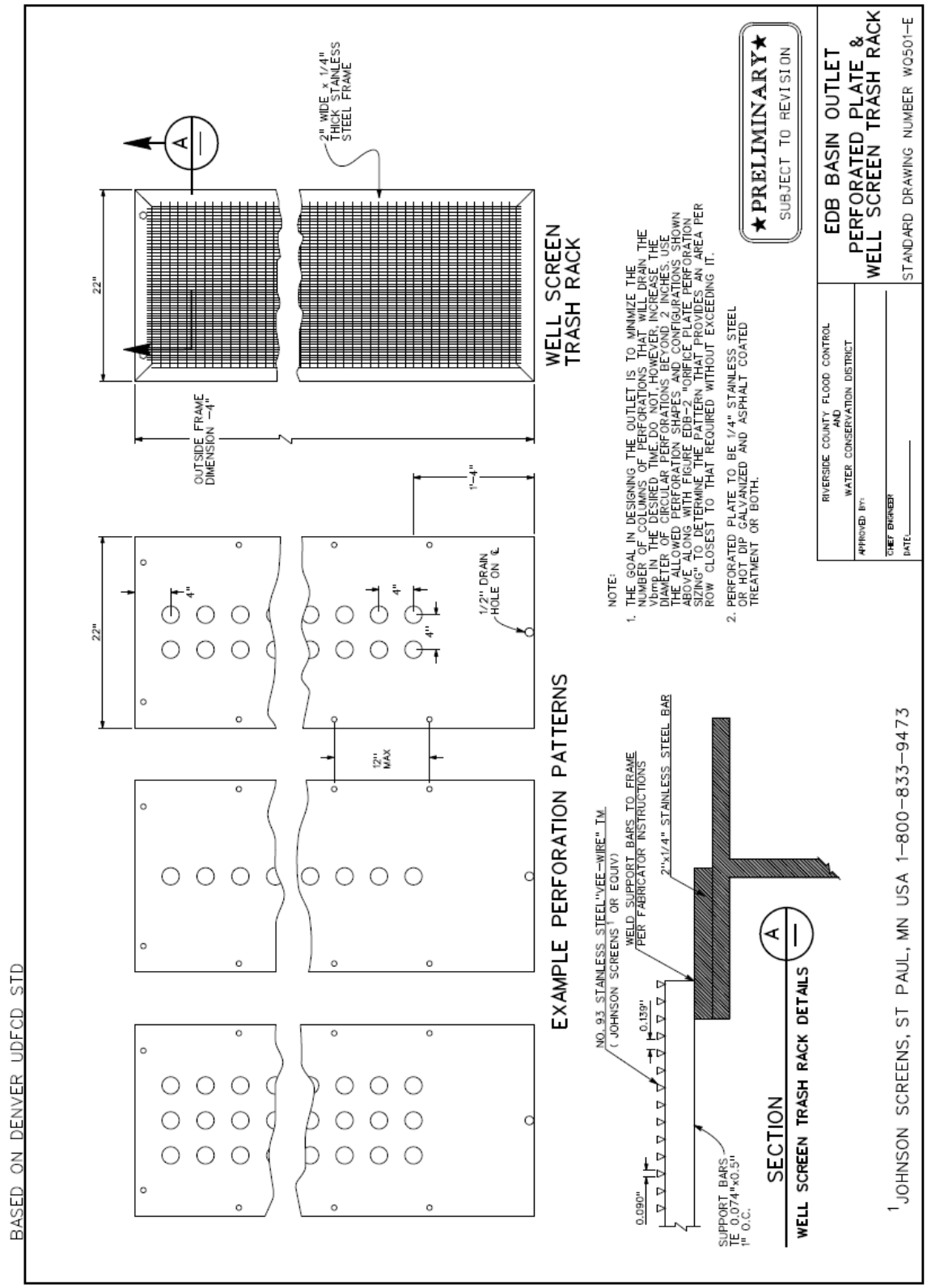
Spillway and overflow structures should be designed in accordance with applicable standards of the "Basin Guidelines" (Appendix C) or other guidelines issued by the Engineering Authority (EA).

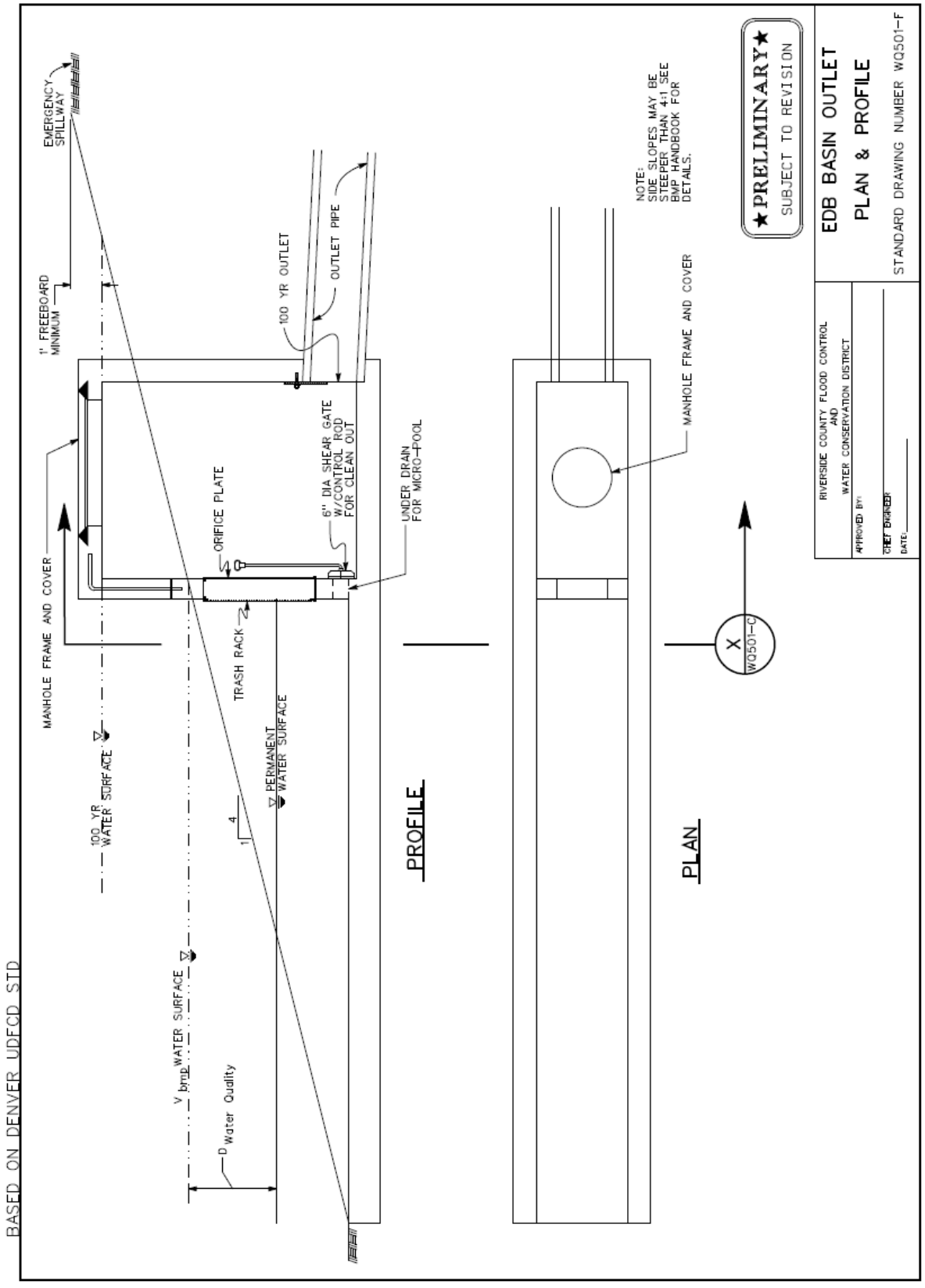

EDB BASIN OUTLET
PLAN & PROFILE
STANDARD DRAWING NUMBER WQ501-A
★PRELIMINARY★
SUBJECT TO REVISION
NOTE:
SIDE SLOPES MAY BE STEEPER THAN 4:1 SEE BMP HANDBOOK FOR DETAILS.
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
APPROVED BY:
CHIEF ENGINEER
DATE:
EMERGENCY SPILLWAY
1' FREEBOARD MINIMUM
100 YR WATER SURFACE
100 YR OUTLET
OUTLET PIPE
6" DIA SHEAR GATE W/CONTROL ROD FOR CLEAN OUT
UNDER DRAIN FOR MICRO-POOL
OVERFLOW TRASH RACK
ORIFICE PLATE
TRASH RACK
PERMANENT WATER SURFACE
WATER SURFACE
D Water Quality
PROFILE
PLAN
X
WQ501-C
BASED ON DENVER UDFCD STD

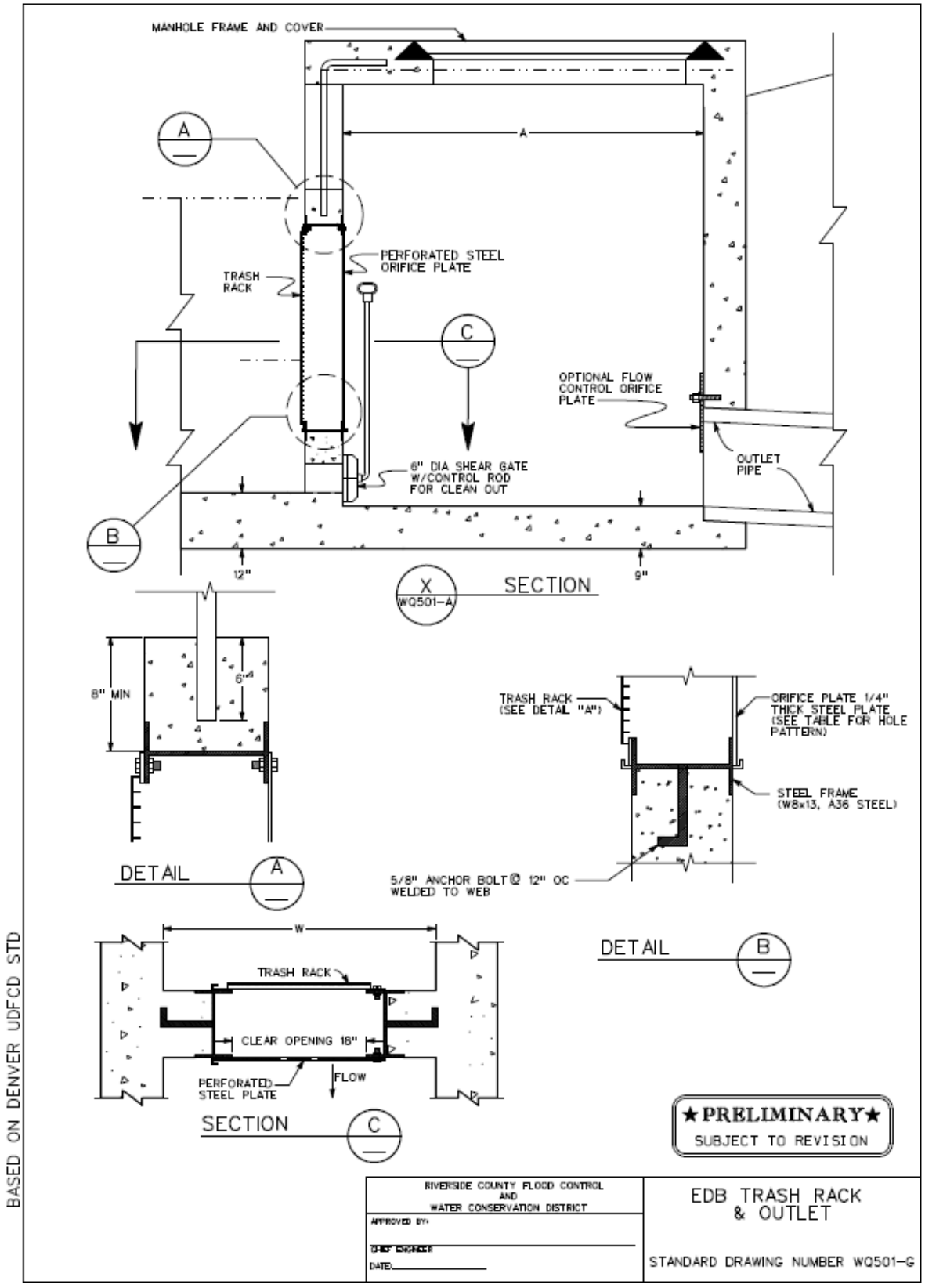

A
B
C
OVERFLOW TRASH RACK PER CALTRANS D77A
REAR WALL REINFORCEMENT #4 @ 12"OC EW
PERFORATED STEEL ORIFICE PLATE
TRASH RACK
2" CL
OPTIONAL FLOW CONTROL ORIFICE PLATE
6" DIA SHEAR GATE W/CONTROL ROD FOR CLEAN OUT
OUTLET PIPE
12"
9"
X
WQ501-A
SECTION
CALTRANS 24-9 GRATE PER STD D77A
6"
RECTANGULAR FRAME PER CALTRANS D77A
DETAIL A
TRASH RACK (SEE DETAIL "A")
ORIFICE PLATE 1/4" THICK STEEL PLATE (SEE TABLE FOR HOLE PATTERN)
STEEL FRAME (W8x13, A36 STEEL)
DETAIL B
35 3/8"
TRASH RACK
CLEAR OPENING 18"
FLOW
PERFORATED STEEL PLATE
SECTION C
★PRELIMINARY★
SUBJECT TO REVISION
BASED ON DENVER UDFCD STD
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
APPROVED BY:
DATE:
EDB TRASH RACK & OUTLET
STANDARD DRAWING NUMBER WQ501-B

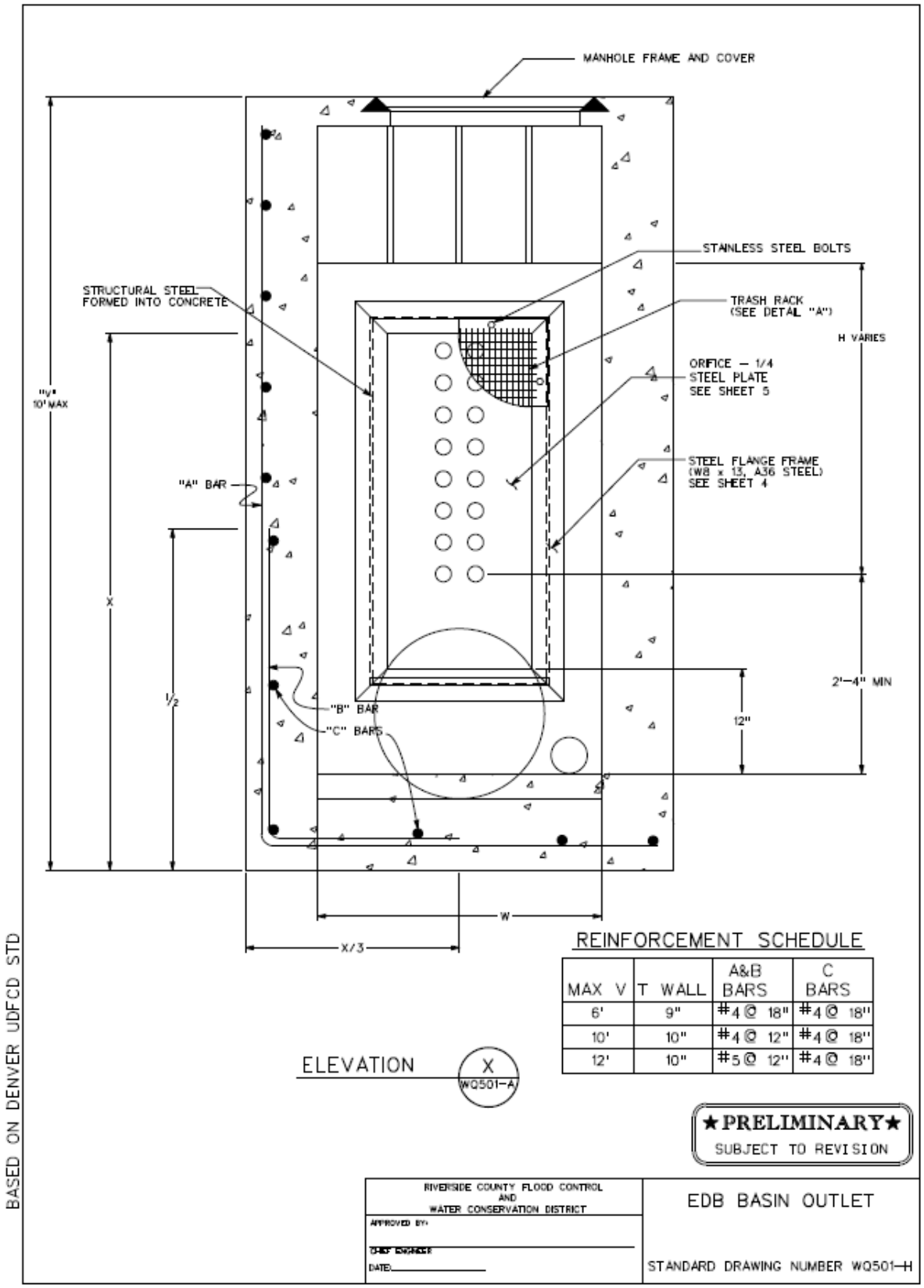

OVERFLOW TRASH RACK CALTRANS STD 24-9 PER D77A
STAINLESS STEEL BOLTS
STRUCTURAL STEEL FORMED INTO CONCRETE
TRASH RACK (SEE DETAIL "A")
ORIFICE - 1/4 STEEL PLATE SEE SHEET WQ501-E
H VARIES 2'-0" TO 10'-0"
STEEL FLANGE FRAME (W8 x 13, A36 STEEL) SEE SHEET WQ501-D
"A" BAR
2" CL
V
V/2
"B" BAR
"C" BARS
2'-4" MIN
12"
3" CL
ALL REINFORCING STEEL SYMETRICAL ABOUT CENTERLINE
V/3
BASED ON DENVER UDFCD STD
REINFORCEMENT SCHEDULE
MAX V | T WALL | A&B BARS | C BARS
6' | 9" | #4 @ 18" | #4 @ 18"
10' | 10" | #4 @ 12" | #4 @ 18"
12' | 10" | #5 @ 12" | #4 @ 18"
REAR WALL REINFORCEMENT #4 @12" OC EW SEE DWG WQ501-B
ELEVATION X WQ501-A
★PRELIMINARY★
SUBJECT TO REVISION
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
APPROVED BY:
CHIEF ENGINEER
DATE:
EDB BASIN OUTLET
STANDARD DRAWING NUMBER WQ501-C


W8x13 A36 STEEL
H VARIES
18"
CLEAR OPENING
1/2"x6" ANCHOR BOLT
3/4"x3/4"x3/8"
ANGLE STEEL
A
W8x13 A36 STEEL
1/2" STAINLESS
NUT AND BOLT
TACK WELD NUT
TO W-FLANGE
PERFORATED PLATE
SEE SHT WQ501-E
WELL SCREEN
TRASH RACK
SEE SHT WQ501-E
3/4"x3/4"x3/8"
ANGLE STEEL
1/2" DIA DRAIN HOLE
THROUGH ℄ OF
FRAME & PLATE
1/4" FILLET
A
SECTION
NOTE:
EXCEPT FOR WELL SCREEN ALL
MATERIALS TO BE STAINLESS
STEEL, ALUMINUM OR HOT DIP
GALVANIZED AND ASPHALT COATED
TREATMENT 1 OR BETTER.
BASED ON DENVER UDFCD STD
★PRELIMINARY★
SUBJECT TO REVISION
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
APPROVED BY:
CHIEF ENGINEER
DATE:
EDB TRASH RACK FRAME
STANDARD DRAWING NUMBER WQ501-D


BASED ON DENVER UDFCD STD
WELL SCREEN TRASH RACK
2" WIDE x 1/4" THICK STAINLESS STEEL FRAME
22"
OUTSIDE FRAME DIMENSION -4"
EXAMPLE PERFORATION PATTERNS
4"
1/2" DRAIN HOLE ON ℄
12" MAX
1'-4"
NOTE:
1. THE GOAL IN DESIGNING THE OUTLET IS TO MINIMIZE THE NUMBER OF COLUMNS OF PERFORATIONS THAT WILL DRAIN THE VOLUME WITHIN THE WQCV IN 40 HOURS. HOWEVER, INCREASING THE DIAMETER OF CIRCULAR PERFORATIONS BEYOND 2 INCHES, USE THE ALLOWED PERFORATION SHAPES AND CONFIGURATIONS SHOWN ABOVE ALONG WITH FIGURE EDB-2 "ORIFICE PLATE PERFORATION SIZING" TO DETERMINE THE PATTERN THAT PROVIDES AN AREA PER ROW CLOSEST TO THAT REQUIRED WITHOUT EXCEEDING IT.
2. PERFORATED PLATE TO BE 1/4" STAINLESS STEEL OR HOT DIP GALVANIZED AND ASPHALT COATED TREATMENT OR BOTH.
★PRELIMINARY★
SUBJECT TO REVISION
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
APPROVED BY:
CHIEF ENGINEER
DATE:
EDB BASIN OUTLET
PERFORATED PLATE & WELL SCREEN TRASH RACK
STANDARD DRAWING NUMBER WQ501-E
NO. 93 STAINLESS STEEL "VEE-WIRE" TM (JOHNSON SCREENS[1] OR EQUIV)
WELD SUPPORT BARS TO FRAME PER FABRICATOR INSTRUCTIONS
2"x1/4" STAINLESS STEEL BAR
0.139"
0.090"
SUPPORT BARS TE 0.074"x0.5" 1" O.C.
SECTION
WELL SCREEN TRASH RACK DETAILS
[1] JOHNSON SCREENS, ST PAUL, MN USA 1-800-833-9473


EDB BASIN OUTLET
PLAN & PROFILE
STANDARD DRAWING NUMBER WQ501-F
★PRELIMINARY★
SUBJECT TO REVISION
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
APPROVED BY:
CHIEF ENGINEER
DATE:
NOTE:
SIDE SLOPES MAY BE STEEPER THAN 4:1 SEE BMP HANDBOOK FOR DETAILS.
EMERGENCY SPILLWAY
1' FREEBOARD MINIMUM
100 YR OUTLET
OUTLET PIPE
6" DIA SHEAR GATE W/CONTROL ROD FOR CLEAN OUT
ORIFICE PLATE
UNDER DRAIN FOR MICRO-POOL
MANHOLE FRAME AND COVER
TRASH RACK
PERMANENT WATER SURFACE
100 YR WATER SURFACE
WATER SURFACE
V bmp
D Water Quality
4
1
PROFILE
PLAN
MANHOLE FRAME AND COVER
X
WQ501-C
BASED ON DENVER UDFCD STD


MANHOLE FRAME AND COVER
A
A
PERFORATED STEEL ORIFICE PLATE
TRASH RACK
C
OPTIONAL FLOW CONTROL ORIFICE PLATE
OUTLET PIPE
6" DIA SHEAR GATE W/CONTROL ROD FOR CLEAN OUT
B
12"
9"
X
WQ501-A
SECTION
8" MIN
6"
DETAIL A
TRASH RACK (SEE DETAIL "A")
ORIFICE PLATE 1/4" THICK STEEL PLATE (SEE TABLE FOR HOLE PATTERN)
STEEL FRAME (W8x13, A36 STEEL)
5/8" ANCHOR BOLT @ 12" OC WELDED TO WEB
DETAIL B
W
TRASH RACK
CLEAR OPENING 18"
PERFORATED STEEL PLATE
FLOW
SECTION C
★PRELIMINARY★
SUBJECT TO REVISION
BASED ON DENVER UDFCD STD
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
APPROVED BY:
DATE:
EDB TRASH RACK & OUTLET
STANDARD DRAWING NUMBER WQ501-G


MANHOLE FRAME AND COVER
STAINLESS STEEL BOLTS
STRUCTURAL STEEL FORMED INTO CONCRETE
TRASH RACK (SEE DETAIL "A")
H VARIES
ORIFICE – 1/4 STEEL PLATE SEE SHEET 5
"y" 10' MAX
STEEL FLANGE FRAME (W8 x 13, A36 STEEL) SEE SHEET 4
"A" BAR
X
1/2
"B" BAR
"C" BARS
2'–4" MIN
12"
W
X/3
BASED ON DENVER UDFCD STD
REINFORCEMENT SCHEDULE
MAX V
T WALL
A&B BARS
C BARS
6' 9" #4 @ 18" #4 @ 18"
10' 10" #4 @ 12" #4 @ 18"
12' 10" #5 @ 12" #4 @ 18"
ELEVATION X WQ501-A
★PRELIMINARY★
SUBJECT TO REVISION
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
APPROVED BY:
CHIEF ENGINEER
DATE:
EDB BASIN OUTLET
STANDARD DRAWING NUMBER WQ501–H

Site Design & Landscape Planning SD-10



Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

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

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Designing New Installations

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

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

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

Conserve Natural Areas during Landscape Planning

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

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.
- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.
- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.
- Promote natural vegetation by using parking lot islands and other landscaped areas.
- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.
- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and

regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

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

Protection of Slopes and Channels during Landscape Design

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

Redeveloping Existing Installations

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

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

Other Resources

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

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

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

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

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

Roof Runoff Controls SD-11



Rain Garden

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

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

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

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

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

Dry wells and Infiltration Trenches

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

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

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

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

Pop-up Drainage Emitter

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

Foundation Planting

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

Redeveloping Existing Installations

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

Supplemental Information

Examples

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

Other Resources

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

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

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

Efficient Irrigation SD-12



Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Designing New Installations

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

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

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

Redeveloping Existing Installations

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

Other Resources

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

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

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

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

Storm Drain Signage SD-13



Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

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

Designing New Installations

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

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

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

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

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

Redeveloping Existing Installations

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

Additional Information

Maintenance Considerations

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

Placement

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

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

Supplemental Information

Examples

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

Other Resources

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

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

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

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