County of San Diego

Stormwater Quality Management Plan (SWQMP)

For Priority Development Projects (PDPs)

Use for all PDPs (see Storm Water Intake Form, Part 4)



Priority Development Project

Project Information		**Development type** ☐ New development ☒ Redevelopment
Project Name	Pala Mesa Plaza	
Project Address	3233 Old Highway 365, Fallbrook, CA 92028	
Assessor's Parcel # (APN)	125-050-54-00	
Permit # / Record ID	PDS2020-STP-20-021	
Project category (select one)	☒ Commercial	☐ Minor subdivision*
	☐ Industrial	☐ Major subdivision*
	☐ Single family residential lot	☐ Multi-family residential*
	*If residential, is a Homeowners Association (HOA) proposed? ☐ Yes ☐ No	

Project Applicant / Project Proponent		
Name	Rafid Hamika	
Address	3702 East Owens Ave #101	
Phone		**Email:** epmnlv2yahoo.com

SWQMP Preparer		
Name	Robert Dentino	
Company (if applicable)	Excel Engineering	
Address	440 State Place, Escondido, CA 92029	
Phone	760 745 8118	**Email:** rdentino@excelengineering.net
PE Number (if applicable)	45629	

Preparer's Certification

I understand that the County of San Diego has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the County of San Diego BMP Design Manual. The BMP Design Manual is a design manual for compliance with local County of San Diego Watershed Protection Ordinance (Sections 67.801 et seq.) and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2013-0001, as amended by Order No. R9-2015-0001 and Order No. R9-2015-0100) requirements for storm water management.

This SWQMP is intended to comply with applicable requirements of the BMP Design Manual. I certify that it has been completed to the best of my ability and accurately reflects the project being proposed and the applicable BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this SWQMP by County staff is confined to a review and does not relieve me as the person in charge of overseeing the selection and design of storm water BMPs for this project, of my responsibilities for project design.

Signature	**Date** June 3, 2022

COUNTY ACCEPTED

SWQMP Approved By: *Approval Date:*

**** NOTE* Approval does not constitute compliance with regulatory requirements.***

Scope of SWQMP Submittal (Required)

Select the option that describes the scope of this SWQMP Submittal. Document your selection as indicated.

SWQMP Scope	Required Documentation
☒ ***a. SWQMP addresses the entire project***	No additional documentation.
☐ ***b. SWQMP implements requirements of an earlier master SWQMP submittal***	Include a copy of the previous submittal as **Attachment 4**.
☐ ***c. First of multiple SWQMP submittals***	Identify below the elements addressed in this submittal and in future submittals.

(1) Elements addressed in current submittal (streets, common areas, first project phase, etc.):

(2) Elements to be addressed in future submittal(s) (individual lots, future project phases, etc.):

Submittal Record: List the dates of SWQMP and plan submittals and updates. Briefly describe key changes from previous versions. If responding to plan check comments, note this in the entry and attach the responses as applicable.

No.	Date	Summary of Changes
Preliminary Design / Planning / CEQA		
1	08/21/2020	Initial Submittal
2	03/02/2021	Plancheck Comments
3	12/20/2021	Plancheck Comments
4	06/03/2022	Plancheck Comments
Final Design		
1	Date	Initial Submittal
2	Date	Summary of Change
3	Date	Summary of Change
No.	Date	Summary of Change
Plan Changes		
1	Date	Initial Submittal
2	Date	Summary of Change
3	Date	Summary of Change
No.	Date	Summary of Change

General Directions

Note: These directions may be omitted from the print version of the SWQMP submittal.

① Scope of SWQMP Submittal and Submittal Record (inside front cover)

Use the ***Submittal Scope*** table to document the scope of activities covered under this SWQMP Form. Select one of the three options presented.

- ***SWQMP addresses the entire project***. If this SWQMP form addresses the entire project from start to finish, additional documentation of the project scope is not required.
- ***SWQMP implements requirements of an earlier master SWQMP submittal***. If this SWQMP Form implements requirements identified in an earlier master SWQMP Form, documentation of those earlier requirements must be provided. Include a copy of the previous submittal as **Attachment 4**.
- ***First of multiple SWQMP submittals***. If this is the first of multiple SWQMP submittals, use the spaces provided under Part c to identify and briefly describe which project elements are addressed in this submittal and which ones will be addressed in future submittals. For example, this PDP addresses only streets and roads, but individual lots will be documented in future submittals.

Use the ***Submittal Record*** table to list the dates of any updates to the SWQMP or construction plans. Briefly describe key changes from previous versions. If responding to plan check comments, note this in the entry and attach the responses as applicable.

② PDP SWQMP Submittal Checklist

The checklist on Page 1 summarizes the tables and attachments to be included with this PDP SWQMP submittal. It should be filled out after completing the remainder of the form. Tables and attachments with boxes already checked (☒) are required for all projects. All tables are required. The applicability of attachments not already checked will be identified during the completion of this form.

③ Attachment 1: Stormwater Intake Form

Submit a copy of your completed ***Storm Water Intake Form*** as **Attachment 1**.

④ Tables 1, 2, and 3: Baseline Site Design and Source Control BMPs

Table 1 Completion: Complete **Table 1** to document existing and proposed site features and the BMPs to be implemented for them. All BMPs must be implemented ***where applicable and feasible***. Applicability is generally assumed if a feature exists or is proposed.

Table 2 Completion: Table 2 is not required for Small Residential Projects. Applicants should check the box at the top of the table to confirm it does not apply.

> *Small Residential Projects* are those requiring *either:* a Building Permit, Minor Residential Grading Permit, or Site Plan Permit for a single family home; *or* a Tentative Parcel Map Permit for up to 4 single family homes and a remainder parcel.

All other projects must complete **Table 2** to identify applicable requirements for documenting pollutant-generating sources/ features and source control BMPs.

BMPs must be implemented for **Table 1** and **2** features ***where feasible***. Leaving the box for a BMP unchecked means it will not be implemented (either partially or fully) either because it is inapplicable or infeasible. Explanations must be provided in **Table 3**. Tables 1 and 2 both provide specific instructions on when explanations are required.

⑤ Attachment 5: Existing Site and Drainage Description

Complete **Attachment 5** to provide a description of (1) the existing pre-development condition of the site, and (2) existing and proposed drainage conditions for the site. If required, include a copy of the site Drainage Study with Attachment 5.

⑥ Structural Performance Standards

Determine which Structural Performance Standards apply to the PDP, where they apply, and which compliance strategies you will use to satisfy them. Record your selections in **Table 4** as follows.

Table 4, Part A.1, Selection of Standards: First select the standards that apply to the project.

- *Pollutant control plus hydromodification* — Select if the PDP is not exempt from hydromodification management requirements. It must satisfy both the Pollutant Control Performance Standard (BMPDM Section 2.2) and the Hydromodification Management Performance Standard (BMPDM Section 2.3).
- *Pollutant control only* — Select if the PDP is exempt from hydromodification management requirements per BMPDM Section 6.1. Document the exemption in **Attachment 9**.

Table 4, Part A.2, Application of Standards: Next indicate where on the site the standards apply.

- If this is a **New Development Project**, the standards apply to all impervious surfaces on the site.
- If this is a **Redevelopment Project**, their applicability will depend on the ratio of created or replaced impervious areas to existing impervious areas (see BMPDM Section 1.7). Complete the calculations in the table to determine your obligation. The **percent (%) impervious created or replaced (c)** is determined by dividing the **impervious area created or replaced (b)** by the **existing impervious area (a)** and multiplying the result by 100.
  - **If c is 50% or more**: The standards apply to all impervious surfaces on the site (a + b).
  - **If c is less than 50%**: The standards apply only to created or replaced impervious surfaces (b only).

Table 4, Part B.1: Summary of Required Attachments (1 through 5)

Use this part of the table to summarize which of Attachments 1 through 5 will be included with the SWQMP submittal. If you are completing an **electronic version** of this form, your selections will be automatically recorded based on your previous input. If you are completing a **hard copy** of this form, you must manually select Attachments 3 and 4 as applicable (see pages 4 and 6). Note that Attachments 1,2, and 5 are required for all projects.

Table 4, Part B.2: Selection of Compliance Strategies

Complete Part B.2 to document which compliance options will be used to satisfy the applicable standards for the site. Before doing so, you must determine which option will be used for each DMA. The following four potential design options are presented in detail in BMPDM Chapters 5 and 6.

1. **Self-mitigating DMAs** (BMPDM Section 5.2.1)
2. **De Minimis DMAs** (BMPDM Section 5.2.2)
3. **Self-retaining DMAs** (BMPDM Section 5.2.3)
4. **Structural BMPs**
   - Pollutant Control BMPs (BMPDM Sections 5.4)
   - Hydromodification BMPs (BMPDM Chapter 6)
   - Alternative Compliance Project (BMPDM Section 1.8)

Only one compliance option may be used per individual DMA. Regardless of which option is selected for any DMA, it must fully satisfy the applicable standard(s) determined in Part A.1.

On the left side of Part B, check the applicable boxes for each compliance option to be used.

⑦ Summary of Additional Required Attachments (6 through 12)

You must complete and submit each attachment identified for the compliance options selected. Applicable attachments are listed to the right of each compliance option. If you are completing an **electronic version** of this form, the required attachments for each design option will automatically be selected when you choose the compliance option. As noted above, these selections will also be recorded on the PDP SWQMP Submittal Checklist (Page 1). If you are completing a **hard copy** of this form, you will need to manually check the boxes for each applicable attachment on both pages.

Note that Attachment 9 (Critical Coarse Sediment Yield Areas) is required for all PDPs. If the PDP is exempt from hydromodification requirements, the exemption must be documented in Attachment 9.

⑧ Table 5: Critical Coarse Sediment Yield Area Requirements

Complete **Table 5** to select a compliance pathway for addressing Critical Coarse Sediment Yield Area (CCSYA) requirements for the PDP. See BMPDM Appendix H for additional description of requirements and options. Document Table 5 selections, including hydromodification management exemptions, in **Attachment 9**.

⑨ Tables 6 and 7: Temporary Construction Phase BMPs

Complete **Table 6** to document the minimum construction BMPs to be implemented for the project. Each BMP must be implemented ***where applicable and feasible***. At least one BMP must be selected for each construction activity listed in the table (except Erosion Control for Disturbed Slopes, which requires one BMP per season).

If applicable, use **Table 7** to describe why BMPs not selected in Table 6 are either infeasible or are only partially feasible. Justifications must be provided for all construction activity types for which NO BMPs were selected. If requested by County staff, also justify why specific individual BMPs were not selected.

⑩ Attachment 2: DMA Exhibits and Construction Plans

Exhibits and construction plan sets incorporating all applicable site features, activities, and BMPs identified in **Tables 1, 2, and 6** must be submitted as **Attachment 2 (DMA Exhibits and Construction Plan Sheets)**. See the Attachment 2 cover sheet for additional instructions.

PDP SWQMP Submittal Checklist

SWQMP Tables: All of the tables below must be completed.

☒ Table 1: Baseline BMPs for Existing and Proposed Site Features ..... Page 2

☒ Table 2: Baseline BMPs for Pollutant-generating Sources ..... Page 3

☒ Table 3: Explanations and Justifications for Table 1 and 2 Baseline BMPs ..... Page 4

☒ Table 4: DMA Structural Compliance Strategies and Documentation ..... Page 5

☒ Table 5: Critical Coarse Sediment Yield Area (CCSYA) Requirements ..... Page 6

☒ Table 6: Minimum Construction Stormwater BMPs ..... Page 7

☒ Table 7: Explanations and Justifications for Construction Phase BMPs ..... Page 8

SWQMP Attachments[1]: Use the checklist below to identify which attachments will be included with this submittal. Attachments with boxes already checked (☒) are required for all projects. The applicability of other attachments will be determined upon completing this form.

☒ Attachment 1: Storm Water Intake Form

☒ Attachment 2: DMA Exhibits and Construction Plan Sheets

☒ Attachment 3: Reserved for Future Use Attached Source Control BMP Worksheet per Countys Request

☐ Attachment 4: Previous SWQMP Submittals

☒ Attachment 5: Existing Site and Drainage Description

☐ Attachment 6: Documentation of DMAs without Structural BMPs

☒ Attachment 7: Documentation of DMAs with Structural Pollutant Control BMPs

☒ Attachment 8: Documentation of DMAs with Structural Hydromodification Management BMPs

☒ Attachment 9: Management of Critical Coarse Sediment Yield Areas

☐ Attachment 10: BMP Installation Verification Form

☒ Attachment 11: BMP Maintenance Agreements and Plans

☐ Attachment 12: Documentation of Alternative Compliance Projects (ACPs)

☒ Attachment 13: Added Via Belmonte (See Attachment 13 for added Via Belmonte)

After completing the remainder of this form, check the applicable SWQMP Attachment boxes to summarize your selections.

[1] All SWQMP Attachments are available at www.sandiego.gov/stormwater under the Development Resources tab, Submittal Templates.

Table 1 – Baseline BMPs for Existing and Proposed Site Features

A. BMPs for Existing Natural Site Features (See Fact Sheet BL-1)

1. Check the boxes below for each existing feature on the site.

2. Select the BMPs to be implemented for each identified feature. Explain why any BMP not selected is infeasible in Table 3.

	Conserve natural features (SD-G)	Provide buffers around waterbodies (SD-H)
☐ Natural waterbodies	☐	☐
☐ Natural storage reservoirs & drainage corridors	☐	---
☐ Natural areas, soils, & vegetation (incl. trees)	☐	---

B. BMPs for Common Impervious Outdoor Site Features (See Fact Sheet BL-2)

1. Check the boxes below for each proposed feature.

*2. Select the BMPs to be implemented for each proposed feature. If neither BMP **SD-B** nor **SD-I** is selected for a feature, explain why both BMPs are infeasible in Table 3.*

	a. Direct runoff to pervious areas (SD-B)	b. Construct surfaces from permeable materials (SD-I)	c. Minimize the size of impervious areas
☐ Streets and roads	☐	☐	☐ *Check this box to confirm that all impervious areas on the site will be minimized where feasible.*
☒ Sidewalks & walkways	☒	☐	
☒ Parking areas & lots	☒	☐	
☒ Driveways	☒	☐	*If this box is not checked, identify the surfaces that cannot be minimized in Table 3, and explain why it is infeasible to do so.*
☐ Patios, decks, & courtyards	☐	☐	
☐ Hardcourt recreation areas	☐	☐	
☐ Other:	☐	☐	

C. ☒ **BMPs for Rooftop Areas:** *Check this box if rooftop areas are proposed and select at least one BMP below.* **(See Fact Sheet BL-3)**

If no BMPs are selected, explain why they are infeasible in Table 3.

1. Direct runoff to pervious areas (SD-B)	2. Install green roofs (SD-C)	3. Install rain barrels (SD-E)
☒	☐	☐

D. ☒ **BMPs for Landscaped Areas:** *Check this box if landscaping is proposed and select at least one BMP below.* **(See Fact Sheet BL-4)**

If no BMPs are selected, explain why they are infeasible in Table 3.

1. Sustainable Landscaping (SD-K)
☒

Note: All features and BMPs must be shown on applicable construction plans. See applicable Fact Sheets in Appendix C of the BMP Design Manual for additional information.

Note: Use Table 3 to explain BMP infeasibility or inapplicability, or to describe features or BMPs not listed in this table. Additional explanation may be required by the County.

Table 2 – Baseline BMPs for Pollutant-generating Sources

☐ If this is a **Small Residential Project**, check this box and skip the rest of this table.

A. Management of Stormwater Discharges

1. Identify all proposed outdoor work areas below (☐ *Check here if none are proposed*)	**2. Which BMPs will be used to prevent materials from contacting rainfall or runoff?** (See Fact Sheet BL-5) *(Select all feasible BMPs for each work area[2])*			**3. Where will runoff from the work area be routed?** (See Fact Sheet BL-6) *(Select one or more option for each work area)*			
	Overhead covering (rooftops, etc.) (SC-A)	**Separation of flows from adjacent areas (berms, etc.) (SC-B)**	**Wind protection (screens, etc.) (SC-C)**	**Sanitary sewer[3] (SC-D)**	**Containment system (SC-E)**	**Stormwater S-BMP or SSD-BMP[4]**	**Other[5]**
☒ Trash & Refuse Storage	☒	☒	☒	☐	☐	☒	☐
☐ Materials & Equipment Storage	☐	☐	☐	☐	☐	☐	☐
☒ Loading & Unloading	☒	☒	---	☐	☐	☒	☐
☐ Fueling	☐	☐	---	☐	☐	☐	☐
☐ Maintenance & Repair	☐	☐	---	☐	☐	☐	☐
☐ Vehicle & Equipment Cleaning	☐	☐	---	☐	☐	☐	☐
☐ Other:	☐	☐	---	☐	☐	☐	☐

B. Prevention of Non-stormwater Discharges (See Fact Sheet BL-7)

Select one option for each feature below:

• **Storm drain inlets and catch basins …**	☐ are not proposed	☒ will be labeled with stenciling or signage to discourage dumping **(SC-F)**
• **Educational BMP Signage …**	☐ are not proposed	☐ will be labeled with educational signage for BMP **(SC-G)**
• **Interior work surfaces, floor drains, & sumps …**	☐ are not proposed	☒ will not discharge directly or indirectly to the MS4 or receiving waters
• **Drain lines (e.g., air conditioning, boiler, etc.) …**	☐ are not proposed	☒ will not discharge directly or indirectly to the MS4 or receiving waters
• **Fire sprinkler test water …**	☐ are not proposed	☒ will not discharge directly or indirectly to the MS4 or receiving waters

Note: All outdoor features and BMPs in this table must be shown on applicable construction plans. See applicable Fact Sheets in Appendix C of the BMP Design Manual for additional information.

Note: Use Table 3 to explain BMP infeasibility or inapplicability, or to describe features or BMPs not listed in this table. Additional explanation may be required by the County.

[2] Each BMP is required where feasible. If none are selected for any feature, explain why they are infeasible in Table 3.

[3] Separate wastewater agency approvals may be required.

[4] Structural Treatment Control BMPs (S-BMPs) and Significant Site Design BMPs (SSD-BMPs) may not receive discharges from work areas that concentrate pollutants in a manner that will impair their functioning. Discharges from the proposed work area must also be included in DCV calculations for the applicable BMP.

[5] Describe other proposed options for managing stormwater discharges in Table 3.

Table 3 – Explanations and Justifications for Table 1 and 2 Baseline BMPs

☒ **Check here if no explanations or justifications for Table 1 or 2 BMPs are required.**

- **Required Justifications**: Provide explanations of BMP inapplicability and/or infeasibility as indicated per Tables 1 and 2.
- **If Requested**: Justify why specific BMPs will not be implemented or will only be partially implemented.
- **Additional Explanation**: Describe any proposed features and/or BMPs not listed in Tables 1 or 2.

BMP-Feature Combination		**Explanation**
Feature	Feature	Explanation
BMP	BMP	
Feature	Feature	Explanation
BMP	BMP	
Feature	Feature	Explanation
BMP	BMP	
Feature	Feature	Explanation
BMP	BMP	
Feature	Feature	Explanation
BMP	BMP	
Feature	Feature	Explanation
BMP	BMP	
Feature	Feature	Explanation
BMP	BMP	

Table 4: DMA Structural Compliance Strategies and Documentation

Part A – Selection and Application Structural Performance Standards

1. Selection of Standards (select one; see BMPDM Section 6.1)

☒ a. Pollutant control + hydromodification ☐ b. Pollutant control only (project is exempt from hydromodification requirements)

2. Application of Structural Performance Standards (select one; see BMPDM Section 1.7)

☐ **New Development Projects:** Standards apply to all impervious surfaces.

☒ **Redevelopment Projects:** Complete the calculations below. Select the applicable scenario based on the results.

a. Existing impervious area (ft²)	b. Impervious area created / replaced (ft²)	c. % Impervious created / replaced [(b/a)*100]
46,319 sf (1.1ac)	113,535 sf (2.62 ac)	245%

☒ *Scenario 1: c is 50% or more*: Performance standards apply to all impervious surfaces (a + b).

☐ *Scenario 2: c is less than 50%*: Performance standards apply only to created or replaced impervious surfaces (b only).

Part B – Compliance Strategies and Required Attachments

1.*Complete and submit each of the applicable attachments on the right.*

Att. 1	Att. 2	Att. 3	Att. 4	Att. 5
Storm Water Intake Form ☒	DMA Exhibits and Construction Plan Sheets ☒	Source Control BMP Worksheet ☒	Previous SWQMP Submittals (see inside cover) ☐	Existing Site and Drainage Description ☒

2. *Indicate each compliance strategy below that will be used for one or more DMAs on the site.*

	Att. 6 DMAs without Structural BMPs	Att. 7 DMAs w/ Structural Pollutant Control BMPs	Att. 8 DMAs w/ Structural Hydromod. BMPs	Att. 9 Critical Coarse Sediment Yield Areas	Att. 10 BMP Installation Verification Form	Att. 11 Maintenance Agreements/ Plans	Att. 12 Alternative Compliance Projects
☒Self-mitigating DMAs (BMPDM Section 5.2.1)	☒			☒			
☐De Minimis DMAs (BMPDM Section 5.2.2)	☐			☐			
☐Self-retaining DMAs (BMPDM Section 5.2.3)	☐			☐	☐		
Structural BMPs (select all that apply)							
☒Pollutant Control BMPs (BMPDM Section 5.4)		☒		☒	☒	☒	
☒Hydromodification Control BMPs (BMPDM Chapter 6)			☒	☒	☒	☒	
☐Alternative Compliance Project (BMPDM Section 1.8)				☐	☐	☐	☐

☒ **Please check this box after you complete this list. Corresponding attachments will be automatically selected on the right.**

- *Attachments 1, 2, and 5 are required for all projects.*

Table 5: Critical Coarse Sediment Yield Area (CCSYA) Requirements

- Identify one applicable compliance pathway for the PDP below.
- Document your selection in **Attachment 9**.

A. Hydromodification Management Exemption (BMPDM Sections 1.6 and 6.1)

☐ **PDP is Exempt from Hydromodification Management Requirements**

Select if hydromodification management exemption was selected in Table 4 Part A.1.

B. Watershed Management Area (WMAA) Mapping (BMPDM Appendix H.1.1.2)

☒ **WMAA mapping demonstrates the following:**

a. <5% of potential onsite CCYSAs will be impacted (built on or obstructed)

b. All potential upstream offsite CCYSAs will be bypassed

C. Resource Protection Ordinance (RPO) Methods (BMPDM Appendix H.1.1.1)

☐ **RPO Scenario 1: PDP is subject to and in compliance with RPO requirements**

a. Project requires one or more discretionary permits (RPO applicability is confirmed during discretionary review)

b. Onsite AND upstream offsite CCSYAs will be avoided and/or bypassed

☐ **RPO Scenario 2: PDP is entirely exempt/not subject to RPO requirements**[6]

a. Project does not require discretionary permits

b. Project will bypass all upstream offsite CCSYAs (no requirements for onsite CCSYAs)

D. No Net Impact Analysis (BMPDM Appendix H.4)

☐ **Project demonstrates no net impact to receiving waters**

[6] Does not include PDPs utilizing exemption(s) via RPO Section 86.604(e)(2)(cc) or 86.604(e)(3).

Table 6 –Minimum Construction Stormwater BMPs

Minimum Required BMPs by Activity Type Select all applicable activities and at least one BMP for each.	References Caltrans[7]	 County of San Diego	
☒ **Erosion Control for Disturbed Slopes** (choose at least 1 per season)			
☐ Vegetation Stabilization Planting[8] (Summer)	SS-2, SS-4		
☒ Hydraulic Stabilization Hydroseeding (Summer)	SS-4		
☐ Bonded Fiber Matrix or Stabilized Fiber Matrix[9] (Winter)	SS-3		
☒ Physical Stabilization Erosion Control Blanket (Winter)	SS-7		
☒ **Erosion control for disturbed flat areas (slope < 5%)**			
☒ County Standard Lot Perimeter Protection Detail	SC-2	PDS 659[10]	
☐ Use of Item A erosion control measures on flat areas	SS-3, SS-4, SS-7		
☐ County Standard Desilting Basin (must treat all site runoff)	SC-2	PDS 660[11]	
☐ Mulch, straw, wood chips, soil application	SS-6, SS-8		
☒ **Energy dissipation (required to control velocity for concentrated runoff or dewatering discharge)**			
☒ Energy Dissipater Outlet Protection	SS-10	RSD D-40[12]	
☒ **Sediment control for all disturbed areas**			
☒ Silt Fence	SC-1		
☐ Fiber Rolls (Straw Wattles)	SC-5		
☒ Gravel & Sand Bags	SC-6, SC-8		
☐ Dewatering Filtration	NS-2		
☒ Storm Drain Inlet Protection	SC-10		
☒ Engineered Desilting Basin (sized for 10-year flow)	SC-2		
☒ **Preventing offsite tracking of sediment**			
☒ Stabilized Construction Entrance	TC-1		
☒ Construction Road Stabilization	TC-2		
☒ Entrance/Exit Tire Wash	TC-3		
☒ Entrance/Exit Inspection & Cleaning Facility	TC-1		
☒ Street Sweeping and Vacuuming	SC-7		
☒ **Materials Management**			
☒ Material Delivery & Storage	WM-1		
☒ Spill Prevention and Control	WM-4		
☒ **Waste Management[13]**			
☒ Waste Management Concrete Waste Management	WM-8		
☒ Solid Waste Management	WM-5		
☒ Sanitary Waste Management	WM-9		
☒ Hazardous Waste Management	WM-6		

[7] See Caltrans 2017 Construction Site Best Management Practices (BMP) Manual available at: https://dot.ca.gov/programs/construction/storm-water-and-water-pollution-control/manuals-and-handbooks
[8] Planting or Hydroseeding may be installed between May 1st and August 15th. Slope irrigation must be in place and operable for slopes >3 feet. Vegetation must be watered and established prior to October 1st. A contingency physical BMP must be implemented by August 15th if vegetation is not established by that date. If landscaping is proposed, erosion control measures must also be used while landscaping is being established. Established vegetation must have a subsurface mat of intertwined mature roots with a uniform vegetative coverage of 70 percent of the natural vegetative coverage or more on all disturbed areas.
[9] All slopes over three feet must have established vegetative cover prior to final permit approval.
[10] County PDS 659. Standard Lot Perimeter Protection Design System (Bldg. Division)
[11] County PDS 660. County Standard Desilting Basin for Disturbed Areas of 1 Acre or Less Bldg. Division
[12] Regional Standard Drawing D-40 – Rip Rap Energy Dissipater (also acceptable for velocity reduction)
[13] Applicants are responsible to apply appropriate BMPs for specific wastes (e.g., BMP WM-8 for concrete).

Table 7 – Explanations and Justifications for Construction Phase BMPs

☒ **Check here if no explanations or justifications for Table 6 BMPs are required.**		
Justifications for Table 6 Temporary Construction Phase BMPs • **Required Justifications**: Justify all construction activity types for which NO BMPs were selected. • **If Requested**: Justify why specific individual BMPs were not selected. • **Additional Explanation**: Describe any proposed features and/or BMPs not listed in Table 6.		
Activity Type / BMP		**Explanation**
Activity Type	Activity Type	Explanation
BMP	BMP	
Activity Type	Activity Type	Explanation
BMP	BMP	
Activity Type	Activity Type	Explanation
BMP	BMP	
Activity Type	Activity Type	Explanation
BMP	BMP	
Activity Type	Activity Type	Explanation
BMP	BMP	
Activity Type	Activity Type	Explanation
BMP	BMP	
Activity Type	Activity Type	Explanation
BMP	BMP	

County of San Diego
Stormwater Quality Management Plan (SWQMP)
Attachment 1: Storm Water Intake Form for All Permit Applications

This form establishes Stormwater Quality Management Plan (SWQMP) requirements for Development Projects per Sections 67.809 and 67.811 of the County of San Diego Watershed Protection Ordinance (WPO).
See ***Storm Water Intake Form Instructions*** for additional guidance and explanation of terms.

Part 1. Project Information	
Project Name:	Pala Mesa Plaza
Record ID (Permit) No(s):	PDS2020-STP-20-021
Assessor's Parcel No(s):	125-050-54-00
Street Address (or Intersection):	3233 Old Hwy 395
City, State, Zip:	Fallbrook, CA 92028
Part 2. Applicant / Project Proponent Information	
Name:	Rafid Hamika
Company:	TGRH3 LLC
Street Address:	3712 East Owens Ave # 101
City, State, Zip:	North Las Vegas, NV 89030
Phone Number	
Email:	epmnlv@yahoo.com>

Part 3. Required Information for All Development Projects

Ⓐ	1. Existing (pre-development) impervious surfaces (ft²)	2. Created or replaced impervious surfaces (ft²)	3. Total disturbed area (acres or ft²)
	46,319 sf (1.1 ac)	113,535 sf (2.62 ac)	190,792 sf (4.4 ac)

Ⓑ		
	☒ Check here and provide a WDID# if this project is subject to the California Construction General Permit (Order No. 2009-0009-DWQ)[1]	**WDID # (if issued)**
		Not Issued Yet

For County Use Only	Reviewed By:	Review Date:
☐ Standard SWQMP	☐ PDP SWQMP	☐ Green Streets PDP Exemption SWQMP

[1] Available at: https://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.html

Part 4. Priority Classification & SWQMP Form Selection

(A) *If your project is the following ... (select one)*	(B) *You must complete ...*
☐ **Standard Project** ☐ a. Project is East of the Pacific/Salton Sea Divide ☐ b. None of the PDP criteria below applies	→ **Standard *SWQMP Form***
☒ **Priority Development Project (PDP)** ☐ 1. Project is part of an existing PDP, OR ☒ 2. Project does any of the following: ☒ a. Creates or replaces a total of 10,000 ft² or more of impervious surface ☒ b. Creates or replaces a combined total of 5,000 ft² or more of impervious surface within one or more of the following uses: (1) parking lots; (2) streets, roads, highways, freeways, and/or driveways; (3) restaurants; and (4) hillsides ☒ c. Creates or replaces a combined total of 5,000 ft² or more of impervious surface within one or more of the following uses: (1) automotive repair shops; and (2) retail gasoline outlets ☐ d. Discharges directly to an Environmentally Sensitive Area (ESA) AND creates or replaces 2,500 ft² or more of impervious surface ☒ e. Disturbs one or more acres of land (43,560 ft²) and is expected to generate pollutants post-construction ☐ f. Is a redevelopment project that creates or replaces 5,000 ft² or more of impervious surface on a site already having at least 10,000 ft² of impervious surface	→ **PDP *SWQMP Form***
☐ **Green Streets PDP Exemption**[2]	→ **Green *Streets PDP Exemption SWQMP Form***

Part 5. Applicant Signature

I have reviewed the information in this form, and it is true and correct to the best of my knowledge.

Applicant / Project Proponent Signature: [signature] Date: 6/08/22

- ***Upon completion*** *submit this form to the County.*
- ***If requested****, attach supporting documentation to justify selections made or exemptions claimed.*
- ***If this is a PDP that is part of a larger existing PDP****, you will be required to attach a copy of the existing SWQMP to the newer SWQMP submittal.*

[2] ***Green Streets PDP Exemption Projects*** are those claiming exemption from PDP classification per WPO Section 67.811(b)(2) because they consist exclusively of *either* 1) development of new sidewalks, bike lanes, and/or trails; *or* 2) improvements to existing roads, sidewalks, bike lanes, and/or trails.

2.0 General Requirements

- Attachment 2 consolidates exhibits and plans required for the entire project.
- Complete the table below to indicate which sub-attachments are included with the submittal. Sub-attachments that are not applicable can be excluded from the submittal.
- Unless otherwise stated, features and BMPs identified and described in each corresponding Attachment (6 through 9) must be shown on applicable DMA Exhibits and construction plans submitted for the project.

Sub-attachments	Requirement
☒ **2.1: DMA Exhibits**	All PDPs
☒ **2.2: Individual Structural BMP DMA Mapbook**	PDPs with structural BMPs
☒ **2.3: Construction Plan Sets**	All projects

2.1 DMA Exhibits

- DMA Exhibits must show all DMAs on the project site. Exhibits must include all applicable features identified in applicable SWQMP attachments.
- Exhibits may be prepared individually for the BMPs associated with each applicable SWQMP Attachment (6, 7, 8, and/or 9) or combined into one or more consolidated exhibits.
- Use this checklist to ensure required information is included on each exhibit (copy as needed).

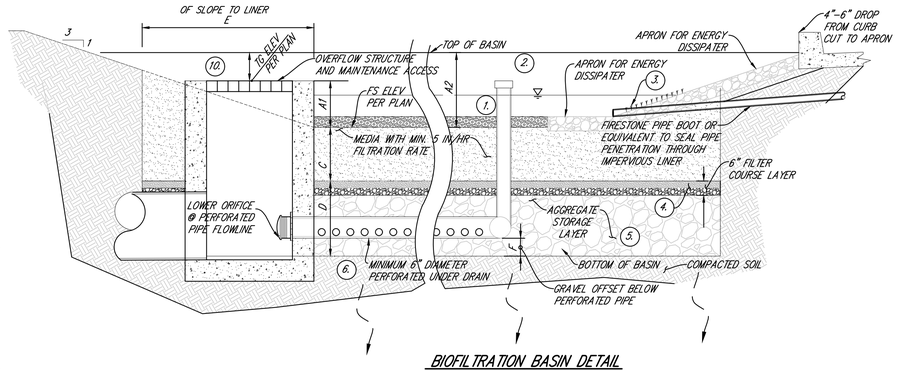
DMA Exhibit ID #:	**Pala Mesa Plaza Post Development DMA Exhibit**	
A. Features required for all exhibits		
1. Existing Site Features		
☒ Underlying hydrologic soil group (A, B, C, D)	☒ Topography and impervious areas	
☒ Approximate depth to groundwater	☒ Existing drainage network, directions, and offsite connections	
☒ Natural hydrologic features		
2. Drainage Management Area (DMA) Information		
☒ Proposed drainage network, directions, and offsite connections	☒ DMA boundaries, ID numbers, areas, and type (structural BMP, de minimis, etc.)	
3. Proposed Site Changes, Features, and BMPs		
☒ Proposed demolition and grading	☐ Construction BMPs[2]	
☐ Group 1, 2, and 3 Features[1]	☒ Baseline source control BMPs	
☐ Group 4 Features	☒ Baseline source control BMPs	
B. Proposed Features and BMPs Specific to Individual SWQMP Attachments[3]		
☐ Attachment 6	☐ SSD-BMP impervious dispersion areas	
	☐ SSD-BMP tree wells	
☒ Attachment 7	☒ Structural pollutant control BMPs	
☒ Attachment 8	☒ Structural hydromodification management BMPs	
	☒ Point(s) of Compliance (POC) for hydromodification management	
	☒ Proposed drainage boundary and drainage area to each POC	
☒ Attachment 9	☐ Onsite CCSYAs	☐ Bypass of onsite CCSYAs
		☒ Bypass of upstream offsite CCSYAs

[1] Group 1-4 features and baseline BMPs from PDP SWQMP Tables 2 and 3.
[2] Minimum Construction Stormwater BMPs from PDP SWQMP Table 7.
[3] Identify the location, ID numbers, type, and size/detail of BMPs.

WATER QUALITY BASIN INSTALLATION NOTES:

1. 3 INCHES OF WELL-AGED, SHREDDED HARDWOOD MULCH.
2. AN UNDERDRAIN CLEANOUT WITH A MINIMUM 6-INCH DIAMETER AND LOCKABLE CAP IS PLACED EVERY 250 TO 300FEET AS REQUIRED BASED ON UNDERDRAIN LENGTH.
3. VEGETATION USED SHOULD BE SUITABLE FOR THE CLIMATE PER LANDSCAPE PLANS
4. FILTER COARSE IS A MINIMUM OF 6 INCHES PROVIDED IN TWO SEPARATE 3 INCH LAYERS. THE TOP LAYER SHALL BE MADE OF ASTM C33 CHOKER SAND AND THE BOTTOM LAYER BE OF ASTM NO. 8 AGGREGATE. MARKERS STAKES SHALL BE USED TO ENSURE UNIFORM LIFT THICKNESS.
5. AASHTO NO. 57 STONE OR CLASS 2 PERMEABLE PER CAL TRANS SPECIFICATION 68-1.025 IS RECOMMENDED FOR THE AGGREGATE STORAGE LAYER. WASHED, OPEN-GRADED CRUSHED ROCK MAY BE USED, HOWEVER, A 4 INCH MINIMUM WASHED PEA GRAVEL FILTER COURSE LAYER AT THE TOP OF THE CRUSHED ROCK IS REQUIRED.
6. IMPERMEABLE LINER SHALL BE INSTALLED WHEN THE BIOFILTRATION BASIN IS WITHIN 10 FEET OF RETAINING WALLS OR BUILDING FOUNDATIONS, OR AS RECOMMENDED BY THE SOILS ENGINEER, OR REQUIRED BY THESE PLANS. IMPERMEABLE LINER SHALL BE 30 MIL THICK (PER COUNTY OF SAN DIEGO GREEN STREETS DESIGN STANDARD DRAWING GS-3.00 AND COUNTY GREEN STREETS SUPPLEMENT TO CAL TRANS SPECIFICATIONS 20-11.08B) CONFIGURED TO ENTIRELY ENCOMPASS THE SIDES OF THE WATER QUALITY BASIN.
7. IMPERMEABLE LINER BE CONSTRUCTED IN COMPLIANCE WITH THE COUNTY OF SAN DIEGO GREEN STREETS SUPPLEMENT TO CAL TRANS SPECIFICATIONS 20-11.08D.
8. BIOFILTRATION SOIL MEDIA LAYER (BSM) SHALL CONSIST OF 60% TO 80% BY VOLUME SAND, UP TO 20% BY VOLUME TOPSOIL, AND UP 20% BY VOLUME COMPOST (PER COUNTY OF SAN DIEGO BMP DESIGN MANUAL SEPTEMBER 2020 APPENDIX F.2 SECTION 803-2 BLENDED BSM CRITERIA AND TESTING REQUIREMENTS) PLACED IN 6" LIFTS AND COMPACTED WITH WATER PRIOR TO THE NEXT LIFT. INITIAL PERMEABILITY SHALL BE 8" PER HOUR (WITH ASSUMED STABILIZED PERMEABILITY OF 5" PER HOUR).
9. THE AGGREGATE STORAGE LAYER SHALL BE COMPACTED IN ACCORDANCE WITH SOILS ENGINEER'S RECOMMENDATIONS.
10. OVERFLOW STRUCTURE TO HAVE A MINIMUM OF 2 INCHES OF FREEBOARD.
11. ALL LINER INSTALLATIONS, FIELD WELDING OF SEAMS, AND OBSERVATION OF SOIL MIX PLACEMENT SHALL REQUIRE SPECIAL INSPECTION BY THE PROJECT GEOTECHNICAL ENGINEER OR OTHER QUALIFIED PERSON. A LETTER CERTIFYING PROPER INSTALLATION SHALL BE PROVIDED TO THE ENGINEER OF RECORD TO ACCEPTANCE OF THE FACILITIES.
12. SPECIAL INSPECTION SHALL BE REQUIRED FOR CONSTRUCTION OF ALL BIOFILTRATION BASINS. INSPECTION SHALL BE PERFORMED BY A QUALIFIED INDIVIDUAL (SUCH AS: ENGINEER OF RECORD, QSD). INSPECTION SHALL INCLUDE:
    - VERIFICATION OF OVERALL DIMENSIONS PRIOR TO PLACEMENT OF MATERIALS;
    - PLACEMENT OF THE LINER, IF REQUIRED; AND SEAMS OR PENETRATIONS
    - PLACEMENT OF THE GRAVEL, FILTER MATERIALS, AND FILTER MEDIA;
    - ALL INLET AND OUTLET STRUCTURES INCLUDING UNDERDRAINS, IF REQUIRED.
    - CONTRACTOR SHALL TAKE PICTURES AT EACH STAGE OF INSTALLATION AND SUBMITTED TO ENGINEER FOR VERIFICATION OF INSTALL.

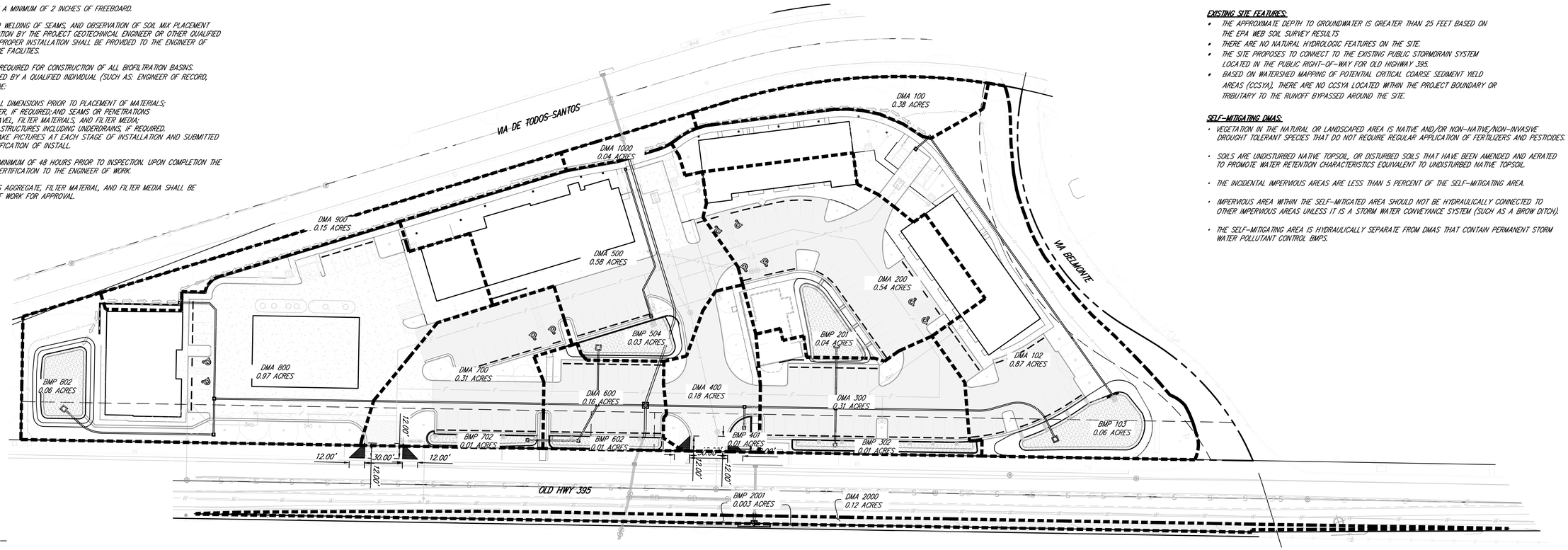
    INSPECTOR SHALL BE GIVEN A MINIMUM OF 48 HOURS PRIOR TO INSPECTION. UPON COMPLETION THE INSPECTOR SHALL PROVIDE A CERTIFICATION TO THE ENGINEER OF WORK.
13. PROPOSED MATERIALS, SUCH AS AGGREGATE, FILTER MATERIAL, AND FILTER MEDIA SHALL BE SUBMITTED TO THE ENGINEER OF WORK FOR APPROVAL.



BIOFILTRATION BASIN DETAIL
NOT TO SCALE

STRUCTURAL BIO-BASIN SUMMARY TABLE													
BMP NAME	TYPE OF BMP	EFFECTIVE AREA (SQFT)	A1 (INCH) TOP OF RISER	A2 (INCH) TOP OF BASIN	A3 (INCH) CLEAN OUT	B (INCH) UPPER ORIFICE	C (INCH) MEDIA	D (INCH) GRAVEL	E (INCH) DISTANCE FROM TOE OF SLOP TO LINER	F (INCH) PERF. PIPE IE OFFSET	BOX RISER OVERFLOW STRUCTURE SIZE (INCHES)	ORIFICES DIAMETER		IMPERMEABLE LINER ?
												UPPER (INCH)	LOWER (INCH)	
BMP-103	BIOFILTRATION	2767	9	36	9	N/A	18	30	27	18	36X36	N/A	0.75	NO
BMP-201	BIOFILTRATION	1712	9	18	9	N/A	18	18	27	6	36X36	N/A	0.5	NO
BMP-302	BIOFILTRATION	1020	9	18	9	N/A	18	18	27	6	24X24	N/A	0.5	NO
BMP-401	BIOFILTRATION	278	9	18	9	N/A	18	18	27	3	18X18	N/A	0.5	NO
BMP-504	BIOFILTRATION	1531	9	17.6	9	N/A	18	18	27	3	36X36	N/A	0.5	NO
BMP-602	BIOFILTRATION	558	9	12	9	N/A	18	18	27	3	18X18	N/A	0.5	NO
BMP-702	BIOFILTRATION	560	9	5.4	9	N/A	18	18	27	3	18X18	N/A	0.5	NO
BMP-802	BIOFILTRATION	1807	SEE CATCH BASIN DETAIL	36	9	SEE CATCH BASIN DETAIL	18	30	27	18	36X36	SEE CATCH BASIN DETAIL	0.75	NO
** BMP-2001	BIOFILTRATION	150	9	9	9	N/A	18	12	27	3	18X18	N/A	0.5	YES

NOTE: * MEASUREMENTS ARE FROM FINISH SURFACE OF BASIN.
** BMP IS SPLIT EVENLY AT TWO SIDES OF THE STREET AND ARE CONNECTED UNDERGROUND.



HYDROLOGIC SOIL GROUP

THE HYDROLOGICAL SOIL GROUPS FOR THIS SITE ARE TYPES (A) AND (C).

EXISTING SITE FEATURES:

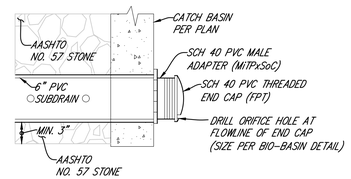
- THE APPROXIMATE DEPTH TO GROUNDWATER IS GREATER THAN 25 FEET BASED ON THE EPA WEB SOIL SURVEY RESULTS
- THERE ARE NO NATURAL HYDROLOGIC FEATURES ON THE SITE.
- THE SITE PROPOSES TO CONNECT TO THE EXISTING PUBLIC STORMDRAIN SYSTEM LOCATED IN THE PUBLIC RIGHT-OF-WAY FOR OLD HIGHWAY 395.
- BASED ON WATERSHED MAPPING OF POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS (CCSYA), THERE ARE NO CCSYA LOCATED WITHIN THE PROJECT BOUNDARY OR TRIBUTARY TO THE RUNOFF BYPASSED AROUND THE SITE.

SELF-MITIGATING DMAS:

- VEGETATION IN THE NATURAL OR LANDSCAPED AREA IS NATIVE AND/OR NON-NATIVE/NON-INVASIVE DROUGHT TOLERANT SPECIES THAT DO NOT REQUIRE REGULAR APPLICATION OF FERTILIZERS AND PESTICIDES.
- SOILS ARE UNDISTURBED NATIVE TOPSOIL OR DISTURBED SOILS THAT HAVE BEEN AMENDED AND AERATED TO PROMOTE WATER RETENTION CHARACTERISTICS EQUIVALENT TO UNDISTURBED NATIVE TOPSOIL.
- THE INCIDENTAL IMPERVIOUS AREAS ARE LESS THAN 5 PERCENT OF THE SELF-MITIGATING AREA.
- IMPERVIOUS AREA WITHIN THE SELF-MITIGATED AREA SHOULD NOT BE HYDRAULICALLY CONNECTED TO OTHER IMPERVIOUS AREAS UNLESS IT IS A STORM WATER CONVEYANCE SYSTEM (SUCH AS A BROW DITCH).
- THE SELF-MITIGATING AREA IS HYDRAULICALLY SEPARATE FROM DMAS THAT CONTAIN PERMANENT STORM WATER POLLUTANT CONTROL BMPS.



6" PVC PIPE PERFORATION LAYOUT DETAIL
NOT TO SCALE



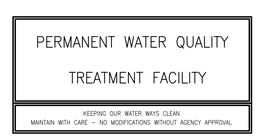
ORIFICE DETAIL
NOT TO SCALE



DETAIL "NO DUMPING" AT CATCH BASINS

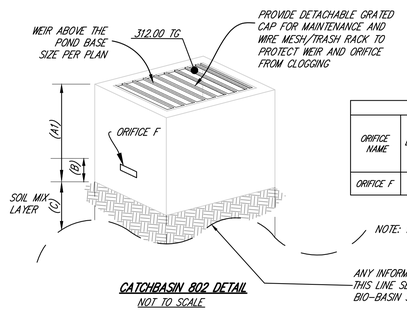
NOTE: ALL CATCH BASINS WITH GRATES SHALL BE STENCILED WITH CITY REQUIRED ITEM PER ABOVE DETAIL:

(DAS MANUFACTURING #SDO OR EQUIVALENT)



DETAIL WATER QUALITY SIGN– PLACED AT EACH BIOFILTRATION BASIN

NOTE: ALL BIOFILTRATION AREAS WILL HAVE A SIGN POSTED TO BE VISIBLE AT ALL TIMES.



CATCHBASIN 802 DETAIL
NOT TO SCALE

ORIFICE SUMMARY TABLE								
ORIFICE NAME	INVERT ELEVATION (FT)	B (INCH)	A1 TOP OF RISER (INCH)	NUMBER OF BARRELS	SPAN (INCH)	RISE (INCH)	MAX WATER SURFACE ELEVATION (FT)	FREE BOARD ELEVATION (FT)
ORIFICE F	310.50	9.00	27	1	8	2	311.75	311.75

DMA EXHIBIT
SHEET 7 OF 7 SHEETS

PALA MESA PLAZA
SITE DEVELOPMENT PLAN
APN 125-050-54-00

K:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\SWDM\DMA and HMP Exhibits\DMA-POST - Current - 2.dwg 6/13/2023 5:41 PM ORIGINAL PLOT SIZE: ---

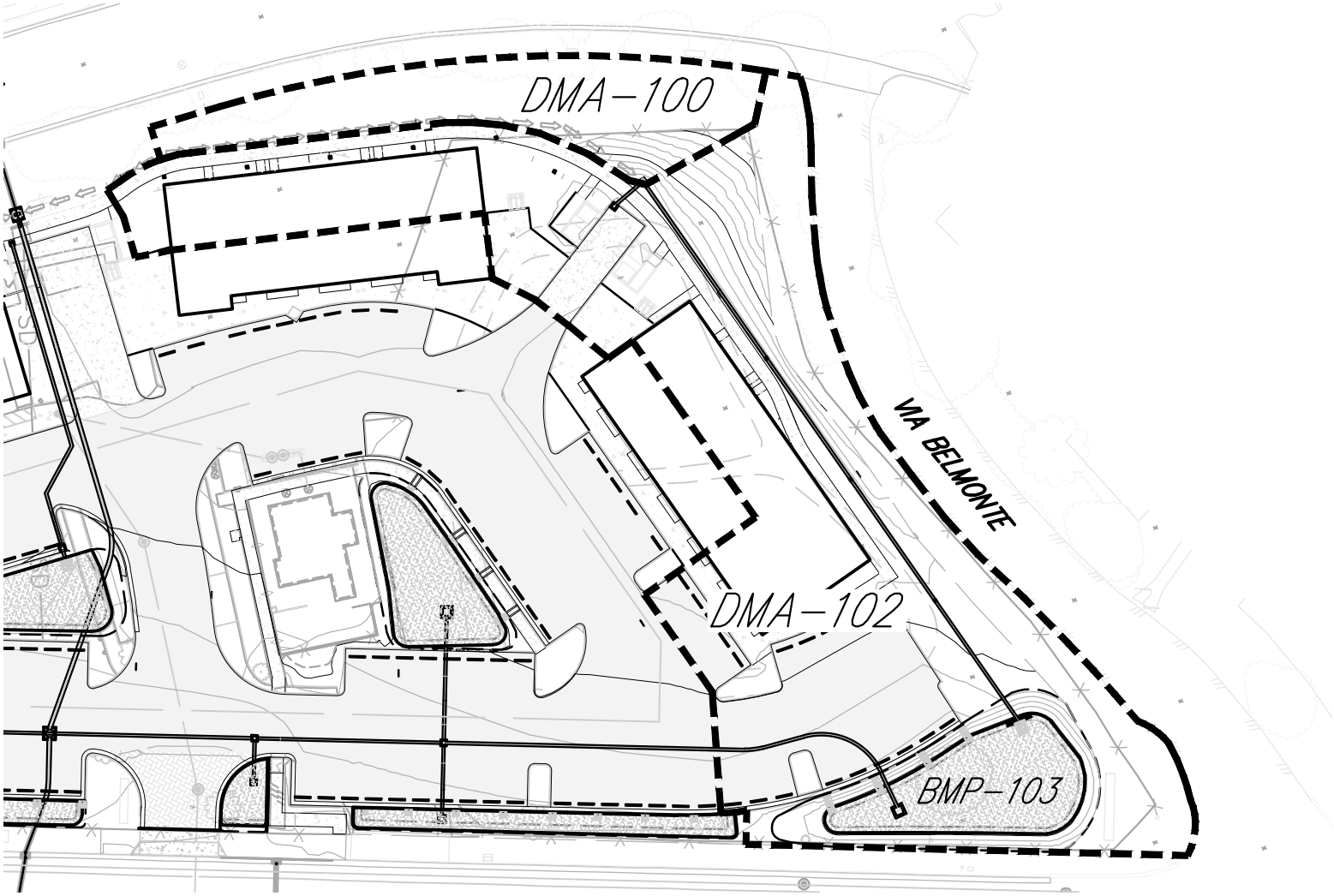
2.2 Individual Structural BMP DMA Mapbook

- Use this page as a cover sheet for the Structural DMA Mapbook.
- An individual Structural DMA Mapbook must be submitted for any project site with one or more structural BMPs. One Mapbook is required for each unique subsequent owner with responsibility for maintenance of a Structural BMP. Mapbook exhibits will be incorporated as exhibits in Stormwater Maintenance Agreements (SWMAs) and Maintenance Notifications (MNs). See Attachment 11 for additional information on maintenance agreements. If the Mapbook has been provided for each subsequent owner in Attachment 11, they are not required here.
- Place each map on 8.5"x11" paper.
- Show at a minimum the DMA, Structural BMP, Assessor's parcel boundaries with parcel numbers, and any existing hydrologic features within the DMA.

☒	All Mapbooks are attached
☐	All Mapbooks are in Attachment 11

STRUCTURAL BIO-BASIN SUMMARY TABLE											
BMP NAME	TYPE OF BMP	EFFECTIVE AREA (SQFT)	A1 (INCH) TOP OF RISER	A2 (INCH) TOP OF BASIN	C (INCH) MEDIA	D (INCH) GRAVEL	E (INCH) DISTANCE FROM TOE OF SLOPE TO LINER	F (INCH) OFFSET	BOX RISER OVERFLOW STRUCTURE SIZE (INCHES)	ORIFICES DIAMETER	IMPERMEABLE LINER ?
BMP-103	BIOFILTRATION	2767	9	36	18	30	27	18	36X36	0.75	NO

NOTE: DMA-100 AND DMA-102 TRIBUTARY TO BMP-103



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0 60 120

SHEET 1 OF 9 SHEETS

PALA MESA PLAZA
SITE DEVELOPMENT PLAN
BMP DMA MAPBOOK

STRUCTURAL BIO-BASIN SUMMARY TABLE											
BMP NAME	TYPE OF BMP	EFFECTIVE AREA (SQFT)	A1 (INCH) TOP OF RISER	A2 (INCH) TOP OF BASIN	C (INCH) MEDIA	D (INCH) GRAVEL	E (INCH) DISTANCE FROM TOE OF SLOPE TO LINER	F (INCH) OFFSET	BOX RISER OVERFLOW STRUCTURE SIZE (INCHES)	ORIFICES DIAMETER	IMPERMEABLE LINER ?
BMP-201	BIOFILTRATION	1712	9	18	18	18	27	6	36X36	0.75	NO

NOTE: DMA-200 TRIBUTARY TO BMP-201



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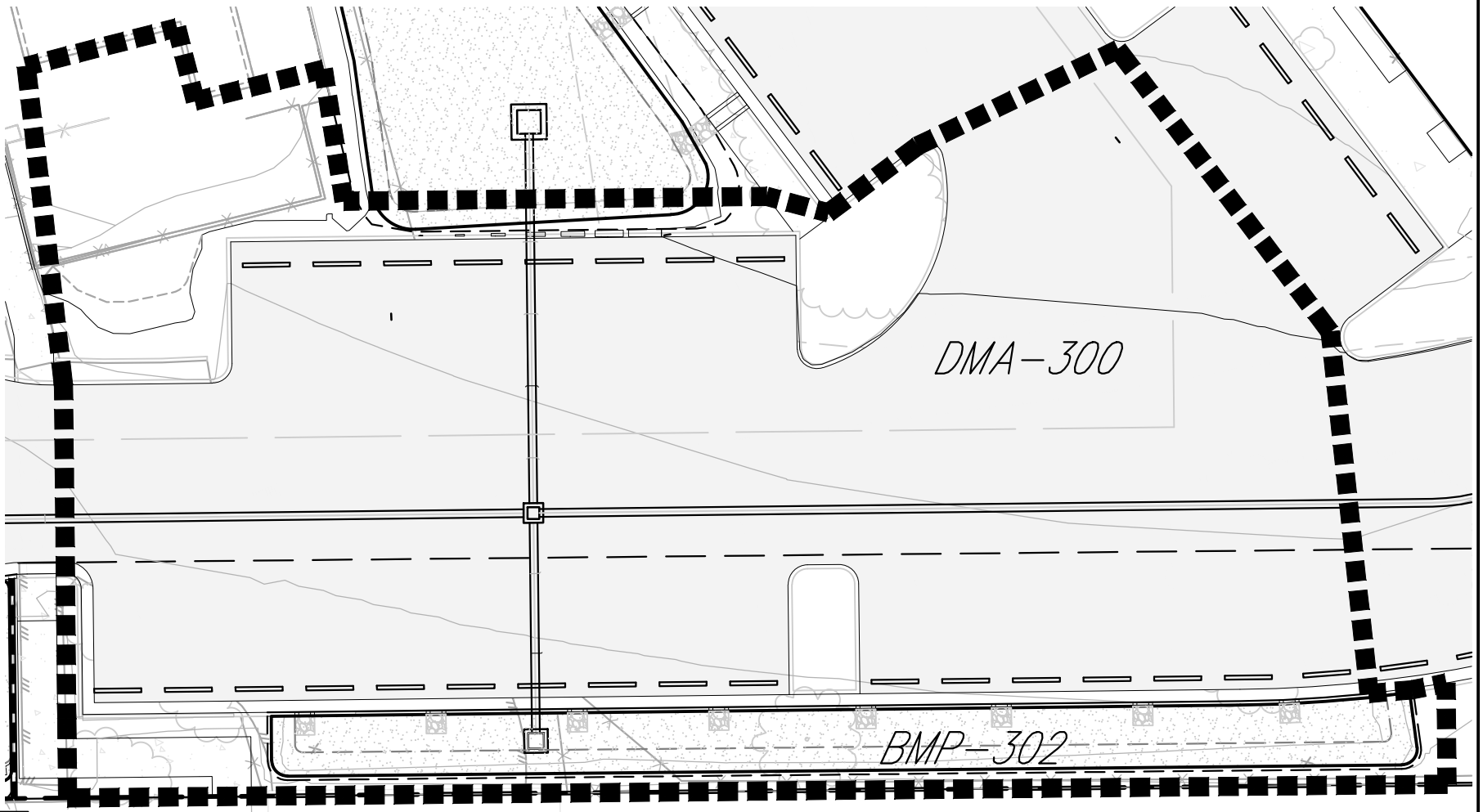
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PALA MESA PLAZA
SITE DEVELOPMENT PLAN
BMP DMA MAPBOOK

STRUCTURAL BIO-BASIN SUMMARY TABLE											
BMP NAME	TYPE OF BMP	EFFECTIVE AREA (SQFT)	A1 (INCH) TOP OF RISER	A2 (INCH) TOP OF BASIN	C (INCH) MEDIA	D (INCH) GRAVEL	E (INCH) DISTANCE FROM TOE OF SLOPE TO LINER	F (INCH) OFFSET	BOX RISER OVERFLOW STRUCTURE SIZE (INCHES)	ORIFICES DIAMETER	IMPERMEABLE LINER ?
BMP-302	BIOFILTRATION	1020	9	18	18	18	27	6	24X24	0.50	NO

NOTE: DMA-300 TRIBUTARY TO BMP-302



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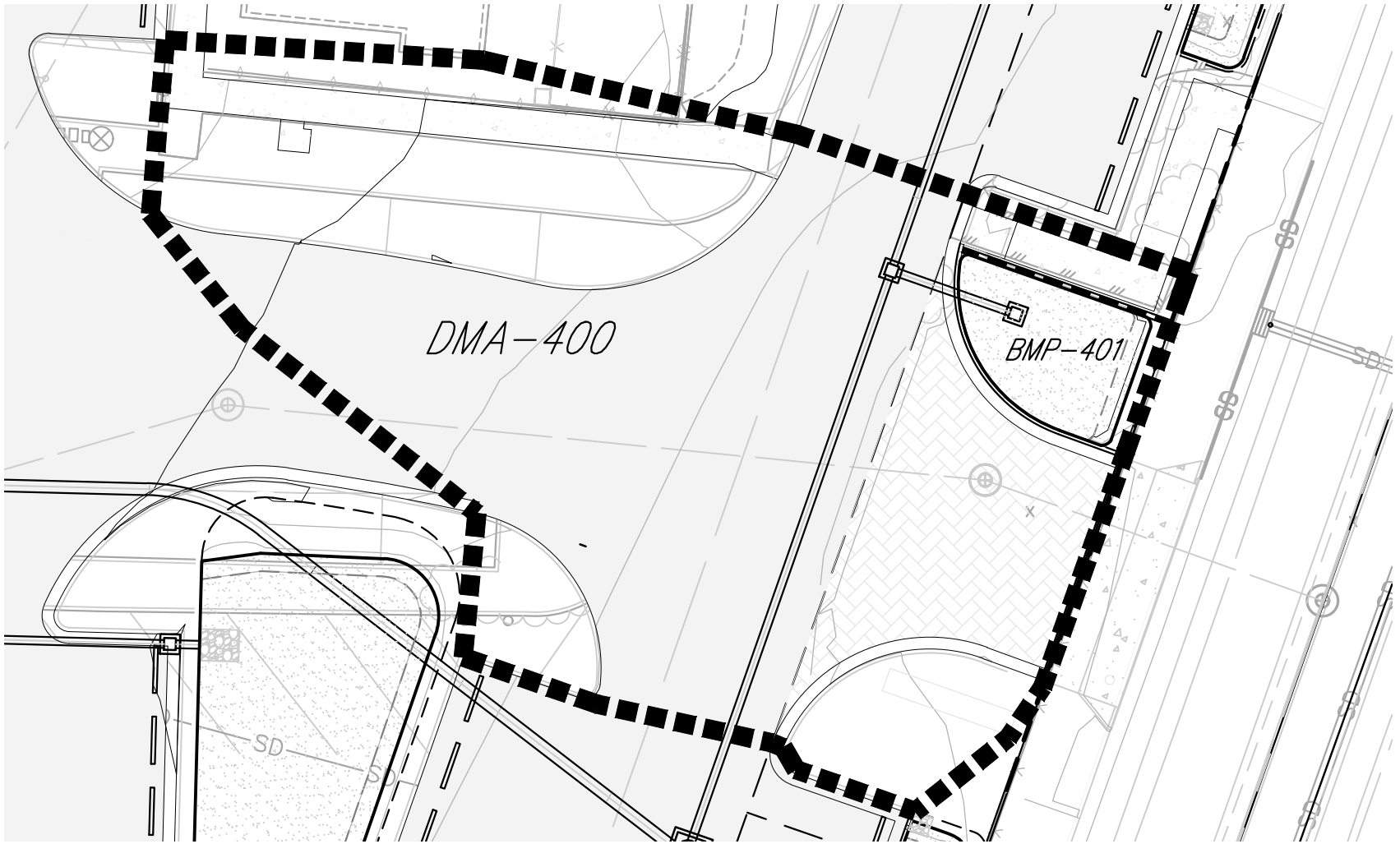
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PALA MESA PLAZA
SITE DEVELOPMENT PLAN
BMP DMA MAPBOOK

STRUCTURAL BIO-BASIN SUMMARY TABLE											
BMP NAME	TYPE OF BMP	EFFECTIVE AREA (SQFT)	A1 (INCH) TOP OF RISER	A2 (INCH) TOP OF BASIN	C (INCH) MEDIA	D (INCH) GRAVEL	E (INCH) DISTANCE FROM TOE OF SLOPE TO LINER	F (INCH) OFFSET	BOX RISER OVERFLOW STRUCTURE SIZE (INCHES)	ORIFICES DIAMETER	IMPERMEABLE LINER ?
BMP-401	BIOFILTRATION	278	9	18	18	18	27	3	18X18	0.50	NO

NOTE: DMA-400 TRIBUTARY TO BMP-401



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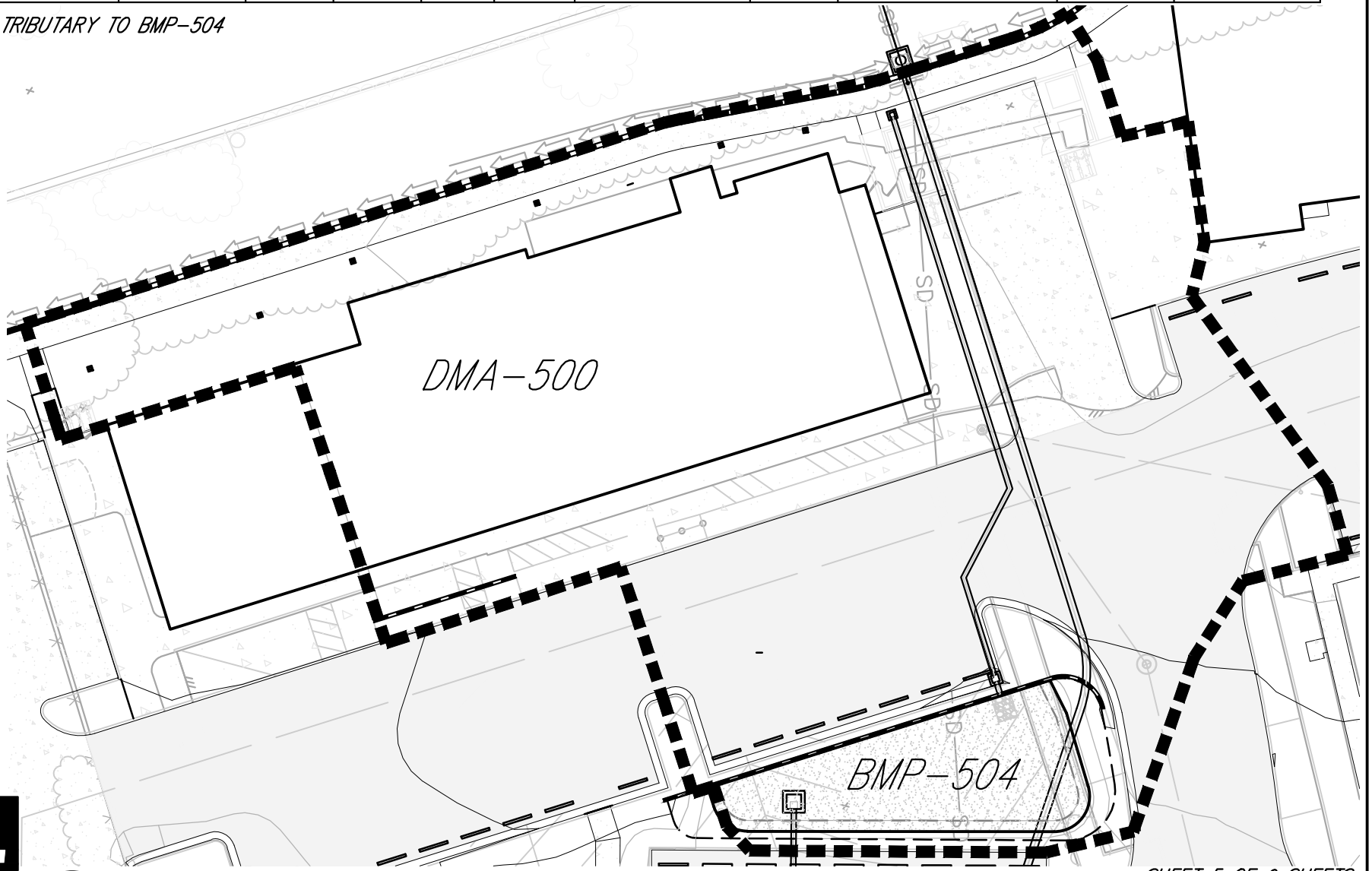
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PALA MESA PLAZA
SITE DEVELOPMENT PLAN
BMP DMA MAPBOOK

STRUCTURAL BIO-BASIN SUMMARY TABLE											
BMP NAME	TYPE OF BMP	EFFECTIVE AREA (SQFT)	A1 (INCH) TOP OF RISER	A2 (INCH) TOP OF BASIN	C (INCH) MEDIA	D (INCH) GRAVEL	E (INCH) DISTANCE FROM TOE OF SLOPE TO LINER	F (INCH) OFFSET	BOX RISER OVERFLOW STRUCTURE SIZE (INCHES)	ORIFICES DIAMETER	IMPERMEABLE LINER ?
BMP-504	BIOFILTRATION	1531	9	17.60	18	18	27	3	36X36	0.50	NO

NOTE: DMA-500 TRIBUTARY TO BMP-504



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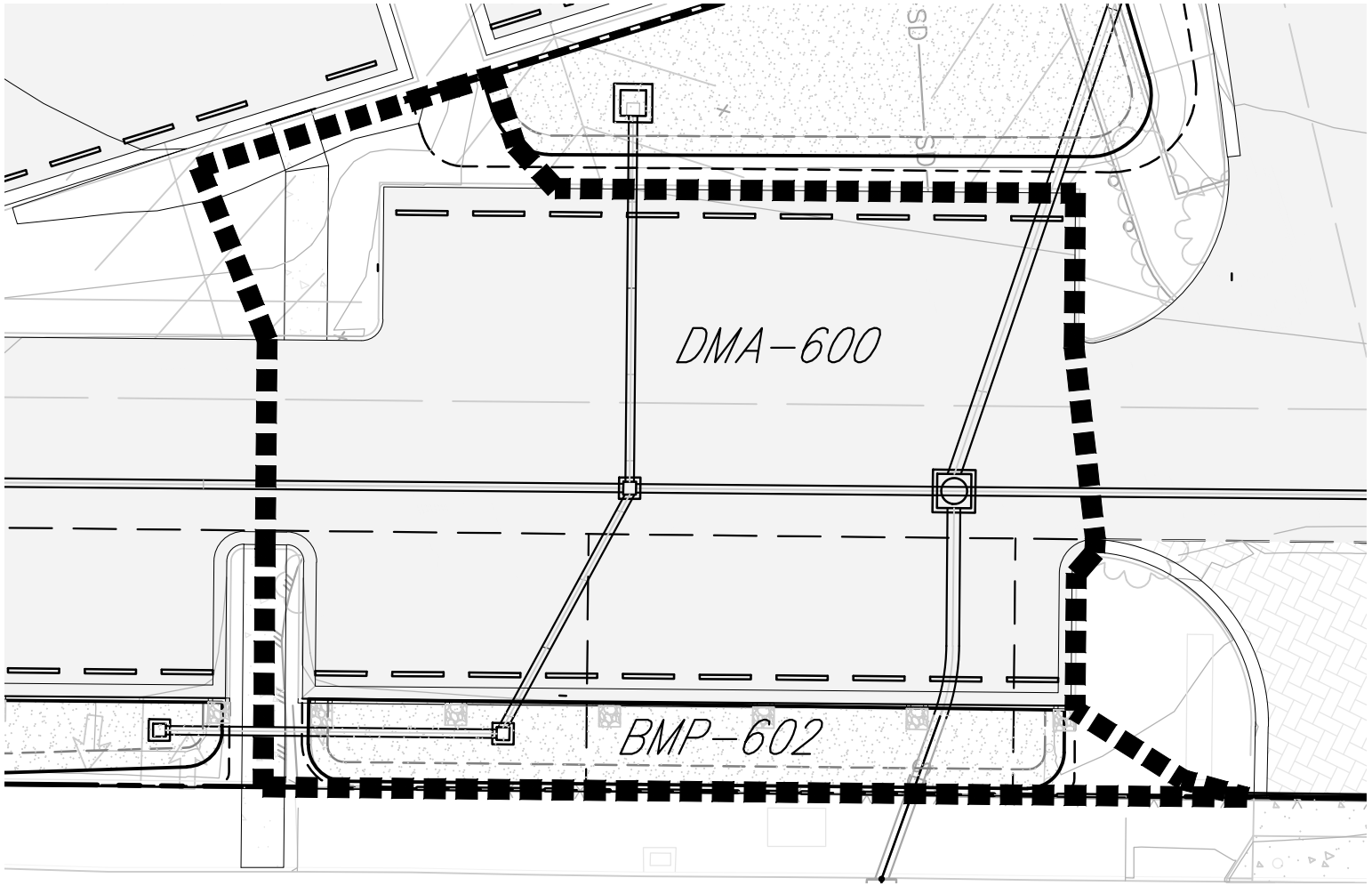
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SHEET 5 OF 9 SHEETS

PALA MESA PLAZA
SITE DEVELOPMENT PLAN
BMP DMA MAPBOOK

STRUCTURAL BIO-BASIN SUMMARY TABLE											
BMP NAME	TYPE OF BMP	EFFECTIVE AREA (SQFT)	A1 (INCH) TOP OF RISER	A2 (INCH) TOP OF BASIN	C (INCH) MEDIA	D (INCH) GRAVEL	E (INCH) DISTANCE FROM TOE OF SLOPE TO LINER	F (INCH) OFFSET	BOX RISER OVERFLOW STRUCTURE SIZE (INCHES)	ORIFICES DIAMETER	IMPERMEABLE LINER ?
BMP-602	BIOFILTRATION	558	9	12	18	18	27	3	18X18	0.50	NO

NOTE: DMA-600 TRIBUTARY TO BMP-602



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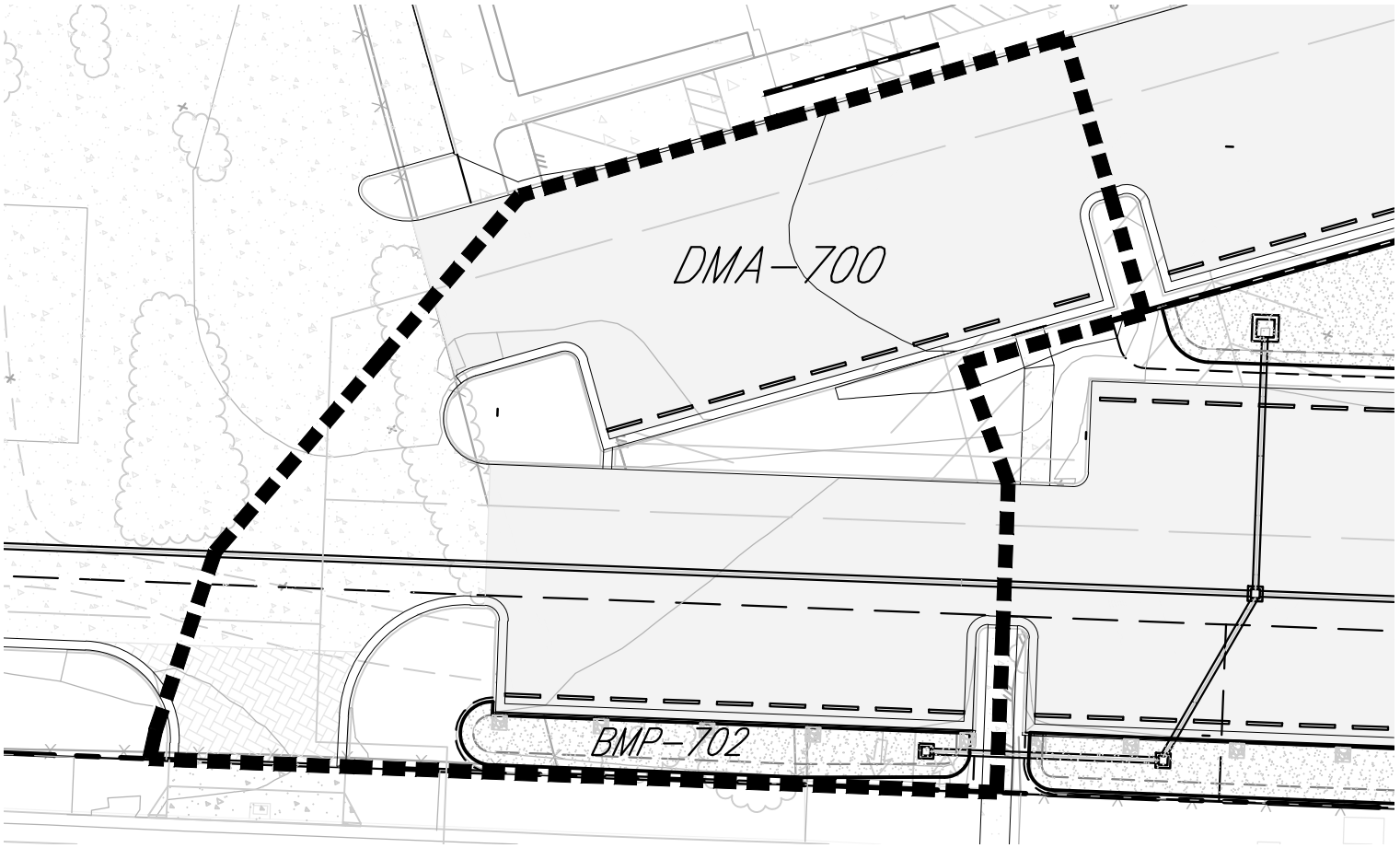
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PALA MESA PLAZA
SITE DEVELOPMENT PLAN
BMP DMA MAPBOOK

STRUCTURAL BIO-BASIN SUMMARY TABLE											
BMP NAME	TYPE OF BMP	EFFECTIVE AREA (SQFT)	A1 (INCH) TOP OF RISER	A2 (INCH) TOP OF BASIN	C (INCH) MEDIA	D (INCH) GRAVEL	E (INCH) DISTANCE FROM TOE OF SLOPE TO LINER	F (INCH) OFFSET	BOX RISER OVERFLOW STRUCTURE SIZE (INCHES)	ORIFICES DIAMETER	IMPERMEABLE LINER ?
BMP-702	BIOFILTRATION	560	9	5.40	18	18	27	3	18X18	0.50	NO

NOTE: DMA-700 TRIBUTARY TO BMP-702



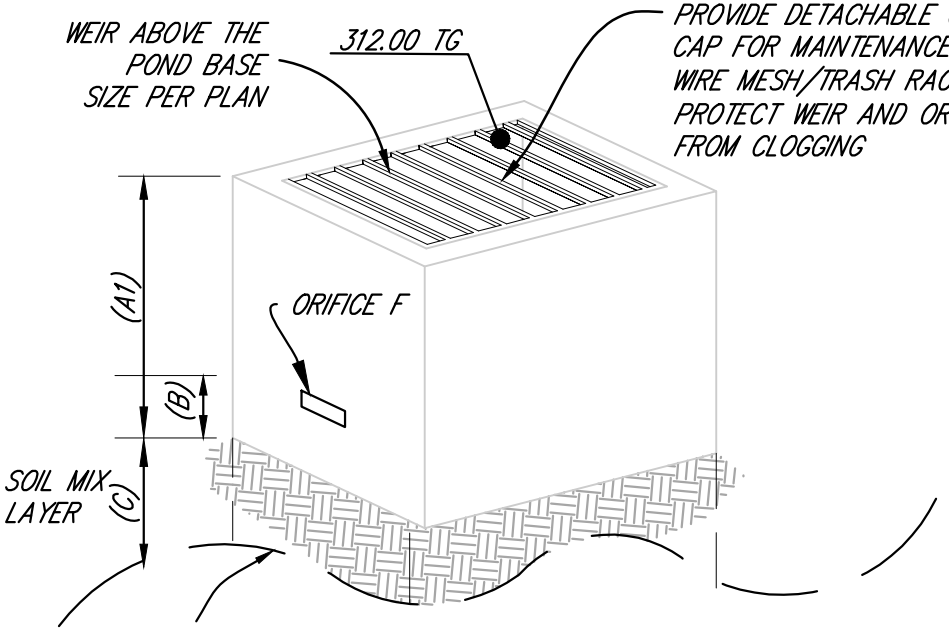
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PH (760)745-8118 FX (760)745-1890

SCALE: 1:30

0 30 60

PALA MESA PLAZA
SITE DEVELOPMENT PLAN
BMP DMA MAPBOOK

STRUCTURAL BIO-BASIN SUMMARY TABLE										
BMP NAME	TYPE OF BMP	EFFECTIVE AREA (SQFT)	A2 (INCH) TOP OF BASIN	C (INCH) MEDIA	D (INCH) GRAVEL	E (INCH) DISTANCE FROM TOE OF SLOPE TO LINER	F (INCH) OFFSET	BOX RISER OVERFLOW STRUCTURE SIZE (INCHES)	ORIFICES DIAMETER	IMPERMEABLE LINER ?
BMP-802	BIOFILTRATION	1807	36	18	30	27	18	36X36	0.75	NO



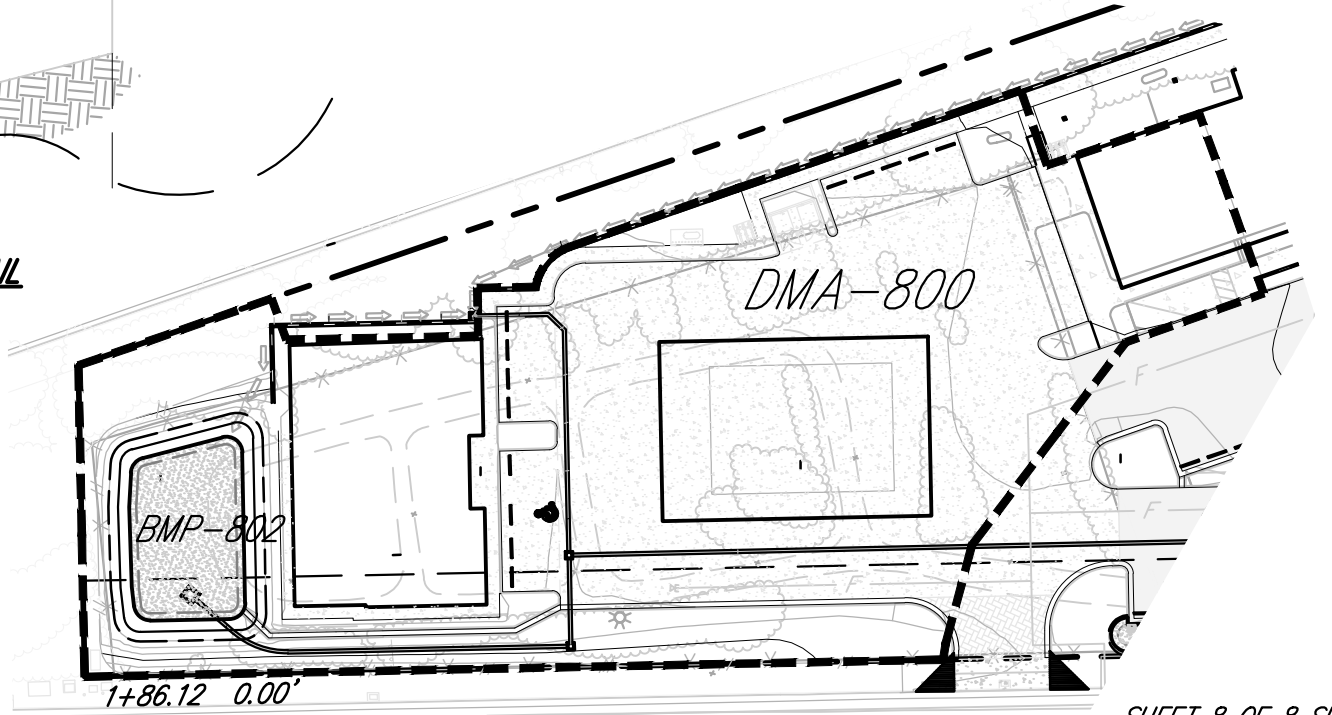
ORIFICE SUMMARY TABLE								
ORIFICE NAME	INVERT ELEVATION (FT)	B (INCH)	A1 TOP OF RISER (INCH)	NUMBER OF BARRELS	SPAN (INCH)	RISE (INCH)	MAX WATER SURFACE ELEVATION (FT)	FREE BOARD ELEVATION (FT)
ORIFICE F	310.50	9.00	27	1	8	2	311.75	311.75

ANY INFORMATION BELOW THIS LINE SEE STRUCTURAL BIO-BASIN SUMMARY TABLE

CATCHBASIN 802 DETAIL

NOT TO SCALE

NOTE: DMA-800 TRIBUTARY TO BMP-802



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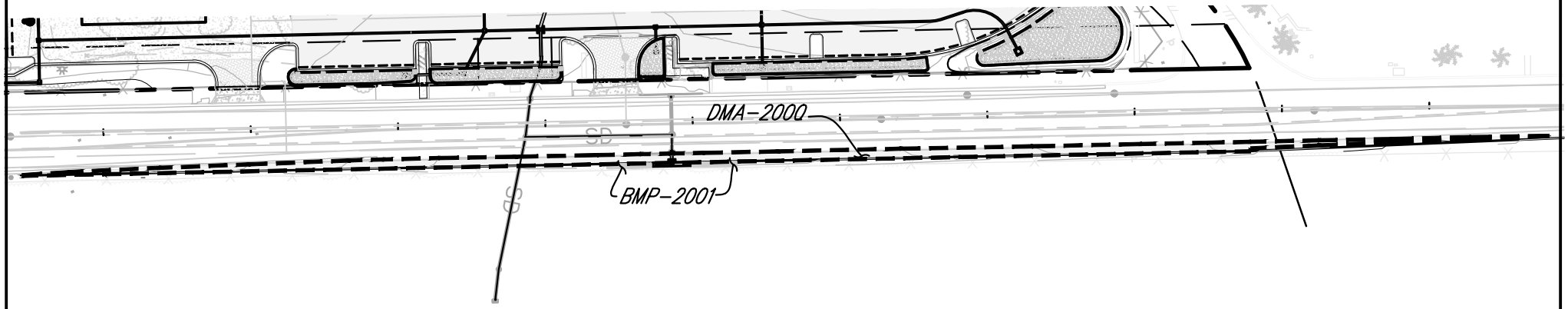
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SHEET 8 OF 8 SHEETS

PALA MESA PLAZA
SITE DEVELOPMENT PLAN
BMP DMA MAPBOOK

STRUCTURAL BIO-BASIN SUMMARY TABLE										
BMP NAME	TYPE OF BMP	EFFECTIVE AREA (SQFT)	A2 (INCH) TOP OF BASIN	C (INCH) MEDIA	D (INCH) GRAVEL	E (INCH) DISTANCE FROM TOE OF SLOPE TO LINER	F (INCH) OFFSET	BOX RISER OVERFLOW STRUCTURE SIZE (INCHES)	ORIFICES DIAMETER	IMPERMEABLE LINER ?
BMP-2001	BIOFILTRATION	150	9	18	12	27	3	18X18	0.5000	YES



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SCALE: 1:100

0 100 200

PALA MESA PLAZA
SITE DEVELOPMENT PLAN
BMP DMA MAPBOOK

2.3 Construction Plan Sets

- DMAs, features, and BMPs identified and described in this attachment must also be shown on all applicable construction and landscape plans.
- As applicable, plan sheets must identify:
    - All features and BMPs identified in Sub-attachment 2.1 (DMA Exhibits).
    - The additional information listed below.
- Use this checklist to ensure required information is included on each plan (copy as needed).

Plan Type	**Grading**
Required Information[4]	
☐ Structural BMP(s) and Significant Site Design BMPs (if applicable) with ID numbers.	
☐ The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit.	
☐ Details and specifications for construction of Structural BMP(s) and Significant Site Design BMPs (if applicable).	
☐ Signage indicating the location and boundary of structural BMP(s) as required by County staff.	
☐ How to access the structural BMP(s) to inspect and perform maintenance.	
☐ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds).	
☐ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP).	
☐ Recommended equipment to perform maintenance.	
☐ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management.	
☐ Include landscaping plan sheets (if available) showing vegetation requirements for vegetated structural BMP(s).	
☐ All BMPs must be fully dimensioned on the plans.	
☐ When proprietary BMPs are used, site-specific cross-section with outflow, inflow, and manufacturer model number must be provided. Photocopies of general brochures are not acceptable.	
☐ Include all source control and site design measures described in the SWQMP.	
☐ Include all construction BMPs described in the SWQMP.	

[4] For Building Permit Applications, refer to Form PDS 272, https://www.sandiegocounty.gov/content/dam/sdc/pds/docs/pds272.pdf

SITE PARKING SUMMARY

BLDG ID	CURRENT / PROJECTED USE	BLDG AREA (SF)	PARKING REQUIRED		PARKING PROVIDED
			PARKING RATIO	REQUIRED (EA)	
"A"	FUEL STATION WITH CONVENIENCE STORE	4,980.00	4 PER 1000 SF	20	20
"B"	MARKET (EXIST. BLDG)	9,075.00	4.5 PER 1000 SF	41	43
"C"	EATING (EXIST. NESSY BURGERS)	1,478.00	6 PER 1000 SF	9	13
"D"	RETAIL	6,000.00	4.5 PER 1000 SF	27	29
"E"	RETAIL	6,000.00	4.5 PER 1000 SF	27	29
			TOTAL	124	134

NOTE: REQUIRED TOTAL NUMBER OF PARKING INCLUDES THE HANDICAPPED, ELECTRIC VEHICLES & CLEAN AIR VEHICLES STALLS.

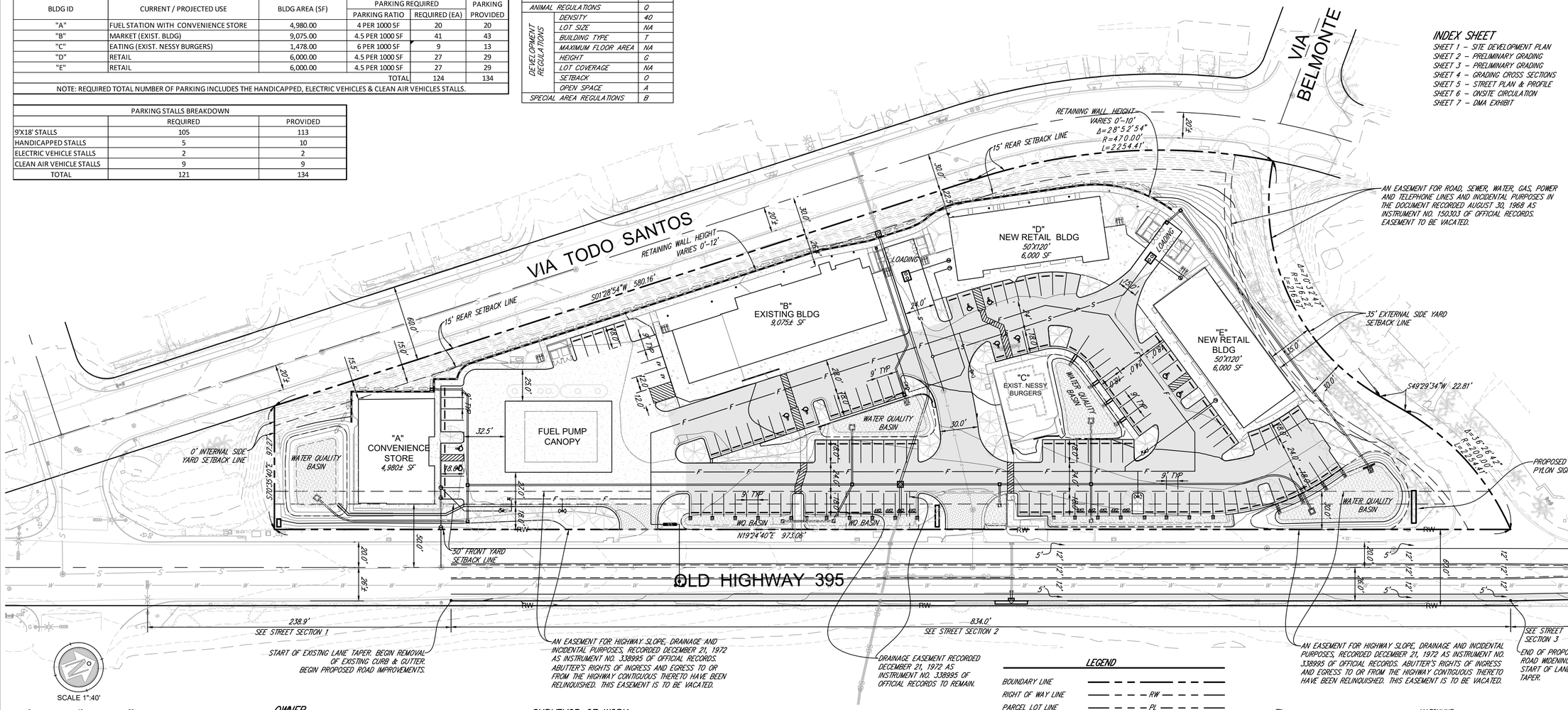
PARKING STALLS BREAKDOWN		
	REQUIRED	PROVIDED
9'X18' STALLS	105	113
HANDICAPPED STALLS	5	10
ELECTRIC VEHICLE STALLS	2	2
CLEAN AIR VEHICLE STALLS	9	9
TOTAL	121	134

APN: 125-050-54

USE REGULATIONS		C36
ANIMAL REGULATIONS		Q
DEVELOPMENT REGULATIONS	DENSITY	40
	LOT SIZE	NA
	BUILDING TYPE	T
	MAXIMUM FLOOR AREA	NA
	HEIGHT	G
	LOT COVERAGE	NA
	SETBACK	O
	OPEN SPACE	A
SPECIAL AREA REGULATIONS		B

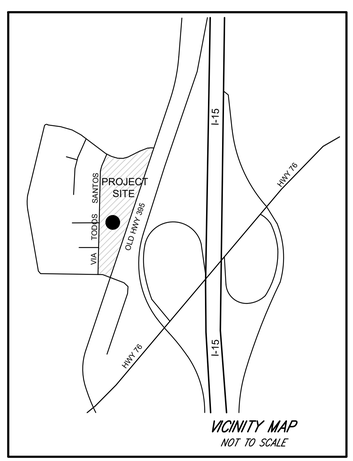
INDEX SHEET

SHEET 1 – SITE DEVELOPMENT PLAN
SHEET 2 – PRELIMINARY GRADING
SHEET 3 – PRELIMINARY GRADING
SHEET 4 – GRADING CROSS SECTIONS
SHEET 5 – STREET PLAN & PROFILE
SHEET 6 – ONSITE CIRCULATION
SHEET 7 – DMA EXHIBIT



SCALE 1":40'

0 40 80 Feet



VICINITY MAP
NOT TO SCALE

OWNER
TGRH3 LLC
3712 EAST OWENS AVE #101, NORTH LAS VEGAS, NV 89030
MANAGING MEMBER: RAFID HAMIKA

LEGAL DESCRIPTION
ALL THAT PORTION OF TRACT "A" OF MONSERATE RANCHO, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP THEREOF ON FILE IN THE OFFICE OF COUNTY RECORDING TO MAP THEREOF ON FILE IN THE OFFICE OF COUNTY RECORDER OF SAN DIEGO COUNTY, IN BOOK 1, PAGE 108 OF PATENTS.

ACREAGE
GROSS AREA – 4.37 AC

PROPERTY ADDRESS
3233 OLD HIGHWAY 395
FALLBROOK, CA 92028

ASSESORS PARCEL NUMBER
125-050-54-00

GENERAL PLAN DESIGNATION
GENERAL COMMERCIAL

SETBACKS
FRONT = 50' FROM CENTERLINE
SIDE YARD EXTERIOR = 35' FROM THE CENTERLINE
SIDE YARD INTERIOR = 0' FROM THE LOTLINE (h)
REAR YARD = 15' FROM THE LOT LINE IF BUILDINGS' PRINCIPAL USE IS COMMERCIAL (m)

AGENCIES
FIRE DISTRICT = NORTH COUNTY FIRE PROTECTION DISTRICT
ELEMENTARY SCHOOL = GEN. ELEM. BONSALL UNION
HIGH SCHOOL DISTRICT = HIGH FALLBROOK UNION
WATER DISTRICT = RAINBOW MUNICIPAL WATER DISTRICT
SANITATION DISTRICT = RAINBOW MUNICIPAL WATER DISTRICT

SURVEYOR OF WORK
EXCEL ENGINEERING
440 STATE PLACE
ESCONDIDO, CA 92029
PHONE (760) 745-8118
FAX (760) 745-1890

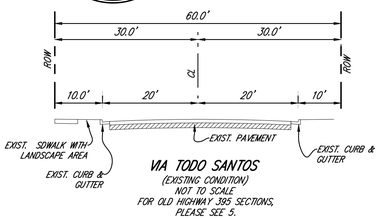
MICHAEL D. LEVIN, P.L.S. NO. 6896

LICENSED LAND SURVEYOR
Michael D. Levin
No. 6896
STATE OF CALIFORNIA

ENGINEER OF WORK
EXCEL ENGINEERING
440 STATE PLACE
ESCONDIDO, CA 92029
PHONE (760) 745-8118
FAX (760) 745-1890

ROBERT D. DENTINO, R.C.E. NO. 45629

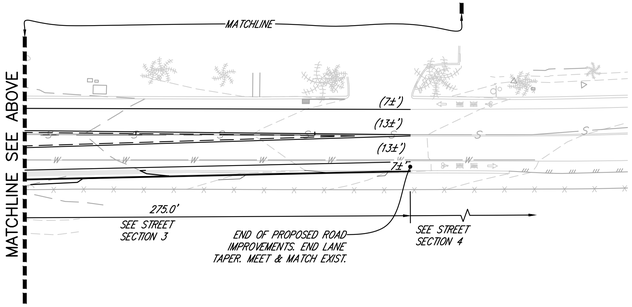
REGISTERED PROFESSIONAL ENGINEER
ROBERT D. DENTINO
No. 45629
CIVIL
STATE OF CALIFORNIA



VIA TODO SANTOS
(EXISTING CONDITION)
NOT TO SCALE
FOR OLD HIGHWAY 395 SECTIONS, PLEASE SEE 5.

LEGEND

BOUNDARY LINE
RIGHT OF WAY LINE — RW
PARCEL LOT LINE — PL
PCC CURB
PCC CURB & GUTTER
SEWER LINE — S
WATER LINE — W
FIRE LINE — F
FIRE HYDRANT
BLDG FIRE SERVICE LATERAL — (F)
WATER SERVICE LATERAL — (W)
SEWER SERVICE LATERAL — (S)
DOUBLE DETECTOR CHECK VALVE
STORM DRAIN INLETS / CLEANOUTS
HEADWALL
HEADWALL
EXIST. TOPO MAJOR CONTOUR — 1000
EXIST. TOPO MINOR CONTOUR
PROPOSED TOPO MAJOR CONTOUR — 1000
PROPOSED TOPO MINOR CONTOUR



SITE DEVELOPMENT PLAN
SHEET 1 OF 7 SHEETS

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PALA MESA PLAZA
SITE DEVELOPMENT PLAN
APN 125-050-54-00

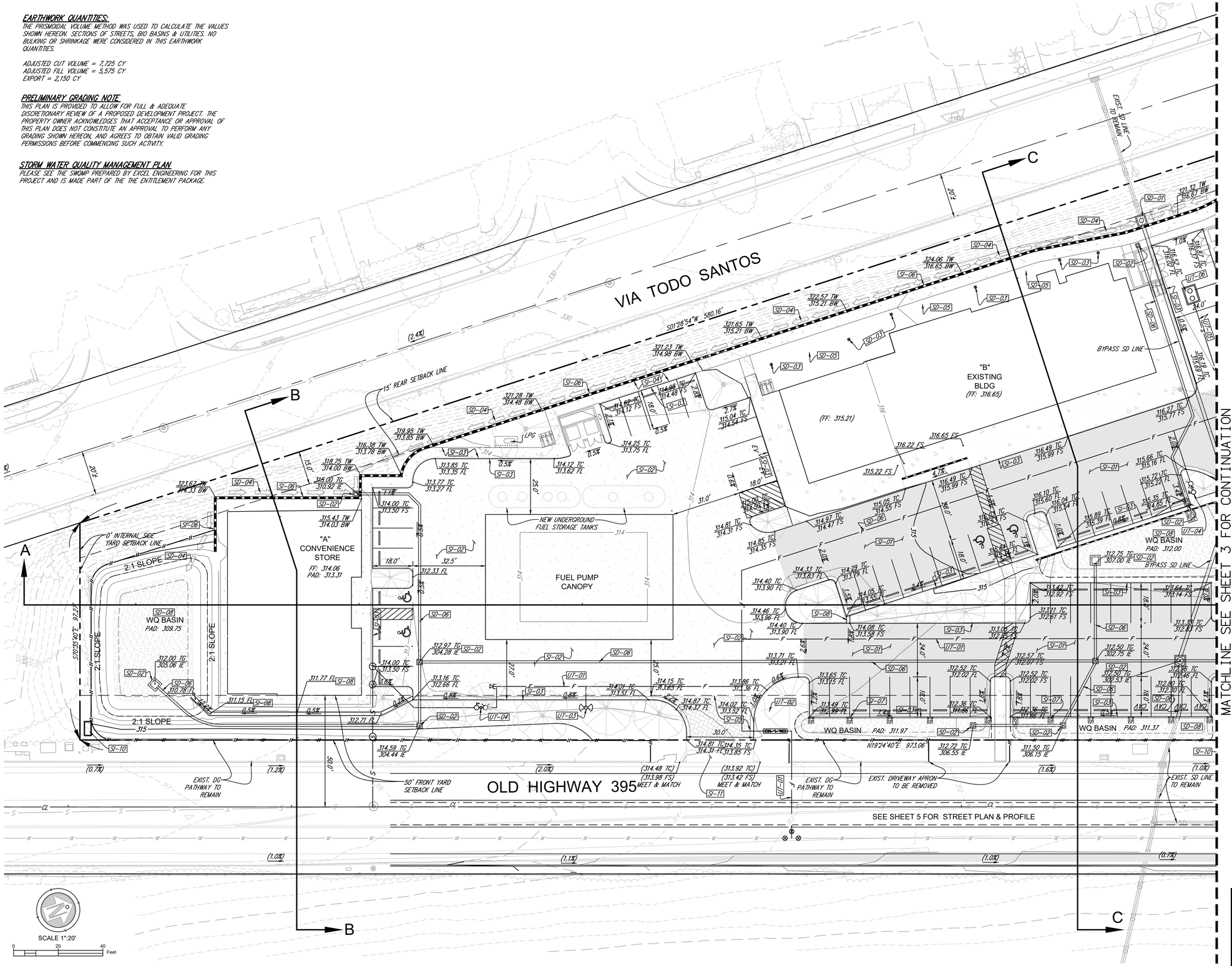
K:\19\10025\engineering\SDP\01\SDP\10025 SDP1 TITLE.dwg 6/8/2022 1:50 PM ORIGINAL PLOT SIZE: ----

EARTHWORK QUANTITIES:
THE PRISMOIDAL VOLUME METHOD WAS USED TO CALCULATE THE VALUES SHOWN HEREON. SECTIONS OF STREETS, BIO BASINS & UTILITIES. NO BULKING OR SHRINKAGE WERE CONSIDERED IN THIS EARTHWORK QUANTITIES.

ADJUSTED CUT VOLUME = 7,725 CY
ADJUSTED FILL VOLUME = 5,575 CY
EXPORT = 2,150 CY

PRELIMINARY GRADING NOTE
THIS PLAN IS PROVIDED TO ALLOW FOR FULL & ADEQUATE DISCRETIONARY REVIEW OF A PROPOSED DEVELOPMENT PROJECT. THE PROPERTY OWNER ACKNOWLEDGES THAT ACCEPTANCE OR APPROVAL OF THIS PLAN DOES NOT CONSTITUTE AN APPROVAL TO PERFORM ANY GRADING SHOWN HEREON, AND AGREES TO OBTAIN VALID GRADING PERMISSIONS BEFORE COMMENCING SUCH ACTIVITY.

STORM WATER QUALITY MANAGEMENT PLAN
PLEASE SEE THE SWQMP PREPARED BY EXCEL ENGINEERING FOR THIS PROJECT AND IS MADE PART OF THE THE ENTITLEMENT PACKAGE.



LEGEND

- BOUNDARY LINE
- RIGHT OF WAY LINE — RW
- PARCEL LOT LINE — PL
- PCC CURB
- PCC CURB & GUTTER
- SEWER LINE — S
- WATER LINE — W
- FIRE LINE — F
- FIRE HYDRANT
- BLDG FIRE SERVICE LATERAL — F
- WATER SERVICE LATERAL — W
- SEWER SERVICE LATERAL — S
- DOUBLE DETECTOR CHECK VALVE
- STORM DRAIN INLETS / CLEANOUTS
- HEADWALL
- HEADWALL
- EXIST. TOPO MAJOR CONTOUR — 1000
- EXIST. TOPO MINOR CONTOUR
- PROPOSED TOPO MAJOR CONTOUR — 1000
- PROPOSED TOPO MINOR CONTOUR

CONSTRUCTION NOTES

SI-01	AC PAVEMENT
SI-02	PCC PAVEMENT
SI-03	PCC CURB / CURB & GUTTER
SI-04	PCC SIDEWALK
SI-05	DECORATIVE PAVERS
SI-06	RETAINING WALL
SI-07	1.5' WIDE CURBCUT 18' O.C. ALONG THE LENGTH OF THE CURB & GUTTER WITH RIPRAP PROTECTION INSTALLED ALL THE WAY TO THE BASIN.
SI-08	1.5' WIDE PCC CHANNEL
SI-09	SIDEWALK UNDERDRAIN
SI-10	MONUMENT SIGN
SI-11	30' WIDE PCC DRIVEWAY PER SDRSD G-14
SD-02	BROOKS BOX OR EQUIVALENT
SD-03	AREA DRAIN
SD-04	BROW DITCH
SD-05	8" PVC PIPE
SD-06	PVC STORM DRAIN PIPE
SD-07	18" RCP STORM DRAIN PIPE
SD-08	WATER QUALITY BASIN
UT-01	INSTALL FIRE LINE
UT-02	INSTALL DDCV
UT-03	INSTALL FIRE HYDRANT
UT-04	INSTALL FDC/PIV
UT-05	NEW SEWER LINE
UT-06	GREASE TRAP

PRELIMINARY GRADING
SHEET 2 OF 7 SHEETS

SITE DEVELOPMENT PLAN
FOR APN 125-050-54-00
OLD HIGHWAY 395 RETAIL CENTER

k:\19\19025\engineering\SDP\SDP01\SDP19025 SDP GRADING.dwg 6/8/2022 1:50 PM ORIGINAL PLOT SIZE: ---

CONSTRUCTION NOTES

SI-01	AC PAVEMENT
SI-02	PCC PAVEMENT
SI-03	PCC CURB / CURB & GUTTER
SI-04	PCC SIDEWALK
SI-05	DECORATIVE PAVERS
SI-06	RETAINING WALL
SI-07	1.5' WIDE CURBCUT 18' O.C. ALONG THE LENGTH OF THE CURB & GUTTER WITH RIPRAP PROTECTION INSTALLED ALL THE WAY TO THE BASIN.
SI-08	1.5' WIDE PCC CHANNEL
SI-09	SIDEWALK UNDERDRAIN
SI-10	MONUMENT SIGN
SI-11	30' WIDE PCC DRIVEWAY PER SDRSD G-14
SD-02	BROOKS BOX OR EQUIVALENT
SD-03	AREA DRAIN
SD-04	BROW DITCH
SD-05	8" PVC PIPE
SD-06	PVC STORM DRAIN PIPE
SD-07	18" RCP STORM DRAIN PIPE
SD-08	WATER QUALITY BASIN
UT-01	INSTALL FIRE LINE
UT-02	INSTALL DDCV
UT-03	INSTALL FIRE HYDRANT
UT-04	INSTALL FDC/PIV
UT-05	NEW SEWER LINE
UT-06	GREASE TRAP

LEGEND

- BOUNDARY LINE
- RIGHT OF WAY LINE — RW
- PARCEL LOT LINE — PL
- PCC CURB
- PCC CURB & GUTTER
- SEWER LINE — S
- WATER LINE — W
- FIRE LINE — F
- FIRE HYDRANT
- BLDG FIRE SERVICE LATERAL — (F)
- WATER SERVICE LATERAL — (W)
- SEWER SERVICE LATERAL — (S)
- DOUBLE DETECTOR CHECK VALVE
- STORM DRAIN INLETS / CLEANOUTS
- HEADWALL
- HEADWALL
- EXIST. TOPO MAJOR CONTOUR — 1000
- EXIST. TOPO MINOR CONTOUR
- PROPOSED TOPO MAJOR CONTOUR — 1000
- PROPOSED TOPO MINOR CONTOUR

MATCHLINE SEE SHEET 2 FOR CONTINUATION

D VIA TODO SANTOS

"D" NEW RETAIL BLDG
FF: 316.83
PAD: 316.08

"E" NEW RETAIL BLDG
FF: 317.02
PAD: 316.27

"C" EXIST. NESSY BURGERS (FF: 316.27)

WQ BASIN
SD-08
PAD: 314.75

WQ BASIN
SD-08
PAD: 311.23

WQ BASIN
SD-08
PAD: 309.00

WQ
PAD: 309.50

Δ=28°52'54"
R=470.00'
L=2254.41'

Δ=10°37'47"
R=170.22'
L=216.97'

Δ=16°26'42"
R=200.00'
L=234.41'

(1.5%)

15' REAR SETBACK LINE

30.0'

15.0'

20'±

EXIST. 35' WIDE DRIVEWAY APRON TO REMAIN

2:1 MAX SLOPE

(12.8%)

22.9'±

EXIST. AC EDGES (TYP)

28.5'±

35' EXTERNAL SIDE YARD SETBACK LINE

S49°29'34"W 22.81'

(8.0%)

31.5'±

2:1

EXIST. AC EDGES (TYP)

RIDGE LINE

EXIST. SEWER MAIN

TRENCH DRAIN

2 EA. WATER LATERAL FOR METER MANIFOLD & USE FOR DOMESTIC SUPPLY

1 EA. WATER LATERAL FOR IRRIGATION

(311.30 TC)
(310.80 FS)
MEET & MATCH

(310.85 TC)
(310.35 FS)
MEET & MATCH

EXIST. SD INLET TO REMAIN

EXIST. SD LINE TO REMAIN

EXIST. DRIVEWAY APRON TO BE REMOVED

EXIST. DG PATHWAY TO REMAIN

EXIST. DG PATHWAY TO REMAIN

OLD HIGHWAY 395

SEE SHEET 5 FOR STREET PLAN & PROFILE

EXIST. SEWER MAIN

EXIST. SD LINE TO REMAIN

EXIST. SD INLET TO BE REMOVED

NEW SD INLET PER SDRSD B-2

(0.5%) (0.5%) (1.1%) (1.0%)

(0.5%) (0.1%) (1.6%) (1.1%)

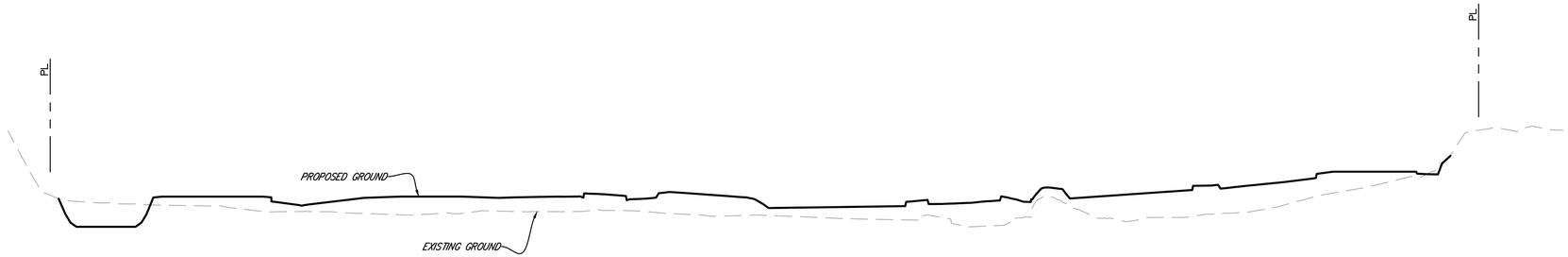
MATCHLINE SEE RIGHT FOR CONTINUATION

MATCHLINE SEE LEFT FOR CONTINUATION

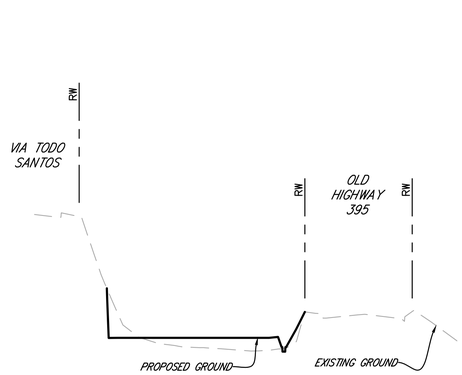
SCALE 1":20'
0 20 40 Feet

PRELIMINARY GRADING
SHEET 3 OF 7 SHEETS

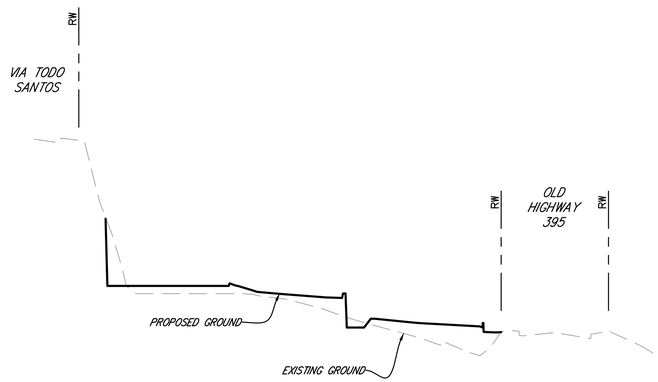
v: 19 | 20025 | engineering | SDP | 01 SDP1 | 20025 SDP GRADING.dwg 6/8/2022 1:50 PM ORIGINAL PLOT SIZE: ----



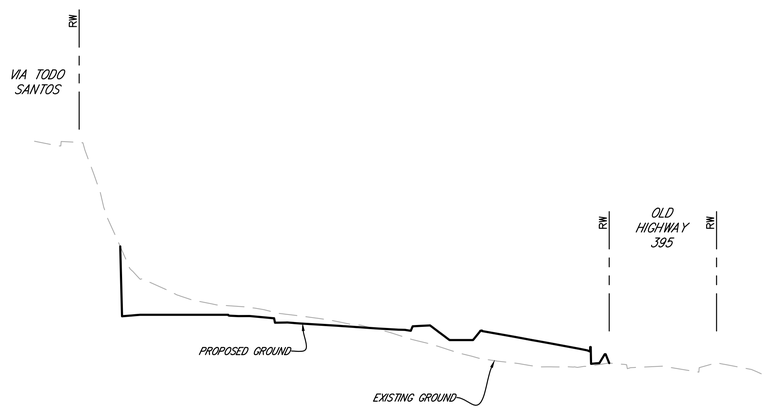
SECTION A-A
SCALE HORIZONTAL = 1":40'
VERTICAL = 1":8'
SEE SHEET 2 & 3



SECTION B-B
SCALE HORIZONTAL = 1":40'
VERTICAL = 1":8'
SEE SHEET 2



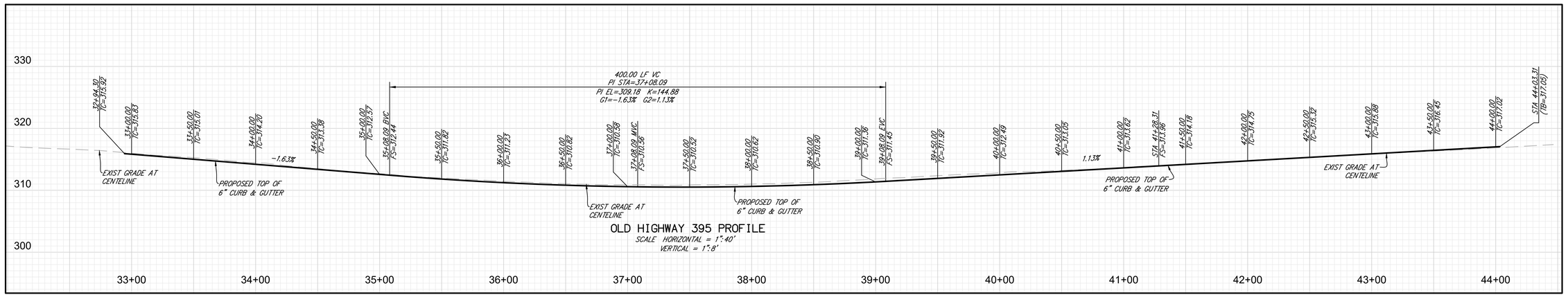
SECTION C-C
SCALE HORIZONTAL = 1":40'
VERTICAL = 1":8'
SEE SHEET 2



SECTION D-D
SCALE HORIZONTAL = 1":40'
VERTICAL = 1":8'
SEE SHEET 3

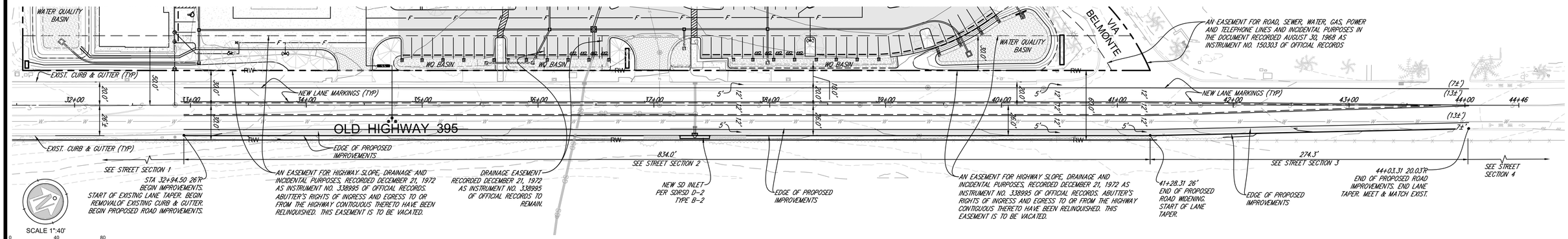
GRADING CROSS SECTIONS
SHEET 4 OF 7 SHEETS

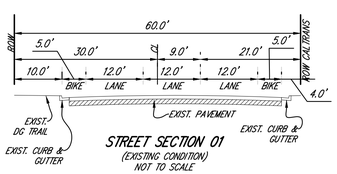
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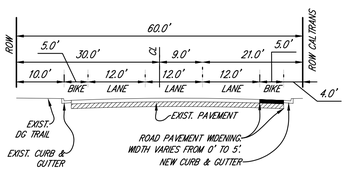
OLD HIGHWAY 395 PROFILE

SCALE HORIZONTAL = 1":40'
VERTICAL = 1":8'

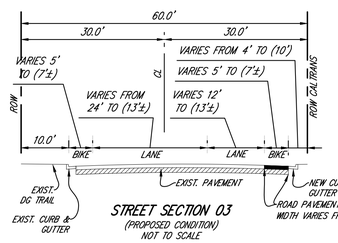




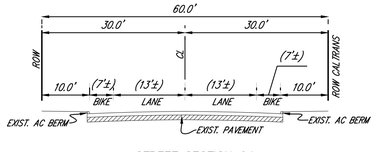
STREET SECTION 01
(EXISTING CONDITION)
NOT TO SCALE



STREET SECTION 02
(PROPOSED CONDITION)
NOT TO SCALE



STREET SECTION 03
(PROPOSED CONDITION)
NOT TO SCALE

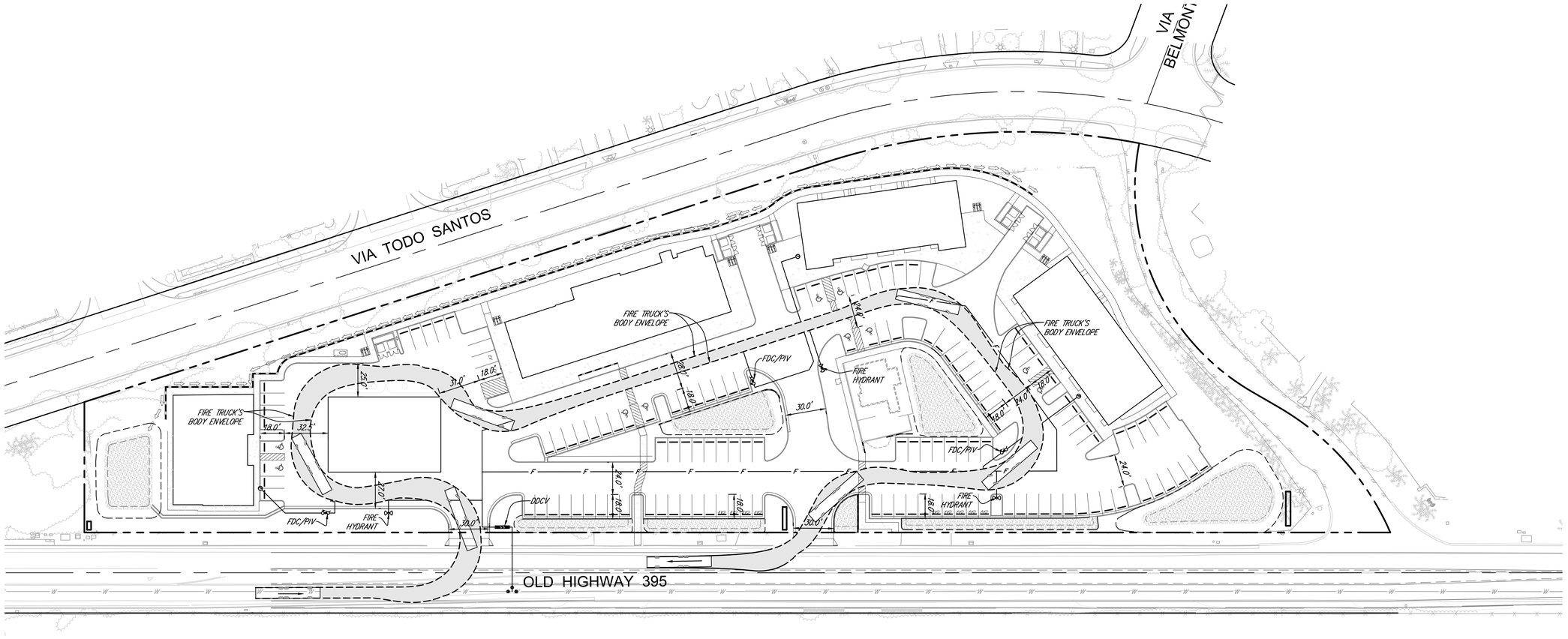


STREET SECTION 04
(EXISTING CONDITION)
NOT TO SCALE

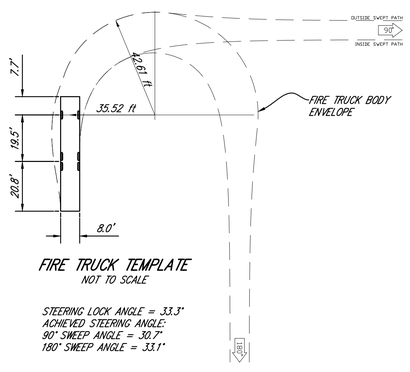
STREET PLAN & PROFILE
SHEET 5 OF 7 SHEETS

PALA MESA PLAZA
SITE DEVELOPMENT PLAN
APN 125-050-54-00

lc | 19025 | engineering | SDP | SDP 01 | SDP | 19025 SDP 1P.dwg 6/8/2022 1:51 PM ORIGINAL PLOT SIZE: ----

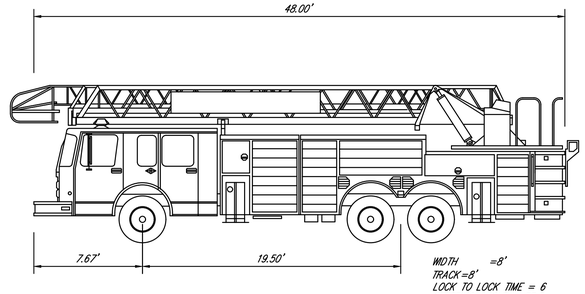






FIRE TRUCK TEMPLATE
NOT TO SCALE

STEERING LOCK ANGLE = 33.3°
ACHIEVED STEERING ANGLE:
90° SWEEP ANGLE = 30.7°
180° SWEEP ANGLE = 33.1°



FIRE TRUCK PROFILE
NOT TO SCALE

ONSITE CIRCULATION

SHEET 6 OF 7 SHEETS

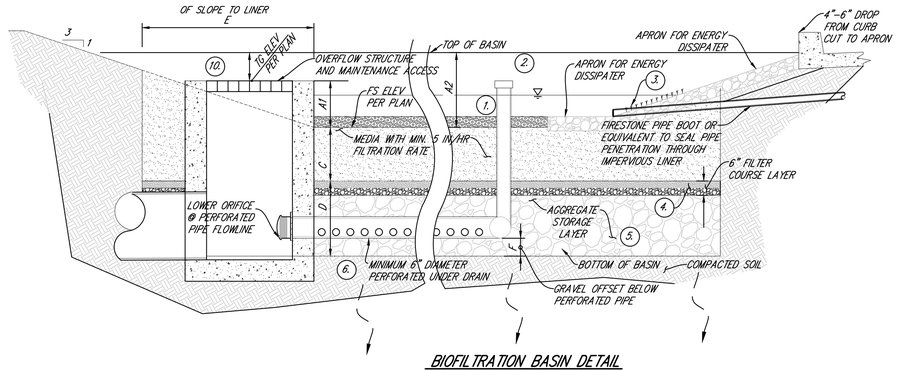
PALA MESA PLAZA
SITE DEVELOPMENT PLAN
APN 125-050-54-00

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WATER QUALITY BASIN INSTALLATION NOTES:

1. 3 INCHES OF WELL-AGED, SHREDDED HARDWOOD MULCH.
2. AN UNDERDRAIN CLEANOUT WITH A MINIMUM 6-INCH DIAMETER AND LOCKABLE CAP IS PLACED EVERY 250 TO 300FEET AS REQUIRED BASED ON UNDERDRAIN LENGTH.
3. VEGETATION USED SHOULD BE SUITABLE FOR THE CLIMATE PER LANDSCAPE PLANS
4. FILTER COARSE IS A MINIMUM OF 6 INCHES PROVIDED IN TWO SEPARATE 3 INCH LAYERS. THE TOP LAYER SHALL BE MADE OF ASTM C33 CHOKER SAND AND THE BOTTOM LAYER BE OF ASTM NO. 8 AGGREGATE. MARKERS STAKES SHALL BE USED TO ENSURE UNIFORM LIFT THICKNESS.
5. AASHTO NO. 57 STONE OR CLASS 2 PERMEABLE PER CAL TRANS SPECIFICATION 68-1.025 IS RECOMMENDED FOR THE AGGREGATE STORAGE LAYER. WASHED, OPEN-GRADED CRUSHED ROCK MAY BE USED, HOWEVER, A 4 INCH MINIMUM WASHED PEA GRAVEL FILTER COURSE LAYER AT THE TOP OF THE CRUSHED ROCK IS REQUIRED.
6. IMPERMEABLE LINER SHALL BE INSTALLED WHEN THE BIOFILTRATION BASIN IS WITHIN 10 FEET OF RETAINING WALLS OR BUILDING FOUNDATIONS, OR AS RECOMMENDED BY THE SOILS ENGINEER, OR REQUIRED BY THESE PLANS. IMPERMEABLE LINER SHALL BE 30 MIL THICK (PER COUNTY OF SAN DIEGO GREEN STREETS DESIGN STANDARD DRAWING GS-3.00 AND COUNTY GREEN STREETS SUPPLEMENT TO CAL TRANS SPECIFICATIONS 20-11.08B) CONFIGURED TO ENTIRELY ENCOMPASS THE SIDES OF THE WATER QUALITY BASIN.
7. IMPERMEABLE LINER BE CONSTRUCTED IN COMPLIANCE WITH THE COUNTY OF SAN DIEGO GREEN STREETS SUPPLEMENT TO CAL TRANS SPECIFICATIONS 20-11.08D.
8. BIOFILTRATION SOIL MEDIA LAYER (BSM) SHALL CONSIST OF 60% TO 80% BY VOLUME SAND, UP TO 20% BY VOLUME TOPSOIL, AND UP 20% BY VOLUME COMPOST (PER COUNTY OF SAN DIEGO BMP DESIGN MANUAL SEPTEMBER 2020 APPENDIX F.2 SECTION 803-2 BLENDED BSM CRITERIA AND TESTING REQUIREMENTS) PLACED IN 6" LIFTS AND COMPACTED WITH WATER PRIOR TO THE NEXT LIFT. INITIAL PERMEABILITY SHALL BE 8" PER HOUR (WITH ASSUMED STABILIZED PERMEABILITY OF 5" PER HOUR).
9. THE AGGREGATE STORAGE LAYER SHALL BE COMPACTED IN ACCORDANCE WITH SOILS ENGINEER'S RECOMMENDATIONS.
10. OVERFLOW STRUCTURE TO HAVE A MINIMUM OF 2 INCHES OF FREEBOARD.
11. ALL LINER INSTALLATIONS, FIELD WELDING OF SEAMS, AND OBSERVATION OF SOIL MIX PLACEMENT SHALL REQUIRE SPECIAL INSPECTION BY THE PROJECT GEOTECHNICAL ENGINEER OR OTHER QUALIFIED PERSON. A LETTER CERTIFYING PROPER INSTALLATION SHALL BE PROVIDED TO THE ENGINEER OF RECORD TO ACCEPTANCE OF THE FACILITIES.
12. SPECIAL INSPECTION SHALL BE REQUIRED FOR CONSTRUCTION OF ALL BIOFILTRATION BASINS. INSPECTION SHALL BE PERFORMED BY A QUALIFIED INDIVIDUAL (SUCH AS: ENGINEER OF RECORD, QSD). INSPECTION SHALL INCLUDE:
    - VERIFICATION OF OVERALL DIMENSIONS PRIOR TO PLACEMENT OF MATERIALS;
    - PLACEMENT OF THE LINER, IF REQUIRED; AND SEAMS OR PENETRATIONS
    - PLACEMENT OF THE GRAVEL, FILTER MATERIALS, AND FILTER MEDIA;
    - ALL INLET AND OUTLET STRUCTURES INCLUDING UNDERDRAINS, IF REQUIRED.
    - CONTRACTOR SHALL TAKE PICTURES AT EACH STAGE OF INSTALLATION AND SUBMITTED TO ENGINEER FOR VERIFICATION OF INSTALL.

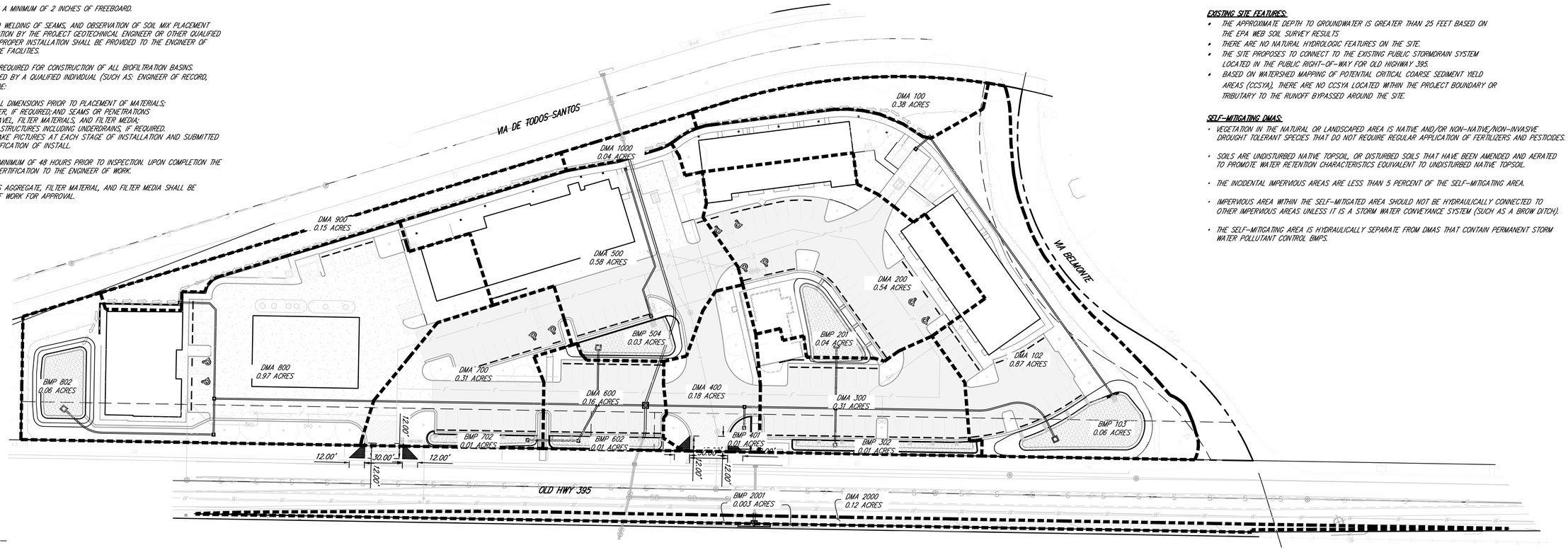
    INSPECTOR SHALL BE GIVEN A MINIMUM OF 48 HOURS PRIOR TO INSPECTION. UPON COMPLETION THE INSPECTOR SHALL PROVIDE A CERTIFICATION TO THE ENGINEER OF WORK.
13. PROPOSED MATERIALS, SUCH AS AGGREGATE, FILTER MATERIAL, AND FILTER MEDIA SHALL BE SUBMITTED TO THE ENGINEER OF WORK FOR APPROVAL.



BIOFILTRATION BASIN DETAIL
NOT TO SCALE

STRUCTURAL BIO-BASIN SUMMARY TABLE													
BMP NAME	TYPE OF BMP	EFFECTIVE AREA (SQFT)	A1 (INCH) TOP OF RISER	A2 (INCH) TOP OF BASIN	A3 (INCH) CLEAN OUT	B (INCH) UPPER ORIFICE	C (INCH) MEDIA	D (INCH) GRAVEL	E (INCH) DISTANCE FROM TOE OF SLOP TO LINER	F (INCH) PERF. PIPE IE OFFSET	BOX RISER OVERFLOW STRUCTURE SIZE (INCHES)	ORIFICES DIAMETER		IMPERMEABLE LINER ?
												UPPER (INCH)	LOWER (INCH)	
BMP-103	BIOFILTRATION	2767	9	36	9	N/A	18	30	27	18	36X36	N/A	0.75	NO
BMP-201	BIOFILTRATION	1712	9	18	9	N/A	18	18	27	6	36X36	N/A	0.5	NO
BMP-302	BIOFILTRATION	1020	9	18	9	N/A	18	18	27	6	24X24	N/A	0.5	NO
BMP-401	BIOFILTRATION	278	9	18	9	N/A	18	18	27	3	18X18	N/A	0.5	NO
BMP-504	BIOFILTRATION	1531	9	17.6	9	N/A	18	18	27	3	36X36	N/A	0.5	NO
BMP-602	BIOFILTRATION	558	9	12	9	N/A	18	18	27	3	18X18	N/A	0.5	NO
BMP-702	BIOFILTRATION	560	9	5.4	9	N/A	18	18	27	3	18X18	N/A	0.5	NO
BMP-802	BIOFILTRATION	1807	SEE CATCH BASIN DETAIL	36	9	SEE CATCH BASIN DETAIL	18	30	27	18	36X36	SEE CATCH BASIN DETAIL	0.75	NO
** BMP-2001	BIOFILTRATION	150	9	9	9	N/A	18	12	27	3	18X18	N/A	0.5	YES

NOTE: * MEASUREMENTS ARE FROM FINISH SURFACE OF BASIN.
** BMP IS SPLIT EVENLY AT TWO SIDES OF THE STREET AND ARE CONNECTED UNDERGROUND.



HYDROLOGIC SOIL GROUP

THE HYDROLOGICAL SOIL GROUPS FOR THIS SITE ARE TYPES (A) AND (C).

EXISTING SITE FEATURES:

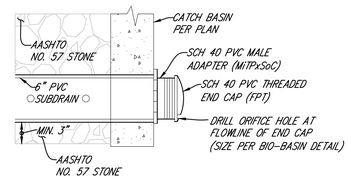
- THE APPROXIMATE DEPTH TO GROUNDWATER IS GREATER THAN 25 FEET BASED ON THE EPA WEB SOIL SURVEY RESULTS
- THERE ARE NO NATURAL HYDROLOGIC FEATURES ON THE SITE.
- THE SITE PROPOSES TO CONNECT TO THE EXISTING PUBLIC STORMDRAIN SYSTEM LOCATED IN THE PUBLIC RIGHT-OF-WAY FOR OLD HIGHWAY 395.
- BASED ON WATERSHED MAPPING OF POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS (CCSYA), THERE ARE NO CCSYA LOCATED WITHIN THE PROJECT BOUNDARY OR TRIBUTARY TO THE RUNOFF BYPASSED AROUND THE SITE.

SELF-MITIGATING DMAS:

- VEGETATION IN THE NATURAL OR LANDSCAPED AREA IS NATIVE AND/OR NON-NATIVE/NON-INVASIVE DROUGHT TOLERANT SPECIES THAT DO NOT REQUIRE REGULAR APPLICATION OF FERTILIZERS AND PESTICIDES.
- SOILS ARE UNDISTURBED NATIVE TOPSOIL OR DISTURBED SOILS THAT HAVE BEEN AMENDED AND AERATED TO PROMOTE WATER RETENTION CHARACTERISTICS EQUIVALENT TO UNDISTURBED NATIVE TOPSOIL.
- THE INCIDENTAL IMPERVIOUS AREAS ARE LESS THAN 5 PERCENT OF THE SELF-MITIGATING AREA.
- IMPERVIOUS AREA WITHIN THE SELF-MITIGATED AREA SHOULD NOT BE HYDRAULICALLY CONNECTED TO OTHER IMPERVIOUS AREAS UNLESS IT IS A STORM WATER CONVEYANCE SYSTEM (SUCH AS A BROW DITCH).
- THE SELF-MITIGATING AREA IS HYDRAULICALLY SEPARATE FROM DMAS THAT CONTAIN PERMANENT STORM WATER POLLUTANT CONTROL BMPS.



6" PVC PIPE PERFORATION LAYOUT DETAIL
NOT TO SCALE



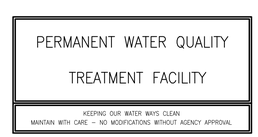
ORIFICE DETAIL
NOT TO SCALE



DETAIL "NO DUMPING" AT CATCH BASINS

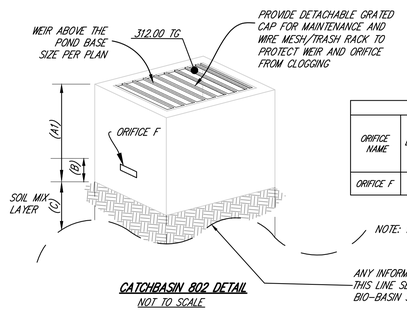
NOTE: ALL CATCH BASINS WITH GRATES SHALL BE STENCILED WITH CITY REQUIRED ITEM PER ABOVE DETAIL:

(DAS MANUFACTURING #SDO OR EQUIVALENT)



DETAIL WATER QUALITY SIGN– PLACED AT EACH BIOFILTRATION BASIN

NOTE: ALL BIOFILTRATION AREAS WILL HAVE A SIGN POSTED TO BE VISIBLE AT ALL TIMES.



CATCHBASIN 802 DETAIL
NOT TO SCALE

ORIFICE SUMMARY TABLE								
ORIFICE NAME	INVERT ELEVATION (FT)	B (INCH)	A1 TOP OF RISER (INCH)	NUMBER OF BARRELS	SPAN (INCH)	RISE (INCH)	MAX WATER SURFACE ELEVATION (FT)	FREE BOARD ELEVATION (FT)
ORIFICE F	310.50	9.00	27	1	8	2	311.75	311.75

DMA EXHIBIT
SHEET 7 OF 7 SHEETS

PALA MESA PLAZA
SITE DEVELOPMENT PLAN
APN 125-050-54-00

K:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\SWDM\DMA and HMP Exhibits\DMA-POST - Current - 2.dwg 6/13/2023 5:41 PM ORIGINAL PLOT SIZE: ---

3.0 Cover Sheet and General Requirements

- Standard SWQMP Form Table 2 and PDP SWQMP Form Table 3 require the identification of pollutant-generating sources and associated BMPs for development projects.

- In some cases, County staff may request additional, more detailed documentation of source control BMP design details. If requested, applicants must submit a completed copy of this Source Control BMP Worksheet. This requirement can be satisfied either by submitting a copy of BMPDM Attachment E.1 (Source Control BMP Requirements) or equivalent documentation at the County's discretion.

- Submit this documentation using this cover sheet.

- Sources and BMPs must also be shown as applicable on DMA exhibits and construction plans (see Attachment 2).

Appendix

E

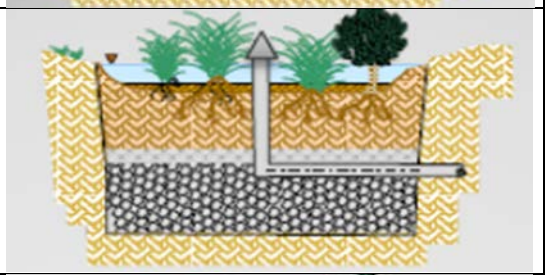
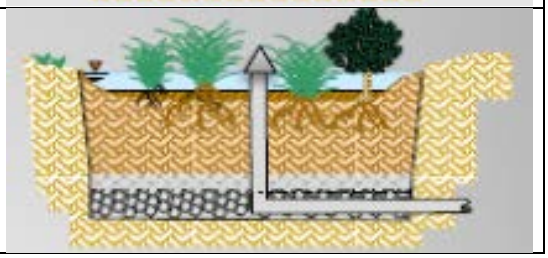
BMP Design Fact Sheets

Appendix E BMP Design Fact Sheets

The following fact sheets were developed to assist the project applicants with designing BMPs to meet the storm water obligations. The Fact Sheet Quick Guide on the next page summarizes the layout and type of information contained in each fact sheet.

MS4 Category	Manual Category	Design Fact Sheet	Page
Source Control	Source Control	SC: Source Control BMP Requirements	E-4
		SC-6A: Source Control for Large Trash Generating Facilities	E-18
		SC-6B: Source Control for Animal Facilities	E-22
		SC-6C: Source Control for Plant Nurseries and Garden Centers	E-24
		SC-6D: Source Control for Automotive-related Uses	E-26
Site Design	Site Design	SD-A Tree Wells	E-28
		SD-B: Impervious Area Dispersion	E-42
		SD-C: Green Roofs	E-50
		SD-D: Permeable Pavement (Site Design BMP)	E-58
		SD-E: Rain Barrels	E-68
		SD-F: Amended Soil	E-74
Retention	Harvest and Use	HU-1: Cistern	E-78
	Infiltration	INF-1: Infiltration Basins	E-88
		INF-2: Bioretention	E-100
		INF-3: Permeable Pavement (Pollutant Control)	E-114
		INF-4: Dry Wells	E-132
	Partial Retention	PR-1: Biofiltration with Partial Retention	E-136
Biofiltration	Biofiltration	BF-1: Biofiltration	E-150
		BF-2: Nutrient Sensitive Media Design	E-164
		BF-3: Proprietary Biofiltration	E-168
Flow-thru Treatment Control	Flow-thru Treatment Control with Alternative Compliance	FT-1: Vegetated Swales	E-170
		FT-2: Media Filters	E-182
		FT-3: Sand Filters	E-190
		FT-4: Dry Extended Detention Basin	E-200
		FT-5: Proprietary Flow-thru Treatment Control	E-210

BMP Comparison Table

BMP Type	Soil Media	Underdrain present?	Bottom Liner Present ?	Typical Design
Infiltration (INF-1)	Optional	No	No	
Bioretention (INF-2)	BSM	No	No	
Biofiltration with Partial Retention (PR-1)	BSM	Yes- Optional	No	
Biofiltration (BF-1)	BSM	Yes	Yes	

E.1 Fact Sheet Quick Guide

BF-1 Biofiltration (1)



Location: 43rd Street and Logan Avenue, San Diego, California (3)

MS4 Permit Category (2)
Biofiltration

Manual Category
Biofiltration

Applicable Performance Standard
Pollutant Control
Flow Control

Primary Benefits
Treatment

Description (4)

Biofiltration (Bioretention with underdrain) facilities are vegetated surface water systems that filter water through vegetation, and soil or engineered media prior to discharge via underdrain or overflow to the downstream conveyance system.

Fact Sheet Key	
1	Best Management Practice (BMP) Title
2	Categories, Standards, and Benefits
3	BMP Image
4	Main Content; Categories Include: •Description •Design Adaptations for Project Goals •Recommended Siting Criteria •Recommended BMP Component Dimensions •Design Criteria and Considerations •Conceptual Design and Sizing Approach for o Site Design o Storm Water Pollutant Control Only o Integrated Storm Water Pollutant Control and Flow Control •Maintenance Overview •Summary of Standard Inspection and Maintenance

E.2 Source Control BMP Requirements

Worksheet E.1-1: Source Control BMP Requirements

How to comply: Projects must comply with this requirement by implementing all source control BMPs listed in this section that are applicable and feasible for their project. Applicability must be determined through consideration of the development project's features and anticipated pollutant sources. Appendix E.2 provides guidance for identifying source control BMPs applicable to a project. The Standard and PDP SWQMP templates include sections that must be used to document compliance with source control BMP requirements.

How to use this worksheet:

1. Review Column 1 and identify which of these potential sources of storm water pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your project site plan.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in a table in your project-specific storm water management report. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternatives.

If These Sources Will Be on the Project Site …	… Then Your SWQMP Must Consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on Drawings**	**3** **Permanent Controls—List in Table and Narrative**	**4** **Operational BMPs—Include in Table and Narrative**
☒ **A.** Onsite storm drain inlets ❑ Not Applicable	☒ Locations of inlets.	☒ Mark all inlets with the words "No Dumping! Flows to Bay" or similar. See stencil template provided in Appendix I-4	☒ Maintain and periodically repaint or replace inlet markings. ☒ Provide storm water 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 Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-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."

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on Drawings**	**3** **Permanent Controls—List in Table and Narrative**	**4** **Operational BMPs—Include in Table and Narrative**
❑ **B.** Interior floor drains and elevator shaft sump pumps ☒ Not Applicable		❑ 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 ☒ Not Applicable		❑ State that parking garage floor drains will be plumbed to the sanitary sewer.	❑ Inspect and maintain drains to prevent blockages and overflow.
☒ **D1.** Need for future indoor & structural pest control ❑ Not Applicable		❑ Note building design features that discourage entry of pests.	☒ Provide Integrated Pest Management information to owners, lessees, and operators.

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on Drawings**	**3** **Permanent Controls—List in Table and Narrative**	**4** **Operational BMPs—Include in Table and Narrative**
☒ **D2.** Landscape/ Outdoor Pesticide Use ❑ Not Applicable	☒ Show locations of existing trees or areas of shrubs and ground cover to be undisturbed and retained. ❑ Show self-retaining landscape areas, if any. ☒ Show storm water treatment facilities.	State that final landscape plans will accomplish all of the following. ☒ Preserve existing drought tolerant 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 storm water pollution. ☒ Where landscaped areas are used to retain or detain storm water, specify plants that are tolerant of periodic saturated soil conditions. ☒ Consider using pest-resistant plants, especially adjacent to hardscape. ☒ To ensure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use,	☒ Maintain landscaping using minimum or no pesticides. ❑ See applicable operational BMPs in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks ❑ Provide IPM information to new owners, lessees and operators.

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on Drawings**	3 **Permanent Controls—List in Table and Narrative**	4 **Operational BMPs—Include in Table and Narrative**
❑ **E.** Pools, spas, ponds, decorative fountains, and other water features. ☒ Not Applicable	❑ Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet.	❑ If the local municipality 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 Fact Sheet SC-72, "Fountain and Pool Maintenance," in the CASQA Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks
☒ **F.** Food service ❑ Not Applicable	☒ 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 ensure that the largest items can be accommodated.	

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of**	2 **Permanent Controls—Show on Drawings**	3 **Permanent Controls—List in Table and Narrative**	4 **Operational BMPs—Include in Table and Narrative**
☒ **G.** Refuse areas ☐ Not Applicable	☒ 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. Also show how the designated area will be protected from wind dispersal. ☒ Any drains from dumpsters, compactors, and tallow bin areas must 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 Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on Drawings**	**3** **Permanent Controls—List in Table and Narrative**	**4** **Operational BMPs—Include in Table and Narrative Table and Narrative**
❑ **H.** Industrial processes. ☒ Not Applicable	❑ Show process area.	❑ If industrial processes are to be located onsite, 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-Storm Water Discharges" in the CASQA Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks
❑ **I.** Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.) ☒ Not Applicable	❑ Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or runoff from area and protected from wind dispersal. ❑ Storage of non-hazardous liquids must 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 local Hazardous Materials Programs for: ▪ Hazardous Waste Generation ▪ Hazardous Materials Release Response and Inventory ▪ California Accidental Release Prevention Program ▪ Aboveground Storage Tank ▪ Uniform Fire Code Article 80 Section 103(b) & (c) 1991 ▪ Underground Storage Tank	❑ See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials" in the CASQA Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on Drawings**	3 **Permanent Controls—List in Table and Narrative**	4 **Operational BMPs—Include in Table and Narrative**
❑ **J.** Vehicle and Equipment Cleaning ☒ Not Applicable	❑ Show on drawings as appropriate: (1) Commercial/industrial facilities having vehicle /equipment cleaning needs must 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 must have a paved, bermed, and covered car wash area (unless car washing is prohibited onsite and hoses are provided with an automatic shut- off to discourage such use). (3) Washing areas for cars, vehicles, and equipment must 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 must be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility must discharge to the sanitary sewer, or a wastewater reclamation system must be installed.	❑ If a car wash area is not provided, describe measures taken to discourage onsite 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 must not be discharged to the storm drain system. ❑ Car dealerships and similar may rinse cars with water only. ❑ See Fact Sheet SC-21, "Vehicle and Equipment Cleaning," in the CASQA Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on Drawings**	3 **Permanent Controls—List in Table and Narrative**	4 **Operational BMPs—Include in Table and Narrative**
❑ **K.** Vehicle/Equipment Repair and Maintenance ☒ Not Applicable	❑ Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to protect from rainfall, run-on runoff, and wind dispersal. ❑ 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 must 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 report, note that all of the following restrictions apply to use the site: ❑ No person must 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 must 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 must be contained or drained from the vehicle immediately. ❑ No person must leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on Drawings**	**3** **Permanent Controls—List in Table and Narrative**	**4** **Operational BMPs—Include in Table and Narrative**
☒ **L.** Fuel Dispensing Areas ☐ Not Applicable	☒ Fueling areas[2] must have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are (1) graded at the minimum slope necessary to prevent ponding; and (2) separated from the rest of the site by a grade break that prevents run-on of storm water to the MEP. ☒ Fueling areas must 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 area1.] The canopy [or cover] must not drain onto the fueling area.		☒ The property owner must dry sweep the fueling area routinely. ☒ See the Business Guide Sheet, "Automotive Service—Service Stations" in the CASQA Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks

[2] The fueling area must 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 SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on Drawings**	**3** **Permanent Controls—List in Table and Narrative**	**4** **Operational BMPs—Include in Table and Narrative**
M. Loading Docks ☒ Not Applicable	❑ Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks must be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts must be positioned to direct storm water away from the loading area. Water from loading dock areas should be drained to the sanitary sewer where feasible. Direct connections to storm drains from depressed loading docks are prohibited. ❑ Loading dock areas draining directly to the sanitary sewer must be equipped with a spill control valve or equivalent device, which must 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 Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on Drawings**	3 **Permanent Controls—List in Table and Narrative**	4 **Operational BMPs—Include in Table and Narrative**
☒ **N.** Fire Sprinkler Test Water ❑ Not Applicable		☒ 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 Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks
O. Miscellaneous Drain or Wash Water ❑ Boiler drain lines ☒ Condensate drain lines ☒ Rooftop equipment ☒ Drainage sumps ☒ Roofing, gutters, and trim ❑ Not Applicable		❑ Boiler drain lines must 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 mounted equipment with potential to produce pollutants must be roofed and/or have secondary containment. ☒ Any drainage sumps onsite must 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.	

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on Drawings**	3 **Permanent Controls—List in Table and Narrative**	4 **Operational BMPs—Include in Table and Narrative**
☒ **P.** Plazas, sidewalks, and parking lots. ☐ Not Applicable			☒ Plazas, sidewalks, and parking lots must be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing must be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser must be collected and discharged to the sanitary sewer and not discharged to a storm drain.

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5.0 General Requirements

- Each Priority Development Project (PDP) must provide a description of existing site conditions and proposed changes to them, including changes to topography and drainage.
- Has a **Drainage Report** has been prepared for the PDP?

  ☒ **Yes**

  - Review of the Drainage Report must be concurrent with the PDP SWQMP.
  - Include the summary page of the Drainage Report with this cover page, and provide the following information:

    Title: HYDROLOGY/HYDRAULICS STUDY, Pala Mesa Plaza, 3233 Old Highway 395, Fallbrook, CA 92028. APN: 125-050-54-00

    Prepared By: Excel Engineering

    Date: 6/13/2023
  - Do not complete the rest of this attachment (also exclude these additional pages from your submittal). Additional documentation of site and drainage conditions is not required unless requested by County staff.

  ☐ **No** -- Complete and submit the remainder of this attachment below.

HYDROLOGY / HYDRAULICS STUDY

FOR THE:
Pala Mesa Plaza
3233 Old Highway 395
Fallbrook, CA 92028
APN: 125-050-54-00

PREPARED FOR:
TGRH3 LLC, Rafid Hamika Managing Member
3712 East Owens Ave #101
North Las Vegas, NV 89030

PREPARED BY:
EXCEL ENGINEERING
440 State Place
Escondido, CA 92029
Tel: (760) 745-8118
Project No: 19-025

ORIGINAL REPORT PREPARATION DATE:
June 17, 2020

REVISION DATE(S):

June 7, 2022

June 13, 2023

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1.0 PROJECT DESCRIPTION

1.1 Purpose of Study

The purpose of this study is to support the site redevelopment plans for an existing commercial property located in the jurisdictional boundary of the County of San Diego. This study will demonstrate that the post-development 100-year peak runoff will not exceed existing peak runoff rates.

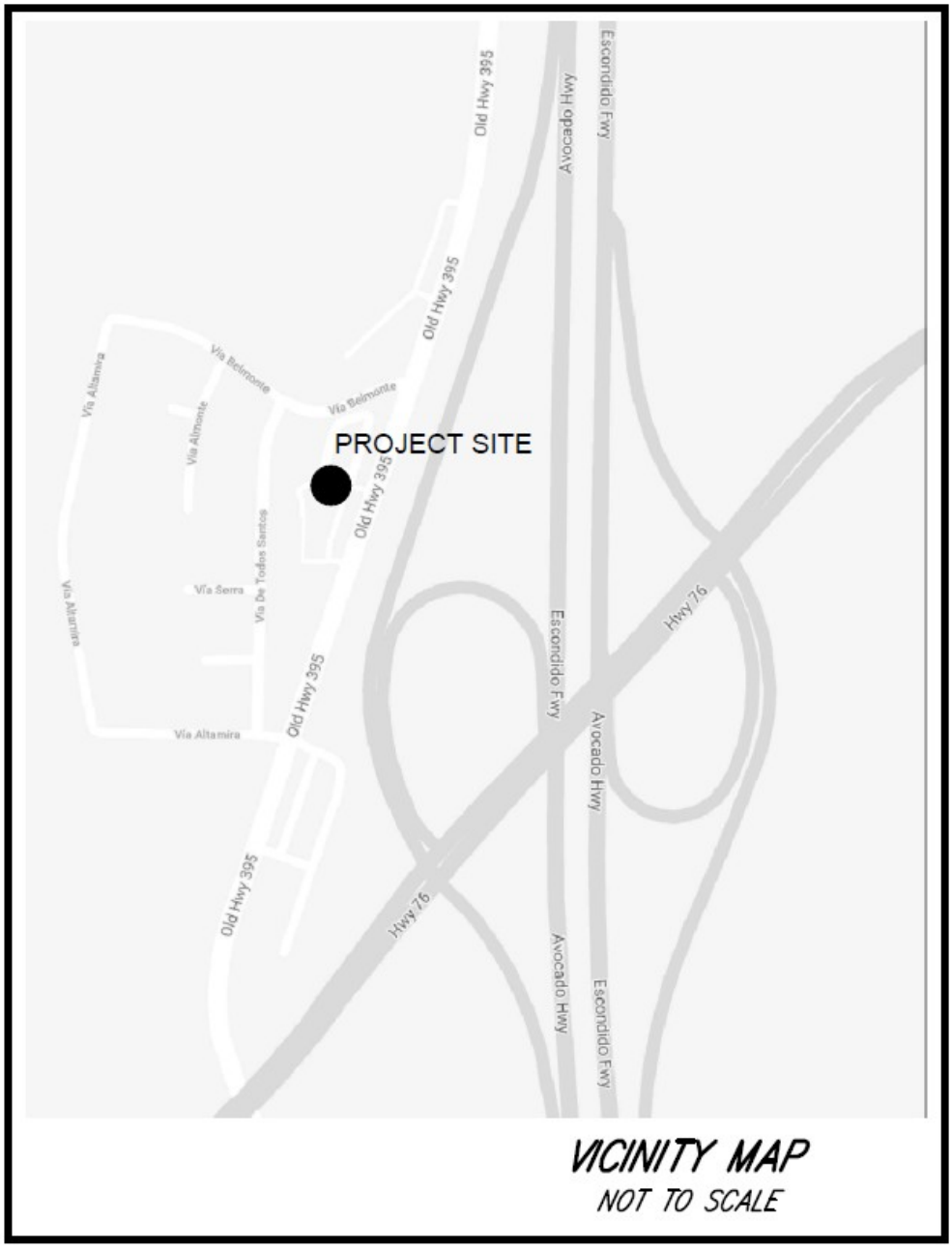
1.2 Project Description

The site is an existing low-density commercial site composed of a small grocery store market, a small hamburger restaurant, and an existing operating landscape nursery. The project fronts onto old highway 395 which bounds the project to the east.

The project proposes to retain the two existing buildings, add two new retail buildings near the northern portion of the site, and add a third convenience store building near the southern point of the site. The convenience store will include a six-pump fuel island. Along with the newly constructed buildings, the project proposes to add reconfigured parking spaces, drive isles and various patio areas and walkways throughout the site. The project will have two access points to Old Highway 395.

2.0 VICINITY MAP

The project is located on the western side of Old Highway 395 just north of the intersection of Interstate 15 and Highway 76 Pala Road, in the county of San Diego, California.



3.0 DESCRIPTION OF WATERSHED

3.1 Pre-Development Topography and Drainage Patterns

The site is an existing low-density commercial site composed of a small grocery store market, a small hamburger restaurant, and an existing operating landscape nursery. The project fronts onto old highway 395 which bounds the project to the east. The project is bounded by Via De Todos Santos to the west, and Via Belmonte to the north. The property drains primarily by overland flow to an existing drain inlet located at about the mid north/south point near the easterly boundary of the site along Old Highway 395. The site is relatively level with a small 2:l cut slope forming the rear of the property where it meets grade with Via De Todos Santos. According to the Web Soil Survey, the western 25% property is composed of Soils Type A (along the cut slope). The remainder of the property is Soil Type C. The site is well traveled, and compaction of topsoil is estimated to be high. The same runoff factors will be used for the overall project calculations.

The approximately average percentage of impervious of the existing site condition was estimated based on aerial photography and detailed aerial topographic mapping. The approximately average percentage of impervious of the existing site condition is 30%. From Table 3-l "RUNOFF COEFFICIENTS FOR URBAN AREA", values of runoff coefficient "C" for 30% impervious are used in the pre-development **onsite** runoff calculations. The Runoff Coefficient C value is chosen based on the percentage of impervious of the entire site.

There is a drainage pipe that crosses the site and meets the on-site discharge at the onsite drain inlet at the POC. The drainpipe conveys the discharge of a portion of Via Todos Santos and the tributary offsite area of approximately 5 acres of the neighboring residential subdivision. The approximately average percentage of impervious of this offsite drainage area is 40%. From table 3-l values of runoff coefficient "C" for 40% impervious are used in the pre-development **offsite** pass-through drainage calculations.

A pre-developed drainage map can be found as Attachment 2 in this report.

3.2 Post-Development Topography and Drainage Patterns

The project proposes to retain the two existing buildings and add two new retail buildings near the northern portion of the site, and a third convenience store building near the southern point of the site. The convenience store will include a six-pump fuel island. Along with the additional new buildings the project proposes to add reconfigured parking spaces, drive isles and various patio areas and walkways throughout the site. The project will have two access points to Old Highway 395.

The project proposed to install several biofiltration basins for storm water quality to incorporate the collection of storm water from the building and parking lot and

direct the storm water through storm water drainage pipes to POC, which is located at the east edge of the study site.

The average impervious square footage of the post-development was estimated based on aerial photography and detailed aerial topographic mapping to be approximately 80% of the site. From table 3-l "RUNOFF COEFFICIENTS FOR URBAN AREAs", runoff coefficients for 80% impervious will be used in the post-development runoff calculations.

A post-developed drainage map can be found as Attachment 2 in this report.

At node 107, the proposed connection to the public storm drain system, the flows provide an increase in runoff of 0.391 cfs, therefore, BMP-802 is being used for the peak flow detention. After mitigation, the flows at this proposed connection to the public storm system decreased by 1.378 cfs. Please see the mitigation calculations in Attachment 3g and Hydrograph report in Attachment 5 in this report.

3.3 Hydrologic Unit Contribution

The project is located in the Bonsall Hydrologic Sub Area of the Lower San Luis Rey Hydrologic Area of the San Luis Rey Hydrologic Unit (903.12). The project is tributary to a public storm drain system that discharges to the San Luis Rey River.

A map showing the project location with respect to the hydrologic basin areas can be found in Attachment 2 in this report.

4.0 METHODOLOGY

This report is prepared in accordance with the 2003 San Diego County Hydrology Manual (Hydrology Manual). Based on the overall tributary study area, calculations are based on the Rational Method.

4.1 Hydrology Software

The main program is the "San Diego County Rational Hydrology Program" by CIVILCADD/CIVILDESIGN Engineering Software, 1991-2004 Version 7.4, refereed hereafter as "CIVILD". This program specifically utilizes the methods prescribed in the County of San Diego Hydrology Manual and is one of the approved programs for the use in the San Diego area.

4.2 Routing Software

Hydraflow Hydrographs Extension for Autodesk Civil 3D, Version 2021is used for hydrologic routing of the entire project site. The hydrograph developed from the rational method is then manually entered into this software and routed into detention system. The hydrograph report can be found in Attachment 5 in this

report.

4.3 Soils Type Determination

The soils type for the project was determined by mapping the project limits on the EPA Web Soil Survey website. The Web Soil Survey indicates that the entire site is composed of soil types A and C. By observation, Appendix A of the Hydrology Manual supports the use of these two soil types in the calculations.

4.4 Isopluvial Value Determination

The isopluvial values for the l00-year 6 hour and 24-hour storm events were determined by plotting the project's location on the respective exhibits from Appendix B of the Hydrology Manual.

4.5 CEQA Requirements

The proposed project would not substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site. No significant alteration of any stream or river will occur on this site due to grading operations. All defined drainage channels are due to erosive effects of high velocity runoff from the uphill slopes. The development of the site will help mitigate further erosion downstream.

- The proposed project does not create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems. The flows from the project leave the site at less than predeveloped rates per the mitigated flow rates shown.

- The proposed project does not place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map, including County Floodplain Maps. No housing is proposed, and no FIRM identified flood hazard areas are located on the parcel.

- The proposed project does not place structures within a 100-year flood hazard area which would impede or redirect flood flows. No FIRM identified flood hazard areas are located on the parcel.

- The proposed project does not expose people or structures to a significant risk of loss, injury or death involving flooding as a result of the failure of a levee or dam. No levees or dams are proposed, and all runoff is being mitigated in properly designed flow control basins with redundancies. This will be noted in the conclusion.

5.0 CALCULATIONS

5.1 Determination of Drainage Area Parameters

The drainage area parameters are determined by delineating the extents and flow direction of runoff from each of the pre and post development drainage areas and measuring the respective changes in elevation, flow length and drainage area acreage. See Attachments **1** and 2 of this report for the respective drainage area exhibits.

5.2 Runoff Coefficient

The runoff coefficients for each of the drainage areas are taken from Table 3-l of the Hydrology Manual. Based on the EPA Web Soil Survey, this project site is type A and type C soil. The runoff coefficients C are based on the %IMPER. for this project. The runoff coefficients for each of the drainage areas are taken from Table 3-l of the San Diego County Hydrology Manual. For this project, the approximately average percent of impervious of the post development is 80%.

Table 3-l is included in the CIVILD software, and the values chosen based on the program input parameters. The output file was checked to ensure that the correct C values are used.

In order to not have a negative impact on the post development downstream facilities, detention structure is needed in this project. The method we are using here on how to use the resulting values of the outflow hydrograph is recalculate the runoff coefficient C value based on fix values of the outflow hydrograph to achieve a C_{out}. The detailed description and calculation of the C_{out} value can be found in Attachment 5 in this report.

5.3 Manning Roughness Coefficient

Three values for the Manning Roughness Coefficient are used in the hydrology calculations. One for the overland flow travel time calculations, second for the pipe flow friction factor, and third for the street section/gutter flow calculations.

For the closed conduit calculations, the value for the roughness coefficient is taken from the Hydraulic Design Manual Table A-2. It is assumed that pipe material of Smooth Plastic Pipe (HPDE and PVC), Spiral Rib Pipe, Reinforced Concrete Pipe (RCP), or a similar material will be used on the project. The Manning's n factor for this class of pipe material is 0.0l3.

For the paved street surfaces and the gutter flow calculations, a value of 0.0l3 is used. This is taken from the hydraulic design manual, Table A-l and Table A-3.

5.4 Rational Method Calculation Summary

The peak runoff values for the 100-year storm are calculated according to the Hydrology Manual rational method. The calculations are performed using the CivilD software. A summary of the initial calculations is summarized in the table below:

Summary Table of Drainage diescharges from the Project							
	Node Number	Q100** (cfs)	Area (Acres)	Tc (Min)	V100 (ft/s)	C*	I* (in/hr)
PRE	POC Node 406	**34.46**	11.192	9.26	19.5	0.5	6.2
POST	POC Node 109	**34.17**	11.192	9.34	19.34	0.5	6.16
POST MITIGATION	POC Node 109	**32.795**	11.192	9.33	21.43	0.48	6.17

Table 1: Q-100 Analysis Results

Note: The comparison of our analysis is made about the same discharge points for the project. Drainage discharging from the project to the existing l8 inches pipe.

Note:

*Average rainfall intensity is calculated based on $I = 7.44*P_6T_c^{-O.645}$. Average runoff coefficient "C" is calculated based on Q = CIA.

** The total discharge here include the public road improvements.

Summary of Post Unmitigated Flows at Each BMP

Basin Node	Area (Acres)	Q100 (cfs)
BMP-103 Node-103	**1.020**	**3.125**
BMP-201 Node-202	**0.540**	**4.183**
BMP-302 Node-302	**0.310**	**2.230**
BMP-401 Node-402	**0.180**	**1.295**
BMP-503 Node-503	**0.566**	**2.554**
BMP-602 Node-602	**0.170**	**1.223**
BMP-702 Node-702	**0.320**	**1.743**
BMP-802 Node-802	**0.970**	**2.674**

Table 2: Q-100 flows at each basin node

Per Table 1 (see above) the post development flow of 34.17 cfs is lower than the pre-development flow of 34.46 cfs.

CivilD data and output files can be found in Attachment 3 of this report.

By observation of the results in the summary table, the proposed redevelopment of the site will have an overall decrease in the 100-year peak flow discharge from the site.

6.0 CONCLUSION

Based on the results of this report, the project does not increase the 100-year peak flow rate of the mitigated stormwater discharge from the site as flows are lower than those of the Pre-development. The project meets the County of San Diego standards for peak flow control and therefore can concluded that this project will not impact the existing downstream storm drainage facilities.

This project does not sit within a 100-year flood hazard zone as mapped on the federal Flood Insurance Rate maps for this area.

- The proposed project would not substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site. No significant alteration of any stream or river will occur on this site due to grading

operations. All defined drainage channels are due to erosive effects of high velocity runoff from the uphill slopes. The development of the site will help mitigate further erosion downstream.

- The proposed project does not create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems. The flows from the project leave the site at less than predeveloped rates per the mitigated flow rates shown.

- The proposed project does not place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map, including County Floodplain Maps. No housing is proposed, and no FIRM identified flood hazard areas are located on the parcel.

- The proposed project does not place structures within a 100-year flood hazard area which would impede or redirect flood flows. No FIRM identified flood hazard areas are located on the parcel.

- The proposed project does not expose people or structures to a significant risk of loss, injury or death involving flooding as a result of the failure of a levee or dam. No levees or dams are proposed, and all runoff is being mitigated in properly designed flow control basins with redundancies. This will be noted in the conclusion.

7.0 REFERENCES

County of San Diego Hydrology Manual, June 2003
San Diego County Hydraulic Design Manual, September 2014

8.0 Declaration of Responsible Charge

I hereby declare that I am the engineer of work for this project. That I have exercised responsible charge over the design of the project as defined in section 6703 of the business and professions codes, and that the design is consistent with current design.

I understand that the check of the project drawings and specifications by the City of San Marcos is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.

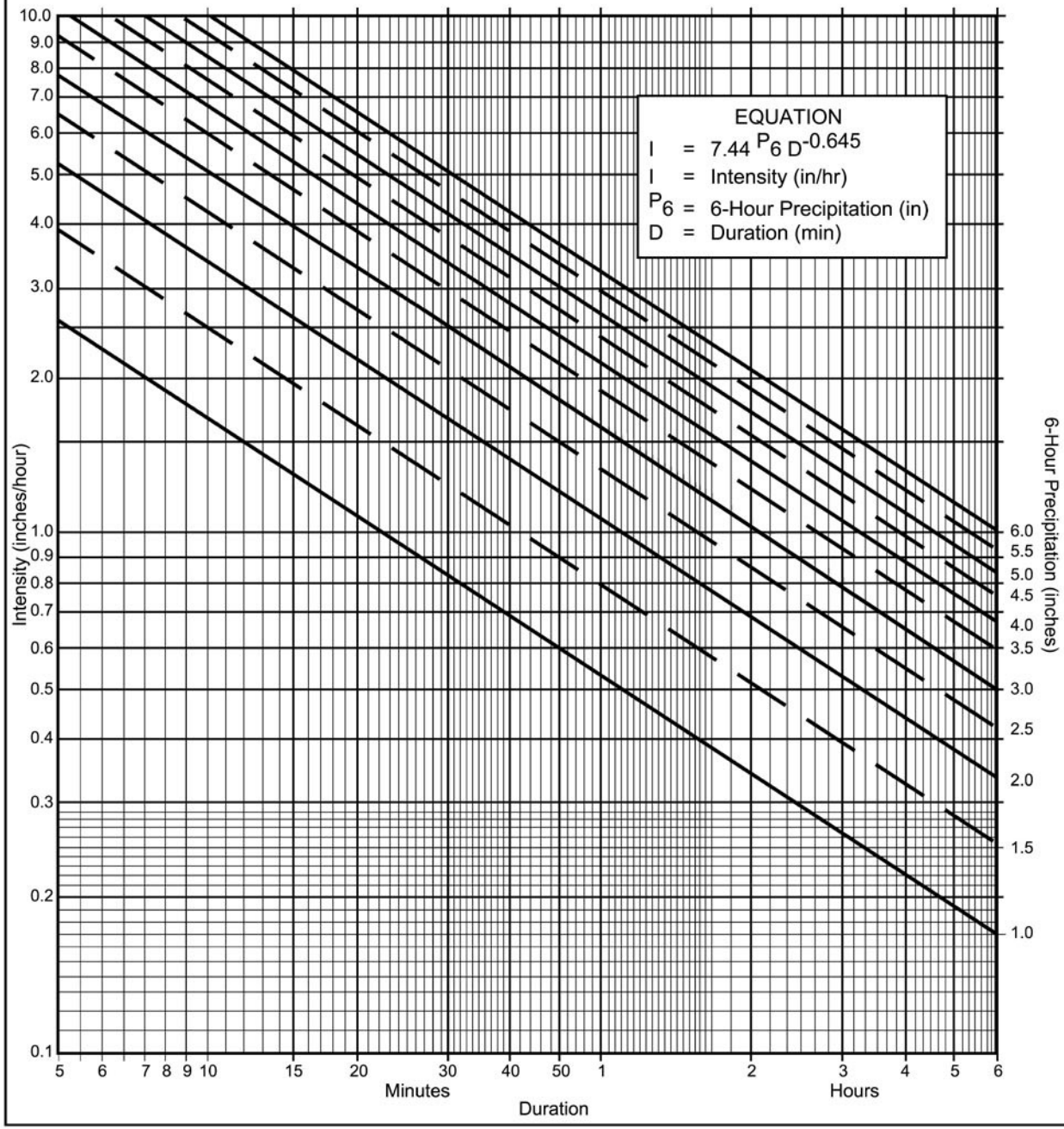
ENGINEER OF WORK
Excel Engineering
440 State Place
Escondido, CA 92029
Tel — (760)745-8118
Fax — (760)745-1890

Project Number: 19-025



Robert D. Dentino, RCE 45629 — Date
Registration Expire: December 31, 2024

ATTACHMENT 1



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency _____ year

(b) P_6 = _____ in., P_{24} = _____, $\frac{P_6}{P_{24}}$ = _____ %(2)

(c) Adjusted P_6(2) = _____ in.

(d) t_x = _____ min.

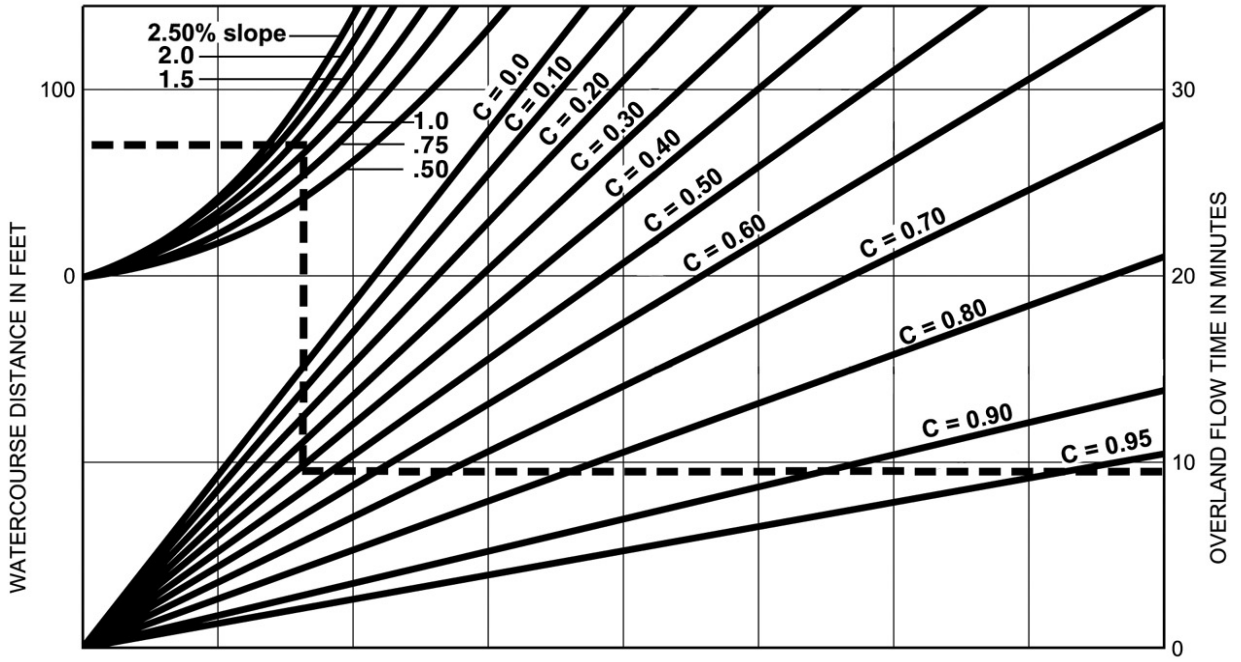
(e) I = _____ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE 3-1



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE

3-3

Rational Formula - Overland Time of Flow Nomograph

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service

Table 3-2

MAXIMUM OVERLAND FLOW LENGTH (L_M) & INITIAL TIME OF CONCENTRATION (T_i)

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description

Table A-2 Average Manning Roughness Coefficients for Closed Conduits[3]

Reinforced Concrete Pipe (RCP)	0.013
Corrugated Metal Pipe and Pipe Arch	
2-3/8 x 1/2 inch Corrugations	
Unlined	0.024
Half Lined	
Full Flow	0.018
d/D>=0.60	0.016
d/D<0.60	0.013
Fully Lined	0.013
3 x 1 inch Corrugations	0.027
6 x 2 inch Corrugations	0.032
Spiral Rib Pipe	0.013
Helically Wound Pipe	
18-inch	0.015
24-inch	0.017
30-inch	0.019
36-inch	0.021
42-inch	0.022
48-inch	0.023
Plastic Pipe (HPDE and PVC)	
Smooth	0.013
Corrugated	0.024
Vitrified Clay Pipe	0.014
Cast-Iron Pipe (Uncoated)	0.013
Steel Pipe	0.011
Brick	0.017
Cast-In-Place Concrete Pipe	
Rough Wood Forms	0.017
Smooth Wood or Steel Forms	0.014

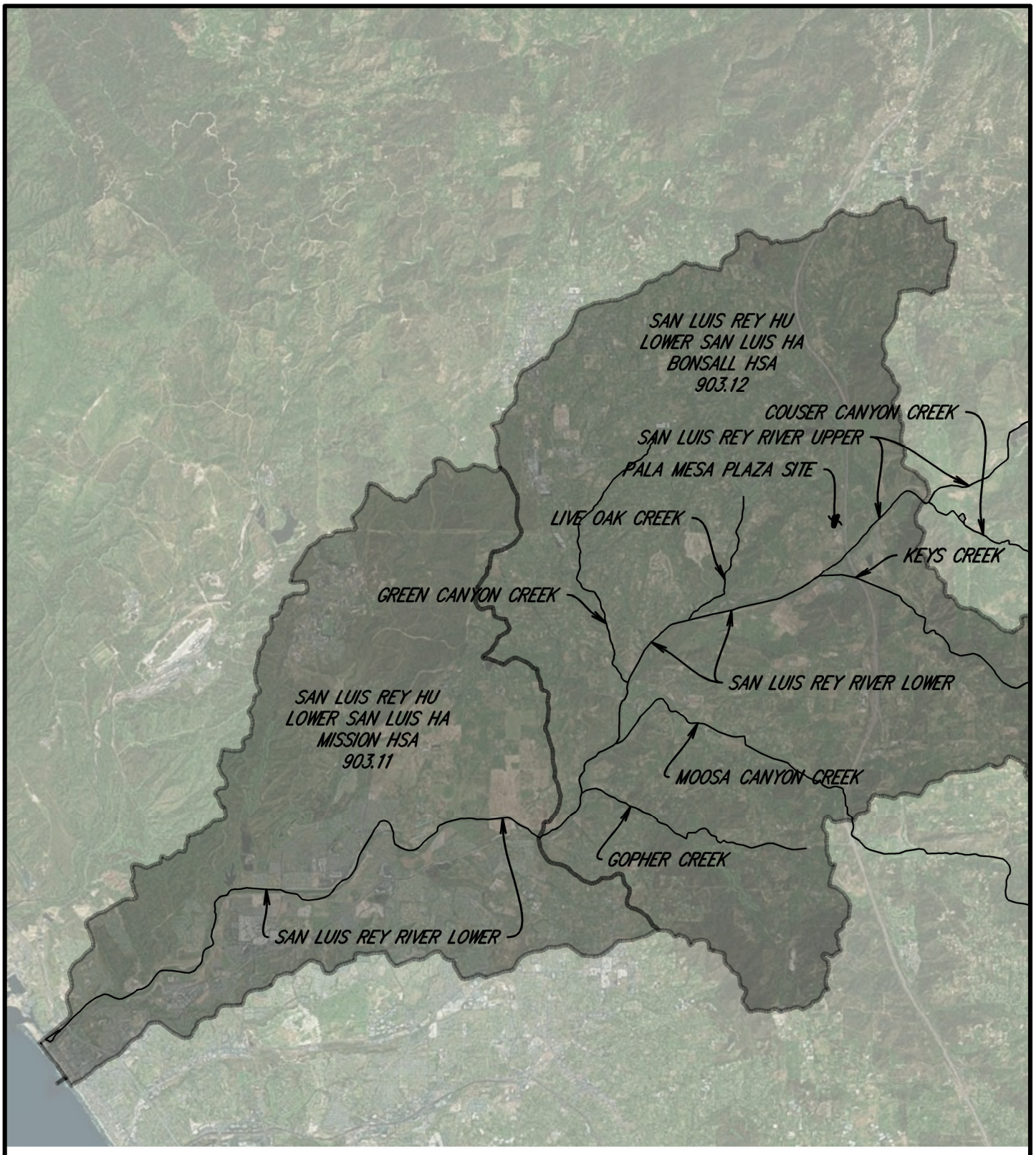
[3] Based on materials and workmanship required by standard specifications.

Table A-5

Table A-5 Average Manning Roughness Coefficients for Natural Channels

Minor Streams (Surface Width at Flood Stage < 100 ft)	
Fairly Regular Section	
(A) Some Grass and Weeds, Little or No Brush	0.030
(B) Dense Growth of Weeds, Depth of Flow Materially Greater Than Weed Height	0.040
(C) Some Weeds, Light Brush on Banks	0.040
(D) Some Weeds, Heavy Brush on Banks	0.060
(E) For Trees within Channel with Branches Submerged at High Stage, Increase All Above Values By	0.015
Irregular Section, with Pools, Slight Channel Meander	
Channels (A) to (E) Above, Increase All Values By	0.015
Mountain Streams; No Vegetation in Channel, Banks Usually Steep, Trees and Brush along Banks Submerged at High Stage	
(A) Bottom, Gravel, Cobbles and Few Boulders	0.050
(B) Bottom, Cobbles with Large Boulders	0.060
Flood Plains (Adjacent To Natural Streams)	
Pasture, No Brush	
(A) Short Grass	0.030
(B) High Grass	0.040
Cultivated Areas	
(A) No Crop	0.040
(B) Mature Row Crops	0.040
(C) Mature Field Crops	0.050
Heavy Weeds, Scattered Brush	0.050
Light Brush and Trees	0.060
Medium To Dense Brush	0.090
Dense Willows	0.170
Cleared Land with Tree Stumps, 100-150 Per Acre	0.060
Heavy Stand of Timber, Little Undergrowth	
(A) Flood Depth below Branches	0.110
(B) Flood Depth Reaches Branches	0.140

ATTACHMENT 2



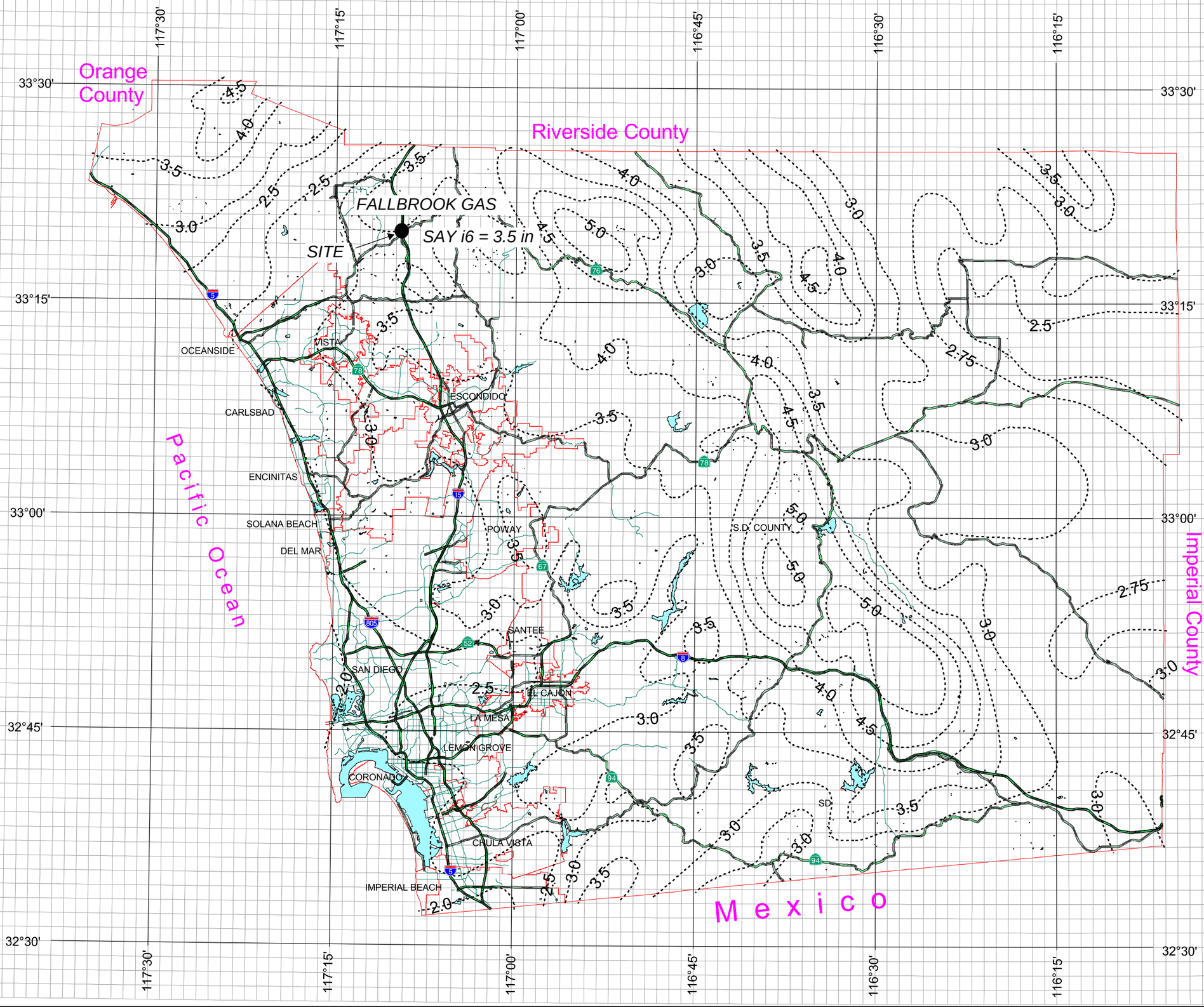
PALA MESA PLAZA
HYDROLOGIC AREAS

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)



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Department of Public Works
Geographic Information Services

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3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

FALLBROOK GAS
SAY i24 = 6 in
SITE

Orange County
Riverside County
Imperial County
Pacific Ocean
Mexico

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
CHULA VISTA
IMPERIAL BEACH
SD

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

DPW GIS
Department of Public Works
Geographic Information Services

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N W E S

3 0 3 Miles

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Hydrologic Soil Group—San Diego County Area, California
(19025 Location)



Map Scale: 1:1,640 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 14, Sep 16, 2019

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

Date(s) aerial images were photographed: Dec 31, 2009—Oct 22, 2017

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
GrC	Greenfield sandy loam, 5 to 9 percent slopes	A	0.9	19.7%
RaB	Ramona sandy loam, 2 to 5 percent slopes	C	3.5	80.3%
Totals for Area of Interest			**4.4**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



LEGEND

- HYD BASIN BOUNDARY
- NODE NUMBER (101)
- SURFACE FLOW
- PIPE FLOW
- STREET FLOW

HYDROLOGIC SOIL GROUP

THE HYROLOGICAL SOIL GROUPS FOR THIS SITE ARE TYPE (A & C)

NOTE:
APPROXIMATE DEPTH TO GROUNDWATER IS GREATER THAN 20'

EXCEL ENGINEERING
LAND PLANNING • ENGINEERING • SURVEYING
440 STATE PLACE, ESCONDIDO, CA 92029
PH (760)745-8118 FX (760)745-1890

PALA MESA PLAZA
HYDROLOGY PRE DEVELOPMENT EXHIBIT

K:\19\19025\Engineering\SDP\SDP 01\Storm Working Files\Hyd\Pre4-current.dwg 6/13/2023 1:15 PM ORIGINAL PLOT SIZE: ----

VIA DE TODOS SANTOS (PUBLIC)

OLD HWY 395 (PUBLIC)

VIA BELAMONTE (PUBLIC)

0.6004 ACRES

0.81 ACRES

0.11 ACRES

0.16 ACRES

0.28 ACRES

0.397 ACRES

0.13 ACRES

0.04 ACRES

0.03 ACRES

0.04ACRES

0.01 ACRES

0.07 ACRES

0.12 ACRES

0.14 ACRES

0.04 ACRES

0.07 ACRES

0.50 ACRES

0.71 ACRES

0.27 ACRES

0.66 ACRES

0.04 ACRES

0.07 ACRES

0.09 ACRES

3.83 ACRES

1.09 ACRES

0.4928 ACRES

0.838 ACRES

0.0338 ACRES

BASIN 802
Q_{100}=2.694 CFS

BASIN 702
Q_{100}=1.741 CFS

BASIN 602
Q_{100}=1.223 CFS

BASIN 502
Q_{100}=2.554 CFS

BASIN 202
Q_{100}=4.180 CFS

BASIN 402
Q_{100}=1.295 CFS

BASIN 102
Q_{100}=2.280 CFS

BASIN 103
Q_{100}=3.119 CFS

Q_{100}OFFSITE=13.794 CFS
TC=8.75 MIN
AREA OFFSITE=5 ACRES

POST Q_{100}=34.170 CFS
V100=19.34 FT/S
TC=9.26 MIN
$AREA_{TOTAL}$=11.192 ACRES
PRE Q_{100}=34.460 CFS
POST MITIGATION
Q_{100}=32.795 CFS

PRE PIPE Q100 FLOW =26.305 CFS
POST PIPE Q100 FLOW =26.696 CFS
POST MITIGATION PIPE Q100 FLOW =25.318 CFS

(379.0) ES
(372.0) ES
(347.0) ES
(344.0) FL 18" PVC OUT
L=839'
(325.6) FL 18" PVC IN
(325.5) FL 18" PVC OUT
(322.0) FL 18"EXIST. PVC IN
(322.0) FL 18"EXIST. PVC IN
311.1 FL 18" PVC OUT
311.5 FS
304.6 FL 12"PVC OUT
304.3 FL 12"PVC IN
304.3 FL 12"PVC IN
304.3 FL 12"PVC OUT
315.8 FS
315.6 FS
315.2 FS
12"PVC IN 316.3 FS
12"PVC OUT 316.5 FL
316.7 FS
316.8 FS
316.8 FS
316.3 FS
316.1 FS
316.1 FS
315.4 FS
316.0 FS
315.5 FS
312.1 FS
312.2 FS
312.0 FS
312.1 FS
310.0 FS
302.8 FL 12"PVC
302.8 FL 12"PVC IN
302.8 FL 12"PVC OUT
302.6 FL 18"PVC IN
302.6 FL 18"PVC IN
302.6 FL 18"PVC IN
302.5 FL 18"PVC OUT
302.1 FS
311.0 FS
303.0 FL 12"PVC IN
303.0 FL 12"PVC IN
303.0 FL 12"PVC OUT
306.83 FL 12"PVC OUT
(310.8) EG
310.14 FL 18"PVC OUT
285.72 FL 18"PVC IN
POC
303.3 FL 12"PVC IN
303.3 FL 12"PVC IN
303.3 FL 12"PVC IN
303.3 FL 12"PVC OUT
313.2 FS
314.6 FS
313.1 FS
306.6 FL 12"PVC OUT
315.2 FS
316.0 FS
304.0 FS
304.2 FL 12"PVC OUT
309.2 FS
(336.7) EG
(321.0) EG
(316.3) EG
(318.0) EG

LEGEND

HYD BASIN BOUNDARY
NODE NUMBER
SURFACE FLOW
PIPE FLOW
STREET FLOW

SCALE 1:60

0 60 120 180 240

HYDROLOGIC SOIL GROUP

THE HYROLOGICAL SOIL GROUPS FOR THIS SITE ARE TYPE (A & C)

NOTE:
APPROXIMATE DEPTH TO GROUNDWATER IS GREATER THAN 20'

PALA MESA PLAZA
HYDROLOGY POST DEVELOPMENT EXHIBIT

EXCEL ENGINEERING
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K:\19\19025\Engineering\SDP 01\Storm Working Files\Hyd\19025-Postdev-current-adjust230608.dwg 6/13/2023 1:13 PM ORIGINAL PLOT SIZE: ----

ATTACHMENT 3

3a. CivilD Pre-Development Calculations

```
        San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
    Rational Hydrology Study        Date: 05/25/23
--------------------------------------------------------------------------
19025 Pre Dev
100 Year Study Onsite
19025Pre100Onsite
offsite ud to onsite
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 6332

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** INITIAL AREA EVALUATION ****
___________________________________________________________________________
Decimal fraction soil group A = 0.900
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.100
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.417
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  337.500(Ft.)
Lowest elevation =  319.900(Ft.)
Elevation difference =   17.600(Ft.) Slope = 17.600 %
Top of Initial Area Slope adjusted by User to 30.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  30.00 %, in a development type of
 4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.96 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4170)*( 100.000^.5)/(  30.000^(1/3)]=   3.96
Calculated TC of    3.957 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.417
Subarea runoff =      0.769(CFS)
Total initial stream area =        0.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
___________________________________________________________________________
```

```
Estimated mean flow rate at midpoint of channel =      4.801(CFS)
Depth of flow =   0.279(Ft.), Average velocity =   2.471(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2             25.00              0.00
    3             50.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      4.801(CFS)
  '     '    flow top width =     13.939(Ft.)
  '     '    velocity=    2.471(Ft/s)
  '     '    area =      1.943(Sq.Ft)
  '     '    Froude number =     1.166

Upstream point elevation =   319.900(Ft.)
Downstream point elevation =   308.700(Ft.)
Flow length =   325.000(Ft.)
Travel time  =    2.19 min.
Time of concentration =    6.15 min.
Depth of flow =   0.279(Ft.)
Average velocity =   2.471(Ft/s)
Total irregular channel flow =     4.801(CFS)
Irregular channel normal depth above invert elev. =   0.279(Ft.)
Average velocity of channel(s) =   2.471(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      8.070(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.200
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.800
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.466
Rainfall intensity =      8.070(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.462  CA =      1.085
Subarea runoff =      7.989(CFS) for      2.150(Ac.)
Total runoff =      8.758(CFS)  Total area =      2.350(Ac.)
Depth of flow =   0.349(Ft.), Average velocity =   2.871(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      2.350(Ac.)
Runoff from this stream =      8.758(CFS)
Time of concentration =    6.15 min.
Rainfall intensity =     8.070(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________
Decimal fraction soil group A = 0.550
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.450
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.442
Initial subarea total flow distance  =  100.000(Ft.)
```

```
      Highest elevation =  326.000(Ft.)
      Lowest elevation =  313.000(Ft.)
      Elevation difference =   13.000(Ft.) Slope = 13.000 %
      Top of Initial Area Slope adjusted by User to 30.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  30.00 %, in a development type of
       4.3 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   3.81 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.4415)*( 100.000^.5)/(  30.000^(1/3)]=   3.81
      Calculated TC of    3.815 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.442
      Subarea runoff =      0.896(CFS)
      Total initial stream area =        0.220(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      202.000 to Point/Station      103.000
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

      ________________________________________________________________________
      Estimated mean flow rate at midpoint of channel =      3.343(CFS)
      Depth of flow =   0.306(Ft.), Average velocity =   1.425(Ft/s)
          ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
          1              0.00              1.00
          2             25.00              0.00
          3             50.00              1.00
      Manning's 'N' friction factor =   0.030
      ------------------------------------------------------------------
      Sub-Channel flow  =      3.343(CFS)
        '     '    flow top width =     15.314(Ft.)
        '     '    velocity=    1.425(Ft/s)
        '     '    area =      2.345(Sq.Ft)
        '     '    Froude number =     0.642

      Upstream point elevation =   313.000(Ft.)
      Downstream point elevation =   308.700(Ft.)
      Flow length =   425.000(Ft.)
      Travel time  =    4.97 min.
      Time of concentration =    8.78 min.
      Depth of flow =   0.306(Ft.)
      Average velocity =   1.425(Ft/s)
      Total irregular channel flow =     3.343(CFS)
      Irregular channel normal depth above invert elev. =   0.306(Ft.)
      Average velocity of channel(s) =   1.425(Ft/s)
       Adding area flow to channel
      Rainfall intensity (I) =      6.411(In/Hr) for a   100.0 year storm
      Decimal fraction soil group A = 0.200
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.800
      Decimal fraction soil group D = 0.000
      [MEDIUM DENSITY RESIDENTIAL                  ]
      (4.3 DU/A or Less       )
      Impervious value, Ai = 0.300
      Sub-Area C Value = 0.466
      Rainfall intensity =      6.411(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.463  CA =      0.889
      Subarea runoff =      4.806(CFS) for      1.700(Ac.)
      Total runoff =      5.702(CFS)  Total area =       1.920(Ac.)
      Depth of flow =   0.374(Ft.), Average velocity =   1.629(Ft/s)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.920(Ac.)
Runoff from this stream =      5.702(CFS)
Time of concentration =    8.78 min.
Rainfall intensity =     6.411(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      305.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Rainfall intensity (I) =      6.428(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   8.75 min.  Rain intensity =       6.43(In/Hr)
Total area =        5.000(Ac.)  Total runoff =    13.794(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   311.100(Ft.)
Downstream point/station elevation =   302.200(Ft.)
Pipe length  =   208.00(Ft.) Slope =   0.0428  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.794(CFS)
Given pipe size =     12.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    29.453(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     31.169(Ft.)
 Minor friction loss =      7.185(Ft.)  K-factor =   1.50
Pipe flow velocity =     17.56(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =     8.95 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      5.000(Ac.)
Runoff from this stream =     13.794(CFS)
Time of concentration =    8.95 min.
Rainfall intensity =     6.336(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        8.758      6.15             8.070
2        5.702      8.78             6.411
3       13.794      8.95             6.336
Qmax(1) =
       1.000 *    1.000 *     8.758) +
       1.000 *    0.700 *     5.702) +
```

```
       1.000 *    0.687 *    13.794) + =      22.229
Qmax(2) =
       0.794 *    1.000 *     8.758) +
       1.000 *    1.000 *     5.702) +
       1.000 *    0.982 *    13.794) + =      26.203
Qmax(3) =
       0.785 *    1.000 *     8.758) +
       0.988 *    1.000 *     5.702) +
       1.000 *    1.000 *    13.794) + =      26.305

Total of 3 streams to confluence:
Flow rates before confluence point:
       8.758       5.702      13.794
Maximum flow rates at confluence using above data:
       22.229       26.203       26.305
Area of streams before confluence:
        2.350        1.920        5.000
Results of confluence:
Total flow rate =     26.305(CFS)
Time of concentration =     8.947 min.
Effective stream area after confluence =      9.270(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      309.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   302.200(Ft.)
Downstream point/station elevation =   301.800(Ft.)
Pipe length  =    27.00(Ft.) Slope =   0.0148  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    26.305(CFS)
Given pipe size =     18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     6.454(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      1.693(Ft.)
 Minor friction loss =      5.161(Ft.)  K-factor =   1.50
Pipe flow velocity =     14.89(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     8.98 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      309.000 to Point/Station      406.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   301.800(Ft.)
Downstream point/station elevation =   285.720(Ft.)
Pipe length  =   137.00(Ft.) Slope =   0.1174  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    26.305(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    26.305(CFS)
Normal flow depth in pipe =   11.43(In.)
Flow top width inside pipe =   17.33(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.23(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     9.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      406.000 to Point/Station      406.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      9.270(Ac.)
Runoff from this stream =     26.305(CFS)
Time of concentration =    9.08 min.
Rainfall intensity =     6.276(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      403.000 to Point/Station      404.000
**** INITIAL AREA EVALUATION ****

----------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                         ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.810
Initial subarea total flow distance  =   94.000(Ft.)
Highest elevation =  318.000(Ft.)
Lowest elevation =  316.300(Ft.)
Elevation difference =    1.700(Ft.) Slope =  1.809 %
Top of Initial Area Slope adjusted by User to  1.400 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.40 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.61 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8100)*(  60.000^.5)/(   1.400^(1/3)]=   3.61
Calculated TC of    3.614 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.810
Subarea runoff =      0.254(CFS)
Total initial stream area =        0.034(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      404.000 to Point/Station      405.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      2.197(CFS)
Depth of flow =   0.242(Ft.), Average velocity =   1.791(Ft/s)
    ******* Irregular Channel Data ***********
---------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.31
    2             26.00              0.13
    3             27.50              0.00
    4             27.50              0.50
Manning's 'N' friction factor =   0.013
---------------------------------------------------------------
Sub-Channel flow  =      2.197(CFS)
  '     '    flow top width =     17.814(Ft.)
  '     '    velocity=    1.791(Ft/s)
  '     '    area =      1.227(Sq.Ft)
  '     '    Froude number =     1.203

Upstream point elevation =   316.300(Ft.)
Downstream point elevation =   310.800(Ft.)
Flow length =   621.000(Ft.)
Travel time  =    5.78 min.
Time of concentration =    9.39 min.
Depth of flow =   0.242(Ft.)
Average velocity =   1.791(Ft/s)
Total irregular channel flow =     2.197(CFS)
Irregular channel normal depth above invert elev. =   0.242(Ft.)
Average velocity of channel(s) =   1.791(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      6.140(In/Hr) for a   100.0 year storm
```

```
User specified 'C' value of 0.762 given for subarea
Rainfall intensity =      6.140(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.764  CA =      0.665
Subarea runoff =      3.831(CFS) for      0.837(Ac.)
Total runoff =      4.085(CFS)  Total area =      0.871(Ac.)
Depth of flow =   0.279(Ft.), Average velocity =   2.078(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      406.000
**** SUBAREA FLOW ADDITION ****

------------------------------------------------------------------------
Rainfall intensity (I) =      6.140(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(14.5 DU/A or Less      )
Impervious value, Ai = 0.500
Sub-Area C Value = 0.595
Time of concentration =     9.39 min.
Rainfall intensity =      6.140(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.695  CA =      1.022
Subarea runoff =      2.192(CFS) for      0.600(Ac.)
Total runoff =      6.277(CFS)  Total area =      1.471(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      402.000 to Point/Station      406.000
**** SUBAREA FLOW ADDITION ****

------------------------------------------------------------------------
Rainfall intensity (I) =      6.140(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                        ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Time of concentration =     9.39 min.
Rainfall intensity =      6.140(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.715  CA =      1.374
Subarea runoff =      2.160(CFS) for      0.451(Ac.)
Total runoff =      8.437(CFS)  Total area =      1.922(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      406.000 to Point/Station      406.000
**** CONFLUENCE OF MINOR STREAMS ****

------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.922(Ac.)
Runoff from this stream =      8.437(CFS)
Time of concentration =    9.39 min.
Rainfall intensity =     6.140(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1       26.305      9.08            6.276
2        8.437      9.39            6.140
Qmax(1) =
```

```
            1.000 *    1.000 *    26.305) +
            1.000 *    0.967 *     8.437) + =      34.460
      Qmax(2) =
            0.978 *    1.000 *    26.305) +
            1.000 *    1.000 *     8.437) + =      34.172

      Total of 2 streams to confluence:
      Flow rates before confluence point:
           26.305       8.437
      Maximum flow rates at confluence using above data:
           34.460       34.172
      Area of streams before confluence:
            9.270        1.922
      Results of confluence:
      Total flow rate =     34.460(CFS)
      Time of concentration =     9.080 min.
      Effective stream area after confluence =     11.192(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      405.000 to Point/Station      406.000
      **** PIPEFLOW TRAVEL TIME (User specified size) ****

      ------------------------------------------------------------------------
      Upstream point/station elevation =   306.830(Ft.)
      Downstream point/station elevation =   285.720(Ft.)
      Pipe length  =   211.00(Ft.) Slope =   0.1000  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =    34.460(CFS)
      Given pipe size =     18.00(In.)
      NOTE: Normal flow is pressure flow in user selected pipe size.
      The approximate hydraulic grade line above the pipe invert is
          10.448(Ft.)  at the headworks or inlet of the pipe(s)
       Pipe friction loss =     22.700(Ft.)
       Minor friction loss =      8.857(Ft.)  K-factor =   1.50
      Critical depth could not be calculated.
      Pipe flow velocity =     19.50(Ft/s)
      Travel time through pipe =    0.18 min.
      Time of concentration (TC) =     9.26 min.
      End of computations, total study area =          11.192 (Ac.)
```

3b. CivilD Pre-Development Offsite Calculations

```
        San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
    Rational Hydrology Study        Date: 01/20/21
------------------------------------------------------------------------
19025 Pre Dev
100 Year Study Offsite
19025Pre100Offsite.rd3

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 6332

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  379.000(Ft.)
Lowest elevation =  372.000(Ft.)
Elevation difference =    7.000(Ft.) Slope =  7.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   7.00 %, in a development type of
 7.3 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   6.00 minutes
 (for slope value of   5.00 %)
Rainfall intensity (I) =      8.198(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
Subarea runoff =      0.315(CFS)
Total initial stream area =        0.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      5.468(CFS)
Depth of flow =   0.404(Ft.), Average velocity =   5.574(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
```

```
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
          1              0.00              2.71
          2             31.00              0.13
          3             32.50              0.00
          4             32.50              0.50
      Manning's 'N' friction factor =   0.015
      -----------------------------------------------------------------
      Sub-Channel flow  =      5.468(CFS)
        '     '    flow top width =      4.851(Ft.)
        '     '    velocity=    5.574(Ft/s)
        '     '    area =      0.981(Sq.Ft)
        '     '    Froude number =     2.184

      Upstream point elevation =   372.000(Ft.)
      Downstream point elevation =   347.000(Ft.)
      Flow length =   839.000(Ft.)
      Travel time  =    2.51 min.
      Time of concentration =    8.51 min.
      Depth of flow =   0.404(Ft.)
      Average velocity =   5.574(Ft/s)
      Total irregular channel flow =     5.468(CFS)
      Irregular channel normal depth above invert elev. =   0.404(Ft.)
      Average velocity of channel(s) =   5.574(Ft/s)
       Adding area flow to channel
      Rainfall intensity (I) =      6.545(In/Hr) for a   100.0 year storm
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [MEDIUM DENSITY RESIDENTIAL                  ]
      (4.3 DU/A or Less       )
      Impervious value, Ai = 0.300
      Sub-Area C Value = 0.410
      Rainfall intensity =      6.545(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.411  CA =      1.609
      Subarea runoff =     10.213(CFS) for      3.830(Ac.)
      Total runoff =     10.528(CFS)  Total area =       3.910(Ac.)
      Depth of flow =   0.517(Ft.), Average velocity =   6.574(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      303.000 to Point/Station      304.000
      **** PIPEFLOW TRAVEL TIME (User specified size) ****
      ______________________________________________________________________
      Upstream point/station elevation =   344.000(Ft.)
      Downstream point/station elevation =   325.600(Ft.)
      Pipe length  =   160.00(Ft.) Slope =   0.1150  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =    10.528(CFS)
      Given pipe size =     18.00(In.)
      Calculated individual pipe flow  =    10.528(CFS)
      Normal flow depth in pipe =    6.70(In.)
      Flow top width inside pipe =   17.40(In.)
      Critical Depth =   14.96(In.)
      Pipe flow velocity =     17.55(Ft/s)
      Travel time through pipe =    0.15 min.
      Time of concentration (TC) =     8.66 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      304.000 to Point/Station      304.000
      **** SUBAREA FLOW ADDITION ****
      ______________________________________________________________________
      Rainfall intensity (I) =      6.470(In/Hr) for a   100.0 year storm
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
```

```
      [MEDIUM DENSITY RESIDENTIAL                  ]
      (7.3 DU/A or Less       )
      Impervious value, Ai = 0.400
      Sub-Area C Value = 0.480
      Time of concentration =     8.66 min.
      Rainfall intensity =      6.470(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.426  CA =      2.132
      Subarea runoff =      3.266(CFS) for      1.090(Ac.)
      Total runoff =     13.794(CFS)  Total area =       5.000(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      304.000 to Point/Station      305.000
      **** PIPEFLOW TRAVEL TIME (User specified size) ****
      ________________________________________________________________________
      Upstream point/station elevation =   325.500(Ft.)
      Downstream point/station elevation =   322.000(Ft.)
      Pipe length  =    71.00(Ft.) Slope =   0.0493  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =    13.794(CFS)
      Given pipe size =     18.00(In.)
      Calculated individual pipe flow  =    13.794(CFS)
      Normal flow depth in pipe =    9.96(In.)
      Flow top width inside pipe =   17.90(In.)
      Critical Depth =   16.50(In.)
      Pipe flow velocity =     13.75(Ft/s)
      Travel time through pipe =    0.09 min.
      Time of concentration (TC) =     8.75 min.
      End of computations, total study area =           5.000 (Ac.)
```

3c. CivilD Post Development Onsite Reach 1 Calculations

```
1
2               San Diego County Rational Hydrology Program
3
4       CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0
5
6       Rational method hydrology  program based on
7       San Diego County Flood Control Division 2003 hydrology manual
8           Rational Hydrology Study        Date: 12/15/21
9       ----------------------------------------------------------------------
10      19025 Post Dev
11      100 Year Study Reach 1
12      PostDev100R1.rd3
13      2021.12.15 Update
14      ----------------------------------------------------------------------
15       *********   Hydrology Study Control Information **********
16
17      ----------------------------------------------------------------------
18
19
20      Program License Serial Number 6332
21
22      ----------------------------------------------------------------------
23      Rational hydrology study storm event year is   100.0
24      English (in-lb) input data Units used
25
26      Map data precipitation entered:
27      6 hour,  precipitation(inches) =  3.500
28      24 hour precipitation(inches) =  6.000
29      P6/P24 =    58.3%
30      San Diego hydrology manual 'C' values used
31
32
33      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
34      Process from Point/Station      100.000 to Point/Station      101.000
35      **** INITIAL AREA EVALUATION ****
36      ________________________________________________________________________
37      Decimal fraction soil group A = 1.000
38      Decimal fraction soil group B = 0.000
39      Decimal fraction soil group C = 0.000
40      Decimal fraction soil group D = 0.000
41      [MEDIUM DENSITY RESIDENTIAL                  ]
42      (7.3 DU/A or Less       )
43      Impervious value, Ai = 0.400
44      Sub-Area C Value = 0.480
45      Initial subarea total flow distance  =   53.000(Ft.)
46      Highest elevation =  316.800(Ft.)
47      Lowest elevation =  316.700(Ft.)
48      Elevation difference =    0.100(Ft.) Slope =  0.189 %
49      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
50      The maximum overland flow distance is 50.00 (Ft)
51      for the top area slope value of   0.19 %, in a development type of
52       7.3 DU/A or Less
53      In Accordance With Figure 3-3
54      Initial Area Time of Concentration =  13.75 minutes
55      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
56      TC = [1.8*(1.1-0.4800)*(  50.000^.5)/(   0.189^(1/3)]=  13.75
57      The initial area total distance of   53.00 (Ft.) entered leaves a
58      remaining distance of    3.00 (Ft.)
59      Using Figure 3-4, the travel time for this distance is   0.20 minutes
60      for a distance of   3.00 (Ft.) and a slope of  0.19 %
61      with an elevation difference of   0.01(Ft.) from the end of the top area
62      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
63       =    0.203 Minutes
64      Tt=[(11.9*0.0006^3)/(  0.01)]^.385=  0.20
65      Total initial area Ti =  13.75 minutes from Figure 3-3 formula plus
66        0.20 minutes from the Figure 3-4 formula =  13.95 minutes
67      Rainfall intensity (I) =      4.757(In/Hr) for a   100.0 year storm
68      Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
69      Subarea runoff =      0.068(CFS)
```

```
Total initial stream area =       0.030(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      0.228(CFS)
Depth of flow =   0.095(Ft.), Average velocity =   0.591(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.33
    2             23.00              0.00
    3             28.50              0.33
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------------
Sub-Channel flow  =      0.228(CFS)
  '     '    flow top width =      8.130(Ft.)
  '     '    velocity=    0.591(Ft/s)
  '     '    area =      0.386(Sq.Ft)
  '     '    Froude number =     0.478

Upstream point elevation =   316.700(Ft.)
Downstream point elevation =   316.300(Ft.)
Flow length =   193.000(Ft.)
Travel time  =    5.44 min.
Time of concentration =   19.39 min.
Depth of flow =   0.095(Ft.)
Average velocity =   0.591(Ft/s)
Total irregular channel flow =     0.228(CFS)
Irregular channel normal depth above invert elev. =   0.095(Ft.)
Average velocity of channel(s) =   0.591(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      3.847(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Rainfall intensity =      3.847(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.480  CA =      0.082
Subarea runoff =      0.245(CFS) for      0.140(Ac.)
Total runoff =      0.314(CFS)  Total area =       0.170(Ac.)
Depth of flow =   0.107(Ft.), Average velocity =   0.640(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Rainfall intensity (I) =      3.847(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                     ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Time of concentration =    19.39 min.
Rainfall intensity =      3.847(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.393  CA =      0.114
```

```
Subarea runoff =      0.125(CFS) for      0.120(Ac.)
Total runoff =      0.439(CFS)  Total area =       0.290(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   310.200(Ft.)
Downstream point/station elevation =   309.000(Ft.)
Pipe length  =   250.00(Ft.) Slope =   0.0048  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.439(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     0.439(CFS)
Normal flow depth in pipe =    3.42(In.)
Flow top width inside pipe =   10.84(In.)
Critical Depth =    3.28(In.)
Pipe flow velocity =      2.37(Ft/s)
Travel time through pipe =    1.76 min.
Time of concentration (TC) =    21.15 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.290(Ac.)
Runoff from this stream =      0.439(CFS)
Time of concentration =   21.15 min.
Rainfall intensity =     3.637(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1100.000 to Point/Station     1101.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                     ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Initial subarea total flow distance  =   59.000(Ft.)
Highest elevation =  336.700(Ft.)
Lowest elevation =  321.600(Ft.)
Elevation difference =   15.100(Ft.) Slope = 25.593 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  25.59 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.07 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2700)*( 100.000^.5)/(  25.593^(1/3)]=   5.07
Rainfall intensity (I) =      9.140(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
Subarea runoff =      0.173(CFS)
Total initial stream area =       0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1101.000 to Point/Station      103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.544(CFS)
Depth of flow =   0.128(Ft.), Average velocity =   3.658(Ft/s)
```

```
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.60
    2             16.00              0.00
    3             46.00              1.20
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      1.544(CFS)
  '     '    flow top width =      6.605(Ft.)
  '     '    velocity=    3.658(Ft/s)
  '     '    area =      0.422(Sq.Ft)
  '     '    Froude number =     2.549

Upstream point elevation =   321.600(Ft.)
Downstream point elevation =   309.000(Ft.)
Flow length =   236.000(Ft.)
Travel time  =    1.08 min.
Time of concentration =    6.15 min.
Depth of flow =   0.128(Ft.)
Average velocity =   3.658(Ft/s)
Total irregular channel flow =     1.544(CFS)
Irregular channel normal depth above invert elev. =   0.128(Ft.)
Average velocity of channel(s) =   3.658(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      8.073(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.534
Rainfall intensity =      8.073(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.509  CA =      0.371
Subarea runoff =      2.825(CFS) for      0.660(Ac.)
Total runoff =      2.998(CFS)  Total area =       0.730(Ac.)
Depth of flow =   0.164(Ft.), Average velocity =   4.317(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.730(Ac.)
Runoff from this stream =      2.998(CFS)
Time of concentration =    6.15 min.
Rainfall intensity =     8.073(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        0.439     21.15             3.637
2        2.998      6.15             8.073
Qmax(1) =
       1.000 *    1.000 *     0.439) +
       0.451 *    1.000 *     2.998) + =       1.789
Qmax(2) =
       1.000 *    0.291 *     0.439) +
       1.000 *    1.000 *     2.998) + =       3.125

Total of 2 streams to confluence:
Flow rates before confluence point:
```

```
       0.439       2.998
Maximum flow rates at confluence using above data:
        1.789        3.125
Area of streams before confluence:
        0.290        0.730
Results of confluence:
Total flow rate =      3.125(CFS)
Time of concentration =     6.145 min.
Effective stream area after confluence =      1.020(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   304.200(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =   189.00(Ft.) Slope =   0.0048  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.125(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     3.125(CFS)
Normal flow depth in pipe =    8.26(In.)
Flow top width inside pipe =   17.94(In.)
Critical Depth =    8.07(In.)
Pipe flow velocity =      3.95(Ft/s)
Travel time through pipe =    0.80 min.
Time of concentration (TC) =     6.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.020(Ac.)
Runoff from this stream =      3.125(CFS)
Time of concentration =    6.94 min.
Rainfall intensity =     7.462(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.050
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                         ]
(Office Professional    )
Impervious value, Ai = 0.900
Sub-Area C Value = 0.839
Initial subarea total flow distance  =   50.000(Ft.)
Highest elevation =  316.800(Ft.)
Lowest elevation =  316.200(Ft.)
Elevation difference =    0.600(Ft.) Slope =  1.200 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.20 %, in a development type of
 Office Professional
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.42 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8395)*(  60.000^.5)/(   1.200^(1/3)]=   3.42
Calculated TC of    3.418 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.839
Subarea runoff =      0.310(CFS)
```

```
 Total initial stream area =        0.040(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.245(CFS)
Depth of flow =   0.209(Ft.), Average velocity =   2.102(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.30
    2              1.50              0.00
    3             45.50              1.00
    4             61.50              1.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      2.245(CFS)
  '     '    flow top width =     10.230(Ft.)
  '     '    velocity=    2.102(Ft/s)
  '     '    area =      1.068(Sq.Ft)
  '     '    Froude number =     1.147

Upstream point elevation =   316.200(Ft.)
Downstream point elevation =   314.500(Ft.)
Flow length =   185.000(Ft.)
Travel time  =    1.47 min.
Time of concentration =    4.88 min.
Depth of flow =   0.209(Ft.)
Average velocity =   2.102(Ft/s)
Total irregular channel flow =     2.245(CFS)
Irregular channel normal depth above invert elev. =   0.209(Ft.)
Average velocity of channel(s) =   2.102(Ft/s)
 Adding area flow to channel
Calculated TC of    4.885 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                          ]
(Office Professional    )
Impervious value, Ai = 0.900
Sub-Area C Value = 0.840
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.840  CA =      0.454
Subarea runoff =      3.873(CFS) for      0.500(Ac.)
Total runoff =      4.183(CFS)  Total area =       0.540(Ac.)
Depth of flow =   0.264(Ft.), Average velocity =   2.456(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   308.500(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =    48.00(Ft.) Slope =   0.1083  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.183(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     4.183(CFS)
Normal flow depth in pipe =    4.95(In.)
Flow top width inside pipe =   11.82(In.)
Critical Depth =   10.36(In.)
Pipe flow velocity =     13.68(Ft/s)
```

```
      Travel time through pipe =    0.06 min.
      Time of concentration (TC) =     4.94 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      202.000 to Point/Station      104.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ________________________________________________________________________
      Along Main Stream number: 1 in normal stream number 2
      Stream flow area =      0.540(Ac.)
      Runoff from this stream =      4.183(CFS)
      Time of concentration =    4.94 min.
      Rainfall intensity =     9.222(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      300.000 to Point/Station      301.000
      **** INITIAL AREA EVALUATION ****
      ________________________________________________________________________
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 1.000
      Decimal fraction soil group D = 0.000
      [COMMERCIAL area type                         ]
      (Neighborhod Commercial )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.780
      Initial subarea total flow distance  =   42.000(Ft.)
      Highest elevation =  316.000(Ft.)
      Lowest elevation =  314.700(Ft.)
      Elevation difference =    1.300(Ft.) Slope =  3.095 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 85.00 (Ft)
      for the top area slope value of   3.10 %, in a development type of
       Neighborhod Commercial
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   3.64 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.7800)*(  85.000^.5)/(   3.095^(1/3)]=   3.64
      Calculated TC of    3.644 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
      Subarea runoff =      0.288(CFS)
      Total initial stream area =        0.040(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      301.000 to Point/Station      302.000
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ________________________________________________________________________
      Estimated mean flow rate at midpoint of channel =      1.259(CFS)
      Depth of flow =   0.087(Ft.), Average velocity =   2.583(Ft/s)
          ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
          1              0.00              0.50
          2              0.00              0.00
          3             64.00              0.50
      Manning's 'N' friction factor =   0.015
      ------------------------------------------------------------------
      Sub-Channel flow  =      1.259(CFS)
        '     '    flow top width =     11.169(Ft.)
        '     '    velocity=    2.583(Ft/s)
        '     '    area =      0.487(Sq.Ft)
        '     '    Froude number =     2.180

      Upstream point elevation =   314.700(Ft.)
```

```
Downstream point elevation =   313.000(Ft.)
Flow length =    38.000(Ft.)
Travel time  =    0.25 min.
Time of concentration =    3.89 min.
Depth of flow =   0.087(Ft.)
Average velocity =   2.583(Ft/s)
Total irregular channel flow =     1.259(CFS)
Irregular channel normal depth above invert elev. =   0.087(Ft.)
Average velocity of channel(s) =   2.583(Ft/s)
 Adding area flow to channel
Calculated TC of    3.889 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                         ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.780  CA =      0.242
Subarea runoff =      1.942(CFS) for      0.270(Ac.)
Total runoff =      2.230(CFS)  Total area =       0.310(Ac.)
Depth of flow =   0.108(Ft.), Average velocity =   2.980(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   306.000(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =    30.00(Ft.) Slope =   0.0900  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.230(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     2.230(CFS)
Normal flow depth in pipe =    3.72(In.)
Flow top width inside pipe =   11.10(In.)
Critical Depth =    7.66(In.)
Pipe flow velocity =     10.75(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     3.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.310(Ac.)
Runoff from this stream =      2.230(CFS)
Time of concentration =    3.94 min.
Rainfall intensity =     9.222(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        3.125      6.94             7.462
2        4.183      4.94             9.222
3        2.230      3.94             9.222
Qmax(1) =
       1.000 *    1.000 *     3.125) +
       0.809 *    1.000 *     4.183) +
       0.809 *    1.000 *     2.230) + =       8.314
```

```
Qmax(2) =
       1.000 *    0.712 *     3.125) +
       1.000 *    1.000 *     4.183) +
       1.000 *    1.000 *     2.230) + =       8.638
Qmax(3) =
       1.000 *    0.567 *     3.125) +
       1.000 *    0.796 *     4.183) +
       1.000 *    1.000 *     2.230) + =       7.332

Total of 3 streams to confluence:
Flow rates before confluence point:
       3.125       4.183       2.230
Maximum flow rates at confluence using above data:
        8.314       8.638       7.332
Area of streams before confluence:
        1.020       0.540       0.310
Results of confluence:
Total flow rate =      8.638(CFS)
Time of concentration =     4.943 min.
Effective stream area after confluence =      1.870(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   303.300(Ft.)
Downstream point/station elevation =   303.000(Ft.)
Pipe length  =    71.00(Ft.) Slope =   0.0042  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.638(CFS)
Given pipe size =     18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     0.736(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      0.480(Ft.)
 Minor friction loss =      0.556(Ft.)  K-factor =   1.50
Pipe flow velocity =      4.89(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     5.19 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.870(Ac.)
Runoff from this stream =      8.638(CFS)
Time of concentration =    5.19 min.
Rainfall intensity =     9.008(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      401.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  316.100(Ft.)
Lowest elevation =  312.600(Ft.)
Elevation difference =    3.500(Ft.) Slope =  3.500 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
```

```
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   3.50 %, in a development type of
 43.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.50 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7800)*(  85.000^.5)/(   3.500^(1/3)]=   3.50
The initial area total distance of  100.00 (Ft.) entered leaves a
remaining distance of   15.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   0.23 minutes
for a distance of  15.00 (Ft.) and a slope of  3.50 %
with an elevation difference of   0.53(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    0.228 Minutes
Tt=[(11.9*0.0028^3)/(  0.53)]^.385=  0.23
Total initial area Ti =   3.50 minutes from Figure 3-3 formula plus
  0.23 minutes from the Figure 3-4 formula =   3.73 minutes
Calculated TC of    3.726 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
Subarea runoff =      0.791(CFS)
Total initial stream area =        0.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      402.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.043(CFS)
Depth of flow =   0.351(Ft.), Average velocity =   4.504(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.10
    2             34.00              0.40
    3             35.50              0.00
    4             35.50              0.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      1.043(CFS)
  '     '    flow top width =      1.318(Ft.)
  '     '    velocity=    4.504(Ft/s)
  '     '    area =      0.232(Sq.Ft)
  '     '    Froude number =     1.894

Upstream point elevation =   312.600(Ft.)
Downstream point elevation =   310.600(Ft.)
Flow length =    67.000(Ft.)
Travel time  =    0.25 min.
Time of concentration =    3.97 min.
Depth of flow =   0.351(Ft.)
Average velocity =   4.504(Ft/s)
Total irregular channel flow =     1.043(CFS)
Irregular channel normal depth above invert elev. =   0.351(Ft.)
Average velocity of channel(s) =   4.504(Ft/s)
 Adding area flow to channel
Calculated TC of    3.974 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
```

```
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.780  CA =      0.140
Subarea runoff =      0.503(CFS) for      0.070(Ac.)
Total runoff =      1.295(CFS)  Total area =       0.180(Ac.)
Depth of flow =   0.381(Ft.), Average velocity =   4.754(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.180(Ac.)
Runoff from this stream =      1.295(CFS)
Time of concentration =    3.97 min.
Rainfall intensity =     9.222(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1        8.638      5.19             9.008
2        1.295      3.97             9.222
Qmax(1) =
       1.000 *    1.000 *     8.638) +
       0.977 *    1.000 *     1.295) + =       9.902
Qmax(2) =
       1.000 *    0.766 *     8.638) +
       1.000 *    1.000 *     1.295) + =       7.915

Total of 2 streams to confluence:
Flow rates before confluence point:
       8.638       1.295
Maximum flow rates at confluence using above data:
        9.902        7.915
Area of streams before confluence:
        1.870        0.180
Results of confluence:
Total flow rate =      9.902(CFS)
Time of concentration =     5.185 min.
Effective stream area after confluence =      2.050(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      106.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   303.000(Ft.)
Downstream point/station elevation =   302.500(Ft.)
Pipe length  =    77.00(Ft.) Slope =   0.0065  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.902(CFS)
Given pipe size =     12.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     9.149(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      5.946(Ft.)
 Minor friction loss =      3.703(Ft.)  K-factor =   1.50
Pipe flow velocity =     12.61(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     5.29 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
```

```
Stream flow area =      2.050(Ac.)
Runoff from this stream =      9.902(CFS)
Time of concentration =    5.29 min.
Rainfall intensity =     8.896(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      804.000 to Point/Station      106.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity (I) =      5.833(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  10.17 min.  Rain intensity =       5.83(In/Hr)
Total area =       2.190(Ac.)  Total runoff =     6.705(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.190(Ac.)
Runoff from this stream =      6.705(CFS)
Time of concentration =   10.17 min.
Rainfall intensity =     5.833(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1004.000 to Point/Station     1005.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                     ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Initial subarea total flow distance  =   30.000(Ft.)
Highest elevation =  334.800(Ft.)
Lowest elevation =  327.500(Ft.)
Elevation difference =    7.300(Ft.) Slope = 24.333 %
Top of Initial Area Slope adjusted by User to  0.189 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 50.00 (Ft)
for the top area slope value of   0.19 %, in a development type of
 1.0 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =  12.20 minutes
 (for slope value of   0.50 %)
Rainfall intensity (I) =      5.187(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
Subarea runoff =      0.014(CFS)
Total initial stream area =       0.010(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1005.000 to Point/Station     1003.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
```

```
      Estimated mean flow rate at midpoint of channel =      0.042(CFS)
      Depth of flow =   0.111(Ft.), Average velocity =   3.401(Ft/s)
          ******* Irregular Channel Data **********
      ------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
          1              0.00              1.00
          2              1.00              0.00
          3              2.00              1.00
      Manning's 'N' friction factor =   0.015
      ------------------------------------------------------------
      Sub-Channel flow  =      0.042(CFS)
        '     '    flow top width =      0.222(Ft.)
        '     '    velocity=    3.401(Ft/s)
        '     '    area =      0.012(Sq.Ft)
        '     '    Froude number =     2.543

      Upstream point elevation =   327.500(Ft.)
      Downstream point elevation =   324.500(Ft.)
      Flow length =    34.000(Ft.)
      Travel time  =    0.17 min.
      Time of concentration =   12.37 min.
      Depth of flow =   0.111(Ft.)
      Average velocity =   3.401(Ft/s)
      Total irregular channel flow =     0.042(CFS)
      Irregular channel normal depth above invert elev. =   0.111(Ft.)
      Average velocity of channel(s) =   3.401(Ft/s)
       Adding area flow to channel
      Rainfall intensity (I) =      5.142(In/Hr) for a   100.0 year storm
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [LOW DENSITY RESIDENTIAL                    ]
      (1.0 DU/A or Less       )
      Impervious value, Ai = 0.100
      Sub-Area C Value = 0.270
      Rainfall intensity =      5.142(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.270  CA =      0.014
      Subarea runoff =      0.055(CFS) for      0.040(Ac.)
      Total runoff =      0.069(CFS)  Total area =      0.050(Ac.)
      Depth of flow =   0.134(Ft.), Average velocity =   3.856(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station     1003.000 to Point/Station      106.000
      **** PIPEFLOW TRAVEL TIME (User specified size) ****
      ______________________________________________________________________
      Upstream point/station elevation =   311.100(Ft.)
      Downstream point/station elevation =   302.600(Ft.)
      Pipe length  =   209.00(Ft.) Slope =   0.0407  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =     0.069(CFS)
      Given pipe size =     18.00(In.)
      Calculated individual pipe flow  =     0.069(CFS)
      Normal flow depth in pipe =    0.75(In.)
      Flow top width inside pipe =    7.22(In.)
      Critical depth could not be calculated.
      Pipe flow velocity =      2.75(Ft/s)
      Travel time through pipe =    1.27 min.
      Time of concentration (TC) =    13.64 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      106.000 to Point/Station      106.000
      **** CONFLUENCE OF MINOR STREAMS ****

      ______________________________________________________________________
      Along Main Stream number: 1 in normal stream number 3
      Stream flow area =      0.050(Ac.)
```

```
Runoff from this stream =      0.069(CFS)
Time of concentration =   13.64 min.
Rainfall intensity =     4.828(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1        9.902      5.29             8.896
2        6.705     10.17             5.833
3        0.069     13.64             4.828
Qmax(1) =
       1.000 *    1.000 *     9.902) +
       1.000 *    0.520 *     6.705) +
       1.000 *    0.388 *     0.069) + =      13.415
Qmax(2) =
       0.656 *    1.000 *     9.902) +
       1.000 *    1.000 *     6.705) +
       1.000 *    0.746 *     0.069) + =      13.250
Qmax(3) =
       0.543 *    1.000 *     9.902) +
       0.828 *    1.000 *     6.705) +
       1.000 *    1.000 *     0.069) + =      10.994

Total of 3 streams to confluence:
Flow rates before confluence point:
       9.902       6.705       0.069
Maximum flow rates at confluence using above data:
       13.415       13.250       10.994
Area of streams before confluence:
        2.050        2.190        0.050
Results of confluence:
Total flow rate =     13.415(CFS)
Time of concentration =     5.287 min.
Effective stream area after confluence =      4.290(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   302.500(Ft.)
Downstream point/station elevation =   302.100(Ft.)
Pipe length  =    31.00(Ft.) Slope =   0.0129  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.415(CFS)
Given pipe size =     18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     1.448(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      0.505(Ft.)
 Minor friction loss =      1.342(Ft.)  K-factor =   1.50
Critical depth could not be calculated.
Pipe flow velocity =      7.59(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     5.36 min.
End of computations, total study area =           4.290 (Ac.)
```

3d. CivilD Post Development Onsite Reach 6 Calculations

```
1
2               San Diego County Rational Hydrology Program
3
4       CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0
5
6       Rational method hydrology  program based on
7       San Diego County Flood Control Division 2003 hydrology manual
8           Rational Hydrology Study        Date: 09/16/21
9       ------------------------------------------------------------------------
10      19025 Post Dev
11      100 Year Study Reach 6
12      PostDev100R6.rd3
13      2021.09.16 update
14      ------------------------------------------------------------------------
15       *********   Hydrology Study Control Information **********
16
17      ------------------------------------------------------------------------
18
19
20      Program License Serial Number 6332
21
22      ------------------------------------------------------------------------
23      Rational hydrology study storm event year is   100.0
24      English (in-lb) input data Units used
25
26      Map data precipitation entered:
27      6 hour,  precipitation(inches) =  3.500
28      24 hour precipitation(inches) =  6.000
29      P6/P24 =    58.3%
30      San Diego hydrology manual 'C' values used
31
32
33      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
34      Process from Point/Station      600.000 to Point/Station      601.000
35      **** INITIAL AREA EVALUATION ****
36      ________________________________________________________________________
37      Decimal fraction soil group A = 0.000
38      Decimal fraction soil group B = 0.000
39      Decimal fraction soil group C = 1.000
40      Decimal fraction soil group D = 0.000
41      [HIGH DENSITY RESIDENTIAL                    ]
42      (43.0 DU/A or Less      )
43      Impervious value, Ai = 0.800
44      Sub-Area C Value = 0.780
45      Initial subarea total flow distance  =   45.000(Ft.)
46      Highest elevation =  315.400(Ft.)
47      Lowest elevation =  312.100(Ft.)
48      Elevation difference =    3.300(Ft.) Slope =  7.333 %
49      Top of Initial Area Slope adjusted by User to  7.300 %
50      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
51      The maximum overland flow distance is 95.00 (Ft)
52      for the top area slope value of   7.30 %, in a development type of
53       43.0 DU/A or Less
54      In Accordance With Figure 3-3
55      Initial Area Time of Concentration =   2.89 minutes
56      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
57      TC = [1.8*(1.1-0.7800)*(  95.000^.5)/(   7.300^(1/3)]=   2.89
58      Calculated TC of    2.894 minutes is less than 5 minutes,
59       resetting TC to 5.0 minutes for rainfall intensity calculations
60      Rainfall intensity (I) =     9.222(In/Hr) for a   100.0 year storm
61      Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
62      Subarea runoff =      0.288(CFS)
63      Total initial stream area =       0.040(Ac.)
64
65
66      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
67      Process from Point/Station      601.000 to Point/Station      602.000
68      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
69      ________________________________________________________________________
```

```
      Estimated mean flow rate at midpoint of channel =     0.755(CFS)
      Depth of flow =   0.022(Ft.), Average velocity =   0.371(Ft/s)
          ******* Irregular Channel Data ***********
      ------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
          1              0.00              0.50
          2              0.00              0.00
          3             91.00              0.00
          4             91.00              0.50
      Manning's 'N' friction factor =   0.015
      ------------------------------------------------------------
      Sub-Channel flow  =     0.755(CFS)
        '     '    flow top width =    91.000(Ft.)
        '     '    velocity=    0.371(Ft/s)
        '     '    area =     2.037(Sq.Ft)
        '     '    Froude number =     0.437

      Upstream point elevation =   312.100(Ft.)
      Downstream point elevation =   312.000(Ft.)
      Flow length =    45.000(Ft.)
      Travel time  =    2.02 min.
      Time of concentration =    4.92 min.
      Depth of flow =   0.022(Ft.)
      Average velocity =   0.371(Ft/s)
      Total irregular channel flow =     0.755(CFS)
      Irregular channel normal depth above invert elev. =   0.022(Ft.)
      Average velocity of channel(s) =   0.371(Ft/s)
       Adding area flow to channel
      Calculated TC of    4.917 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =     9.222(In/Hr) for a   100.0 year storm
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 1.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.780
      Rainfall intensity =     9.222(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.780  CA =     0.133
      Subarea runoff =     0.935(CFS) for      0.130(Ac.)
      Total runoff =     1.223(CFS)  Total area =      0.170(Ac.)
      Depth of flow =   0.030(Ft.), Average velocity =   0.450(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station     602.000 to Point/Station     602.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
      Along Main Stream number: 1 in normal stream number 1
      Stream flow area =     0.170(Ac.)
      Runoff from this stream =     1.223(CFS)
      Time of concentration =    4.92 min.
      Rainfall intensity =    9.222(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station     700.000 to Point/Station     701.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 1.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (43.0 DU/A or Less      )
```

```
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Initial subarea total flow distance  =   46.000(Ft.)
Highest elevation =  316.000(Ft.)
Lowest elevation =  315.400(Ft.)
Elevation difference =    0.600(Ft.) Slope =  1.304 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   1.30 %, in a development type of
 43.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.25 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7800)*(  65.000^.5)/(   1.304^(1/3)]=   4.25
Calculated TC of    4.251 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
Subarea runoff =      0.288(CFS)
Total initial stream area =        0.040(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      701.000 to Point/Station      702.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.057(CFS)
Depth of flow =   0.011(Ft.), Average velocity =   0.730(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.50
    2              0.00              0.00
    3            130.00              0.00
    4            130.00              0.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      1.057(CFS)
  '     '    flow top width =    130.000(Ft.)
  '     '    velocity=    0.730(Ft/s)
  '     '    area =      1.448(Sq.Ft)
  '     '    Froude number =     1.219

Upstream point elevation =   315.400(Ft.)
Downstream point elevation =   312.100(Ft.)
Flow length =   151.000(Ft.)
Travel time  =    3.45 min.
Time of concentration =    7.70 min.
Depth of flow =   0.011(Ft.)
Average velocity =   0.730(Ft/s)
Total irregular channel flow =     1.057(CFS)
Irregular channel normal depth above invert elev. =   0.011(Ft.)
Average velocity of channel(s) =   0.730(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      6.981(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity =      6.981(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.780  CA =      0.250
Subarea runoff =      1.455(CFS) for      0.280(Ac.)
Total runoff =      1.743(CFS)  Total area =       0.320(Ac.)
```

```
Depth of flow =   0.015(Ft.), Average velocity =   0.892(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      702.000 to Point/Station      602.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   312.100(Ft.)
Downstream point/station elevation =   312.000(Ft.)
Pipe length  =    40.00(Ft.) Slope =   0.0025  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.743(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     1.743(CFS)
Normal flow depth in pipe =    9.61(In.)
Flow top width inside pipe =    9.59(In.)
Critical Depth =    6.74(In.)
Pipe flow velocity =      2.59(Ft/s)
Travel time through pipe =    0.26 min.
Time of concentration (TC) =     7.96 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      602.000 to Point/Station      602.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.320(Ac.)
Runoff from this stream =      1.743(CFS)
Time of concentration =    7.96 min.
Rainfall intensity =     6.834(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1        1.223      4.92             9.222
2        1.743      7.96             6.834
Qmax(1) =
       1.000 *    1.000 *     1.223) +
       1.000 *    0.618 *     1.743) + =       2.300
Qmax(2) =
       0.741 *    1.000 *     1.223) +
       1.000 *    1.000 *     1.743) + =       2.649

Total of 2 streams to confluence:
Flow rates before confluence point:
       1.223       1.743
Maximum flow rates at confluence using above data:
        2.300        2.649
Area of streams before confluence:
        0.170        0.320
Results of confluence:
Total flow rate =      2.649(CFS)
Time of concentration =     7.956 min.
Effective stream area after confluence =      0.490(Ac.)
End of computations, total study area =          0.490 (Ac.)
```

3e. CivilD Post Development Onsite Reach 8 Calculations

```
            San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
    Rational Hydrology Study        Date: 04/07/23
--------------------------------------------------------------------------
19025 Post Dev
100 Year Study Reach 8
PostDev100R8.rd3
2021.09.16 update
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 6332

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      800.000 to Point/Station      801.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(14.5 DU/A or Less      )
Impervious value, Ai = 0.500
Sub-Area C Value = 0.595
Initial subarea total flow distance  =   99.000(Ft.)
Highest elevation =  315.200(Ft.)
Lowest elevation =  314.100(Ft.)
Elevation difference =    1.100(Ft.) Slope =  1.111 %
Top of Initial Area Slope adjusted by User to  1.000 %
Bottom of Initial Area Slope adjusted by User to  1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 14.5 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.33 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5950)*(  65.000^.5)/(   1.000^(1/3)]=   7.33
The initial area total distance of   99.00 (Ft.) entered leaves a
remaining distance of   34.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   0.69 minutes
for a distance of  34.00 (Ft.) and a slope of  1.00 %
with an elevation difference of   0.34(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    0.695 Minutes
Tt=[(11.9*0.0064^3)/(  0.34)]^.385=  0.69
Total initial area Ti =   7.33 minutes from Figure 3-3 formula plus
  0.69 minutes from the Figure 3-4 formula =   8.02 minutes
Rainfall intensity (I) =     6.797(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.595
Subarea runoff =      0.647(CFS)
Total initial stream area =        0.160(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      801.000 to Point/Station      802.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.706(CFS)
Depth of flow =   0.166(Ft.), Average velocity =   0.858(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.50
    2              0.00              0.00
    3             72.00              0.50
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      1.706(CFS)
  '     '    flow top width =     23.925(Ft.)
  '     '    velocity=    0.858(Ft/s)
  '     '    area =      1.988(Sq.Ft)
  '     '    Froude number =     0.525

Upstream point elevation =   314.100(Ft.)
Downstream point elevation =   311.500(Ft.)
Flow length =   311.000(Ft.)
Travel time  =    6.04 min.
Time of concentration =   14.06 min.
Depth of flow =   0.166(Ft.)
Average velocity =   0.858(Ft/s)
Total irregular channel flow =     1.706(CFS)
Irregular channel normal depth above invert elev. =   0.166(Ft.)
Average velocity of channel(s) =   0.858(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      4.733(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.400
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.600
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(14.5 DU/A or Less      )
Impervious value, Ai = 0.500
Sub-Area C Value = 0.580
Rainfall intensity =      4.733(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.582  CA =      0.565
Subarea runoff =      2.027(CFS) for      0.810(Ac.)
Total runoff =      2.674(CFS)  Total area =       0.970(Ac.)
Depth of flow =   0.197(Ft.), Average velocity =   0.960(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      802.000 to Point/Station      803.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   304.600(Ft.)
Downstream point/station elevation =   304.300(Ft.)
Pipe length  =   173.00(Ft.) Slope =   0.0017  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.674(CFS)
Given pipe size =     12.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     0.944(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      0.974(Ft.)
 Minor friction loss =      0.270(Ft.)  K-factor =   1.50
Pipe flow velocity =      3.40(Ft/s)
```

```
      Travel time through pipe =    0.85 min.
      Time of concentration (TC) =    14.91 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      803.000 to Point/Station      803.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ------------------------------------------------------------------------
      Along Main Stream number: 1 in normal stream number 1
      Stream flow area =      0.970(Ac.)
      Runoff from this stream =      2.674(CFS)
      Time of concentration =   14.91 min.
      Rainfall intensity =     4.558(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      900.000 to Point/Station      901.000
      **** INITIAL AREA EVALUATION ****
      ------------------------------------------------------------------------
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [LOW DENSITY RESIDENTIAL                    ]
      (1.0 DU/A or Less       )
      Impervious value, Ai = 0.100
      Sub-Area C Value = 0.270
      Initial subarea total flow distance  =  100.000(Ft.)
      Highest elevation =  333.100(Ft.)
      Lowest elevation =  323.900(Ft.)
      Elevation difference =    9.200(Ft.) Slope =  9.200 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of   9.20 %, in a development type of
       1.0 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   7.13 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.2700)*( 100.000^.5)/(   9.200^(1/3)]=   7.13
      Rainfall intensity (I) =      7.335(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
      Subarea runoff =      0.059(CFS)
      Total initial stream area =        0.030(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      901.000 to Point/Station      902.000
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ------------------------------------------------------------------------
      Estimated mean flow rate at midpoint of channel =      0.168(CFS)
      Depth of flow =   0.228(Ft.), Average velocity =   3.226(Ft/s)
          ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
          1              0.00              1.00
          2              1.00              0.00
          3              2.00              1.00
      Manning's 'N' friction factor =   0.016
      ------------------------------------------------------------------
      Sub-Channel flow  =      0.168(CFS)
        '     '    flow top width =      0.457(Ft.)
        '     '    velocity=    3.226(Ft/s)
        '     '    area =      0.052(Sq.Ft)
        '     '    Froude number =     1.682

      Upstream point elevation =   323.900(Ft.)
      Downstream point elevation =   315.400(Ft.)
      Flow length =   246.000(Ft.)
```

```
Travel time  =    1.27 min.
Time of concentration =    8.40 min.
Depth of flow =   0.228(Ft.)
Average velocity =   3.226(Ft/s)
Total irregular channel flow =     0.168(CFS)
Irregular channel normal depth above invert elev. =   0.228(Ft.)
Average velocity of channel(s) =   3.226(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      6.599(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Rainfall intensity =      6.599(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.270  CA =      0.038
Subarea runoff =      0.190(CFS) for      0.110(Ac.)
Total runoff =      0.249(CFS)  Total area =      0.140(Ac.)
Depth of flow =   0.265(Ft.), Average velocity =   3.559(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      902.000 to Point/Station      803.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   310.900(Ft.)
Downstream point/station elevation =   304.300(Ft.)
Pipe length  =   100.00(Ft.) Slope =   0.0660  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.249(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     0.249(CFS)
Normal flow depth in pipe =    1.36(In.)
Flow top width inside pipe =    7.62(In.)
Critical Depth =    2.46(In.)
Pipe flow velocity =      5.07(Ft/s)
Travel time through pipe =    0.33 min.
Time of concentration (TC) =     8.73 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      803.000 to Point/Station      803.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.140(Ac.)
Runoff from this stream =      0.249(CFS)
Time of concentration =    8.73 min.
Rainfall intensity =     6.437(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        2.674     14.91             4.558
2        0.249      8.73             6.437
Qmax(1) =
       1.000 *    1.000 *     2.674) +
       0.708 *    1.000 *     0.249) + =       2.851
Qmax(2) =
       1.000 *    0.586 *     2.674) +
       1.000 *    1.000 *     0.249) + =       1.815

Total of 2 streams to confluence:
Flow rates before confluence point:
```

```
        2.674       0.249
Maximum flow rates at confluence using above data:
        2.851       1.815
Area of streams before confluence:
        0.970       0.140
Results of confluence:
Total flow rate =      2.851(CFS)
Time of concentration =    14.909 min.
Effective stream area after confluence =      1.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      803.000 to Point/Station      804.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   304.300(Ft.)
Downstream point/station elevation =   302.800(Ft.)
Pipe length  =   301.00(Ft.) Slope =   0.0050  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.851(CFS)
Given pipe size =     12.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     0.733(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      1.926(Ft.)
 Minor friction loss =      0.307(Ft.)  K-factor =   1.50
Pipe flow velocity =      3.63(Ft/s)
Travel time through pipe =    1.38 min.
Time of concentration (TC) =    16.29 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      804.000 to Point/Station      804.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.110(Ac.)
Runoff from this stream =      2.851(CFS)
Time of concentration =   16.29 min.
Rainfall intensity =     4.305(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      600.000 to Point/Station      804.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity (I) =      6.834(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   7.96 min.  Rain intensity =       6.83(In/Hr)
Total area =        0.490(Ac.)  Total runoff =     2.649(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      804.000 to Point/Station      804.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.490(Ac.)
Runoff from this stream =      2.649(CFS)
Time of concentration =    7.96 min.
Rainfall intensity =     6.834(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      500.000 to Point/Station      501.000
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------------
Decimal fraction soil group A = 0.900
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.100
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(24.0 DU/A or Less      )
Impervious value, Ai = 0.650
Sub-Area C Value = 0.663
Initial subarea total flow distance  =   68.000(Ft.)
Highest elevation =  315.800(Ft.)
Lowest elevation =  315.600(Ft.)
Elevation difference =    0.200(Ft.) Slope =  0.294 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 50.00 (Ft)
for the top area slope value of   0.29 %, in a development type of
 24.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   8.36 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6630)*(  50.000^.5)/(   0.294^(1/3)]=   8.36
The initial area total distance of   68.00 (Ft.) entered leaves a
remaining distance of   18.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   0.68 minutes
for a distance of  18.00 (Ft.) and a slope of  0.29 %
with an elevation difference of   0.05(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    0.682 Minutes
Tt=[(11.9*0.0034^3)/(  0.05)]^.385=  0.68
Total initial area Ti =   8.36 minutes from Figure 3-3 formula plus
  0.68 minutes from the Figure 3-4 formula =   9.05 minutes
Rainfall intensity (I) =     6.291(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.663
Subarea runoff =      0.167(CFS)
Total initial stream area =       0.040(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      501.000 to Point/Station      502.000
**** SUBAREA FLOW ADDITION ****

------------------------------------------------------------------------------
Rainfall intensity (I) =     6.291(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.900
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.100
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.762
Time of concentration =     9.05 min.
Rainfall intensity =     6.291(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.739  CA =      0.126
Subarea runoff =      0.623(CFS) for      0.130(Ac.)
Total runoff =      0.790(CFS)  Total area =       0.170(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      502.000 to Point/Station      503.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

------------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      1.710(CFS)
Depth of flow =   0.034(Ft.), Average velocity =   2.019(Ft/s)
    ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.50
    2              0.00              0.00
    3             25.00              0.00
    4             25.00              0.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      1.710(CFS)
   '     '    flow top width =     25.000(Ft.)
   '     '    velocity=    2.019(Ft/s)
   '     '    area =      0.847(Sq.Ft)
   '     '    Froude number =     1.933

Upstream point elevation =   316.600(Ft.)
Downstream point elevation =   312.000(Ft.)
Flow length =   121.000(Ft.)
Travel time  =    1.00 min.
Time of concentration =   10.05 min.
Depth of flow =   0.034(Ft.)
Average velocity =   2.019(Ft/s)
Total irregular channel flow =     1.710(CFS)
Irregular channel normal depth above invert elev. =   0.034(Ft.)
Average velocity of channel(s) =   2.019(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.880(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.990
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity =      5.880(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.767  CA =      0.434
Subarea runoff =      1.764(CFS) for      0.396(Ac.)
Total runoff =      2.554(CFS)  Total area =       0.566(Ac.)
Depth of flow =   0.043(Ft.), Average velocity =   2.369(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      503.000 to Point/Station      804.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

------------------------------------------------------------------------
Upstream point/station elevation =   307.000(Ft.)
Downstream point/station elevation =   302.800(Ft.)
Pipe length  =    44.00(Ft.) Slope =   0.0955  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.554(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     2.554(CFS)
Normal flow depth in pipe =    3.93(In.)
Flow top width inside pipe =   11.26(In.)
Critical Depth =    8.22(In.)
Pipe flow velocity =     11.41(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    10.11 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      804.000 to Point/Station      804.000
**** CONFLUENCE OF MINOR STREAMS ****

------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.566(Ac.)
Runoff from this stream =      2.554(CFS)
Time of concentration =   10.11 min.
```

```
Rainfall intensity =     5.856(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        2.851     16.29             4.305
2        2.649      7.96             6.834
3        2.554     10.11             5.856
Qmax(1) =
       1.000 *    1.000 *     2.851) +
       0.630 *    1.000 *     2.649) +
       0.735 *    1.000 *     2.554) + =       6.397
Qmax(2) =
       1.000 *    0.488 *     2.851) +
       1.000 *    1.000 *     2.649) +
       1.000 *    0.787 *     2.554) + =       6.051
Qmax(3) =
       1.000 *    0.621 *     2.851) +
       0.857 *    1.000 *     2.649) +
       1.000 *    1.000 *     2.554) + =       6.593

Total of 3 streams to confluence:
Flow rates before confluence point:
       2.851       2.649       2.554
Maximum flow rates at confluence using above data:
        6.397        6.051        6.593
Area of streams before confluence:
        1.110        0.490        0.566
Results of confluence:
Total flow rate =      6.593(CFS)
Time of concentration =    10.110 min.
Effective stream area after confluence =      2.166(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      804.000 to Point/Station      106.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   302.800(Ft.)
Downstream point/station elevation =   302.600(Ft.)
Pipe length  =    38.00(Ft.) Slope =   0.0053  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.593(CFS)
Given pipe size =     12.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     2.742(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      1.301(Ft.)
 Minor friction loss =      1.641(Ft.)  K-factor =   1.50
Pipe flow velocity =      8.39(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    10.19 min.
End of computations, total study area =           2.166 (Ac.)
```

3f. CivilD Post Development Offsite Calculations

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        San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
    Rational Hydrology Study        Date: 01/27/21
------------------------------------------------------------------------
19025 Post Dev
100 Year Study Offsite
19025Post100Offsite.rd3

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 6332

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1000.000 to Point/Station     1001.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  379.000(Ft.)
Lowest elevation =  372.000(Ft.)
Elevation difference =    7.000(Ft.) Slope =  7.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   7.00 %, in a development type of
 7.3 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   6.00 minutes
 (for slope value of   5.00 %)
Rainfall intensity (I) =      8.198(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
Subarea runoff =      0.315(CFS)
Total initial stream area =        0.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1001.000 to Point/Station     1002.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      5.468(CFS)
Depth of flow =   0.404(Ft.), Average velocity =   5.574(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
```

```
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
          1              0.00              2.71
          2             31.00              0.13
          3             32.50              0.00
          4             32.50              0.50
      Manning's 'N' friction factor =   0.015
      -----------------------------------------------------------------
      Sub-Channel flow  =      5.468(CFS)
        '     '    flow top width =      4.851(Ft.)
        '     '    velocity=    5.574(Ft/s)
        '     '    area =      0.981(Sq.Ft)
        '     '    Froude number =     2.184

      Upstream point elevation =   372.000(Ft.)
      Downstream point elevation =   347.000(Ft.)
      Flow length =   839.000(Ft.)
      Travel time  =    2.51 min.
      Time of concentration =    8.51 min.
      Depth of flow =   0.404(Ft.)
      Average velocity =   5.574(Ft/s)
      Total irregular channel flow =     5.468(CFS)
      Irregular channel normal depth above invert elev. =   0.404(Ft.)
      Average velocity of channel(s) =   5.574(Ft/s)
       Adding area flow to channel
      Rainfall intensity (I) =      6.545(In/Hr) for a   100.0 year storm
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [MEDIUM DENSITY RESIDENTIAL                  ]
      (4.3 DU/A or Less       )
      Impervious value, Ai = 0.300
      Sub-Area C Value = 0.410
      Rainfall intensity =      6.545(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.411  CA =      1.609
      Subarea runoff =     10.213(CFS) for      3.830(Ac.)
      Total runoff =     10.528(CFS)  Total area =       3.910(Ac.)
      Depth of flow =   0.517(Ft.), Average velocity =   6.574(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station     1002.000 to Point/Station     1002.500
      **** PIPEFLOW TRAVEL TIME (User specified size) ****
      ______________________________________________________________________
      Upstream point/station elevation =   344.000(Ft.)
      Downstream point/station elevation =   325.600(Ft.)
      Pipe length  =   160.00(Ft.) Slope =   0.1150  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =    10.528(CFS)
      Given pipe size =     18.00(In.)
      Calculated individual pipe flow  =    10.528(CFS)
      Normal flow depth in pipe =    6.70(In.)
      Flow top width inside pipe =   17.40(In.)
      Critical Depth =   14.96(In.)
      Pipe flow velocity =     17.55(Ft/s)
      Travel time through pipe =    0.15 min.
      Time of concentration (TC) =     8.66 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station     1002.500 to Point/Station     1002.500
      **** SUBAREA FLOW ADDITION ****
      ______________________________________________________________________
      Rainfall intensity (I) =      6.470(In/Hr) for a   100.0 year storm
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
```

```
      [MEDIUM DENSITY RESIDENTIAL                  ]
      (7.3 DU/A or Less       )
      Impervious value, Ai = 0.400
      Sub-Area C Value = 0.480
      Time of concentration =     8.66 min.
      Rainfall intensity =      6.470(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.426  CA =      2.132
      Subarea runoff =      3.266(CFS) for      1.090(Ac.)
      Total runoff =     13.794(CFS)  Total area =       5.000(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station     1002.500 to Point/Station     1003.000
      **** PIPEFLOW TRAVEL TIME (User specified size) ****
      ------------------------------------------------------------------------
      Upstream point/station elevation =   325.500(Ft.)
      Downstream point/station elevation =   322.000(Ft.)
      Pipe length  =    71.00(Ft.) Slope =   0.0493  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =    13.794(CFS)
      Given pipe size =     18.00(In.)
      Calculated individual pipe flow  =    13.794(CFS)
      Normal flow depth in pipe =    9.96(In.)
      Flow top width inside pipe =   17.90(In.)
      Critical Depth =   16.50(In.)
      Pipe flow velocity =     13.75(Ft/s)
      Travel time through pipe =    0.09 min.
      Time of concentration (TC) =     8.75 min.
      End of computations, total study area =           5.000 (Ac.)
```

3f. CivilD Post Development Calculations

```
1
2                San Diego County Rational Hydrology Program
3
4       CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0
5
6       Rational method hydrology  program based on
7       San Diego County Flood Control Division 2003 hydrology manual
8           Rational Hydrology Study        Date: 05/25/23
9       ------------------------------------------------------------------------
10      19025 Post Dev
11      100 Year Study Reach 1
12      PostDev100R1.rd3
13      offiste ud to onsite w/main confulence
14      ------------------------------------------------------------------------
15       *********   Hydrology Study Control Information **********
16
17      ------------------------------------------------------------------------
18
19
20      Program License Serial Number 6332
21
22      ------------------------------------------------------------------------
23      Rational hydrology study storm event year is   100.0
24      English (in-lb) input data Units used
25
26      Map data precipitation entered:
27      6 hour,  precipitation(inches) =  3.500
28      24 hour precipitation(inches) =  6.000
29      P6/P24 =    58.3%
30      San Diego hydrology manual 'C' values used
31
32
33      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
34      Process from Point/Station      100.000 to Point/Station      101.000
35      **** INITIAL AREA EVALUATION ****
36      ________________________________________________________________________
37      Decimal fraction soil group A = 1.000
38      Decimal fraction soil group B = 0.000
39      Decimal fraction soil group C = 0.000
40      Decimal fraction soil group D = 0.000
41      [MEDIUM DENSITY RESIDENTIAL                  ]
42      (7.3 DU/A or Less       )
43      Impervious value, Ai = 0.400
44      Sub-Area C Value = 0.480
45      Initial subarea total flow distance  =   53.000(Ft.)
46      Highest elevation =  316.800(Ft.)
47      Lowest elevation =  316.700(Ft.)
48      Elevation difference =    0.100(Ft.) Slope =  0.189 %
49      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
50      The maximum overland flow distance is 50.00 (Ft)
51      for the top area slope value of   0.19 %, in a development type of
52       7.3 DU/A or Less
53      In Accordance With Figure 3-3
54      Initial Area Time of Concentration =  13.75 minutes
55      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
56      TC = [1.8*(1.1-0.4800)*(  50.000^.5)/(   0.189^(1/3)]=  13.75
57      The initial area total distance of   53.00 (Ft.) entered leaves a
58      remaining distance of    3.00 (Ft.)
59      Using Figure 3-4, the travel time for this distance is   0.20 minutes
60      for a distance of   3.00 (Ft.) and a slope of  0.19 %
61      with an elevation difference of   0.01(Ft.) from the end of the top area
62      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
63       =    0.203 Minutes
64      Tt=[(11.9*0.0006^3)/(  0.01)]^.385=  0.20
65      Total initial area Ti =  13.75 minutes from Figure 3-3 formula plus
66        0.20 minutes from the Figure 3-4 formula =  13.95 minutes
67      Rainfall intensity (I) =      4.757(In/Hr) for a   100.0 year storm
68      Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
69      Subarea runoff =      0.068(CFS)
```

```
Total initial stream area =        0.030(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

------------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      0.228(CFS)
Depth of flow =   0.095(Ft.), Average velocity =   0.591(Ft/s)
    ******* Irregular Channel Data ***********
-------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.33
    2             23.00              0.00
    3             28.50              0.33
Manning's 'N' friction factor =   0.015
-------------------------------------------------------------------
Sub-Channel flow  =      0.228(CFS)
  '     '    flow top width =      8.130(Ft.)
  '     '    velocity=    0.591(Ft/s)
  '     '    area =      0.386(Sq.Ft)
  '     '    Froude number =     0.478

Upstream point elevation =   316.700(Ft.)
Downstream point elevation =   316.300(Ft.)
Flow length =   193.000(Ft.)
Travel time  =    5.44 min.
Time of concentration =   19.39 min.
Depth of flow =   0.095(Ft.)
Average velocity =   0.591(Ft/s)
Total irregular channel flow =     0.228(CFS)
Irregular channel normal depth above invert elev. =   0.095(Ft.)
Average velocity of channel(s) =   0.591(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      3.847(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Rainfall intensity =      3.847(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.480  CA =      0.082
Subarea runoff =      0.245(CFS) for      0.140(Ac.)
Total runoff =      0.314(CFS)  Total area =      0.170(Ac.)
Depth of flow =   0.107(Ft.), Average velocity =   0.640(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****

------------------------------------------------------------------------------
Rainfall intensity (I) =      3.847(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Time of concentration =    19.39 min.
Rainfall intensity =      3.847(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.393  CA =      0.114
```

```
Subarea runoff =      0.125(CFS) for      0.120(Ac.)
Total runoff =      0.439(CFS)  Total area =       0.290(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   310.200(Ft.)
Downstream point/station elevation =   309.000(Ft.)
Pipe length  =   250.00(Ft.) Slope =   0.0048  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.439(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     0.439(CFS)
Normal flow depth in pipe =    3.42(In.)
Flow top width inside pipe =   10.84(In.)
Critical Depth =    3.28(In.)
Pipe flow velocity =      2.37(Ft/s)
Travel time through pipe =    1.76 min.
Time of concentration (TC) =    21.15 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.290(Ac.)
Runoff from this stream =      0.439(CFS)
Time of concentration =   21.15 min.
Rainfall intensity =     3.637(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1100.000 to Point/Station     1101.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                     ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Initial subarea total flow distance  =   59.000(Ft.)
Highest elevation =  336.700(Ft.)
Lowest elevation =  321.600(Ft.)
Elevation difference =   15.100(Ft.) Slope = 25.593 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  25.59 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.07 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2700)*( 100.000^.5)/(  25.593^(1/3)]=   5.07
Rainfall intensity (I) =      9.140(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
Subarea runoff =      0.173(CFS)
Total initial stream area =       0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1101.000 to Point/Station      103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      1.544(CFS)
Depth of flow =   0.128(Ft.), Average velocity =   3.658(Ft/s)
```

```
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.60
    2             16.00              0.00
    3             46.00              1.20
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      1.544(CFS)
  '     '    flow top width =      6.605(Ft.)
  '     '    velocity=    3.658(Ft/s)
  '     '    area =      0.422(Sq.Ft)
  '     '    Froude number =     2.549

Upstream point elevation =   321.600(Ft.)
Downstream point elevation =   309.000(Ft.)
Flow length =   236.000(Ft.)
Travel time  =    1.08 min.
Time of concentration =    6.15 min.
Depth of flow =   0.128(Ft.)
Average velocity =   3.658(Ft/s)
Total irregular channel flow =     1.544(CFS)
Irregular channel normal depth above invert elev. =   0.128(Ft.)
Average velocity of channel(s) =   3.658(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      8.073(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.534
Rainfall intensity =      8.073(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.509  CA =      0.371
Subarea runoff =      2.825(CFS) for      0.660(Ac.)
Total runoff =      2.998(CFS)  Total area =       0.730(Ac.)
Depth of flow =   0.164(Ft.), Average velocity =   4.317(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
__________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.730(Ac.)
Runoff from this stream =      2.998(CFS)
Time of concentration =    6.15 min.
Rainfall intensity =     8.073(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        0.439     21.15             3.637
2        2.998      6.15             8.073
Qmax(1) =
       1.000 *    1.000 *     0.439) +
       0.451 *    1.000 *     2.998) + =       1.789
Qmax(2) =
       1.000 *    0.291 *     0.439) +
       1.000 *    1.000 *     2.998) + =       3.125

Total of 2 streams to confluence:
Flow rates before confluence point:
```

```
        0.439       2.998
Maximum flow rates at confluence using above data:
        1.789       3.125
Area of streams before confluence:
        0.290       0.730
Results of confluence:
Total flow rate =      3.125(CFS)
Time of concentration =     6.145 min.
Effective stream area after confluence =      1.020(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   304.200(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =   189.00(Ft.) Slope =   0.0048  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.125(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     3.125(CFS)
Normal flow depth in pipe =    8.26(In.)
Flow top width inside pipe =   17.94(In.)
Critical Depth =    8.07(In.)
Pipe flow velocity =      3.95(Ft/s)
Travel time through pipe =    0.80 min.
Time of concentration (TC) =     6.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.020(Ac.)
Runoff from this stream =      3.125(CFS)
Time of concentration =    6.94 min.
Rainfall intensity =     7.462(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.050
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                        ]
(Office Professional    )
Impervious value, Ai = 0.900
Sub-Area C Value = 0.839
Initial subarea total flow distance  =   50.000(Ft.)
Highest elevation =  316.800(Ft.)
Lowest elevation =  316.200(Ft.)
Elevation difference =    0.600(Ft.) Slope =  1.200 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.20 %, in a development type of
 Office Professional
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.42 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8395)*(  60.000^.5)/(   1.200^(1/3)]=   3.42
Calculated TC of    3.418 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.839
Subarea runoff =      0.310(CFS)
```

```
 Total initial stream area =        0.040(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      2.245(CFS)
Depth of flow =   0.209(Ft.), Average velocity =   2.102(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.30
    2              1.50              0.00
    3             45.50              1.00
    4             61.50              1.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------------
Sub-Channel flow  =      2.245(CFS)
  '     '    flow top width =     10.230(Ft.)
  '     '    velocity=    2.102(Ft/s)
  '     '    area =      1.068(Sq.Ft)
  '     '    Froude number =     1.147

Upstream point elevation =   316.200(Ft.)
Downstream point elevation =   314.500(Ft.)
Flow length =   185.000(Ft.)
Travel time  =    1.47 min.
Time of concentration =    4.88 min.
Depth of flow =   0.209(Ft.)
Average velocity =   2.102(Ft/s)
Total irregular channel flow =     2.245(CFS)
Irregular channel normal depth above invert elev. =   0.209(Ft.)
Average velocity of channel(s) =   2.102(Ft/s)
 Adding area flow to channel
Calculated TC of    4.885 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                        ]
(Office Professional    )
Impervious value, Ai = 0.900
Sub-Area C Value = 0.840
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.840  CA =      0.454
Subarea runoff =      3.873(CFS) for      0.500(Ac.)
Total runoff =      4.183(CFS)  Total area =       0.540(Ac.)
Depth of flow =   0.264(Ft.), Average velocity =   2.456(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

------------------------------------------------------------------------
Upstream point/station elevation =   308.500(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =    48.00(Ft.) Slope =   0.1083  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.183(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     4.183(CFS)
Normal flow depth in pipe =    4.95(In.)
Flow top width inside pipe =   11.82(In.)
Critical Depth =   10.36(In.)
Pipe flow velocity =     13.68(Ft/s)
```

```
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     4.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.540(Ac.)
Runoff from this stream =      4.183(CFS)
Time of concentration =    4.94 min.
Rainfall intensity =     9.222(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                         ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Initial subarea total flow distance  =   42.000(Ft.)
Highest elevation =  316.000(Ft.)
Lowest elevation =  314.700(Ft.)
Elevation difference =    1.300(Ft.) Slope =  3.095 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   3.10 %, in a development type of
 Neighborhod Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.64 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7800)*(  85.000^.5)/(   3.095^(1/3)]=   3.64
Calculated TC of    3.644 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
Subarea runoff =      0.288(CFS)
Total initial stream area =       0.040(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      1.259(CFS)
Depth of flow =   0.087(Ft.), Average velocity =   2.583(Ft/s)
    ******* Irregular Channel Data ***********
-------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.50
    2              0.00              0.00
    3             64.00              0.50
Manning's 'N' friction factor =   0.015
-------------------------------------------------------------
Sub-Channel flow  =      1.259(CFS)
  '     '    flow top width =     11.169(Ft.)
  '     '    velocity=    2.583(Ft/s)
  '     '    area =      0.487(Sq.Ft)
  '     '    Froude number =     2.180

Upstream point elevation =   314.700(Ft.)
```

```
Downstream point elevation =   313.000(Ft.)
Flow length =    38.000(Ft.)
Travel time  =    0.25 min.
Time of concentration =    3.89 min.
Depth of flow =   0.087(Ft.)
Average velocity =   2.583(Ft/s)
Total irregular channel flow =     1.259(CFS)
Irregular channel normal depth above invert elev. =   0.087(Ft.)
Average velocity of channel(s) =   2.583(Ft/s)
 Adding area flow to channel
Calculated TC of    3.889 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                         ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.780  CA =      0.242
Subarea runoff =      1.942(CFS) for      0.270(Ac.)
Total runoff =      2.230(CFS)  Total area =       0.310(Ac.)
Depth of flow =   0.108(Ft.), Average velocity =   2.980(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

------------------------------------------------------------------------
Upstream point/station elevation =   306.000(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =    30.00(Ft.) Slope =   0.0900  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.230(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     2.230(CFS)
Normal flow depth in pipe =    3.72(In.)
Flow top width inside pipe =   11.10(In.)
Critical Depth =    7.66(In.)
Pipe flow velocity =     10.75(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     3.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****

------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.310(Ac.)
Runoff from this stream =      2.230(CFS)
Time of concentration =    3.94 min.
Rainfall intensity =     9.222(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        3.125      6.94             7.462
2        4.183      4.94             9.222
3        2.230      3.94             9.222
Qmax(1) =
       1.000 *    1.000 *     3.125) +
       0.809 *    1.000 *     4.183) +
       0.809 *    1.000 *     2.230) + =       8.314
```

```
Qmax(2) =
       1.000 *    0.712 *     3.125) +
       1.000 *    1.000 *     4.183) +
       1.000 *    1.000 *     2.230) + =       8.638
Qmax(3) =
       1.000 *    0.567 *     3.125) +
       1.000 *    0.796 *     4.183) +
       1.000 *    1.000 *     2.230) + =       7.332

Total of 3 streams to confluence:
Flow rates before confluence point:
       3.125       4.183       2.230
Maximum flow rates at confluence using above data:
        8.314       8.638       7.332
Area of streams before confluence:
        1.020       0.540       0.310
Results of confluence:
Total flow rate =      8.638(CFS)
Time of concentration =     4.943 min.
Effective stream area after confluence =      1.870(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   303.300(Ft.)
Downstream point/station elevation =   303.000(Ft.)
Pipe length  =    71.00(Ft.) Slope =   0.0042  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.638(CFS)
Given pipe size =     18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     0.736(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      0.480(Ft.)
 Minor friction loss =      0.556(Ft.)  K-factor =   1.50
Pipe flow velocity =      4.89(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     5.19 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.870(Ac.)
Runoff from this stream =      8.638(CFS)
Time of concentration =    5.19 min.
Rainfall intensity =     9.008(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      401.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  316.100(Ft.)
Lowest elevation =  312.600(Ft.)
Elevation difference =    3.500(Ft.) Slope =  3.500 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
```

```
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   3.50 %, in a development type of
 43.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.50 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7800)*(  85.000^.5)/(   3.500^(1/3)]=   3.50
The initial area total distance of  100.00 (Ft.) entered leaves a
remaining distance of   15.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   0.23 minutes
for a distance of  15.00 (Ft.) and a slope of  3.50 %
with an elevation difference of   0.53(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    0.228 Minutes
Tt=[(11.9*0.0028^3)/(  0.53)]^.385=  0.23
Total initial area Ti =   3.50 minutes from Figure 3-3 formula plus
  0.23 minutes from the Figure 3-4 formula =   3.73 minutes
Calculated TC of    3.726 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
Subarea runoff =      0.791(CFS)
Total initial stream area =        0.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      402.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.043(CFS)
Depth of flow =   0.351(Ft.), Average velocity =   4.504(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.10
    2             34.00              0.40
    3             35.50              0.00
    4             35.50              0.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      1.043(CFS)
  '     '    flow top width =      1.318(Ft.)
  '     '    velocity=    4.504(Ft/s)
  '     '    area =      0.232(Sq.Ft)
  '     '    Froude number =     1.894

Upstream point elevation =   312.600(Ft.)
Downstream point elevation =   310.600(Ft.)
Flow length =    67.000(Ft.)
Travel time  =    0.25 min.
Time of concentration =    3.97 min.
Depth of flow =   0.351(Ft.)
Average velocity =   4.504(Ft/s)
Total irregular channel flow =     1.043(CFS)
Irregular channel normal depth above invert elev. =   0.351(Ft.)
Average velocity of channel(s) =   4.504(Ft/s)
 Adding area flow to channel
Calculated TC of    3.974 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
```

```
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.780  CA =      0.140
Subarea runoff =      0.503(CFS) for      0.070(Ac.)
Total runoff =      1.295(CFS)  Total area =       0.180(Ac.)
Depth of flow =   0.381(Ft.), Average velocity =   4.754(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.180(Ac.)
Runoff from this stream =      1.295(CFS)
Time of concentration =    3.97 min.
Rainfall intensity =     9.222(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        8.638      5.19             9.008
2        1.295      3.97             9.222
Qmax(1) =
       1.000 *    1.000 *     8.638) +
       0.977 *    1.000 *     1.295) + =       9.902
Qmax(2) =
       1.000 *    0.766 *     8.638) +
       1.000 *    1.000 *     1.295) + =       7.915

Total of 2 streams to confluence:
Flow rates before confluence point:
       8.638       1.295
Maximum flow rates at confluence using above data:
        9.902        7.915
Area of streams before confluence:
        1.870        0.180
Results of confluence:
Total flow rate =      9.902(CFS)
Time of concentration =     5.185 min.
Effective stream area after confluence =      2.050(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      106.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   303.000(Ft.)
Downstream point/station elevation =   302.500(Ft.)
Pipe length  =    77.00(Ft.) Slope =   0.0065  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.902(CFS)
Given pipe size =     12.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     9.149(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      5.946(Ft.)
 Minor friction loss =      3.703(Ft.)  K-factor =   1.50
Pipe flow velocity =     12.61(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     5.29 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
```

```
In Main Stream number: 1
Stream flow area =      2.050(Ac.)
Runoff from this stream =      9.902(CFS)
Time of concentration =    5.29 min.
Rainfall intensity =     8.896(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      804.000 to Point/Station      106.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity (I) =      5.826(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  10.19 min.  Rain intensity =       5.83(In/Hr)
Total area =        2.170(Ac.)  Total runoff =     6.593(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.170(Ac.)
Runoff from this stream =      6.593(CFS)
Time of concentration =   10.19 min.
Rainfall intensity =     5.826(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1004.000 to Point/Station     1005.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                     ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Initial subarea total flow distance  =   30.000(Ft.)
Highest elevation =  334.800(Ft.)
Lowest elevation =  327.500(Ft.)
Elevation difference =    7.300(Ft.) Slope = 24.333 %
Top of Initial Area Slope adjusted by User to  0.189 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 50.00 (Ft)
for the top area slope value of   0.19 %, in a development type of
 1.0 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =  12.20 minutes
 (for slope value of   0.50 %)
Rainfall intensity (I) =      5.187(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
Subarea runoff =      0.014(CFS)
Total initial stream area =        0.010(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1005.000 to Point/Station     1003.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      0.042(CFS)
Depth of flow =   0.111(Ft.), Average velocity =   3.401(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      0.042(CFS)
  '     '    flow top width =      0.222(Ft.)
  '     '    velocity=    3.401(Ft/s)
  '     '    area =      0.012(Sq.Ft)
  '     '    Froude number =     2.543

Upstream point elevation =   327.500(Ft.)
Downstream point elevation =   324.500(Ft.)
Flow length =    34.000(Ft.)
Travel time  =    0.17 min.
Time of concentration =   12.37 min.
Depth of flow =   0.111(Ft.)
Average velocity =   3.401(Ft/s)
Total irregular channel flow =     0.042(CFS)
Irregular channel normal depth above invert elev. =   0.111(Ft.)
Average velocity of channel(s) =   3.401(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.142(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Rainfall intensity =      5.142(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.270  CA =      0.014
Subarea runoff =      0.055(CFS) for      0.040(Ac.)
Total runoff =      0.069(CFS)  Total area =       0.050(Ac.)
Depth of flow =   0.134(Ft.), Average velocity =   3.856(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1003.000
**** CONFLUENCE OF MINOR STREAMS ****

------------------------------------------------------------------------
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      0.050(Ac.)
Runoff from this stream =      0.069(CFS)
Time of concentration =   12.37 min.
Rainfall intensity =     5.142(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1003.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

------------------------------------------------------------------------
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
```

```
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Rainfall intensity (I) =      6.428(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   8.75 min.  Rain intensity =       6.43(In/Hr)
Total area =        5.000(Ac.)  Total runoff =    13.794(CFS)


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Process from Point/Station     1003.000 to Point/Station     1003.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      5.000(Ac.)
Runoff from this stream =     13.794(CFS)
Time of concentration =    8.75 min.
Rainfall intensity =     6.428(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1         0.069     12.37             5.142
2        13.794      8.75             6.428
Qmax(1) =
       1.000 *    1.000 *     0.069) +
       0.800 *    1.000 *    13.794) + =      11.105
Qmax(2) =
       1.000 *    0.708 *     0.069) +
       1.000 *    1.000 *    13.794) + =      13.843

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.069      13.794
Maximum flow rates at confluence using above data:
       11.105       13.843
Area of streams before confluence:
        0.050        5.000
Results of confluence:
Total flow rate =     13.843(CFS)
Time of concentration =     8.750 min.
Effective stream area after confluence =      5.050(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station      106.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   311.100(Ft.)
Downstream point/station elevation =   302.600(Ft.)
Pipe length  =   209.00(Ft.) Slope =   0.0407  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.843(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    13.843(CFS)
Normal flow depth in pipe =   10.61(In.)
Flow top width inside pipe =   17.71(In.)
Critical Depth =   16.52(In.)
Pipe flow velocity =     12.78(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =     9.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
```

```
In Main Stream number: 3
Stream flow area =      5.050(Ac.)
Runoff from this stream =     13.843(CFS)
Time of concentration =    9.02 min.
Rainfall intensity =     6.302(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1         9.902      5.29             8.896
2         6.593     10.19             5.826
3        13.843      9.02             6.302
Qmax(1) =
       1.000 *    1.000 *     9.902) +
       1.000 *    0.519 *     6.593) +
       1.000 *    0.586 *    13.843) + =      21.435
Qmax(2) =
       0.655 *    1.000 *     9.902) +
       1.000 *    1.000 *     6.593) +
       0.925 *    1.000 *    13.843) + =      25.877
Qmax(3) =
       0.708 *    1.000 *     9.902) +
       1.000 *    0.885 *     6.593) +
       1.000 *    1.000 *    13.843) + =      26.696

Total of 3 main streams to confluence:
Flow rates before confluence point:
       9.902       6.593      13.843
Maximum flow rates at confluence using above data:
       21.435       25.877       26.696
Area of streams before confluence:
        2.050        2.170        5.050


Results of confluence:
Total flow rate =     26.696(CFS)
Time of concentration =     9.023 min.
Effective stream area after confluence  =      9.270(Ac.)


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Process from Point/Station      106.000 to Point/Station      107.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   302.500(Ft.)
Downstream point/station elevation =   302.100(Ft.)
Pipe length  =    31.00(Ft.) Slope =   0.0129  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    26.696(CFS)
Given pipe size =     18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     6.917(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      2.002(Ft.)
 Minor friction loss =      5.316(Ft.)  K-factor =   1.50
Pipe flow velocity =     15.11(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     9.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      109.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   302.100(Ft.)
Downstream point/station elevation =   285.720(Ft.)
Pipe length  =   137.00(Ft.) Slope =   0.1196  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    26.696(CFS)
```

```
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    26.696(CFS)
Normal flow depth in pipe =   11.47(In.)
Flow top width inside pipe =   17.31(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.47(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     9.16 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      109.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      9.270(Ac.)
Runoff from this stream =     26.696(CFS)
Time of concentration =    9.16 min.
Rainfall intensity =     6.241(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2002.000 to Point/Station     2003.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.810
Initial subarea total flow distance  =   93.000(Ft.)
Highest elevation =  318.000(Ft.)
Lowest elevation =  316.300(Ft.)
Elevation difference =    1.700(Ft.) Slope =  1.828 %
Top of Initial Area Slope adjusted by User to  1.400 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.40 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.61 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8100)*(  60.000^.5)/(   1.400^(1/3)]=   3.61
Calculated TC of    3.614 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =     9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.810
Subarea runoff =     0.254(CFS)
Total initial stream area =       0.034(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2003.000 to Point/Station     2004.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     2.206(CFS)
Depth of flow =   0.250(Ft.), Average velocity =   1.603(Ft/s)
    ******* Irregular Channel Data ***********
-------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.31
    2             26.00              0.13
    3             27.50              0.00
    4             27.50              0.50
Manning's 'N' friction factor =   0.015
```

```
------------------------------------------------------------------
Sub-Channel flow  =      2.206(CFS)
  '     '    flow top width =     18.940(Ft.)
  '     '    velocity=    1.603(Ft/s)
  '     '    area =      1.376(Sq.Ft)
  '     '    Froude number =     1.048

Upstream point elevation =   316.300(Ft.)
Downstream point elevation =   310.800(Ft.)
Flow length =   625.000(Ft.)
Travel time  =    6.50 min.
Time of concentration =   10.11 min.
Depth of flow =   0.250(Ft.)
Average velocity =   1.603(Ft/s)
Total irregular channel flow =     2.206(CFS)
Irregular channel normal depth above invert elev. =   0.250(Ft.)
Average velocity of channel(s) =   1.603(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.855(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.804 given for subarea
Rainfall intensity =      5.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.804  CA =      0.700
Subarea runoff =      3.848(CFS) for      0.837(Ac.)
Total runoff =      4.102(CFS)  Total area =       0.871(Ac.)
Depth of flow =   0.289(Ft.), Average velocity =   1.862(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2000.000 to Point/Station      109.000
**** SUBAREA FLOW ADDITION ****

------------------------------------------------------------------------
Rainfall intensity (I) =      5.855(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(14.5 DU/A or Less      )
Impervious value, Ai = 0.500
Sub-Area C Value = 0.595
Time of concentration =    10.11 min.
Rainfall intensity =      5.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.719  CA =      1.057
Subarea runoff =      2.090(CFS) for      0.600(Ac.)
Total runoff =      6.192(CFS)  Total area =       1.471(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2001.000 to Point/Station      109.000
**** SUBAREA FLOW ADDITION ****

------------------------------------------------------------------------
Rainfall intensity (I) =      5.855(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                       ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Time of concentration =    10.11 min.
Rainfall intensity =      5.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.733  CA =      1.409
Subarea runoff =      2.060(CFS) for      0.451(Ac.)
Total runoff =      8.252(CFS)  Total area =       1.922(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      109.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.922(Ac.)
Runoff from this stream =      8.252(CFS)
Time of concentration =   10.11 min.
Rainfall intensity =     5.855(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       26.696      9.16             6.241
2        8.252     10.11             5.855
Qmax(1) =
       1.000 *    1.000 *    26.696) +
       1.000 *    0.906 *     8.252) + =      34.170
Qmax(2) =
       0.938 *    1.000 *    26.696) +
       1.000 *    1.000 *     8.252) + =      33.297

Total of 2 streams to confluence:
Flow rates before confluence point:
      26.696       8.252
Maximum flow rates at confluence using above data:
       34.170       33.297
Area of streams before confluence:
        9.270        1.922
Results of confluence:
Total flow rate =     34.170(CFS)
Time of concentration =     9.158 min.
Effective stream area after confluence =     11.192(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2004.000 to Point/Station      109.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =   306.830(Ft.)
Downstream point/station elevation =   285.720(Ft.)
Pipe length  =   211.00(Ft.) Slope =   0.1000  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    34.170(CFS)
Given pipe size =     18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     9.918(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     22.320(Ft.)
 Minor friction loss =      8.709(Ft.)  K-factor =   1.50
Critical depth could not be calculated.
Pipe flow velocity =     19.34(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =     9.34 min.
End of computations, total study area =          11.192 (Ac.)
```

3g. CivilD Post Development Mitigation Calculations

```
            San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
    Rational Hydrology Study        Date: 06/08/23
--------------------------------------------------------------------------
19025 Post Dev
100 Year Study Reach 8
MIT
2021.09.16 update
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 6332

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      800.000 to Point/Station      802.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________________
User specified 'C' value of 0.195 given for subarea
Rainfall intensity (I) =      3.045(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  27.86 min.  Rain intensity =       3.05(In/Hr)
Total area =        0.970(Ac.)  Total runoff =     0.577(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      802.000 to Point/Station      803.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   304.600(Ft.)
Downstream point/station elevation =   304.300(Ft.)
Pipe length  =   173.00(Ft.) Slope =   0.0017  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.577(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     0.577(CFS)
Normal flow depth in pipe =    5.19(In.)
Flow top width inside pipe =   11.89(In.)
Critical Depth =    3.79(In.)
Pipe flow velocity =      1.77(Ft/s)
Travel time through pipe =    1.63 min.
Time of concentration (TC) =    29.49 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      803.000 to Point/Station      803.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.970(Ac.)
Runoff from this stream =      0.577(CFS)
Time of concentration =   29.49 min.
```

```
Rainfall intensity =     2.936(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      900.000 to Point/Station      901.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                      ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  333.100(Ft.)
Lowest elevation =  323.900(Ft.)
Elevation difference =    9.200(Ft.) Slope =  9.200 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   9.20 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.13 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2700)*( 100.000^.5)/(   9.200^(1/3)]=   7.13
Rainfall intensity (I) =      7.335(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
Subarea runoff =      0.059(CFS)
Total initial stream area =        0.030(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      901.000 to Point/Station      902.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      0.168(CFS)
Depth of flow =   0.228(Ft.), Average velocity =   3.226(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.016
------------------------------------------------------------------
Sub-Channel flow  =      0.168(CFS)
  '     '    flow top width =      0.457(Ft.)
  '     '    velocity=    3.226(Ft/s)
  '     '    area =      0.052(Sq.Ft)
  '     '    Froude number =     1.682

Upstream point elevation =   323.900(Ft.)
Downstream point elevation =   315.400(Ft.)
Flow length =   246.000(Ft.)
Travel time  =    1.27 min.
Time of concentration =    8.40 min.
Depth of flow =   0.228(Ft.)
Average velocity =   3.226(Ft/s)
Total irregular channel flow =     0.168(CFS)
Irregular channel normal depth above invert elev. =   0.228(Ft.)
Average velocity of channel(s) =   3.226(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      6.599(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
```

```
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Rainfall intensity =      6.599(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.270  CA =      0.038
Subarea runoff =      0.190(CFS) for      0.110(Ac.)
Total runoff =      0.249(CFS)  Total area =       0.140(Ac.)
Depth of flow =   0.265(Ft.), Average velocity =   3.559(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      902.000 to Point/Station      803.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   310.900(Ft.)
Downstream point/station elevation =   304.300(Ft.)
Pipe length  =   100.00(Ft.) Slope =   0.0660  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.249(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     0.249(CFS)
Normal flow depth in pipe =    1.36(In.)
Flow top width inside pipe =    7.62(In.)
Critical Depth =    2.46(In.)
Pipe flow velocity =      5.07(Ft/s)
Travel time through pipe =    0.33 min.
Time of concentration (TC) =     8.73 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      803.000 to Point/Station      803.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.140(Ac.)
Runoff from this stream =      0.249(CFS)
Time of concentration =    8.73 min.
Rainfall intensity =     6.437(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        0.577     29.49             2.936
2        0.249      8.73             6.437
Qmax(1) =
       1.000 *    1.000 *     0.577) +
       0.456 *    1.000 *     0.249) + =       0.691
Qmax(2) =
       1.000 *    0.296 *     0.577) +
       1.000 *    1.000 *     0.249) + =       0.420

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.577       0.249
Maximum flow rates at confluence using above data:
        0.691       0.420
Area of streams before confluence:
        0.970       0.140
Results of confluence:
Total flow rate =      0.691(CFS)
Time of concentration =    29.489 min.
Effective stream area after confluence =      1.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

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Process from Point/Station      803.000 to Point/Station      804.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   304.300(Ft.)
Downstream point/station elevation =   302.800(Ft.)
Pipe length  =   301.00(Ft.) Slope =   0.0050  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.691(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     0.691(CFS)
Normal flow depth in pipe =    4.30(In.)
Flow top width inside pipe =   11.51(In.)
Critical Depth =    4.15(In.)
Pipe flow velocity =      2.73(Ft/s)
Travel time through pipe =    1.84 min.
Time of concentration (TC) =    31.32 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      804.000 to Point/Station      804.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.110(Ac.)
Runoff from this stream =      0.691(CFS)
Time of concentration =   31.32 min.
Rainfall intensity =     2.824(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      600.000 to Point/Station      804.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity (I) =      6.834(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   7.96 min.  Rain intensity =       6.83(In/Hr)
Total area =       0.490(Ac.)  Total runoff =     2.649(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      804.000 to Point/Station      804.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.490(Ac.)
Runoff from this stream =      2.649(CFS)
Time of concentration =    7.96 min.
Rainfall intensity =     6.834(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      500.000 to Point/Station      501.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.900
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.100
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(24.0 DU/A or Less      )
Impervious value, Ai = 0.650
Sub-Area C Value = 0.663
```

```
 Initial subarea total flow distance  =   68.000(Ft.)
 Highest elevation =  315.800(Ft.)
 Lowest elevation =  315.600(Ft.)
 Elevation difference =    0.200(Ft.) Slope =  0.294 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 50.00 (Ft)
 for the top area slope value of   0.29 %, in a development type of
  24.0 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration =   8.36 minutes
 TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
 TC = [1.8*(1.1-0.6630)*(  50.000^.5)/(   0.294^(1/3)]=   8.36
 The initial area total distance of   68.00 (Ft.) entered leaves a
 remaining distance of   18.00 (Ft.)
 Using Figure 3-4, the travel time for this distance is   0.68 minutes
 for a distance of  18.00 (Ft.) and a slope of  0.29 %
 with an elevation difference of   0.05(Ft.) from the end of the top area
 Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
  =    0.682 Minutes
 Tt=[(11.9*0.0034^3)/(  0.05)]^.385=  0.68
 Total initial area Ti =   8.36 minutes from Figure 3-3 formula plus
   0.68 minutes from the Figure 3-4 formula =   9.05 minutes
 Rainfall intensity (I) =      6.291(In/Hr) for a   100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.663
 Subarea runoff =      0.167(CFS)
 Total initial stream area =        0.040(Ac.)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station      501.000 to Point/Station      502.000
 **** SUBAREA FLOW ADDITION ****

 ------------------------------------------------------------------------
 Rainfall intensity (I) =      6.291(In/Hr) for a   100.0 year storm
 Decimal fraction soil group A = 0.900
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.100
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL                    ]
 (43.0 DU/A or Less      )
 Impervious value, Ai = 0.800
 Sub-Area C Value = 0.762
 Time of concentration =     9.05 min.
 Rainfall intensity =      6.291(In/Hr) for a   100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.739  CA =      0.126
 Subarea runoff =      0.623(CFS) for      0.130(Ac.)
 Total runoff =      0.790(CFS)  Total area =       0.170(Ac.)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station      502.000 to Point/Station      503.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

 ------------------------------------------------------------------------
 Estimated mean flow rate at midpoint of channel =      1.710(CFS)
 Depth of flow =   0.034(Ft.), Average velocity =   2.019(Ft/s)
     ******* Irregular Channel Data ***********
 ------------------------------------------------------------------
 Information entered for subchannel number 1 :
 Point number      'X' coordinate     'Y' coordinate
     1              0.00              0.50
     2              0.00              0.00
     3             25.00              0.00
     4             25.00              0.50
 Manning's 'N' friction factor =   0.015
 ------------------------------------------------------------------
 Sub-Channel flow  =      1.710(CFS)
   '     '    flow top width =     25.000(Ft.)
   '     '    velocity=    2.019(Ft/s)
   '     '    area =      0.847(Sq.Ft)
```

```
  '     '    Froude number =     1.933

Upstream point elevation =   316.600(Ft.)
Downstream point elevation =   312.000(Ft.)
Flow length =   121.000(Ft.)
Travel time  =    1.00 min.
Time of concentration =   10.05 min.
Depth of flow =   0.034(Ft.)
Average velocity =   2.019(Ft/s)
Total irregular channel flow =     1.710(CFS)
Irregular channel normal depth above invert elev. =   0.034(Ft.)
Average velocity of channel(s) =   2.019(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.880(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.990
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity =      5.880(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.767  CA =      0.434
Subarea runoff =      1.764(CFS) for      0.396(Ac.)
Total runoff =      2.554(CFS)  Total area =       0.566(Ac.)
Depth of flow =   0.043(Ft.), Average velocity =   2.369(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      503.000 to Point/Station      804.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   307.000(Ft.)
Downstream point/station elevation =   302.800(Ft.)
Pipe length  =    44.00(Ft.) Slope =   0.0955  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.554(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     2.554(CFS)
Normal flow depth in pipe =    3.93(In.)
Flow top width inside pipe =   11.26(In.)
Critical Depth =    8.22(In.)
Pipe flow velocity =     11.41(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    10.11 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      804.000 to Point/Station      804.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.566(Ac.)
Runoff from this stream =      2.554(CFS)
Time of concentration =   10.11 min.
Rainfall intensity =     5.856(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        0.691     31.32            2.824
2        2.649      7.96            6.834
3        2.554     10.11            5.856
Qmax(1) =
       1.000 *    1.000 *     0.691) +
       0.413 *    1.000 *     2.649) +
```

```
       0.482 *    1.000 *     2.554) + =       3.017
Qmax(2) =
       1.000 *    0.254 *     0.691) +
       1.000 *    1.000 *     2.649) +
       1.000 *    0.787 *     2.554) + =       4.834
Qmax(3) =
       1.000 *    0.323 *     0.691) +
       0.857 *    1.000 *     2.649) +
       1.000 *    1.000 *     2.554) + =       5.047

Total of 3 streams to confluence:
Flow rates before confluence point:
       0.691       2.649       2.554
Maximum flow rates at confluence using above data:
        3.017       4.834       5.047
Area of streams before confluence:
        1.110       0.490       0.566
Results of confluence:
Total flow rate =      5.047(CFS)
Time of concentration =    10.110 min.
Effective stream area after confluence =      2.166(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      804.000 to Point/Station      106.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   302.800(Ft.)
Downstream point/station elevation =   302.600(Ft.)
Pipe length  =    38.00(Ft.) Slope =   0.0053  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.047(CFS)
Given pipe size =     12.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     1.524(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      0.762(Ft.)
 Minor friction loss =      0.962(Ft.)  K-factor =   1.50
Pipe flow velocity =      6.43(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    10.21 min.
End of computations, total study area =           2.166 (Ac.)
```

```
1
2               San Diego County Rational Hydrology Program
3
4       CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0
5
6       Rational method hydrology  program based on
7       San Diego County Flood Control Division 2003 hydrology manual
8           Rational Hydrology Study        Date: 06/08/23
9       ----------------------------------------------------------------------
10      19025 Post Dev
11      100 Year Study Reach 1
12      PostDev100R1.rd3
13      mit
14      ----------------------------------------------------------------------
15       *********   Hydrology Study Control Information **********
16
17      ----------------------------------------------------------------------
18
19
20      Program License Serial Number 6332
21
22      ----------------------------------------------------------------------
23      Rational hydrology study storm event year is   100.0
24      English (in-lb) input data Units used
25
26      Map data precipitation entered:
27      6 hour,  precipitation(inches) =  3.500
28      24 hour precipitation(inches) =  6.000
29      P6/P24 =    58.3%
30      San Diego hydrology manual 'C' values used
31
32
33      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
34      Process from Point/Station      100.000 to Point/Station      101.000
35      **** INITIAL AREA EVALUATION ****
36      ________________________________________________________________________
37      Decimal fraction soil group A = 1.000
38      Decimal fraction soil group B = 0.000
39      Decimal fraction soil group C = 0.000
40      Decimal fraction soil group D = 0.000
41      [MEDIUM DENSITY RESIDENTIAL                  ]
42      (7.3 DU/A or Less       )
43      Impervious value, Ai = 0.400
44      Sub-Area C Value = 0.480
45      Initial subarea total flow distance  =   53.000(Ft.)
46      Highest elevation =  316.800(Ft.)
47      Lowest elevation =  316.700(Ft.)
48      Elevation difference =    0.100(Ft.) Slope =  0.189 %
49      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
50      The maximum overland flow distance is 50.00 (Ft)
51      for the top area slope value of   0.19 %, in a development type of
52       7.3 DU/A or Less
53      In Accordance With Figure 3-3
54      Initial Area Time of Concentration =  13.75 minutes
55      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
56      TC = [1.8*(1.1-0.4800)*(  50.000^.5)/(   0.189^(1/3)]=  13.75
57      The initial area total distance of   53.00 (Ft.) entered leaves a
58      remaining distance of    3.00 (Ft.)
59      Using Figure 3-4, the travel time for this distance is   0.20 minutes
60      for a distance of   3.00 (Ft.) and a slope of  0.19 %
61      with an elevation difference of   0.01(Ft.) from the end of the top area
62      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
63       =    0.203 Minutes
64      Tt=[(11.9*0.0006^3)/(  0.01)]^.385=  0.20
65      Total initial area Ti =  13.75 minutes from Figure 3-3 formula plus
66        0.20 minutes from the Figure 3-4 formula =  13.95 minutes
67      Rainfall intensity (I) =     4.757(In/Hr) for a   100.0 year storm
68      Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
69      Subarea runoff =     0.068(CFS)
```

```
Total initial stream area =       0.030(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      0.228(CFS)
Depth of flow =   0.095(Ft.), Average velocity =   0.591(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.33
    2             23.00              0.00
    3             28.50              0.33
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------------
Sub-Channel flow  =      0.228(CFS)
  '     '    flow top width =      8.130(Ft.)
  '     '    velocity=    0.591(Ft/s)
  '     '    area =      0.386(Sq.Ft)
  '     '    Froude number =     0.478

Upstream point elevation =   316.700(Ft.)
Downstream point elevation =   316.300(Ft.)
Flow length =   193.000(Ft.)
Travel time  =    5.44 min.
Time of concentration =   19.39 min.
Depth of flow =   0.095(Ft.)
Average velocity =   0.591(Ft/s)
Total irregular channel flow =     0.228(CFS)
Irregular channel normal depth above invert elev. =   0.095(Ft.)
Average velocity of channel(s) =   0.591(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      3.847(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Rainfall intensity =      3.847(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.480  CA =      0.082
Subarea runoff =      0.245(CFS) for      0.140(Ac.)
Total runoff =      0.314(CFS)  Total area =       0.170(Ac.)
Depth of flow =   0.107(Ft.), Average velocity =   0.640(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Rainfall intensity (I) =      3.847(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                     ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Time of concentration =    19.39 min.
Rainfall intensity =      3.847(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.393  CA =      0.114
```

```
Subarea runoff =      0.125(CFS) for      0.120(Ac.)
Total runoff =      0.439(CFS)  Total area =       0.290(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   310.200(Ft.)
Downstream point/station elevation =   309.000(Ft.)
Pipe length  =   250.00(Ft.) Slope =   0.0048  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.439(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     0.439(CFS)
Normal flow depth in pipe =    3.42(In.)
Flow top width inside pipe =   10.84(In.)
Critical Depth =    3.28(In.)
Pipe flow velocity =      2.37(Ft/s)
Travel time through pipe =    1.76 min.
Time of concentration (TC) =    21.15 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.290(Ac.)
Runoff from this stream =      0.439(CFS)
Time of concentration =   21.15 min.
Rainfall intensity =     3.637(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1100.000 to Point/Station     1101.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                     ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Initial subarea total flow distance  =   59.000(Ft.)
Highest elevation =  336.700(Ft.)
Lowest elevation =  321.600(Ft.)
Elevation difference =   15.100(Ft.) Slope = 25.593 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  25.59 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.07 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2700)*( 100.000^.5)/(  25.593^(1/3)]=   5.07
Rainfall intensity (I) =      9.140(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
Subarea runoff =      0.173(CFS)
Total initial stream area =       0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1101.000 to Point/Station      103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.544(CFS)
Depth of flow =   0.128(Ft.), Average velocity =   3.658(Ft/s)
```

```
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.60
    2             16.00              0.00
    3             46.00              1.20
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      1.544(CFS)
  '     '    flow top width =      6.605(Ft.)
  '     '    velocity=    3.658(Ft/s)
  '     '    area =      0.422(Sq.Ft)
  '     '    Froude number =     2.549

Upstream point elevation =   321.600(Ft.)
Downstream point elevation =   309.000(Ft.)
Flow length =   236.000(Ft.)
Travel time  =    1.08 min.
Time of concentration =    6.15 min.
Depth of flow =   0.128(Ft.)
Average velocity =   3.658(Ft/s)
Total irregular channel flow =     1.544(CFS)
Irregular channel normal depth above invert elev. =   0.128(Ft.)
Average velocity of channel(s) =   3.658(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      8.073(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.534
Rainfall intensity =      8.073(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.509  CA =      0.371
Subarea runoff =      2.825(CFS) for      0.660(Ac.)
Total runoff =      2.998(CFS)  Total area =       0.730(Ac.)
Depth of flow =   0.164(Ft.), Average velocity =   4.317(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.730(Ac.)
Runoff from this stream =      2.998(CFS)
Time of concentration =    6.15 min.
Rainfall intensity =     8.073(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        0.439     21.15             3.637
2        2.998      6.15             8.073
Qmax(1) =
       1.000 *    1.000 *     0.439) +
       0.451 *    1.000 *     2.998) + =       1.789
Qmax(2) =
       1.000 *    0.291 *     0.439) +
       1.000 *    1.000 *     2.998) + =       3.125

Total of 2 streams to confluence:
Flow rates before confluence point:
```

```
       0.439       2.998
Maximum flow rates at confluence using above data:
        1.789        3.125
Area of streams before confluence:
        0.290        0.730
Results of confluence:
Total flow rate =      3.125(CFS)
Time of concentration =     6.145 min.
Effective stream area after confluence =      1.020(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   304.200(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =   189.00(Ft.) Slope =   0.0048  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.125(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     3.125(CFS)
Normal flow depth in pipe =    8.26(In.)
Flow top width inside pipe =   17.94(In.)
Critical Depth =    8.07(In.)
Pipe flow velocity =      3.95(Ft/s)
Travel time through pipe =    0.80 min.
Time of concentration (TC) =     6.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.020(Ac.)
Runoff from this stream =      3.125(CFS)
Time of concentration =    6.94 min.
Rainfall intensity =     7.462(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.050
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                         ]
(Office Professional    )
Impervious value, Ai = 0.900
Sub-Area C Value = 0.839
Initial subarea total flow distance  =   50.000(Ft.)
Highest elevation =  316.800(Ft.)
Lowest elevation =  316.200(Ft.)
Elevation difference =    0.600(Ft.) Slope =  1.200 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.20 %, in a development type of
 Office Professional
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.42 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8395)*(  60.000^.5)/(   1.200^(1/3)]=   3.42
Calculated TC of    3.418 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.839
Subarea runoff =      0.310(CFS)
```

```
 Total initial stream area =        0.040(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.245(CFS)
Depth of flow =   0.209(Ft.), Average velocity =   2.102(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.30
    2              1.50              0.00
    3             45.50              1.00
    4             61.50              1.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      2.245(CFS)
  '     '    flow top width =     10.230(Ft.)
  '     '    velocity=    2.102(Ft/s)
  '     '    area =      1.068(Sq.Ft)
  '     '    Froude number =     1.147

Upstream point elevation =   316.200(Ft.)
Downstream point elevation =   314.500(Ft.)
Flow length =   185.000(Ft.)
Travel time  =    1.47 min.
Time of concentration =    4.88 min.
Depth of flow =   0.209(Ft.)
Average velocity =   2.102(Ft/s)
Total irregular channel flow =     2.245(CFS)
Irregular channel normal depth above invert elev. =   0.209(Ft.)
Average velocity of channel(s) =   2.102(Ft/s)
 Adding area flow to channel
Calculated TC of    4.885 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                          ]
(Office Professional    )
Impervious value, Ai = 0.900
Sub-Area C Value = 0.840
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.840  CA =      0.454
Subarea runoff =      3.873(CFS) for      0.500(Ac.)
Total runoff =      4.183(CFS)  Total area =       0.540(Ac.)
Depth of flow =   0.264(Ft.), Average velocity =   2.456(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   308.500(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =    48.00(Ft.) Slope =   0.1083  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.183(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     4.183(CFS)
Normal flow depth in pipe =    4.95(In.)
Flow top width inside pipe =   11.82(In.)
Critical Depth =   10.36(In.)
Pipe flow velocity =     13.68(Ft/s)
```

```
      Travel time through pipe =    0.06 min.
      Time of concentration (TC) =     4.94 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      202.000 to Point/Station      104.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ________________________________________________________________________
      Along Main Stream number: 1 in normal stream number 2
      Stream flow area =      0.540(Ac.)
      Runoff from this stream =      4.183(CFS)
      Time of concentration =    4.94 min.
      Rainfall intensity =     9.222(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      300.000 to Point/Station      301.000
      **** INITIAL AREA EVALUATION ****
      ________________________________________________________________________
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 1.000
      Decimal fraction soil group D = 0.000
      [COMMERCIAL area type                         ]
      (Neighborhod Commercial )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.780
      Initial subarea total flow distance  =   42.000(Ft.)
      Highest elevation =  316.000(Ft.)
      Lowest elevation =  314.700(Ft.)
      Elevation difference =    1.300(Ft.) Slope =  3.095 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 85.00 (Ft)
      for the top area slope value of   3.10 %, in a development type of
       Neighborhod Commercial
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   3.64 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.7800)*(  85.000^.5)/(   3.095^(1/3)]=   3.64
      Calculated TC of    3.644 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
      Subarea runoff =      0.288(CFS)
      Total initial stream area =        0.040(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station      301.000 to Point/Station      302.000
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ________________________________________________________________________
      Estimated mean flow rate at midpoint of channel =      1.259(CFS)
      Depth of flow =   0.087(Ft.), Average velocity =   2.583(Ft/s)
          ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
          1              0.00              0.50
          2              0.00              0.00
          3             64.00              0.50
      Manning's 'N' friction factor =   0.015
      ------------------------------------------------------------------
      Sub-Channel flow  =      1.259(CFS)
        '     '    flow top width =     11.169(Ft.)
        '     '    velocity=    2.583(Ft/s)
        '     '    area =      0.487(Sq.Ft)
        '     '    Froude number =     2.180

      Upstream point elevation =   314.700(Ft.)
```

```
Downstream point elevation =   313.000(Ft.)
Flow length =    38.000(Ft.)
Travel time  =    0.25 min.
Time of concentration =    3.89 min.
Depth of flow =   0.087(Ft.)
Average velocity =   2.583(Ft/s)
Total irregular channel flow =     1.259(CFS)
Irregular channel normal depth above invert elev. =   0.087(Ft.)
Average velocity of channel(s) =   2.583(Ft/s)
 Adding area flow to channel
Calculated TC of    3.889 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                         ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.780  CA =      0.242
Subarea runoff =      1.942(CFS) for      0.270(Ac.)
Total runoff =      2.230(CFS)  Total area =       0.310(Ac.)
Depth of flow =   0.108(Ft.), Average velocity =   2.980(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   306.000(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =    30.00(Ft.) Slope =   0.0900  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.230(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     2.230(CFS)
Normal flow depth in pipe =    3.72(In.)
Flow top width inside pipe =   11.10(In.)
Critical Depth =    7.66(In.)
Pipe flow velocity =     10.75(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     3.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.310(Ac.)
Runoff from this stream =      2.230(CFS)
Time of concentration =    3.94 min.
Rainfall intensity =     9.222(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        3.125      6.94             7.462
2        4.183      4.94             9.222
3        2.230      3.94             9.222
Qmax(1) =
       1.000 *    1.000 *     3.125) +
       0.809 *    1.000 *     4.183) +
       0.809 *    1.000 *     2.230) + =       8.314
```

```
Qmax(2) =
       1.000 *    0.712 *     3.125) +
       1.000 *    1.000 *     4.183) +
       1.000 *    1.000 *     2.230) + =       8.638
Qmax(3) =
       1.000 *    0.567 *     3.125) +
       1.000 *    0.796 *     4.183) +
       1.000 *    1.000 *     2.230) + =       7.332

Total of 3 streams to confluence:
Flow rates before confluence point:
       3.125       4.183       2.230
Maximum flow rates at confluence using above data:
        8.314       8.638       7.332
Area of streams before confluence:
        1.020       0.540       0.310
Results of confluence:
Total flow rate =      8.638(CFS)
Time of concentration =     4.943 min.
Effective stream area after confluence =      1.870(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   303.300(Ft.)
Downstream point/station elevation =   303.000(Ft.)
Pipe length  =    71.00(Ft.) Slope =   0.0042  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.638(CFS)
Given pipe size =     18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     0.736(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      0.480(Ft.)
 Minor friction loss =      0.556(Ft.)  K-factor =   1.50
Pipe flow velocity =      4.89(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     5.19 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.870(Ac.)
Runoff from this stream =      8.638(CFS)
Time of concentration =    5.19 min.
Rainfall intensity =     9.008(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      401.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  316.100(Ft.)
Lowest elevation =  312.600(Ft.)
Elevation difference =    3.500(Ft.) Slope =  3.500 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
```

```
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   3.50 %, in a development type of
 43.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.50 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7800)*(  85.000^.5)/(   3.500^(1/3)]=   3.50
The initial area total distance of  100.00 (Ft.) entered leaves a
remaining distance of   15.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   0.23 minutes
for a distance of  15.00 (Ft.) and a slope of  3.50 %
with an elevation difference of   0.53(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    0.228 Minutes
Tt=[(11.9*0.0028^3)/(  0.53)]^.385=  0.23
Total initial area Ti =   3.50 minutes from Figure 3-3 formula plus
  0.23 minutes from the Figure 3-4 formula =   3.73 minutes
Calculated TC of    3.726 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
Subarea runoff =      0.791(CFS)
Total initial stream area =        0.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      402.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.043(CFS)
Depth of flow =   0.351(Ft.), Average velocity =   4.504(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.10
    2             34.00              0.40
    3             35.50              0.00
    4             35.50              0.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      1.043(CFS)
  '     '    flow top width =      1.318(Ft.)
  '     '    velocity=    4.504(Ft/s)
  '     '    area =      0.232(Sq.Ft)
  '     '    Froude number =     1.894

Upstream point elevation =   312.600(Ft.)
Downstream point elevation =   310.600(Ft.)
Flow length =    67.000(Ft.)
Travel time  =    0.25 min.
Time of concentration =    3.97 min.
Depth of flow =   0.351(Ft.)
Average velocity =   4.504(Ft/s)
Total irregular channel flow =     1.043(CFS)
Irregular channel normal depth above invert elev. =   0.351(Ft.)
Average velocity of channel(s) =   4.504(Ft/s)
 Adding area flow to channel
Calculated TC of    3.974 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
```

```
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.780  CA =      0.140
Subarea runoff =      0.503(CFS) for      0.070(Ac.)
Total runoff =      1.295(CFS)  Total area =       0.180(Ac.)
Depth of flow =   0.381(Ft.), Average velocity =   4.754(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.180(Ac.)
Runoff from this stream =      1.295(CFS)
Time of concentration =    3.97 min.
Rainfall intensity =     9.222(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1        8.638      5.19             9.008
2        1.295      3.97             9.222
Qmax(1) =
       1.000 *    1.000 *     8.638) +
       0.977 *    1.000 *     1.295) + =       9.902
Qmax(2) =
       1.000 *    0.766 *     8.638) +
       1.000 *    1.000 *     1.295) + =       7.915

Total of 2 streams to confluence:
Flow rates before confluence point:
       8.638       1.295
Maximum flow rates at confluence using above data:
        9.902        7.915
Area of streams before confluence:
        1.870        0.180
Results of confluence:
Total flow rate =      9.902(CFS)
Time of concentration =     5.185 min.
Effective stream area after confluence =      2.050(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      106.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   303.000(Ft.)
Downstream point/station elevation =   302.500(Ft.)
Pipe length  =    77.00(Ft.) Slope =   0.0065  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.902(CFS)
Given pipe size =     12.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     9.149(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      5.946(Ft.)
 Minor friction loss =      3.703(Ft.)  K-factor =   1.50
Pipe flow velocity =     12.61(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     5.29 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
```

```
In Main Stream number: 1
Stream flow area =      2.050(Ac.)
Runoff from this stream =      9.902(CFS)
Time of concentration =    5.29 min.
Rainfall intensity =     8.896(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      804.000 to Point/Station      106.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity (I) =      5.819(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  10.21 min.  Rain intensity =       5.82(In/Hr)
Total area =       2.170(Ac.)  Total runoff =     5.047(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.170(Ac.)
Runoff from this stream =      5.047(CFS)
Time of concentration =   10.21 min.
Rainfall intensity =     5.819(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1004.000 to Point/Station     1005.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                     ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Initial subarea total flow distance  =   30.000(Ft.)
Highest elevation =  334.800(Ft.)
Lowest elevation =  327.500(Ft.)
Elevation difference =    7.300(Ft.) Slope = 24.333 %
Top of Initial Area Slope adjusted by User to  0.189 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 50.00 (Ft)
for the top area slope value of   0.19 %, in a development type of
 1.0 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =  12.20 minutes
 (for slope value of   0.50 %)
Rainfall intensity (I) =      5.187(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
Subarea runoff =      0.014(CFS)
Total initial stream area =       0.010(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1005.000 to Point/Station     1003.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      0.042(CFS)
Depth of flow =   0.111(Ft.), Average velocity =   3.401(Ft/s)
    ******* Irregular Channel Data **********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      0.042(CFS)
  '     '    flow top width =      0.222(Ft.)
  '     '    velocity=    3.401(Ft/s)
  '     '    area =      0.012(Sq.Ft)
  '     '    Froude number =     2.543

Upstream point elevation =   327.500(Ft.)
Downstream point elevation =   324.500(Ft.)
Flow length =    34.000(Ft.)
Travel time  =    0.17 min.
Time of concentration =   12.37 min.
Depth of flow =   0.111(Ft.)
Average velocity =   3.401(Ft/s)
Total irregular channel flow =     0.042(CFS)
Irregular channel normal depth above invert elev. =   0.111(Ft.)
Average velocity of channel(s) =   3.401(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.142(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Rainfall intensity =      5.142(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.270  CA =      0.014
Subarea runoff =      0.055(CFS) for      0.040(Ac.)
Total runoff =      0.069(CFS)  Total area =       0.050(Ac.)
Depth of flow =   0.134(Ft.), Average velocity =   3.856(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1003.000
**** CONFLUENCE OF MINOR STREAMS ****

------------------------------------------------------------------------
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      0.050(Ac.)
Runoff from this stream =      0.069(CFS)
Time of concentration =   12.37 min.
Rainfall intensity =     5.142(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1003.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

------------------------------------------------------------------------
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
```

```
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Rainfall intensity (I) =      6.428(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   8.75 min.  Rain intensity =       6.43(In/Hr)
Total area =        5.000(Ac.)  Total runoff =    13.794(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1003.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      5.000(Ac.)
Runoff from this stream =     13.794(CFS)
Time of concentration =    8.75 min.
Rainfall intensity =     6.428(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        0.069     12.37             5.142
2       13.794      8.75             6.428
Qmax(1) =
       1.000 *    1.000 *     0.069) +
       0.800 *    1.000 *    13.794) + =      11.105
Qmax(2) =
       1.000 *    0.708 *     0.069) +
       1.000 *    1.000 *    13.794) + =      13.843

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.069      13.794
Maximum flow rates at confluence using above data:
       11.105       13.843
Area of streams before confluence:
        0.050        5.000
Results of confluence:
Total flow rate =     13.843(CFS)
Time of concentration =     8.750 min.
Effective stream area after confluence =      5.050(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station      106.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   311.100(Ft.)
Downstream point/station elevation =   302.600(Ft.)
Pipe length  =   209.00(Ft.) Slope =   0.0407  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.843(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    13.843(CFS)
Normal flow depth in pipe =   10.61(In.)
Flow top width inside pipe =   17.71(In.)
Critical Depth =   16.52(In.)
Pipe flow velocity =     12.78(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =     9.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
```

```
In Main Stream number: 3
Stream flow area =      5.050(Ac.)
Runoff from this stream =     13.843(CFS)
Time of concentration =    9.02 min.
Rainfall intensity =     6.302(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        9.902      5.29             8.896
2        5.047     10.21             5.819
3       13.843      9.02             6.302
Qmax(1) =
       1.000 *    1.000 *     9.902) +
       1.000 *    0.518 *     5.047) +
       1.000 *    0.586 *    13.843) + =      20.628
Qmax(2) =
       0.654 *    1.000 *     9.902) +
       1.000 *    1.000 *     5.047) +
       0.923 *    1.000 *    13.843) + =      24.306
Qmax(3) =
       0.708 *    1.000 *     9.902) +
       1.000 *    0.884 *     5.047) +
       1.000 *    1.000 *    13.843) + =      25.318

Total of 3 main streams to confluence:
Flow rates before confluence point:
       9.902       5.047      13.843
Maximum flow rates at confluence using above data:
       20.628       24.306       25.318
Area of streams before confluence:
        2.050        2.170        5.050


Results of confluence:
Total flow rate =     25.318(CFS)
Time of concentration =     9.023 min.
Effective stream area after confluence  =      9.270(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   302.500(Ft.)
Downstream point/station elevation =   302.100(Ft.)
Pipe length  =    31.00(Ft.) Slope =   0.0129  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    25.318(CFS)
Given pipe size =     18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     6.181(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      1.800(Ft.)
 Minor friction loss =      4.781(Ft.)  K-factor =   1.50
Pipe flow velocity =     14.33(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     9.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      109.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   302.100(Ft.)
Downstream point/station elevation =   285.720(Ft.)
Pipe length  =   137.00(Ft.) Slope =   0.1196  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    25.318(CFS)
```

```
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    25.318(CFS)
Normal flow depth in pipe =   11.06(In.)
Flow top width inside pipe =   17.52(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.22(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     9.16 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      109.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      9.270(Ac.)
Runoff from this stream =     25.318(CFS)
Time of concentration =    9.16 min.
Rainfall intensity =     6.240(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2002.000 to Point/Station     2003.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.810
Initial subarea total flow distance  =   93.000(Ft.)
Highest elevation =  318.000(Ft.)
Lowest elevation =  316.300(Ft.)
Elevation difference =    1.700(Ft.) Slope =  1.828 %
Top of Initial Area Slope adjusted by User to  1.400 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.40 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.61 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8100)*(  60.000^.5)/(   1.400^(1/3)]=   3.61
Calculated TC of    3.614 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =     9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.810
Subarea runoff =     0.254(CFS)
Total initial stream area =       0.034(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2003.000 to Point/Station     2004.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     2.206(CFS)
Depth of flow =   0.250(Ft.), Average velocity =   1.603(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.31
    2             26.00              0.13
    3             27.50              0.00
    4             27.50              0.50
Manning's 'N' friction factor =   0.015
```

```
------------------------------------------------------------------
Sub-Channel flow  =      2.206(CFS)
  '     '    flow top width =     18.940(Ft.)
  '     '    velocity=    1.603(Ft/s)
  '     '    area =      1.376(Sq.Ft)
  '     '    Froude number =     1.048

Upstream point elevation =   316.300(Ft.)
Downstream point elevation =   310.800(Ft.)
Flow length =   625.000(Ft.)
Travel time  =    6.50 min.
Time of concentration =   10.11 min.
Depth of flow =   0.250(Ft.)
Average velocity =   1.603(Ft/s)
Total irregular channel flow =     2.206(CFS)
Irregular channel normal depth above invert elev. =   0.250(Ft.)
Average velocity of channel(s) =   1.603(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.855(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.804 given for subarea
Rainfall intensity =      5.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.804  CA =      0.700
Subarea runoff =      3.848(CFS) for      0.837(Ac.)
Total runoff =      4.102(CFS)  Total area =       0.871(Ac.)
Depth of flow =   0.289(Ft.), Average velocity =   1.862(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2000.000 to Point/Station      109.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Rainfall intensity (I) =      5.855(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(14.5 DU/A or Less      )
Impervious value, Ai = 0.500
Sub-Area C Value = 0.595
Time of concentration =    10.11 min.
Rainfall intensity =      5.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.719  CA =      1.057
Subarea runoff =      2.090(CFS) for      0.600(Ac.)
Total runoff =      6.192(CFS)  Total area =       1.471(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2001.000 to Point/Station      109.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Rainfall intensity (I) =      5.855(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                        ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Time of concentration =    10.11 min.
Rainfall intensity =      5.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.733  CA =      1.409
Subarea runoff =      2.060(CFS) for      0.451(Ac.)
Total runoff =      8.252(CFS)  Total area =       1.922(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      109.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.922(Ac.)
Runoff from this stream =      8.252(CFS)
Time of concentration =   10.11 min.
Rainfall intensity =     5.855(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1       25.318      9.16             6.240
2        8.252     10.11             5.855
Qmax(1) =
       1.000 *    1.000 *    25.318) +
       1.000 *    0.906 *     8.252) + =      32.795
Qmax(2) =
       0.938 *    1.000 *    25.318) +
       1.000 *    1.000 *     8.252) + =      32.009

Total of 2 streams to confluence:
Flow rates before confluence point:
      25.318       8.252
Maximum flow rates at confluence using above data:
       32.795       32.009
Area of streams before confluence:
        9.270        1.922
Results of confluence:
Total flow rate =     32.795(CFS)
Time of concentration =     9.161 min.
Effective stream area after confluence =     11.192(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2004.000 to Point/Station      109.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   306.830(Ft.)
Downstream point/station elevation =   285.720(Ft.)
Pipe length  =   211.00(Ft.) Slope =   0.1000  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    32.795(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    32.795(CFS)
Normal flow depth in pipe =   14.53(In.)
Flow top width inside pipe =   14.20(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.43(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =     9.33 min.
End of computations, total study area =          11.192 (Ac.)
```

ATTACHMENT 4

4. FEMA Floodplains/Floodways

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 11. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was provided in digital format by the USDA National Agriculture Imagery Program (NAIP). this information was photogrammetrically compiled at a scale of 1:24,000 from aerial photography dated 2009.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

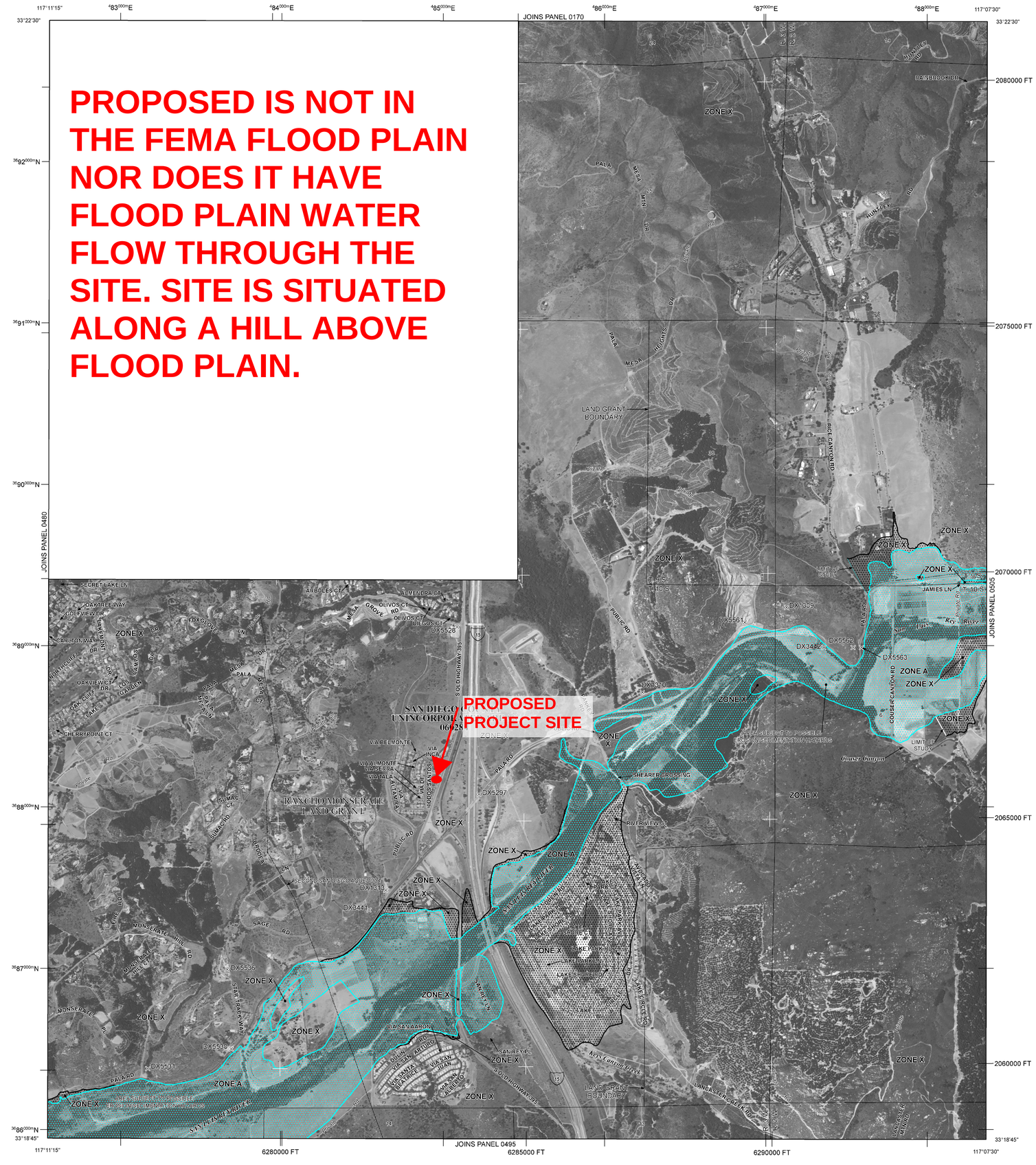
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-877-FEMA MAP (1-877-336-2627) for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip/.

The **"profile base lines"** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the "profile base line", in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

PROPOSED IS NOT IN THE FEMA FLOOD PLAIN NOR DOES IT HAVE FLOOD PLAIN WATER FLOW THROUGH THE SITE. SITE IS SITUATED ALONG A HILL ABOVE FLOOD PLAIN.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4275000mE — 1000-meter Universal Transverse Mercator grid ticks, zone 11
- 6000000 FT — 5000-foot grid values: California State Plane coordinate system, Zone VI (FIPSZONE = 406), Lambert projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
June 19, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
May 16, 2012 – to update corporate limits, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to update map elevations to North American Vertical Datum of 1988.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 500 1,000 1,500 2,000 FEET
300 0 300 600 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0485G

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 485 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO COUNTY	060284	0485	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 06073C0485G

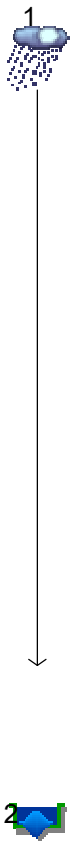
MAP REVISED MAY 16, 2012

Federal Emergency Management Agency

ATTACHMENT 5

5a. Hydrograph Report

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	Manual	<no description>
2	Reservoir	<no description>

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	Manual	------	-------	-------	-------	-------	-------	-------	-------	2.670	<no description>
2	Reservoir	1	-------	-------	-------	-------	-------	-------	-------	0.577	<no description>

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

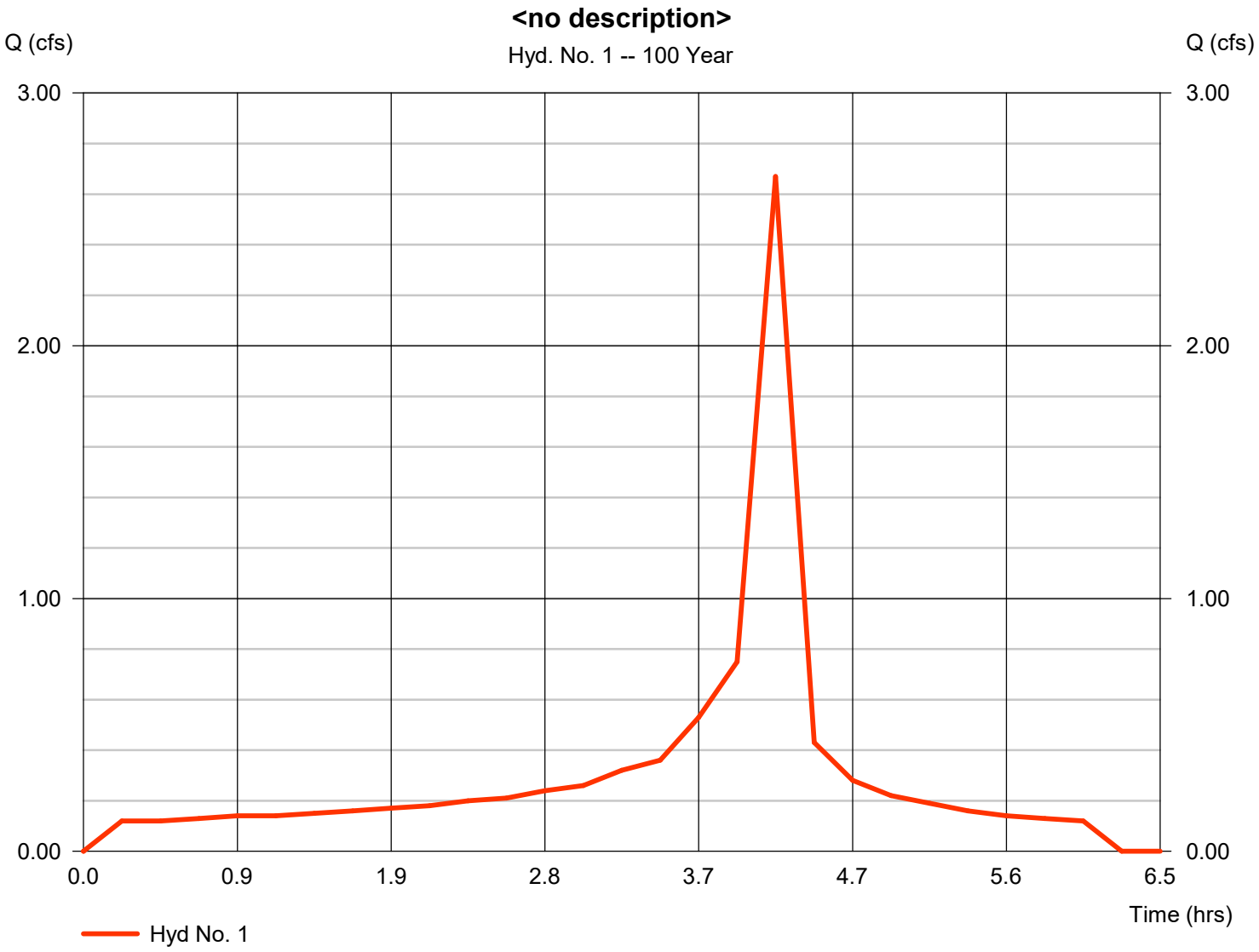
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	2.670	14	252	7,157	------	------	------	<no description>
2	Reservoir	0.577	14	266	7,154	1	311.75	3,118	<no description>

Hydrograph Report

Hyd. No. 1

<no description>

Hydrograph type	= Manual	Peak discharge	= 2.670 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.20 hrs
Time interval	= 14 min	Hyd. volume	= 7,157 cuft



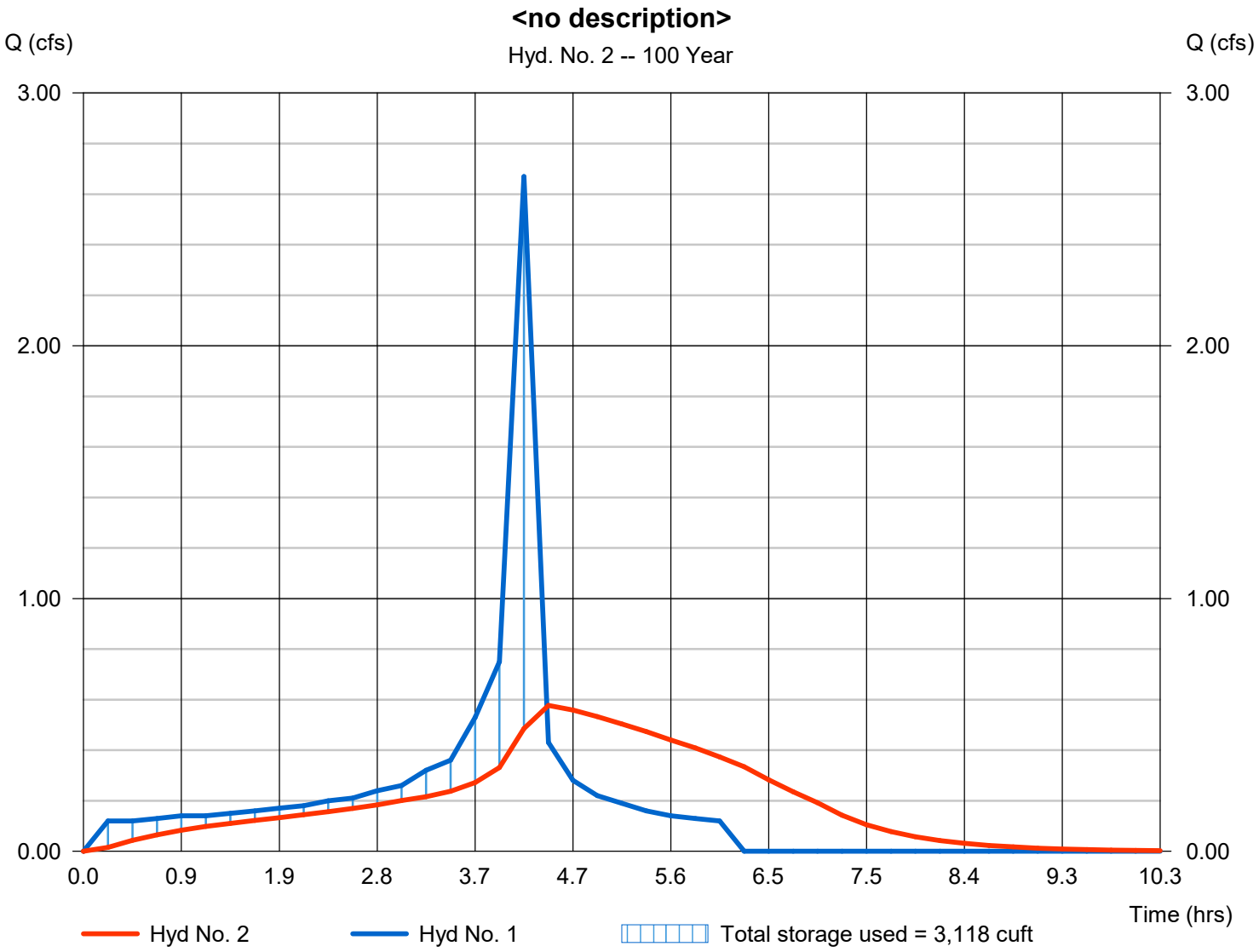
Hydrograph Report

Hyd. No. 2

<no description>

Hydrograph type	=	Reservoir	Peak discharge	=	0.577 cfs
Storm frequency	=	100 yrs	Time to peak	=	4.43 hrs
Time interval	=	14 min	Hyd. volume	=	7,154 cuft
Inflow hyd. No.	=	1 - <no description>	Max. Elevation	=	311.75 ft
Reservoir name	=	bmp802	Max. Storage	=	3,118 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - bmp802

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 310.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	310.50	1,880	0	0
2.25	312.75	3,167	5,615	5,615

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	0.00	0.00
Span (in)	= 12.00	8.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 304.60	310.50	0.00	0.00
Length (ft)	= 173.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.49	0.00	0.00	0.00
Crest El. (ft)	= 312.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	310.50	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.22	561	310.73	5.33 oc	0.20 ic	---	---	0.00	---	---	---	---	---	0.201
0.45	1,123	310.95	5.33 oc	0.32 ic	---	---	0.00	---	---	---	---	---	0.324
0.68	1,684	311.17	5.33 oc	0.41 ic	---	---	0.00	---	---	---	---	---	0.412
0.90	2,246	311.40	5.33 oc	0.48 ic	---	---	0.00	---	---	---	---	---	0.483
1.13	2,807	311.63	5.33 oc	0.55 ic	---	---	0.00	---	---	---	---	---	0.546
1.35	3,369	311.85	5.33 oc	0.60 ic	---	---	0.00	---	---	---	---	---	0.602
1.58	3,930	312.08	5.33 oc	0.65 ic	---	---	0.58	---	---	---	---	---	1.234
1.80	4,492	312.30	5.35 oc	0.70 ic	---	---	4.65	---	---	---	---	---	5.346
2.03	5,053	312.53	6.29 oc	0.16 ic	---	---	6.14 s	---	---	---	---	---	6.292
2.25	5,615	312.75	6.42 oc	0.10 ic	---	---	6.32 s	---	---	---	---	---	6.412

5b. Runoff Coefficient C After Detention Structure

CALCULATION AFTER THE DETENTION STRUCTURE

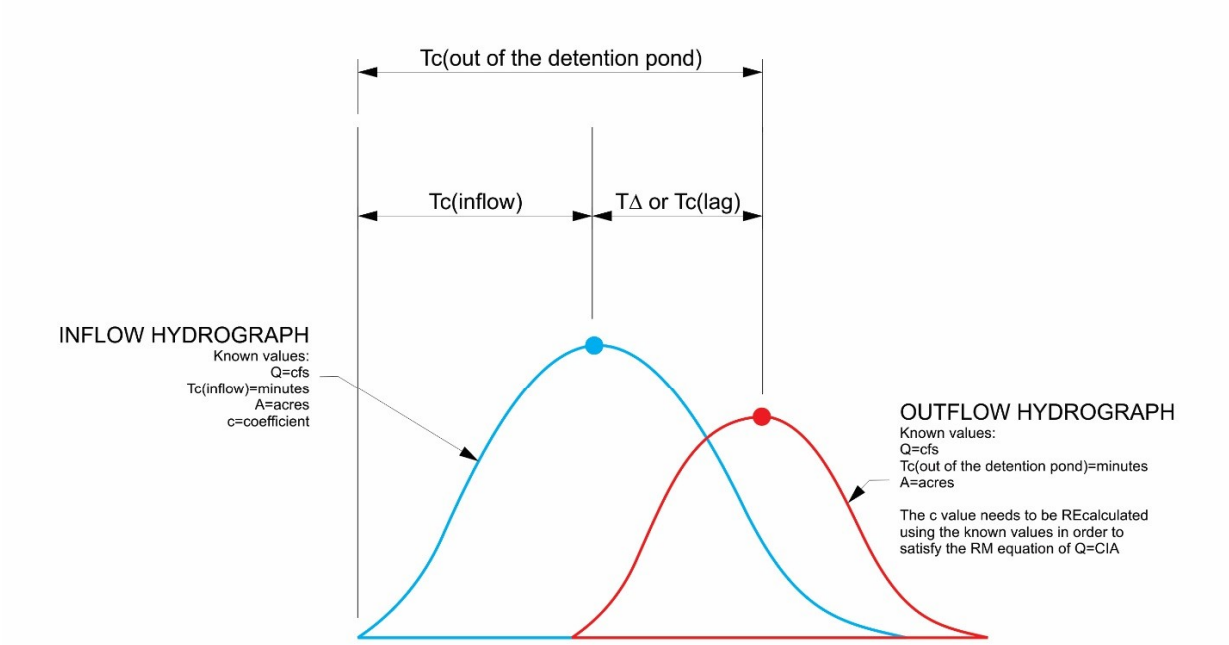
The purpose of the detention structure is to alter the peak flow and or time to peak of a given storm so it will not have a negative impact on the downstream facilities. There are different methods on how to use the resulting values of the outflow hydrograph.

For the purposes of this example there will be an association of the following values:

Q_{in} = Is equal to the inflow value that will enter the basin before storage
Q_{out} = Is equal to the outflow value that will exit the basin after storage
Tc_{in} = Is equal to the Time of Concentration flowing into the basin before detention
Tc_{out} = Is equal to the Time of Concentration exiting the basin after detention
A = Area of the tributary area being examined; (This value does not change)
c_{inflow} = The runoff coefficient going into the basin for detention
c_{out} = The runoff coefficient recalculated taking into account water stored in pond for detention

One method is to keep the value of c(inflow) and solve for the I=intensity & Tc(outflow). In this interpretation, we will get a Tc that will not match the value of the $Tc_{(\text{out of the detention structure})}$ of the outflow hydrograph that was calculated using the detention pond. The Tc Using this method shows a disruption on the oneness & continuity of the outflow hydrograph & the formula Q=cIA.

The second method; that is the method we are using is to recalculate the c=coefficient based on the fix values of the outflow hydrograph to achieve a c_{out} . This value uses the c_{inflow} from the flow into the detention basin and then is recalculated by the output of the hydrograph software using Q=cIA; translated as c=Q/IA. This method preserves the formula Q=cIA & does not alter the $Tc_{(\text{out of the detention structure})}$. This method shows that in order to maintain mathematical integrity of the rational equation (Q=CIA), the detention structure alters the runoff coefficient which is the only unknown in the equation. It is noted that the designer feels it is important to hold the value of Tc and the Q values that are calculated from the hydrograph.



GRAPHICAL DIAGRAM OF THE HYDROGRAPH COMING OUT OF THE DETENTION POND

The routing of the runoff through the detention structure gives us the $Q_{(\text{out of the detention structure})}$ and TΔ time lag between $Q_{(\text{inflow})}$ & $Q_{(\text{out of the detention structure})}$.

The known fix values coming out of the detention structure are:

- Q = cfs
- $Tc_{(\text{out of the detention structure})}$ = minutes
- A = acres
- *Please note that c=coefficient is not given directly from the resulting hydrograph coming out of the detention pond.*

In order to satisfy the rational equation of Q=CIA (see Section 3 of the 2003 San Diego County Hydrology Manual) coming out of the detention structure, we will calculate the only unknown value of the equation which is the outlet runoff coefficient, $C_{(\text{outlet})}$. By using the $Tc_{(\text{out of the detention structure})}$ we can solve for the intensity, I. With the intensity (I) value calculated, we can solve for the outlet runoff coefficient, $C_{(\text{outlet})}$.

The following equations are used in this stage: $Q = CIA$

$I = 7.44P_6D^{-0.645}$

Where:

$Q_{(\text{out of the detention structure})}$ = runoff (cfs), known value

$Tc_{(\text{inflow})}$ = detention structure inflow time of concentration (D) (minutes)

TΔ = time lag between $Q_{(\text{inflow})}$ & $Q_{(\text{out of the detention structure})}$

(minutes) $Tc_{(\text{out of the detention structure})} = Tc_{(\text{inflow})} + T\Delta$ (minutes)
P_6 = 6 hour precipitation (inches), known value.
I = intensity (inches/hour), calculated based on the value of $Tc_{(\text{out of the detention structure})}$
A = tributary area of the detention structure (acres),
known value $C_{(\text{outflow})}$ = runoff coefficient (unitless),
value to be solved

STORAGE PIPE			
LINE	**ITEM**	**STORAGE PIPE**	**REMARKS**
1	P6 inch	3.5	KNOWN VALUE
2	TC (inflow) mins	14.06	KNOWN VALUE
3	TC (lag) mins	13.8	FROM THE OUTFLOW HYDROGRAPH
4	TC (ouflow) mins	27.86	LINE 2+3
5	I inches/hour	3.045	FROM THE INTENSITY FORMULA
6	Q(outflow)	0.577	KNOWN VALUE
7	A (inflow=outflow)	0.97	KNOWN VALUE
8	c(inflow)	0.582	KNOWN VALUE FROM THE CONTRIBUTING BASIN(S)
9	c(outflow)	0.195	CALCULATED FROM C=Q/IA

The preceding highlighted data are then used to continue the calculations downstream of the detention structure.

In summary these are the steps of the calculations presented here:

1. Hydrologic methods of calculation as laid out in the 2003 San Diego Hydrology Manual was used upstream of the detention structure. These includes the methods of determining c, Tc and confluence of a junction. The c values used in the proposed conditions range from “undisturbed natural terrain” to “low & high density residential” whichever is appropriate for the contributing basin.
2. At the outflow of the detention structure, the c value was recalculated using the resulting values of the outflow hydrograph. This method preserves the values of $Tc_{(\text{out of the detention structure})}$, A & $Q_{(\text{outflow})}$. Methods and software satisfy the formula Q=cIA & the 2003 San Diego Hydrology Manual. This step shows that in order to maintain mathematical integrity of the rational equation (Q=CIA), the detention structure alters the runoff coefficient which is the only unknown in the equation.
3. The values determined in step 2 were used in the continuation of the calculations using the Hydrologic methods of calculation as laid out in the 2003 San Diego Hydrology Manual downstream of the detention structure. These includes the methods of determining c, Tc and confluence of a junction. The c values used in the proposed conditions range from “undisturbed natural terrain” to “low & high density residential” whichever is appropriate for the contributing basin.

End of Report

6.3 Self-retaining DMAs using Significant Site Design BMPs

Self-retaining DMAs use Site Design BMPs to fully-retain the entire DCV, at a minimum. Site Design BMPs that fully retain the DCV, at a minimum, therefore replacing the need for a Structural BMP (S-BMP), are classified as Significant Site Design BMPs (SSD-BMPs). To satisfy pollutant control requirements only, self-retaining means retention of the entire DCV. However, under some circumstances, a self-retaining DMA can also satisfy hydromodification management requirements by implementing BMPs that retain a greater volume of runoff.

- Provide the information requested below for each proposed self-retaining DMA. Add rows or copy the table if additional entries are needed.

DMA #	**DMA Area (ft^2)**	**BMP Type** (choose one per DMA)		***Permit # and Sheet #***
		Dispersion Area (Att. 6.3.1)	**Tree Wells (Att. 6.3.2)**	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
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		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	

Copy and Paste table here for additional DMAs

- "DMA #", "DMA Area", and "Permit # and Sheet #" are required.
- Select one BMP Type per DMA. Provide detailed documentation for each DMA in Attachments 6.3.1 (Impervious Dispersion Areas) and/or 6.3.2 (Tree Wells) below.
- Each self-retaining DMA must <u>fully</u> satisfy all design requirements and restrictions described in BMPDM Section 5.2.3, applicable BMPDM Appendix E Fact Sheets, BMPDM Appendix I, and any other guidance or instruction identified by the County.

6.3.1 Self-retaining DMAs with Impervious Dispersion Areas

Impervious area dispersion (dispersion) refers to the practice of effectively disconnecting impervious areas from directly draining to the storm drain system by routing runoff from impervious areas such as rooftops (through downspout disconnection), walkways, and driveways onto the surface of adjacent pervious areas. The intent is to slow runoff discharges and reduce volumes. Dispersion with partial or full infiltration results in significant volume reduction by means of infiltration and evapotranspiration. When adequately sized, dispersion can also be used to satisfy both the pollutant control and hydromodification management structural performance standards for a DMA.

- Each self-retaining DMA with impervious area dispersion must fully satisfy all design requirements and restrictions described in BMPDM Section 5.2.3, Fact Sheet SD-B: Impervious Area Dispersion, and any other guidance or instruction identified by the County.
- Documentation of compliance with all applicable conditions must be submitted with this sub-attachment using the ***Summary Sheet for DMAs with Impervious Area Dispersion*** on the next page. One version of this Summary Sheet must be completed for each applicable DMA.
- Applicants are responsible to comply with all other applicable requirements, regardless of whether they are included in the summary sheet.
- The following applies if the dispersion area is **native soil** (SD-B in Appendix E):
    - For pollutant control only, the DMA is considered self-retaining if the impervious to pervious ratio is:
        - 2:1 when the pervious area is composed of Hydrologic Soil Group A
        - 1:1 when the pervious area is composed of Hydrologic Soil Group B
- The following applies if the dispersion area includes **amended soil** (SD-B in Appendix E):
    - DMAs using impervious area dispersion can be considered to meet both pollutant control and hydromodification flow control requirements if the impervious to pervious area ratio is 1:1 or less and all other design requirements of SD-B are satisfied, including 11 inches of amended soil.

Summary Sheet for Self-retaining DMAs with Impervious Area Dispersion

Attach Printouts from SSD-BMP tool below

- DCV calculations from SSD-BMP tool
- Dispersion Areas calculations from SSD-BMP tool

6.3.2 Self-retaining DMAs with Tree Wells

Trees wells can provide a variety of benefits such as interception and increased infiltration of rainfall, reduced erosion, energy conservation, air quality improvement, and aesthetic enhancement. They can also be used to satisfy both pollutant control and hydromodification management performance standards for a DMA.

- Each self-retaining DMA with tree wells must fully satisfy all design requirements and restrictions described in BMPDM Section 5.2.3, Fact Sheet SD-A: Tree Wells, and any other guidance or instruction identified by the County.
- For pollutant control only, the DMA must retain the entire DCV. For hydromodification management, an additional volume must be retained in accordance with the sizing requirements presented in the DCV multiplier table in Fact Sheet SD-A.
- Documentation of compliance with applicable conditions must be submitted using the ***Summary Sheet for Self-retaining DMAs with Tree Wells*** on the next page. One version of this Summary Sheet must be completed for each applicable DMA.
- If both pollutant control and hydromodification standards apply, the soil depth of all tree wells in the DMA must be selected before determining the Required Retention Volume (RRV). Each tree well must be constructed to the selected depth. For pollutant control only, tree wells within a DMA may be constructed to different soil depths.
- In most cases tree wells must use Amended Soil per Fact Sheet SD-F. However, Structural Soil is required in some cases (e.g., placing the tree well next to a curb). See ***Structural Requirements for Confined Tree Well Soil Volume*** in Fact Sheet SD-A for additional explanation. If applicable, list the DMAs and Tree Well #s below for all tree wells requiring Structural Soil.

DMA #	**Tree Wells Requiring Structural Soil (list Tree Well #s)**

- The Design Capture Volume (DCV) must be known for each DMA in order to determine the volume to be mitigated by the tree wells. Instructions for DCV calculation are provided in BMPDM Appendix I.1. An automated version of Worksheet I.1 (Calculation of Design Capture Volume) is available at www.sandiegocounty.gov/stormwater under the Development Resources tab.

Summary Sheet for Self-retaining DMAs with Tree Wells

Attach Printouts from SSD-BMP tool below

- DCV calculations from SSD-BMP tool
- Tree Wells calculations from SSD-BMP tool

7.0 General Requirements

- Submit this cover page and all required Sub-attachments for all structural BMPs proposed for the project.
- See the BMPDM sections and appendices listed under "BMPDM Design Resources" in the table below for additional explanation of design requirements. Constructed features must fully satisfy the requirements described in these resources, and any other guidance identified by the County.
- PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management. Completion of SWQMP Attachment 8 is also required for these BMPs.
- DMA Exhibits and Construction Plans: DMAs, features, and BMPs identified and described in this attachment must be shown on DMA Exhibits and all applicable construction plans submitted for the project. See Attachment 2 for additional instruction on exhibits and plans.
- Structural BMP Certification. All structural BMPs documented this attachment and in Attachment 8 must be certified by a registered engineer in Sub-attachment 7.1.
- Structural BMP Verification. Structural BMP installation must be verified by the County at the completion of construction. Applicants must complete an Installation Verification Form (Attachment 10).

Sub-attachments (check all that are completed)	**Requirement**	**BMPDM Design Resources**
☒ **7.1: Preparer's Certification**	Required	• N/A
☒ **7.2: Structural BMP Strategy**	Required	• BMPDM Sections 5.1., 5.3, 5.4, and Chapter 6 • BMPDM Appendix E (pages E-78 through E-210)
☒ **7.3: Structural BMP Checklist(s)**	Required	
☒ **7.4: Stormwater Pollutant Control Worksheet Calculations**	Required	• BMPDM Appendix B
☐ **7.5: Identification and Narrative of Receiving Water and Pollutants of Concern**	Required if flow-thru BMPs are proposed	• N/A

7.1 Engineer of Work Certification for Structural BMPs

Project Name Pala Mesa Plaza
Permit Application Number PDS2020-STP-20-021

CERTIFICATION

I hereby declare that I am the Engineer in Responsible Charge of design of structural storm water best management practices (BMPs) for this project, and that I have exercised responsible charge over the design of the BMPs as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the PDP requirements of the County of San Diego BMP Design Manual, which is a design manual for compliance with local County of San Diego Watershed Protection Ordinance (Sections 67.801 et seq.) and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100) requirements for storm water management. I have read and understand that the County of San Diego has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the BMP Design Manual.

I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this PDP SWQMP by County staff is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of structural storm water BMPs for this project, of my responsibilities for their design.

☒ In addition to the structural pollutant control BMPs described in this attachment, this certification applies to the Structural Hydromodification Management BMPs described in Attachment 8 (check if applicable).

Engineer of Work's Signature, PE Number & Expiration Date

Robert D. Dentino
Print Name

Excel Engineering
Company

6/08/22
Date

Engineer's Seal:



7.2 Structural BMP Strategy

7.2.1 Narrative Strategy (Continue description on subsequent pages as necessary)

Describe the general strategy for structural BMP implementation at the project site. For pollutant control BMPs, your description must address the key points outlined in Section 5.1 of the BMP Design Manual, and the type of BMPs selected. For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate.

The general strategy for structural BMP implementation on this project follows the steps outlined in the BMP manual (Manual) section 5.1 which refers to sections in appendix B of the Manual.

Step 1. Determine DCV per Appendix B.1

The first step in performing storm water pollutant control calculations is to calculate the Design Capture Volume (DCV). The DCV represents the volume of storm water runoff that must be retained and/or biofiltered in order to satisfy pollutant control requirements. The DCV is calculated through use of the automated worksheet (Worksheet B.1) which is part of the workbook provided by the County for this purpose:

(https://www.sandiegocounty.gov/content/dam/sdc/dpw/WATERSHED_PROTECTION_PROGRAM/watershedpdf/Dev_Sup/County_BMPDM_PC_Worksheet.xlsx) (County Workbook).

A. Determine rainfall depth per Appendix B.1.1.

The rainfall depth (D) used to calculate the DCV is determined through examination of the 85th percentile, 24-hour isopluvial map provided in Figure B.1-1 of the BMP Manual. The isopluvial map represents rainfall depths as blue line work provided at 0.02" intervals. Appropriate rainfall depths are determined by plotting the project location on the map, examining adjacent rainfall depths, and interpolating an appropriate depth to the nearest hundredth of an inch. The result is then entered into the appropriate field on Worksheet B.1.

B. Delineate tributary areas per Appendix B.1.2.

The entire project site is divided up into distinct tributary areas to each point of discharge from the site. All areas of the site that are intended to be developed with buildings or site improvements are delineated by their tributary area and available space to construct structural BMPs. BMPs must be sized to treat the DCV from the total area draining to the BMP, including any offsite or onsite areas that comingle with project runoff draining to the BMP. To minimize offsite flows treated by project BMPs, upgradient flows from offsite areas and self-treating cut and fill slopes are diverted around the developed portions of the project.

C. Determine runoff factors per Appendix B.1.3.

Runoff factors (C) represent the ratio of storm water runoff over rainfall that is anticipated for a particular surface type. Impervious surfaces typically have high runoff factors (0.90) as nearly all rainfall is converted into runoff. Pervious surfaces typically have low runoff factors (0.10) as much of the rainfall is retained in natural surface features. For each of the DMAs draining to structural BMPs, each DMA area is evaluated for the relative quantities of impervious surfaces (roofs, concrete, asphalt, etc.) and pervious surfaces (amended soils, landscaped areas, mulched areas). The respective areas are entered into Worksheet B.1 (County Workbook), and the worksheet calculates the respective weighted runoff factor. Dispersion Area Runoff Factor Adjustments are not considered for this project.

D. Determine site design volume reductions per Appendix B.1.4

Site design volume reductions (R) account for the effects of incorporating non-structural BMPs such as tree wells and rain barrels into the site design. Effective use of these site design elements can significantly reduce and/or completely eliminate the DCV requiring treatment through structural

BMP strategies. Tree wells designed per the SD-A fact sheet provide the volume reductions to the DCV of up to 420 cf/tree (30-foot tree canopy). Rain barrels provide less substantial effects. For the nature of this project, the use of volume reductions is not considered.

Step 2. Determine Retention Requirements Appendix B.2

The second step in performing storm water pollutant control calculations is to determine the retention requirements for each drainage area. Retention requirements are calculated through use of the automated Worksheet B.2 (County Workbook).

A. Determine if capture and use analysis is required per Appendix B.2.1

Projects that propose habitable structures over 9 stories tall are required to perform a capture and use analysis to identify whether the DCV from the project site can be utilized for onsite toilet flushing and/or irrigation within 36 hours of the storm. This project does not propose this type development, therefore Capture and Use is not required.

B. Evaluate infiltration restrictions per Appendix B.2.2

Infiltration Restrictions are listed in table B.2-1 of the Manual. Restriction elements are divided into Mandatory Considerations and Optional Considerations. Mandatory Considerations include elements that may pose a significant risk to human health and safety. These elements must always be evaluated and discretion regarding the setbacks is not permitted, unless supported by the recommendations of a geotechnical engineer. None of the mandatory considerations are applicable to this project. Optional Considerations include elements that are not necessarily associated with human health and safety, so analysis is not mandated. Even though not mandated, none of the optional considerations are applicable to this project.

C. Determine design infiltration rate per Appendix B.2.3

The design infiltration rate for each drainage area must be determined through either a basic or advanced analysis. The basic analysis allows for the use of a default design infiltration rate based on the predominant NRCS soil type present within the proposed BMP footprint. The basic analysis is not permitted for BMPs that lack an underdrain. The advanced analysis allows for a geotechnical engineer to assign a more specific design infiltration rate based on field testing. Table B.2-3 of the Manual identifies the design infiltration rates that can be used for each analysis. For this project all of the proposed BMPs are located in areas of type C soil and have no infiltration restrictions, therefore the basic design infiltration rate of 0.2 in/hr is used.

D. Determine retention requirements per Appendix B.2.4

Using the results from the previous discussion, the values are entered into Automated Worksheet B.2 (County Workbook). From this worksheet the required retention volume is read.

Step 3. Determine BMP Performance per Appendix B.3

The third step in performing stormwater pollutant control calculations is to design a structural BMP with the characteristics that provide stormwater treatment for the DCV and meet the minimum retention requirements for the drainage area.

A. Identify proposed BMP characteristics per Appendix B.3.1.

The performance of a BMP is a function of its retention and biofiltration processes, which are directly related to the proposed BMP geometry and design components. BMP geometries identify the area and depth over which retention and/or biofiltration processes occur. Critical BMP geometries include: BMP surface area, surface ponding depth, biofiltration soil media depth, gravel depth, underdrain depth, underdrain diameter and underdrain offset. BMP components dictate how retention and biofiltration processes occur over the BMP footprint. Critical BMP components include: vegetation vs no vegetation, standard biofiltration soil media vs non-standard biofiltration soil media, impermeable liner vs no impermeable liner, underdrain vs no underdrain, and design

infiltration rates. By default, these BMPs must be sized to provide a surface area that is equal to at least 3% of the tributary effective impervious area. If a smaller BMP surface area is desired, the application must include additional calculations determining the required maintenance interval required to maintain BMP effectiveness. This project does not propose BMPs smaller than the 3% limit. The most common BMPs proposed for storm water compliance are infiltration BMPs, bioretention BMPs, and biofiltration BMPs. For this project the site layout, soil characteristics, and maintenance requirements were considered against the advantages and disadvantages of each of the common BMP options.

B. Calculate retention processes per Appendix B.3.2

BMP retention processes include infiltration and evapotranspiration occurring within the BMP.

Part 1) Is to determine the amount of infiltration in a 6 hour storm event.

Located on the county spreadsheet B.3 Line 18 is located the infiltration over a 6 hour time frame, some basins may not be infiltrating and those basins will have a "zero" listed in line 18.

Part 2) Of this section is in reference to the retention capacity of the bmp.

This item is characterized in the county's spreadsheet as well in terms of an efficiency of retention listed on line item 25.

C. Calculate biofiltration processes per Appendix B.3.3

Any portion of the DCV that has not been retained within site design or structural BMP elements must be biofiltered. BMP biofiltration processes include filtration, sedimentation, sorption, biochemical processes and/or vegetative uptake. This section presents how to calculate the biofiltration processes occurring within the proposed BMP.

Part 1) Determine the filtration rate (in/hr) of the proposed BMP.

This is the rate in which storm water biofilters through the BMP and exits through the underdrain. Filtration rates can be governed by characteristics of the biofiltration soil media or by flow restrictions experienced due to the design of the BMP underdrain/orifice. The soil infiltration rate can be seen in the County's spreadsheet on B.3 Line item 30.

Part 2) Determine the volume of biofiltration occurring within the BMP during a 6 hour storm event. This volume is a function of the BMP filtration rate, BMP surface area, and the rainfall duration as shown below. The item can be found in the County’s spreadsheet in B.3 from ((item 33)/12) * Line 8 and is built into the spreadsheet to check for efficiency.

Part 3) Determine the static biofiltration capacity of the BMP assuming it is entirely full.

This volume is a function of the BMP surface area and the effective biofiltration depth. This is located from Worksheet B.3 line 37 * Line 8

Part 4) Determine the drawdown time (hours) for surface ponding.

This is the ponding depth divided by the sum of the design infiltration rate and BMP filtration rate. Surface ponding depths of 24 hours or less are typically required; however, longer drawdown times up to 96 hours may be proposed if supported by a landscape architect/agronomist and no safety hazards are anticipated due to excessive ponding. Surface ponding drawdown times over 96 hours are not permitted due to vector concerns. This item is located on worksheet B.3 item 11.

Part 5) Determine the efficacy of the biofiltration processes provided by the BMP.

This value represents the portion of the pollutant control standard that is satisfied through the biofiltration processes of the BMP. There are two options available for establishing the biofiltration performance standard. Applicants may select the option of their choice. Option 1 requires that the BMP treat 1.5 times the portion of the DCV not reliably retained onsite (assuming a 6 hour routing period). Option 2 requires that the BMP treat 1.0 times the portion of the DCV not reliably retained onsite; and additionally check that the system has a total static (i.e., non-routed) storage volume,

including pore spaces and pre-filter detention volume, equal to at least 0.75 times the portion of the DCV not reliably retained onsite. For option of 1.5 times the DCV see worksheet B.3 Line item 41 For option of 1.0 times the DCV with a static volume of 0.75 DCV see worksheet B.3 Line item 43.

Both items are calculated and the minimum value between the two is chosen to be used in the calculations.

D. Satisfaction of pollutant control requirements per Appendix B.3.4

The performance of a BMP with respect to the pollutant control performance standards is referred to as the BMP efficacy. Worksheet B.3 Line item 47 is the efficiency; if the efficiency is not at least 100% then changes to sizing parameter will need to be considered.

E. Satisfaction of minimum retention requirements per Appendix B.3.5

Minimum retention requirements can be satisfied by demonstrating that the all of the retention elements incorporated within a drainage area (rain barrels, tree wells, dispersion areas, and BMPs) retain a volume of water that is greater than or equal to what is required. Worksheet B.1 will provide areas that have been incorporated into any retention volumes for rain barrels and or tree wells (this project uses neither of these for this portion of the project). the remaining retention requirements are on Worksheet B.2 Retention Requirements. When incorporated into worksheet B.3 a box is Labeled as " "YES" or "NO" to determine if the requirements have been met. for this project all items are to be reflective of "YES" in the box.

7.2.2 Structural BMP Summary Table (Complete for all proposed structural BMPs)

- List and provide the information requested below for all pollutant control and hydromodification management BMPs proposed for the project.
- For each BMP listed, complete the Structural BMP Checklist on the next page. Copy the Checklist as many times as needed.

BMP ID #	DMA #	DMA Area (ft^2)	Structural BMP Type							Permit # and Sheet #
			Harvest and Use	Infiltration	Unlined Biofiltration	Lined Biofiltration	Flow-thru treatment	Hydromodification Management [1]	Other	
BMP-103	DMA-100, DMA-102	44037	☐	☐	☒	☐	☐	☒	☐	PDS2020-STP-20-021, Sheets 2, 3, and 7
BMP-201	DMA-200	23531	☐	☐	☒	☐	☐	☒	☐	PDS2020-STP-20-021, Sheets 2, 3, and 7
BMP-302	DMA-300	13525	☐	☐	☒	☐	☐	☒	☐	PDS2020-STP-20-021, Sheets 2, 3, and 7
BMP-401	DMA-400	7780	☐	☐	☒	☐	☐	☒	☐	PDS2020-STP-20-021, Sheets 2, 3, and 7
BMP-504	DMA-500	25396	☐	☐	☒	☐	☐	☒	☐	PDS2020-STP-20-021, Sheets 2, 3, and 7
BMP-602	DMA-600	7152	☐	☐	☒	☐	☐	☒	☐	PDS2020-STP-20-021, Sheets 2, 3, and 7
BMP-702	DMA-700	13612	☐	☐	☒	☐	☐	☒	☐	PDS2020-STP-20-021, Sheets 2, 3, and 7
BMP-802	DMA-800	42323	☐	☐	☒	☐	☐	☒	☐	PDS2020-STP-20-021, Sheets 2, 3, and 7
BMP-2001	DMA-2000	5172	☐	☐	☐	☒	☐	☒	☐	PDS2020-STP-20-021, Sheets 2, 3, and 7
			☐	☐	☐	☐	☐	☐	☐	
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			☐	☐	☐	☐	☐	☐	☐	

Copy and Paste table here for additional BMPs

[1] Hydromodification Management BMPs must be accompanied by BMPs that provide pollutant control.

7.3 Structural BMP Checklist (Complete once for each proposed structural BMP)

Structural BMP ID # BMP-103	**Permit # and Sheet #** PDS2020-STP-20-021, Sheets 2, 3, and 7

BMP Type

Infiltration
- ☐ Infiltration basin (INF-1)
- ☐ Bioretention (INF-2)
- ☐ Permeable pavement (INF-3)

Unlined Biofiltration
- ☒ Biofiltration with partial retention (PR-1)

Lined Biofiltration
- ☐ Biofiltration (BF-1)
- ☐ Nutrient Sensitive Media Design (BF-2)
- ☐ Proprietary Biofiltration (BF-3)

Harvest and Use
- ☐ Cistern (HU-1)

Flow-thru Treatment (describe below)
- ☐ With prior lawful approval to meet earlier PDP requirements
- ☐ Pre-treatment/forebay for an onsite retention or biofiltration BMP[2]
- ☐ With alternative compliance

Hydromodification Management[3]
- ☒ Detention pond or vault

☐ **Other** (describe below)

BMP Purpose
- ☐ Pollutant control only
- ☐ Hydromodification control only
- ☒ Combined pollutant control and hydromodification
- ☐ Pre-treatment/forebay for another BMP
- ☐ Other (describe below)

BMP Verification (See BMPDM Section 8.3)

Provide name and contact information for the party responsible to sign BMP verification forms	Robert D. Dentino, PE Excel Engineering 760-745-8118

BMP Ownership and Maintenance (See BMPDM Section 7.3 and Attachment 11)

BMP Maintenance Category	Cat. 1 ☐	Cat. 2 ☒	Cat. 3 ☐	Cat. 4 ☐
Final owner of BMP	☐ HOA	☒ Property Owner	☐ County	☐ Other (describe):
Maintenance of BMP into perpetuity	☐ HOA	☒ Property Owner	☐ County	☐ Other (describe):

Discussion (As needed; Continue on subsequent pages as necessary)

The BMP is a biofiltration unit sized and designed to provide stormwater treatment, hydromodification mitigation, and flood control peak flow mitigation functions.

7.3 Structural BMP Checklist (Complete once for each proposed structural BMP)

Structural BMP ID # BMP-201	**Permit # and Sheet #** PDS2020-STP-20-021, Sheets 2, 3, and 7

BMP Type

Infiltration
- ☐ Infiltration basin (INF-1)
- ☐ Bioretention (INF-2)
- ☐ Permeable pavement (INF-3)

Unlined Biofiltration
- ☒ Biofiltration with partial retention (PR-1)

Lined Biofiltration
- ☐ Biofiltration (BF-1)
- ☐ Nutrient Sensitive Media Design (BF-2)
- ☐ Proprietary Biofiltration (BF-3)

Harvest and Use
- ☐ Cistern (HU-1)

Flow-thru Treatment (describe below)
- ☐ With prior lawful approval to meet earlier PDP requirements
- ☐ Pre-treatment/forebay for an onsite retention or biofiltration BMP[2]
- ☐ With alternative compliance

Hydromodification Management[3]
- ☒ Detention pond or vault

☐ **Other** (describe below)

BMP Purpose
- ☐ Pollutant control only
- ☐ Hydromodification control only
- ☒ Combined pollutant control and hydromodification
- ☐ Pre-treatment/forebay for another BMP
- ☐ Other (describe below)

BMP Verification (See BMPDM Section 8.3)

Provide name and contact information for the party responsible to sign BMP verification forms	Robert D. Dentino, PE Excel Engineering 760-745-8118

BMP Ownership and Maintenance (See BMPDM Section 7.3 and Attachment 11)

BMP Maintenance Category	Cat. 1 ☐	Cat. 2 ☒	Cat. 3 ☐	Cat. 4 ☐
Final owner of BMP	☐ HOA	☒ Property Owner	☐ County	
	☐ Other (describe):			
Maintenance of BMP into perpetuity	☐ HOA	☒ Property Owner	☐ County	
	☐ Other (describe):			

Discussion (As needed; Continue on subsequent pages as necessary)

The BMP is a biofiltration unit sized and designed to provide stormwater treatment, hydromodification mitigation, and flood control peak flow mitigation functions.

7.3 Structural BMP Checklist (Complete once for each proposed structural BMP)

Structural BMP ID # BMP-302	**Permit # and Sheet #** PDS2020-STP-20-021, Sheets 2, 3, and 7

BMP Type

Infiltration
- ☐ Infiltration basin (INF-1)
- ☐ Bioretention (INF-2)
- ☐ Permeable pavement (INF-3)

Unlined Biofiltration
- ☒ Biofiltration with partial retention (PR-1)

Lined Biofiltration
- ☐ Biofiltration (BF-1)
- ☐ Nutrient Sensitive Media Design (BF-2)
- ☐ Proprietary Biofiltration (BF-3)

Harvest and Use
- ☐ Cistern (HU-1)

Flow-thru Treatment (describe below)
- ☐ With prior lawful approval to meet earlier PDP requirements
- ☐ Pre-treatment/forebay for an onsite retention or biofiltration BMP[2]
- ☐ With alternative compliance

Hydromodification Management[3]
- ☒ Detention pond or vault
- ☐ **Other** (describe below)

BMP Purpose
- ☐ Pollutant control only
- ☐ Hydromodification control only
- ☒ Combined pollutant control and hydromodification
- ☐ Pre-treatment/forebay for another BMP
- ☐ Other (describe below)

BMP Verification (See BMPDM Section 8.3)

Provide name and contact information for the party responsible to sign BMP verification forms	Robert D. Dentino, PE Excel Engineering 760-745-8118

BMP Ownership and Maintenance (See BMPDM Section 7.3 and Attachment 11)

BMP Maintenance Category	Cat. 1 ☐	Cat. 2 ☒	Cat. 3 ☐	Cat. 4 ☐
Final owner of BMP	☐ HOA	☒ Property Owner	☐ County	
	☐ Other (describe):			
Maintenance of BMP into perpetuity	☐ HOA	☒ Property Owner	☐ County	
	☐ Other (describe):			

Discussion (As needed; Continue on subsequent pages as necessary)

The BMP is a biofiltration unit sized and designed to provide stormwater treatment, hydromodification mitigation, and flood control peak flow mitigation functions.

7.3 Structural BMP Checklist (Complete once for each proposed structural BMP)

Structural BMP ID # BMP-401	**Permit # and Sheet #** PDS2020-STP-20-021, Sheets 2, 3, and 7

BMP Type

Infiltration
- ☐ Infiltration basin (INF-1)
- ☐ Bioretention (INF-2)
- ☐ Permeable pavement (INF-3)

Unlined Biofiltration
- ☒ Biofiltration with partial retention (PR-1)

Lined Biofiltration
- ☐ Biofiltration (BF-1)
- ☐ Nutrient Sensitive Media Design (BF-2)
- ☐ Proprietary Biofiltration (BF-3)

Harvest and Use
- ☐ Cistern (HU-1)

Flow-thru Treatment (describe below)
- ☐ With prior lawful approval to meet earlier PDP requirements
- ☐ Pre-treatment/forebay for an onsite retention or biofiltration BMP[2]
- ☐ With alternative compliance

Hydromodification Management[3]
- ☒ Detention pond or vault

☐ **Other** (describe below)

BMP Purpose
- ☐ Pollutant control only
- ☐ Hydromodification control only
- ☒ Combined pollutant control and hydromodification
- ☐ Pre-treatment/forebay for another BMP
- ☐ Other (describe below)

BMP Verification (See BMPDM Section 8.3)

Provide name and contact information for the party responsible to sign BMP verification forms	Robert D. Dentino, PE Excel Engineering 760-745-8118

BMP Ownership and Maintenance (See BMPDM Section 7.3 and Attachment 11)

BMP Maintenance Category	Cat. 1 ☐	Cat. 2 ☒	Cat. 3 ☐	Cat. 4 ☐
Final owner of BMP	☐ HOA	☒ Property Owner	☐ County	☐ Other (describe):
Maintenance of BMP into perpetuity	☐ HOA	☒ Property Owner	☐ County	☐ Other (describe):

Discussion (As needed; Continue on subsequent pages as necessary)

The BMP is a biofiltration unit sized and designed to provide stormwater treatment, hydromodification mitigation, and flood control peak flow mitigation functions.

7.3 Structural BMP Checklist (Complete once for each proposed structural BMP)

Structural BMP ID # BMP-504	**Permit # and Sheet #** PDS2020-STP-20-021, Sheets 2, 3, and 7

BMP Type

Infiltration
- ☐ Infiltration basin (INF-1)
- ☐ Bioretention (INF-2)
- ☐ Permeable pavement (INF-3)

Unlined Biofiltration
- ☒ Biofiltration with partial retention (PR-1)

Lined Biofiltration
- ☐ Biofiltration (BF-1)
- ☐ Nutrient Sensitive Media Design (BF-2)
- ☐ Proprietary Biofiltration (BF-3)

Harvest and Use
- ☐ Cistern (HU-1)

Flow-thru Treatment (describe below)
- ☐ With prior lawful approval to meet earlier PDP requirements
- ☐ Pre-treatment/forebay for an onsite retention or biofiltration BMP[2]
- ☐ With alternative compliance

Hydromodification Management[3]
- ☒ Detention pond or vault

☐ **Other** (describe below)

BMP Purpose
- ☐ Pollutant control only
- ☐ Hydromodification control only
- ☒ Combined pollutant control and hydromodification
- ☐ Pre-treatment/forebay for another BMP
- ☐ Other (describe below)

BMP Verification (See BMPDM Section 8.3)

Provide name and contact information for the party responsible to sign BMP verification forms	Robert D. Dentino, PE Excel Engineering 760-745-8118

BMP Ownership and Maintenance (See BMPDM Section 7.3 and Attachment 11)

BMP Maintenance Category	Cat. 1 ☐	Cat. 2 ☒	Cat. 3 ☐	Cat. 4 ☐
Final owner of BMP	☐ HOA	☒ Property Owner	☐ County	☐ Other (describe):
Maintenance of BMP into perpetuity	☐ HOA	☒ Property Owner	☐ County	☐ Other (describe):

Discussion (As needed; Continue on subsequent pages as necessary)

The BMP is a biofiltration unit sized and designed to provide stormwater treatment, hydromodification mitigation, and flood control peak flow mitigation functions.

7.3 Structural BMP Checklist (Complete once for each proposed structural BMP)

Structural BMP ID # BMP-602	**Permit # and Sheet #** PDS2020-STP-20-021, Sheets 2, 3, and 7

BMP Type

Infiltration
- ☐ Infiltration basin (INF-1)
- ☐ Bioretention (INF-2)
- ☐ Permeable pavement (INF-3)

Unlined Biofiltration
- ☒ Biofiltration with partial retention (PR-1)

Lined Biofiltration
- ☐ Biofiltration (BF-1)
- ☐ Nutrient Sensitive Media Design (BF-2)
- ☐ Proprietary Biofiltration (BF-3)

Harvest and Use
- ☐ Cistern (HU-1)

Flow-thru Treatment (describe below)
- ☐ With prior lawful approval to meet earlier PDP requirements
- ☐ Pre-treatment/forebay for an onsite retention or biofiltration BMP[2]
- ☐ With alternative compliance

Hydromodification Management[3]
- ☒ Detention pond or vault
- ☐ **Other** (describe below)

BMP Purpose
- ☐ Pollutant control only
- ☐ Hydromodification control only
- ☒ Combined pollutant control and hydromodification
- ☐ Pre-treatment/forebay for another BMP
- ☐ Other (describe below)

BMP Verification (See BMPDM Section 8.3)

Provide name and contact information for the party responsible to sign BMP verification forms	Robert D. Dentino, PE Excel Engineering 760-745-8118

BMP Ownership and Maintenance (See BMPDM Section 7.3 and Attachment 11)

BMP Maintenance Category	Cat. 1 ☐	Cat. 2 ☒	Cat. 3 ☐	Cat. 4 ☐
Final owner of BMP	☐ HOA	☒ Property Owner	☐ County	
	☐ Other (describe):			
Maintenance of BMP into perpetuity	☐ HOA	☒ Property Owner	☐ County	
	☐ Other (describe):			

Discussion (As needed; Continue on subsequent pages as necessary)

The BMP is a biofiltration unit sized and designed to provide stormwater treatment, hydromodification mitigation, and flood control peak flow mitigation functions.

7.3 Structural BMP Checklist (Complete once for each proposed structural BMP)

Structural BMP ID # BMP-702	**Permit # and Sheet #** PDS2020-STP-20-021, Sheets 2, 3, and 7

BMP Type

Infiltration
- ☐ Infiltration basin (INF-1)
- ☐ Bioretention (INF-2)
- ☐ Permeable pavement (INF-3)

Unlined Biofiltration
- ☒ Biofiltration with partial retention (PR-1)

Lined Biofiltration
- ☐ Biofiltration (BF-1)
- ☐ Nutrient Sensitive Media Design (BF-2)
- ☐ Proprietary Biofiltration (BF-3)

Harvest and Use
- ☐ Cistern (HU-1)

Flow-thru Treatment (describe below)
- ☐ With prior lawful approval to meet earlier PDP requirements
- ☐ Pre-treatment/forebay for an onsite retention or biofiltration BMP[2]
- ☐ With alternative compliance

Hydromodification Management[3]
- ☒ Detention pond or vault
- ☐ **Other** (describe below)

BMP Purpose
- ☐ Pollutant control only
- ☐ Hydromodification control only
- ☒ Combined pollutant control and hydromodification
- ☐ Pre-treatment/forebay for another BMP
- ☐ Other (describe below)

BMP Verification (See BMPDM Section 8.3)

Provide name and contact information for the party responsible to sign BMP verification forms	Robert D. Dentino, PE Excel Engineering 760-745-8118

BMP Ownership and Maintenance (See BMPDM Section 7.3 and Attachment 11)

BMP Maintenance Category	Cat. 1 ☐	Cat. 2 ☒	Cat. 3 ☐	Cat. 4 ☐
Final owner of BMP	☐ HOA	☒ Property Owner	☐ County	
	☐ Other (describe):			
Maintenance of BMP into perpetuity	☐ HOA	☒ Property Owner	☐ County	
	☐ Other (describe):			

Discussion (As needed; Continue on subsequent pages as necessary)

The BMP is a biofiltration unit sized and designed to provide stormwater treatment, hydromodification mitigation, and flood control peak flow mitigation functions.

7.3 Structural BMP Checklist (Complete once for each proposed structural BMP)

Structural BMP ID # BMP-802	**Permit # and Sheet #** PDS2020-STP-20-021, Sheets 2, 3, and 7

BMP Type

Infiltration

- ☐ Infiltration basin (INF-1)
- ☐ Bioretention (INF-2)
- ☐ Permeable pavement (INF-3)

Unlined Biofiltration

- ☒ Biofiltration with partial retention (PR-1)

Lined Biofiltration

- ☐ Biofiltration (BF-1)
- ☐ Nutrient Sensitive Media Design (BF-2)
- ☐ Proprietary Biofiltration (BF-3)

Harvest and Use

- ☐ Cistern (HU-1)

Flow-thru Treatment (describe below)

- ☐ With prior lawful approval to meet earlier PDP requirements
- ☐ Pre-treatment/forebay for an onsite retention or biofiltration BMP[2]
- ☐ With alternative compliance

Hydromodification Management[3]

- ☒ Detention pond or vault

☐ **Other** (describe below)

BMP Purpose

- ☐ Pollutant control only
- ☐ Hydromodification control only
- ☒ Combined pollutant control and hydromodification
- ☐ Pre-treatment/forebay for another BMP
- ☐ Other (describe below)

BMP Verification (See BMPDM Section 8.3)

Provide name and contact information for the party responsible to sign BMP verification forms	Robert D. Dentino, PE Excel Engineering 760-745-8118

BMP Ownership and Maintenance (See BMPDM Section 7.3 and Attachment 11)

BMP Maintenance Category	Cat. 1 ☐	Cat. 2 ☒	Cat. 3 ☐	Cat. 4 ☐
Final owner of BMP	☐ HOA	☒ Property Owner	☐ County	☐ Other (describe):
Maintenance of BMP into perpetuity	☐ HOA	☒ Property Owner	☐ County	☐ Other (describe):

Discussion (As needed; Continue on subsequent pages as necessary)

The BMP is a biofiltration unit sized and designed to provide stormwater treatment, hydromodification mitigation, and flood control peak flow mitigation functions.

7.3 Structural BMP Checklist (Complete once for each proposed structural BMP)

Structural BMP ID # BMP-2001	**Permit # and Sheet #** PDS2020-STP-20-021, Sheets 2, 3, and 7

BMP Type

Infiltration
- ☐ Infiltration basin (INF-1)
- ☐ Bioretention (INF-2)
- ☐ Permeable pavement (INF-3)

Unlined Biofiltration
- ☐ Biofiltration with partial retention (PR-1)

Lined Biofiltration
- ☒ Biofiltration (BF-1)
- ☐ Nutrient Sensitive Media Design (BF-2)
- ☐ Proprietary Biofiltration (BF-3)

Harvest and Use
- ☐ Cistern (HU-1)

Flow-thru Treatment (describe below)
- ☐ With prior lawful approval to meet earlier PDP requirements
- ☐ Pre-treatment/forebay for an onsite retention or biofiltration BMP[2]
- ☐ With alternative compliance

Hydromodification Management[3]
- ☒ Detention pond or vault
- ☐ **Other** (describe below)

BMP Purpose
- ☐ Pollutant control only
- ☐ Hydromodification control only
- ☒ Combined pollutant control and hydromodification
- ☐ Pre-treatment/forebay for another BMP
- ☐ Other (describe below)

BMP Verification (See BMPDM Section 8.3)

Provide name and contact information for the party responsible to sign BMP verification forms	Robert D. Dentino, PE Excel Engineering 760-745-8118

BMP Ownership and Maintenance (See BMPDM Section 7.3 and Attachment 11)

BMP Maintenance Category	Cat. 1 ☐	Cat. 2 ☒	Cat. 3 ☐	Cat. 4 ☐
Final owner of BMP	☐ HOA	☒ Property Owner	☐ County	
	☐ Other (describe):			
Maintenance of BMP into perpetuity	☐ HOA	☒ Property Owner	☐ County	
	☐ Other (describe):			

Discussion (As needed; Continue on subsequent pages as necessary)

The BMP is a biofiltration unit sized and designed to provide stormwater treatment, hydromodification mitigation, and flood control peak flow mitigation functions.

Shurui Jiang

From: Eric Harrington
Sent: Friday, June 3, 2022 2:00 PM
To: Shurui Jiang
Subject: FW: RE: STP-20-021: Fallbrook Commercial - LD/Flood

From: McLean, Sean <Sean.McLean@sdcounty.ca.gov>
Sent: Wednesday, May 25, 2022 1:53 PM
To: Michael Levin <mlevin@excelengineering.net>
Cc: Eric Harrington <eharrington@excelengineering.net>; Castillo, Lyann <Lyann.Castillo@sdcounty.ca.gov>
Subject: RE: RE: STP-20-021: Fallbrook Commercial - LD/Flood

Hi Mike,

Yes its always a pleasure to work with you. Yes you are correct development projects are required to treat only areas that are improved/proposed by the development.

Sean

From: Michael Levin <mlevin@excelengineering.net>
Sent: Wednesday, May 25, 2022 12:21 PM
To: McLean, Sean <Sean.McLean@sdcounty.ca.gov>
Cc: Eric Harrington <eharrington@excelengineering.net>
Subject: [External] RE: STP-20-021: Fallbrook Commercial - LD/Flood

Hi Sean

Great to work with you on another project.

As a follow up to our call we just wan to confirm that the treatment for the offsite road widening will only be required to mitigate for the new surface area and the we will not be required to mitigate for the comingled flows associate with the existing street improvements.

Thanks

Michael Levin, PLS
Co-President
Excel *Engineering*
440 State Place
Escondido, CA 92029
(760) 745-8118 ext. 211
(760) 745-1890 fax
mdlevin@excelengineering.net

Automated Worksheet B.1: Calculation of Design Capture Volume (V2.0)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Standard Drainage Basin Inputs	1	Drainage Basin ID or Name	BMP-103	BMP-201	BMP-302	BMP-401	BMP-504	BMP-602	BMP-702	BMP-802	BMP-2001	BMP-3001	unitless
	2	85th Percentile 24-hr Storm Depth	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	inches
	3	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	20,834	16,683	10,914	5,559	20,173	5,403	10,996	31,249	5,172	5,343	sq-ft
	4	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)											sq-ft
	5	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)									2,919		sq-ft
	6	Natural Type A Soil Not Serving as Dispersion Area (C=0.10)	11,530	0	0	0	2,292	0	0	3,310	0	503	sq-ft
	7	Natural Type B Soil Not Serving as Dispersion Area (C=0.14)											sq-ft
	8	Natural Type C Soil Not Serving as Dispersion Area (C=0.23)	14,618	3,887	2,611	2,221	2,930	1,749	2,616	7,764	0	1,664	sq-ft
	9	Natural Type D Soil Not Serving as Dispersion Area (C=0.30)											sq-ft
Dispersion Area, Tree Well & Rain Barrel Inputs (Optional)	10	Does Tributary Incorporate Dispersion, Tree Wells, and/or Rain Barrels?	No	No	No	No	No	No	No	No	No	No	yes/no
	11	Impervious Surfaces **Directed to Dispersion Area** per SD-B (Ci=0.90)											sq-ft
	12	Semi-Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	13	Engineered Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	14	Natural Type A Soil **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	15	Natural Type B Soil **Serving as Dispersion Area** per SD-B (Ci=0.14)											sq-ft
	16	Natural Type C Soil **Serving as Dispersion Area** per SD-B (Ci=0.23)											sq-ft
	17	Natural Type D Soil **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	18	Number of Tree Wells Proposed per SD-A											#
	19	Average Mature Tree Canopy Diameter											ft
	20	Number of Rain Barrels Proposed per SD-E											#
	21	Average Rain Barrel Size											gal
Initial Runoff Factor Calculation	22	Total Tributary Area	46,982	20,570	13,525	7,780	25,396	7,152	13,612	42,323	8,091	7,510	sq-ft
	23	Initial Runoff Factor for Standard Drainage Areas	0.50	0.77	0.77	0.71	0.75	0.74	0.77	0.71	0.61	0.70	unitless
	24	Initial Runoff Factor for Dispersed & Dispersion Areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	25	Initial Weighted Runoff Factor	0.50	0.77	0.77	0.71	0.75	0.74	0.77	0.71	0.61	0.70	unitless
	26	Initial Design Capture Volume	1,449	977	642	341	1,175	326	646	1,853	304	324	cubic-feet
Dispersion Area Adjustments	27	Total Impervious Area Dispersed to Pervious Surface	0	0	0	0	0	0	0	0	0	0	sq-ft
	28	Total Pervious Dispersion Area	0	0	0	0	0	0	0	0	0	0	sq-ft
	29	Ratio of Dispersed Impervious Area to Pervious Dispersion Area	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	ratio
	30	Adjustment Factor for Dispersed & Dispersion Areas	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	ratio
	31	Runoff Factor After Dispersion Techniques	0.50	0.77	0.77	0.71	0.75	0.74	0.77	0.71	0.61	0.70	unitless
	32	Design Capture Volume After Dispersion Techniques	1,449	977	642	341	1,175	326	646	1,853	304	324	cubic-feet
Tree & Barrel Adjustments	33	Total Tree Well Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
	34	Total Rain Barrel Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
Results	35	Final Adjusted Runoff Factor	0.50	0.77	0.77	0.71	0.75	0.74	0.77	0.71	0.61	0.70	unitless
	36	Final Effective Tributary Area	23,491	15,839	10,414	5,524	19,047	5,292	10,481	30,049	4,936	5,257	sq-ft
	37	Initial Design Capture Volume Retained by Site Design Elements	0	0	0	0	0	0	0	0	0	0	cubic-feet
	38	Final Design Capture Volume Tributary to BMP	1,449	977	642	341	1,175	326	646	1,853	304	324	cubic-feet

No Warning Messages

Automated Worksheet B.2: Retention Requirements (V2.0)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Basic Analysis	1	Drainage Basin ID or Name	BMP-103	BMP-201	BMP-302	BMP-401	BMP-504	BMP-602	BMP-702	BMP-802	BMP-2001	BMP-3001	unitless
	2	85th Percentile Rainfall Depth	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	inches
	3	Predominant NRCS Soil Type Within BMP Location	C	C	C	C	C	C	C	C	C	C	unitless
	4	Is proposed BMP location Restricted or Unrestricted for Infiltration Activities?	Unrestricted	Unrestricted	Unrestricted	Unrestricted	Unrestricted	Unrestricted	Unrestricted	Unrestricted	Unrestricted	Unrestricted	unitless
	5	Nature of Restriction											unitless
	6	Do Minimum Retention Requirements Apply to this Project?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes/no
	7	Are Habitable Structures Greater than 9 Stories Proposed?	No	No	No	No	No	No	No	No	No	No	yes/no
Advanced Analysis	8	Has Geotechnical Engineer Performed an Infiltration Analysis?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	yes/no
	9	Design Infiltration Rate Recommended by Geotechnical Engineer	0.360	0.150	0.360	0.360	0.360	0.360	0.360	0.040	~~0.000~~		in/hr
Result	10	Design Infiltration Rate Used To Determine Retention Requirements	0.360	0.150	0.360	0.360	0.360	0.360	0.360	0.040	0.100	0.100	in/hr
	11	Percent of Average Annual Runoff that Must be Retained within DMA	40.0%	21.2%	40.0%	40.0%	40.0%	40.0%	40.0%	1.5%	16.3%	16.3%	percentage
	12	Fraction of DCV Requiring Retention	0.32	0.14	0.32	0.32	0.32	0.32	0.32	0.01	0.10	0.10	ratio
	13	Required Retention Volume	464	137	205	109	376	104	207	19	30	32	cubic-feet

No Warning Messages

Automated Worksheet B.3: BMP Performance (V2.0)

Category	#	Description	i	ii	iii	iv	v	vi	vii	viii	ix	x	Units
BMP Inputs	1	Drainage Basin ID or Name	BMP-103	BMP-201	BMP-302	BMP-401	BMP-504	BMP-602	BMP-702	BMP-802	BMP-2001	BMP-3001	sq-ft
	2	Design Infiltration Rate Recommended	0.360	0.150	0.360	0.360	0.360	0.360	0.360	0.040	0.100	0.100	in/hr
	3	Design Capture Volume Tributary to BMP	1,449	977	642	341	1,175	326	646	1,853	304	324	cubic-feet
	4	Is BMP Vegetated or Unvegetated?	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated	unitless
	5	Is BMP Impermeably Lined or Unlined?	Unlined	Unlined	Unlined	Unlined	Unlined	Unlined	Unlined	Unlined	Unlined	Unlined	unitless
	6	Does BMP Have an Underdrain?	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain	unitless
	7	Does BMP Utilize Standard or Specialized Media?	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	unitless
	8	Provided Surface Area	2,670	1,581	1,109	359	1,541	676	712	1,752	150	150	sq-ft
	9	Provided Surface Ponding Depth	6	6	6	6	6	6	6	6	4	6	inches
	10	Provided Soil Media Thickness	21	21	21	21	21	21	21	21	18	21	inches
	11	Provided Gravel Thickness (Total Thickness)	30	18	18	18	18	18	18	30	15	17	inches
	12	Underdrain Offset	18	6	3	3	6	3	3	9	3	3	inches
	13	Diameter of Underdrain or Hydromod Orifice (Select Smallest)	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	6.00	8.00	inches
	14	Specialized Soil Media Filtration Rate											in/hr
	15	Specialized Soil Media Pore Space for Retention											unitless
	16	Specialized Soil Media Pore Space for Biofiltration											unitless
	17	Specialized Gravel Media Pore Space											unitless
Retention Calculations	18	Volume Infiltrated Over 6 Hour Storm	481	119	200	65	277	122	128	35	8	8	cubic-feet
	19	Ponding Pore Space Available for Retention	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	20	Soil Media Pore Space Available for Retention	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	unitless
	21	Gravel Pore Space Available for Retention (Above Underdrain)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	22	Gravel Pore Space Available for Retention (Below Underdrain)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	unitless
	23	Effective Retention Depth	8.25	3.45	2.25	2.25	3.45	2.25	2.25	4.65	2.10	2.25	inches
	24	Fraction of DCV Retained (Independent of Drawdown Time)	1.60	0.59	0.63	0.39	0.61	0.76	0.41	0.39	0.11	0.11	ratio
	25	Calculated Retention Storage Drawdown Time	23	23	6	6	10	6	6	116	21	23	hours
	26	Efficacy of Retention Processes	1.00	0.88	1.00	1.00	1.00	1.00	1.00	0.39	0.27	0.25	ratio
	27	Volume Retained by BMP (Considering Drawdown Time)	1,449	857	642	341	1,175	326	646	720	82	82	cubic-feet
	28	Design Capture Volume Remaining for Biofiltration	0	120	0	0	0	0	0	1,133	222	242	cubic-feet
Biofiltration Calculations	29	Max Hydromod Flow Rate through Underdrain	0.0118	0.0118	0.0122	0.0122	0.0118	0.0122	0.0122	0.0131	1.5195	2.9513	cfs
	30	Max Soil Filtration Rate Allowed by Underdrain Orifice	0.19	0.32	0.48	1.47	0.33	0.78	0.74	0.32	437.63	849.97	in/hr
	31	Soil Media Filtration Rate per Specifications	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	in/hr
	32	Soil Media Filtration Rate to be used for Sizing	0.19	0.32	0.48	1.47	0.33	0.78	0.74	0.32	5.00	5.00	in/hr
	33	Depth Biofiltered Over 6 Hour Storm	1.15	1.93	2.86	8.84	1.98	4.70	4.46	1.94	30.00	30.00	inches
	34	Ponding Pore Space Available for Biofiltration	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	unitless
	35	Soil Media Pore Space Available for Biofiltration	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	unitless
	36	Gravel Pore Space Available for Biofiltration (Above Underdrain)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	unitless
	37	Effective Depth of Biofiltration Storage	15.00	15.00	16.20	16.20	15.00	16.20	16.20	18.60	12.40	15.80	inches
	38	Drawdown Time for Surface Ponding	11	13	7	3	9	5	5	17	1	1	hours
	39	Drawdown Time for Effective Biofiltration Depth	27	32	19	9	22	14	15	51	2	3	hours
	40	Total Depth Biofiltered	16.15	16.93	19.06	25.04	16.98	20.90	20.66	20.54	42.40	45.80	inches
	41	Option 1 - Biofilter 1.50 DCV: Target Volume	0	181	0	0	0	0	0	1,700	334	363	cubic-feet
	42	Option 1 - Provided Biofiltration Volume	0	181	0	0	0	0	0	1,700	334	363	cubic-feet
	43	Option 2 - Store 0.75 DCV: Target Volume	0	90	0	0	0	0	0	850	167	182	cubic-feet
	44	Option 2 - Provided Storage Volume	0	90	0	0	0	0	0	850	155	182	cubic-feet
	45	Portion of Biofiltration Performance Standard Satisfied	0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	ratio
Result	46	Do Site Design Elements and BMPs Satisfy Annual Retention Requirements?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes/no
	47	Overall Portion of Performance Standard Satisfied (BMP Efficacy Factor)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	ratio
	48	**Deficit of Effectively Treated Stormwater**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	cubic-feet

Attention!

- BMPs sized at <3% of the effective tributary areas must be accompanied by Reduced Size BMP Maintenance calculations (see last tab).

See next sheet for Reduced Size BMP Maintenance

Automated Worksheet B.4: Reduced Size BMP Maintenance Interval (V2.0)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Drainage Basin Info	1	Drainage Basin ID or Name	-	-	-	-	-	-	-	-	-	BMP-3001	unitless
	2	Final Effective Tributary Area	-	-	-	-	-	-	-	-	-	5,257	sq-ft
	3	Provided BMP Surface Area	-	-	-	-	-	-	-	-	-	150	sq-ft
Biofiltration Clogging Inputs	4	Average Annual Precipitation										15.0	inches
	5	Load to Clog (default =2.0)										2.0	lb/sq-ft
	6	TSS Pretreatment Efficacy											yes/no
	7	Percentage "Commercial"											percentage
	8	Percentage "Education"											percentage
	9	Percentage "Industrial"											percentage
	10	Percentage "Low Traffic Areas"										100%	percentage
	11	Percentage "Multi-Family Residential"											percentage
	12	Percentage "Roof Areas"											percentage
	13	Percentage "Single Family Residential"											percentage
	14	Percentage "Transportation"											percentage
	15	Percentage "Vacant/Open Space"											percentage
	16	Percentage "Steep Hillslopes"											percentage
Result	17	Total Percentage of Above Land Uses	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	percentage
	18	Average TSS Concentration for Tributary After Pretreatment	0	0	0	0	0	0	0	0	0	25	mg/L
	19	Average Annual Runoff Volume	0	0	0	0	0	0	0	0	0	6,571	cubic-feet
	20	Average Annual TSS Load	0	0	0	0	0	0	0	0	0	10	lb/yr
	21	Available Sediment Storage within BMP	0	0	0	0	0	0	0	0	0	300	lb
	22	Anticipated Major Maintenance Frequency	-	-	-	-	-	-	-	-	-	29.3	years

No Warning Messages

BMP meets 10 year minimum maintenance threshold

8.0 General Requirements

- Completion of this attachment is required for all PDPs subject to hydromodification management requirements (see PDP SWQMP Form Table 5). Do not submit this attachment if exempt from Hydromodification Management requirements. Document the PDP exemption in Attachment 9.
- Submit this cover page and all required Sub-attachments for all structural hydromodification management BMPs proposed for the project.
- Constructed features must fully satisfy the requirements described in applicable BMPDM sections and appendices, and any other guidance identified by the County.
- DMA Exhibits and Construction Plans: DMAs, features, and BMPs identified and described in this attachment must be shown on DMA Exhibits and all applicable construction plans submitted for the project. See Attachment 2 for additional instruction on exhibits and plans.
- Structural BMP Certification. All structural hydromodification management BMPs documented this attachment must be certified by a registered engineer in Attachment 7, Sub-attachment 7.1.
- Structural BMP Verification. BMP installation must be verified by the County at the completion of construction. Applicants must complete an Installation Verification Form (Attachment 10).

Sub-attachments (check all that are completed)
☒ **8.1: Flow Control Facility Design** (required)[1] Submit using ☒ the Sub-attachment 8.1 cover sheet provided, or ☐ as a separate stand-alone document labeled Sub-attachment 8.1.
☒ **8.2: Hydromodification Management Points of Compliance** (required) Complete the table provided in Sub-attachment 8.2.
8.3: Geomorphic Assessment of Receiving Channels 1. Has a geomorphic assessment been performed for the receiving channel(s)? ☒ No, the low flow threshold is 0.1Q2 (default low flow threshold)
☐ Yes (provide the information below): Low flow threshold: ☐ 0.1Q2 ☐ 0.3Q2 ☐ 0.5Q2
Title: Date: Preparer:
Submit using ☐ the Sub-attachment 8.3 cover sheet provided, or ☐ as a separate stand-alone document labeled Sub-attachment 8.3.
8.4: Vector Control Plan (required if BMPs will not drain in less than 96 hours) ☐ Included with this attachment ☒ Not required

[1] Including Structural BMP Drawdown Calculations and Overflow Design Summary. See BMPDM Chapter 6 and Appendix G for additional design guidance.

8.1 Flow Control Facility Design

Insert Flow Control Facility Design behind this cover page or submit as a separate stand-alone document labeled Sub-attachment 8.1.

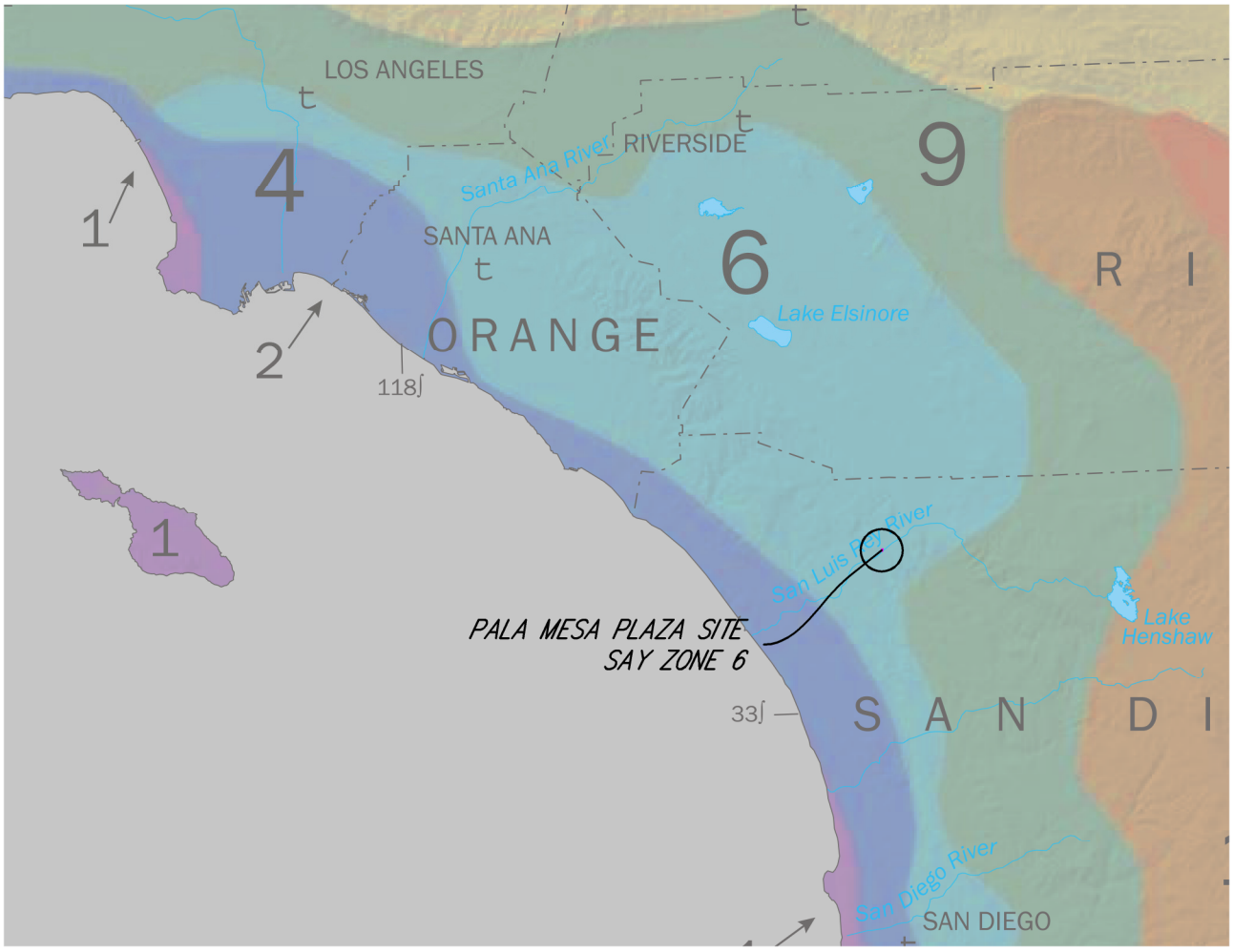
8.2 Hydromodification Management Points of Compliance

- List and describe all points of compliance (POCs) for flow control for hydromodification management.
- For each POC, provide a POC identification name or number, and a receiving channel identification name or number correlating to the project's HMP Exhibit (see Attachment 2).

POC name or #	Channel name or #	POC Description
POC-1	Public storm drain system leading to the San Luis Rey River	On-site surface drain inlet collecting piped offsite pass through flows and all of the on-site overland flows. This inlet is pipe underground into the public right of way where it connects to the public storm drain system.

CALIFORNIA IRRIGATION MANAGEMENT INFORMATION SYSTEM (CIMIS)

REFERENCE EVAPOTRANSPIRATION ZONES



DEPARTMENT OF WATER RESOURCES

UNIVERSITY OF CALIFORNIA, DAVIS

STATE OF CALIFORNIA
ARNOLD SCHWARZENEGGER, GOVERNOR

DEPARTMENT OF WATER RESOURCES
LESTER A. SNOW, DIRECTOR

Lambert Conformal Conic Projection
1927 North American Datum

PALA MESA PLAZA
PROJECT 19-025
EVAPORATION ZONE
MAPPING

SELF-MITIGATING DMAS:

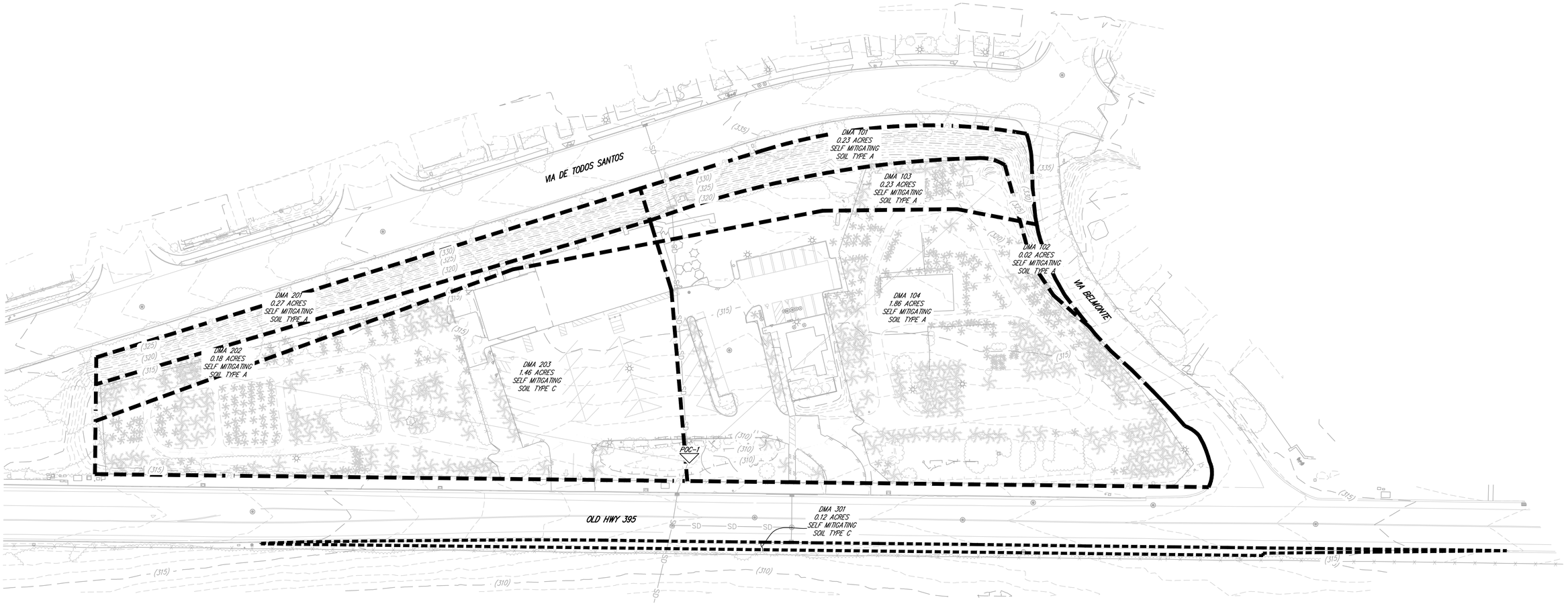
- VEGETATION IN THE NATURAL OR LANDSCAPED AREA IS NATIVE AND/OR NON-NATIVE/NON-INVASIVE DROUGHT TOLERANT SPECIES THAT DO NOT REQUIRE REGULAR APPLICATION OF FERTILIZERS AND PESTICIDES.
- SOILS ARE UNDISTURBED NATIVE TOPSOIL, OR DISTURBED SOILS THAT HAVE BEEN AMENDED AND AERATED TO PROMOTE WATER RETENTION CHARACTERISTICS EQUIVALENT TO UNDISTURBED NATIVE TOPSOIL.
- THE INCIDENTAL IMPERVIOUS AREAS ARE LESS THAN 5 PERCENT OF THE SELF-MITIGATING AREA.
- IMPERVIOUS AREA WITHIN THE SELF-MITIGATED AREA SHOULD NOT BE HYDRAULICALLY CONNECTED TO OTHER IMPERVIOUS AREAS UNLESS IT IS A STORM WATER CONVEYANCE SYSTEM (SUCH AS A BROW DITCH).
- THE SELF-MITIGATING AREA IS HYDRAULICALLY SEPARATE FROM DMAS THAT CONTAIN PERMANENT STORM WATER POLLUTANT CONTROL BMPS.

EXISTING SITE FEATURES:

- THE APPROXIMATE DEPTH TO GROUNDWATER IS GREATER THAN 25 FEET BASED ON THE EPA WEB SOIL SURVEY RESULTS
- THERE ARE NO NATURAL HYDROLOGIC FEATURES ON THE SITE.
- THE SITE PROPOSES TO CONNECT TO THE EXISTING PUBLIC STORMDRAIN SYSTEM LOCATED IN THE PUBLIC RIGHT-OF-WAY FOR OLD HIGHWAY 395.
- BASED ON WATERSHED MAPPING OF POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS (CCSYA), THERE ARE NO CCSYA LOCATED WITHIN THE PROJECT BOUNDARY OR TRIBUTARY TO THE RUNOFF BYPASSED AROUND THE SITE.

HYDROMOD DATA TABLE

DMA NAME	DMA TYPE	AREA (AC)	AREA (SF)	OUTLET	% SLOPE	FLOW LENGTH (FT)	WIDTH (FT)	% IMP	SOIL TYPE
DMA-101	SELF MITIGATING	0.2	10202	DMA-103	50	33	309	0	A
DMA-102	SELF MITIGATING	0.0	865	DMA-104	50	155	58	0	A
DMA-103	SELF MITIGATING	0.2	10174	DMA-104	5	9	172	0	A
DMA-104	SELF MITIGATING	1.9	80970	POC-1	5	354	229	0	C
DMA-201	SELF MITIGATING	0.3	11763	DMA-202	50	25	471	0	A
DMA-202	SELF MITIGATING	0.2	8034	DMA203	2	27	298	0	A
DMA-203	SELF MITIGATING	1.5	63614	POC-1	2	494	129	0	C
DMA-301	SELF MITIGATING	0.1	5172	POC-1	1	698	5	0	C



EXISTING SITE FEATURES:

- THE APPROXIMATE DEPTH TO GROUNDWATER IS GREATER THAN 25 FEET BASED ON THE EPA WEB SOIL SURVEY RESULTS
- THERE ARE NO NATURAL HYDROLOGIC FEATURES ON THE SITE.
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HYDROLOGIC SOIL GROUP

THE HYDROLOGICAL SOIL GROUPS FOR THIS SITE ARE TYPES (A) AND (C).

SCALE 1:40
0 40 80

EXCEL ENGINEERING
LAND PLANNING • ENGINEERING • SURVEYING
440 STATE PLACE, ESCONDIDO, CA 92029
PH (760)745-8118 FX (760)745-1890

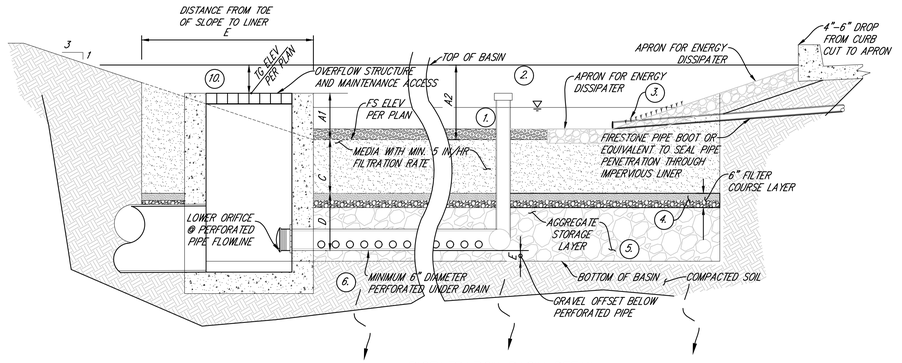
PALA MESA PLAZA
PRE DEVELOPMENT
HYDROMODIFICATION EXHIBIT

K:\19\19025\Engineering\SDP\SDP 01\Storm Working Files\SWQMP\DMA and HMP Exhibits\Current\HMP-PRE-CURRENT.dwg 6/6/2022 11:40 AM ORIGINAL PLOT SIZE:

WATER QUALITY BASIN INSTALLATION NOTES:

1. 3 INCHES OF WELL-AGED, SHREDDED HARDWOOD MULCH.
2. AN UNDERDRAIN CLEANOUT WITH A MINIMUM 6-INCH DIAMETER AND LOCKABLE CAP IS PLACED EVERY 250 TO 300FEET AS REQUIRED BASED ON UNDERDRAIN LENGTH.
3. VEGETATION USED SHOULD BE SUITABLE FOR THE CLIMATE PER LANDSCAPE PLANS
4. FILTER COARSE IS A MINIMUM OF 6 INCHES PROVIDED IN TWO SEPARATE 3 INCH LAYERS. THE TOP LAYER SHALL BE MADE OF ASTM C33 CHOKER SAND AND THE BOTTOM LAYER BE OF ASTM NO. 8 AGGREGATE. MARKERS STAKES SHALL BE USED TO ENSURE UNIFORM LIFT THICKNESS.
5. AASHTO NO. 57 STONE OR CLASS 2 PERMEABLE PER CAL TRANS SPECIFICATION 68-1.025 IS RECOMMENDED FOR THE AGGREGATE STORAGE LAYER. WASHED, OPEN-GRADED CRUSHED ROCK MAY BE USED, HOWEVER, A 4 INCH MINIMUM WASHED PEA GRAVEL FILTER COURSE LAYER AT THE TOP OF THE CRUSHED ROCK IS REQUIRED.
6. IMPERMEABLE LINER SHALL BE INSTALLED WHEN THE BIOFILTRATION BASIN IS WITHIN 10 FEET OF RETAINING WALLS OR BUILDING FOUNDATIONS, OR AS RECOMMENDED BY THE SOILS ENGINEER, OR REQUIRED BY THESE PLANS. IMPERMEABLE LINER SHALL BE 30 MIL THICK (PER COUNTY OF SAN DIEGO GREEN STREETS DESIGN STANDARD DRAWING GS-3.00 AND COUNTY GREEN STREETS SUPPLEMENT TO CAL TRANS SPECIFICATIONS 20-11.08B) CONFIGURED TO ENTIRELY ENCOMPASS THE SIDES OF THE WATER QUALITY BASIN.
7. IMPERMEABLE LINER BE CONSTRUCTED IN COMPLIANCE WITH THE COUNTY OF SAN DIEGO GREEN STREETS SUPPLEMENT TO CAL TRANS SPECIFICATIONS 20-11.08B.
8. BIOFILTRATION SOIL MEDIA LAYER (BSM) SHALL CONSIST OF 60% TO 80% BY VOLUME SAND, UP TO 20% BY VOLUME TOPSOIL, AND UP 20% BY VOLUME COMPOST (PER COUNTY OF SAN DIEGO BMP DESIGN MANUAL SEPTEMBER 2020 APPENDIX F.2 SECTION 803-2 BLENDED BSM CRITERIA AND TESTING REQUIREMENTS) PLACED IN 6" LIFTS AND COMPACTED WITH WATER PRIOR TO THE NEXT LIFT. INITIAL PERMEABILITY SHALL BE 8" PER HOUR (WITH ASSUMED STABILIZED PERMEABILITY OF 5" PER HOUR).
9. THE AGGREGATE STORAGE LAYER SHALL BE COMPACTED IN ACCORDANCE WITH SOILS ENGINEER'S RECOMMENDATIONS.
10. OVERFLOW STRUCTURE TO HAVE A MINIMUM OF 2 INCHES OF FREEBOARD.
11. ALL LINER INSTALLATIONS, FIELD WELDING OF SEAMS, AND OBSERVATION OF SOIL MIX PLACEMENT SHALL REQUIRE SPECIAL INSPECTION BY THE PROJECT GEOTECHNICAL ENGINEER OR OTHER QUALIFIED PERSON. A LETTER CERTIFYING PROPER INSTALLATION SHALL BE PROVIDED TO THE ENGINEER OF RECORD TO ACCEPTANCE OF THE FACILITIES.
12. SPECIAL INSPECTION SHALL BE REQUIRED FOR CONSTRUCTION OF ALL BIOFILTRATION BASINS. INSPECTION SHALL BE PERFORMED BY A QUALIFIED INDIVIDUAL (SUCH AS: ENGINEER OF RECORD, QSD). INSPECTION SHALL INCLUDE:
    - VERIFICATION OF OVERALL DIMENSIONS PRIOR TO PLACEMENT OF MATERIALS;
    - PLACEMENT OF THE LINER, IF REQUIRED; AND SEAMS OR PENETRATIONS
    - PLACEMENT OF THE GRAVEL, FILTER MATERIALS, AND FILTER MEDIA;
    - ALL INLET AND OUTLET STRUCTURES INCLUDING UNDERDRAINS, IF REQUIRED.
    - CONTRACTOR SHALL TAKE PICTURES AT EACH STAGE OF INSTALLATION AND SUBMITTED TO ENGINEER FOR VERIFICATION OF INSTALL.

    INSPECTOR SHALL BE GIVEN A MINIMUM OF 48 HOURS PRIOR TO INSPECTION. UPON COMPLETION THE INSPECTOR SHALL PROVIDE A CERTIFICATION TO THE ENGINEER OF WORK.
13. PROPOSED MATERIALS, SUCH AS AGGREGATE, FILTER MATERIAL, AND FILTER MEDIA SHALL BE SUBMITTED TO THE ENGINEER OF WORK FOR APPROVAL.



BIOFILTRATION BASIN DETAIL
NOT TO SCALE

STRUCTURAL BIO-BASIN SUMMARY TABLE													
BMP NAME	TYPE OF BMP	EFFECTIVE AREA (SQFT)	A1 (INCH) TOP OF RISER	A2 (INCH) TOP OF BASIN	A3 (INCH) CLEAN OUT	B (INCH) UPPER ORIFICE	C (INCH) MEDIA	D (INCH) GRAVEL	E (INCH) DISTANCE FROM TOE OF SLOP TO LINER	F (INCH) PERF. PIPE IE OFFSET	BOX RISER OVERFLOW STRUCTURE SIZE (INCHES)	ORIFICES DIAMETER		IMPERMEABLE LINER ?
												UPPER (INCH)	LOWER (INCH)	
BMP-103	BIOFILTRATION	2767	9	36	9	N/A	18	30	27	18	36X36	N/A	0.75	NO
BMP-201	BIOFILTRATION	1712	9	18	9	N/A	18	18	27	6	36X36	N/A	0.5	NO
BMP-302	BIOFILTRATION	1020	9	18	9	N/A	18	18	27	6	24X24	N/A	0.5	NO
BMP-401	BIOFILTRATION	278	9	18	9	N/A	18	18	27	3	18X18	N/A	0.5	NO
BMP-504	BIOFILTRATION	1531	9	17.6	9	N/A	18	18	27	3	36X36	N/A	0.5	NO
BMP-602	BIOFILTRATION	558	9	12	9	N/A	18	18	27	3	18X18	N/A	0.5	NO
BMP-702	BIOFILTRATION	560	9	5.4	9	N/A	18	18	27	3	18X18	N/A	0.5	NO
BMP-802	BIOFILTRATION	1807	SEE CATCH BASIN DETAIL	36	9	SEE CATCH BASIN DETAIL	18	30	27	18	36X36	SEE CATCH BASIN DETAIL	0.75	NO
** BMP-2001	BIOFILTRATION	150	9	9	9	N/A	18	12	27	3	18X18	N/A	0.5	YES

NOTE: * MEASUREMENTS ARE FROM FINISH SURFACE OF BASIN.
** BMP IS SPLIT EVENLY AT TWO SIDES OF THE STREET AND ARE CONNECTED UNDERGROUND.

SELF-MITIGATING DMAS:

- VEGETATION IN THE NATURAL OR LANDSCAPED AREA IS NATIVE AND/OR NON-NATIVE/NON-INVASIVE DROUGHT TOLERANT SPECIES THAT DO NOT REQUIRE REGULAR APPLICATION OF FERTILIZERS AND PESTICIDES.
- SOILS ARE UNDISTURBED NATIVE TOPSOIL, OR DISTURBED SOILS THAT HAVE BEEN AMENDED AND AERATED TO PROMOTE WATER RETENTION CHARACTERISTICS EQUIVALENT TO UNDISTURBED NATIVE TOPSOIL.
- THE INCIDENTAL IMPERVIOUS AREAS ARE LESS THAN 5 PERCENT OF THE SELF-MITIGATING AREA.
- IMPERVIOUS AREA WITHIN THE SELF-MITIGATED AREA SHOULD NOT BE HYDRAULICALLY CONNECTED TO OTHER IMPERVIOUS AREAS UNLESS IT IS A STORM WATER CONVEYANCE SYSTEM (SUCH AS A BROW DITCH).
- THE SELF-MITIGATING AREA IS HYDRAULICALLY SEPARATE FROM DMAS THAT CONTAIN PERMANENT STORM WATER POLLUTANT CONTROL BMPS.

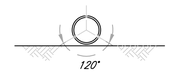
PERMANENT WATER QUALITY TREATMENT FACILITY

KEEPING OUR WATER WAYS CLEAN
MAINTAIN WITH CARE - NO MODIFICATIONS WITHOUT AGENCY APPROVAL

DETAIL
WATER QUALITY SIGN- PLACED AT EACH BIOFILTRATION BASIN

NOTE: ALL BIOFILTRATION AREAS WILL HAVE A SIGN POSTED TO BE VISIBLE AT ALL TIMES.

ORIFICE DETAIL
NOT TO SCALE



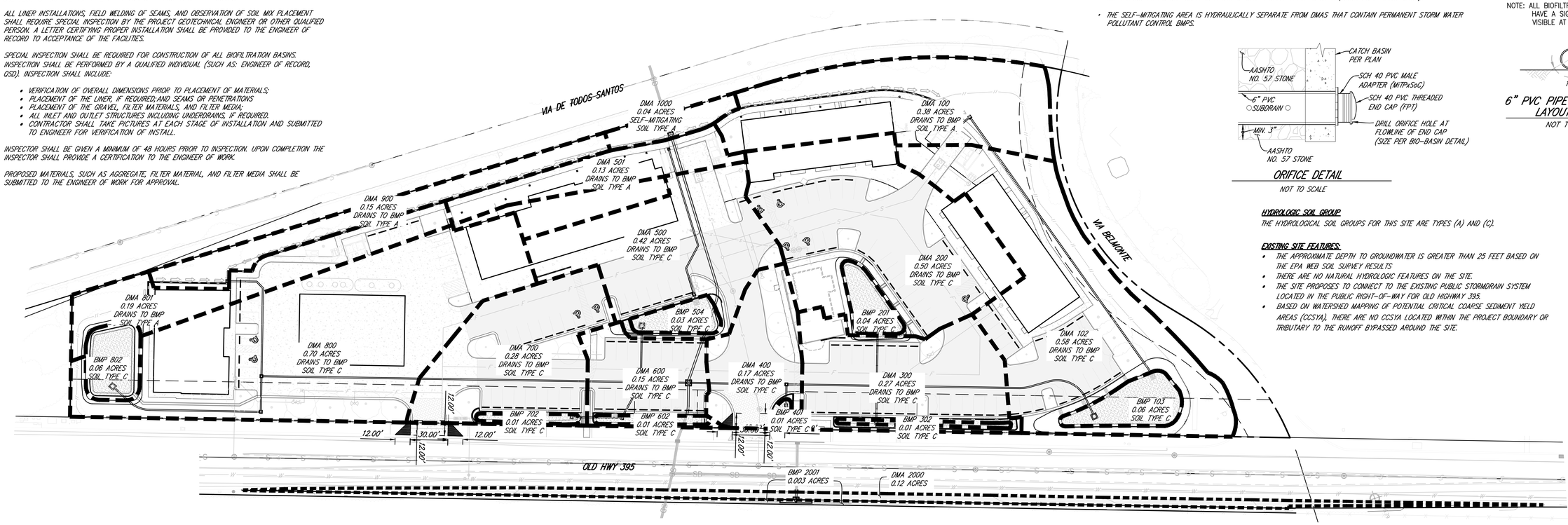
6" PVC PIPE PERFORATION LAYOUT DETAIL
NOT TO SCALE

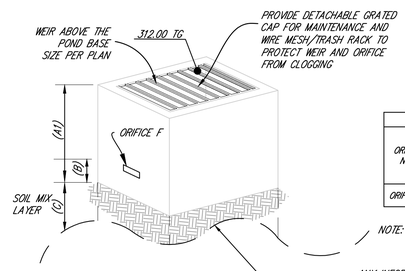
HYDROLOGIC SOIL GROUP

THE HYDROLOGICAL SOIL GROUPS FOR THIS SITE ARE TYPES (A) AND (C).

EXISTING SITE FEATURES:

- THE APPROXIMATE DEPTH TO GROUNDWATER IS GREATER THAN 25 FEET BASED ON THE EPA WEB SOIL SURVEY RESULTS
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- BASED ON WATERSHED MAPPING OF POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS (CCSYA), THERE ARE NO CCSYA LOCATED WITHIN THE PROJECT BOUNDARY OR TRIBUTARY TO THE RUNOFF BYPASSED AROUND THE SITE.





CATCHBASIN 802 DETAIL
NOT TO SCALE

ORIFICE SUMMARY TABLE								
ORIFICE NAME	INVERT ELEVATION (FT)	B (INCH)	A1 TOP OF RISER (INCH)	NUMBER OF BARRELS	SPAN (INCH)	RISE (INCH)	MAX WATER SURFACE ELEVATION (FT)	FREE BOARD ELEVATION (FT)
ORIFICE F	310.50	9.00	27	1	8	2	311.75	311.75

NOTE: MEASUREMENTS ARE FROM FINISH SURFACE OF BASIN



DETAIL
"NO DUMPING" AT CATCH BASINS

NOTE: ALL CATCH BASINS WITH GRATES SHALL BE STENCILED WITH CITY REQUIRED ITEM PER ABOVE DETAIL:

(DAS MANUFACTURING #SDO OR EQUIVALENT)



PALA MESA PLAZA
POST DEVELOPMENT
HYDROMODIFICATION EXHIBIT

EXCEL ENGINEERING
LAND PLANNING • ENGINEERING • SURVEYING
440 STATE PLACE, ESCONDIDO, CA 92029
PH (760)745-8118 FX (760)745-1890

K:\19\19025\Engineering\SDP 01\Storm Working Files\SWQMP\DMA and HMP Exhibits\Current\HMP-POST-CURRENT-2.dwg 6/14/2023 11:38 AM ORIGINAL PLOT SIZE: 24X36

Table of Contents

INTRODUCTION

Section I Pre- and Post-Development Model Setup 3
Section II System Representation 8
Section III Continuous Simulation Options 13
Section IV Bio-filtration As LID Control 14
Section V Running the Simulation 17
Section VI Result Analysis 18
Section VII Summary and Conclusion 27

ATTACHEMENTS

Attachment A SWMM Drainage Management Area Map
Attachment B SWMM Statistics Analysis, Flow Duration Curve and Pass/Fail Table
Attachment C SWMM Input Data Summary and Detail

INTRODUCTION

This report provides Hydromodification and Water Quality design based on LID (Low Impact Development) principles for the project Fallbrook.

The project site is located on the western side of Old Highway 395 just north of the intersection of Interstate 15 and Highway 76 Pala Road, in the county of San Diego, California. The site is an existing low-density commercial site composed of a small grocery store market, a small hamburger restaurant, and an existing operating landscape nursery. The project fronts onto old highway 395 which bounds the project to the east.

The project proposes to retain the two existing buildings, add two new retail buildings near the northern portion of the site, and add a third convenience store building near the southern point of the site. The convenience store will include a six-pump fuel island. Along with the newly constructed buildings, the project proposes to add reconfigured parking spaces, drive isles and various patio areas and walkways throughout the site. The project will have two access points to Old Highway 395. The project will also construct several biofiltration basins to treat the anticipated pollutants generated by this type of project.

The Hydromodification and Water Quality calculations were performed utilizing continuous simulation analysis to size the storm water treatment and control facilities. Storm Water Management Model (SWMM) version 5.1 distributed by USEPA is the basis of all calculations within this report. SWMM generates peak flow recurrence frequencies and flow duration series statistics based on an assigned rain gauge for pre-development, unmitigated post-development flows and post-development mitigated flows to determine compliance with the State Water Resources Control Board Order No.R9-2015-001 and Hydromodification Management Plan (HMP) requirements.

The total developed tributary area is approximately 4.37 acres. There is one point of compliance (POC) for this project in the analysis; POC receives flows from western portion of the site and drains to east edge of the site and flows to an existing storm drain system at the east edge of the site.

The Hydromodification and Water Quality system proposed for this project consists of 8 bio-filtration basins with one point of compliances located on the east edge of the project. This system detains storm water in the basin surface and in the underdrain reservoir. The bio-filtration system, filters storm water through plant roots and a biologically active soil mix, and then releases it into the existing storm drain system which currently collects the site storm flows. The resulting mitigated outflows are shown to be equal to or less than all continuously simulated storms based on the historical data collected from the Fallbrook rain gage.

Low Flow Threshold

A downstream channel assessment has not been completed for this project and therefore the low flow threshold utilized for the system analysis is 10% of 2-year storm event (0.1Q2). This will be used as the low flow threshold to meet peak flow frequency and flow duration controls.

SECTION I. MODEL SETUP

Pre-development Model Setup

The SWMM model for this project's pre-development site is analyzed using historical rain gauge data. The Fallbrook Rain gauge is utilized for this project. That data provides continuous precipitation input to a sub-catchment with its outfall based on the contributing basins imperviousness.

The imperviousness parameter in SWMM is the amount of effective or directly connected impervious area. The effective impervious area is the impervious area that drains directly to the Stormwater conveyance system. The pre-development condition describes existing condition (use same description from HYD -Report).

The pre-development topography is described as low-density commercial site composed of a small grocery store market, a small hamburger restaurant, and an existing operating landscape nursery.

The property drains primarily by overland flow to an existing storm drain inlet located at the east edge of the project site. The site is relatively level with a small 2:1 cut slope forming the rear of the property where it meets grade with Via De Todos Santos. Storm water drains from the west to the east of the project site and travel to POC at the east edge of the site.

For this study, the site is assumed to have 0% of impervious surface in the existing condition.

Post-Development Model Setup

The project proposes to retain the two existing buildings and add two new retail buildings near the northern portion of the site, and a third convenience store building near the southern point of the site. The convenience store will include a six-pump fuel island. Along with the additional new buildings the project proposes to add reconfigured parking spaces, drive isles and various patio areas and walkways throughout the site. The project will have two access points to Old Highway 395.

The project proposed to install nine biofiltration basins for storm water quality to incorporate the collection of storm water from the building and parking lot and direct the storm water through storm water drainage pipes to POC, which is located at the east edge of the study site.

For the areas of the project that will remain vegetated, such as the cut and fill slopes, the county element for Natural ground cover is used. For the remainder of the site the entire area is considered commercial as far as ground surface and percent imperviousness.

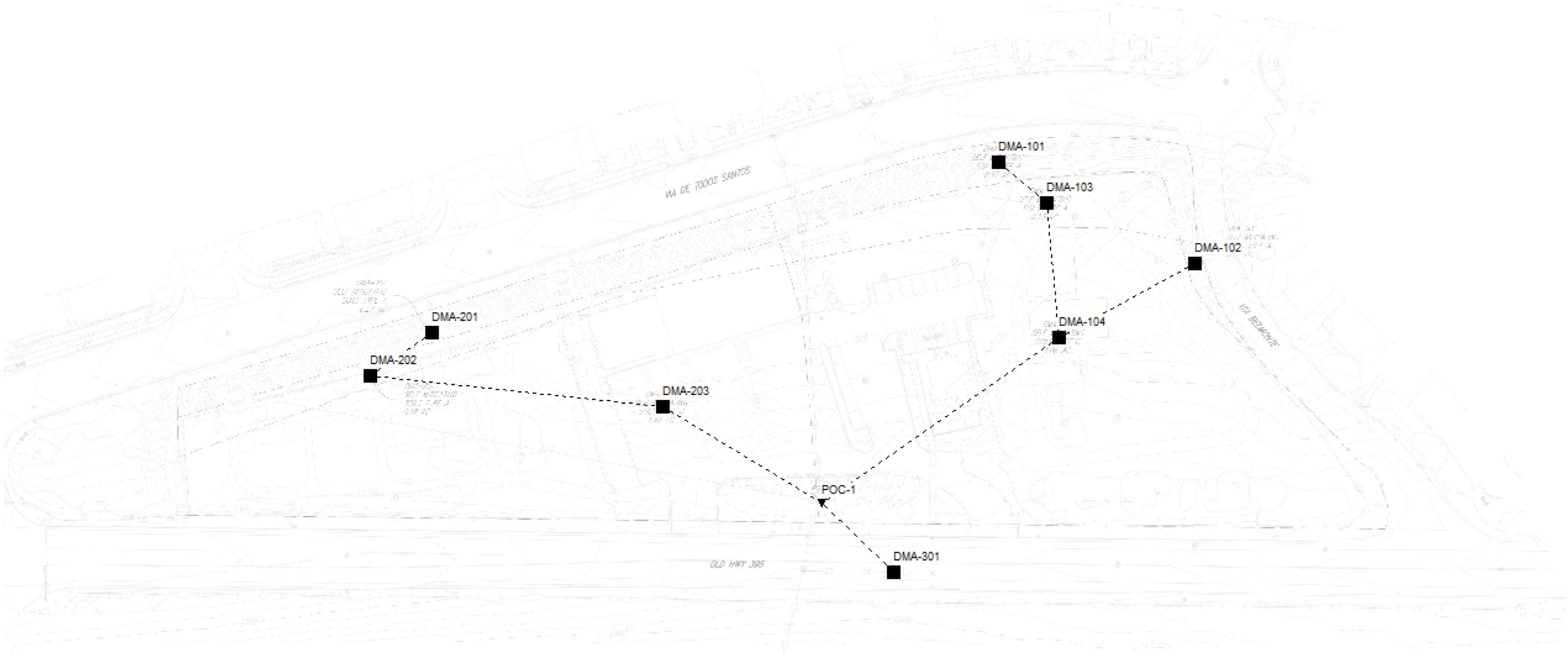


Fig. 1 – SWMM Pre-Development Model

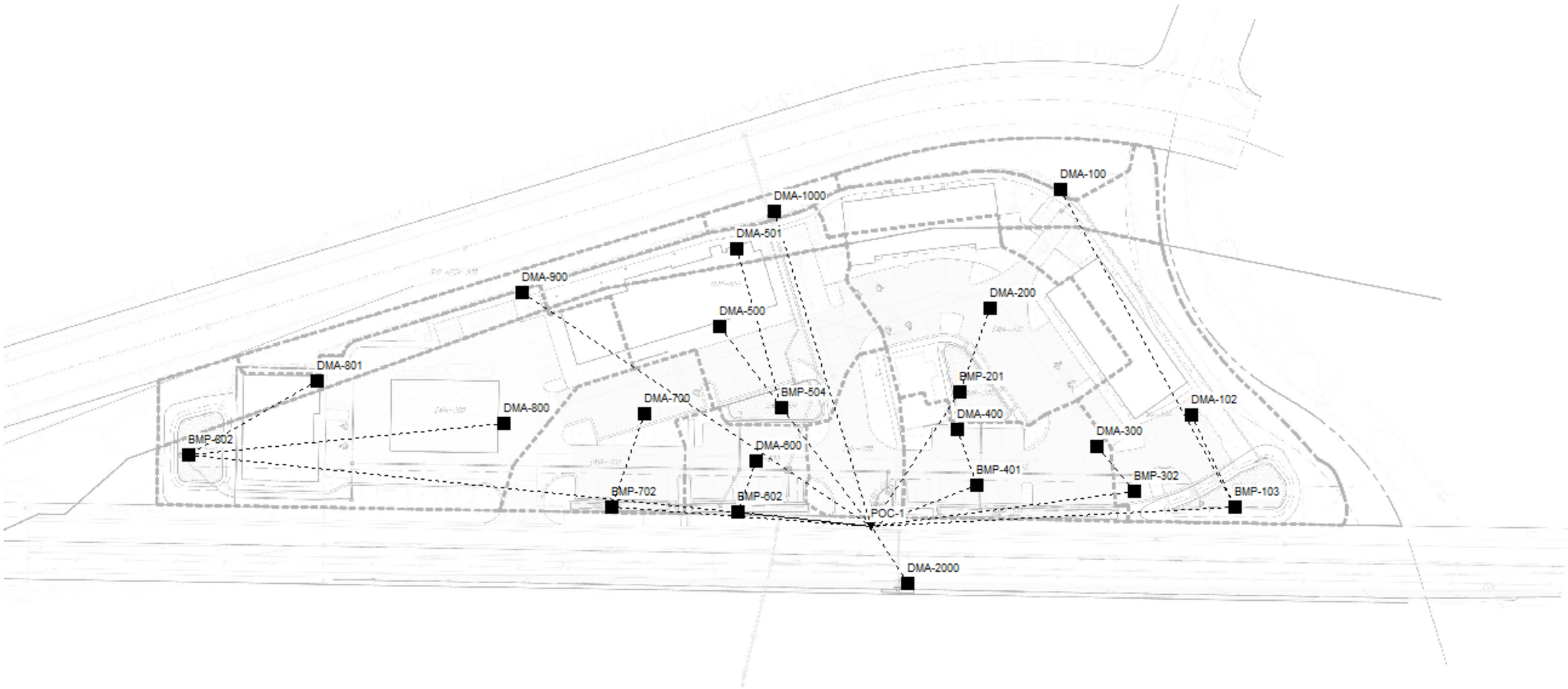


Fig.2 – SWMM Post-Development Model

Post-Development Drainage Management Areas (DMAs)

The DMAs provide an important framework for feasibility screening, BMP prioritization and storm water management system configuration. DMAs are defined based on drainage patterns of the site and the BMPs to which they drain.

Note: Hydromod and Hydrology areas will not equal the same area.

DMA Table for Post Development

DMA/BMP	AREA (ACRE)	% IMPERV.
DMA-100	0.37	8
DMA-1000	0.04	0
DMA-102	0.57	54
DMA-200	0.50	87
DMA-300	0.29	81
DMA-400	0.17	71
DMA-501	0.13	79
DMA-500	0.42	79
DMA-600	0.15	76
DMA-700	0.30	81
DMA-801	0.19	61
DMA-800	0.73	74
DMA-900	0.15	0
DMA-2000	0.12	100
BMP-103	0.06	0
BMP-201	0.04	0
BMP-302	0.02	0
BMP-401	0.01	0
BMP-504	0.04	0
BMP-602	0.01	0
BMP-702	0.01	0
BMP-802	0.04	0
TOTAL AREA	4.37 ACRE	

DMA Table for Pre Development

DMA	AREA (ACRE)	% IMPERV.
DMA-101	0.23	0
DMA-102	0.02	0
DMA-103	0.23	0
DMA-104	1.86	0
DMA-201	0.27	0
DMA-202	0.18	0
DMA-203	1.46	0
DAM-301	0.12	0
TOTAL AREA	4.37 ACRE	

SECTION II. SYSTEM REPRESENTATION

SWMM is a distributed model, which means that a study area can be subdivided into any number of irregular sub-catchments to best capture the effect that spatial variability in topography, drainage pathways, land cover, and soil characteristics have on runoff generation. For modeling of Hydromodification calculations, there are four main system representations: Rain gage, Sub-catchment (contributing basin or LID area), Nodes and Links.

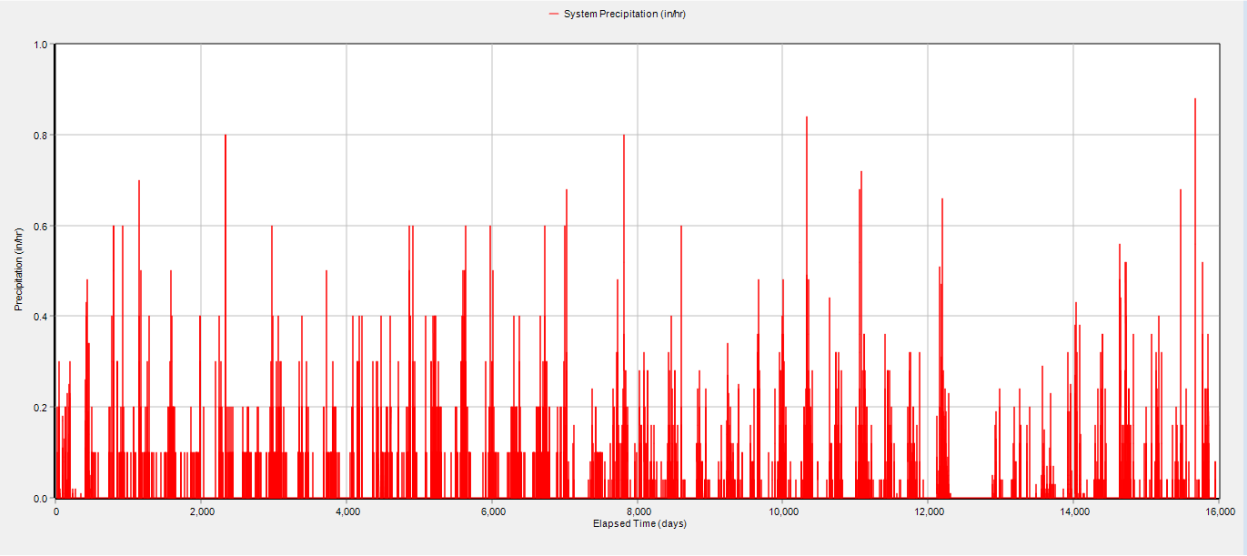


Fig. 2.1 – Time series rain data, which corresponds to runoff estimates for each of the 498,263 time steps (each date and hour) of the 57-year simulation period. (Inches/hour vs. elapsed time)

Rain Gauge

The properties of a rain gauge describe the source and format of the precipitation data that are applied to the study area. In this project, the rainfall data consist of a long-term rainfall record stored in a file labeled as "FALLBROOK" rain gauge station. The Escondido rain station was chosen due to its data quality and its location to the project site.

The rain gauge supplies precipitation data for one or more sub-catchment areas in a study region taken from the Project Clean Water website (www.projectcleanwater.org). This data file contains rainfall intensity, hourly-recorded time interval, and the dates of recorded precipitation each hour. The Fallbrook rain data has approximately 57 years of hourly precipitation data from 7/25/1951 to 5/26/2008 and generates 57 years of hourly runoff estimates, which corresponds to runoff estimates for each of the 498,263 time steps (each date and hour) of the 57 year simulation period. See figure 2.1 for hourly precipitation intensity graph for 57 years in inches.

Sub-catchment (contributing basin or LID area)

A basin is modeled using a sub-catchment object, which contains some of the following properties:

Rain Gauge

The rate of stormwater runoff and volume depends directly on the precipitation magnitude and its spatial and temporal distribution over the catchment. Each sub-catchment in SWMM is linked to a rain gauge object that describes the format and source of the rainfall input for the sub-catchment.

Area

This area is bounded by the sub-catchment boundary. Its value is determined directly from maps or field surveys of the site or by using SWMM's Auto-length tool when the sub-catchment is drawn to scale on SWMM's study area map. This Project is divided into several sub-catchments based on its outfall.

Width

Width can be defined as the sub-catchment's area divided by the length of the longest overland flow path that water can travel. When there are several such paths, one would use an average of their lengths to compute a width. If overland flow is visualized as running down –slope off an idealized, rectangular catchment, then the width of the sub-catchment is the physical width of overland flow.

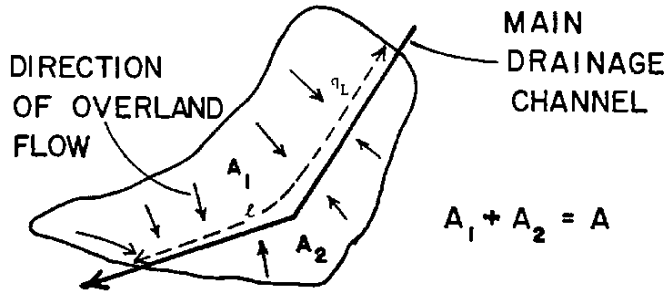


Figure-2-2 Irregular subcatchment shape for width calculations (DiGiano et al., 1977, p.165).

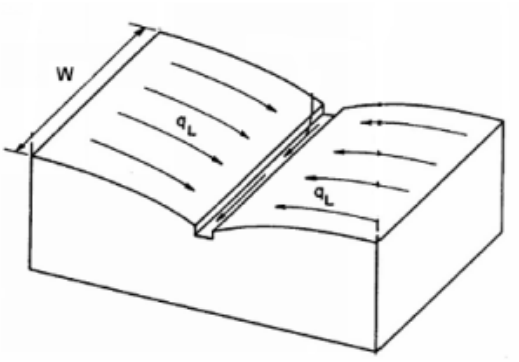


Figure-2-3 Idealized representation of a subcatchment.

Source: STORM WATER MANAGEMENT MODEL REFERENCE MANUAL VOLUME 1- JANUARY 2016

The method of calculations used following Figure 2-2 involves an estimitation by Guo and Urbonas (2007). As stated in the Storm Water Management Model Reference Manual Vol. 1

A more fundamental approach to estimating both subcatchment width and sloe has recently been developed by Guo and Urbonas (2007). The idea is to use "shape factors" to convert a natural watershed as pictured in Figure 2-2 into the idealized overland flow plane of Figure 2-3. A shape factor is an index that reflects how overland flows are collected in a watershed. The shape factor X for the actual watershed is defined as A/L^2 where A is the watershed area and L is the length of the watershed's main drainage channel (not necessarily the length of overland flow). The shape factor Y for the idealized watershed is W/L. Requiring that the areas of the actual and idealized watersheds be the same and that the potential energy in terms of the vertical fall along the drainage channel be preserved, Guo and Urbonas (2007) derive the following expression for the shape factor Y of the idealized watershed:

$$Y = 2X(1.5 - Z)(2K - X)/(2K - 1) \quad (2\text{-}1)$$

where K is an upper limit on the watershed shape factor. Guo and Urbonas (2007) recommend that K

be between 4 and 6 and note that a value of 4 is used by Denver's Urban Drainage and Flood Control District. Once Y is determined, the equivalent width W for the idealized watershed is computed as YL.

Applying this approach:

$X = (A \bullet 43{,}560\ ft^2/acre) / (L^2)$

$Z = A_m/A$

Z = skew factor, $0.5 \leq Z \leq 1$,
A_m = larger of the two areas on each side of the channel A = total area.

$W = L \bullet Y$

This width value is considerably lower than those derived from direct estimates of either the longest flow path length or the drainage channel length. As a result, it would most likely produce a longer time to peak for the runoff hydrograph.

Slope

This is the slope of the land surface over which runoff flows and is the same for both the pervious and impervious surfaces. It is the slope of what one considers being the overland flow path or its area-weighted average if there are several paths in the sub-catchment.

Imperviousness

This is the percentage of sub-catchment area covered by impervious surfaces such as sidewalks and roadways or whatever surfaces that rainfall cannot infiltrate.

Roughness Coefficient

The roughness coefficient reflects the amount of resistance that overland flow encounters as it runs off of the sub-catchment surface.

Infiltration Model

The pre-development condition is primarily empty land with moderate vegetation cover. In the model, clay soil was used for the post-development condition and the pre-development condition for a conservative approach (yield to a higher runoff). Infiltration of rainfall from the pervious area of a sub-catchment into the unsaturated upper soil zone can be described using three different infiltration models: Horton, Green-Ampt, and Curve Number. There is no general agreement on which method of these three is the best.

The Green-Ampt method was chosen to calculate the infiltration of the pervious areas based on the availability of data for this project. It is invoked when editing the infiltration property of a sub-catchment.

Table 2.1 – Soil Infiltration Parameter

SWMM Parameter Name	Unit	Range	Use in San Diego
Infiltration	Method	HORTON GREEN_AMPT CURVE_NUMBER	GREEN_AMPT
Suction Head (Green-Ampt)	Inches	1.93 – 12.60 presented in Table A.2 of SWMM Manual	Hydrologic Soil Group A: 1.5 Hydrologic Soil Group B: 3.0 Hydrologic Soil Group C: 6.0 Hydrologic Soil Group D: 9.0
Conductivity (Green-Ampt)	Inches per hour	0.01 – 4.74 presented in Table A.2 of SWMM Manual by soil texture class 0.00 – Ç0.45 presented in Table A.3 of SWMM Manual by hydrologic soil group	Hydrologic Soil Group A: 0.3 Hydrologic Soil Group B: 0.2 Hydrologic Soil Group C: 0.1 Hydrologic Soil Group D: 0.025 Note: reduce conductivity by 25% in the post-project condition when native soils will be compacted. Conductivity may also be reduced by 25% in the pre-development condition model for redevelopment areas that are currently concrete or asphalt but must be modeled according to their underlying soil characteristics. For fill soils in postproject condition, see Section G.1.4.3.
Initial Deficit (Green-Ampt)		The difference between soil porosity and initial moisture content. Based on the values provided in Table A.2 of SWMM Manual, the range for completely dry soil would be 0.097 to 0.375	Hydrologic Soil Group A: 0.30 Hydrologic Soil Group B: 0.31 Hydrologic Soil Group C: 0.32 Hydrologic Soil Group D: 0.33 Note: in long-term continuous simulation, this value is not important as the soil will reach equilibrium after a few storm events regardless of the initial moisture content specified.
Groundwater	yes/no	yes/no	NO
LID Controls			Project Specific
Snow Pack Land Uses Initial Buildup Curb Length			Not applicable to hydromodification management studies

Source: Model BMP Design Manual San Diego Region Appendices, February 26, 2016

LID controls

Utilizing LID controls within a SWMM project is a two-step process that:

- Creates a set of scale-independent LID controls that can be deployed throughout the study area,
- Assign any desired mix and sizing of these controls to designated sub-catchments.

The LID control type that was selected was a bio-filtration cell that contains vegetation grown in an engineered soil mixture placed above a gravel drainage bed. Bio-filtration provides storage, infiltration (depending on the soil type) and evaporation of both direct rainfall and runoff captured from surrounding areas. For this project, we do not allow infiltration to the existing/filled soil.

SECTION III. CONTINUES SIMULATION OPTIONS

Simulation Dates

These dates determine the starting and ending dates/times of a simulation and are chosen based on the rain data availability.

Start analysis on 07/25/1951
Start Reporting on 07/25/1951
End Analysis on 05/26/2008

Time Steps

The Time Steps establish the length of the time steps used for runoff computation, routing computation and results reporting. Time steps are specified in days and hours: minutes: seconds except for flow routing which is entered as decimal seconds.

Climatology

-Evaporation Data

The available evaporation data for San Diego County is taken from Table G.1-1: Monthly Average Reference Evapotranspiration by ETo Zone for use in SWMM Models for Hydromodification Management Studies in San Diego County CIMIS Zone 6 (in/day).

January	February	March	April	May	June
0.06	0.08	0.11	0.16	0.18	0.21
July	August	September	October	November	December
0.21	0.20	0.16	0.12	0.08	0.06

SECTION IV. BIO-FILTRATION AS LID CONTROL

LID controls are represented by a combination of vertical layers whose properties are defined on a per-unit-area basis. This allows an LID of the same design but differing coverage area to easily be placed within different sub-catchments of a study area. During a simulation, SWMM performs a moisture balance that keeps track of how much water moves between and is stored within each LID layer. If the bio-filtration basin is full and water is leaving the upper weir, the flow is divided in two flows: the lower flow discharging from the bottom orifice directly draining to the point of compliance and the upper flow is routed at the top of the bio-filtration basin and after routing, discharged to the point of compliance. In this project, we used 100% of the area of this specific sub-catchment for bio-filtration.

1. Surface

Storage Depth

When confining walls or berms are present, this is the maximum depth to which water can pond above the surface of the unit before overflow occurs (in inches). In this project, storage depths vary.

Vegetation Volume Fraction

It is the fraction of the volume within the storage depth that is filled with vegetation. This is the volume occupied by stems and leaves, not their surface area coverage. Normally this volume can be ignored, but may be as high as 0.1 to 0.2 for very dense vegetative growth. Based on our visual observation in the field, the average type of vegetation for this site is a low-density vegetation type. Therefore, we used 0.1 for the vegetation volume fraction assuming type of vegetation used is a low-density type.

Surface Roughness

Manning's n value for overland flow over a vegetative surface.

Surface Slope

Slope of porous pavement surface or vegetative swale (percent).

2. Soil

Thickness

The thickness of the soil layer in inches. We used a value of 21 inches soil thickness for a biofiltration.

The volume of pore space relative to total volume of soil (as a fraction). We designed it with a soil mix porosity of 0.40 maximum for a good percolation rate (Countywide Model BMP Table B1 – Soil Porosity Appendix A: Assumed Water Movement Hydraulics for Modeling BMPs).

Field Capacity

Volume of pore water relative to total volume after the soil has been allowed to drain fully (as a fraction). We used 0.2 for this soil. Below this level, vertical drainage of water through the soil layer does not occur. (See Table 1 – Soil Infiltration Parameter).

Wilting Point

Volume of pore water relative to total volume for a well-dried soil where only bound water remains (as

a fraction). The moisture content of the soil cannot fall below this limit. We assumed the minimum moisture content within this bio-filtration soil is 0.1.

Conductivity

Hydraulic conductivity for the fully saturated soil is 5 inches/hour. This is a design minimum value for percolation rate.

Conductivity Slope

Slope of the curve of log (conductivity) versus soil moisture content (dimensionless). Typical values range from 5 for sands to 15 for silty clay. We designed this soil to have a very good percolation rate therefore the conductivity slope is 5.

Suction Head

The average value of soil capillary suction along the wetting front (inches). This is the same parameter as used in the Green-Ampt infiltration model. Table 1 was utilized to determine the capillary of the soil mix top layer of a bio-filtration system. The suction head will be 1.5 inches.

3. Storage Layer

The Storage Layer page of the LID Control Editor describes the properties of the crushed stone or gravel layer used in bio-filtration cells as a bottom storage/drainage layer. The following data fields are displayed:

Height

this is the thickness of a gravel layer (inches). Crushed stone and gravel layers are vary ranging from 12 to 36 inches thick. A table is provided to summarized the BMP configurations.

Void Ratio

The volume of void space relative to the volume of solids in the layer. Typical values range from 0.5 to 0.75 for gravel beds. Note that porosity = void ratio / (1 + void ratio). We designed this void ratio to have a value of 0.67.

Seepage Rate

The rate at which water infiltrates into the native soil below the layer (in inches/hour). This would typically be the Saturated Hydraulic Conductivity of the surrounding sub-catchment if Green-Ampt infiltration is used. Since there is no liner beneath the gravel layer and infiltration is allowed by Geotech Engineer, the seepage rate is per geotechnical report and varies by the boring location.

Clogging Factor

Total volume of treated runoff it takes to completely clog the bottom of the layer divided by the void volume of the layer. For south east bio-filtration, a value of 0 was used to ignore clogging since the system does NOT consider infiltration to the native soils. Clogging progressively reduces the Infiltration Rate in direct proportion to the cumulative volume of runoff treated and may only be of concern for infiltration trenches with permeable bottoms and no under drains. We assumed zero for the clogging factor since the infiltration rate is not considered.

4. Underdrain Layer

LID storage layers can contain an optional underdrain system that collects stored water from the bottom of the layer and conveys it to a conventional storm drain. The Underdrain page of the LID Control Editor describes the properties of this system. It contains the following data entry fields:

Drain Coefficient and Drain Exponent

Coefficient *C* and exponent *n* that determines the rate of flow through the underdrain as a function of height of stored water above the drain height. The following equation is used to compute this flow rate (per unit area of the LID unit):

$q = C(h\text{-}Hd)^n$

where *q* is the outflow (in/hr), *h* is the height of stored water (inches), and *Hd* is the drain height. A typical value for *n* would be 0.5 (making the drain act like an orifice).

Drain Offset Height

Height of any underdrain piping above the bottom of a storage layer (inches). In this project, this value varies in different basins.

Note:

$q = C(h\text{-}Hd)^n$

C= $C_o A_o \frac{\sqrt{2g}}{A} \times 12^{0.5} \times 3600$

SECTION V. RUNNING THE SIMULATION

In general, the Run time will depend on the complexity of the watershed being modeled, the routing method used, and the size of the routing time step used. The larger the time steps, the faster the simulation, but the less detailed the results.

Model Results

SWMM's Status Report summarizes overall results for the 57-yr simulation. The runoff continuity error is -5.11% and the flow routing continuity error is 0.00%. When a run completes successfully, the mass continuity errors for runoff, flow routing, and pollutant routing will be displayed in the Run Status window. These errors represent the percent difference between initial storage + total inflow and final storage + total outflow for the entire drainage system. If they exceed some reasonable level, such as 10 percent, then the validity of the analysis results must be questioned. The most common reasons for an excessive continuity error are computational time steps that are too long or conduits that are too short.

In addition to the system continuity error, the Status Report produced by a run will list those nodes of the drainage network that have the largest flow continuity errors. If the error for a node is excessive, then one should first consider if the node in question is of importance to the purpose of the simulation. If it is, then further study is warranted to determine how the error might be reduced.

The SWMM program ranks the partial duration series, the exceedance frequency and the return period. They are computed using the Weibull formula for plotting position. See the flow duration curve and peak flow frequency on the following pages.

SECTION VI. RESULT ANALYSIS

Development of the Flow Duration Statistics

The flow duration statistics are also developed directly from the SWMM binary output file. It should be noted right from the start that the "durations" that we are talking about in this section have nothing to do with the "storm durations" presented in the peak flow statistics section. Other than using the same sequence of letters for the word, the two concepts have nothing to do with each other and the reader is cautioned not to confuse the two. The goal of the flow duration statistics is to determine, for the flow rates that fall within the hydromorphologicaly significant range, the length of time that each of those flow rates occur. Since the amount of sediment transported by a river or stream is proportional to the velocity of the water flowing and the length of time that velocity of flow acts on the sediment, knowing the velocity and length of time for each flow rate is very useful.

Methodology

The methodology for determining the flow duration curves comes from a document developed by the U.S. Geological Survey (USGS). The first stop on the journey to find this document was a link to the USGS water site (http://www.usgs.gov/water/). This link is found in Appendix E (SDHMP Continuous Simulation Modeling Primer), found in the County Hydromodification Management Plan[1]. On this web site a search for "Flow Duration Curves" leads to USGS Publication 1542-A, Flow-duration curves, by James K. Searcy 1959 (http://pubs.er.usgs.gov/publication/wsp1542A). In this publication the development of the flow duration curves is discussed in detail.

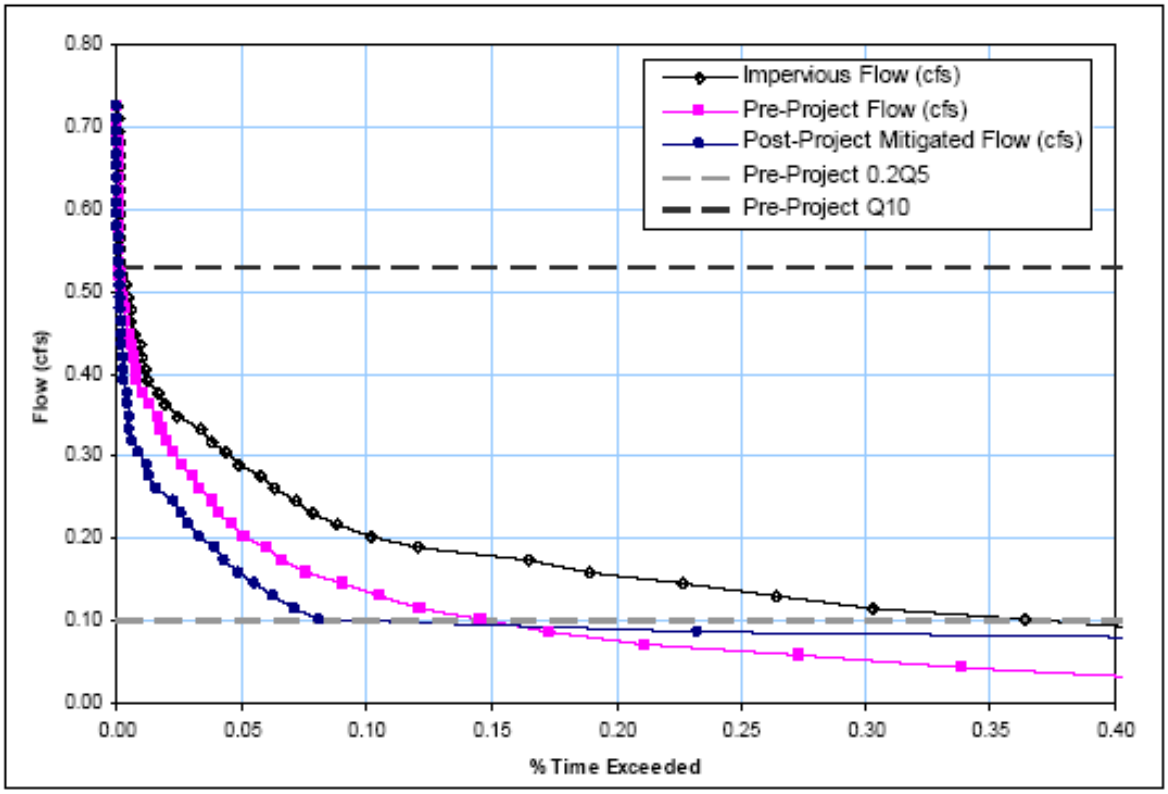
In Pub 1542-A, beginning on page 7 an example problem is used to illustrate the compilation of data used to create the flow duration plots. A completed form 9-217-c form shows the monthly tabulation of flow rates for Bowie Creek near Hattiesburg, Miss. For each flow range the number of readings is tabulated and then the total number of each flow rate is totaled for the year. It should be noted that while this example is for a stream with a minimum flow rate of 100cfs, for the purposes of run-off studies in Southern California the minimum flow rate of zero (0) cfs is the common low flow value. Once each of the year's data has been compiled the summary numbers from each year are transferred to form 9-217-d. On this form the total number of each flow rate is again totaled and the percentage of time exceeded calculated (as will be explained later under the discussion of our calculations). Once the data has been compiled a graph of Discharge Rate vs. Percent Time Exceeded is developed. As will be explained in the next section, the use of these curves leads to the amount of time each particular flow can be expected to occur (based on historical data).

How to Read the Graphs[2]

Figure 6.1 shows a flow duration curve for a hypothetical development. The three curves show what percentage of the time a range of flow rates are exceeded for three different conditions: pre-project,

[1] FINAL HYDROMODIFICATION MANAGEMENT PLAN, Prepared for County of San Diego, California, March 2011, by Brown and Caldwell Engineering of San Diego. (http://www.projectcleanwater.org/images/stories/Docs/LDS/HMP/0311_SD_HMP_wAppendices.pdf)

[2] The graph and the explanation were taken directly from Appendix E of the Hydromodification Plan



post-project and post-project with storm water mitigation. Under pre-project conditions the minimum geomorphically significant flow rate is 0.10cfs (assumed) and as read from the graph, flows would equal or exceed this value about 0.14% of the time (or about 12 hours per year) (0.0014 x 365days x 24 hour/day). For post-project conditions, this flow rate would occur more often – about 0.38% of the time (or about 33 hours per year) (0.0038 x 365days x 24 hour/day). This increase in the duration of the geomorphically significant flow after development illustrates why duration control is closely linked to protecting creeks from accelerated erosion.

Development of Flow Duration Curves

The first step in developing the flow duration curves is to count the number of occurrences of each flow rate. This is done by first rounding every non-zero flow value to an appropriate number of decimal places (say two places). This in effect groups each flow into closely related values or "bins" as they are referred to in publication 9-217d. Then the entire runoff record is queried for each value and the number of each value counted. The next step is to enter the results of the query into a grid patterned after form 9-217d. The data is entered in ascending order starting with the lowest flow first. The grid is composed of four columns. They are (from left to right) Discharge Rate, Number of **Periods (count),** Total Periods Exceeding (the total number of periods equal to or exceeding this value), and Percent Time Exceeded. Starting at the top row (row 1), the flow rate (which is often times zero) is entered with the corresponding number of times that value was found. The next column is the total number of values greater than or equal to that flow rate. For the first flow rate point, by definition all flow rate values are greater than or equal to this value, therefore the total number of runoff records of the rainfall record is entered here. The final column which is the percent of time exceeded is calculated by dividing the total

Figure 6.1 Flow Duration Series Statistics for a Hypothetical Development Scenario

periods exceeded by the total number of periods in the study. For the first row this number should be 100%[3]

For the next row (row 2), the flow rate, and the flow rate count are entered. The total number of periods exceeding for row 2 is calculated by subtracting Number of Periods of row 1 from the Total Periods Exceeding of line 1. This result is entered in the Total Periods Exceeding on row 2. As was the case for line 1, the final column is calculated by dividing the total periods exceeded by the total number of periods in the study. For the second row this number should be something less than 100% and continually decrease as we move down the chart. If all the calculations are correct, then everything should zero out on the last line of the calculations.

The final step in developing the flow duration curves is to make a plot of the Discharge Rate vs. the Percent Time Exceeded. For the purposes of this report, the first value corresponding to the zero flow rate is not plotted allowing the graph to be focused on the actual flow rate values.

The Flow Duration Analysis
The Peak Flow Statistics analysis is composed of the following series of files:

1. The Flow Duration Plot
2. Comparison of the Un-Mitigated Flow Duration Curve to the Pre-Development Curve (Pass/Fail)
3. Comparison of the Mitigated Flow Duration Curve to the Pre-Development Curve (Pass/Fail)
4. The calculations for the Pre-Development flow duration curve development (USGS9217d)
5. The calculations for the Post-Development flow duration curve development (USGS9217d)
6. The calculations for the Mitigated flow duration curve development (USGS9217d)

The Flow Duration Plot

The Flow Duration Curves Plot is the plotting of all three (pre, un-mitigated and mitigated) sets of Discharge Rate vs. the Percent Time Exceeded data point pair lists. In addition to these curves horizontal lines are plotted corresponding to the Q_{10} and Q_{lf} (low flow threshold) values. Within the geomorphically significant range ($Q_{10} – Q_{lf}$) one can see a visual representation of the relative positions of the flow duration curves. The flow duration curves are compared in an East/West (horizontal) direction to compare post development Discharge Rates to pre-development Discharge Rates. The pre-development curve is plotted in blue, the unmitigated curve is plotted in red, and the mitigated curve is plotted in green. As long as the post development curve lies to the left of the pre-development curve (mostly[4]), the project meets the peak flow hydromodification requirements.

Pass/Fail comparison of the curves

The next two sets of data are the point by point comparison of the post-development curve(s) and the pre-development curve. The Pass/Fail table is helpful in determining compliance since the plotted lines can be difficult to see at the scales suitable for use in a report. Each point on the post- development curve has a corresponding “Y” value (Flow Rate), and “X” value (% Time Exceeded). For each point on the post development curve, the “Y” value is used to interpolate the corresponding Percent Time

[4] See hydromodification limits for exceedance of pre-development values

Exceeded (X) value from the pre-development curve. Then the Post-development Percent Time Exceeded value is compared to the pre-development Percent Time Exceeded value. Based on the relative values of each point, pass/fail criteria are determined point by point.

For each set of data, the upper right hand header value shows the name of the file being displayed (ex. flowDurationPassFailMitigated.TXT). The first line of the file shows the name of the SWMM output file (*.out). The next line shows the time stamp of the SWMM file that is being analyzed. The time stamps of all of the report files should be within a minute or two of each other, otherwise there may have been tampering with the files. Each report run creates and prints all of the files and reports at one time so all the time stamps should be very close.

The first column is the zero based number of the point. The next two columns show the post development "X" and "Y" values. The next column shows the value interpolated between the two bounding points on the pre-development curve. The next three columns show the true or false values of the comparison of the two "X" values. The last column shows the resultant pass or fail status of the point. There are three ways a point can pass. They are:

1. Q_{post} being outside of the geomorphically significant range Q_{lf} to Q_{10}
2. Q_{post} being less than Q_{pre}
3. Q_{post} being less than 110% of the value of Q_{pre} if the point is between Q_{lf} and Q_{10}

There are two ways that a point can fail. They are:

1. Q_{post} being greater than 110% of Q_{pre} if the point is between Q_{lf} and Q_{10}
2. If more than 10% of the points are between 100% and 110% of Q_{pre} for the points between Q_{lf} and Q_{10}

A quick scan down the last column will quickly tell if there are any points that fail.

At the bottom of each set of data are the date stamp of the report to the left, and to the right is the page number/number of pages for the specific set of data (not the pages of the report!). Each new set of data has its own page numbering. Between the file name in the header row and the page numbering in the footer row, the engineer can readily scan the document for the data of interest.

Plan Check Suggestions

As was described under the peak flow section, is the responsibility of the reviewing agency to confirm that the data sets presented are valid results from consistent calculations, and that any and all results can be duplicated by manual methods and achieve the same results. In light of these goals, the plan checker is invited to consider the following tasks as part of the plan check process.

Compare the Data Stamps for Each of the Statistics Files Used In This Analysis.

As was described in the Peak Flows section, all report files should have time stamps that are nearly identical. If the time values are more than a few minutes apart then the potential for inconsistent results files should be investigated.

Verify the Flow Rate Counts

For each of the pre, un-mitigate and mitigated flow duration tables, a few randomly selected flow value counts should be checked against the values taken directly from the SWMM file. This can be done by

opening the corresponding SWMM file, selecting the outfall node, selecting Report>Table>By Object, Setting the time format to Date/Time, selecting the appropriate node value, and clicking the OK button to generate a table of the date/time/Total Inflow values. Next step is to click in the left most header row of the SWMM table which will select the entire table. Now from the main menu select Edit>Copy To>Clipboard. Now open a new blank sheet in MS Excel (or suitable spread sheet program) select cell A1 and paste the results from the clipboard into the spread sheet. Now sort the values based on the Total Inflow column. This will group all the flow values together enabling the number of occurrences of each value to be counted. At this point the a few (or all) of the counts on the various USGS9217d.txt files can be verified.

Manually Verify That the Percent Exceeded Values (form USGS9217d) are Correctly Calculated

The discharge rates and counts are confirmed as was described above. The top row should be the smallest runoff value (0.00cfs usually). Total Periods Exceeding of the first line should be the total number of rainfall records in the study. The percentage of Time Exceeding should be the total periods Exceeding divided by the total number of rainfall records in the study (100% for the first line). For each successive discharge rate, the total periods exceeding for the current line should be the total periods exceeding from the line above minus the number of periods from the line above. The number of periods and the number of periods exceeding should zero out at the last line.

Compare Plotted Curves to Table Data
Randomly check a few of the plotted points against the values verified above.
Verify by Observation that the plotted values of $Q_{10\,a}$nd Q_{lf} are reasonable.
Verify that the correct values for each of these return periods are plotted correctly on the graph.

Development of the Peak Flow Statistics

The peak flow statistics are developed directly from the binary output file produced by the SWMM program. The site is modeled three ways, Pre-Development, Post-Development-Unmitigated, and Post-Development-Mitigated. For each of these files a specific time period differentiating distinct storms is chosen. The SWMM results are extracted and each flow value is queried. The majority of the values for Southern California sites are zero flow. As each successive record is read, as soon as a non-zero value is read the time and flow value of that record are recorded as the beginning of an event. The first record is automatically recorded as the “tentative” peak value. As each successive non-zero value is read and the successive flow value is compared to the peak value and the greater value is retained as the peak value of the storm. As soon as a successive number of zero values equal to the predetermined storm separation value, then the time value of the last non-zero value is recorded as the end of the storm, the duration of the storm is the difference between the end time and the start time, and the peak value is recorded as the highest flow value between the start and end times.

Once the entire SWMM output file is read all of the distinct storm events will have been recorded in a special list. The storms will be in the order of their occurrence. To develop the peak flow statistics table the first step is to sort the storms in descending order of the peak flow value. Once the list is sorted then the relative rank of each storm is assigned with the highest ranking storm being the storm with the highest peak flow. There are several methods that can be used to determine which storm should be ranked above another equally valued storm. For the purposes of these studies an Ordinal ranking is used so that each storm has a unique rank number. Where two or more storms have equal flow values, the earlier storm is assigned the higher rank. This is done consistently throughout the storm record.

Since we are only looking at peak flow statistics, it is assumed that the relative ranking of individual (but equal) storms is irrelevant to the calculations.

The exceedance frequency and return period are both computed using the Weibull formula for plotting position. Therefore, for a specific event the exceedance frequency F and the return period in years T are calculated using the following equations[5]:

$F=m/(n_R+1)$ and $T=n+1/m$

where m is the event's rank, n_R is the total number of events and n is the number of years under analysis.

Once the Peak flow statistics table is complete, a plot of Return Frequency vs. peak flow is created. All three conditions (pre, post and mitigated) are plotted on the same plot.

The Peak Flow Statistics Analysis

The Peak Flow Statistics analysis is composed of the following series of files:

1. The Peak Flow Frequency Plot
2. The Comparison of the Un-Mitigated Peak Flow Curve to the Pre-Development Curve (Pass/Fail)
3. The Comparison of the Mitigated Conditions Curve to the Pre-Development Curve (Pass/Fail)
4. The Peak Flow Statistics Calculation for the Pre-Development Curve.
5. The Peak Flow Statistics Calculation for the Un-Mitigated Curve.
6. The Peak Flow Statistics Calculation for the Mitigated Curve.

The Peak Flow Frequency Plot

The Peak Flow Frequency Curves are the plotting of all three (Pre, Un-Mitigated and Mitigated) sets of return Period vs peak flow data point pair lists. In addition to these curves horizontal lines are plotted corresponding to the Q_{10}, Q_5, Q_2 and Q_{lf} (low flow threshold) values. Within the geomorphically significant range ($Q_{10} – Q_{lf}$) one can see a visual representation of the relative positions of the peak flow curves. The peak flow curves are compared in a North/South (vertical) direction to compare post development peak flows to pre-development flows. The Pre-Development curve is plotted in blue, the unmitigated curve is plotted in red, and the mitigated curve is plotted in green. As long as the post development curve lies below the pre-development curve (mostly[6]), the project meets the peak flow hydromodification requirements.

Pass/Fail comparison of the curves

The next two sets of data are the point by point comparison of the post-development curve(s) and the pre-development curve. The Pass/Fail table is helpful in determining compliance since the plotted lines can be difficult to see at the scales suitable for use in a report. Each point on the post- development curve has a corresponding "X" value (Recurrence Interval), and "Y" value (Peak Flow). For each point on the post development curve, the "X" value is used to interpolate the corresponding peak flow value from the pre-development curve. Then the Post-development peak flow value is compared to the pre-development peak flow value. Based on the relative values of each point, pass/fail criteria are determined point by point.

[5] Pg 169-170 STORM WATER MANAGEMENT MODEL APPLICATIONS MANUAL, EPA/600/R-09/000 July 2009

[6] See hydromodification limits for exceedance of pre-development values

For each set of data, the upper right hand header value shows the name of the file being displayed (ex. peakFlowPassFailMitigated.TXT). The first line of the file also shows this value. The next line shows the time stamp of the file that is being analyzed. The time stamps of all of the report files should be within a minute or two of each other, otherwise there may have been tampering with the files. Each report run creates and prints all of the files and reports at one time so all the time stamps should be very close. It should be noted that the SWMM.out files will not have related time stamps since each file is developed independently.

The first column is the zero based number of the point. The next two columns show the post development "X" and "Y" values. The next column shows the value interpolated between the two bounding points on the pre-development curve. The next three columns show the true or false values of the comparison of the two "Y" values. The last column shows the resultant pass or fail status of the point. There are three ways a point can pass. They are:

1. Point is outside of the geomorphically significant range $Q_{10} – Q_{lf}$
2. Q_{post} being less than Q_{pre}
3. Q_{post} being less than 110% of the value of Q_{pre} if the point is between Q_5 and Q_{10}[7]

There are four ways that a point can fail. They are:

1. Q_{post} being greater than Q_{pre} if the point is between Q_{lf} and Q_5
2. Q_{post} being greater than 110% of Q_{pre} if the point is between Q_{lf} and Q_{10}
3. If more than 10% of the points are between 100% and 110% of Q_{pre} for the points between Q_5 and Q_{10}
4. If the frequency interval for points > 100% of Q_{pre} is greater than 1 year for the points between Q_5 and Q_{10}

A quick scan down the last column will quickly tell if there are any points that fail.

At the bottom of each set of data are the date stamp of the report to the left, and to the right is the page number/number of pages for the specific set of data (not the pages of the report!). Each new set of data has its own page numbering. Between the file name in the header row and the page numbering in the footer row, the engineer can readily scan the document for the data of interest.

The Peak Flow Statistics Calculations

There are three sets of data for the Peak Flow Statistics calculations (Pre-Development, Un-Mitigated, and Mitigated). As was the case for the pass/fail data, the upper right hand corner of each sheet has the file name. The first row of the data is the SWMM file name. The second row is the SWMM file time stamp of the file being analyzed. The 4th, 5th, and 6th rows are the calculated values for Q_{10}, Q_5, and Q_2. These values are derived by linear interpolation between the nearest bounding points in the listing. While the relationship between the points in the peak flow analysis is not technically a linear relationship, the error introduced in using linear interpolation between such relatively close data points is assumed to be irrelevant. Finally, the footer row shows the report time and the page/number of pages of the data set.

As was previously discussed, each storm listed was determined by reading the flow values directly from the binary output file from the SWMM program. The storms were then sorted in descending order of

[7] See section on how a point can fail point number 3 hereon

peak flow values. Then each storm was assigned a unique rank, then the Frequency and Return Period were calculated using Weibull formulas. Every discharge value for the entire rainfall record is listed in each of these lists. It should be noted that the derivation of these peak flow statistics values use full precision (i.e. no rounding off) of the SWMM output values. Since the precision of the calculations may not be the same as the SWMM program uses, and also the assignment of rank to values of equal peak flow value may differ slightly from the way SWMM calculates the tables, minor variances in the data values and/or the order of storms can be expected.

Finally, as was previously stated, the values of the Return Period were plotted vs. the peak flow values to develop the peak flow frequency curves.

Plan Check Suggestions

As is the responsibility of the reviewing agency, any and all methods should be considered to verify that the SWMM analysis adequately models the site as far as hydrologic discharge is concerned, and that the data sets presented are valid results from consistent calculations, and that any and all results can be duplicated by manual methods and achieve the same results. In light of these goals, the plan checker is invited to consider the following tasks as part of the plan check process.

Compare the Data Stamps for Each of the Statistics Files Used In This Analysis.

For each set of calculations and report files, the first step of the process is to list out all the files in the report folder and delete those files. The very first step leaves the reports folder completely empty. Then as each successive step is performed, the results file is placed in the reports folder. Once all of the results files are complete, then the report file is compiled using the data directly from the files placed in the results folder. This means that the time stamps on each of the report files in the report should be within a minute or two depending on the speed of the computer. If the time values are more than a few minutes apart then the potential for inconsistent results files should be investigated.

Verify A Few Random Storm Statistics

For each of the Pre, Un-mitigate and Mitigated peak flow statics tables, a few randomly selected storms should be checked against the values taken directly from the SWMM file. This can be done by opening the corresponding SWMM file, selecting the outfall node, selecting Report>Table>By Object, Setting the time format to Date/Time, selecting the appropriate node value, and clicking the OK button to generate a table of the date/time/Total Inflow values. Now scroll down the list to the start date and time of the randomly selected storm. Verify that the start date, end date, and the highest flow value between the start and end date correspond to the values shown in the statistics table. Do this for a few storm to verify that the data corresponds to the SWMM output file. Verify by hand a few of the frequency and return period values.

Compare Plotted Curves to Table Data

Randomly check a few of the plotted points against the values found in the Peak Flow Frequency Tables.

Verify by Observation that the values of Q_{10}, Q_5, Q_2 and Q_{lf} are reasonable.

For each value shown on the reports, verify that the value shown for say Q10 is in between the next higher return period and the next lower period. Also verify that the correct values for each of these return periods are plotted correctly on the peak flow frequency graph.

Manually Verify That the Pass Fail Table Is Correctly Calculated

Select at random several points on each of the pass/fail tables to verify that the values for post X/Y and interpolated Y look reasonable. Also check that the various test results are shown accurately in the chart and also the final pass/fail result looks accurate.

Drawdown Time of Bio-filtration Surface Ponding

The drawdown time for hydromodification flow control facilities was calculated using the attached draw down calculations included in the SWMM Report

VII. SUMMARY AND CONCLUSION

Hydromodification calculations were performed utilizing continuous simulation to size storm water control facilities. SWMM (Storm Water Management Model) version 5.0 distributed by USEPA was used to generate computed peak flow recurrence and flow duration series statistics.

There are several tributary areas planned for commercial use and treated by 8 biofiltration BMPS (Best Management Practices) on Fallbrook with a total tributary area of approximately 4.37 acres. The areas were grouped based on its outfall and were analyzed for pre-development and mitigated post-development conditions.

The analyzed SWMM runs attached show that the proposed bio-filtration facilities provided with variety of orifice flow control at the base of the gravel storage configured as shown in Figure 1 is in compliance with the HMP and BMP Manual.

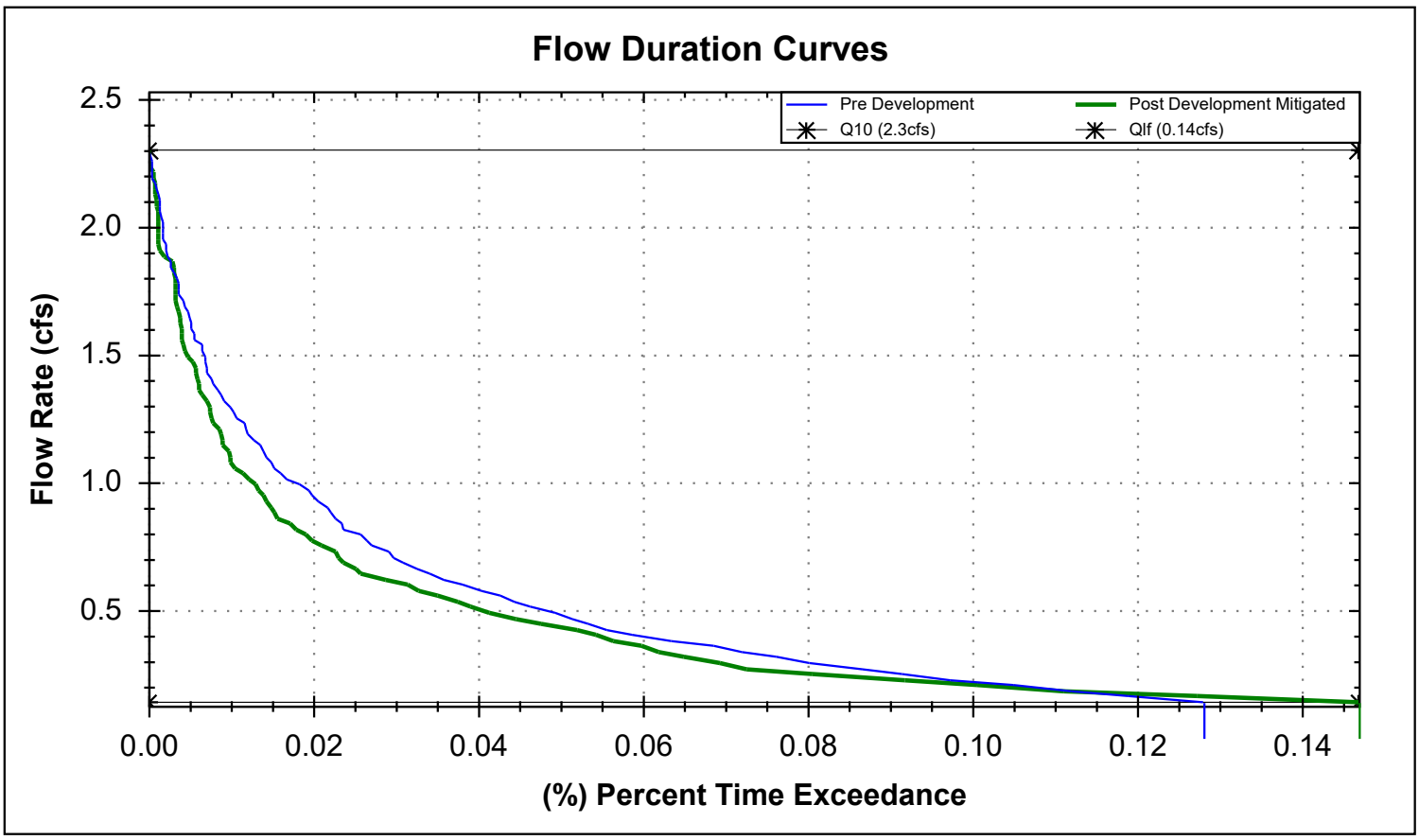
Fallbrook

On POC-1, The flow duration curve on the following page shows the existing condition 11.2 hours (0.128%×365days×24 hour/day = 11.2 hours).

With the proposed square footage of LID areas and orifices acting as the low flow restrictor configured as shown in Figure 1 the duration of the flow is 12.9 hours (0.147%×365days×24 hour/day =12.9 hours).

Therefore, this study has demonstrated that the proposed optimized bio-filtration basin is sufficient to meet the current HMP and BMP criteria (See Table 6.1).

(Table 6.1) (Flow Duration Curves)



SECTION VII. SUMMARY AND CONCLUSION

```
[TITLE]
;;Project Title/Notes
HMP-PRE

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        YES
SKIP_STEADY_STATE    NO

START_DATE           07/25/1951
START_TIME           00:00:00
REPORT_START_DATE    07/25/1951
REPORT_START_TIME    00:00:00
END_DATE             05/26/2008
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             24:00:00
ROUTING_STEP         0:01:00
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.557
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          0.06   0.08   0.11   0.16   0.18   0.21   0.21   0.2    0.16   0.12
0.08   0.06
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- ------ ------ ----------
Fallbrook        INTENSITY 1:00     1.0      FILE
"V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM Files\Fallbrook
ALERT Station.dat" Fallbrook  IN

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope
CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- --------
-------- ----------------
DMA-101          Fallbrook        DMA-103          0.234208056847562 0        309
50       0
DMA-102          Fallbrook        DMA-104          0.0198576149256159 0        58
50       0
DMA-103          Fallbrook        DMA-104          0.233557528573922 0        172
5        0
DMA-104          Fallbrook        POC-1            1.85881630687934 0        229
5        0
```

```
DMA-201          Fallbrook        DMA-202          0.270030867624903 0        471
50       0
DMA-202          Fallbrook        DMA-203          0.184426110654627 0        298
2        0
DMA-203          Fallbrook        POC-1            1.46036539583051 0        129
2        0
DMA-301          Fallbrook        POC-1            0.12     0        5        1
0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo
PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ----------
----------
DMA-101          0.012      0.15       0.05       0.10       0          OUTLET
DMA-102          0.012      0.15       0.05       0.10       0          OUTLET
DMA-103          0.012      0.15       0.05       0.10       0          OUTLET
DMA-104          0.012      0.15       0.05       0.10       0          OUTLET
DMA-201          0.012      0.15       0.05       0.10       0          OUTLET
DMA-202          0.012      0.15       0.05       0.10       0          OUTLET
DMA-203          0.012      0.15       0.05       0.10       0          OUTLET
DMA-301          0.012      0.15       0.05       0.1        0          OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
DMA-101          1.5        0.3        0.30
DMA-102          1.5        0.3        0.30
DMA-103          1.5        0.225      0.30
DMA-104          6.0        0.075      0.32
DMA-201          1.5        0.3        0.30
DMA-202          1.5        0.225      0.30
DMA-203          6.0        0.075      0.32
DMA-301          6          0.075      0.32

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-1            0          FREE                        NO

[REPORT]
;;Reporting Options
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS -2500.000 0.000 12500.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            5732.245           3264.740

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-101          7142.049           5992.402
DMA-102          8714.175           5184.657
DMA-103          7526.987           5662.414
DMA-104          7622.879           4589.526
DMA-201          2610.402           4631.992
```

```
DMA-202          2119.725           4288.518
DMA-203          4452.402           4033.049
DMA-301          6303.060           2714.709

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------


[BACKDROP]
FILE       "V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM
Files\HMP-PRE.jpg"
DIMENSIONS -2500.000 0.000 12500.000 10000.000

```

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

19025-PALA MESA PLAZA-PRE
HYDROMODIFICATION.RPT

HMP-PRE

****
Rainfall File Summary
****

Station ID	First Date	Last Date	Recording Frequency	Periods w/Precip	Periods Missing	Periods Malfunc.
Fallbrook	07/25/1951	05/26/2008	60 min	8771	0	0

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... NO
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Starting Date 07/25/1951 00:00:00
Ending Date 05/26/2008 23:00:00
Antecedent Dry Days 0.0
Report Time Step 01:00:00
Wet Time Step 00:15:00
Dry Time Step 00:00:00

********** Runoff Quantity Continuity **********	Volume acre-feet	Depth inches
Total Precipitation	315.974	865.433
Evaporation Loss	4.826	13.218
Infiltration Loss	285.169	781.059
Surface Runoff	28.802	78.886
Final Storage	0.000	0.000
Continuity Error (%)	-0.893	

********** Flow Routing Continuity **********	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	28.800	9.385
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	28.800	9.385
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

****
Subcatchment Runoff Summary
****

Subcatchment	Total Perv Precip Runoff in	Total Runon Runoff in	Total Evap Runoff in	Total Infil Runoff in	Imperv Peak Runoff Coeff in	in	10^6 gal	CFS
DMA-101	865.43	0.00	1.03	846.65	0.00	20.08	20.08	0.13	0.15	0.023
DMA-102	865.43	0.00	1.02	846.11	0.00	20.69	20.69	0.01	0.01	0.024
DMA-103	865.43	20.09	2.34	831.28	0.00	54.43	54.43	0.35	0.31	0.061
DMA-104	865.43	7.06	15.23	760.33	0.00	105.35	105.35	5.32	1.88	0.121
DMA-201	865.43	0.00	1.02	846.45	0.00	20.32	20.32	0.15	0.17	0.023
DMA-202	865.43	29.68	2.33	830.97	0.00	64.74	64.74	0.32	0.30	0.072
DMA-203	865.43	8.17	17.48	769.34	0.00	96.60	96.60	3.83	1.48	0.111
DMA-301	865.43	0.00	21.44	784.39	0.00	72.65	72.65	0.24	0.09	0.084

Analysis begun on: Wed Jun 1 16:49:50 2022
Analysis ended on: Wed Jun 1 16:50:25 2022
Total elapsed time: 00:00:35

```
[TITLE]
;;Project Title/Notes
HMP-POST

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        YES
SKIP_STEADY_STATE    NO

START_DATE           07/25/1951
START_TIME           00:00:00
REPORT_START_DATE    07/25/1951
REPORT_START_TIME    00:00:00
END_DATE             05/26/2008
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             06:00:00
ROUTING_STEP         0:01:00
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.557
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          0.06   0.08   0.11   0.16   0.18   0.21   0.21   0.2    0.16   0.12
0.08   0.06
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- ------ ------ ----------
Fallbrook        INTENSITY 1:00     1.0      FILE
"V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM Files\Fallbrook
ALERT Station.dat" Fallbrook  IN

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope
CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- --------
-------- ----------------
BMP-103          Fallbrook        POC-1            0.063521579 0        26
0        0
BMP-201          Fallbrook        POC-1            0.039302112 0        28
0        0
BMP-302          Fallbrook        POC-1            0.023415978 0        4
0        0
BMP-401          Fallbrook        POC-1            0.006382002 0        1
0        0
```

```
BMP-504         Fallbrook       POC-1           0.035167126 0       27
0       0
BMP-602         Fallbrook       POC-1           0.012809917 0       8
0       0
BMP-702         Fallbrook       POC-1           0.012855831 0       7
0       0
BMP-802         Fallbrook       POC-1           0.041483012 0       43
0       0
DMA-100         Fallbrook       BMP-103         0.374101446 8       62
2       0
DMA-1000        Fallbrook       POC-1           0.0443   0       113     50
0
DMA-102         Fallbrook       BMP-103         0.574114274 54      78
2       0
DMA-200         Fallbrook       BMP-201         0.500895317 87      115
2       0
DMA-300         Fallbrook       BMP-302         0.287075298 81      74
2       0
DMA-400         Fallbrook       BMP-401         0.172222222 71      58
2       0
DMA-501         Fallbrook       BMP-504         0.131337417 79      23
2       0
DMA-500         Fallbrook       BMP-504         0.416507394 79      151
2       0
DMA-600         Fallbrook       BMP-602         0.15137741 76       44
2       0
DMA-700         Fallbrook       BMP-702         0.299632691 81      102
2       0
DMA-801         Fallbrook       BMP-802         0.1989052 61       30       2
0
DMA-800         Fallbrook       BMP-802         0.731219584 74      104
2       0
DMA-900         Fallbrook       POC-1           0.1454   0       18      50
0
DMA-2000        Fallbrook       POC-1           0.12     100     5       1
0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo
PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ----------
----------
BMP-103         0.012      0.15       0.05       0.10       0          OUTLET
BMP-201         0.012      0.15       0.05       0.10       0          OUTLET
BMP-302         0.012      0.15       0.05       0.10       0          OUTLET
BMP-401         0.012      0.15       0.05       0.10       0          OUTLET
BMP-504         0.012      0.15       0.05       0.10       0          OUTLET
BMP-602         0.012      0.15       0.05       0.10       0          OUTLET
BMP-702         0.012      0.15       0.05       0.10       0          OUTLET
BMP-802         0.012      0.15       0.05       0.10       0          OUTLET
DMA-100         0.012      0.15       0.05       0.10       25         OUTLET
DMA-1000        0.012      0.15       0.05       0.10       0          OUTLET
DMA-102         0.012      0.15       0.05       0.10       25         OUTLET
DMA-200         0.012      0.15       0.05       0.10       25         OUTLET
DMA-300         0.012      0.15       0.05       0.10       25         OUTLET
DMA-400         0.012      0.15       0.05       0.10       25         OUTLET
DMA-501         0.012      0.15       0.05       0.10       25         OUTLET
DMA-500         0.012      0.15       0.05       0.10       25         OUTLET
DMA-600         0.012      0.15       0.05       0.10       25         OUTLET
DMA-700         0.012      0.15       0.05       0.10       25         OUTLET
DMA-801         0.012      0.15       0.05       0.10       25         OUTLET
DMA-800         0.012      0.15       0.05       0.10       25         OUTLET
DMA-900         0.012      0.15       0.05       0.10       0          OUTLET
DMA-2000        0.012      0.15       0.05       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
BMP-103         6.0        0.1        0.32       7          0
```

```
BMP-201          6.0        0.1        0.32       7          0
BMP-302          6.0        0.1        0.32       7          0
BMP-401          6.0        0.1        0.32       7          0
BMP-504          6.0        0.1        0.32       7          0
BMP-602          6.0        0.1        0.32       7          0
BMP-702          6.0        0.1        0.32       7          0
BMP-802          6.0        0.1        0.32       7          0
DMA-100          1.5        0.225      0.30       7          0
DMA-1000         1.5        0.3        0.30       7          0
DMA-102          6.0        0.075      0.32       7          0
DMA-200          6.0        0.075      0.32       7          0
DMA-300          6.0        0.075      0.32       7          0
DMA-400          6.0        0.075      0.32       7          0
DMA-501          1.5        0.225      0.30       7          0
DMA-500          6.0        0.075      0.32       7          0
DMA-600          6.0        0.075      0.32       7          0
DMA-700          6.0        0.075      0.32       7          0
DMA-801          1.5        0.225      0.30       7          0
DMA-800          6.0        0.075      0.32       7          0
DMA-900          1.5        0.3        0.30       7          0
DMA-2000         6          0.075      0.32

[LID_CONTROLS]
;;Name           Type/Layer Parameters
;;-------------- ---------- ----------
BioReten-BMP-103 BC
BioReten-BMP-103 SURFACE    6          0.05       0.0        0.0        5
BioReten-BMP-103 SOIL       21         0.4        0.2        0.1        5.0
5.0        1.5
BioReten-BMP-103 STORAGE    30         0.67       0.37       0.0
BioReten-BMP-103 DRAIN      0.0695322708971646 0.5        18         6
0          0

BioReten-BMP-201 BC
BioReten-BMP-201 SURFACE    6          0.05       0.0        0.0        5
BioReten-BMP-201 SOIL       21         0.4        0.2        0.1        5.0
5.0        1.5
BioReten-BMP-201 STORAGE    18         0.67       0.151      0.0
BioReten-BMP-201 DRAIN      0.0503958634948015 0.5        6          6
0          0

BioReten-BMP-302 BC
BioReten-BMP-302 SURFACE    6          0.05       0.0        0.0        5
BioReten-BMP-302 SOIL       21         0.4        0.2        0.1        5.0
5.0        1.5
BioReten-BMP-302 STORAGE    18         0.67       0.08       0.0
BioReten-BMP-302 DRAIN      0.162748746972309 0.5        3          6
0          0

BioReten-BMP-401 BC
BioReten-BMP-401 SURFACE    6          0.05       0.0        0.0        5
BioReten-BMP-401 SOIL       21         0.4        0.2        0.1        5.0
5.0        1.5
BioReten-BMP-401 STORAGE    18         0.67       0.08       0.0
BioReten-BMP-401 DRAIN      0.313555605188531 0.5        3          6
0          0

BioReten-BMP-504 BC
BioReten-BMP-504 SURFACE    6          0.05       0.0        0.0        5
BioReten-BMP-504 SOIL       21         0.4        0.2        0.1        5.0
5.0        1.5
BioReten-BMP-504 STORAGE    18         0.67       0.366      0.0
BioReten-BMP-504 DRAIN      0.0550791044976685 0.5        6          6
0          0

BioReten-BMP-602 BC
BioReten-BMP-602 SURFACE    6          0.05       0.0        0.0        5
BioReten-BMP-602 SOIL       21         0.4        0.2        0.1        5.0
5.0        1.5
```

```
BioReten-BMP-602 STORAGE    18         0.67       0.08       0.0
BioReten-BMP-602 DRAIN      0.12911084069515 0.5        3          6
0          0

BioReten-BMP-702 BC
BioReten-BMP-702 SURFACE    6          0.05       0.0        0.0        5
BioReten-BMP-702 SOIL       21         0.4        0.2        0.1        5.0
5.0        1.5
BioReten-BMP-702 STORAGE    18         0.67       0.08       0.0
BioReten-BMP-702 DRAIN      0.142613157107226 0.5        3          6
0          0

BioReten-BMP-802 BC
BioReten-BMP-802 SURFACE    6          0.05       0.0        0.0        5
BioReten-BMP-802 SOIL       21         0.4        0.2        0.1        5.0
5.0        1.5
BioReten-BMP-802 STORAGE    30         0.67       0.1        0.0
BioReten-BMP-802 DRAIN      0.073356212160333 0.5        18         6
0          0

[LID_USAGE]
;;Subcatchment   LID Process      Number  Area       Width      InitSat    FromImp
ToPerv     RptFile                  DrainTo          FromPerv
;;-------------- ---------------- ------- ---------- ---------- ---------- ----------
---------- ------------------------ ---------------- ----------
BMP-103          BioReten-BMP-103 1       2767.00    0          0          0
0          "V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM
Files\BMP-103 LID report.txt" POC-1            0
BMP-201          BioReten-BMP-201 1       1712.00    0          0          0
0          "V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM
Files\BMP-201 LID report.txt" POC-1            0
BMP-302          BioReten-BMP-302 1       1020.00    0          0          0
0          "V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM
Files\BMP-302 LID report.txt" POC-1            0
BMP-401          BioReten-BMP-401 1       278.00     0          0          0
0          "V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM
Files\BMP-401 LID report.txt" POC-1            0
BMP-504          BioReten-BMP-504 1       1531.88    0          0          0
0          "V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM
Files\BMP-504 LID report.txt" POC-1            0
BMP-602          BioReten-BMP-602 1       558.00     0          0          0
0          "V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM
Files\BMP-602 LID report.txt" POC-1            0
BMP-702          BioReten-BMP-702 1       560.00     0          0          0
0          "V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM
Files\BMP-702 LID report.txt" POC-1            0
BMP-802          BioReten-BMP-802 1       1807.00    0          0          0
0          "V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM
Files\BMP-802 LID report.txt" POC-1            0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-1            0          FREE                        NO

[REPORT]
;;Reporting Options
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS -2500.000 0.000 12500.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
```

```
;;-------------- ------------------ ------------------
POC-1            5643.330           2894.986

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
BMP-103          8606.477           3052.012
BMP-201          6359.176           3984.298
BMP-302          7782.139           3179.588
BMP-401          6496.565           3228.656
BMP-504          4906.771           3856.722
BMP-602          4553.484           3012.758
BMP-702          3532.875           3052.012
BMP-802          88.779             3471.237
DMA-100          7183.513           5632.974
DMA-1000         4847.591           5457.227
DMA-102          8243.376           3797.841
DMA-200          6604.514           4671.246
DMA-300          7477.920           3542.689
DMA-400          6339.549           3680.079
DMA-501          4543.670           5152.110
DMA-500          4406.281           4524.043
DMA-600          4700.687           3424.926
DMA-700          3797.710           3809.669
DMA-801          1131.700           4072.126
DMA-800          2651.188           3733.694
DMA-900          2796.389           4794.265
DMA-2000         5937.808           2428.430

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------


[BACKDROP]
FILE       "V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM
Files\HMP-POST1_recover-EXCEL.jpg"
DIMENSIONS -2500.000 0.000 12500.000 10000.000

```

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

HMP-POST

19025-PALA MESA PLAZA POST HYDROMODIFICATION. RPT

****
Rainfall File Summary
****

Station ID	First Date	Last Date	Recording Frequency	Periods w/Precip	Periods Missing	Periods Malfunc.
Fallbrook	07/25/1951	05/26/2008	60 min	8771	0	0

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... NO
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Starting Date 07/25/1951 00:00:00
Ending Date 05/26/2008 23:00:00
Antecedent Dry Days 0.0
Report Time Step 01:00:00
Wet Time Step 00:15:00
Dry Time Step 06:00:00

Runoff Quantity Continuity	Volume acre-feet	Depth inches
Initial LID Storage	0.041	0.113
Total Precipitation	316.029	865.433
Evaporation Loss	43.104	118.040
Infiltration Loss	185.981	509.301
Surface Runoff	25.985	71.160
LID Drainage	63.916	175.030
Final Storage	0.075	0.205
Continuity Error (%)	-0.946	

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	89.901	29.296
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	89.901	29.296
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000

Continuity Error (%) 0.000

****
Subcatchment Runoff Summary
****

Subcatchment	Total Perv Precip in	Total Runon in	Total Evap in	Total Peak Infil Runoff in	Imperv Runoff Coeff in	in	10^6 gal	CFS
BMP-103	865.43	4687.67	839.10	4263.76	0.00	0.00	449.28	0.77	0.80	0.081
BMP-201	865.43	8714.43	926.11	4788.74	0.00	0.00	3864.30	4.12	0.49	0.403
BMP-302	865.43	7909.14	912.29	2293.65	0.00	0.00	5568.25	3.54	0.28	0.635
BMP-401	865.43	15673.81	984.48	2539.06	0.00	0.00	13019.71	2.26	0.16	0.787
BMP-504	865.43	9800.60	936.00	6915.23	0.00	0.00	2814.64	2.69	0.51	0.264
BMP-602	865.43	7244.02	903.80	2315.64	0.00	0.00	4889.47	1.70	0.15	0.603
BMP-702	865.43	15081.21	985.67	2972.09	0.00	0.00	11991.48	4.19	0.28	0.752
BMP-802	865.43	12790.11	960.52	6029.91	0.00	0.00	6665.22	7.51	0.86	0.488
DMA-100	865.43	0.00	10.44	769.45	62.15	25.41	87.55	0.89	0.26	0.101
DMA-1000	865.43	0.00	1.02	846.19	0.00	20.60	20.60	0.02	0.03	0.024
DMA-102	865.43	0.00	62.77	348.44	414.95	46.71	461.66	7.20	0.51	0.533
DMA-200	865.43	0.00	95.64	97.09	668.86	14.97	683.83	9.30	0.46	0.790
DMA-300	865.43	0.00	89.02	142.30	623.80	21.39	645.19	5.03	0.26	0.746
DMA-400	865.43	0.00	78.08	217.35	548.48	32.41	580.89	2.72	0.16	0.671
DMA-501	865.43	0.00	86.94	174.38	606.27	7.30	613.58	2.19	0.12	0.709
DMA-500	865.43	0.00	86.03	157.06	610.15	23.96	634.11	7.17	0.38	0.733
DMA-600	865.43	0.00	83.53	179.83	586.19	26.88	613.07	2.52	0.14	0.708
DMA-700	865.43	0.00	88.21	141.88	625.23	21.90	647.13	5.27	0.27	0.748
DMA-801	865.43	0.00	67.37	324.85	468.66	12.30	480.95	2.60	0.17	0.556
DMA-800	865.43	0.00	83.68	195.75	567.00	27.82	594.83	11.81	0.66	0.687
DMA-900	865.43	0.00	1.07	849.42	0.00	16.01	16.01	0.06	0.09	0.018
DMA-2000	865.43	0.00	124.41	0.00	745.07	0.00	745.07	2.43	0.11	0.861

****
LID Performance Summary
****

Subcatchment	LID Control	Total Drain Inflow Outflow in	Evap Initial Loss Storage in	Infil Final Loss Storage in	Surface Continuity Outflow Error in	in	in	in	%
BMP-103	BioReten-BMP-103	5553.11	839.13	4263.91	128.77	320.53	2.10	3.78	-0.02
BMP-201	BioReten-BMP-201	9579.86	926.15	4788.92	935.28	2929.16	2.10	3.82	-0.01
BMP-302	BioReten-BMP-302	8774.57	912.32	2293.73	302.57	5265.89	2.10	3.81	-0.02
BMP-401	BioReten-BMP-401	16539.24	984.51	2539.15	1681.98	11338.21	2.10	3.89	-0.04
BMP-504	BioReten-BMP-504	10666.04	936.04	6915.49	874.68	1940.07	2.10	3.83	-0.02
BMP-602	BioReten-BMP-602	8109.45	903.83	2315.73	314.47	4575.17	2.10	3.81	-0.02
BMP-702	BioReten-BMP-702	15946.64	985.71	2972.20	2433.05	9558.86	2.10	3.88	-0.03
BMP-802	BioReten-BMP-802	13655.54	960.56	6030.13	2178.23	4487.23	2.10	3.86	-0.02

Analysis begun on: Wed Jun 1 16:50:25 2022
Analysis ended on: Wed Jun 1 16:55:14 2022
Total elapsed time: 00:04:49

STATISTICS ANALYSIS OF THE SWMM FILES FOR:

DISCHARGE NODE: POC-1

ANALYSIS DETAILS

Stream Susceptibility to Channel Erosion: High
Low Flow Threshold = (0.1)Q2 = (0.1)1.400 = Qlf = 0.1400 (cfs)
Flow Control Upper Limit = Q10 = 2.300 (cfs)
Assumed time between storms (hours): 24

PRE-DEVELOPMENT SWMM FILE

SWMM file name: V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM Files\Current\ST Improvement\19025-HMP-PRE.out
SWMM file time stamp: 6/6/2022 6:04:44 PM
Selected Node to Analyze: POC-1

POST-DEVELOPMENT MITIGATED SWMM FILE

SWMM file name: V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM Files\Current\ST Improvement\19025-HMP-POST.out
SWMM file time stamp: 6/1/2022 4:55:14 PM
Selected Node to Analyze: POC-1

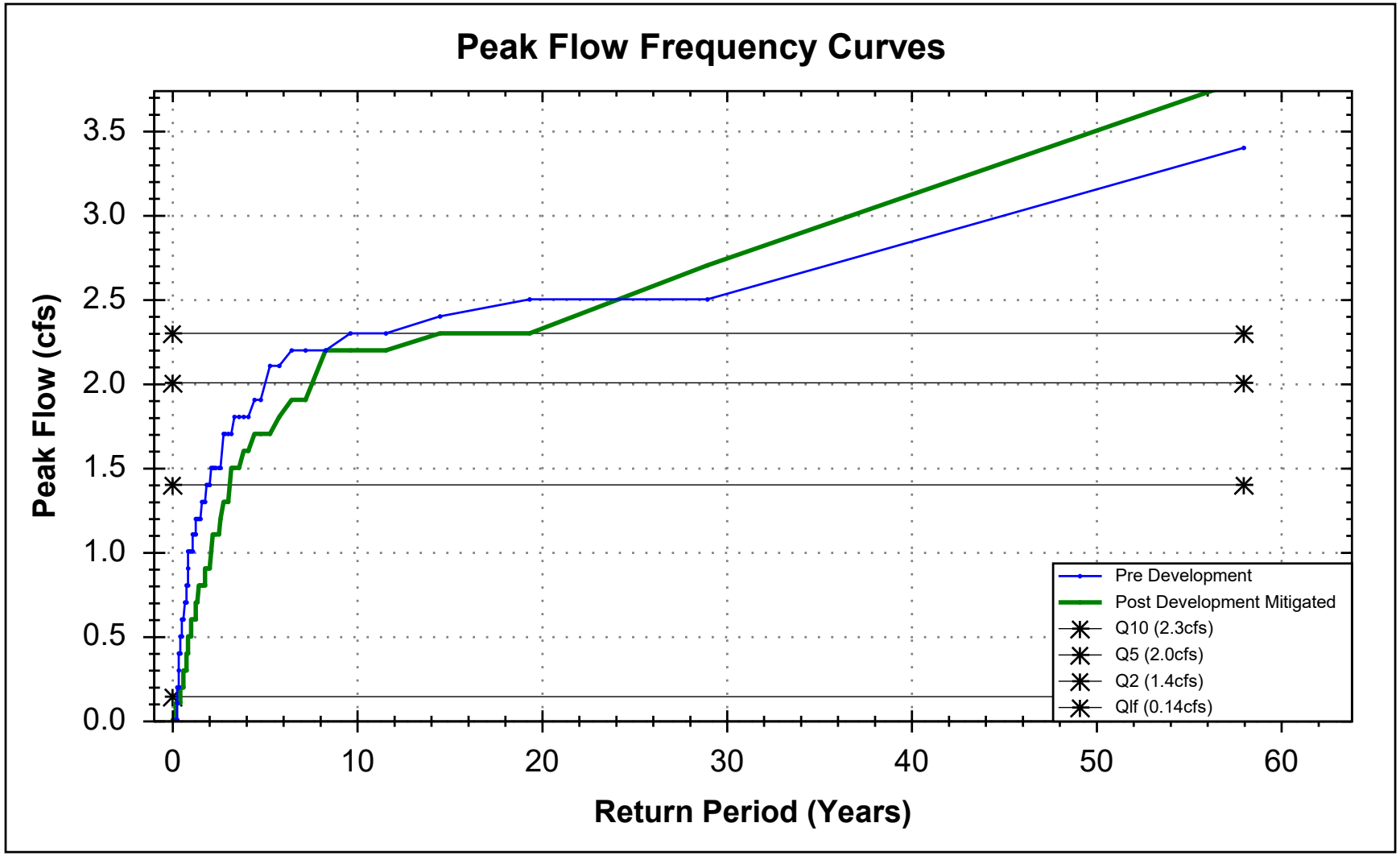
MITIGATED CONDITIONS RESULTS

For the Mitigated Conditions:

Peak Flow Conditions PASS
Flow Duration Conditions PASS

The Mitigated Conditions peak flow frequency curve is composed of 429 points. Of the points, 2 point(s) are above the flow control upper limit (Q10 = 2.3 (cfs)), 310 point(s) are below the low flow threshold value (Qlf = 0.14 (cfs)). Of the points within the flow control range (Qlf to Q10), 117 point(s) have a lower peak flow rate than pre-development conditions. These points all pass. There are no points that failed, therefore the peak flow requirements have been met.

The Mitigated Conditions flow duration curve is composed of 100 flow bins (points). Each point represents the number of hours where the discharge was equal to or greater than the discharge value, but less than the next greater discharge value. Within the flow control range, comparing the post-development flow duration curve to the pre-development flow duration curve, 100 post-development curve point(s) have a lower flow duration than pre-development conditions. These points all pass. There are no points that failed, therefore the flow duration requirements have been met.


Peak Flow Frequency Curves
Peak Flow (cfs)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
10
20
30
40
50
60
Return Period (Years)
Pre Development
Post Development Mitigated
Q10 (2.3cfs)
Q5 (2.0cfs)
Q2 (1.4cfs)
Qlf (0.14cfs)

Compare Post-Development Curve to Pre-Development Curve
Flow Control Upper Limit: 2.3 (cfs)
Flow Control Lower Limit: 0.14 (cfs)

post-development SWMM file: V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM Files\Current\ST Improvement\19025-HMP-POST.out
post-development time stamp: 6/1/2022 4:55:14 PM
Compared to:
pre-development SWMM file: V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM Files\Current\ST Improvement\19025-HMP-PRE.out
pre-development time stamp: 6/6/2022 6:04:44 PM

Post PT #	Rtn Prd (yrs)	Post Dev Q (cfs)	Pre Dev Q (cfs)	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
0	58.00	3.80	3.40	FALSE	FALSE	FALSE	Pass- Qpost Above Q10 (2.3 (cfs))
1	29.00	2.70	2.50	FALSE	FALSE	FALSE	Pass- Qpost Above Q10 (2.3 (cfs))
2	19.30	2.30	2.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
3	14.50	2.30	2.40	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
4	11.60	2.20	2.30	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
5	9.70	2.20	2.30	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
6	8.30	2.20	2.20	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
7	7.30	1.90	2.20	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
8	6.40	1.90	2.20	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
9	5.80	1.80	2.10	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
10	5.30	1.70	2.10	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
11	4.80	1.70	1.90	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
12	4.50	1.70	1.90	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
13	4.10	1.60	1.80	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
14	3.90	1.60	1.80	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
15	3.60	1.50	1.80	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
16	3.40	1.50	1.80	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
17	3.20	1.50	1.70	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
18	3.10	1.30	1.70	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
19	2.90	1.30	1.70	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
20	2.80	1.30	1.70	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
21	2.60	1.20	1.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
22	2.50	1.10	1.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
23	2.40	1.10	1.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
24	2.30	1.10	1.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
25	2.20	1.10	1.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
26	2.10	1.00	1.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
27	2.10	0.90	1.40	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
28	2.00	0.90	1.40	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
29	1.90	0.90	1.40	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
30	1.90	0.90	1.40	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
31	1.80	0.90	1.30	TRUE	FALSE	FALSE	Pass- Qpost < Qpre

Post PT #	Rtn Prd (yrs)	Post Dev Q (cfs)	Pre Dev Q (cfs)	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
32	1.80	0.80	1.30	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
33	1.70	0.80	1.30	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
34	1.70	0.80	1.30	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
35	1.60	0.80	1.30	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
36	1.60	0.80	1.20	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
37	1.50	0.80	1.20	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
38	1.50	0.80	1.20	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
39	1.50	0.80	1.20	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
40	1.40	0.70	1.20	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
41	1.40	0.70	1.20	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
42	1.30	0.70	1.20	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
43	1.30	0.70	1.20	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
44	1.30	0.70	1.20	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
45	1.30	0.60	1.10	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
46	1.20	0.60	1.10	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
47	1.20	0.60	1.10	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
48	1.20	0.60	1.10	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
49	1.20	0.60	1.10	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
50	1.10	0.60	1.00	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
51	1.10	0.60	1.00	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
52	1.10	0.60	1.00	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
53	1.10	0.60	1.00	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
54	1.10	0.50	1.00	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
55	1.00	0.50	1.00	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
56	1.00	0.50	1.00	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
57	1.00	0.50	1.00	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
58	1.00	0.50	1.00	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
59	1.00	0.50	1.00	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
60	1.00	0.50	1.00	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
61	0.90	0.50	1.00	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
62	0.90	0.50	1.00	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
63	0.90	0.50	1.00	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
64	0.90	0.40	0.90	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
65	0.90	0.40	0.90	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
66	0.90	0.40	0.90	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
67	0.90	0.40	0.80	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
68	0.80	0.40	0.80	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
69	0.80	0.40	0.80	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
70	0.80	0.40	0.80	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
71	0.80	0.40	0.80	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
72	0.80	0.40	0.80	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
73	0.80	0.40	0.70	TRUE	FALSE	FALSE	Pass- Qpost < Qpre

Post PT #	Rtn Prd (yrs)	Post Dev Q (cfs)	Pre Dev Q (cfs)	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
74	0.80	0.40	0.70	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
75	0.80	0.30	0.70	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
76	0.80	0.30	0.70	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
77	0.70	0.30	0.70	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
78	0.70	0.30	0.70	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
79	0.70	0.30	0.70	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
80	0.70	0.30	0.70	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
81	0.70	0.30	0.70	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
82	0.70	0.30	0.70	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
83	0.70	0.30	0.70	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
84	0.70	0.30	0.70	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
85	0.70	0.30	0.70	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
86	0.70	0.30	0.70	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
87	0.70	0.30	0.60	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
88	0.70	0.30	0.60	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
89	0.60	0.30	0.60	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
90	0.60	0.30	0.60	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
91	0.60	0.30	0.60	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
92	0.60	0.20	0.60	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
93	0.60	0.20	0.60	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
94	0.60	0.20	0.60	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
95	0.60	0.20	0.60	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
96	0.60	0.20	0.60	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
97	0.60	0.20	0.60	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
98	0.60	0.20	0.60	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
99	0.60	0.20	0.60	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
100	0.60	0.20	0.60	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
101	0.60	0.20	0.60	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
102	0.60	0.20	0.60	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
103	0.60	0.20	0.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
104	0.60	0.20	0.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
105	0.50	0.20	0.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
106	0.50	0.20	0.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
107	0.50	0.20	0.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
108	0.50	0.20	0.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
109	0.50	0.20	0.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
110	0.50	0.20	0.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
111	0.50	0.20	0.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
112	0.50	0.20	0.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
113	0.50	0.20	0.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
114	0.50	0.20	0.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
115	0.50	0.20	0.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre

Post PT #	Rtn Prd (yrs)	Post Dev Q (cfs)	Pre Dev Q (cfs)	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
116	0.50	0.20	0.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
117	0.50	0.20	0.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
118	0.50	0.20	0.50	TRUE	FALSE	FALSE	Pass- Qpost < Qpre
119	0.50	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
120	0.50	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
121	0.50	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
122	0.50	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
123	0.50	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
124	0.50	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
125	0.50	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
126	0.50	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
127	0.50	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
128	0.50	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
129	0.40	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
130	0.40	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
131	0.40	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
132	0.40	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
133	0.40	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
134	0.40	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
135	0.40	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
136	0.40	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
137	0.40	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
138	0.40	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
139	0.40	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
140	0.40	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
141	0.40	0.10	0.40	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
142	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
143	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
144	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
145	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
146	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
147	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
148	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
149	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
150	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
151	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
152	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
153	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
154	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
155	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
156	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
157	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))

Post PT #	Rtn Prd (yrs)	Post Dev Q (cfs)	Pre Dev Q (cfs)	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
158	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
159	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
160	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
161	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
162	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
163	0.40	0.10	0.30	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
164	0.40	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
165	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
166	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
167	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
168	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
169	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
170	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
171	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
172	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
173	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
174	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
175	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
176	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
177	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
178	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
179	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
180	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
181	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
182	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
183	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
184	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
185	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
186	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
187	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
188	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
189	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
190	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
191	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
192	0.30	0.10	0.20	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
193	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
194	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
195	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
196	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
197	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
198	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
199	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))

Post PT #	Rtn Prd (yrs)	Post Dev Q (cfs)	Pre Dev Q (cfs)	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
200	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
201	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
202	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
203	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
204	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
205	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
206	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
207	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
208	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
209	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
210	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
211	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
212	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
213	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
214	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
215	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
216	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
217	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
218	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
219	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
220	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
221	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
222	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
223	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
224	0.30	0.10	0.10	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
225	0.30	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
226	0.30	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
227	0.30	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
228	0.30	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
229	0.30	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
230	0.30	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
231	0.30	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
232	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
233	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
234	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
235	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
236	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
237	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
238	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
239	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
240	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
241	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))

Post PT #	Rtn Prd (yrs)	Post Dev Q (cfs)	Pre Dev Q (cfs)	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
242	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
243	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
244	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
245	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
246	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
247	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
248	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
249	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
250	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
251	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
252	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
253	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
254	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
255	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
256	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
257	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
258	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
259	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
260	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
261	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
262	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
263	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
264	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
265	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
266	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
267	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
268	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
269	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
270	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
271	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
272	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
273	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
274	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
275	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
276	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
277	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
278	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
279	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
280	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
281	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
282	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
283	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))

Post PT #	Rtn Prd (yrs)	Post Dev Q (cfs)	Pre Dev Q (cfs)	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
284	0.20	0.10	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
285	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
286	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
287	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
288	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
289	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
290	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
291	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
292	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
293	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
294	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
295	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
296	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
297	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
298	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
299	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
300	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
301	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
302	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
303	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
304	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
305	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
306	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
307	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
308	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
309	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
310	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
311	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
312	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
313	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
314	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
315	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
316	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
317	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
318	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
319	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
320	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
321	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
322	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
323	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
324	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
325	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))

Post PT #	Rtn Prd (yrs)	Post Dev Q (cfs)	Pre Dev Q (cfs)	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
326	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
327	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
328	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
329	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
330	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
331	0.20	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
332	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
333	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
334	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
335	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
336	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
337	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
338	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
339	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
340	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
341	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
342	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
343	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
344	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
345	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
346	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
347	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
348	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
349	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
350	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
351	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
352	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
353	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
354	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
355	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
356	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
357	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
358	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
359	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
360	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
361	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
362	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
363	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
364	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
365	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
366	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
367	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))

Post PT #	Rtn Prd (yrs)	Post Dev Q (cfs)	Pre Dev Q (cfs)	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
368	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
369	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
370	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
371	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
372	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
373	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
374	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
375	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
376	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
377	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
378	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
379	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
380	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
381	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
382	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
383	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
384	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
385	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
386	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
387	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
388	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
389	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
390	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
391	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
392	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
393	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
394	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
395	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
396	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
397	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
398	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
399	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
400	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
401	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
402	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
403	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
404	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
405	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
406	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
407	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
408	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
409	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))

Post PT #	Rtn Prd (yrs)	Post Dev Q (cfs)	Pre Dev Q (cfs)	Qpost < Qpre	Qpost > Qpre	Qpost > 110% Qpre	Pass/Fail
410	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
411	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
412	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
413	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
414	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
415	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
416	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
417	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
418	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
419	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
420	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
421	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
422	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
423	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
424	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
425	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
426	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
427	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))
428	0.10	0.00	0.00	FALSE	FALSE	FALSE	Pass- Qpost Below Qlf (0.14 (cfs))

SWMM.out file name: V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM Files\Current\ST Improvement\19025-HMP-PRE.out
SWMM.out time stamp: 6/6/2022 6:04:44 PM

Q10: 2.300 (cfs)
Q5: 2.000 (cfs)
Q2: 1.400 (cfs)

Peak Flow Statistics Table Values

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
1	1995/01/04 14:00:00	1995/01/05 03:00:00	14	3.4	0.40%	58
2	1963/02/09 23:00:00	1963/02/10 17:00:00	19	2.5	0.80%	29
3	1995/03/05 02:00:00	1995/03/06 03:00:00	26	2.5	1.20%	19.33
4	1978/01/16 17:00:00	1978/01/17 02:00:00	10	2.4	1.60%	14.5
5	1959/02/11 09:00:00	1959/02/11 15:00:00	7	2.3	1.90%	11.6
6	1998/02/22 09:00:00	1998/02/24 06:00:00	46	2.3	2.30%	9.67
7	1978/01/04 14:00:00	1978/01/05 10:00:00	21	2.2	2.70%	8.29
8	1978/02/07 17:00:00	1978/02/10 16:00:00	72	2.2	3.10%	7.25
9	1986/03/15 21:00:00	1986/03/16 10:00:00	14	2.2	3.50%	6.44
10	1980/01/28 20:00:00	1980/01/29 08:00:00	13	2.1	3.90%	5.8
11	1980/02/16 18:00:00	1980/02/21 05:00:00	108	2.1	4.30%	5.27
12	1966/12/05 03:00:00	1966/12/07 02:00:00	48	1.9	4.70%	4.83
13	1998/01/09 22:00:00	1998/01/10 03:00:00	6	1.9	5.00%	4.46
14	1969/02/23 22:00:00	1969/02/25 22:00:00	49	1.8	5.40%	4.14
15	1980/01/09 05:00:00	1980/01/11 16:00:00	60	1.8	5.80%	3.87
16	1992/02/15 12:00:00	1992/02/15 19:00:00	8	1.8	6.20%	3.63
17	2004/02/22 08:00:00	2004/02/22 12:00:00	5	1.8	6.60%	3.41
18	1965/11/22 09:00:00	1965/11/23 06:00:00	22	1.7	7.00%	3.22
19	1978/02/12 15:00:00	1978/02/13 01:00:00	11	1.7	7.40%	3.05
20	1982/03/17 12:00:00	1982/03/18 05:00:00	18	1.7	7.80%	2.9
21	1993/01/14 04:00:00	1993/01/14 08:00:00	5	1.7	8.10%	2.76
22	1969/01/24 13:00:00	1969/01/26 19:00:00	55	1.5	8.50%	2.64
23	1973/02/11 06:00:00	1973/02/11 13:00:00	8	1.5	8.90%	2.52
24	1976/09/10 10:00:00	1976/09/10 13:00:00	4	1.5	9.30%	2.42
25	1983/03/24 02:00:00	1983/03/24 07:00:00	6	1.5	9.70%	2.32
26	1993/01/15 13:00:00	1993/01/17 03:00:00	39	1.5	10.10%	2.23
27	1995/03/11 04:00:00	1995/03/11 12:00:00	9	1.5	10.50%	2.15
28	1983/02/26 13:00:00	1983/02/28 05:00:00	41	1.4	10.90%	2.07
29	1983/11/24 23:00:00	1983/11/25 01:00:00	3	1.4	11.20%	2
30	1986/02/14 23:00:00	1986/02/15 10:00:00	12	1.4	11.60%	1.93
31	1992/02/12 16:00:00	1992/02/13 13:00:00	22	1.4	12.00%	1.87
32	1952/11/15 13:00:00	1952/11/16 08:00:00	20	1.3	12.40%	1.81
33	1955/01/18 16:00:00	1955/01/18 21:00:00	6	1.3	12.80%	1.76
34	1969/02/06 06:00:00	1969/02/06 16:00:00	11	1.3	13.20%	1.71
35	1978/01/14 23:00:00	1978/01/15 08:00:00	10	1.3	13.60%	1.66
36	2005/01/09 04:00:00	2005/01/11 10:00:00	55	1.3	14.00%	1.61
37	1968/03/08 08:00:00	1968/03/08 12:00:00	5	1.2	14.30%	1.57
38	1978/01/10 04:00:00	1978/01/10 06:00:00	3	1.2	14.70%	1.53
39	1980/02/14 03:00:00	1980/02/15 03:00:00	25	1.2	15.10%	1.49

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
40	1981/01/29 17:00:00	1981/01/29 20:00:00	4	1.2	15.50%	1.45
41	1983/01/29 00:00:00	1983/01/29 06:00:00	7	1.2	15.90%	1.42
42	1983/03/01 13:00:00	1983/03/03 11:00:00	47	1.2	16.30%	1.38
43	1990/06/10 06:00:00	1990/06/10 07:00:00	2	1.2	16.70%	1.35
44	1993/01/06 05:00:00	1993/01/07 10:00:00	30	1.2	17.10%	1.32
45	2007/11/30 15:00:00	2007/11/30 23:00:00	9	1.2	17.40%	1.29
46	1952/03/15 19:00:00	1952/03/16 06:00:00	12	1.1	17.80%	1.26
47	1957/01/13 02:00:00	1957/01/13 10:00:00	9	1.1	18.20%	1.23
48	1991/03/26 22:00:00	1991/03/27 06:00:00	9	1.1	18.60%	1.21
49	1994/02/07 14:00:00	1994/02/07 19:00:00	6	1.1	19.00%	1.18
50	2005/02/21 03:00:00	2005/02/23 07:00:00	53	1.1	19.40%	1.16
51	1960/01/12 03:00:00	1960/01/12 09:00:00	7	1	19.80%	1.14
52	1963/11/21 04:00:00	1963/11/21 07:00:00	4	1	20.20%	1.12
53	1964/01/22 06:00:00	1964/01/22 10:00:00	5	1	20.50%	1.09
54	1967/12/18 14:00:00	1967/12/18 18:00:00	5	1	20.90%	1.07
55	1970/11/29 13:00:00	1970/11/29 20:00:00	8	1	21.30%	1.06
56	1971/12/24 15:00:00	1971/12/25 21:00:00	31	1	21.70%	1.04
57	1972/11/14 13:00:00	1972/11/14 15:00:00	3	1	22.10%	1.02
58	1973/01/18 20:00:00	1973/01/19 01:00:00	6	1	22.50%	1
59	1977/01/05 23:00:00	1977/01/07 07:00:00	33	1	22.90%	0.98
60	1982/01/01 08:00:00	1982/01/02 08:00:00	25	1	23.30%	0.97
61	1997/12/06 12:00:00	1997/12/06 19:00:00	8	1	23.60%	0.95
62	1998/02/08 00:00:00	1998/02/08 07:00:00	8	1	24.00%	0.94
63	2001/01/11 04:00:00	2001/01/11 09:00:00	6	1	24.40%	0.92
64	2004/10/19 17:00:00	2004/10/20 17:00:00	25	1	24.80%	0.91
65	1962/01/20 14:00:00	1962/01/20 21:00:00	8	0.9	25.20%	0.89
66	1979/01/15 14:00:00	1979/01/15 16:00:00	3	0.9	25.60%	0.88
67	1982/04/01 10:00:00	1982/04/01 13:00:00	4	0.9	26.00%	0.87
68	1958/04/03 09:00:00	1958/04/03 14:00:00	6	0.8	26.40%	0.85
69	1970/02/28 16:00:00	1970/03/02 04:00:00	37	0.8	26.70%	0.84
70	1985/11/29 09:00:00	1985/11/29 17:00:00	9	0.8	27.10%	0.83
71	1991/03/01 00:00:00	1991/03/01 19:00:00	20	0.8	27.50%	0.82
72	1993/02/08 01:00:00	1993/02/08 10:00:00	10	0.8	27.90%	0.81
73	2004/10/18 06:00:00	2004/10/18 08:00:00	3	0.8	28.30%	0.8
74	1952/01/16 08:00:00	1952/01/16 18:00:00	11	0.7	28.70%	0.78
75	1958/03/15 18:00:00	1958/03/16 12:00:00	19	0.7	29.10%	0.77
76	1960/02/01 23:00:00	1960/02/02 02:00:00	4	0.7	29.50%	0.76
77	1964/03/22 22:00:00	1964/03/23 05:00:00	8	0.7	29.80%	0.75
78	1965/12/29 19:00:00	1965/12/29 21:00:00	3	0.7	30.20%	0.74
79	1967/01/22 17:00:00	1967/01/23 01:00:00	9	0.7	30.60%	0.73
80	1973/01/16 21:00:00	1973/01/16 23:00:00	3	0.7	31.00%	0.73
81	1977/05/08 18:00:00	1977/05/08 22:00:00	5	0.7	31.40%	0.72
82	1987/01/06 23:00:00	1987/01/07 02:00:00	4	0.7	31.80%	0.71
83	1988/12/24 21:00:00	1988/12/25 03:00:00	7	0.7	32.20%	0.7
84	1996/06/01 02:00:00	1996/06/01 02:00:00	1	0.7	32.60%	0.69
85	2005/02/19 10:00:00	2005/02/19 12:00:00	3	0.7	32.90%	0.68
86	2006/03/11 06:00:00	2006/03/11 09:00:00	4	0.7	33.30%	0.67

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
87	2008/01/27 02:00:00	2008/01/28 10:00:00	33	0.7	33.70%	0.67
88	1952/12/02 00:00:00	1952/12/02 04:00:00	5	0.6	34.10%	0.66
89	1956/01/26 19:00:00	1956/01/27 09:00:00	15	0.6	34.50%	0.65
90	1959/12/24 11:00:00	1959/12/24 15:00:00	5	0.6	34.90%	0.64
91	1961/12/02 08:00:00	1961/12/02 11:00:00	4	0.6	35.30%	0.64
92	1967/04/11 09:00:00	1967/04/11 11:00:00	3	0.6	35.70%	0.63
93	1974/01/06 17:00:00	1974/01/08 06:00:00	38	0.6	36.00%	0.62
94	1976/02/08 17:00:00	1976/02/09 14:00:00	22	0.6	36.40%	0.62
95	1978/02/28 18:00:00	1978/03/01 14:00:00	21	0.6	36.80%	0.61
96	1979/01/05 17:00:00	1979/01/06 08:00:00	16	0.6	37.20%	0.6
97	1982/11/30 04:00:00	1982/11/30 11:00:00	8	0.6	37.60%	0.6
98	1984/12/18 23:00:00	1984/12/19 21:00:00	23	0.6	38.00%	0.59
99	1984/12/27 17:00:00	1984/12/27 20:00:00	4	0.6	38.40%	0.59
100	1986/03/10 15:00:00	1986/03/10 17:00:00	3	0.6	38.80%	0.58
101	1995/01/10 14:00:00	1995/01/10 23:00:00	10	0.6	39.10%	0.57
102	1997/01/26 01:00:00	1997/01/26 08:00:00	8	0.6	39.50%	0.57
103	2008/01/07 00:00:00	2008/01/07 06:00:00	7	0.6	39.90%	0.56
104	1957/01/28 02:00:00	1957/01/29 10:00:00	33	0.5	40.30%	0.56
105	1957/02/28 23:00:00	1957/03/01 00:00:00	2	0.5	40.70%	0.55
106	1958/02/04 03:00:00	1958/02/04 11:00:00	9	0.5	41.10%	0.55
107	1958/04/07 01:00:00	1958/04/07 15:00:00	15	0.5	41.50%	0.54
108	1966/12/03 16:00:00	1966/12/03 20:00:00	5	0.5	41.90%	0.54
109	1967/01/24 17:00:00	1967/01/25 00:00:00	8	0.5	42.20%	0.53
110	1967/11/19 15:00:00	1967/11/20 04:00:00	14	0.5	42.60%	0.53
111	1969/01/21 09:00:00	1969/01/21 11:00:00	3	0.5	43.00%	0.52
112	1970/12/21 08:00:00	1970/12/21 13:00:00	6	0.5	43.40%	0.52
113	1982/01/20 05:00:00	1982/01/20 07:00:00	3	0.5	43.80%	0.51
114	1986/03/12 12:00:00	1986/03/12 14:00:00	3	0.5	44.20%	0.51
115	1998/02/14 15:00:00	1998/02/14 20:00:00	6	0.5	44.60%	0.5
116	2004/02/26 04:00:00	2004/02/26 11:00:00	8	0.5	45.00%	0.5
117	2004/10/27 03:00:00	2004/10/27 09:00:00	7	0.5	45.30%	0.5
118	2004/12/28 10:00:00	2004/12/29 09:00:00	24	0.5	45.70%	0.49
119	2005/01/07 14:00:00	2005/01/07 21:00:00	8	0.5	46.10%	0.49
120	1951/10/25 18:00:00	1951/10/25 18:00:00	1	0.4	46.50%	0.48
121	1951/12/29 22:00:00	1951/12/30 14:00:00	17	0.4	46.90%	0.48
122	1952/01/13 04:00:00	1952/01/13 10:00:00	7	0.4	47.30%	0.48
123	1952/04/10 18:00:00	1952/04/10 20:00:00	3	0.4	47.70%	0.47
124	1952/12/20 09:00:00	1952/12/20 15:00:00	7	0.4	48.10%	0.47
125	1954/01/18 22:00:00	1954/01/19 23:00:00	26	0.4	48.40%	0.46
126	1954/01/25 04:00:00	1954/01/25 11:00:00	8	0.4	48.80%	0.46
127	1958/01/26 08:00:00	1958/01/26 11:00:00	4	0.4	49.20%	0.46
128	1960/01/14 17:00:00	1960/01/14 19:00:00	3	0.4	49.60%	0.45
129	1967/03/13 18:00:00	1967/03/13 22:00:00	5	0.4	50.00%	0.45
130	1972/11/16 11:00:00	1972/11/17 06:00:00	20	0.4	50.40%	0.45
131	1973/02/12 23:00:00	1973/02/13 03:00:00	5	0.4	50.80%	0.44
132	1974/03/08 02:00:00	1974/03/08 13:00:00	12	0.4	51.20%	0.44
133	1977/01/03 03:00:00	1977/01/03 05:00:00	3	0.4	51.60%	0.44

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
134	1983/10/01 02:00:00	1983/10/01 03:00:00	2	0.4	51.90%	0.43
135	1991/03/20 07:00:00	1991/03/20 10:00:00	4	0.4	52.30%	0.43
136	1991/12/29 15:00:00	1991/12/30 01:00:00	11	0.4	52.70%	0.43
137	1992/01/05 14:00:00	1992/01/05 23:00:00	10	0.4	53.10%	0.42
138	1992/03/23 03:00:00	1992/03/23 05:00:00	3	0.4	53.50%	0.42
139	1993/01/18 09:00:00	1993/01/18 16:00:00	8	0.4	53.90%	0.42
140	1998/02/03 12:00:00	1998/02/03 17:00:00	6	0.4	54.30%	0.41
141	1998/12/06 06:00:00	1998/12/06 08:00:00	3	0.4	54.70%	0.41
142	2000/03/05 17:00:00	2000/03/05 20:00:00	4	0.4	55.00%	0.41
143	1952/01/18 01:00:00	1952/01/18 08:00:00	8	0.3	55.40%	0.41
144	1952/03/07 14:00:00	1952/03/07 21:00:00	8	0.3	55.80%	0.4
145	1954/02/13 19:00:00	1954/02/13 23:00:00	5	0.3	56.20%	0.4
146	1956/04/13 16:00:00	1956/04/13 20:00:00	5	0.3	56.60%	0.4
147	1957/01/07 14:00:00	1957/01/07 20:00:00	7	0.3	57.00%	0.4
148	1957/12/17 05:00:00	1957/12/17 06:00:00	2	0.3	57.40%	0.39
149	1963/09/18 19:00:00	1963/09/18 21:00:00	3	0.3	57.80%	0.39
150	1965/04/08 15:00:00	1965/04/10 00:00:00	34	0.3	58.10%	0.39
151	1971/12/27 13:00:00	1971/12/27 18:00:00	6	0.3	58.50%	0.38
152	1974/01/04 22:00:00	1974/01/04 23:00:00	2	0.3	58.90%	0.38
153	1974/12/04 07:00:00	1974/12/04 07:00:00	1	0.3	59.30%	0.38
154	1978/02/06 10:00:00	1978/02/06 12:00:00	3	0.3	59.70%	0.38
155	1978/11/13 20:00:00	1978/11/13 21:00:00	2	0.3	60.10%	0.37
156	1981/11/28 05:00:00	1981/11/28 09:00:00	5	0.3	60.50%	0.37
157	1992/12/07 15:00:00	1992/12/07 16:00:00	2	0.3	60.90%	0.37
158	1995/01/07 21:00:00	1995/01/08 03:00:00	7	0.3	61.20%	0.37
159	1996/03/13 03:00:00	1996/03/13 04:00:00	2	0.3	61.60%	0.37
160	1996/11/21 21:00:00	1996/11/22 20:00:00	24	0.3	62.00%	0.36
161	2003/12/25 19:00:00	2003/12/25 19:00:00	1	0.3	62.40%	0.36
162	2004/12/31 14:00:00	2004/12/31 17:00:00	4	0.3	62.80%	0.36
163	2005/01/03 08:00:00	2005/01/03 11:00:00	4	0.3	63.20%	0.36
164	2005/01/28 15:00:00	2005/01/28 18:00:00	4	0.3	63.60%	0.35
165	1954/03/30 04:00:00	1954/03/30 05:00:00	2	0.2	64.00%	0.35
166	1955/01/10 09:00:00	1955/01/10 11:00:00	3	0.2	64.30%	0.35
167	1958/04/01 16:00:00	1958/04/01 19:00:00	4	0.2	64.70%	0.35
168	1962/02/19 14:00:00	1962/02/19 16:00:00	3	0.2	65.10%	0.35
169	1963/09/17 06:00:00	1963/09/17 07:00:00	2	0.2	65.50%	0.34
170	1964/12/27 13:00:00	1964/12/27 13:00:00	1	0.2	65.90%	0.34
171	1965/11/16 17:00:00	1965/11/16 19:00:00	3	0.2	66.30%	0.34
172	1967/11/21 13:00:00	1967/11/21 14:00:00	2	0.2	66.70%	0.34
173	1972/12/04 14:00:00	1972/12/04 15:00:00	2	0.2	67.10%	0.34
174	1973/02/07 14:00:00	1973/02/07 16:00:00	3	0.2	67.40%	0.33
175	1973/03/18 07:00:00	1973/03/18 08:00:00	2	0.2	67.80%	0.33
176	1975/03/11 14:00:00	1975/03/11 15:00:00	2	0.2	68.20%	0.33
177	1975/04/08 18:00:00	1975/04/09 01:00:00	8	0.2	68.60%	0.33
178	1978/03/04 12:00:00	1978/03/04 14:00:00	3	0.2	69.00%	0.33
179	1979/01/31 05:00:00	1979/01/31 05:00:00	1	0.2	69.40%	0.32
180	1983/01/27 08:00:00	1983/01/27 12:00:00	5	0.2	69.80%	0.32

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
181	1983/03/21 04:00:00	1983/03/21 04:00:00	1	0.2	70.20%	0.32
182	1984/12/11 05:00:00	1984/12/11 07:00:00	3	0.2	70.50%	0.32
183	1985/02/09 08:00:00	1985/02/09 13:00:00	6	0.2	70.90%	0.32
184	1986/11/18 00:00:00	1986/11/18 03:00:00	4	0.2	71.30%	0.32
185	1987/11/04 17:00:00	1987/11/05 05:00:00	13	0.2	71.70%	0.31
186	1988/04/21 19:00:00	1988/04/21 21:00:00	3	0.2	72.10%	0.31
187	1988/12/21 03:00:00	1988/12/21 08:00:00	6	0.2	72.50%	0.31
188	1989/02/13 18:00:00	1989/02/13 21:00:00	4	0.2	72.90%	0.31
189	1992/03/03 14:00:00	1992/03/03 15:00:00	2	0.2	73.30%	0.31
190	1997/01/12 17:00:00	1997/01/13 06:00:00	14	0.2	73.60%	0.31
191	1998/03/29 03:00:00	1998/03/29 05:00:00	3	0.2	74.00%	0.3
192	1999/01/26 12:00:00	1999/01/26 13:00:00	2	0.2	74.40%	0.3
193	2000/02/21 17:00:00	2000/02/21 18:00:00	2	0.2	74.80%	0.3
194	1953/03/01 22:00:00	1953/03/02 01:00:00	4	0.1	75.20%	0.3
195	1961/11/20 18:00:00	1961/11/20 18:00:00	1	0.1	75.60%	0.3
196	1963/03/17 00:00:00	1963/03/17 01:00:00	2	0.1	76.00%	0.3
197	1965/12/10 15:00:00	1965/12/10 15:00:00	1	0.1	76.40%	0.29
198	1970/12/19 03:00:00	1970/12/19 13:00:00	11	0.1	76.70%	0.29
199	1971/12/22 10:00:00	1971/12/22 11:00:00	2	0.1	77.10%	0.29
200	1976/02/06 04:00:00	1976/02/06 07:00:00	4	0.1	77.50%	0.29
201	1976/03/01 16:00:00	1976/03/01 16:00:00	1	0.1	77.90%	0.29
202	1977/12/18 04:00:00	1977/12/18 05:00:00	2	0.1	78.30%	0.29
203	1979/03/28 09:00:00	1979/03/28 09:00:00	1	0.1	78.70%	0.29
204	1980/03/06 10:00:00	1980/03/06 10:00:00	1	0.1	79.10%	0.28
205	1982/12/22 22:00:00	1982/12/22 23:00:00	2	0.1	79.50%	0.28
206	1983/04/20 05:00:00	1983/04/20 06:00:00	2	0.1	79.80%	0.28
207	1983/11/20 10:00:00	1983/11/20 11:00:00	2	0.1	80.20%	0.28
208	1987/02/25 01:00:00	1987/02/25 02:00:00	2	0.1	80.60%	0.28
209	1987/10/12 12:00:00	1987/10/12 14:00:00	3	0.1	81.00%	0.28
210	1990/02/17 18:00:00	1990/02/17 18:00:00	1	0.1	81.40%	0.28
211	1991/02/27 23:00:00	1991/02/27 23:00:00	1	0.1	81.80%	0.28
212	1992/03/20 23:00:00	1992/03/20 23:00:00	1	0.1	82.20%	0.27
213	1993/02/18 13:00:00	1993/02/18 13:00:00	1	0.1	82.60%	0.27
214	1993/02/19 20:00:00	1993/02/20 00:00:00	5	0.1	82.90%	0.27
215	1993/03/28 03:00:00	1993/03/28 03:00:00	1	0.1	83.30%	0.27
216	1994/01/27 13:00:00	1994/01/27 13:00:00	1	0.1	83.70%	0.27
217	1994/04/26 18:00:00	1994/04/26 18:00:00	1	0.1	84.10%	0.27
218	1995/01/26 18:00:00	1995/01/26 18:00:00	1	0.1	84.50%	0.27
219	1995/04/18 11:00:00	1995/04/18 12:00:00	2	0.1	84.90%	0.27
220	1996/02/27 21:00:00	1996/02/27 21:00:00	1	0.1	85.30%	0.26
221	1997/01/15 18:00:00	1997/01/15 18:00:00	1	0.1	85.70%	0.26
222	1998/05/13 14:00:00	1998/05/13 15:00:00	2	0.1	86.00%	0.26
223	2006/01/02 14:00:00	2006/01/02 15:00:00	2	0.1	86.40%	0.26
224	2006/03/28 22:00:00	2006/03/29 08:00:00	11	0.1	86.80%	0.26
225	2006/04/04 22:00:00	2006/04/04 23:00:00	2	0.1	87.20%	0.26
226	1954/03/22 13:00:00	1954/03/23 11:00:00	23	0	87.60%	0.26
227	1957/10/14 03:00:00	1957/10/14 04:00:00	2	0	88.00%	0.26

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
228	1958/02/19 13:00:00	1958/02/19 13:00:00	1	0	88.40%	0.25
229	1958/03/20 22:00:00	1958/03/20 22:00:00	1	0	88.80%	0.25
230	1966/11/07 16:00:00	1966/11/07 17:00:00	2	0	89.10%	0.25
231	1969/01/14 10:00:00	1969/01/14 10:00:00	1	0	89.50%	0.25
232	1969/02/15 23:00:00	1969/02/15 23:00:00	1	0	89.90%	0.25
233	1969/02/18 09:00:00	1969/02/18 15:00:00	7	0	90.30%	0.25
234	1969/02/22 04:00:00	1969/02/22 04:00:00	1	0	90.70%	0.25
235	1973/11/23 00:00:00	1973/11/23 00:00:00	1	0	91.10%	0.25
236	1975/03/08 08:00:00	1975/03/08 09:00:00	2	0	91.50%	0.25
237	1975/03/10 11:00:00	1975/03/10 12:00:00	2	0	91.90%	0.25
238	1976/03/02 23:00:00	1976/03/02 23:00:00	1	0	92.20%	0.24
239	1977/12/28 07:00:00	1977/12/28 07:00:00	1	0	92.60%	0.24
240	1978/01/19 08:00:00	1978/01/19 11:00:00	4	0	93.00%	0.24
241	1978/03/11 18:00:00	1978/03/11 18:00:00	1	0	93.40%	0.24
242	1978/12/18 12:00:00	1978/12/18 12:00:00	1	0	93.80%	0.24
243	1982/02/10 16:00:00	1982/02/10 16:00:00	1	0	94.20%	0.24
244	1983/03/22 23:00:00	1983/03/22 23:00:00	1	0	94.60%	0.24
245	1983/12/25 05:00:00	1983/12/25 05:00:00	1	0	95.00%	0.24
246	1984/11/13 09:00:00	1984/11/13 09:00:00	1	0	95.30%	0.24
247	1986/09/25 03:00:00	1986/09/25 03:00:00	1	0	95.70%	0.24
248	1987/12/04 21:00:00	1987/12/04 21:00:00	1	0	96.10%	0.23
249	1990/01/17 01:00:00	1990/01/17 02:00:00	2	0	96.50%	0.23
250	1996/12/09 18:00:00	1996/12/09 18:00:00	1	0	96.90%	0.23
251	1998/02/06 14:00:00	1998/02/06 14:00:00	1	0	97.30%	0.23
252	1998/02/17 07:00:00	1998/02/17 08:00:00	2	0	97.70%	0.23
253	2000/02/12 17:00:00	2000/02/12 18:00:00	2	0	98.10%	0.23
254	2000/10/29 22:00:00	2000/10/29 22:00:00	1	0	98.40%	0.23
255	2001/11/25 17:00:00	2001/11/25 17:00:00	1	0	98.80%	0.23
256	2005/10/18 04:00:00	2005/10/18 04:00:00	1	0	99.20%	0.23
257	2006/03/21 02:00:00	2006/03/21 02:00:00	1	0	99.60%	0.23
--End of Data----------						

SWMM.out file name: V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM Files\Current\ST Improvement\19025-HMP-POST.out

SWMM.out time stamp: 6/1/2022 4:55:14 PM

Peak Flow Statistics Table Values

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
1	1995/01/03 06:00:00	1995/01/14 00:00:00	259	3.8	0.10%	58
2	1963/02/09 15:00:00	1963/02/12 17:00:00	75	2.7	0.20%	29
3	1966/12/03 05:00:00	1966/12/08 17:00:00	133	2.3	0.30%	19.33
4	1978/01/14 13:00:00	1978/01/20 12:00:00	144	2.3	0.40%	14.5
5	1978/01/03 17:00:00	1978/01/07 13:00:00	93	2.2	0.50%	11.6
6	1980/01/27 18:00:00	1980/01/31 19:00:00	98	2.2	0.50%	9.67
7	1980/02/13 11:00:00	1980/02/23 01:00:00	231	2.2	0.60%	8.29
8	1965/11/22 04:00:00	1965/11/26 00:00:00	93	1.9	0.70%	7.25
9	1998/02/22 04:00:00	1998/02/25 23:00:00	92	1.9	0.80%	6.44
10	1980/01/07 05:00:00	1980/01/15 12:00:00	200	1.8	0.90%	5.8
11	1969/02/18 07:00:00	1969/02/27 13:00:00	223	1.7	1.00%	5.27
12	1998/01/09 12:00:00	1998/01/12 00:00:00	61	1.7	1.10%	4.83
13	2007/11/30 06:00:00	2007/12/02 20:00:00	63	1.7	1.20%	4.46
14	1969/01/18 20:00:00	1969/01/29 05:00:00	250	1.6	1.30%	4.14
15	1995/03/11 01:00:00	1995/03/13 12:00:00	60	1.6	1.40%	3.87
16	1986/02/13 04:00:00	1986/02/17 09:00:00	102	1.5	1.40%	3.63
17	1986/03/08 10:00:00	1986/03/18 14:00:00	245	1.5	1.50%	3.41
18	1993/01/12 14:00:00	1993/01/20 09:00:00	188	1.5	1.60%	3.22
19	1968/03/07 19:00:00	1968/03/10 06:00:00	60	1.3	1.70%	3.05
20	1995/03/03 04:00:00	1995/03/07 20:00:00	113	1.3	1.80%	2.9
21	2005/01/07 05:00:00	2005/01/13 03:00:00	143	1.3	1.90%	2.76
22	1978/02/05 09:00:00	1978/02/15 02:00:00	234	1.2	2.00%	2.64
23	1962/01/20 10:00:00	1962/01/23 23:00:00	86	1.1	2.10%	2.52
24	1970/02/28 12:00:00	1970/03/04 00:00:00	85	1.1	2.20%	2.42
25	1979/01/05 07:00:00	1979/01/08 02:00:00	68	1.1	2.30%	2.32
26	1997/12/06 07:00:00	1997/12/09 02:00:00	68	1.1	2.40%	2.23
27	1991/02/27 13:00:00	1991/03/03 13:00:00	97	1	2.40%	2.15
28	1956/01/25 14:00:00	1956/01/29 03:00:00	86	0.9	2.50%	2.07
29	1976/09/09 23:00:00	1976/09/12 21:00:00	71	0.9	2.60%	2
30	1982/03/14 03:00:00	1982/03/20 01:00:00	143	0.9	2.70%	1.93
31	1985/11/29 05:00:00	1985/12/03 11:00:00	103	0.9	2.80%	1.87
32	1991/03/25 05:00:00	1991/03/29 00:00:00	92	0.9	2.90%	1.81
33	1952/01/16 06:00:00	1952/01/21 07:00:00	122	0.8	3.00%	1.76
34	1959/02/11 06:00:00	1959/02/13 12:00:00	55	0.8	3.10%	1.71
35	1967/01/22 14:00:00	1967/01/26 17:00:00	100	0.8	3.20%	1.66
36	1970/11/28 18:00:00	1970/12/02 19:00:00	98	0.8	3.30%	1.61
37	1971/12/22 04:00:00	1971/12/29 17:00:00	182	0.8	3.40%	1.57
38	1983/02/26 09:00:00	1983/03/06 10:00:00	194	0.8	3.40%	1.53
39	2004/10/17 03:00:00	2004/10/22 13:00:00	131	0.8	3.50%	1.49

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
40	2005/02/17 18:00:00	2005/02/26 07:00:00	206	0.8	3.60%	1.45
41	1964/01/21 05:00:00	1964/01/24 04:00:00	72	0.7	3.70%	1.42
42	1974/01/04 14:00:00	1974/01/10 02:00:00	133	0.7	3.80%	1.38
43	1978/02/27 03:00:00	1978/03/07 13:00:00	203	0.7	3.90%	1.35
44	1982/11/29 06:00:00	1982/12/02 07:00:00	74	0.7	4.00%	1.32
45	1993/01/06 00:00:00	1993/01/11 07:00:00	128	0.7	4.10%	1.29
46	1954/02/13 12:00:00	1954/02/16 00:00:00	61	0.6	4.20%	1.26
47	1958/03/15 12:00:00	1958/03/18 06:00:00	67	0.6	4.30%	1.23
48	1977/05/07 20:00:00	1977/05/11 02:00:00	79	0.6	4.30%	1.21
49	1981/12/30 06:00:00	1982/01/03 12:00:00	103	0.6	4.40%	1.18
50	1996/11/21 11:00:00	1996/11/24 10:00:00	72	0.6	4.50%	1.16
51	1998/02/14 12:00:00	1998/02/20 16:00:00	149	0.6	4.60%	1.14
52	2001/01/10 19:00:00	2001/01/13 13:00:00	67	0.6	4.70%	1.12
53	2004/02/21 20:00:00	2004/02/24 17:00:00	70	0.6	4.80%	1.09
54	2004/10/27 02:00:00	2004/10/29 19:00:00	66	0.6	4.90%	1.07
55	1951/12/28 17:00:00	1952/01/01 12:00:00	92	0.5	5.00%	1.06
56	1955/01/18 14:00:00	1955/01/20 16:00:00	51	0.5	5.10%	1.04
57	1957/01/12 02:00:00	1957/01/15 01:00:00	72	0.5	5.20%	1.02
58	1958/02/02 19:00:00	1958/02/06 10:00:00	88	0.5	5.30%	1
59	1969/02/05 06:00:00	1969/02/08 09:00:00	76	0.5	5.30%	0.98
60	1973/02/11 02:00:00	1973/02/14 12:00:00	83	0.5	5.40%	0.97
61	1983/01/27 06:00:00	1983/01/30 20:00:00	87	0.5	5.50%	0.95
62	1990/06/09 09:00:00	1990/06/11 17:00:00	57	0.5	5.60%	0.94
63	1996/06/01 02:00:00	1996/06/02 02:00:00	25	0.5	5.70%	0.92
64	1998/02/03 11:00:00	1998/02/10 15:00:00	173	0.5	5.80%	0.91
65	1956/04/12 20:00:00	1956/04/15 13:00:00	66	0.4	5.90%	0.89
66	1958/04/06 14:00:00	1958/04/09 05:00:00	64	0.4	6.00%	0.88
67	1961/12/01 19:00:00	1961/12/04 15:00:00	69	0.4	6.10%	0.87
68	1963/11/20 04:00:00	1963/11/22 21:00:00	66	0.4	6.20%	0.85
69	1976/02/03 18:00:00	1976/02/11 17:00:00	192	0.4	6.30%	0.84
70	1977/01/05 19:00:00	1977/01/09 01:00:00	79	0.4	6.30%	0.83
71	1990/02/17 04:00:00	1990/02/19 17:00:00	62	0.4	6.40%	0.82
72	1992/02/09 23:00:00	1992/02/17 11:00:00	181	0.4	6.50%	0.81
73	1993/02/07 19:00:00	1993/02/10 14:00:00	68	0.4	6.60%	0.8
74	1997/01/25 14:00:00	1997/01/28 11:00:00	70	0.4	6.70%	0.78
75	2004/02/25 22:00:00	2004/02/28 01:00:00	52	0.4	6.80%	0.77
76	1952/03/15 11:00:00	1952/03/18 03:00:00	65	0.3	6.90%	0.76
77	1954/01/18 07:00:00	1954/01/21 22:00:00	88	0.3	7.00%	0.75
78	1954/01/24 03:00:00	1954/01/27 01:00:00	71	0.3	7.10%	0.74
79	1957/01/24 13:00:00	1957/01/31 07:00:00	163	0.3	7.20%	0.73
80	1960/01/10 08:00:00	1960/01/16 08:00:00	145	0.3	7.20%	0.73
81	1960/02/01 18:00:00	1960/02/03 18:00:00	49	0.3	7.30%	0.72
82	1965/12/09 06:00:00	1965/12/17 06:00:00	193	0.3	7.40%	0.71
83	1967/03/13 07:00:00	1967/03/15 15:00:00	57	0.3	7.50%	0.7
84	1967/11/19 04:00:00	1967/11/23 04:00:00	97	0.3	7.60%	0.69
85	1973/01/16 16:00:00	1973/01/20 17:00:00	98	0.3	7.70%	0.68
86	1974/12/04 01:00:00	1974/12/06 04:00:00	52	0.3	7.80%	0.67

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
87	1978/01/09 12:00:00	1978/01/12 10:00:00	71	0.3	7.90%	0.67
88	1983/11/24 20:00:00	1983/11/26 07:00:00	36	0.3	8.00%	0.66
89	1987/10/11 13:00:00	1987/10/14 09:00:00	69	0.3	8.10%	0.65
90	1997/01/12 12:00:00	1997/01/16 13:00:00	98	0.3	8.20%	0.64
91	2008/01/05 00:00:00	2008/01/08 20:00:00	93	0.3	8.20%	0.64
92	2008/01/26 22:00:00	2008/01/30 00:00:00	75	0.3	8.30%	0.63
93	1952/03/07 05:00:00	1952/03/14 01:00:00	165	0.2	8.40%	0.62
94	1952/11/14 15:00:00	1952/11/17 23:00:00	81	0.2	8.50%	0.62
95	1958/04/01 06:00:00	1958/04/05 10:00:00	101	0.2	8.60%	0.61
96	1964/03/21 23:00:00	1964/03/25 06:00:00	80	0.2	8.70%	0.6
97	1964/12/27 06:00:00	1964/12/29 21:00:00	64	0.2	8.80%	0.6
98	1965/11/14 07:00:00	1965/11/18 21:00:00	111	0.2	8.90%	0.59
99	1967/04/11 06:00:00	1967/04/13 14:00:00	57	0.2	9.00%	0.59
100	1969/01/13 22:00:00	1969/01/16 04:00:00	55	0.2	9.10%	0.58
101	1970/12/16 22:00:00	1970/12/23 15:00:00	162	0.2	9.10%	0.57
102	1972/12/04 09:00:00	1972/12/09 15:00:00	127	0.2	9.20%	0.57
103	1974/03/06 10:00:00	1974/03/10 03:00:00	90	0.2	9.30%	0.56
104	1975/04/04 15:00:00	1975/04/10 18:00:00	148	0.2	9.40%	0.56
105	1976/03/01 10:00:00	1976/03/04 14:00:00	77	0.2	9.50%	0.55
106	1979/01/14 16:00:00	1979/01/19 04:00:00	109	0.2	9.60%	0.55
107	1981/01/28 05:00:00	1981/01/31 13:00:00	81	0.2	9.70%	0.54
108	1982/01/20 02:00:00	1982/01/22 23:00:00	70	0.2	9.80%	0.54
109	1982/02/09 19:00:00	1982/02/12 12:00:00	66	0.2	9.90%	0.53
110	1982/12/22 12:00:00	1982/12/24 14:00:00	51	0.2	10.00%	0.53
111	1983/03/21 03:00:00	1983/03/26 02:00:00	120	0.2	10.10%	0.52
112	1986/09/23 22:00:00	1986/09/26 21:00:00	72	0.2	10.10%	0.52
113	1986/11/17 12:00:00	1986/11/19 20:00:00	57	0.2	10.20%	0.51
114	1988/12/24 17:00:00	1988/12/26 19:00:00	51	0.2	10.30%	0.51
115	1991/12/29 14:00:00	1991/12/31 16:00:00	51	0.2	10.40%	0.5
116	1992/01/05 07:00:00	1992/01/08 22:00:00	88	0.2	10.50%	0.5
117	1993/02/18 10:00:00	1993/02/21 18:00:00	81	0.2	10.60%	0.5
118	2005/02/10 21:00:00	2005/02/14 14:00:00	90	0.2	10.70%	0.49
119	2006/02/27 17:00:00	2006/03/01 20:00:00	52	0.2	10.80%	0.49
120	1951/08/28 05:00:00	1951/08/29 13:00:00	33	0.1	10.90%	0.48
121	1951/10/25 02:00:00	1951/10/27 08:00:00	55	0.1	11.00%	0.48
122	1951/12/04 23:00:00	1951/12/06 00:00:00	26	0.1	11.10%	0.48
123	1951/12/11 17:00:00	1951/12/13 02:00:00	34	0.1	11.10%	0.47
124	1952/01/12 16:00:00	1952/01/14 16:00:00	49	0.1	11.20%	0.47
125	1952/04/10 10:00:00	1952/04/12 05:00:00	44	0.1	11.30%	0.46
126	1952/11/30 00:00:00	1952/12/03 10:00:00	83	0.1	11.40%	0.46
127	1952/12/17 07:00:00	1952/12/18 11:00:00	29	0.1	11.50%	0.46
128	1952/12/20 08:00:00	1952/12/22 02:00:00	43	0.1	11.60%	0.45
129	1953/01/06 14:00:00	1953/01/09 05:00:00	64	0.1	11.70%	0.45
130	1954/01/11 23:00:00	1954/01/13 13:00:00	39	0.1	11.80%	0.45
131	1954/03/20 09:00:00	1954/03/25 21:00:00	133	0.1	11.90%	0.44
132	1954/07/13 04:00:00	1954/07/13 22:00:00	19	0.1	12.00%	0.44
133	1954/11/10 21:00:00	1954/11/12 18:00:00	46	0.1	12.00%	0.44

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
134	1955/01/09 23:00:00	1955/01/11 06:00:00	32	0.1	12.10%	0.43
135	1955/01/16 07:00:00	1955/01/17 09:00:00	27	0.1	12.20%	0.43
136	1955/02/26 07:00:00	1955/02/28 15:00:00	57	0.1	12.30%	0.43
137	1955/04/30 19:00:00	1955/05/02 14:00:00	44	0.1	12.40%	0.42
138	1955/11/14 04:00:00	1955/11/15 02:00:00	23	0.1	12.50%	0.42
139	1957/01/07 06:00:00	1957/01/10 23:00:00	90	0.1	12.60%	0.42
140	1957/02/28 12:00:00	1957/03/02 20:00:00	57	0.1	12.70%	0.41
141	1957/12/15 05:00:00	1957/12/18 05:00:00	73	0.1	12.80%	0.41
142	1958/01/25 00:00:00	1958/01/27 20:00:00	69	0.1	12.90%	0.41
143	1958/02/19 07:00:00	1958/02/20 23:00:00	41	0.1	13.00%	0.41
144	1958/02/25 06:00:00	1958/02/26 08:00:00	27	0.1	13.00%	0.4
145	1958/03/06 08:00:00	1958/03/07 23:00:00	40	0.1	13.10%	0.4
146	1958/03/20 16:00:00	1958/03/23 07:00:00	64	0.1	13.20%	0.4
147	1958/03/27 11:00:00	1958/03/28 11:00:00	25	0.1	13.30%	0.4
148	1959/02/16 02:00:00	1959/02/17 23:00:00	46	0.1	13.40%	0.39
149	1959/02/21 09:00:00	1959/02/22 14:00:00	30	0.1	13.50%	0.39
150	1959/12/24 01:00:00	1959/12/26 03:00:00	51	0.1	13.60%	0.39
151	1960/02/28 16:00:00	1960/03/02 10:00:00	67	0.1	13.70%	0.38
152	1960/04/27 02:00:00	1960/04/28 16:00:00	39	0.1	13.80%	0.38
153	1960/11/26 16:00:00	1960/11/27 19:00:00	28	0.1	13.90%	0.38
154	1961/01/26 07:00:00	1961/01/27 19:00:00	37	0.1	13.90%	0.38
155	1961/03/28 00:00:00	1961/03/29 19:00:00	44	0.1	14.00%	0.37
156	1961/11/20 13:00:00	1961/11/21 18:00:00	30	0.1	14.10%	0.37
157	1962/02/07 18:00:00	1962/02/12 14:00:00	117	0.1	14.20%	0.37
158	1962/02/19 07:00:00	1962/02/21 20:00:00	62	0.1	14.30%	0.37
159	1962/03/18 17:00:00	1962/03/20 06:00:00	38	0.1	14.40%	0.37
160	1963/03/16 22:00:00	1963/03/18 04:00:00	31	0.1	14.50%	0.36
161	1963/09/17 04:00:00	1963/09/20 09:00:00	78	0.1	14.60%	0.36
162	1964/11/17 10:00:00	1964/11/18 23:00:00	38	0.1	14.70%	0.36
163	1965/03/31 13:00:00	1965/04/05 14:00:00	122	0.1	14.80%	0.36
164	1965/04/07 05:00:00	1965/04/13 04:00:00	144	0.1	14.90%	0.35
165	1965/12/29 05:00:00	1966/01/01 04:00:00	72	0.1	14.90%	0.35
166	1966/01/30 06:00:00	1966/01/31 19:00:00	38	0.1	15.00%	0.35
167	1966/02/06 10:00:00	1966/02/08 09:00:00	48	0.1	15.10%	0.35
168	1966/11/07 12:00:00	1966/11/09 13:00:00	50	0.1	15.20%	0.35
169	1967/12/18 12:00:00	1967/12/21 02:00:00	63	0.1	15.30%	0.34
170	1968/04/01 19:00:00	1968/04/03 20:00:00	50	0.1	15.40%	0.34
171	1968/12/25 16:00:00	1968/12/27 00:00:00	33	0.1	15.50%	0.34
172	1969/03/21 11:00:00	1969/03/22 14:00:00	28	0.1	15.60%	0.34
173	1970/02/10 00:00:00	1970/02/11 22:00:00	47	0.1	15.70%	0.34
174	1972/11/11 03:00:00	1972/11/12 02:00:00	24	0.1	15.80%	0.33
175	1972/11/14 11:00:00	1972/11/18 20:00:00	106	0.1	15.90%	0.33
176	1973/02/06 02:00:00	1973/02/08 12:00:00	59	0.1	15.90%	0.33
177	1973/03/04 06:00:00	1973/03/07 10:00:00	77	0.1	16.00%	0.33
178	1973/03/09 01:00:00	1973/03/11 15:00:00	63	0.1	16.10%	0.33
179	1973/03/18 06:00:00	1973/03/20 22:00:00	65	0.1	16.20%	0.32
180	1973/11/17 02:00:00	1973/11/19 10:00:00	57	0.1	16.30%	0.32

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
181	1973/11/22 22:00:00	1973/11/23 23:00:00	26	0.1	16.40%	0.32
182	1974/03/02 07:00:00	1974/03/04 03:00:00	45	0.1	16.50%	0.32
183	1974/10/28 08:00:00	1974/10/30 05:00:00	46	0.1	16.60%	0.32
184	1974/12/28 06:00:00	1974/12/30 07:00:00	50	0.1	16.70%	0.32
185	1975/02/03 05:00:00	1975/02/05 19:00:00	63	0.1	16.80%	0.31
186	1975/03/05 13:00:00	1975/03/12 17:00:00	173	0.1	16.80%	0.31
187	1976/04/12 15:00:00	1976/04/15 17:00:00	75	0.1	16.90%	0.31
188	1976/12/30 12:00:00	1977/01/01 06:00:00	43	0.1	17.00%	0.31
189	1977/01/02 22:00:00	1977/01/04 16:00:00	43	0.1	17.10%	0.31
190	1977/03/25 01:00:00	1977/03/26 01:00:00	25	0.1	17.20%	0.31
191	1977/08/16 15:00:00	1977/08/19 10:00:00	68	0.1	17.30%	0.3
192	1977/12/08 13:00:00	1977/12/19 03:00:00	255	0.1	17.40%	0.3
193	1977/12/25 16:00:00	1977/12/30 10:00:00	115	0.1	17.50%	0.3
194	1978/03/30 20:00:00	1978/04/02 13:00:00	66	0.1	17.60%	0.3
195	1978/09/05 17:00:00	1978/09/06 21:00:00	29	0.1	17.70%	0.3
196	1978/11/10 08:00:00	1978/11/14 22:00:00	111	0.1	17.80%	0.3
197	1978/12/16 23:00:00	1978/12/20 08:00:00	82	0.1	17.80%	0.29
198	1979/01/30 17:00:00	1979/02/03 07:00:00	87	0.1	17.90%	0.29
199	1979/02/20 23:00:00	1979/02/24 04:00:00	78	0.1	18.00%	0.29
200	1979/03/01 07:00:00	1979/03/02 10:00:00	28	0.1	18.10%	0.29
201	1979/03/17 04:00:00	1979/03/18 01:00:00	22	0.1	18.20%	0.29
202	1979/03/19 03:00:00	1979/03/22 03:00:00	73	0.1	18.30%	0.29
203	1979/03/27 03:00:00	1979/03/29 23:00:00	69	0.1	18.40%	0.29
204	1979/10/20 01:00:00	1979/10/21 18:00:00	42	0.1	18.50%	0.28
205	1980/03/02 19:00:00	1980/03/07 19:00:00	121	0.1	18.60%	0.28
206	1980/12/04 08:00:00	1980/12/06 09:00:00	50	0.1	18.70%	0.28
207	1981/02/08 15:00:00	1981/02/10 18:00:00	52	0.1	18.80%	0.28
208	1981/02/28 11:00:00	1981/03/03 04:00:00	66	0.1	18.80%	0.28
209	1981/03/19 19:00:00	1981/03/21 01:00:00	31	0.1	18.90%	0.28
210	1981/11/26 18:00:00	1981/11/30 08:00:00	87	0.1	19.00%	0.28
211	1982/01/08 08:00:00	1982/01/09 15:00:00	32	0.1	19.10%	0.28
212	1982/04/01 09:00:00	1982/04/02 23:00:00	39	0.1	19.20%	0.27
213	1982/09/26 01:00:00	1982/09/27 10:00:00	34	0.1	19.30%	0.27
214	1982/11/09 13:00:00	1982/11/11 15:00:00	51	0.1	19.40%	0.27
215	1983/03/17 01:00:00	1983/03/19 19:00:00	67	0.1	19.50%	0.27
216	1983/04/20 02:00:00	1983/04/22 00:00:00	47	0.1	19.60%	0.27
217	1983/09/29 10:00:00	1983/10/02 16:00:00	79	0.1	19.70%	0.27
218	1983/11/11 17:00:00	1983/11/14 04:00:00	60	0.1	19.70%	0.27
219	1983/11/20 07:00:00	1983/11/21 13:00:00	31	0.1	19.80%	0.27
220	1983/12/03 14:00:00	1983/12/04 10:00:00	21	0.1	19.90%	0.26
221	1983/12/24 17:00:00	1983/12/28 05:00:00	85	0.1	20.00%	0.26
222	1984/11/13 07:00:00	1984/11/14 04:00:00	22	0.1	20.10%	0.26
223	1984/11/24 15:00:00	1984/11/25 18:00:00	28	0.1	20.20%	0.26
224	1984/12/10 18:00:00	1984/12/12 02:00:00	33	0.1	20.30%	0.26
225	1984/12/18 07:00:00	1984/12/21 15:00:00	81	0.1	20.40%	0.26
226	1984/12/26 13:00:00	1984/12/29 09:00:00	69	0.1	20.50%	0.26
227	1985/02/09 00:00:00	1985/02/10 15:00:00	40	0.1	20.60%	0.26

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
228	1985/11/11 04:00:00	1985/11/13 13:00:00	58	0.1	20.70%	0.25
229	1985/11/24 14:00:00	1985/11/26 19:00:00	54	0.1	20.70%	0.25
230	1986/02/07 20:00:00	1986/02/09 10:00:00	39	0.1	20.80%	0.25
231	1987/01/04 13:00:00	1987/01/08 20:00:00	104	0.1	20.90%	0.25
232	1987/11/04 14:00:00	1987/11/06 12:00:00	47	0.1	21.00%	0.25
233	1987/12/04 19:00:00	1987/12/05 22:00:00	28	0.1	21.10%	0.25
234	1987/12/16 11:00:00	1987/12/19 22:00:00	84	0.1	21.20%	0.25
235	1988/01/17 04:00:00	1988/01/19 07:00:00	52	0.1	21.30%	0.25
236	1988/02/02 00:00:00	1988/02/03 12:00:00	37	0.1	21.40%	0.25
237	1988/04/14 17:00:00	1988/04/15 20:00:00	28	0.1	21.50%	0.25
238	1988/04/19 21:00:00	1988/04/23 18:00:00	94	0.1	21.60%	0.24
239	1988/11/25 04:00:00	1988/11/26 07:00:00	28	0.1	21.60%	0.24
240	1988/12/15 07:00:00	1988/12/19 01:00:00	91	0.1	21.70%	0.24
241	1988/12/20 22:00:00	1988/12/23 04:00:00	55	0.1	21.80%	0.24
242	1989/02/12 15:00:00	1989/02/14 18:00:00	52	0.1	21.90%	0.24
243	1990/01/13 05:00:00	1990/01/15 20:00:00	64	0.1	22.00%	0.24
244	1990/01/17 00:00:00	1990/01/18 08:00:00	33	0.1	22.10%	0.24
245	1990/05/28 04:00:00	1990/05/29 10:00:00	31	0.1	22.20%	0.24
246	1990/11/19 21:00:00	1990/11/21 02:00:00	30	0.1	22.30%	0.24
247	1991/03/19 00:00:00	1991/03/22 11:00:00	84	0.1	22.40%	0.24
248	1992/02/06 05:00:00	1992/02/08 15:00:00	59	0.1	22.50%	0.23
249	1992/03/02 01:00:00	1992/03/04 21:00:00	69	0.1	22.60%	0.23
250	1992/03/20 15:00:00	1992/03/24 18:00:00	100	0.1	22.60%	0.23
251	1992/12/07 07:00:00	1992/12/09 01:00:00	43	0.1	22.70%	0.23
252	1993/01/30 23:00:00	1993/01/31 20:00:00	22	0.1	22.80%	0.23
253	1993/02/23 16:00:00	1993/02/24 19:00:00	28	0.1	22.90%	0.23
254	1994/01/24 23:00:00	1994/01/26 03:00:00	29	0.1	23.00%	0.23
255	1994/02/03 19:00:00	1994/02/05 17:00:00	47	0.1	23.10%	0.23
256	1994/02/07 02:00:00	1994/02/09 18:00:00	65	0.1	23.20%	0.23
257	1994/02/17 08:00:00	1994/02/19 07:00:00	48	0.1	23.30%	0.23
258	1994/03/06 04:00:00	1994/03/08 02:00:00	47	0.1	23.40%	0.23
259	1994/03/19 02:00:00	1994/03/20 09:00:00	32	0.1	23.50%	0.22
260	1994/03/24 20:00:00	1994/03/25 21:00:00	26	0.1	23.60%	0.22
261	1994/04/25 15:00:00	1994/04/28 06:00:00	64	0.1	23.60%	0.22
262	1995/02/13 12:00:00	1995/02/15 22:00:00	59	0.1	23.70%	0.22
263	1995/04/18 09:00:00	1995/04/19 16:00:00	32	0.1	23.80%	0.22
264	1995/12/13 00:00:00	1995/12/14 17:00:00	42	0.1	23.90%	0.22
265	1996/01/31 03:00:00	1996/02/03 17:00:00	87	0.1	24.00%	0.22
266	1996/02/19 22:00:00	1996/02/22 11:00:00	62	0.1	24.10%	0.22
267	1996/02/27 20:00:00	1996/02/28 21:00:00	26	0.1	24.20%	0.22
268	1996/03/12 15:00:00	1996/03/14 13:00:00	47	0.1	24.30%	0.22
269	1996/10/30 10:00:00	1996/10/31 10:00:00	25	0.1	24.40%	0.22
270	1996/12/09 14:00:00	1996/12/13 05:00:00	88	0.1	24.50%	0.22
271	1997/01/22 23:00:00	1997/01/24 05:00:00	31	0.1	24.50%	0.21
272	1997/09/25 03:00:00	1997/09/26 14:00:00	36	0.1	24.60%	0.21
273	1998/03/24 22:00:00	1998/04/01 14:00:00	185	0.1	24.70%	0.21
274	1998/05/04 12:00:00	1998/05/06 08:00:00	45	0.1	24.80%	0.21

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
275	1998/05/12 15:00:00	1998/05/14 21:00:00	55	0.1	24.90%	0.21
276	1998/11/08 05:00:00	1998/11/09 21:00:00	41	0.1	25.00%	0.21
277	2000/02/20 02:00:00	2000/02/24 07:00:00	102	0.1	25.10%	0.21
278	2000/03/04 02:00:00	2000/03/09 08:00:00	127	0.1	25.20%	0.21
279	2000/04/17 16:00:00	2000/04/19 04:00:00	37	0.1	25.30%	0.21
280	2000/10/29 19:00:00	2000/10/31 06:00:00	36	0.1	25.40%	0.21
281	2003/12/24 22:00:00	2003/12/27 03:00:00	54	0.1	25.50%	0.21
282	2004/02/02 22:00:00	2004/02/03 22:00:00	25	0.1	25.50%	0.21
283	2004/12/28 05:00:00	2005/01/01 18:00:00	110	0.1	25.60%	0.21
284	2005/01/03 05:00:00	2005/01/05 20:00:00	64	0.1	25.70%	0.2
285	2005/01/26 12:00:00	2005/01/29 12:00:00	73	0.1	25.80%	0.2
286	2005/04/28 06:00:00	2005/04/29 12:00:00	31	0.1	25.90%	0.2
287	2005/10/16 16:00:00	2005/10/18 23:00:00	56	0.1	26.00%	0.2
288	2005/12/31 15:00:00	2006/01/03 21:00:00	79	0.1	26.10%	0.2
289	2006/03/10 04:00:00	2006/03/13 03:00:00	72	0.1	26.20%	0.2
290	2006/03/20 23:00:00	2006/03/21 20:00:00	22	0.1	26.30%	0.2
291	2006/04/04 17:00:00	2006/04/06 17:00:00	49	0.1	26.40%	0.2
292	2006/10/13 21:00:00	2006/10/14 23:00:00	27	0.1	26.40%	0.2
293	2007/01/30 13:00:00	2007/01/31 20:00:00	32	0.1	26.50%	0.2
294	2008/02/03 06:00:00	2008/02/04 21:00:00	40	0.1	26.60%	0.2
295	2008/02/22 02:00:00	2008/02/24 19:00:00	66	0.1	26.70%	0.2
296	1951/07/25 05:00:00	1951/07/25 15:00:00	11	0	26.80%	0.2
297	1951/09/28 01:00:00	1951/09/28 07:00:00	7	0	26.90%	0.2
298	1951/10/03 01:00:00	1951/10/03 04:00:00	4	0	27.00%	0.2
299	1951/10/29 21:00:00	1951/10/30 11:00:00	15	0	27.10%	0.19
300	1951/11/12 20:00:00	1951/11/13 10:00:00	15	0	27.20%	0.19
301	1951/11/20 00:00:00	1951/11/21 10:00:00	35	0	27.30%	0.19
302	1951/11/22 20:00:00	1951/11/23 19:00:00	24	0	27.40%	0.19
303	1951/12/01 22:00:00	1951/12/02 12:00:00	15	0	27.40%	0.19
304	1951/12/19 06:00:00	1951/12/20 02:00:00	21	0	27.50%	0.19
305	1952/01/07 03:00:00	1952/01/08 14:00:00	36	0	27.60%	0.19
306	1952/01/25 02:00:00	1952/01/26 01:00:00	24	0	27.70%	0.19
307	1952/02/09 19:00:00	1952/02/10 00:00:00	6	0	27.80%	0.19
308	1952/02/17 22:00:00	1952/02/18 03:00:00	6	0	27.90%	0.19
309	1952/02/29 10:00:00	1952/03/02 01:00:00	40	0	28.00%	0.19
310	1952/03/19 10:00:00	1952/03/19 13:00:00	4	0	28.10%	0.19
311	1952/04/07 10:00:00	1952/04/08 02:00:00	17	0	28.20%	0.19
312	1952/04/19 10:00:00	1952/04/19 12:00:00	3	0	28.30%	0.19
313	1952/04/25 07:00:00	1952/04/26 01:00:00	19	0	28.40%	0.19
314	1952/04/28 01:00:00	1952/04/28 15:00:00	15	0	28.40%	0.19
315	1952/09/19 13:00:00	1952/09/19 19:00:00	7	0	28.50%	0.18
316	1952/11/22 22:00:00	1952/11/23 18:00:00	21	0	28.60%	0.18
317	1952/12/06 02:00:00	1952/12/06 09:00:00	8	0	28.70%	0.18
318	1952/12/08 10:00:00	1952/12/08 15:00:00	6	0	28.80%	0.18
319	1952/12/27 17:00:00	1952/12/28 22:00:00	30	0	28.90%	0.18
320	1952/12/30 19:00:00	1952/12/31 16:00:00	22	0	29.00%	0.18
321	1953/01/13 10:00:00	1953/01/14 02:00:00	17	0	29.10%	0.18

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
322	1953/02/23 08:00:00	1953/02/24 10:00:00	27	0	29.20%	0.18
323	1953/03/01 01:00:00	1953/03/02 17:00:00	41	0	29.30%	0.18
324	1953/03/20 00:00:00	1953/03/20 09:00:00	10	0	29.30%	0.18
325	1953/04/20 10:00:00	1953/04/20 17:00:00	8	0	29.40%	0.18
326	1953/04/21 20:00:00	1953/04/21 22:00:00	3	0	29.50%	0.18
327	1953/04/27 15:00:00	1953/04/28 16:00:00	26	0	29.60%	0.18
328	1953/04/29 19:00:00	1953/04/30 13:00:00	19	0	29.70%	0.18
329	1953/05/28 03:00:00	1953/05/28 06:00:00	4	0	29.80%	0.18
330	1953/10/22 06:00:00	1953/10/23 01:00:00	20	0	29.90%	0.18
331	1953/11/05 06:00:00	1953/11/05 13:00:00	8	0	30.00%	0.18
332	1953/11/14 15:00:00	1953/11/15 07:00:00	17	0	30.10%	0.18
333	1953/11/20 06:00:00	1953/11/20 10:00:00	5	0	30.20%	0.17
334	1953/12/04 08:00:00	1953/12/04 15:00:00	8	0	30.30%	0.17
335	1954/02/18 03:00:00	1954/02/18 08:00:00	6	0	30.30%	0.17
336	1954/03/10 18:00:00	1954/03/10 22:00:00	5	0	30.40%	0.17
337	1954/03/16 20:00:00	1954/03/17 23:00:00	28	0	30.50%	0.17
338	1954/03/29 20:00:00	1954/03/30 20:00:00	25	0	30.60%	0.17
339	1954/04/28 04:00:00	1954/04/28 13:00:00	10	0	30.70%	0.17
340	1954/06/09 06:00:00	1954/06/09 08:00:00	3	0	30.80%	0.17
341	1954/12/03 06:00:00	1954/12/04 06:00:00	25	0	30.90%	0.17
342	1954/12/09 20:00:00	1954/12/10 17:00:00	22	0	31.00%	0.17
343	1955/01/01 17:00:00	1955/01/02 12:00:00	20	0	31.10%	0.17
344	1955/01/04 01:00:00	1955/01/04 05:00:00	5	0	31.20%	0.17
345	1955/01/05 07:00:00	1955/01/06 18:00:00	36	0	31.30%	0.17
346	1955/01/30 22:00:00	1955/01/31 09:00:00	12	0	31.30%	0.17
347	1955/02/16 16:00:00	1955/02/18 00:00:00	33	0	31.40%	0.17
348	1955/03/10 20:00:00	1955/03/11 06:00:00	11	0	31.50%	0.17
349	1955/04/18 08:00:00	1955/04/18 10:00:00	3	0	31.60%	0.17
350	1955/04/22 00:00:00	1955/04/22 18:00:00	19	0	31.70%	0.17
351	1955/04/26 09:00:00	1955/04/26 16:00:00	8	0	31.80%	0.17
352	1955/05/25 00:00:00	1955/05/25 05:00:00	6	0	31.90%	0.17
353	1955/11/17 04:00:00	1955/11/17 22:00:00	19	0	32.00%	0.16
354	1955/11/21 07:00:00	1955/11/22 04:00:00	22	0	32.10%	0.16
355	1955/12/01 17:00:00	1955/12/02 17:00:00	25	0	32.20%	0.16
356	1955/12/04 07:00:00	1955/12/04 17:00:00	11	0	32.20%	0.16
357	1955/12/07 00:00:00	1955/12/07 06:00:00	7	0	32.30%	0.16
358	1956/01/23 08:00:00	1956/01/23 15:00:00	8	0	32.40%	0.16
359	1956/01/31 03:00:00	1956/01/31 18:00:00	16	0	32.50%	0.16
360	1956/02/23 03:00:00	1956/02/24 18:00:00	40	0	32.60%	0.16
361	1956/02/25 19:00:00	1956/02/25 22:00:00	4	0	32.70%	0.16
362	1956/03/31 22:00:00	1956/04/02 02:00:00	29	0	32.80%	0.16
363	1956/04/11 09:00:00	1956/04/11 14:00:00	6	0	32.90%	0.16
364	1956/04/26 15:00:00	1956/04/26 18:00:00	4	0	33.00%	0.16
365	1956/05/09 03:00:00	1956/05/09 14:00:00	12	0	33.10%	0.16
366	1956/10/23 03:00:00	1956/10/23 12:00:00	10	0	33.20%	0.16
367	1956/10/28 19:00:00	1956/10/29 14:00:00	20	0	33.20%	0.16
368	1956/12/05 15:00:00	1956/12/06 14:00:00	24	0	33.30%	0.16

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
369	1957/01/04 21:00:00	1957/01/05 19:00:00	23	0	33.40%	0.16
370	1957/01/20 22:00:00	1957/01/21 05:00:00	8	0	33.50%	0.16
371	1957/02/23 04:00:00	1957/02/24 02:00:00	23	0	33.60%	0.16
372	1957/03/09 16:00:00	1957/03/09 23:00:00	8	0	33.70%	0.16
373	1957/03/16 08:00:00	1957/03/17 02:00:00	19	0	33.80%	0.16
374	1957/04/18 01:00:00	1957/04/18 09:00:00	9	0	33.90%	0.16
375	1957/04/20 14:00:00	1957/04/22 14:00:00	49	0	34.00%	0.16
376	1957/05/10 21:00:00	1957/05/11 11:00:00	15	0	34.10%	0.15
377	1957/05/19 03:00:00	1957/05/19 17:00:00	15	0	34.10%	0.15
378	1957/05/21 02:00:00	1957/05/21 09:00:00	8	0	34.20%	0.15
379	1957/06/09 23:00:00	1957/06/10 17:00:00	19	0	34.30%	0.15
380	1957/10/11 07:00:00	1957/10/11 23:00:00	17	0	34.40%	0.15
381	1957/10/13 18:00:00	1957/10/14 21:00:00	28	0	34.50%	0.15
382	1957/10/21 03:00:00	1957/10/21 10:00:00	8	0	34.60%	0.15
383	1957/10/30 15:00:00	1957/10/31 10:00:00	20	0	34.70%	0.15
384	1957/11/02 18:00:00	1957/11/03 22:00:00	29	0	34.80%	0.15
385	1957/11/05 14:00:00	1957/11/05 19:00:00	6	0	34.90%	0.15
386	1957/11/16 18:00:00	1957/11/17 01:00:00	8	0	35.00%	0.15
387	1957/12/05 01:00:00	1957/12/06 12:00:00	36	0	35.10%	0.15
388	1958/02/12 23:00:00	1958/02/13 05:00:00	7	0	35.10%	0.15
389	1958/03/02 17:00:00	1958/03/02 20:00:00	4	0	35.20%	0.15
390	1958/03/11 00:00:00	1958/03/13 01:00:00	50	0	35.30%	0.15
391	1958/05/11 08:00:00	1958/05/11 15:00:00	8	0	35.40%	0.15
392	1958/09/23 17:00:00	1958/09/24 11:00:00	19	0	35.50%	0.15
393	1958/10/24 23:00:00	1958/10/25 04:00:00	6	0	35.60%	0.15
394	1958/11/11 05:00:00	1958/11/11 09:00:00	5	0	35.70%	0.15
395	1958/11/15 21:00:00	1958/11/16 02:00:00	6	0	35.80%	0.15
396	1959/01/06 01:00:00	1959/01/06 18:00:00	18	0	35.90%	0.15
397	1959/02/07 22:00:00	1959/02/09 10:00:00	37	0	36.00%	0.15
398	1959/04/06 10:00:00	1959/04/06 13:00:00	4	0	36.10%	0.15
399	1959/04/26 02:00:00	1959/04/26 20:00:00	19	0	36.10%	0.15
400	1959/09/30 05:00:00	1959/10/01 13:00:00	33	0	36.20%	0.15
401	1959/11/02 02:00:00	1959/11/02 10:00:00	9	0	36.30%	0.15
402	1959/12/08 08:00:00	1959/12/08 17:00:00	10	0	36.40%	0.14
403	1959/12/09 22:00:00	1959/12/10 06:00:00	9	0	36.50%	0.14
404	1959/12/20 22:00:00	1959/12/21 21:00:00	24	0	36.60%	0.14
405	1960/01/25 19:00:00	1960/01/26 11:00:00	17	0	36.70%	0.14
406	1960/02/08 19:00:00	1960/02/10 18:00:00	48	0	36.80%	0.14
407	1960/03/13 05:00:00	1960/03/13 09:00:00	5	0	36.90%	0.14
408	1960/03/28 00:00:00	1960/03/28 18:00:00	19	0	37.00%	0.14
409	1960/04/23 07:00:00	1960/04/24 08:00:00	26	0	37.00%	0.14
410	1960/05/03 22:00:00	1960/05/04 12:00:00	15	0	37.10%	0.14
411	1960/07/20 17:00:00	1960/07/20 19:00:00	3	0	37.20%	0.14
412	1960/10/09 19:00:00	1960/10/09 22:00:00	4	0	37.30%	0.14
413	1960/11/03 13:00:00	1960/11/04 04:00:00	16	0	37.40%	0.14
414	1960/11/05 20:00:00	1960/11/06 22:00:00	27	0	37.50%	0.14
415	1960/11/12 21:00:00	1960/11/13 17:00:00	21	0	37.60%	0.14

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
416	1960/12/02 04:00:00	1960/12/02 09:00:00	6	0	37.70%	0.14
417	1961/03/04 17:00:00	1961/03/04 21:00:00	5	0	37.80%	0.14
418	1961/03/15 09:00:00	1961/03/15 15:00:00	7	0	37.90%	0.14
419	1961/03/17 15:00:00	1961/03/17 18:00:00	4	0	38.00%	0.14
420	1961/03/24 23:00:00	1961/03/25 07:00:00	9	0	38.00%	0.14
421	1961/10/08 04:00:00	1961/10/09 02:00:00	23	0	38.10%	0.14
422	1961/11/25 01:00:00	1961/11/26 08:00:00	32	0	38.20%	0.14
423	1961/12/10 18:00:00	1961/12/11 00:00:00	7	0	38.30%	0.14
424	1961/12/14 07:00:00	1961/12/14 19:00:00	13	0	38.40%	0.14
425	1962/01/12 22:00:00	1962/01/13 21:00:00	24	0	38.50%	0.14
426	1962/02/15 18:00:00	1962/02/16 23:00:00	30	0	38.60%	0.14
427	1962/02/24 22:00:00	1962/02/26 18:00:00	45	0	38.70%	0.14
428	1962/03/06 06:00:00	1962/03/07 06:00:00	25	0	38.80%	0.14
429	1962/03/09 21:00:00	1962/03/10 00:00:00	4	0	38.90%	0.14
430	1962/03/22 20:00:00	1962/03/23 07:00:00	12	0	38.90%	0.14
431	1962/05/14 08:00:00	1962/05/14 22:00:00	15	0	39.00%	0.14
432	1962/05/16 17:00:00	1962/05/16 19:00:00	3	0	39.10%	0.13
433	1962/05/26 22:00:00	1962/05/27 00:00:00	3	0	39.20%	0.13
434	1962/06/15 06:00:00	1962/06/15 09:00:00	4	0	39.30%	0.13
435	1962/12/17 22:00:00	1962/12/18 03:00:00	6	0	39.40%	0.13
436	1963/01/31 16:00:00	1963/02/01 14:00:00	23	0	39.50%	0.13
437	1963/02/14 11:00:00	1963/02/15 05:00:00	19	0	39.60%	0.13
438	1963/03/15 03:00:00	1963/03/15 07:00:00	5	0	39.70%	0.13
439	1963/03/28 08:00:00	1963/03/28 23:00:00	16	0	39.80%	0.13
440	1963/04/08 06:00:00	1963/04/08 11:00:00	6	0	39.90%	0.13
441	1963/04/14 15:00:00	1963/04/15 11:00:00	21	0	39.90%	0.13
442	1963/04/17 04:00:00	1963/04/18 01:00:00	22	0	40.00%	0.13
443	1963/04/20 21:00:00	1963/04/21 11:00:00	15	0	40.10%	0.13
444	1963/04/26 02:00:00	1963/04/26 23:00:00	22	0	40.20%	0.13
445	1963/06/11 15:00:00	1963/06/11 17:00:00	3	0	40.30%	0.13
446	1963/08/07 11:00:00	1963/08/07 12:00:00	2	0	40.40%	0.13
447	1963/09/04 06:00:00	1963/09/04 19:00:00	14	0	40.50%	0.13
448	1963/10/16 10:00:00	1963/10/16 17:00:00	8	0	40.60%	0.13
449	1963/10/18 01:00:00	1963/10/19 01:00:00	25	0	40.70%	0.13
450	1963/11/06 13:00:00	1963/11/07 01:00:00	13	0	40.80%	0.13
451	1963/11/15 14:00:00	1963/11/16 09:00:00	20	0	40.90%	0.13
452	1963/12/09 11:00:00	1963/12/09 16:00:00	6	0	40.90%	0.13
453	1964/01/18 12:00:00	1964/01/19 00:00:00	13	0	41.00%	0.13
454	1964/02/16 08:00:00	1964/02/16 12:00:00	5	0	41.10%	0.13
455	1964/02/29 03:00:00	1964/02/29 09:00:00	7	0	41.20%	0.13
456	1964/03/02 07:00:00	1964/03/02 10:00:00	4	0	41.30%	0.13
457	1964/03/12 20:00:00	1964/03/13 03:00:00	8	0	41.40%	0.13
458	1964/03/31 16:00:00	1964/04/01 19:00:00	28	0	41.50%	0.13
459	1964/04/19 09:00:00	1964/04/19 13:00:00	5	0	41.60%	0.13
460	1964/04/28 06:00:00	1964/04/28 12:00:00	7	0	41.70%	0.13
461	1964/05/04 22:00:00	1964/05/07 05:00:00	56	0	41.80%	0.13
462	1964/06/09 06:00:00	1964/06/09 13:00:00	8	0	41.80%	0.13

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
463	1964/09/24 14:00:00	1964/09/24 17:00:00	4	0	41.90%	0.13
464	1964/10/15 12:00:00	1964/10/15 16:00:00	5	0	42.00%	0.13
465	1964/10/29 12:00:00	1964/10/29 15:00:00	4	0	42.10%	0.13
466	1964/11/09 13:00:00	1964/11/12 09:00:00	69	0	42.20%	0.12
467	1964/11/26 12:00:00	1964/11/26 16:00:00	5	0	42.30%	0.12
468	1965/01/07 08:00:00	1965/01/07 15:00:00	8	0	42.40%	0.12
469	1965/01/24 06:00:00	1965/01/24 17:00:00	12	0	42.50%	0.12
470	1965/02/06 01:00:00	1965/02/06 19:00:00	19	0	42.60%	0.12
471	1965/03/06 20:00:00	1965/03/07 07:00:00	12	0	42.70%	0.12
472	1965/03/11 01:00:00	1965/03/11 19:00:00	19	0	42.80%	0.12
473	1965/03/13 03:00:00	1965/03/13 22:00:00	20	0	42.80%	0.12
474	1965/03/15 03:00:00	1965/03/15 20:00:00	18	0	42.90%	0.12
475	1965/03/24 11:00:00	1965/03/24 14:00:00	4	0	43.00%	0.12
476	1965/07/29 21:00:00	1965/07/30 13:00:00	17	0	43.10%	0.12
477	1965/08/16 17:00:00	1965/08/17 07:00:00	15	0	43.20%	0.12
478	1965/09/16 17:00:00	1965/09/17 08:00:00	16	0	43.30%	0.12
479	1965/11/20 23:00:00	1965/11/21 03:00:00	5	0	43.40%	0.12
480	1965/12/22 00:00:00	1965/12/22 18:00:00	19	0	43.50%	0.12
481	1966/01/19 23:00:00	1966/01/20 04:00:00	6	0	43.60%	0.12
482	1966/01/27 04:00:00	1966/01/27 09:00:00	6	0	43.70%	0.12
483	1966/02/02 00:00:00	1966/02/02 04:00:00	5	0	43.80%	0.12
484	1966/02/25 03:00:00	1966/02/25 07:00:00	5	0	43.80%	0.12
485	1966/03/02 06:00:00	1966/03/02 12:00:00	7	0	43.90%	0.12
486	1966/03/24 16:00:00	1966/03/25 17:00:00	26	0	44.00%	0.12
487	1966/05/10 03:00:00	1966/05/10 06:00:00	4	0	44.10%	0.12
488	1966/10/10 13:00:00	1966/10/11 05:00:00	17	0	44.20%	0.12
489	1967/01/31 02:00:00	1967/01/31 07:00:00	6	0	44.30%	0.12
490	1967/03/04 01:00:00	1967/03/04 19:00:00	19	0	44.40%	0.12
491	1967/03/11 14:00:00	1967/03/11 17:00:00	4	0	44.50%	0.12
492	1967/03/31 09:00:00	1967/04/02 09:00:00	49	0	44.60%	0.12
493	1967/04/04 15:00:00	1967/04/05 09:00:00	19	0	44.70%	0.12
494	1967/04/15 22:00:00	1967/04/16 01:00:00	4	0	44.70%	0.12
495	1967/04/18 18:00:00	1967/04/20 03:00:00	34	0	44.80%	0.12
496	1967/04/21 12:00:00	1967/04/22 08:00:00	21	0	44.90%	0.12
497	1967/04/24 08:00:00	1967/04/24 11:00:00	4	0	45.00%	0.12
498	1967/04/28 21:00:00	1967/04/29 00:00:00	4	0	45.10%	0.12
499	1967/05/10 02:00:00	1967/05/10 05:00:00	4	0	45.20%	0.12
500	1967/06/13 05:00:00	1967/06/13 14:00:00	10	0	45.30%	0.12
501	1967/09/02 20:00:00	1967/09/03 00:00:00	5	0	45.40%	0.12
502	1967/11/06 13:00:00	1967/11/06 17:00:00	5	0	45.50%	0.12
503	1967/11/30 12:00:00	1967/12/01 21:00:00	34	0	45.60%	0.12
504	1967/12/07 22:00:00	1967/12/08 03:00:00	6	0	45.70%	0.12
505	1967/12/13 09:00:00	1967/12/13 18:00:00	10	0	45.70%	0.12
506	1967/12/16 03:00:00	1967/12/17 08:00:00	30	0	45.80%	0.12
507	1968/01/26 20:00:00	1968/01/28 06:00:00	35	0	45.90%	0.11
508	1968/02/12 16:00:00	1968/02/13 09:00:00	18	0	46.00%	0.11
509	1968/03/06 13:00:00	1968/03/06 16:00:00	4	0	46.10%	0.11

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
510	1968/03/17 00:00:00	1968/03/18 18:00:00	43	0	46.20%	0.11
511	1968/05/21 11:00:00	1968/05/21 14:00:00	4	0	46.30%	0.11
512	1968/07/07 03:00:00	1968/07/07 10:00:00	8	0	46.40%	0.11
513	1968/11/13 11:00:00	1968/11/13 15:00:00	5	0	46.50%	0.11
514	1968/11/15 04:00:00	1968/11/16 06:00:00	27	0	46.60%	0.11
515	1968/12/01 09:00:00	1968/12/01 14:00:00	6	0	46.60%	0.11
516	1968/12/11 07:00:00	1968/12/11 12:00:00	6	0	46.70%	0.11
517	1968/12/16 12:00:00	1968/12/16 17:00:00	6	0	46.80%	0.11
518	1968/12/20 08:00:00	1968/12/20 15:00:00	8	0	46.90%	0.11
519	1969/02/15 20:00:00	1969/02/16 13:00:00	18	0	47.00%	0.11
520	1969/02/28 21:00:00	1969/03/01 13:00:00	17	0	47.10%	0.11
521	1969/03/09 02:00:00	1969/03/09 05:00:00	4	0	47.20%	0.11
522	1969/03/10 06:00:00	1969/03/11 16:00:00	35	0	47.30%	0.11
523	1969/03/12 23:00:00	1969/03/14 17:00:00	43	0	47.40%	0.11
524	1969/04/03 01:00:00	1969/04/03 06:00:00	6	0	47.50%	0.11
525	1969/04/05 19:00:00	1969/04/06 10:00:00	16	0	47.60%	0.11
526	1969/05/05 09:00:00	1969/05/06 13:00:00	29	0	47.60%	0.11
527	1969/11/06 16:00:00	1969/11/07 17:00:00	26	0	47.70%	0.11
528	1969/11/10 00:00:00	1969/11/10 13:00:00	14	0	47.80%	0.11
529	1969/12/08 21:00:00	1969/12/09 02:00:00	6	0	47.90%	0.11
530	1969/12/10 10:00:00	1969/12/10 15:00:00	6	0	48.00%	0.11
531	1970/01/09 21:00:00	1970/01/10 13:00:00	17	0	48.10%	0.11
532	1970/01/11 15:00:00	1970/01/12 06:00:00	16	0	48.20%	0.11
533	1970/01/14 19:00:00	1970/01/15 00:00:00	6	0	48.30%	0.11
534	1970/01/16 05:00:00	1970/01/17 11:00:00	31	0	48.40%	0.11
535	1970/03/10 09:00:00	1970/03/10 12:00:00	4	0	48.50%	0.11
536	1970/04/27 09:00:00	1970/04/27 12:00:00	4	0	48.60%	0.11
537	1970/06/11 14:00:00	1970/06/11 16:00:00	3	0	48.60%	0.11
538	1970/11/03 10:00:00	1970/11/03 14:00:00	5	0	48.70%	0.11
539	1970/11/25 22:00:00	1970/11/26 17:00:00	20	0	48.80%	0.11
540	1970/12/09 10:00:00	1970/12/09 15:00:00	6	0	48.90%	0.11
541	1971/01/12 16:00:00	1971/01/13 11:00:00	20	0	49.00%	0.11
542	1971/02/16 20:00:00	1971/02/20 00:00:00	77	0	49.10%	0.11
543	1971/03/12 10:00:00	1971/03/13 19:00:00	34	0	49.20%	0.11
544	1971/04/14 10:00:00	1971/04/15 07:00:00	22	0	49.30%	0.11
545	1971/04/17 21:00:00	1971/04/18 05:00:00	9	0	49.40%	0.11
546	1971/04/21 04:00:00	1971/04/21 07:00:00	4	0	49.50%	0.11
547	1971/04/25 05:00:00	1971/04/26 07:00:00	27	0	49.50%	0.11
548	1971/05/06 03:00:00	1971/05/06 15:00:00	13	0	49.60%	0.11
549	1971/05/07 17:00:00	1971/05/08 15:00:00	23	0	49.70%	0.11
550	1971/05/28 09:00:00	1971/05/28 18:00:00	10	0	49.80%	0.11
551	1971/09/11 18:00:00	1971/09/11 21:00:00	4	0	49.90%	0.11
552	1971/09/29 07:00:00	1971/09/29 11:00:00	5	0	50.00%	0.11
553	1971/10/16 06:00:00	1971/10/17 06:00:00	25	0	50.10%	0.11
554	1971/10/28 15:00:00	1971/10/28 18:00:00	4	0	50.20%	0.11
555	1971/11/12 05:00:00	1971/11/12 17:00:00	13	0	50.30%	0.11
556	1971/11/29 09:00:00	1971/11/29 13:00:00	5	0	50.40%	0.1

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
557	1971/12/03 00:00:00	1971/12/04 08:00:00	33	0	50.50%	0.1
558	1971/12/07 00:00:00	1971/12/07 16:00:00	17	0	50.50%	0.1
559	1971/12/13 02:00:00	1971/12/13 15:00:00	14	0	50.60%	0.1
560	1972/02/05 09:00:00	1972/02/05 17:00:00	9	0	50.70%	0.1
561	1972/02/28 13:00:00	1972/02/28 17:00:00	5	0	50.80%	0.1
562	1972/04/13 05:00:00	1972/04/13 08:00:00	4	0	50.90%	0.1
563	1972/04/19 13:00:00	1972/04/20 00:00:00	12	0	51.00%	0.1
564	1972/05/19 00:00:00	1972/05/19 03:00:00	4	0	51.10%	0.1
565	1972/05/20 10:00:00	1972/05/20 13:00:00	4	0	51.20%	0.1
566	1972/06/07 05:00:00	1972/06/07 07:00:00	3	0	51.30%	0.1
567	1972/06/20 20:00:00	1972/06/21 02:00:00	7	0	51.40%	0.1
568	1972/09/08 08:00:00	1972/09/08 11:00:00	4	0	51.40%	0.1
569	1972/10/17 04:00:00	1972/10/17 07:00:00	4	0	51.50%	0.1
570	1972/10/19 09:00:00	1972/10/20 06:00:00	22	0	51.60%	0.1
571	1972/10/21 14:00:00	1972/10/21 17:00:00	4	0	51.70%	0.1
572	1972/11/08 01:00:00	1972/11/08 05:00:00	5	0	51.80%	0.1
573	1972/11/21 12:00:00	1972/11/21 16:00:00	5	0	51.90%	0.1
574	1972/11/24 12:00:00	1972/11/24 16:00:00	5	0	52.00%	0.1
575	1973/01/04 09:00:00	1973/01/04 16:00:00	8	0	52.10%	0.1
576	1973/01/09 07:00:00	1973/01/10 04:00:00	22	0	52.20%	0.1
577	1973/01/25 19:00:00	1973/01/26 03:00:00	9	0	52.30%	0.1
578	1973/02/03 00:00:00	1973/02/04 06:00:00	31	0	52.40%	0.1
579	1973/02/28 00:00:00	1973/02/28 21:00:00	22	0	52.40%	0.1
580	1973/03/25 06:00:00	1973/03/25 09:00:00	4	0	52.50%	0.1
581	1973/04/01 08:00:00	1973/04/01 11:00:00	4	0	52.60%	0.1
582	1973/04/30 08:00:00	1973/04/30 11:00:00	4	0	52.70%	0.1
583	1973/05/28 09:00:00	1973/05/28 12:00:00	4	0	52.80%	0.1
584	1973/05/31 15:00:00	1973/05/31 18:00:00	4	0	52.90%	0.1
585	1973/09/25 12:00:00	1973/09/25 15:00:00	4	0	53.00%	0.1
586	1973/11/26 06:00:00	1973/11/26 10:00:00	5	0	53.10%	0.1
587	1973/12/01 15:00:00	1973/12/02 02:00:00	12	0	53.20%	0.1
588	1973/12/22 03:00:00	1973/12/22 08:00:00	6	0	53.30%	0.1
589	1973/12/28 01:00:00	1973/12/28 06:00:00	6	0	53.40%	0.1
590	1974/01/01 03:00:00	1974/01/01 11:00:00	9	0	53.40%	0.1
591	1974/01/20 12:00:00	1974/01/21 05:00:00	18	0	53.50%	0.1
592	1974/02/19 18:00:00	1974/02/19 22:00:00	5	0	53.60%	0.1
593	1974/03/27 07:00:00	1974/03/27 12:00:00	6	0	53.70%	0.1
594	1974/04/01 23:00:00	1974/04/02 21:00:00	23	0	53.80%	0.1
595	1974/05/20 12:00:00	1974/05/20 15:00:00	4	0	53.90%	0.1
596	1974/09/17 05:00:00	1974/09/17 08:00:00	4	0	54.00%	0.1
597	1974/10/26 13:00:00	1974/10/26 16:00:00	4	0	54.10%	0.1
598	1974/11/01 06:00:00	1974/11/02 07:00:00	26	0	54.20%	0.1
599	1975/01/07 12:00:00	1975/01/07 17:00:00	6	0	54.30%	0.1
600	1975/01/08 19:00:00	1975/01/09 00:00:00	6	0	54.30%	0.1
601	1975/01/30 14:00:00	1975/01/30 19:00:00	6	0	54.40%	0.1
602	1975/02/09 05:00:00	1975/02/11 03:00:00	47	0	54.50%	0.1
603	1975/03/14 01:00:00	1975/03/14 12:00:00	12	0	54.60%	0.1

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
604	1975/03/22 06:00:00	1975/03/23 00:00:00	19	0	54.70%	0.1
605	1975/03/25 13:00:00	1975/03/25 16:00:00	4	0	54.80%	0.1
606	1975/03/31 11:00:00	1975/04/01 09:00:00	23	0	54.90%	0.1
607	1975/04/16 10:00:00	1975/04/17 15:00:00	30	0	55.00%	0.1
608	1975/04/25 05:00:00	1975/04/25 12:00:00	8	0	55.10%	0.1
609	1975/05/19 07:00:00	1975/05/20 05:00:00	23	0	55.20%	0.1
610	1975/06/07 09:00:00	1975/06/07 11:00:00	3	0	55.30%	0.1
611	1975/06/17 21:00:00	1975/06/17 23:00:00	3	0	55.30%	0.1
612	1975/06/19 05:00:00	1975/06/19 07:00:00	3	0	55.40%	0.1
613	1975/10/07 01:00:00	1975/10/07 09:00:00	9	0	55.50%	0.1
614	1975/10/31 07:00:00	1975/11/03 07:00:00	73	0	55.60%	0.09
615	1975/11/05 01:00:00	1975/11/05 05:00:00	5	0	55.70%	0.09
616	1975/11/27 09:00:00	1975/11/29 05:00:00	45	0	55.80%	0.09
617	1975/12/04 14:00:00	1975/12/05 02:00:00	13	0	55.90%	0.09
618	1975/12/07 12:00:00	1975/12/07 17:00:00	6	0	56.00%	0.09
619	1975/12/12 14:00:00	1975/12/12 21:00:00	8	0	56.10%	0.09
620	1975/12/16 13:00:00	1975/12/16 18:00:00	6	0	56.20%	0.09
621	1976/03/09 20:00:00	1976/03/09 23:00:00	4	0	56.30%	0.09
622	1976/03/12 13:00:00	1976/03/12 16:00:00	4	0	56.30%	0.09
623	1976/04/04 06:00:00	1976/04/04 09:00:00	4	0	56.40%	0.09
624	1976/05/07 08:00:00	1976/05/07 11:00:00	4	0	56.50%	0.09
625	1976/05/28 00:00:00	1976/05/28 03:00:00	4	0	56.60%	0.09
626	1976/08/21 17:00:00	1976/08/21 19:00:00	3	0	56.70%	0.09
627	1976/09/03 18:00:00	1976/09/03 21:00:00	4	0	56.80%	0.09
628	1976/11/12 00:00:00	1976/11/12 21:00:00	22	0	56.90%	0.09
629	1976/11/27 05:00:00	1976/11/27 09:00:00	5	0	57.00%	0.09
630	1977/01/26 00:00:00	1977/01/26 05:00:00	6	0	57.10%	0.09
631	1977/01/29 12:00:00	1977/01/29 17:00:00	6	0	57.20%	0.09
632	1977/02/22 06:00:00	1977/02/22 10:00:00	5	0	57.20%	0.09
633	1977/02/23 14:00:00	1977/02/25 07:00:00	42	0	57.30%	0.09
634	1977/03/16 13:00:00	1977/03/17 15:00:00	27	0	57.40%	0.09
635	1977/04/02 14:00:00	1977/04/02 19:00:00	6	0	57.50%	0.09
636	1977/05/12 10:00:00	1977/05/12 16:00:00	7	0	57.60%	0.09
637	1977/05/24 06:00:00	1977/05/24 09:00:00	4	0	57.70%	0.09
638	1977/07/23 10:00:00	1977/07/23 18:00:00	9	0	57.80%	0.09
639	1977/10/03 11:00:00	1977/10/03 14:00:00	4	0	57.90%	0.09
640	1977/10/14 13:00:00	1977/10/14 16:00:00	4	0	58.00%	0.09
641	1977/12/23 03:00:00	1977/12/23 08:00:00	6	0	58.10%	0.09
642	1978/01/30 09:00:00	1978/01/31 12:00:00	28	0	58.20%	0.09
643	1978/03/09 15:00:00	1978/03/10 03:00:00	13	0	58.20%	0.09
644	1978/03/11 06:00:00	1978/03/12 21:00:00	40	0	58.30%	0.09
645	1978/03/17 14:00:00	1978/03/17 17:00:00	4	0	58.40%	0.09
646	1978/03/21 13:00:00	1978/03/22 13:00:00	25	0	58.50%	0.09
647	1978/03/24 17:00:00	1978/03/24 20:00:00	4	0	58.60%	0.09
648	1978/04/04 16:00:00	1978/04/04 19:00:00	4	0	58.70%	0.09
649	1978/04/06 21:00:00	1978/04/07 17:00:00	21	0	58.80%	0.09
650	1978/04/15 19:00:00	1978/04/16 17:00:00	23	0	58.90%	0.09

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
651	1978/04/19 11:00:00	1978/04/19 14:00:00	4	0	59.00%	0.09
652	1978/08/09 03:00:00	1978/08/09 05:00:00	3	0	59.10%	0.09
653	1978/09/03 14:00:00	1978/09/03 17:00:00	4	0	59.10%	0.09
654	1978/09/08 09:00:00	1978/09/08 12:00:00	4	0	59.20%	0.09
655	1978/09/16 07:00:00	1978/09/16 10:00:00	4	0	59.30%	0.09
656	1978/11/21 15:00:00	1978/11/22 09:00:00	19	0	59.40%	0.09
657	1978/11/24 04:00:00	1978/11/25 00:00:00	21	0	59.50%	0.09
658	1978/12/09 15:00:00	1978/12/09 20:00:00	6	0	59.60%	0.09
659	1979/01/09 08:00:00	1979/01/09 17:00:00	10	0	59.70%	0.09
660	1979/01/23 15:00:00	1979/01/23 20:00:00	6	0	59.80%	0.09
661	1979/01/28 12:00:00	1979/01/28 17:00:00	6	0	59.90%	0.09
662	1979/02/14 03:00:00	1979/02/14 13:00:00	11	0	60.00%	0.09
663	1979/03/14 12:00:00	1979/03/14 15:00:00	4	0	60.10%	0.09
664	1979/03/15 22:00:00	1979/03/16 01:00:00	4	0	60.10%	0.09
665	1979/03/31 14:00:00	1979/04/04 11:00:00	94	0	60.20%	0.09
666	1979/04/10 08:00:00	1979/04/10 11:00:00	4	0	60.30%	0.09
667	1979/06/04 11:00:00	1979/06/04 13:00:00	3	0	60.40%	0.09
668	1979/07/18 13:00:00	1979/07/18 15:00:00	3	0	60.50%	0.09
669	1979/07/20 08:00:00	1979/07/20 10:00:00	3	0	60.60%	0.09
670	1979/08/20 16:00:00	1979/08/20 18:00:00	3	0	60.70%	0.09
671	1979/11/07 18:00:00	1979/11/08 17:00:00	24	0	60.80%	0.09
672	1979/12/03 11:00:00	1979/12/03 16:00:00	6	0	60.90%	0.09
673	1979/12/21 06:00:00	1979/12/22 03:00:00	22	0	61.00%	0.09
674	1979/12/25 08:00:00	1979/12/25 13:00:00	6	0	61.10%	0.09
675	1979/12/30 08:00:00	1979/12/30 13:00:00	6	0	61.10%	0.09
676	1980/01/18 01:00:00	1980/01/19 07:00:00	31	0	61.20%	0.09
677	1980/03/10 14:00:00	1980/03/11 08:00:00	19	0	61.30%	0.09
678	1980/03/18 16:00:00	1980/03/18 19:00:00	4	0	61.40%	0.09
679	1980/03/25 22:00:00	1980/03/26 18:00:00	21	0	61.50%	0.09
680	1980/04/01 10:00:00	1980/04/02 15:00:00	30	0	61.60%	0.09
681	1980/04/21 05:00:00	1980/04/21 08:00:00	4	0	61.70%	0.09
682	1980/04/22 11:00:00	1980/04/22 14:00:00	4	0	61.80%	0.09
683	1980/04/24 12:00:00	1980/04/24 15:00:00	4	0	61.90%	0.09
684	1980/04/28 09:00:00	1980/04/30 09:00:00	49	0	62.00%	0.09
685	1980/05/10 10:00:00	1980/05/10 18:00:00	9	0	62.00%	0.09
686	1980/10/03 16:00:00	1980/10/03 19:00:00	4	0	62.10%	0.09
687	1980/10/15 23:00:00	1980/10/16 12:00:00	14	0	62.20%	0.08
688	1980/10/26 03:00:00	1980/10/26 10:00:00	8	0	62.30%	0.08
689	1980/12/07 12:00:00	1980/12/07 17:00:00	6	0	62.40%	0.08
690	1981/01/11 05:00:00	1981/01/11 10:00:00	6	0	62.50%	0.08
691	1981/01/12 16:00:00	1981/01/12 21:00:00	6	0	62.60%	0.08
692	1981/02/25 20:00:00	1981/02/26 17:00:00	22	0	62.70%	0.08
693	1981/03/05 02:00:00	1981/03/06 03:00:00	26	0	62.80%	0.08
694	1981/04/02 04:00:00	1981/04/03 02:00:00	23	0	62.90%	0.08
695	1981/04/18 11:00:00	1981/04/19 12:00:00	26	0	63.00%	0.08
696	1981/04/25 13:00:00	1981/04/25 16:00:00	4	0	63.00%	0.08
697	1981/05/20 10:00:00	1981/05/20 13:00:00	4	0	63.10%	0.08

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
698	1981/10/01 01:00:00	1981/10/01 04:00:00	4	0	63.20%	0.08
699	1981/10/11 06:00:00	1981/10/11 09:00:00	4	0	63.30%	0.08
700	1981/10/28 21:00:00	1981/10/29 00:00:00	4	0	63.40%	0.08
701	1982/01/05 01:00:00	1982/01/05 19:00:00	19	0	63.50%	0.08
702	1982/01/10 23:00:00	1982/01/11 14:00:00	16	0	63.60%	0.08
703	1982/01/28 15:00:00	1982/01/29 08:00:00	18	0	63.70%	0.08
704	1982/02/08 07:00:00	1982/02/08 11:00:00	5	0	63.80%	0.08
705	1982/03/25 20:00:00	1982/03/26 21:00:00	26	0	63.90%	0.08
706	1982/03/28 20:00:00	1982/03/30 08:00:00	37	0	63.90%	0.08
707	1982/05/11 19:00:00	1982/05/11 22:00:00	4	0	64.00%	0.08
708	1982/09/16 10:00:00	1982/09/17 16:00:00	31	0	64.10%	0.08
709	1982/11/18 22:00:00	1982/11/20 00:00:00	27	0	64.20%	0.08
710	1982/12/07 18:00:00	1982/12/08 12:00:00	19	0	64.30%	0.08
711	1983/01/19 04:00:00	1983/01/19 18:00:00	15	0	64.40%	0.08
712	1983/01/22 22:00:00	1983/01/23 12:00:00	15	0	64.50%	0.08
713	1983/01/24 15:00:00	1983/01/25 07:00:00	17	0	64.60%	0.08
714	1983/02/02 10:00:00	1983/02/03 01:00:00	16	0	64.70%	0.08
715	1983/02/05 17:00:00	1983/02/05 21:00:00	5	0	64.80%	0.08
716	1983/02/07 01:00:00	1983/02/08 21:00:00	45	0	64.90%	0.08
717	1983/02/13 14:00:00	1983/02/13 18:00:00	5	0	64.90%	0.08
718	1983/02/24 05:00:00	1983/02/25 03:00:00	23	0	65.00%	0.08
719	1983/03/14 01:00:00	1983/03/14 12:00:00	12	0	65.10%	0.08
720	1983/04/11 00:00:00	1983/04/12 08:00:00	33	0	65.20%	0.08
721	1983/04/17 23:00:00	1983/04/18 22:00:00	24	0	65.30%	0.08
722	1983/04/29 01:00:00	1983/05/01 09:00:00	57	0	65.40%	0.08
723	1983/07/09 12:00:00	1983/07/09 14:00:00	3	0	65.50%	0.08
724	1983/08/09 05:00:00	1983/08/09 07:00:00	3	0	65.60%	0.08
725	1983/08/16 06:00:00	1983/08/16 08:00:00	3	0	65.70%	0.08
726	1983/08/18 08:00:00	1983/08/18 10:00:00	3	0	65.80%	0.08
727	1983/10/07 08:00:00	1983/10/07 14:00:00	7	0	65.90%	0.08
728	1983/10/20 11:00:00	1983/10/20 14:00:00	4	0	65.90%	0.08
729	1983/11/17 23:00:00	1983/11/18 07:00:00	9	0	66.00%	0.08
730	1983/12/01 08:00:00	1983/12/01 13:00:00	6	0	66.10%	0.08
731	1983/12/09 17:00:00	1983/12/10 02:00:00	10	0	66.20%	0.08
732	1984/01/08 13:00:00	1984/01/08 17:00:00	5	0	66.30%	0.08
733	1984/01/13 21:00:00	1984/01/14 02:00:00	6	0	66.40%	0.08
734	1984/01/16 16:00:00	1984/01/16 22:00:00	7	0	66.50%	0.08
735	1984/02/10 05:00:00	1984/02/10 09:00:00	5	0	66.60%	0.08
736	1984/03/14 12:00:00	1984/03/14 20:00:00	9	0	66.70%	0.08
737	1984/03/31 14:00:00	1984/03/31 17:00:00	4	0	66.80%	0.08
738	1984/04/06 05:00:00	1984/04/06 16:00:00	12	0	66.80%	0.08
739	1984/04/19 02:00:00	1984/04/19 15:00:00	14	0	66.90%	0.08
740	1984/06/05 08:00:00	1984/06/06 09:00:00	26	0	67.00%	0.08
741	1984/07/15 18:00:00	1984/07/15 20:00:00	3	0	67.10%	0.08
742	1984/10/12 06:00:00	1984/10/12 09:00:00	4	0	67.20%	0.08
743	1984/10/17 04:00:00	1984/10/17 16:00:00	13	0	67.30%	0.08
744	1984/10/19 22:00:00	1984/10/20 01:00:00	4	0	67.40%	0.08

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
745	1984/11/07 10:00:00	1984/11/08 16:00:00	31	0	67.50%	0.08
746	1984/11/16 19:00:00	1984/11/17 10:00:00	16	0	67.60%	0.08
747	1984/11/22 17:00:00	1984/11/23 08:00:00	16	0	67.70%	0.08
748	1984/11/28 14:00:00	1984/11/28 17:00:00	4	0	67.80%	0.08
749	1984/12/03 08:00:00	1984/12/03 17:00:00	10	0	67.80%	0.08
750	1984/12/07 23:00:00	1984/12/08 16:00:00	18	0	67.90%	0.08
751	1984/12/16 02:00:00	1984/12/16 18:00:00	17	0	68.00%	0.08
752	1985/01/07 08:00:00	1985/01/08 14:00:00	31	0	68.10%	0.08
753	1985/01/28 15:00:00	1985/01/29 01:00:00	11	0	68.20%	0.08
754	1985/01/30 08:00:00	1985/01/30 12:00:00	5	0	68.30%	0.08
755	1985/02/02 03:00:00	1985/02/04 21:00:00	67	0	68.40%	0.08
756	1985/02/20 14:00:00	1985/02/21 01:00:00	12	0	68.50%	0.08
757	1985/02/28 06:00:00	1985/02/28 09:00:00	4	0	68.60%	0.08
758	1985/03/02 11:00:00	1985/03/03 01:00:00	15	0	68.70%	0.08
759	1985/03/21 08:00:00	1985/03/21 11:00:00	4	0	68.80%	0.08
760	1985/03/27 06:00:00	1985/03/29 04:00:00	47	0	68.80%	0.08
761	1985/04/10 09:00:00	1985/04/10 11:00:00	3	0	68.90%	0.08
762	1985/04/21 17:00:00	1985/04/22 06:00:00	14	0	69.00%	0.08
763	1985/09/18 12:00:00	1985/09/18 14:00:00	3	0	69.10%	0.08
764	1985/10/21 22:00:00	1985/10/22 02:00:00	5	0	69.20%	0.08
765	1985/12/09 17:00:00	1985/12/11 10:00:00	42	0	69.30%	0.08
766	1986/01/30 01:00:00	1986/02/01 07:00:00	55	0	69.40%	0.08
767	1986/02/19 00:00:00	1986/02/19 19:00:00	20	0	69.50%	0.08
768	1986/03/06 06:00:00	1986/03/06 09:00:00	4	0	69.60%	0.08
769	1986/04/01 03:00:00	1986/04/01 05:00:00	3	0	69.70%	0.08
770	1986/04/06 00:00:00	1986/04/06 21:00:00	22	0	69.70%	0.08
771	1986/07/23 08:00:00	1986/07/23 10:00:00	3	0	69.80%	0.08
772	1986/08/18 06:00:00	1986/08/18 08:00:00	3	0	69.90%	0.08
773	1986/10/09 18:00:00	1986/10/10 19:00:00	26	0	70.00%	0.08
774	1986/12/20 07:00:00	1986/12/20 15:00:00	9	0	70.10%	0.08
775	1987/02/13 18:00:00	1987/02/14 05:00:00	12	0	70.20%	0.08
776	1987/02/15 19:00:00	1987/02/15 22:00:00	4	0	70.30%	0.08
777	1987/02/18 13:00:00	1987/02/19 02:00:00	14	0	70.40%	0.08
778	1987/02/24 02:00:00	1987/02/26 12:00:00	59	0	70.50%	0.08
779	1987/03/05 20:00:00	1987/03/06 19:00:00	24	0	70.60%	0.07
780	1987/03/14 23:00:00	1987/03/15 22:00:00	24	0	70.70%	0.07
781	1987/03/21 15:00:00	1987/03/22 09:00:00	19	0	70.70%	0.07
782	1987/03/23 22:00:00	1987/03/25 01:00:00	28	0	70.80%	0.07
783	1987/04/03 05:00:00	1987/04/04 01:00:00	21	0	70.90%	0.07
784	1987/04/05 16:00:00	1987/04/05 19:00:00	4	0	71.00%	0.07
785	1987/05/28 15:00:00	1987/05/28 18:00:00	4	0	71.10%	0.07
786	1987/07/17 12:00:00	1987/07/17 14:00:00	3	0	71.20%	0.07
787	1987/08/14 09:00:00	1987/08/14 11:00:00	3	0	71.30%	0.07
788	1987/09/13 03:00:00	1987/09/13 06:00:00	4	0	71.40%	0.07
789	1987/09/23 00:00:00	1987/09/23 02:00:00	3	0	71.50%	0.07
790	1987/10/22 15:00:00	1987/10/23 15:00:00	25	0	71.60%	0.07
791	1987/10/28 21:00:00	1987/10/29 03:00:00	7	0	71.60%	0.07

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
792	1987/10/31 02:00:00	1987/11/02 15:00:00	62	0	71.70%	0.07
793	1987/11/14 01:00:00	1987/11/14 09:00:00	9	0	71.80%	0.07
794	1987/11/17 21:00:00	1987/11/18 01:00:00	5	0	71.90%	0.07
795	1987/11/21 03:00:00	1987/11/21 06:00:00	4	0	72.00%	0.07
796	1987/12/07 07:00:00	1987/12/07 11:00:00	5	0	72.10%	0.07
797	1987/12/29 16:00:00	1987/12/30 08:00:00	17	0	72.20%	0.07
798	1988/01/05 13:00:00	1988/01/06 02:00:00	14	0	72.30%	0.07
799	1988/02/29 20:00:00	1988/03/02 08:00:00	37	0	72.40%	0.07
800	1988/04/18 08:00:00	1988/04/18 10:00:00	3	0	72.50%	0.07
801	1988/05/05 22:00:00	1988/05/06 00:00:00	3	0	72.60%	0.07
802	1988/05/29 07:00:00	1988/05/29 09:00:00	3	0	72.60%	0.07
803	1988/11/11 02:00:00	1988/11/11 13:00:00	12	0	72.70%	0.07
804	1988/11/14 04:00:00	1988/11/14 22:00:00	19	0	72.80%	0.07
805	1988/11/23 21:00:00	1988/11/24 03:00:00	7	0	72.90%	0.07
806	1988/12/27 22:00:00	1988/12/28 03:00:00	6	0	73.00%	0.07
807	1989/01/04 02:00:00	1989/01/06 16:00:00	63	0	73.10%	0.07
808	1989/02/02 07:00:00	1989/02/02 14:00:00	8	0	73.20%	0.07
809	1989/02/03 18:00:00	1989/02/05 03:00:00	34	0	73.30%	0.07
810	1989/02/08 17:00:00	1989/02/08 20:00:00	4	0	73.40%	0.07
811	1989/02/10 17:00:00	1989/02/11 00:00:00	8	0	73.50%	0.07
812	1989/03/02 10:00:00	1989/03/03 04:00:00	19	0	73.60%	0.07
813	1989/03/25 06:00:00	1989/03/26 12:00:00	31	0	73.60%	0.07
814	1989/04/25 21:00:00	1989/04/26 03:00:00	7	0	73.70%	0.07
815	1989/05/10 21:00:00	1989/05/11 07:00:00	11	0	73.80%	0.07
816	1989/05/15 04:00:00	1989/05/15 06:00:00	3	0	73.90%	0.07
817	1989/09/17 03:00:00	1989/09/17 08:00:00	6	0	74.00%	0.07
818	1989/09/19 09:00:00	1989/09/19 13:00:00	5	0	74.10%	0.07
819	1989/10/22 01:00:00	1989/10/22 10:00:00	10	0	74.20%	0.07
820	1989/11/26 07:00:00	1989/11/26 10:00:00	4	0	74.30%	0.07
821	1989/12/28 11:00:00	1989/12/28 20:00:00	10	0	74.40%	0.07
822	1990/01/02 05:00:00	1990/01/02 21:00:00	17	0	74.50%	0.07
823	1990/01/31 00:00:00	1990/01/31 14:00:00	15	0	74.50%	0.07
824	1990/02/04 10:00:00	1990/02/04 20:00:00	11	0	74.60%	0.07
825	1990/03/05 11:00:00	1990/03/05 15:00:00	5	0	74.70%	0.07
826	1990/03/11 00:00:00	1990/03/11 07:00:00	8	0	74.80%	0.07
827	1990/03/12 10:00:00	1990/03/12 13:00:00	4	0	74.90%	0.07
828	1990/04/04 09:00:00	1990/04/04 17:00:00	9	0	75.00%	0.07
829	1990/04/16 17:00:00	1990/04/17 16:00:00	24	0	75.10%	0.07
830	1990/04/25 00:00:00	1990/04/25 04:00:00	5	0	75.20%	0.07
831	1990/08/15 11:00:00	1990/08/15 13:00:00	3	0	75.30%	0.07
832	1990/11/26 02:00:00	1990/11/26 07:00:00	6	0	75.40%	0.07
833	1990/12/19 22:00:00	1990/12/20 10:00:00	13	0	75.50%	0.07
834	1991/01/03 13:00:00	1991/01/04 17:00:00	29	0	75.50%	0.07
835	1991/01/09 11:00:00	1991/01/10 04:00:00	18	0	75.60%	0.07
836	1991/01/21 06:00:00	1991/01/21 12:00:00	7	0	75.70%	0.07
837	1991/03/05 02:00:00	1991/03/05 05:00:00	4	0	75.80%	0.07
838	1991/03/11 02:00:00	1991/03/11 05:00:00	4	0	75.90%	0.07

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
839	1991/03/13 16:00:00	1991/03/14 08:00:00	17	0	76.00%	0.07
840	1991/03/15 17:00:00	1991/03/16 02:00:00	10	0	76.10%	0.07
841	1991/04/01 05:00:00	1991/04/01 08:00:00	4	0	76.20%	0.07
842	1991/07/31 05:00:00	1991/08/01 10:00:00	30	0	76.30%	0.07
843	1991/10/26 21:00:00	1991/10/27 07:00:00	11	0	76.40%	0.07
844	1991/11/18 01:00:00	1991/11/18 04:00:00	4	0	76.40%	0.07
845	1991/11/29 18:00:00	1991/11/29 22:00:00	5	0	76.50%	0.07
846	1991/12/11 05:00:00	1991/12/11 09:00:00	5	0	76.60%	0.07
847	1991/12/17 13:00:00	1991/12/19 10:00:00	46	0	76.70%	0.07
848	1991/12/28 00:00:00	1991/12/28 11:00:00	12	0	76.80%	0.07
849	1992/01/02 23:00:00	1992/01/03 10:00:00	12	0	76.90%	0.07
850	1992/03/06 11:00:00	1992/03/08 07:00:00	45	0	77.00%	0.07
851	1992/03/09 18:00:00	1992/03/09 21:00:00	4	0	77.10%	0.07
852	1992/03/26 17:00:00	1992/03/27 10:00:00	18	0	77.20%	0.07
853	1992/04/01 13:00:00	1992/04/01 23:00:00	11	0	77.30%	0.07
854	1992/05/09 02:00:00	1992/05/09 04:00:00	3	0	77.40%	0.07
855	1992/05/22 17:00:00	1992/05/22 21:00:00	5	0	77.40%	0.07
856	1992/07/10 08:00:00	1992/07/11 08:00:00	25	0	77.50%	0.07
857	1992/07/12 11:00:00	1992/07/12 13:00:00	3	0	77.60%	0.07
858	1992/08/13 16:00:00	1992/08/13 20:00:00	5	0	77.70%	0.07
859	1992/10/13 15:00:00	1992/10/13 18:00:00	4	0	77.80%	0.07
860	1992/10/23 02:00:00	1992/10/24 00:00:00	23	0	77.90%	0.07
861	1992/10/28 21:00:00	1992/10/29 12:00:00	16	0	78.00%	0.07
862	1992/10/30 17:00:00	1992/10/31 00:00:00	8	0	78.10%	0.07
863	1992/12/03 09:00:00	1992/12/04 16:00:00	32	0	78.20%	0.07
864	1992/12/11 14:00:00	1992/12/11 21:00:00	8	0	78.30%	0.07
865	1992/12/17 23:00:00	1992/12/18 07:00:00	9	0	78.40%	0.07
866	1992/12/27 17:00:00	1992/12/30 06:00:00	62	0	78.40%	0.07
867	1993/01/02 06:00:00	1993/01/02 16:00:00	11	0	78.50%	0.07
868	1993/02/26 15:00:00	1993/02/27 08:00:00	18	0	78.60%	0.07
869	1993/02/28 15:00:00	1993/02/28 18:00:00	4	0	78.70%	0.07
870	1993/03/25 23:00:00	1993/03/28 23:00:00	73	0	78.80%	0.07
871	1993/06/05 11:00:00	1993/06/06 08:00:00	22	0	78.90%	0.07
872	1993/10/16 07:00:00	1993/10/17 13:00:00	31	0	79.00%	0.07
873	1993/11/11 07:00:00	1993/11/12 10:00:00	28	0	79.10%	0.07
874	1993/11/14 18:00:00	1993/11/14 21:00:00	4	0	79.20%	0.07
875	1993/11/22 22:00:00	1993/11/23 08:00:00	11	0	79.30%	0.07
876	1993/11/30 03:00:00	1993/11/30 10:00:00	8	0	79.30%	0.07
877	1993/12/11 15:00:00	1993/12/12 05:00:00	15	0	79.40%	0.07
878	1993/12/14 17:00:00	1993/12/14 23:00:00	7	0	79.50%	0.07
879	1993/12/19 06:00:00	1993/12/19 10:00:00	5	0	79.60%	0.07
880	1994/01/27 10:00:00	1994/01/28 05:00:00	20	0	79.70%	0.07
881	1994/02/20 09:00:00	1994/02/21 00:00:00	16	0	79.80%	0.07
882	1994/04/01 13:00:00	1994/04/01 15:00:00	3	0	79.90%	0.07
883	1994/04/09 10:00:00	1994/04/09 15:00:00	6	0	80.00%	0.07
884	1994/04/24 02:00:00	1994/04/24 13:00:00	12	0	80.10%	0.07
885	1994/05/07 00:00:00	1994/05/07 02:00:00	3	0	80.20%	0.07

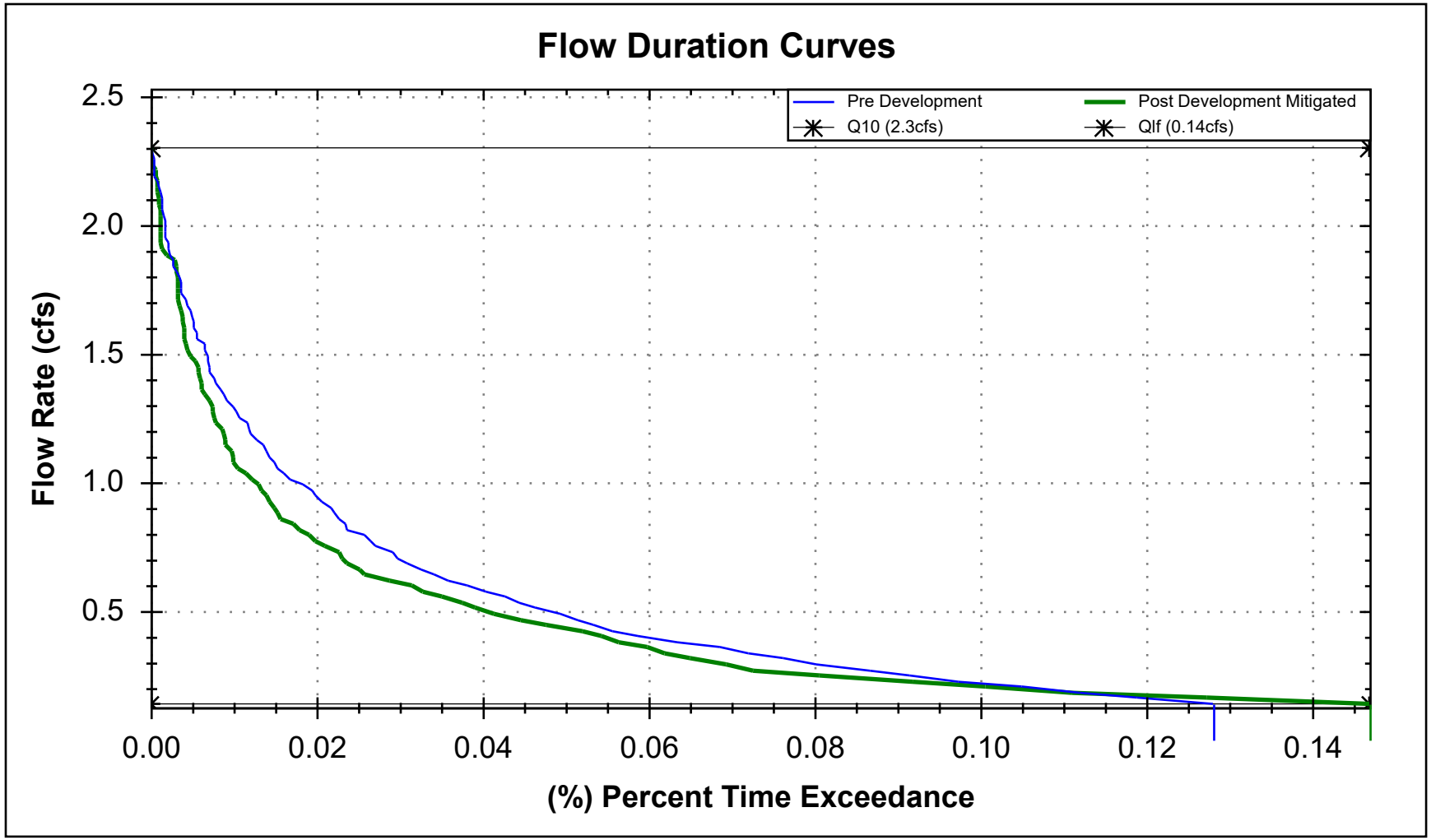
Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
886	1994/05/29 06:00:00	1994/05/29 08:00:00	3	0	80.30%	0.07
887	1994/10/04 13:00:00	1994/10/05 16:00:00	28	0	80.30%	0.07
888	1994/10/16 00:00:00	1994/10/16 03:00:00	4	0	80.40%	0.07
889	1994/11/10 10:00:00	1994/11/11 03:00:00	18	0	80.50%	0.07
890	1994/11/16 08:00:00	1994/11/16 13:00:00	6	0	80.60%	0.07
891	1994/11/17 20:00:00	1994/11/18 14:00:00	19	0	80.70%	0.07
892	1994/11/26 06:00:00	1994/11/26 11:00:00	6	0	80.80%	0.07
893	1994/12/13 05:00:00	1994/12/13 10:00:00	6	0	80.90%	0.07
894	1994/12/22 20:00:00	1994/12/23 03:00:00	8	0	81.00%	0.07
895	1994/12/24 08:00:00	1994/12/25 19:00:00	36	0	81.10%	0.07
896	1995/01/15 02:00:00	1995/01/17 01:00:00	48	0	81.20%	0.07
897	1995/01/21 01:00:00	1995/01/21 14:00:00	14	0	81.30%	0.07
898	1995/01/23 01:00:00	1995/01/27 15:00:00	111	0	81.30%	0.07
899	1995/02/09 07:00:00	1995/02/09 10:00:00	4	0	81.40%	0.07
900	1995/03/21 07:00:00	1995/03/22 02:00:00	20	0	81.50%	0.06
901	1995/03/23 09:00:00	1995/03/24 15:00:00	31	0	81.60%	0.06
902	1995/04/16 06:00:00	1995/04/17 03:00:00	22	0	81.70%	0.06
903	1995/04/21 03:00:00	1995/04/21 05:00:00	3	0	81.80%	0.06
904	1995/05/06 02:00:00	1995/05/06 12:00:00	11	0	81.90%	0.06
905	1995/05/13 07:00:00	1995/05/13 11:00:00	5	0	82.00%	0.06
906	1995/05/14 22:00:00	1995/05/15 00:00:00	3	0	82.10%	0.06
907	1995/05/23 12:00:00	1995/05/23 14:00:00	3	0	82.20%	0.06
908	1995/06/01 07:00:00	1995/06/01 09:00:00	3	0	82.20%	0.06
909	1995/06/15 19:00:00	1995/06/17 06:00:00	36	0	82.30%	0.06
910	1995/07/16 08:00:00	1995/07/16 11:00:00	4	0	82.40%	0.06
911	1995/10/01 02:00:00	1995/10/01 05:00:00	4	0	82.50%	0.06
912	1995/11/18 01:00:00	1995/11/18 04:00:00	4	0	82.60%	0.06
913	1995/12/23 09:00:00	1995/12/23 19:00:00	11	0	82.70%	0.06
914	1996/01/16 18:00:00	1996/01/19 15:00:00	70	0	82.80%	0.06
915	1996/01/21 18:00:00	1996/01/22 16:00:00	23	0	82.90%	0.06
916	1996/01/25 09:00:00	1996/01/26 00:00:00	16	0	83.00%	0.06
917	1996/01/28 04:00:00	1996/01/28 12:00:00	9	0	83.10%	0.06
918	1996/02/12 10:00:00	1996/02/12 16:00:00	7	0	83.20%	0.06
919	1996/02/25 08:00:00	1996/02/26 19:00:00	36	0	83.20%	0.06
920	1996/03/04 14:00:00	1996/03/05 18:00:00	29	0	83.30%	0.06
921	1996/03/20 06:00:00	1996/03/20 09:00:00	4	0	83.40%	0.06
922	1996/03/28 13:00:00	1996/03/28 18:00:00	6	0	83.50%	0.06
923	1996/04/01 21:00:00	1996/04/01 23:00:00	3	0	83.60%	0.06
924	1996/04/17 07:00:00	1996/04/18 15:00:00	33	0	83.70%	0.06
925	1996/10/05 07:00:00	1996/10/05 10:00:00	4	0	83.80%	0.06
926	1996/11/03 04:00:00	1996/11/03 07:00:00	4	0	83.90%	0.06
927	1996/11/19 03:00:00	1996/11/19 06:00:00	4	0	84.00%	0.06
928	1996/12/05 19:00:00	1996/12/06 10:00:00	16	0	84.10%	0.06
929	1996/12/22 13:00:00	1996/12/23 00:00:00	12	0	84.10%	0.06
930	1996/12/27 09:00:00	1996/12/28 21:00:00	37	0	84.20%	0.06
931	1996/12/31 16:00:00	1996/12/31 20:00:00	5	0	84.30%	0.06
932	1997/01/03 01:00:00	1997/01/03 19:00:00	19	0	84.40%	0.06

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
933	1997/01/05 08:00:00	1997/01/05 22:00:00	15	0	84.50%	0.06
934	1997/02/10 19:00:00	1997/02/11 06:00:00	12	0	84.60%	0.06
935	1997/02/27 08:00:00	1997/02/28 02:00:00	19	0	84.70%	0.06
936	1997/03/05 15:00:00	1997/03/05 21:00:00	7	0	84.80%	0.06
937	1997/04/03 17:00:00	1997/04/04 00:00:00	8	0	84.90%	0.06
938	1997/06/13 10:00:00	1997/06/13 12:00:00	3	0	85.00%	0.06
939	1997/09/15 13:00:00	1997/09/15 16:00:00	4	0	85.10%	0.06
940	1997/11/10 16:00:00	1997/11/11 05:00:00	14	0	85.10%	0.06
941	1997/11/13 11:00:00	1997/11/14 08:00:00	22	0	85.20%	0.06
942	1997/12/18 17:00:00	1997/12/19 04:00:00	12	0	85.30%	0.06
943	1998/01/03 07:00:00	1998/01/05 02:00:00	44	0	85.40%	0.06
944	1998/01/16 02:00:00	1998/01/16 07:00:00	6	0	85.50%	0.06
945	1998/01/19 04:00:00	1998/01/19 11:00:00	8	0	85.60%	0.06
946	1998/01/29 11:00:00	1998/01/29 17:00:00	7	0	85.70%	0.06
947	1998/01/31 21:00:00	1998/02/01 01:00:00	5	0	85.80%	0.06
948	1998/03/06 04:00:00	1998/03/06 19:00:00	16	0	85.90%	0.06
949	1998/04/05 15:00:00	1998/04/06 22:00:00	32	0	86.00%	0.06
950	1998/04/11 01:00:00	1998/04/11 22:00:00	22	0	86.10%	0.06
951	1998/05/02 03:00:00	1998/05/02 06:00:00	4	0	86.10%	0.06
952	1998/06/11 14:00:00	1998/06/11 19:00:00	6	0	86.20%	0.06
953	1998/09/03 21:00:00	1998/09/04 08:00:00	12	0	86.30%	0.06
954	1998/09/26 09:00:00	1998/09/26 11:00:00	3	0	86.40%	0.06
955	1998/10/26 11:00:00	1998/10/26 17:00:00	7	0	86.50%	0.06
956	1998/11/11 19:00:00	1998/11/11 22:00:00	4	0	86.60%	0.06
957	1998/11/28 06:00:00	1998/11/29 07:00:00	26	0	86.70%	0.06
958	1998/12/01 17:00:00	1998/12/01 22:00:00	6	0	86.80%	0.06
959	1998/12/04 21:00:00	1998/12/07 00:00:00	52	0	86.90%	0.06
960	1998/12/19 18:00:00	1998/12/20 04:00:00	11	0	87.00%	0.06
961	1999/01/20 05:00:00	1999/01/21 12:00:00	32	0	87.00%	0.06
962	1999/01/25 04:00:00	1999/01/27 15:00:00	60	0	87.10%	0.06
963	1999/01/31 10:00:00	1999/01/31 15:00:00	6	0	87.20%	0.06
964	1999/02/04 07:00:00	1999/02/06 05:00:00	47	0	87.30%	0.06
965	1999/02/09 19:00:00	1999/02/10 02:00:00	8	0	87.40%	0.06
966	1999/03/04 01:00:00	1999/03/04 04:00:00	4	0	87.50%	0.06
967	1999/03/07 07:00:00	1999/03/07 16:00:00	10	0	87.60%	0.06
968	1999/03/11 10:00:00	1999/03/11 17:00:00	8	0	87.70%	0.06
969	1999/03/15 10:00:00	1999/03/15 17:00:00	8	0	87.80%	0.06
970	1999/03/20 14:00:00	1999/03/20 17:00:00	4	0	87.90%	0.06
971	1999/03/25 14:00:00	1999/03/26 00:00:00	11	0	88.00%	0.06
972	1999/04/01 08:00:00	1999/04/02 03:00:00	20	0	88.00%	0.06
973	1999/04/03 18:00:00	1999/04/04 01:00:00	8	0	88.10%	0.06
974	1999/04/06 20:00:00	1999/04/07 18:00:00	23	0	88.20%	0.06
975	1999/04/11 18:00:00	1999/04/12 19:00:00	26	0	88.30%	0.06
976	1999/04/28 20:00:00	1999/04/28 22:00:00	3	0	88.40%	0.06
977	1999/05/03 02:00:00	1999/05/03 04:00:00	3	0	88.50%	0.06
978	1999/06/02 00:00:00	1999/06/02 08:00:00	9	0	88.60%	0.06
979	1999/06/03 23:00:00	1999/06/04 01:00:00	3	0	88.70%	0.06

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
980	1999/06/21 20:00:00	1999/06/21 23:00:00	4	0	88.80%	0.06
981	1999/07/08 10:00:00	1999/07/08 13:00:00	4	0	88.90%	0.06
982	1999/07/16 20:00:00	1999/07/16 22:00:00	3	0	88.90%	0.06
983	1999/08/23 02:00:00	1999/08/23 04:00:00	3	0	89.00%	0.06
984	1999/09/22 11:00:00	1999/09/22 14:00:00	4	0	89.10%	0.06
985	1999/09/24 12:00:00	1999/09/24 15:00:00	4	0	89.20%	0.06
986	1999/10/04 20:00:00	1999/10/04 23:00:00	4	0	89.30%	0.06
987	1999/11/11 11:00:00	1999/11/11 14:00:00	4	0	89.40%	0.06
988	1999/12/10 16:00:00	1999/12/10 20:00:00	5	0	89.50%	0.06
989	2000/01/02 17:00:00	2000/01/02 19:00:00	3	0	89.60%	0.06
990	2000/01/16 17:00:00	2000/01/16 20:00:00	4	0	89.70%	0.06
991	2000/01/25 09:00:00	2000/01/26 20:00:00	36	0	89.80%	0.06
992	2000/01/31 06:00:00	2000/02/01 03:00:00	22	0	89.90%	0.06
993	2000/02/10 17:00:00	2000/02/14 20:00:00	100	0	89.90%	0.06
994	2000/02/16 15:00:00	2000/02/18 07:00:00	41	0	90.00%	0.06
995	2000/02/28 17:00:00	2000/02/28 18:00:00	2	0	90.10%	0.06
996	2000/04/22 04:00:00	2000/04/22 06:00:00	3	0	90.20%	0.06
997	2000/05/08 07:00:00	2000/05/09 06:00:00	24	0	90.30%	0.06
998	2000/05/16 05:00:00	2000/05/16 07:00:00	3	0	90.40%	0.06
999	2000/05/25 05:00:00	2000/05/25 07:00:00	3	0	90.50%	0.06
1000	2000/08/10 15:00:00	2000/08/10 17:00:00	3	0	90.60%	0.06
1001	2000/09/22 07:00:00	2000/09/23 08:00:00	26	0	90.70%	0.06
1002	2000/10/04 06:00:00	2000/10/04 09:00:00	4	0	90.80%	0.06
1003	2000/10/26 13:00:00	2000/10/27 12:00:00	24	0	90.90%	0.06
1004	2000/11/10 05:00:00	2000/11/11 10:00:00	30	0	90.90%	0.06
1005	2001/01/08 16:00:00	2001/01/09 04:00:00	13	0	91.00%	0.06
1006	2001/01/15 11:00:00	2001/01/16 03:00:00	17	0	91.10%	0.06
1007	2001/01/24 10:00:00	2001/01/24 14:00:00	5	0	91.20%	0.06
1008	2001/01/26 10:00:00	2001/01/28 06:00:00	45	0	91.30%	0.06
1009	2001/04/21 00:00:00	2001/04/21 09:00:00	10	0	91.40%	0.06
1010	2001/05/31 14:00:00	2001/05/31 16:00:00	3	0	91.50%	0.06
1011	2001/11/04 17:00:00	2001/11/04 18:00:00	2	0	91.60%	0.06
1012	2001/11/13 13:00:00	2001/11/13 21:00:00	9	0	91.70%	0.06
1013	2001/11/24 17:00:00	2001/11/26 14:00:00	46	0	91.80%	0.06
1014	2001/11/29 17:00:00	2001/11/30 20:00:00	28	0	91.80%	0.06
1015	2001/12/10 02:00:00	2001/12/11 07:00:00	30	0	91.90%	0.06
1016	2001/12/14 05:00:00	2001/12/15 03:00:00	23	0	92.00%	0.06
1017	2001/12/21 11:00:00	2001/12/21 23:00:00	13	0	92.10%	0.06
1018	2001/12/30 17:00:00	2002/01/01 02:00:00	34	0	92.20%	0.06
1019	2002/01/28 03:00:00	2002/01/29 11:00:00	33	0	92.30%	0.06
1020	2002/02/19 15:00:00	2002/02/19 19:00:00	5	0	92.40%	0.06
1021	2002/03/01 06:00:00	2002/03/01 09:00:00	4	0	92.50%	0.06
1022	2002/03/07 07:00:00	2002/03/08 04:00:00	22	0	92.60%	0.06
1023	2002/03/15 23:00:00	2002/03/16 10:00:00	12	0	92.70%	0.06
1024	2002/03/17 19:00:00	2002/03/18 10:00:00	16	0	92.80%	0.06
1025	2002/03/23 06:00:00	2002/03/24 06:00:00	25	0	92.80%	0.06
1026	2002/04/15 09:00:00	2002/04/15 13:00:00	5	0	92.90%	0.06

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
1027	2002/04/24 12:00:00	2002/04/24 16:00:00	5	0	93.00%	0.06
1028	2003/07/30 17:00:00	2003/07/30 18:00:00	2	0	93.10%	0.06
1029	2003/11/01 07:00:00	2003/11/01 10:00:00	4	0	93.20%	0.06
1030	2003/11/12 00:00:00	2003/11/13 09:00:00	34	0	93.30%	0.06
1031	2003/11/15 23:00:00	2003/11/16 14:00:00	16	0	93.40%	0.06
1032	2003/12/07 21:00:00	2003/12/08 01:00:00	5	0	93.50%	0.06
1033	2003/12/14 18:00:00	2003/12/14 23:00:00	6	0	93.60%	0.06
1034	2003/12/23 17:00:00	2003/12/23 21:00:00	5	0	93.70%	0.06
1035	2004/01/02 17:00:00	2004/01/03 15:00:00	23	0	93.80%	0.06
1036	2004/01/09 14:00:00	2004/01/10 03:00:00	14	0	93.80%	0.06
1037	2004/01/21 00:00:00	2004/01/21 04:00:00	5	0	93.90%	0.06
1038	2004/01/28 04:00:00	2004/01/28 08:00:00	5	0	94.00%	0.06
1039	2004/02/18 16:00:00	2004/02/18 23:00:00	8	0	94.10%	0.06
1040	2004/03/01 21:00:00	2004/03/02 19:00:00	23	0	94.20%	0.06
1041	2004/03/26 08:00:00	2004/03/26 11:00:00	4	0	94.30%	0.06
1042	2004/04/01 20:00:00	2004/04/03 06:00:00	35	0	94.40%	0.06
1043	2004/04/17 12:00:00	2004/04/18 01:00:00	14	0	94.50%	0.06
1044	2004/07/23 00:00:00	2004/07/23 02:00:00	3	0	94.60%	0.06
1045	2004/11/07 23:00:00	2004/11/08 11:00:00	13	0	94.70%	0.06
1046	2004/11/21 03:00:00	2004/11/21 19:00:00	17	0	94.70%	0.06
1047	2004/11/27 16:00:00	2004/11/29 02:00:00	35	0	94.80%	0.06
1048	2004/12/05 03:00:00	2004/12/06 07:00:00	29	0	94.90%	0.06
1049	2004/12/08 03:00:00	2004/12/08 13:00:00	11	0	95.00%	0.06
1050	2005/02/06 20:00:00	2005/02/07 06:00:00	11	0	95.10%	0.06
1051	2005/03/01 00:00:00	2005/03/01 03:00:00	4	0	95.20%	0.06
1052	2005/03/04 12:00:00	2005/03/05 01:00:00	14	0	95.30%	0.06
1053	2005/03/11 08:00:00	2005/03/11 11:00:00	4	0	95.40%	0.06
1054	2005/03/18 18:00:00	2005/03/20 02:00:00	33	0	95.50%	0.06
1055	2005/03/22 19:00:00	2005/03/24 18:00:00	48	0	95.60%	0.06
1056	2005/04/08 22:00:00	2005/04/09 01:00:00	4	0	95.70%	0.06
1057	2005/04/24 05:00:00	2005/04/25 03:00:00	23	0	95.70%	0.06
1058	2005/05/05 22:00:00	2005/05/06 00:00:00	3	0	95.80%	0.06
1059	2005/07/23 03:00:00	2005/07/23 10:00:00	8	0	95.90%	0.06
1060	2005/09/20 02:00:00	2005/09/20 07:00:00	6	0	96.00%	0.06
1061	2005/11/10 09:00:00	2005/11/10 12:00:00	4	0	96.10%	0.06
1062	2005/12/03 00:00:00	2005/12/03 04:00:00	5	0	96.20%	0.06
1063	2006/01/15 05:00:00	2006/01/15 09:00:00	5	0	96.30%	0.06
1064	2006/02/17 21:00:00	2006/02/19 09:00:00	37	0	96.40%	0.06
1065	2006/03/03 14:00:00	2006/03/03 17:00:00	4	0	96.50%	0.05
1066	2006/03/07 00:00:00	2006/03/08 02:00:00	27	0	96.60%	0.05
1067	2006/03/17 18:00:00	2006/03/19 17:00:00	48	0	96.60%	0.05
1068	2006/03/26 01:00:00	2006/03/26 04:00:00	4	0	96.70%	0.05
1069	2006/03/28 05:00:00	2006/03/29 23:00:00	43	0	96.80%	0.05
1070	2006/03/31 12:00:00	2006/04/01 14:00:00	27	0	96.90%	0.05
1071	2006/04/14 13:00:00	2006/04/15 08:00:00	20	0	97.00%	0.05
1072	2006/04/23 05:00:00	2006/04/23 07:00:00	3	0	97.10%	0.05
1073	2006/05/22 04:00:00	2006/05/22 14:00:00	11	0	97.20%	0.05

Rank	Start Date	End Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
1074	2006/05/27 05:00:00	2006/05/27 07:00:00	3	0	97.30%	0.05
1075	2006/07/27 00:00:00	2006/07/27 03:00:00	4	0	97.40%	0.05
1076	2006/11/27 10:00:00	2006/11/28 08:00:00	23	0	97.50%	0.05
1077	2006/12/09 21:00:00	2006/12/11 05:00:00	33	0	97.60%	0.05
1078	2006/12/16 20:00:00	2006/12/17 19:00:00	24	0	97.60%	0.05
1079	2006/12/22 07:00:00	2006/12/22 14:00:00	8	0	97.70%	0.05
1080	2006/12/27 07:00:00	2006/12/27 14:00:00	8	0	97.80%	0.05
1081	2007/01/04 21:00:00	2007/01/05 05:00:00	9	0	97.90%	0.05
1082	2007/02/11 10:00:00	2007/02/11 19:00:00	10	0	98.00%	0.05
1083	2007/02/12 22:00:00	2007/02/13 06:00:00	9	0	98.10%	0.05
1084	2007/02/19 01:00:00	2007/02/20 15:00:00	39	0	98.20%	0.05
1085	2007/02/22 20:00:00	2007/02/23 15:00:00	20	0	98.30%	0.05
1086	2007/02/28 03:00:00	2007/02/28 23:00:00	21	0	98.40%	0.05
1087	2007/03/20 20:00:00	2007/03/21 11:00:00	16	0	98.50%	0.05
1088	2007/03/27 05:00:00	2007/03/27 08:00:00	4	0	98.60%	0.05
1089	2007/04/20 13:00:00	2007/04/21 08:00:00	20	0	98.60%	0.05
1090	2007/04/23 00:00:00	2007/04/23 04:00:00	5	0	98.70%	0.05
1091	2007/08/26 11:00:00	2007/08/26 15:00:00	5	0	98.80%	0.05
1092	2007/09/20 07:00:00	2007/09/20 09:00:00	3	0	98.90%	0.05
1093	2007/09/28 07:00:00	2007/09/28 09:00:00	3	0	99.00%	0.05
1094	2007/10/13 04:00:00	2007/10/13 11:00:00	8	0	99.10%	0.05
1095	2007/12/07 02:00:00	2007/12/09 03:00:00	50	0	99.20%	0.05
1096	2007/12/18 21:00:00	2007/12/19 18:00:00	22	0	99.30%	0.05
1097	2007/12/20 21:00:00	2007/12/21 01:00:00	5	0	99.40%	0.05
1098	2008/01/22 05:00:00	2008/01/22 10:00:00	6	0	99.50%	0.05
1099	2008/01/23 17:00:00	2008/01/25 00:00:00	32	0	99.50%	0.05
1100	2008/02/14 08:00:00	2008/02/14 22:00:00	15	0	99.60%	0.05
1101	2008/02/20 08:00:00	2008/02/20 15:00:00	8	0	99.70%	0.05
1102	2008/03/16 00:00:00	2008/03/16 03:00:00	4	0	99.80%	0.05
1103	2008/05/22 14:00:00	2008/05/24 03:00:00	38	0	99.90%	0.05
--End of Data----------						


Flow Duration Curves
Pre Development
Post Development Mitigated
Q10 (2.3cfs)
Qlf (0.14cfs)
Flow Rate (cfs)
2.5
2.0
1.5
1.0
0.5
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
(%) Percent Time Exceedance

Compare Post-Development Curve to Pre-Development Curve
Flow Control Upper Limit: 2.3 (cfs)
Flow Control Lower Limit: 0.14 (cfs)

post-development SWMM file: V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM Files\Current\ST Improvement\19025-HMP-POST.out
post-development time stamp: 6/1/2022 4:55:14 PM
Compared to:
pre-development SWMM file: V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM Files\Current\ST Improvement\19025-HMP-PRE.out
pre-development time stamp: 6/6/2022 6:04:44 PM

Post PT #	Flow Rate (cfs)	Post Dev % Exceed	Pre Dev % Exceed	%Ex post < %Ex pre	%Ex post > %Ex pre	%Ex post > 110% %Ex pre	Pass/Fail
0	0.10	0.10	0.10	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
1	0.20	0.10	0.10	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
2	0.20	0.10	0.10	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
3	0.20	0.10	0.10	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
4	0.20	0.10	0.10	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
5	0.20	0.10	0.10	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
6	0.30	0.10	0.10	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
7	0.30	0.10	0.10	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
8	0.30	0.10	0.10	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
9	0.30	0.10	0.10	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
10	0.40	0.10	0.10	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
11	0.40	0.10	0.10	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
12	0.40	0.10	0.10	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
13	0.40	0.10	0.10	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
14	0.40	0.00	0.10	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
15	0.50	0.00	0.10	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
16	0.50	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
17	0.50	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
18	0.50	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
19	0.60	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
20	0.60	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
21	0.60	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
22	0.60	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
23	0.60	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
24	0.70	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
25	0.70	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
26	0.70	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
27	0.70	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
28	0.80	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
29	0.80	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration

Post PT #	Flow Rate (cfs)	Post Dev % Exceed	Pre Dev % Exceed	%Ex post < %Ex pre	%Ex post > %Ex pre	%Ex post > 110% %Ex pre	Pass/Fail
30	0.80	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
31	0.80	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
32	0.80	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
33	0.90	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
34	0.90	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
35	0.90	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
36	0.90	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
37	0.90	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
38	1.00	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
39	1.00	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
40	1.00	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
41	1.00	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
42	1.10	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
43	1.10	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
44	1.10	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
45	1.10	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
46	1.10	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
47	1.20	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
48	1.20	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
49	1.20	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
50	1.20	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
51	1.30	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
52	1.30	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
53	1.30	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
54	1.30	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
55	1.30	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
56	1.40	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
57	1.40	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
58	1.40	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
59	1.40	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
60	1.40	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
61	1.50	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
62	1.50	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
63	1.50	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
64	1.50	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
65	1.60	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
66	1.60	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
67	1.60	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
68	1.60	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
69	1.60	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration

Post PT #	Flow Rate (cfs)	Post Dev % Exceed	Pre Dev % Exceed	%Ex post < %Ex pre	%Ex post > %Ex pre	%Ex post > 110% %Ex pre	Pass/Fail
70	1.70	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
71	1.70	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
72	1.70	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
73	1.70	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
74	1.80	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
75	1.80	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
76	1.80	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
77	1.80	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
78	1.80	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
79	1.90	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
80	1.90	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
81	1.90	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
82	1.90	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
83	2.00	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
84	2.00	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
85	2.00	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
86	2.00	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
87	2.00	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
88	2.10	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
89	2.10	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
90	2.10	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
91	2.10	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
92	2.10	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
93	2.20	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
94	2.20	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
95	2.20	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
96	2.20	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
97	2.30	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
98	2.30	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration
99	2.30	0.00	0.00	TRUE	FALSE	FALSE	Pass: Post Duration <= Pre Duration

Duration Table Summary at Project Discharge Point

file name: V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM Files\Current\ST Improvement\19025-HMP-PRE.c
time stamp: 6/6/2022 6:04:44 PM

DISCHARGE		Number of periods when discharge was equal to or greater than DISCHARGE column but less than that shown on the next line		
Bin Number	Discharge Rate (cfs)	Number of Periods	Total Periods Exceeding	Percent Time Exceeded
1	0.1	46	638	0.128
2	0.2	34	592	0.119
3	0.2	35	558	0.112
4	0.2	38	523	0.105
5	0.2	29	485	0.097
6	0.2	24	456	0.092
7	0.3	32	432	0.087
8	0.3	20	400	0.080
9	0.3	21	380	0.076
10	0.3	17	359	0.072
11	0.4	26	342	0.069
12	0.4	24	316	0.063
13	0.4	15	292	0.059
14	0.4	11	277	0.056
15	0.4	10	266	0.053
16	0.5	10	256	0.051
17	0.5	15	246	0.049
18	0.5	10	231	0.046
19	0.5	8	221	0.044
20	0.6	12	213	0.043
21	0.6	11	201	0.040
22	0.6	11	190	0.038
23	0.6	9	179	0.036
24	0.6	8	170	0.034
25	0.7	8	162	0.033
26	0.7	6	154	0.031
27	0.7	3	148	0.030
28	0.7	10	145	0.029
29	0.8	3	135	0.027
30	0.8	4	132	0.026
31	0.8	10	128	0.026
32	0.8	1	118	0.024
33	0.8	4	117	0.023
34	0.9	3	113	0.023
35	0.9	2	110	0.022
36	0.9	5	108	0.022
37	0.9	4	103	0.021
38	0.9	2	99	0.020
39	1.0	6	97	0.019
40	1.0	7	91	0.018
41	1.0	4	84	0.017
42	1.0	4	80	0.016
43	1.1	2	76	0.015
44	1.1	3	74	0.015
45	1.1	2	71	0.014
46	1.1	1	69	0.014
47	1.1	4	68	0.014
48	1.2	4	64	0.013
49	1.2	1	60	0.012
50	1.2	1	59	0.012
51	1.2	5	58	0.012

Bin Number	Discharge Rate (cfs)	Number of Periods	Total Periods Exceeding	Percent Time Exceeded
52	1.3	2	53	0.011
53	1.3	1	51	0.010
54	1.3	4	50	0.010
55	1.3	2	46	0.009
56	1.3	2	44	0.009
57	1.4	3	42	0.008
58	1.4	1	39	0.008
59	1.4	3	38	0.008
60	1.4	0	35	0.007
61	1.4	1	35	0.007
62	1.5	0	34	0.007
63	1.5	2	34	0.007
64	1.5	0	32	0.006
65	1.5	4	32	0.006
66	1.6	0	28	0.006
67	1.6	2	28	0.006
68	1.6	0	26	0.005
69	1.6	1	26	0.005
70	1.6	1	25	0.005
71	1.7	2	24	0.005
72	1.7	1	22	0.004
73	1.7	3	21	0.004
74	1.7	0	18	0.004
75	1.8	0	18	0.004
76	1.8	1	18	0.004
77	1.8	2	17	0.003
78	1.8	2	15	0.003
79	1.8	0	13	0.003
80	1.9	1	13	0.003
81	1.9	1	12	0.002
82	1.9	0	11	0.002
83	1.9	2	11	0.002
84	2.0	0	9	0.002
85	2.0	0	9	0.002
86	2.0	0	9	0.002
87	2.0	1	9	0.002
88	2.0	1	8	0.002
89	2.1	0	7	0.001
90	2.1	0	7	0.001
91	2.1	1	7	0.001
92	2.1	1	6	0.001
93	2.1	1	5	0.001
94	2.2	2	4	0.001
95	2.2	0	2	0.000
96	2.2	0	2	0.000
97	2.2	0	2	0.000
98	2.3	1	2	0.000
99	2.3	1	1	0.000
100	2.3	0	0	0.000
---------End of Data----------				

Duration Table Summary at Project Discharge Point

file name: V:\19\19025\Engineering\SDP\SDP 01\Storm\Working Files\Hydromod\SWMM Files\Current\ST Improvement\19025-HMP-POST
time stamp: 6/1/2022 4:55:14 PM

DISCHARGE		Number of periods when discharge was equal to or greater than DISCHARGE column but less than that shown on the next line		
Bin Number	Discharge Rate (cfs)	Number of Periods	Total Periods Exceeding	Percent Time Exceeded
1	0.1	98	732	0.147
2	0.2	81	634	0.127
3	0.2	52	553	0.111
4	0.2	43	501	0.101
5	0.2	56	458	0.092
6	0.2	40	402	0.081
7	0.3	16	362	0.073
8	0.3	22	346	0.069
9	0.3	15	324	0.065
10	0.3	11	309	0.062
11	0.4	17	298	0.060
12	0.4	10	281	0.056
13	0.4	12	271	0.054
14	0.4	22	259	0.052
15	0.4	15	237	0.048
16	0.5	16	222	0.045
17	0.5	11	206	0.041
18	0.5	8	195	0.039
19	0.5	12	187	0.038
20	0.6	12	175	0.035
21	0.6	6	163	0.033
22	0.6	14	157	0.032
23	0.6	15	143	0.029
24	0.6	3	128	0.026
25	0.7	7	125	0.025
26	0.7	3	118	0.024
27	0.7	2	115	0.023
28	0.7	8	113	0.023
29	0.8	6	105	0.021
30	0.8	4	99	0.020
31	0.8	6	95	0.019
32	0.8	3	89	0.018
33	0.8	8	86	0.017
34	0.9	2	78	0.016
35	0.9	2	76	0.015
36	0.9	3	74	0.015
37	0.9	2	71	0.014
38	0.9	2	69	0.014
39	1.0	2	67	0.013
40	1.0	4	65	0.013
41	1.0	4	61	0.012
42	1.0	5	57	0.011
43	1.1	2	52	0.010
44	1.1	0	50	0.010
45	1.1	1	50	0.010
46	1.1	4	49	0.010
47	1.1	0	45	0.009
48	1.2	1	45	0.009
49	1.2	1	44	0.009
50	1.2	4	43	0.009
51	1.2	1	39	0.008

Bin Number	Discharge Rate (cfs)	Number of Periods	Total Periods Exceeding	Percent Time Exceeded
52	1.3	1	38	0.008
53	1.3	0	37	0.007
54	1.3	2	37	0.007
55	1.3	3	35	0.007
56	1.3	1	32	0.006
57	1.4	0	31	0.006
58	1.4	1	31	0.006
59	1.4	1	30	0.006
60	1.4	0	29	0.006
61	1.4	2	29	0.006
62	1.5	3	27	0.005
63	1.5	2	24	0.005
64	1.5	1	22	0.004
65	1.5	1	21	0.004
66	1.6	0	20	0.004
67	1.6	0	20	0.004
68	1.6	1	20	0.004
69	1.6	0	19	0.004
70	1.6	1	19	0.004
71	1.7	1	18	0.004
72	1.7	1	17	0.003
73	1.7	0	16	0.003
74	1.7	0	16	0.003
75	1.8	0	16	0.003
76	1.8	0	16	0.003
77	1.8	1	16	0.003
78	1.8	0	15	0.003
79	1.8	1	15	0.003
80	1.9	4	14	0.003
81	1.9	3	10	0.002
82	1.9	1	7	0.001
83	1.9	0	6	0.001
84	2.0	0	6	0.001
85	2.0	0	6	0.001
86	2.0	0	6	0.001
87	2.0	0	6	0.001
88	2.0	0	6	0.001
89	2.1	1	6	0.001
90	2.1	0	5	0.001
91	2.1	1	5	0.001
92	2.1	0	4	0.001
93	2.1	0	4	0.001
94	2.2	1	4	0.001
95	2.2	0	3	0.001
96	2.2	2	3	0.001
97	2.2	1	1	0.000
98	2.3	0	0	0.000
99	2.3	0	0	0.000
100	2.3	0	0	0.000
---------End of Data----------				

END OF STATISTICS ANALYSIS

8.3 Geomorphic Assessment of Receiving Water Channels

Insert Geomorphic Assessment behind this cover page or submit as a separate stand-alone document labeled Sub-attachment 8.3.

No Geomorphic assessment has been performed for this project. Calculations assume the default of receiving channel is of high sensitivity to erosion and compare developed hydromodification discharges to 10% of the predevelopment Q2 flows.

8.4 Vector Control Plan

Insert Vector Control Plan behind this cover page or submit as a separate stand-alone document labeled Sub-attachment 8.4.

All drainage detention facilities on this project are designed to drawdown in less than 96 hour and therefore no vector control plan is required.

9.0 General Requirements

- Complete the table below to indicate which compliance pathway was selected in PDP SWQMP Table 6. Include the corresponding sub-attachment with your SWQMP submittal. Other sub-attachments do not need to be included.
- See the BMPDM sections and appendices listed under "BMPDM Design Resources" for additional explanation of design requirements. Constructed features must fully satisfy the requirements described in these resources, and any other guidance identified by the County.
- DMA Exhibits and Construction Plans: CCSYAs and applicable BMPs identified and described in this attachment must be shown on DMA Exhibits and all applicable construction plans submitted for the project. See Attachment 2 for additional instruction on exhibits and plans.

Sub-attachments	BMPDM Design Resources
☐ **9.1: Documentation of Hydromodification Management Exemption**[1]	Section 1.6
☒ **9.2: Watershed Management Area Analysis (WMAA) Mapping**[1]	Appendix H.1.1.2
☐ **9.3: Resource Protection Ordinance (RPO) Methods**	Appendix H.1.1.1
☐ **9.4: No Net Impact Analysis**	Appendix H.4

[1] The San Diego County Regional comprehensive WMAA mapping data can be found on the Project Clean Water website here: http://www.projectcleanwater.org/download/wmaa_attc_data/

9.1 Documentation of Hydromodification Management Exemption (BMPDM Section 1.6)

- If the PDP is exempt from hydromodification management requirements (see Table 4 Part A.1 of the PDP SWQMP), use this Sub-attachment to document the exemption.
- Select the type of exemption below that applies and provide an explanation of the selection, including maps or other applicable documentation. Additional documentation may be requested by County staff.

Exemption Type per BMPDM Figure 1-2 (select one)

☐ a. The proposed project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐ b. The proposed project will discharge runoff directly to conveyance channels whose bed and bank are concrete lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐ c. The proposed project will discharge runoff directly to an area identified by the County as appropriate for an exemption by the WMAA for the watershed in which the project resides[2].

Explanation (add or attach pages as necessary)

[2] This option must include an analysis of the project using the methodology presented in Attachment E of the Regional Watershed Management Area Analysis.

9.2 Watershed Management Area Analysis (WMAA) Mapping (BMPDM Appendix H.1.1.2)

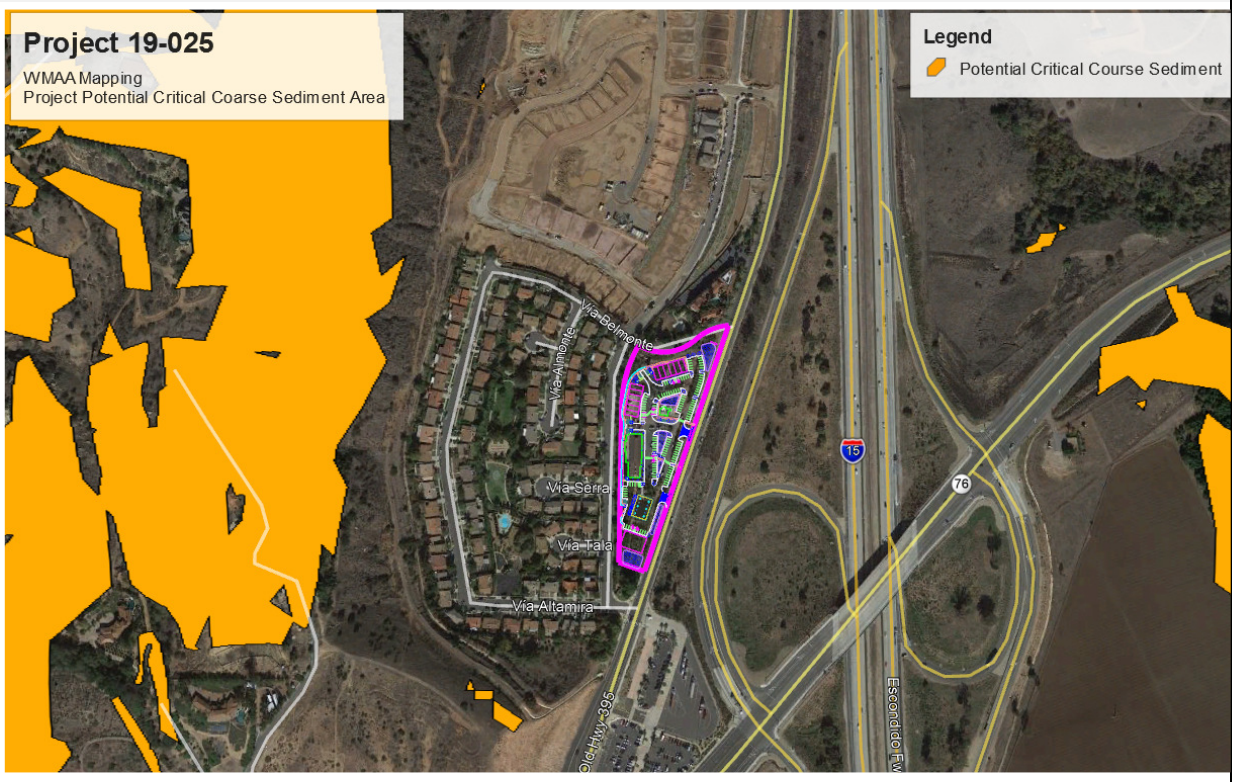
Watershed Management Area Analysis (WMAA) mapping is a simple way to screen projects to determine the presence of onsite or offsite upstream Potential Critical Coarse Sediment Yield Areas (PCCSYAs). The San Diego County Regional WMAA mapping data can be found on the Project Clean Water website here: http://www.projectcleanwater.org/download/wmaa_attc_data/ .[3]

- Based on the WMAA map and the proposed project design, demonstrate below that both of the following conditions apply to the PDP:

  (a) Less than 5% of PCCSYAs will be impacted (built on or obstructed) by the PDP, and

  (b) All upstream offsite PCCYSAs will be bypassed (see BMPDM Appendix H.3).

A. Mapping Results -- At a minimum, show: (1) the project footprint, (2) areas of proposed development, (3) impacted onsite PCCSYAs, (4) offsite tributary areas[4], and (5) bypass of upstream offsite PCCSYAs.



[3] Applicants may refine initial mapping results using options identified in BMPDM Appendix H.1.2.
[4] Tributary areas must be shown to demonstrate that upstream offsite PCCSYAs do not exist. If bypassing these areas, only the bypass should be shown.

B. Explanation -- Provide documentation as needed to demonstrate that (1) impacts to PCCSYAs are below 5%, and (2) upstream offsite PCCYSAs are effectively bypassed. Add pages as necessary.

By observation of the mapping results, it can be seen that there are no areas of PCCSYAs within the project boundary.

By observation of the mapping, the nearest PCCSYAs to the project site are across Interstate 15 to the east, and on the opposite site of the neighboring development to the west. No areas of PCCSY are tributary to the project site.

9.3 Resource Protection Ordinance (RPO) Methods (BMPDM Appendix H.1.1.1)

- Either of two Resource Protection Ordinance (RPO) methods may also be used to demonstrate compliance with CCSYA requirements. Select either option and document the selection below:

  ☐ **RPO Scenario 1: PDP is subject to and in compliance with RPO requirements**[5]

  - **Select** if the project requires one or more discretionary permits;
  - **Demonstrate** that onsite AND upstream offsite CCSYAs will be avoided and/or bypassed.

  ☐ **RPO Scenario 2: PDP is entirely exempt/not subject to RPO requirements**[6]

  - **Select** if the project does not require discretionary permits;
  - **Demonstrate** that all upstream offsite CCSYAs will be bypassed[7].

A. Mapping Results -- At a minimum, show as applicable: (1) the project footprint, (2) areas of proposed development, (3) locations of onsite and upstream offsite CCSYAs, and (4) bypass of all identified CCSYAs.

[5] RPO applicability is normally confirmed during discretionary review. Check with your project manager if you're not sure of your status.
[6] Does not include PDPs utilizing exemption(s) via RPO Section 86.604(e)(2)(cc) or 86.604(e)(3).
[7] This scenario does not impose requirements for onsite CCSYAs.

B. Explanation -- Provide documentation as needed to demonstrate that (1) onsite CCSYAs are avoided and bypassed [if applicable], and (2) upstream offsite CCYSAs are effectively bypassed. Add pages as necessary.

9.4 No Net Impact Analysis (BMPDM Appendix H.4)

- When impacts to CCSYAs cannot be avoided or effectively bypassed, applicants must demonstrate that their project generates no net impact to the receiving water per the performance metrics identified in BMPDM Appendix H.4.
- Use the space below to document that the PDP will generate no net impact to any receiving water.

No Net Impact Analysis (add or attach pages as necessary)

This form must be accepted by the County prior to the release of construction permits or granting of occupancy for applicable portions of a Priority Development Project (PDP). Its purpose is to provide documentation of the final installation of permanent Best Management Practices (BMPs) used to satisfy Structural Performance Standards for the development project. Compliance with these standards reduces the discharge of pollutants and flows from the completed project site. Applicable standards may be satisfied using Structural BMPs (S-BMPs), Significant Site Design BMPs (SSD-BMPs), or both. Applicants are responsible for providing all requested information. Do not leave any fields blank; indicate *N/A* for any requested item that is not applicable.

PART 1 General Project and Applicant Information

Table 1: Project and Applicant Information

A. Project Summary Information	ID No. IVF-20___-____ To be assigned by DPW-WPP
Project Name	Pala Mesa Plaza
Record ID (e.g. grading/improvement plan number, building permit)	
Project Address	3235 Old Highway 395, Fallbrook, CA 92028
Assessor's Parcel Number(s) APN(s)	APN: 125-050-54-00
Project Watershed (complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier)	San Luis Rey HU, Lower San Luis Rey HA, Bonsall HSA 903.12
B. Owner Information	
Name	TGRH3 LLC Rafid Hamika Managing Member
Address	3712 East Owens Ave #101, North Las Vegas, NV 89030
Email Address	epmnvl@yahoo.com
Phone Number	760-745-8118

PART 2 BMP INVENTORY INFORMATION

Use this table to document Structural BMPs (S-BMPs) and Significant Site Design BMPs (SSD-BMPs) for the PDP. All DMAs that are not self-mitigating or de minimis must have at least one Structural BMP or Significant Site Design BMP.

- In **Part A** list all Structural BMPs (including both Pollutant Control and/or Hydromodification as applicable) by DMA.
- Complete **Part B** for all DMAs that contain only Significant Site Design BMPs. SSD-BMPs are Site Design BMPs (SD-BMPs) that are sized and constructed to satisfy Structural Performance Standards for a DMA.
- The information provided for each BMP in the table must match that provided in the Stormwater Quality Management Plan (SWQMP), construction plans, maintenance agreements, and other relevant project documentation.

DMA #	BMP Information			Maintenance Category	Maintenance Agreement Recorded Doc #	Construction Plan Sheet #	Landscape Plan Sheet #	FOR DPW-WPP USE ONLY
	Quantity	Description/Type of Structural BMP	BMP ID #					
A. Structural BMPs (S-BMPs)								
DMA-100 DMA-102	1	Biofiltration	BMP-103	2	TBD			
DMA-200	1	Biofiltration	BMP-201	2	TBD			
DMA-300	1	Biofiltration	BMP-302	2	TBD			
DMA-400	1	Biofiltration	BMP-401	2	TBD			
DMA-500	1	Biofiltration	BMP-504	2	TBD			
DMA-600	1	Biofiltration	BMP-602	2	TBD			
DMA-700	1	Biofiltration	BMP-702	2	TBD			
DMA-800	1	Biofiltration	BMP-802	2	TBD			
DMA-2000	1	Biofiltration	BMP 2001	2	TBD			
Add rows as needed. Click into the last column in the row below this, then press TAB to add a new row.								
B. Significant Site Design BMPs (SSD-BMPs)								
		Choose an item.		---	---			
		Choose an item.		---	---			
		Choose an item.		---	---			
		Choose an item.		---	---			

PART 3 Required Attachments for All BMPs Listed in Table 3

For ALL projects, submit the following to the County inspector (check all that are attached):

☐ Photographs: Labeled photographs illustrating proper construction of each S-BMP or SSD-BMP.

☐ Maintenance Agreements: Copies of all approved and recorded Storm Water Maintenance Agreements (SWMAs) or Maintenance Notifications (MNs) for all S-BMPs.

Note: All BMPs proposed for County ownership will remain the responsibility of the owner listed on **Page 1** until a signed Letter of Acceptance of Completion is received by the DPW Watershed Protection Program.

For Grading and Improvement projects only, ALSO submit:

☐ Construction Plans: An 11" X 17" copy of the most current applicable approved Construction Plan sheets:

- ☐ Grading Plans, AND/OR
- ☐ Improvement Plans, AND/OR
- ☐ Precise Grading Plan(s) (only for residential subdivisions with tract homes), AND/OR
- ☐ Other (Please specify) Click here to enter text.

Note: For each Construction Plan, the sheets submitted must incorporate all of the following:

- ☐ A BMP Table, AND
- ☐ A plan/cross-section of each verified as-built BMP, AND
- ☐ The location of each verified as-built BMP

☐ Landscape Plans: An 11" X 17" copy of the most current applicable Landscape Plan sheets where the BMPs are required to be vegetated, including:

- ☐ The Certification of Completion (Form 407), AND
- ☐ The Certificate of Approval from PDS Landscape Architect

Note: For each Landscape Plan, the sheets submitted must show the location of each verified as-built BMP.

Required only for Verifications for Partial Record Plans

☐ If this is a partial record plan verification, please include the following:

- ☐ A list of previously submitted Verification Forms (**Table 2, A**)
- ☐ A map of DMAs and BMPs (**Table 2, B**)

PART 4 Preparer's Certification

By signing below, I certify that the BMP(s) listed in Table 3 of this Verification Form have been constructed and all are in substantial conformance with the approved plans and applicable regulations. I understand the County reserves the right to inspect the above BMPs to verify compliance with the approved plans and Watershed Protection Ordinance (WPO). Should it be determined that the BMPs were not constructed to plan or code, corrective actions may be necessary before permits can be closed.

Note: Structural BMPs (Table 3, Part A) must be certified by a licensed professional engineer.

Please sign and, if applicable, provide your seal below.

[SEAL]

Preparer's Printed Name:

Robert Dentino

Email: rdentino@excelengineering.net

Phone Number: 760-745-8118

Preparer's Signed Name:

_____

Date: _____

COUNTY - OFFICIAL USE ONLY:

For County Inspectors

County Department: _____

Date verification received from EOW: _____

By signing below, County Inspector concurs that every noted BMP has been installed per plan.

Inspector Name: _____

Inspector's Signature: _____ Date: _____

For Building Division Only

Inspection Supervisor Name: _____

Inspector Supervisor's Signature: _____ Date: _____

PDCI & Building, along with the rest of this package, please provide to DPW WPP:

☐ A copy of the final accepted SWQMP and any accepted addendum

For Watershed Protection Program Only

Date Received: _____

WPP Reviewer: _____

WPP Reviewer concurs that the BMPs accepted in **Part 2** above may be entered into inventory.

WPP Reviewer's Signature: _____ Date: _____

11.0 Cover Sheet and General Requirements

- All Structural BMPs must have a plan and mechanism to ensure on-going maintenance. Use the table below to document the types of agreements to be submitted for the PDP and submit them under cover of this sheet.
- See BMPDM Section 7.3 for a description of maintenance categories and responsibilities. Note that since Category 3 and 4 BMPs are County-maintained, they do not require maintenance agreements.

a. Applicability of Maintenance Agreements

Check the boxes below to indicate which types of agreements are included with this attachment.

☐ Maintenance Notification (Category 1 BMPs)

- Exhibit A: Project Site Vicinity; Project Site Map; and a map for each BMP and its Drainage Management Area
- Exhibit B: BMP Maintenance Plan (see below)

☒ Stormwater Maintenance Agreement (Category 2 BMPs)

- Exhibit A: Legal Description of Property
- Exhibit B: BMP Maintenance Plan (see below)
- Exhibit C: Project Site Vicinity Map

Maintenance agreement templates and instructions are provided on the County's website:

www.sandiegocounty.gov/stormwater under the Development Resources tab.

PDP applicants contact County staff to ensure they have the most current forms.

b. Maintenance Plan Requirements

Use this checklist to confirm that each maintenance plan includes the following that as applicable.

☒ Specific **maintenance indicators and actions** for proposed structural BMP(s). These must be based on based on maintenance indicators presented in BMP Design Fact Sheets in Appendix E and enhanced to reflect actual proposed components of the structural BMP(s).

☒ **Access** to inspect and perform maintenance on the structural BMP(s).

☒ Features to **facilitate inspection** (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds).

☒ Manufacturer and part number for **proprietary parts** of structural BMP(s) when applicable.

☒ **Maintenance thresholds** specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP).

☒ Recommended **equipment** to perform maintenance.

☒ When applicable, necessary special **training or certification** requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management.

Exhibit A: Legal Description of Property

LEGAL DESCRIPTION
Real property in the unincorporated area of the County of San Diego, State of California, described as follows:

ALL THAT PORTION OF TRACT "A" OF MONSERATE RANCHO, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP THEREOF ON FILE IN THE OFFICE OF COUNTY RECORDING TO MAP THEREOF ON FILE IN THE OFFICE OF COUNTY RECORDER OF SAN DIEGO COUNTY, IN BOOK 1, PAGE 108 OF PATENTS, DESCRIBED AS FOLLOWS:

BEGINNING AT THE INTERSECTION OF THE CENTER LINE OF VIA BELMONTE AND THE CENTER LINE OF VIA DE TODOS SANTOS, IN PALA MESA VILLAGE UNIT NO. 1, ACCORDING TO MAP THEREOF NO. 5494, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, BEING A POINT ON A 500.00 FOOT RADIUS CURVE, CONCAVE EASTERLY IN SAID CENTER LINE OF VIA DE TODOS SANTOS: THENCE ALONG A RADIUS OF SAID CURVE, SOUTH 60°22'30" EAST, 30.00 FEET TO A 470.00 FOOT RADIUS CURVE IN THE EASTERLY LINE OF VIA DE TODOS SANTOS, BEING THE TRUE POINT OF BEGINNING AND BEING THE BEGINNING OF A TANGENT 175.27 FOOT RADIUS CURVE, CONCAVE NORTHERLY, ALSO BEING THE MOST WESTERLY CORNER OF LAND DESCRIBED IN DEED TO DEAN J. MILLER, RECORDED MAY 27, 1965 AS INSTRUMENT NO. 94867 OF OFFICIAL RECORDS; THENCE ALONG THE SOUTHERLY BOUNDARY OF SAID LAND, EASTERLY ALONG SAID CURVE, THROUGH AN ANGLE OF 70°59'35" - RECORD 70°59'55" - A DISTANCE OF 217.17 FEET - RECORD 217.19 FEET - 1 THENCE TANGENT TO SAID CURVE, NORTH 48°37'55" FEET, 22.81 FEET - RECORD 25.81 FEET- TO THE BEGINNING OF A TANGENT 200.00 FOOT RADIUS CURVE, CONCAVE SOUTHERLY; THENCE EASTERLY ALONG SAID CURVE, THROUGH AN ANGLE OF 42°07'15" - RECORD 40°36'55" - A DISTANCE OF 147.03 FEET -RECORD 141.77 FEET - 1 THENCE TANGENT TO SAID CURVE, SOUTH 89°14'50" EAST, 222.99 FEET TO THE WESTERLY BOUNDARY OF THE LAND DESCRIBED IN DEED TO THE STATE OF CALIFORNIA - XI-SD-77-G, RECORDED NOVEMBER 23, 1948, AS INSTRUMENT NO. 116540 OF OFFICIAL RECORDS; THENCE ALONG SAID WESTERLY BOUNDARY SOUTH 0°45'10" WEST 849.57 FEET TO THE MOST NORTHERLY CORNER OF THE LAND DESCRIBED IN DEED TO THE RENDALE COMPANY, RECORDED NOVEMBER 1, 1963 AS INSTRUMENT NO. 196272 OF OFFICIAL RECORDS; THENCE ALONG THE NORTHWESTERLY LINE OF SAID LAND, SOUTH 44°25'30" WEST, 308.50 FEET TO THE MOST WESTERLY CORNER OF SAID LAND; THENCE ALONG THE SOUTHWESTERLY LINE THEREOF, SOUTH 45°34'30" EAST, 103.58 FEET TO THE NORTHWESTERLY BOUNDARY OF SAID STATE OF CALIFORNIA LAND; THENCE ALONG SAID NORTHWESTERLY BOUNDARY SOUTH 44°25'30" WEST, 422.69 FEET TO THE MOST EASTERLY CORNER OF SAID VIA DE TODOS SANTOS AS SHOWN ON SAID MAP NO. 5494; THENCE ALONG THE NORTHEASTERLY AND EASTERLY BOUNDARY OF SAID MAP AS FOLLOWS:

WESTERLY ALONG A TANGENT 25.00 FOOT RADIUS CURVE, CONCAVE NORTHERLY THROUGH AN ANGLE OF 90° A DISTANCE OF 39.27 FEET; TANGENT TO SAID CURVE, NORTH 45°34'30" WEST, 118.30 FEET TO A TANGENT 270.00 FOOT RADIUS CURVE, CONCAVE NORTHEASTERLY, NORTHWESTERLY ALONG SAID CURVE THROUGH AN ANGLE OF 46°19' A DISTANCE OF 218.26 FEET; TANGENT TO SAID CURVE, NORTH 0°44'30" EAST, 856.39 FEET TO A TANGENT 470.00 FOOT RADIUS CURVE, CONCAVE EASTERLY: AND NORTHERLY ALONG SAID CURVE, THROUGH AN ANGLE OF 28°53' A DISTANCE OF 236.93 FEET TO THE TRUE POINT OF BEGINNING. EXCEPT THEREFROM THAT PORTION LYING SOUTHERLY AND EASTERLY OF THE NORTHERLY AND WESTERLY LINE OF LAND DESCRIBED IN A DEED

TO THE STATE OF CALIFORNIA FOR FREEWAY PURPOSES, RECORDED DECEMBER 21, 1972 AS INSTRUMENT NO. 338995 OF OFFICIAL RECORDS, SAID NORTHERLY AND WESTERLY LINE BEING DESCRIBED AS FOLLOWS:

BEGINNING AT THE MOST EASTERLY CORNER OF VIA DE TODOS SANTOS AS SHOWN ON MAP NO. 5494 OF PALA MESA VILLAGE, UNIT NO. 1, FILED IN THE OFFICE OF THE COUNTY RECORDER'S OFFICE NOVEMBER 12, 1964, BEING A POINT IN THE WESTERLY BOUNDARY OF LAND DESCRIBED IN DEED TO THE STATE OF CALIFORNIA, RECORDED NOVEMBER 23, 1948 AS INSTRUMENT NO. 116540; THENCE ALONG THE EASTERLY BOUNDARY OF SAID MAP NO. 5494 AS FOLLOWS: -1- WESTERLY FROM A TANGENT WHICH BEARS SOUTH 44°55'38" WEST, ALONG A CURVE CONCAVE NORTHERLY HAVING A RADIUS OF 25.00 FEET, THROUGH A CENTRAL ANGLE OF 90°00'00", AN ARC DISTANCE OF 39.27 FEET; -2- TANGENT TO SAID CURVE NORTH 45°04'22" WEST, 117.42 FEET; -3- NORTHWESTERLY ALONG A TANGENT CURVE CONCAVE NORTHEASTERLY HAVING A RADIUS OF 270.46 FEET, THROUGH A CENTRAL ANGLE OF 46°23'17", AN ARC DISTANCE OF 218.97 FEET; -4- TANGENT TO SAID CURVE NORTH 1°18'55" EAST, 276.13 FEET; TO THE TRUE POINT OF BEGINNING OF THE HEREIN DESCRIBED LINE, THENCE -5- LEAVING THE EASTERLY BOUNDARY OF SAID MAP NO. 5494, SOUTH 70°46'49" EAST, 97.57 FEET TO POINT "A" OF THIS DESCRIPTION; THENCE -6- NORTH 19°13'11" EAST TO THE NORTHERLY LINE OF PARCEL 1.

APN: 125-050-54-00

Order Number: NCS-918593-SD

First American Title

Exhibit B: BMP Maintenance Plan

PR-1

Biofiltration with Partial Retention

BMP MAINTENANCE FACT SHEET
FOR
STRUCTURAL BMP PR-1 BIOFILTRATION WITH PARTIAL RETENTION

Biofiltration with partial retention facilities are vegetated surface water systems that filter water through vegetation and soil or engineered media prior to infiltrating into native soils, discharge via underdrain, or overflow to the downstream conveyance system. These BMPs have an elevated underdrain discharge point that creates storage capacity in the aggregate storage layer. Typical biofiltration with partial retention components include:

- Inflow distribution mechanisms (e.g., perimeter flow spreader or filter strips)
- Energy dissipation mechanism for concentrated inflows (e.g., splash blocks or riprap)
- Shallow surface ponding for captured flows
- Side slope and basin bottom vegetation selected based on climate and ponding depth
- Non-floating mulch layer
- Media layer (planting mix or engineered media) capable of supporting vegetation growth
- Filter course layer consisting of aggregate to prevent the migration of fines into uncompacted native soils or the aggregate storage layer
- Aggregate storage layer with underdrain(s)
- Uncompacted native soils at the bottom of the facility
- Overflow structure

Normal Expected Maintenance

Biofiltration with partial retention requires routine maintenance to: remove accumulated materials such as sediment, trash or debris; maintain vegetation health; maintain infiltration capacity of the media layer; replenish mulch; and maintain integrity of side slopes, inlets, energy dissipators, and outlets. A summary table of standard inspection and maintenance indicators is provided within this Fact Sheet.

Non-Standard Maintenance or BMP Failure

If any of the following scenarios are observed, the BMP is not performing as intended to protect downstream waterways from pollution and/or erosion. Corrective maintenance, increased inspection and maintenance, BMP replacement, or a different BMP type will be required.

- The BMP is not drained between storm events. Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.
- Sediment, trash, or debris accumulation greater than 25% of the surface ponding volume within one month. This means the load from the tributary drainage area is too high, reducing BMP function or clogging the BMP. This would require pretreatment measures within the tributary area draining to the BMP to intercept the materials. Pretreatment components, especially for sediment, will extend the life of components that are more expensive to replace such as media, filter course, and aggregate layers.

- Erosion due to concentrated storm water runoff flow that is not readily corrected by adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.

Other Special Considerations

Biofiltration with partial retention is a vegetated structural BMP. Vegetated structural BMPs that are constructed in the vicinity of, or connected to, an existing jurisdictional water or wetland could inadvertently result in creation of expanded waters or wetlands. As such, vegetated structural BMPs have the potential to come under the jurisdiction of the United States Army Corps of Engineers, SDRWQCB, California Department of Fish and Wildlife, or the United States Fish and Wildlife Service. This could result in the need for specific resource agency permits and costly mitigation to perform maintenance of the structural BMP. Along with proper placement of a structural BMP, **routine maintenance is key to preventing this scenario**.

PR-1
Biofiltration with Partial Retention

SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION		
The property owner is responsible to ensure inspection, operation and maintenance of permanent BMPs on their property unless responsibility has been formally transferred to an agency, community facilities district, homeowners association, property owners association, or other special district. Maintenance frequencies listed in this table are average/typical frequencies. Actual maintenance needs are site-specific, and maintenance may be required more frequently. Maintenance must be performed whenever needed, based on maintenance indicators presented in this table. The BMP owner is responsible for conducting regular inspections to see when maintenance is needed based on the maintenance indicators. During the first year of operation of a structural BMP, inspection is recommended at least once prior to August 31 and then monthly from September through May. Inspection during a storm event is also recommended. After the initial period of frequent inspections, the minimum inspection and maintenance frequency can be determined based on the results of the first year inspections.		
Threshold/Indicator	**Maintenance Action**	**Typical Maintenance Frequency**
Accumulation of sediment, litter, or debris	Remove and properly dispose of accumulated materials, without damage to the vegetation or compaction of the media layer.	• Inspect monthly. If the BMP is 25% full* or more in one month, increase inspection frequency to monthly plus after every 0.1-inch or larger storm event. • Remove any accumulated materials found at each inspection.
Obstructed inlet or outlet structure	Clear blockage.	• Inspect monthly and after every 0.5-inch or larger storm event. • Remove any accumulated materials found at each inspection.
Damage to structural components such as weirs, inlet or outlet structures	Repair or replace as applicable.	• Inspect annually. • Maintenance when needed.
Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintenance when needed.
Dead or diseased vegetation	Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintenance when needed.
Overgrown vegetation	Mow or trim as appropriate.	• Inspect monthly. • Maintenance when needed.
2/3 of mulch has decomposed, or mulch has been removed	Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches.	• Inspect monthly. • Replenish mulch annually, or more frequently when needed based on inspection.

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION (Continued from previous page)		
Threshold/Indicator	**Maintenance Action**	**Typical Maintenance Frequency**
Erosion due to concentrated irrigation flow	Repair/re-seed/re-plant eroded areas and adjust the irrigation system.	• Inspect monthly. • Maintenance when needed.
Erosion due to concentrated storm water runoff flow	Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.	• Inspect after every 0.5-inch or larger storm event. If erosion due to storm water flow has been observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.
Standing water in BMP for longer than 24 hours following a storm event Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils.	• Inspect monthly and after every 0.5-inch or larger storm event. If standing water is observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed.
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology	If mosquitos/larvae are observed: first, immediately remove any standing water by dispersing to nearby landscaping; second, make corrective measures as applicable to restore BMP drainage to prevent standing water. If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.	• Inspect monthly and after every 0.5-inch or larger storm event. If mosquitos are observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed.
Underdrain clogged	Clear blockage.	• Inspect if standing water is observed for longer than 24-96 hours following a storm event. • Maintenance when needed.

References

American Mosquito Control Association.
http://www.mosquito.org/
California Storm Water Quality Association (CASQA). 2003. Municipal BMP Handbook.
https://www.casqa.org/resources/bmp-handbooks/municipal-bmp-handbook
County of San Diego. 2014. Low Impact Development Handbook.
http://www.sandiegocounty.gov/content/sdc/dpw/watersheds/susmp/lid.html
San Diego County Copermittees. 2016. Model BMP Design Manual, Appendix E, Fact Sheet PR-1.
http://www.projectcleanwater.org/index.php?option=com_content&view=article&id=250&Itemid=220

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PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-103
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	
Property / Development Name:	Responsible Party Name and Phone Number:	
Property Address of BMP:	Responsible Party Address:	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 1 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Accumulation of sediment, litter, or debris Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove and properly dispose of accumulated materials, without damage to the vegetation ☐ If sediment, litter, or debris accumulation exceeds 25% of the surface ponding volume within one month (25% full*), add a forebay or other pre-treatment measures within the tributary area draining to the BMP to intercept the materials. ☐ Other / Comments:		
Poor vegetation establishment Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-103
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 2 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Dead or diseased vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		
Overgrown vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Mow or trim as appropriate ☐ Other / Comments:		
2/3 of mulch has decomposed, or mulch has been removed Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-103
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 3 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Erosion due to concentrated irrigation flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas and adjust the irrigation system ☐ Other / Comments:		
Erosion due to concentrated storm water runoff flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan ☐ If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction ☐ Other / Comments:		

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Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-103
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 4 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Obstructed inlet or outlet structure Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Underdrain clogged (inspect underdrain if standing water is observed for longer than 24-96 hours following a storm event) Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Damage to structural components such as weirs, inlet or outlet structures Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair or replace as applicable ☐ Other / Comments:		

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Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-103
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 5 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Standing water in BMP for longer than 24 hours following a storm event* Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils ☐ Other / Comments:		
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Apply corrective measures to remove standing water in BMP when standing water occurs for longer than 24-96 hours following a storm event.** ☐ Other / Comments:		

*Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.

**If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-201
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	
Property / Development Name:	Responsible Party Name and Phone Number:	
Property Address of BMP:	Responsible Party Address:	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 1 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Accumulation of sediment, litter, or debris Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove and properly dispose of accumulated materials, without damage to the vegetation ☐ If sediment, litter, or debris accumulation exceeds 25% of the surface ponding volume within one month (25% full*), add a forebay or other pre-treatment measures within the tributary area draining to the BMP to intercept the materials. ☐ Other / Comments:		
Poor vegetation establishment Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

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Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-201
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 2 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Dead or diseased vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		
Overgrown vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Mow or trim as appropriate ☐ Other / Comments:		
2/3 of mulch has decomposed, or mulch has been removed Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-201
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 3 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Erosion due to concentrated irrigation flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas and adjust the irrigation system ☐ Other / Comments:		
Erosion due to concentrated storm water runoff flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan ☐ If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-201
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 4 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Obstructed inlet or outlet structure Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Underdrain clogged (inspect underdrain if standing water is observed for longer than 24-96 hours following a storm event) Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Damage to structural components such as weirs, inlet or outlet structures Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair or replace as applicable ☐ Other / Comments:		

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Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-201
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 5 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Standing water in BMP for longer than 24 hours following a storm event* Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils ☐ Other / Comments:		
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Apply corrective measures to remove standing water in BMP when standing water occurs for longer than 24-96 hours following a storm event.** ☐ Other / Comments:		

*Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.

**If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-302
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	
Property / Development Name:	Responsible Party Name and Phone Number:	
Property Address of BMP:	Responsible Party Address:	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 1 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Accumulation of sediment, litter, or debris Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove and properly dispose of accumulated materials, without damage to the vegetation ☐ If sediment, litter, or debris accumulation exceeds 25% of the surface ponding volume within one month (25% full*), add a forebay or other pre-treatment measures within the tributary area draining to the BMP to intercept the materials. ☐ Other / Comments:		
Poor vegetation establishment Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-302
Permit No.:PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 2 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Dead or diseased vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		
Overgrown vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Mow or trim as appropriate ☐ Other / Comments:		
2/3 of mulch has decomposed, or mulch has been removed Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-302
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 3 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Erosion due to concentrated irrigation flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas and adjust the irrigation system ☐ Other / Comments:		
Erosion due to concentrated storm water runoff flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan ☐ If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-302
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 4 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Obstructed inlet or outlet structure Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Underdrain clogged (inspect underdrain if standing water is observed for longer than 24-96 hours following a storm event) Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Damage to structural components such as weirs, inlet or outlet structures Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair or replace as applicable ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-302
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 5 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Standing water in BMP for longer than 24 hours following a storm event* Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils ☐ Other / Comments:		
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Apply corrective measures to remove standing water in BMP when standing water occurs for longer than 24-96 hours following a storm event.** ☐ Other / Comments:		

*Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.

**If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-401
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	
Property / Development Name:	Responsible Party Name and Phone Number:	
Property Address of BMP:	Responsible Party Address:	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 1 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Accumulation of sediment, litter, or debris Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove and properly dispose of accumulated materials, without damage to the vegetation ☐ If sediment, litter, or debris accumulation exceeds 25% of the surface ponding volume within one month (25% full*), add a forebay or other pre-treatment measures within the tributary area draining to the BMP to intercept the materials. ☐ Other / Comments:		
Poor vegetation establishment Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-401
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 2 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Dead or diseased vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		
Overgrown vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Mow or trim as appropriate ☐ Other / Comments:		
2/3 of mulch has decomposed, or mulch has been removed Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-401
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 3 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Erosion due to concentrated irrigation flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas and adjust the irrigation system ☐ Other / Comments:		
Erosion due to concentrated storm water runoff flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan ☐ If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-401
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 4 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Obstructed inlet or outlet structure Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Underdrain clogged (inspect underdrain if standing water is observed for longer than 24-96 hours following a storm event) Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Damage to structural components such as weirs, inlet or outlet structures Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair or replace as applicable ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-401
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 5 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Standing water in BMP for longer than 24 hours following a storm event* Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils ☐ Other / Comments:		
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Apply corrective measures to remove standing water in BMP when standing water occurs for longer than 24-96 hours following a storm event.** ☐ Other / Comments:		

*Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.

**If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-504
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	
Property / Development Name:	Responsible Party Name and Phone Number:	
Property Address of BMP:	Responsible Party Address:	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 1 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Accumulation of sediment, litter, or debris Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove and properly dispose of accumulated materials, without damage to the vegetation ☐ If sediment, litter, or debris accumulation exceeds 25% of the surface ponding volume within one month (25% full*), add a forebay or other pre-treatment measures within the tributary area draining to the BMP to intercept the materials. ☐ Other / Comments:		
Poor vegetation establishment Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-504
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 2 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Dead or diseased vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		
Overgrown vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Mow or trim as appropriate ☐ Other / Comments:		
2/3 of mulch has decomposed, or mulch has been removed Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-504
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 3 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Erosion due to concentrated irrigation flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas and adjust the irrigation system ☐ Other / Comments:		
Erosion due to concentrated storm water runoff flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan ☐ If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-504
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 4 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Obstructed inlet or outlet structure Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Underdrain clogged (inspect underdrain if standing water is observed for longer than 24-96 hours following a storm event) Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Damage to structural components such as weirs, inlet or outlet structures Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair or replace as applicable ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-504
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 5 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Standing water in BMP for longer than 24 hours following a storm event* Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils ☐ Other / Comments:		
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Apply corrective measures to remove standing water in BMP when standing water occurs for longer than 24-96 hours following a storm event.** ☐ Other / Comments:		

*Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.

**If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-602
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	
Property / Development Name:	Responsible Party Name and Phone Number:	
Property Address of BMP:	Responsible Party Address:	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 1 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Accumulation of sediment, litter, or debris Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove and properly dispose of accumulated materials, without damage to the vegetation ☐ If sediment, litter, or debris accumulation exceeds 25% of the surface ponding volume within one month (25% full*), add a forebay or other pre-treatment measures within the tributary area draining to the BMP to intercept the materials. ☐ Other / Comments:		
Poor vegetation establishment Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-602
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 2 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Dead or diseased vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		
Overgrown vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Mow or trim as appropriate ☐ Other / Comments:		
2/3 of mulch has decomposed, or mulch has been removed Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-602
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 3 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Erosion due to concentrated irrigation flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas and adjust the irrigation system ☐ Other / Comments:		
Erosion due to concentrated storm water runoff flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan ☐ If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-602
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 4 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Obstructed inlet or outlet structure Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Underdrain clogged (inspect underdrain if standing water is observed for longer than 24-96 hours following a storm event) Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Damage to structural components such as weirs, inlet or outlet structures Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair or replace as applicable ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-602
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 5 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Standing water in BMP for longer than 24 hours following a storm event* Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils ☐ Other / Comments:		
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Apply corrective measures to remove standing water in BMP when standing water occurs for longer than 24-96 hours following a storm event.** ☐ Other / Comments:		

*Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.

**If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-702
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	
Property / Development Name:	Responsible Party Name and Phone Number:	
Property Address of BMP:	Responsible Party Address:	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 1 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Accumulation of sediment, litter, or debris Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove and properly dispose of accumulated materials, without damage to the vegetation ☐ If sediment, litter, or debris accumulation exceeds 25% of the surface ponding volume within one month (25% full*), add a forebay or other pre-treatment measures within the tributary area draining to the BMP to intercept the materials. ☐ Other / Comments:		
Poor vegetation establishment Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-702
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 2 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Dead or diseased vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		
Overgrown vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Mow or trim as appropriate ☐ Other / Comments:		
2/3 of mulch has decomposed, or mulch has been removed Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-702
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 3 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Erosion due to concentrated irrigation flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas and adjust the irrigation system ☐ Other / Comments:		
Erosion due to concentrated storm water runoff flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan ☐ If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-702
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 4 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Obstructed inlet or outlet structure Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Underdrain clogged (inspect underdrain if standing water is observed for longer than 24-96 hours following a storm event) Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Damage to structural components such as weirs, inlet or outlet structures Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair or replace as applicable ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-702
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 5 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Standing water in BMP for longer than 24 hours following a storm event* Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils ☐ Other / Comments:		
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Apply corrective measures to remove standing water in BMP when standing water occurs for longer than 24-96 hours following a storm event.** ☐ Other / Comments:		

*Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.

**If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-802
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	
Property / Development Name:	Responsible Party Name and Phone Number:	
Property Address of BMP:	Responsible Party Address:	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 1 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Accumulation of sediment, litter, or debris Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove and properly dispose of accumulated materials, without damage to the vegetation ☐ If sediment, litter, or debris accumulation exceeds 25% of the surface ponding volume within one month (25% full*), add a forebay or other pre-treatment measures within the tributary area draining to the BMP to intercept the materials. ☐ Other / Comments:		
Poor vegetation establishment Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-802
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 2 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Dead or diseased vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		
Overgrown vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Mow or trim as appropriate ☐ Other / Comments:		
2/3 of mulch has decomposed, or mulch has been removed Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-802
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 3 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Erosion due to concentrated irrigation flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas and adjust the irrigation system ☐ Other / Comments:		
Erosion due to concentrated storm water runoff flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan ☐ If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-2001
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 4 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Obstructed inlet or outlet structure Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Underdrain clogged (inspect underdrain if standing water is observed for longer than 24-96 hours following a storm event) Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Damage to structural components such as weirs, inlet or outlet structures Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair or replace as applicable ☐ Other / Comments:		

PR-1

Biofiltration with Partial Retention

Date:	Inspector:	BMP ID No.: BMP-2001
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION PAGE 5 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Standing water in BMP for longer than 24 hours following a storm event* Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils ☐ Other / Comments:		
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Apply corrective measures to remove standing water in BMP when standing water occurs for longer than 24-96 hours following a storm event.** ☐ Other / Comments:		

*Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.

**If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.

BF-1
Biofiltration

BMP MAINTENANCE FACT SHEET
FOR
STRUCTURAL BMP BF-1 BIOFILTRATION

Biofiltration facilities are vegetated surface water systems that filter water through vegetation, and soil or engineered media prior to discharge via underdrain or overflow to the downstream conveyance system. Biofiltration facilities have limited or no infiltration. They are typically designed to provide enough hydraulic head to move flows through the underdrain connection to the storm drain system. Typical biofiltration components include:

- Inflow distribution mechanisms (e.g., perimeter flow spreader or filter strips)
- Energy dissipation mechanism for concentrated inflows (e.g., splash blocks or riprap)
- Shallow surface ponding for captured flows
- Side slope and basin bottom vegetation selected based on climate and ponding depth
- Non-floating mulch layer
- Media layer (planting mix or engineered media) capable of supporting vegetation growth
- Filter course layer consisting of aggregate to prevent the migration of fines into uncompacted native soils or the aggregate storage layer
- Aggregate storage layer with underdrain(s)
- Impermeable liner or uncompacted native soils at the bottom of the facility
- Overflow structure

Normal Expected Maintenance

Biofiltration requires routine maintenance to: remove accumulated materials such as sediment, trash or debris; maintain vegetation health; maintain infiltration capacity of the media layer; replenish mulch; and maintain integrity of side slopes, inlets, energy dissipators, and outlets. A summary table of standard inspection and maintenance indicators is provided within this Fact Sheet.

Non-Standard Maintenance or BMP Failure

If any of the following scenarios are observed, the BMP is not performing as intended to protect downstream waterways from pollution and/or erosion. Corrective maintenance, increased inspection and maintenance, BMP replacement, or a different BMP type will be required.

- The BMP is not drained between storm events. Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.
- Sediment, trash, or debris accumulation greater than 25% of the surface ponding volume within one month. This means the load from the tributary drainage area is too high, reducing BMP function or clogging the BMP. This would require pretreatment measures within the tributary area draining to the BMP to intercept the materials. Pretreatment components, especially for sediment, will extend the life of components that are more expensive to replace such as media, filter course, and aggregate layers.
- Erosion due to concentrated storm water runoff flow that is not readily corrected by adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.

Other Special Considerations

Biofiltration is a vegetated structural BMP. Vegetated structural BMPs that are constructed in the vicinity of, or connected to, an existing jurisdictional water or wetland could inadvertently result in creation of expanded waters or wetlands. As such, vegetated structural BMPs have the potential to come under the jurisdiction of the United States Army Corps of Engineers, SDRWQCB, California Department of Fish and Wildlife, or the United States Fish and Wildlife Service. This could result in the need for specific resource agency permits and costly mitigation to perform maintenance of the structural BMP. Along with proper placement of a structural BMP, **routine maintenance is key to preventing this scenario**.

BF-1
Biofiltration

SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR BF-1 BIOFILTRATION		
The property owner is responsible to ensure inspection, operation and maintenance of permanent BMPs on their property unless responsibility has been formally transferred to an agency, community facilities district, homeowners association, property owners association, or other special district. Maintenance frequencies listed in this table are average/typical frequencies. Actual maintenance needs are site-specific, and maintenance may be required more frequently. Maintenance must be performed whenever needed, based on maintenance indicators presented in this table. The BMP owner is responsible for conducting regular inspections to see when maintenance is needed based on the maintenance indicators. During the first year of operation of a structural BMP, inspection is recommended at least once prior to August 31 and then monthly from September through May. Inspection during a storm event is also recommended. After the initial period of frequent inspections, the minimum inspection and maintenance frequency can be determined based on the results of the first year inspections.		
Threshold/Indicator	**Maintenance Action**	**Typical Maintenance Frequency**
Accumulation of sediment, litter, or debris	Remove and properly dispose of accumulated materials, without damage to the vegetation or compaction of the media layer.	• Inspect monthly. If the BMP is 25% full* or more in one month, increase inspection frequency to monthly plus after every 0.1-inch or larger storm event. • Remove any accumulated materials found at each inspection.
Obstructed inlet or outlet structure	Clear blockage.	• Inspect monthly and after every 0.5-inch or larger storm event. • Remove any accumulated materials found at each inspection.
Damage to structural components such as weirs, inlet or outlet structures	Repair or replace as applicable	• Inspect annually. • Maintenance when needed.
Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintenance when needed.
Dead or diseased vegetation	Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintenance when needed.
Overgrown vegetation	Mow or trim as appropriate.	• Inspect monthly. • Maintenance when needed.
2/3 of mulch has decomposed, or mulch has been removed	Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches.	• Inspect monthly. • Replenish mulch annually, or more frequently when needed based on inspection.

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR BF-1 BIOFILTRATION (Continued from previous page)		
Threshold/Indicator	**Maintenance Action**	**Typical Maintenance Frequency**
Erosion due to concentrated irrigation flow	Repair/re-seed/re-plant eroded areas and adjust the irrigation system.	• Inspect monthly. • Maintenance when needed.
Erosion due to concentrated storm water runoff flow	Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.	• Inspect after every 0.5-inch or larger storm event. If erosion due to storm water flow has been observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.
Standing water in BMP for longer than 24 hours following a storm event Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils.	• Inspect monthly and after every 0.5-inch or larger storm event. If standing water is observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed.
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology	If mosquitos/larvae are observed: first, immediately remove any standing water by dispersing to nearby landscaping; second, make corrective measures as applicable to restore BMP drainage to prevent standing water. If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.	• Inspect monthly and after every 0.5-inch or larger storm event. If mosquitos are observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed.
Underdrain clogged	Clear blockage.	• Inspect if standing water is observed for longer than 24-96 hours following a storm event. • Maintenance when needed.

References

American Mosquito Control Association.
http://www.mosquito.org/
California Storm Water Quality Association (CASQA). 2003. Municipal BMP Handbook.
https://www.casqa.org/resources/bmp-handbooks/municipal-bmp-handbook
County of San Diego. 2014. Low Impact Development Handbook.
http://www.sandiegocounty.gov/content/sdc/dpw/watersheds/susmp/lid.html
San Diego County Copermittees. 2016. Model BMP Design Manual, Appendix E, Fact Sheet BF-1.
http://www.projectcleanwater.org/index.php?option=com_content&view=article&id=250&Itemid=220

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BF-1
Biofiltration

Date:	Inspector:	BMP ID No.: BMP-2001
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	
Property / Development Name:	Responsible Party Name and Phone Number:	
Property Address of BMP:	Responsible Party Address:	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 1 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Accumulation of sediment, litter, or debris Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove and properly dispose of accumulated materials, without damage to the vegetation ☐ If sediment, litter, or debris accumulation exceeds 25% of the surface ponding volume within one month (25% full*), add a forebay or other pre-treatment measures within the tributary area draining to the BMP to intercept the materials. ☐ Other / Comments:		
Poor vegetation establishment Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

BF-1
Biofiltration

Date:	Inspector:	BMP ID No.: BMP-2001
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 2 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Dead or diseased vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		
Overgrown vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Mow or trim as appropriate ☐ Other / Comments:		
2/3 of mulch has decomposed, or mulch has been removed Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches ☐ Other / Comments:		

BF-1
Biofiltration

Date:	Inspector:	BMP ID No.: BMP-2001
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 3 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Erosion due to concentrated irrigation flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas and adjust the irrigation system ☐ Other / Comments:		
Erosion due to concentrated storm water runoff flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan ☐ If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction ☐ Other / Comments:		

BF-1
Biofiltration

Date:	Inspector:	BMP ID No.: BMP-2001
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 4 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Obstructed inlet or outlet structure Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Underdrain clogged (inspect underdrain if standing water is observed for longer than 24-96 hours following a storm event) Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Damage to structural components such as weirs, inlet or outlet structures Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair or replace as applicable ☐ Other / Comments:		

BF-1
Biofiltration

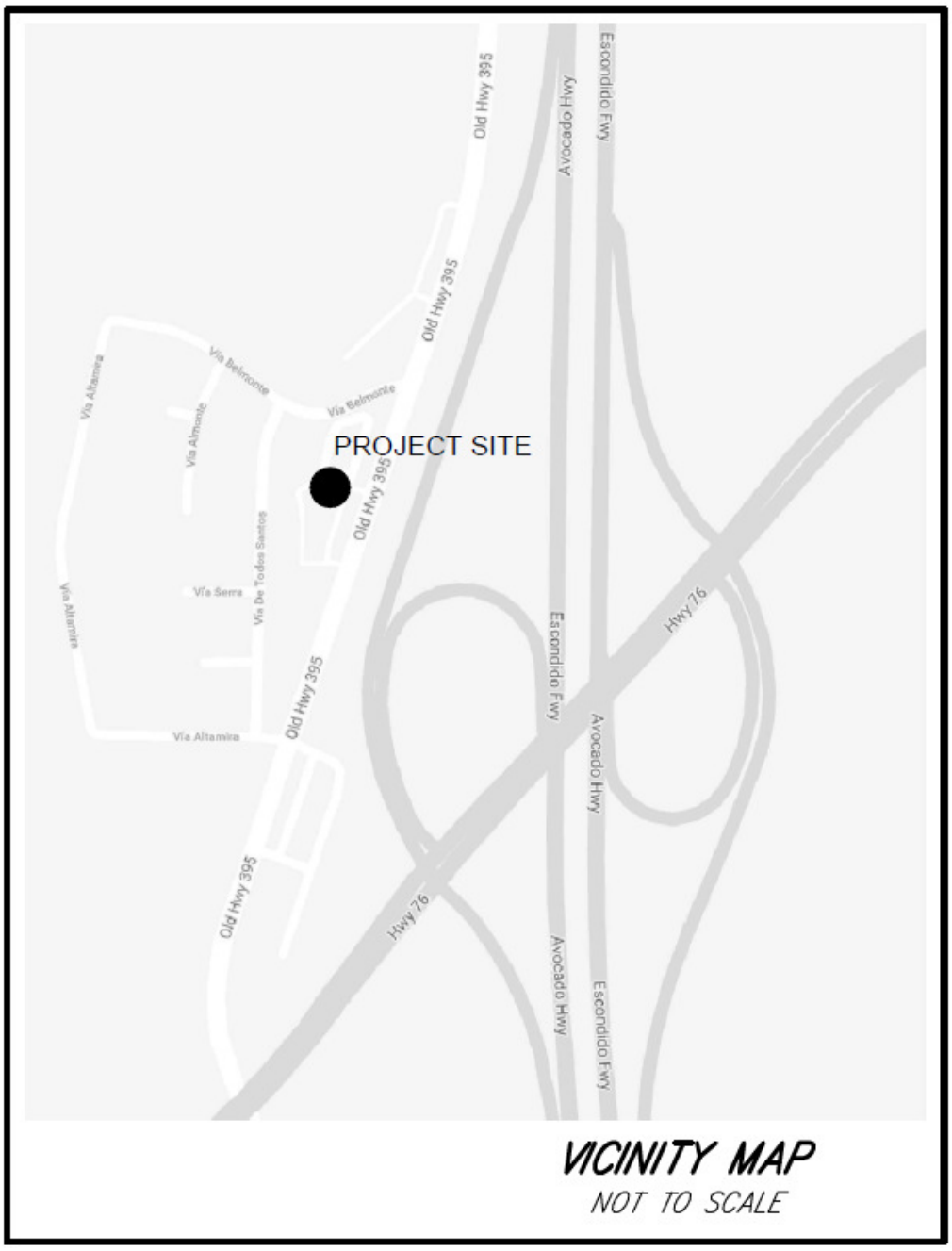
Date:	Inspector:	BMP ID No.: BMP-2001
Permit No.: PDS2020-STP-20-021	APN(s): 125-050-54-00	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 5 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Standing water in BMP for longer than 24-96 hours following a storm event* Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils ☐ Other / Comments:		
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Apply corrective measures to remove standing water in BMP when standing water occurs for longer than 24-96 hours following a storm event.** ☐ Other / Comments:		

*Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.

**If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.

Exhibit C: Project Site Vicinity Map



Added Items:

Added Attachment
☒ **Form 2.1 DMA Exhibit for Via Belmonte**
☒ **DMA-Exhibit for Via Belamonte**
☒ **Attachment 5: Updated Drainage for Via Belmonte**
☒ **Attachment 6: Non Structural BMPS and Calculations for Via Belmonte**

Sub-attachments	Requirement
2.1: DMA Exhibits	All PDPs
☐ **2.2: Individual Structural BMP DMA Mapbook**	PDPs with structural BMPs
☒ **2.3: Construction Plan Sets**	All projects

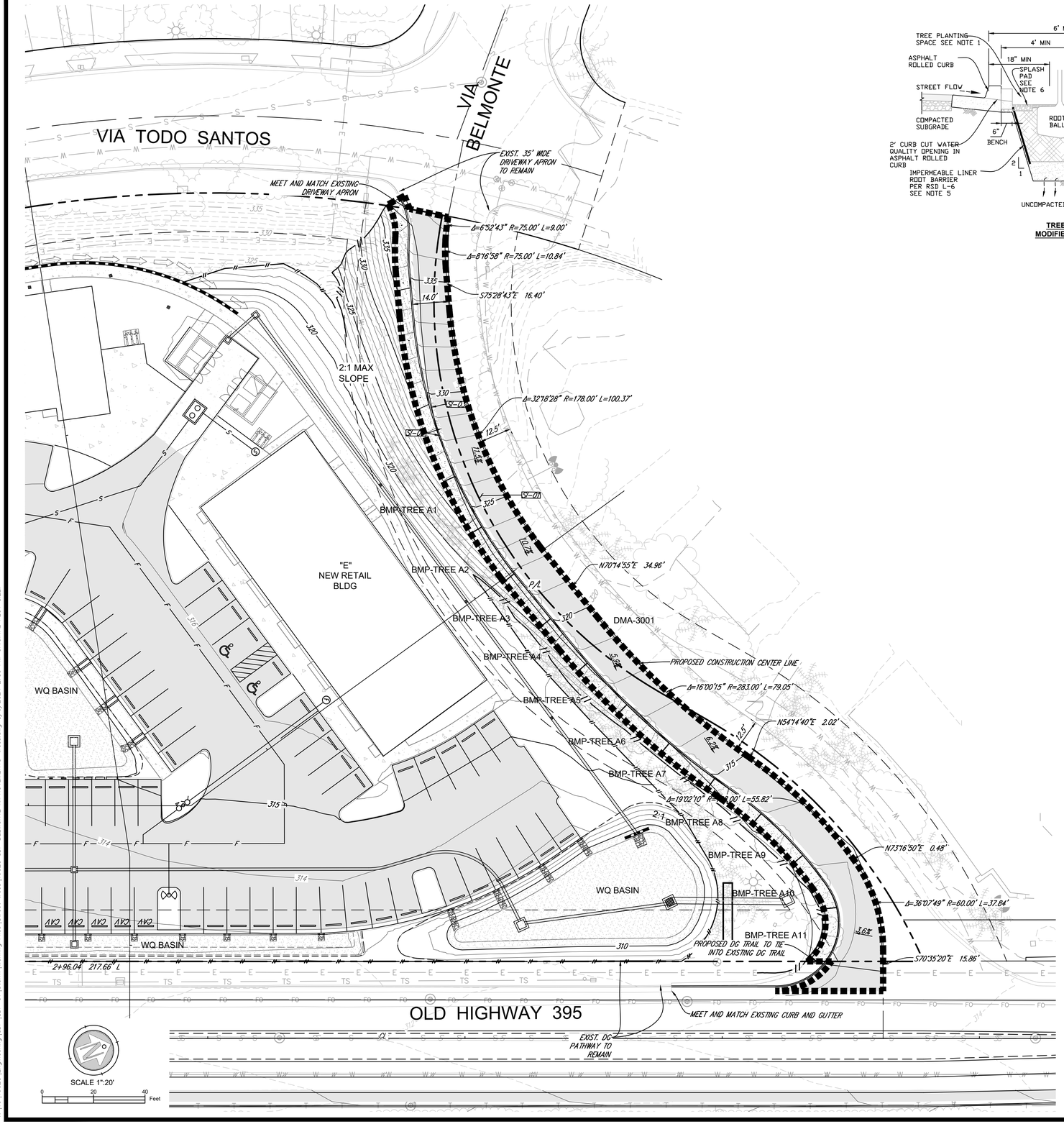
2.1 DMA Exhibits

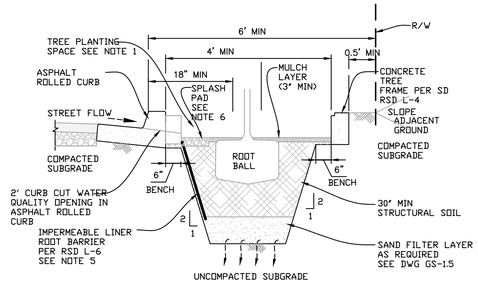
UPDATE TO INCLUDE VIA BELMONTE

- DMA Exhibits must show all DMAs on the project site. Exhibits must include all applicable features identified in applicable SWQMP attachments.
- Exhibits may be prepared individually for the BMPs associated with each applicable SWQMP Attachment (6, 7, 8, and/or 9) or combined into one or more consolidated exhibits.
- Use this checklist to ensure required information is included on each exhibit (copy as needed).

DMA Exhibit ID #:	Pala Mesa Plaza - Via Belmonte	
A. Features required for all exhibits		
1. Existing Site Features		
☒ Underlying hydrologic soil group (A, B, C, D)	☒ Topography and impervious areas	
☒ Approximate depth to groundwater	☒ Existing drainage network, directions, and offsite connections	
☒ Natural hydrologic features		
2. Drainage Management Area (DMA) Information		
☒ Proposed drainage network, directions, and offsite connections	☒ DMA boundaries, ID numbers, areas, and type (structural BMP, de minimis, etc.)	
3. Proposed Site Changes, Features, and BMPs		
☒ Proposed demolition and grading	☐ Construction BMPs[2]	
☐ Group 1, 2, and 3 Features[1]	☒ Baseline source control BMPs	
☐ Group 4 Features	☒ Baseline source control BMPs	
B. Proposed Features and BMPs Specific to Individual SWQMP Attachments[3]		
☒ Attachment 6	☐ SSD-BMP impervious dispersion areas	
	☒ SSD-BMP tree wells	
☐ Attachment 7	☐ Structural pollutant control BMPs	
☐ Attachment 8	☐ Structural hydromodification management BMPs	
	☐ Point(s) of Compliance (POC) for hydromodification management	
	☐ Proposed drainage boundary and drainage area to each POC	
☐ Attachment 9	☐ Onsite CCSYAs	☐ Bypass of onsite CCSYAs
		☒ Bypass of upstream offsite CCSYAs

[1] Group 1-4 features and baseline BMPs from PDP SWQMP Tables 2 and 3.
[2] Minimum Construction Stormwater BMPs from PDP SWQMP Table 7.
[3] Identify the location, ID numbers, type, and size/detail of BMPs.





TREE WELL
MODIFIED GS-1.3b

NOTES:

1. MINIMUM TREE PLANTING SPACE DIMENSION 4'X6'.
2. MAXIMUM WATERSHED AREA: 6 TIMES AREA OF THE TREE PLANTING BED.
3. DETAIL INTENDED FOR NEW TREE PLANTINGS ON SITES WITH CONSTRAINTS TO ACHIEVE FULL SOIL VOLUME.
4. TO ADAPT DETAIL TO EXISTING TREE LOCATION, PROVIDE EXPANDED SOIL VOLUMES BEYOND EXISTING TREE ROOTING AREA; DO NOT DISTURB AROUND EXISTING TREE ROOT.
5. PROVIDE 18" DEEP ROOT BARRIER ON STREET SIDE OF TREE WELL AS NECESSARY.
6. PROVIDE SPLASH PAD FOR TREE PLANTING SPACE PER GS-2.6b.

SITE BMP SUMMARY TABLE

DRAINAGE BASIN ID	DMA-3001
DMA TYPE (DRAINS TO BMP, DE-MINIMUS, MAINTENANCE)	DRAINS TO BMP
BMP TYPE	TREE WELLS A1-A11
IMPERVIOUS SURFACE (SF)	4,790
PERVIOUS SURFACE (SF) AMENDED SOIL SD-F C FACTOR IS 0 AND THEREFORE NOT IN CALCS.	503
IMPERVIOUS AREA TO DISPERSION SD-B	N/A
PERVIOUS AREA ACTING AS DISPERSION SD-B	N/A
AVERAGE MATURE TREE CANOPY DIAMETER (FT)	15
TOTAL TRIBUTARY AREA (SF)	5,293
INITIAL DESIGN CAPTURE VOLUME (CF)	297
PROVIDED NUMBER OF TREE WELLS	11
PROVIDE TREE CREDIT VOLUME (CF)	1,100
PROVIDED REQUIRED RETENTION VOL (RRV)	941
DCV REMAINING (CF)	0
DESIGN CAPTURE VOLUME MET? (Y/N)	Y

VIA BELMONTE DMA EXHIBIT
SHEET 1 OF 1 SHEETS

SITE DEVELOPMENT PLAN
FOR APN 125-050-54-00
OLD HIGHWAY 395 RETAIL CENTER

K:\19\19025\Engineering\SDP\SDP 01\Storm Water\Working Files\Street trees\19025 SDP BELMONTE IMPROVEMENTS-trees.dwg 5/16/2024 2:39 PM ORIGINAL PLOT SIZE: ---

5.0 General Requirements UPDATE TO INCLUE VIA BELMONTE

- Each Priority Development Project (PDP) must provide a description of existing site conditions and proposed changes to them, including changes to topography and drainage.
- Has a **Drainage Report** has been prepared for the PDP?

  ☒ **Yes**

  - Review of the Drainage Report must be concurrent with the PDP SWQMP.
  - Include the summary page of the Drainage Report with this cover page, and provide the following information:

    Title: HYDROLGY/ HYDRAULICS STUDY

    Prepared By: EXCEL ENGINEERING

    Date: ORIGINAL STUDY, JUNE 13,2023; VIA BELMONTE ADDITION APRIL 26, 2024

  - Do not complete the rest of this attachment (also exclude these additional pages from your submittal). Additional documentation of site and drainage conditions is not required unless requested by County staff.

  ☐ **No** -- Complete and submit the remainder of this attachment below.

HYDROLOGY / HYDRAULICS STUDY

FOR THE:
Pala Mesa Plaza
3233 Old Highway 395
Fallbrook, CA 92028
APN: 125-050-54-00

PREPARED FOR:
TGRH3 LLC, Rafid Hamika Managing Member
3712 East Owens Ave #101
North Las Vegas, NV 89030

PREPARED BY:
EXCEL ENGINEERING
440 State Place
Escondido, CA 92029
Tel: (760) 745-8118
Project No: 17-047

ORIGINAL REPORT PREPARATION DATE:
June 17, 2020

REVISION DATE(S):

June 7, 2022

June 13, 2023

April 26, 2024 – Via Belmonte Addition

Post Development Mitigation Drainage Map

Attachment 3 – Modified Rational Method Runoff Calculations
- 3a. CivilD Pre-Development Calculations
- 3b. CivilD Pre-Development Offsite Calculations
- 3c. CivilD Post Development Onsite Reach 1 Calculations
- 3d. CivilD Post Development Onsite Reach 6 Calculations
- 3e. CivilD Post Development Onsite Reach 8 Calculations
- 3f. CivilD Post Development Offsite Calculations
- 3g. CivilD Mitigated Onsite Reach 1 Calculations
- 3h. CivilD Mitigated Onsite Reach 8 Calculations

Attachments 4 – Hydraulics
- 4a. Hydrograph Adjust C Factor
- 4b. Hydraflow Hydrographs
- 4c. Rick Rat Hydrographs

Attachment 5 – FEMA Floodplains/Floodways

Attachment 6 – Via Belmonte Addition
- 6a. Project Description
- 6b. Description of Watershed
- 6c. Rational Method Calculation Summary
- 6d. Hydraflow Hydrographs
- 6e. Hydrograph Adjust C Factor
- 6f. Pre-Development Drainage Map
- 6g. Post-Development Drainage Map
- 6h. CivilD Via Belmonte Pre Development Calculations
- 6i. CivilD Pre-Development Calculations
- 6j. CivilD Via Belmonte Post Development Calculations
- 6k. CivilD Post Development Calculations
- 6l. CivilD Mitigated Onsite Reach 1 Calculations

ATTACHMENT 6

6a. Project Description

In addition to any prior project description, this project also proposes to make improvements to half of the section of Via Belmonte between Via de Todos Santos and Old Highway 395, including new paving, curb, gutter, and DG trail along the street.

6b. DESCRIPTION OF WATERSHED

Pre-Development Topography and Drainage Patterns

Via Belmonte drains easterly towards Old Highway 395, where there is a sump condition on the corner of the existing project site. Water sheets across the empty lot to the north of Via Belmonte and towards this sump condition. Via Belmonte has an approximate slope of 6.5%. The soil type is consistent with the rest of the project site; the western 25% is composed of Soils Type A and the remainder of the street is Soils Type C. Via Belmonte is paved with rough asphalt, and the empty lot to the north is full of grass and weeds, as well as a few trees and bushes.

A pre-developed drainage map can be found as Attachment 6f in this report.

Post-Development Topography and Drainage Patterns

The project proposes to expand Via Belmonte and repave the southerly half of the existing street, add curb, gutter, and DG trail. It also proposes to add street trees along the DG trail.

Water will sheet flow across the empty lot to the north of Via Belmonte and easterly down Via Belmonte, and then into a reverse D-25 where it will travel through pipes to a cleanout box in Basin 103. Water will also infiltrate through the street trees and into a perforated pipe to the cleanout box in Basin 103. This perforated pipe is only meant to collect overflow water to help prevent erosion of the slope along Via Belmonte. In Basin 103, there will be a cleanout and a 30" diameter, 30 foot long detention pipe. The flow of water out of this detention pipe will be controlled by a weir plate. Water leaving this detention pipe will flow into the storm drain system and into POC 109.

A post-developed drainage map can be found as Attachment 6G in this report.

6b. Rational Method Calculation Summary

The peak runoff values for the 100-year storm are calculated according to the Hydrology Manual rational method. The calculations are performed using the CivilD software. A summary of the initial calculations is summarized in the table below:

Summary Table of Drainage Discharges from the Project							
	Node Number	Q100 (cfs)	Area* (Acres)	Tc (Min)	V100 (ft/s)	C**	I** (in/hr)
PRE	POC Node 309	**36.398**	11.915	9.077	14.89	0.45	6.32
POST	POC Node 107	37.500	11.929	9.152	15.17	0.46	6.28
POST MITIGATED	POC Node 107	**35.615**	11.929	9.155	14.88	0.45	6.28

Table 1: Q100 Analysis Results

Note: the comparison of our analysis is made about the same discharge points for the project. Drainage discharging from the project to the existing 18 inches pipe.

*Note: Areas (acres) of Predeveloped and Post-developed can potentially differ because of rounding errors.

**Note: Average rainfall intensity is calculated based on $I = 7.44*P_6T_c^{-0.645}$. Average runoff coefficient "C" is calculated based on Q = CIA.

Per Table 1 (see above) The Post development flow of 37.5 cfs is higher than the Pre-Development flow of 36.398 cfs. Therefore, mitigation is to be used. Upon analysis of the Post Mitigated flow, the Mitigated flow is 35.615 cfs lower than the Predevelopment flow of 36.398 cfs showing compliance.

CivilD data and output files can be found in Attachment 3 of this report.

By observation of the results in the summary table, the proposed redevelopment of the site will have an overall decrease in the 100-year peak flow discharge from the site.

CONCLUSION

Based on the results of this report, the project does not increase the 100-year peak flow rate of the mitigated stormwater discharge from the site as flows are lower than those of the Pre-development. The project meets the County of San Diego standards for peak flow control and therefore can concluded that this project will not impact the existing downstream storm drainage facilities.
This project does not sit within a 100-year flood hazard zone as mapped on the federal Flood Insurance Rate maps for this area.

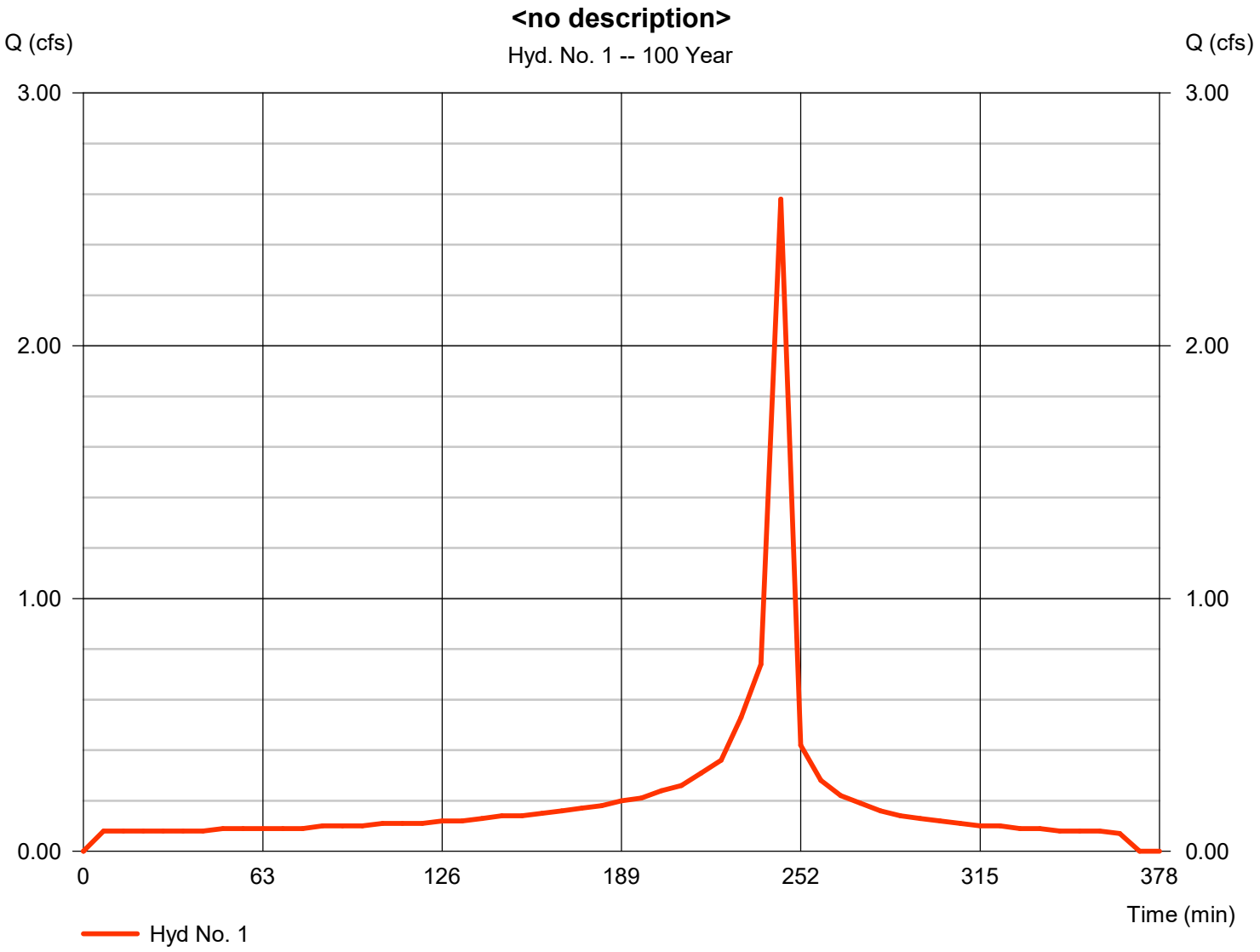
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Friday, 04 / 26 / 2024

Hyd. No. 1

<no description>

Hydrograph type	= Manual	Peak discharge	= 2.580 cfs
Storm frequency	= 100 yrs	Time to peak	= 245 min
Time interval	= 7 min	Hyd. volume	= 4,519 cuft



Hydrograph Report

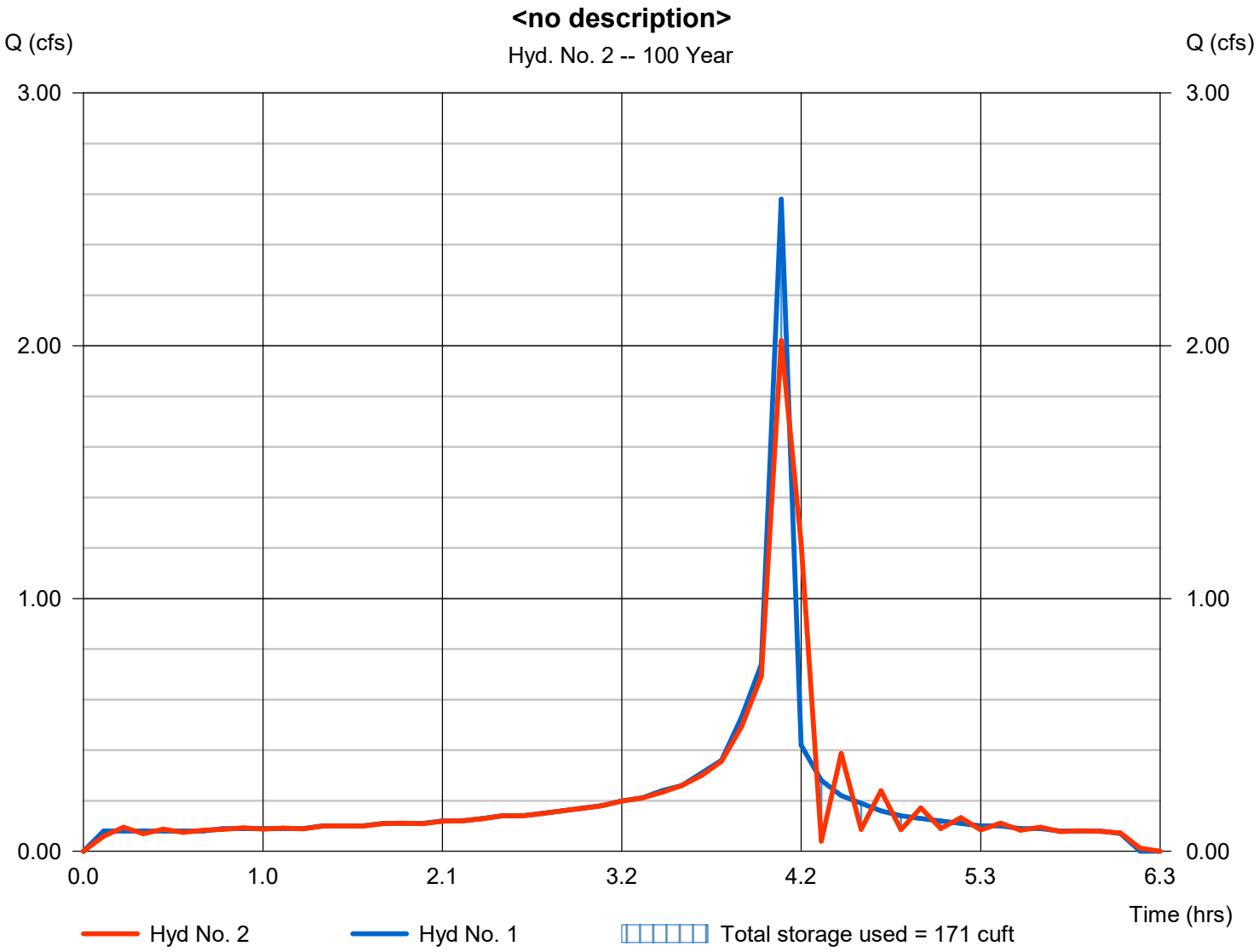
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Friday, 04 / 26 / 2024

Hyd. No. 2

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 2.020 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.08 hrs
Time interval	= 7 min	Hyd. volume	= 4,520 cuft
Inflow hyd. No.	= 1 - <no description>	Max. Elevation	= 305.48 ft
Reservoir name	= Pond 3003	Max. Storage	= 171 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Pond 3003

Pond Data

UG Chambers -Invert elev. = 303.00 ft, Rise x Span = 2.50 x 2.50 ft, Barrel Len = 35.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	303.00	n/a	0	0
0.25	303.25	n/a	9	9
0.50	303.50	n/a	16	24
0.75	303.75	n/a	19	43
1.00	304.00	n/a	21	64
1.25	304.25	n/a	22	86
1.50	304.50	n/a	22	108
1.75	304.75	n/a	21	128
2.00	305.00	n/a	19	147
2.25	305.25	n/a	16	163
2.50	305.50	n/a	9	172

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	Inactive	3.00	0.00
Span (in)	= 12.00	5.00	12.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 303.00	305.08	303.00	0.00
Length (ft)	= 42.90	0.04	0.04	0.00
Slope (%)	= 0.50	0.01	0.01	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.00	2.00	0.00	0.00
Crest El. (ft)	= 309.00	305.25	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= 1	Broad	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	303.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.03	1	303.02	0.00 ic	0.00	0.00 ic	---	0.00	0.00	---	---	---	---	0.003
0.05	2	303.05	0.01 ic	0.00	0.01 ic	---	0.00	0.00	---	---	---	---	0.011
0.08	3	303.07	0.02 ic	0.00	0.02 ic	---	0.00	0.00	---	---	---	---	0.023
0.10	4	303.10	0.04 ic	0.00	0.04 ic	---	0.00	0.00	---	---	---	---	0.040
0.13	4	303.12	0.06 ic	0.00	0.06 ic	---	0.00	0.00	---	---	---	---	0.061
0.15	5	303.15	0.08 ic	0.00	0.08 ic	---	0.00	0.00	---	---	---	---	0.085
0.18	6	303.17	0.11 ic	0.00	0.11 ic	---	0.00	0.00	---	---	---	---	0.110
0.20	7	303.20	0.14 ic	0.00	0.14 ic	---	0.00	0.00	---	---	---	---	0.140
0.23	8	303.22	0.18 ic	0.00	0.17 ic	---	0.00	0.00	---	---	---	---	0.172
0.25	9	303.25	0.21 ic	0.00	0.21 ic	---	0.00	0.00	---	---	---	---	0.211
0.28	10	303.27	0.24 ic	0.00	0.24 ic	---	0.00	0.00	---	---	---	---	0.238
0.30	12	303.30	0.27 ic	0.00	0.27 ic	---	0.00	0.00	---	---	---	---	0.265
0.33	14	303.32	0.29 ic	0.00	0.29 ic	---	0.00	0.00	---	---	---	---	0.294
0.35	15	303.35	0.32 ic	0.00	0.32 ic	---	0.00	0.00	---	---	---	---	0.323
0.38	17	303.37	0.35 ic	0.00	0.35 ic	---	0.00	0.00	---	---	---	---	0.353
0.40	18	303.40	0.39 ic	0.00	0.38 ic	---	0.00	0.00	---	---	---	---	0.378
0.43	20	303.42	0.40 ic	0.00	0.40 ic	---	0.00	0.00	---	---	---	---	0.405
0.45	21	303.45	0.44 ic	0.00	0.43 ic	---	0.00	0.00	---	---	---	---	0.428
0.48	23	303.47	0.46 ic	0.00	0.46 ic	---	0.00	0.00	---	---	---	---	0.457
0.50	24	303.50	0.48 ic	0.00	0.48 ic	---	0.00	0.00	---	---	---	---	0.479
0.52	26	303.52	0.50 ic	0.00	0.50 ic	---	0.00	0.00	---	---	---	---	0.500
0.55	28	303.55	0.54 ic	0.00	0.52 ic	---	0.00	0.00	---	---	---	---	0.524
0.57	30	303.57	0.56 oc	0.00	0.55 ic	---	0.00	0.00	---	---	---	---	0.547
0.60	32	303.60	0.58 oc	0.00	0.57 ic	---	0.00	0.00	---	---	---	---	0.570
0.62	34	303.62	0.59 oc	0.00	0.59 ic	---	0.00	0.00	---	---	---	---	0.592
0.65	36	303.65	0.61 oc	0.00	0.61 ic	---	0.00	0.00	---	---	---	---	0.613
0.67	38	303.67	0.63 oc	0.00	0.63 ic	---	0.00	0.00	---	---	---	---	0.632
0.70	40	303.70	0.65 oc	0.00	0.65 ic	---	0.00	0.00	---	---	---	---	0.651
0.72	41	303.72	0.67 oc	0.00	0.67 ic	---	0.00	0.00	---	---	---	---	0.670
0.75	43	303.75	0.69 oc	0.00	0.69 ic	---	0.00	0.00	---	---	---	---	0.689
0.77	45	303.77	0.71 oc	0.00	0.71 ic	---	0.00	0.00	---	---	---	---	0.707

Continues on next page...

Pond 3003

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.80	48	303.80	0.73 oc	0.00	0.72 ic	---	0.00	0.00	---	---	---	---	0.725
0.82	50	303.82	0.75 oc	0.00	0.74 ic	---	0.00	0.00	---	---	---	---	0.742
0.85	52	303.85	0.77 oc	0.00	0.76 ic	---	0.00	0.00	---	---	---	---	0.758
0.87	54	303.87	0.79 oc	0.00	0.77 ic	---	0.00	0.00	---	---	---	---	0.775
0.90	56	303.90	0.81 oc	0.00	0.79 ic	---	0.00	0.00	---	---	---	---	0.791
0.92	58	303.92	0.81 oc	0.00	0.81 ic	---	0.00	0.00	---	---	---	---	0.808
0.95	60	303.95	0.83 oc	0.00	0.83 ic	---	0.00	0.00	---	---	---	---	0.828
0.97	62	303.97	0.85 oc	0.00	0.84 ic	---	0.00	0.00	---	---	---	---	0.843
1.00	64	304.00	0.87 oc	0.00	0.86 ic	---	0.00	0.00	---	---	---	---	0.858
1.02	66	304.02	0.89 oc	0.00	0.87 ic	---	0.00	0.00	---	---	---	---	0.872
1.05	69	304.05	0.89 oc	0.00	0.89 ic	---	0.00	0.00	---	---	---	---	0.888
1.07	71	304.07	0.91 oc	0.00	0.91 ic	---	0.00	0.00	---	---	---	---	0.906
1.10	73	304.10	0.93 oc	0.00	0.92 ic	---	0.00	0.00	---	---	---	---	0.920
1.12	75	304.12	0.95 oc	0.00	0.93 ic	---	0.00	0.00	---	---	---	---	0.933
1.15	77	304.15	0.95 oc	0.00	0.95 ic	---	0.00	0.00	---	---	---	---	0.948
1.17	79	304.17	0.97 oc	0.00	0.97 ic	---	0.00	0.00	---	---	---	---	0.966
1.20	82	304.20	0.99 oc	0.00	0.98 ic	---	0.00	0.00	---	---	---	---	0.978
1.22	84	304.22	1.01 oc	0.00	0.99 ic	---	0.00	0.00	---	---	---	---	0.991
1.25	86	304.25	1.01 oc	0.00	1.01 ic	---	0.00	0.00	---	---	---	---	1.008
1.27	88	304.27	1.03 oc	0.00	1.02 ic	---	0.00	0.00	---	---	---	---	1.021
1.30	90	304.30	1.05 oc	0.00	1.03 ic	---	0.00	0.00	---	---	---	---	1.034
1.32	92	304.32	1.05 oc	0.00	1.05 ic	---	0.00	0.00	---	---	---	---	1.048
1.35	95	304.35	1.07 oc	0.00	1.06 ic	---	0.00	0.00	---	---	---	---	1.063
1.37	97	304.37	1.09 oc	0.00	1.07 ic	---	0.00	0.00	---	---	---	---	1.074
1.40	99	304.40	1.09 oc	0.00	1.09 ic	---	0.00	0.00	---	---	---	---	1.087
1.42	101	304.42	1.11 oc	0.00	1.10 ic	---	0.00	0.00	---	---	---	---	1.103
1.45	103	304.45	1.13 oc	0.00	1.11 ic	---	0.00	0.00	---	---	---	---	1.114
1.47	106	304.47	1.13 oc	0.00	1.13 ic	---	0.00	0.00	---	---	---	---	1.126
1.50	108	304.50	1.14 oc	0.00	1.14 ic	---	0.00	0.00	---	---	---	---	1.141
1.52	110	304.52	1.16 oc	0.00	1.15 ic	---	0.00	0.00	---	---	---	---	1.152
1.55	112	304.55	1.16 oc	0.00	1.16 ic	---	0.00	0.00	---	---	---	---	1.164
1.57	114	304.57	1.18 oc	0.00	1.18 ic	---	0.00	0.00	---	---	---	---	1.178
1.60	116	304.60	1.20 oc	0.00	1.19 ic	---	0.00	0.00	---	---	---	---	1.189
1.62	118	304.62	1.20 oc	0.00	1.20 ic	---	0.00	0.00	---	---	---	---	1.201
1.65	120	304.65	1.22 oc	0.00	1.21 ic	---	0.00	0.00	---	---	---	---	1.215
1.67	122	304.67	1.24 oc	0.00	1.22 ic	---	0.00	0.00	---	---	---	---	1.225
1.70	124	304.70	1.24 oc	0.00	1.24 ic	---	0.00	0.00	---	---	---	---	1.238
1.72	126	304.72	1.26 oc	0.00	1.25 ic	---	0.00	0.00	---	---	---	---	1.250
1.75	128	304.75	1.27 oc	0.00	1.26 ic	---	0.00	0.00	---	---	---	---	1.260
1.77	130	304.77	1.27 oc	0.00	1.27 ic	---	0.00	0.00	---	---	---	---	1.274
1.80	132	304.80	1.29 oc	0.00	1.28 ic	---	0.00	0.00	---	---	---	---	1.284
1.82	134	304.82	1.31 oc	0.00	1.29 ic	---	0.00	0.00	---	---	---	---	1.294
1.85	136	304.85	1.31 oc	0.00	1.31 ic	---	0.00	0.00	---	---	---	---	1.308
1.87	138	304.87	1.33 oc	0.00	1.32 ic	---	0.00	0.00	---	---	---	---	1.318
1.90	140	304.90	1.34 oc	0.00	1.33 ic	---	0.00	0.00	---	---	---	---	1.327
1.92	142	304.92	1.34 oc	0.00	1.34 ic	---	0.00	0.00	---	---	---	---	1.341
1.95	144	304.95	1.36 oc	0.00	1.35 ic	---	0.00	0.00	---	---	---	---	1.350
1.97	145	304.97	1.36 oc	0.00	1.36 ic	---	0.00	0.00	---	---	---	---	1.361
2.00	147	305.00	1.38 oc	0.00	1.37 ic	---	0.00	0.00	---	---	---	---	1.373
2.03	149	305.02	1.39 oc	0.00	1.38 ic	---	0.00	0.00	---	---	---	---	1.383
2.05	150	305.05	1.39 oc	0.00	1.39 ic	---	0.00	0.00	---	---	---	---	1.393
2.08	152	305.07	1.41 oc	0.00	1.40 ic	---	0.00	0.00	---	---	---	---	1.405
2.10	154	305.10	1.42 oc	0.00	1.41 ic	---	0.00	0.00	---	---	---	---	1.414
2.13	155	305.12	1.42 oc	0.00	1.42 ic	---	0.00	0.00	---	---	---	---	1.425
2.15	157	305.15	1.44 oc	0.00	1.44 ic	---	0.00	0.00	---	---	---	---	1.436
2.18	158	305.17	1.46 oc	0.00	1.44 ic	---	0.00	0.00	---	---	---	---	1.445
2.20	160	305.20	1.46 oc	0.00	1.46 ic	---	0.00	0.00	---	---	---	---	1.455
2.23	161	305.22	1.47 oc	0.00	1.47 ic	---	0.00	0.00	---	---	---	---	1.466
2.25	163	305.25	1.48 oc	0.00	1.48 ic	---	0.00	0.00	---	---	---	---	1.475
2.28	164	305.27	1.51 oc	0.00	1.48 ic	---	0.00	0.02	---	---	---	---	1.502
2.30	165	305.30	1.55 oc	0.00	1.48 ic	---	0.00	0.06	---	---	---	---	1.542
2.33	166	305.32	1.60 oc	0.00	1.48 ic	---	0.00	0.11	---	---	---	---	1.590
2.35	166	305.35	1.65 oc	0.00	1.48 ic	---	0.00	0.16	---	---	---	---	1.645
2.38	167	305.37	1.71 oc	0.00	1.47 ic	---	0.00	0.23	---	---	---	---	1.704
2.40	168	305.40	1.76 oc	0.00	1.46 ic	---	0.00	0.30	---	---	---	---	1.762
2.43	169	305.42	1.81 oc	0.00	1.43 ic	---	0.00	0.38	---	---	---	---	1.808
2.45	170	305.45	1.89 oc	0.00	1.43 ic	---	0.00	0.46	---	---	---	---	1.894
2.48	171	305.47	1.98 oc	0.00	1.43 ic	---	0.00	0.55	---	---	---	---	1.984
2.50	172	305.50	2.08 oc	0.00	1.43 ic	---	0.00	0.65	---	---	---	---	2.078

...End

CALCULATION AFTER THE DETENTION STRUCTURE

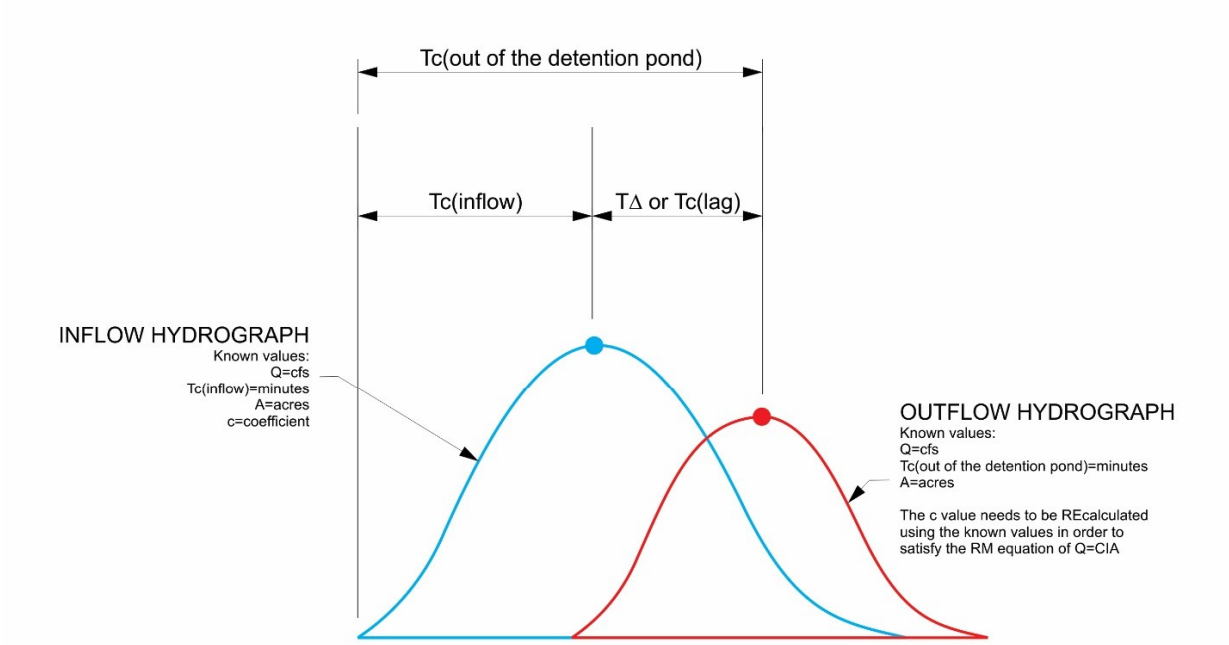
The purpose of the detention structure is to alter the peak flow and or time to peak of a given storm so it will not have a negative impact on the downstream facilities. There are different methods on how to use the resulting values of the outflow hydrograph.

For the purposes of this example there will be an association of the following values:

Q_{in} = Is equal to the inflow value that will enter the basin before storage
Q_{out} = Is equal to the outflow value that will exit the basin after storage
Tc_{in} = Is equal to the Time of Concentration flowing into the basin before detention
Tc_{out} = Is equal to the Time of Concentration exiting the basin after detention
A = Area of the tributary area being examined; (This value does not change)
c_{inflow} = The runoff coefficient going into the basin for detention
c_{out} = The runoff coefficient recalculated taking into account water stored in pond for detention

One method is to keep the value of c(inflow) and solve for the I=intensity & Tc(outflow). In this interpretation, we will get a Tc that will not match the value of the $Tc_{(\text{out of the detention structure})}$ of the outflow hydrograph that was calculated using the detention pond. The Tc Using this method shows a disruption on the oneness & continuity of the outflow hydrograph & the formula Q=cIA.

The second method; that is the method we are using is to recalculate the c=coefficient based on the fix values of the outflow hydrograph to achieve a c_{out} . This value uses the c_{inflow} from the flow into the detention basin and then is recalculated by the output of the hydrograph software using Q=cIA; translated as c=Q/IA. This method preserves the formula Q=cIA & does not alter the $Tc_{(\text{out of the detention structure})}$. This method shows that in order to maintain mathematical integrity of the rational equation (Q=CIA), the detention structure alters the runoff coefficient which is the only unknown in the equation. It is noted that the designer feels it is important to hold the value of Tc and the Q values that are calculated from the hydrograph.



GRAPHICAL DIAGRAM OF THE HYDROGRAPH COMING OUT OF THE DETENTION POND

The routing of the runoff through the detention structure gives us the $Q_{(\text{out of the detention structure})}$ and TΔ time lag between $Q_{(\text{inflow})}$ & $Q_{(\text{out of the detention structure})}$.

The known fix values coming out of the detention structure are:

- Q = cfs
- $Tc_{(\text{out of the detention structure})}$ = minutes
- A = acres
- *Please note that c=coefficient is not given directly from the resulting hydrograph coming out of the detention pond.*

In order to satisfy the rational equation of Q=CIA (see Section 3 of the 2003 San Diego County Hydrology Manual) coming out of the detention structure, we will calculate the only unknown value of the equation which is the outlet runoff coefficient, $C_{(\text{outlet})}$. By using the $Tc_{(\text{out of the detention structure})}$ we can solve for the intensity, I. With the intensity (I) value calculated, we can solve for the outlet runoff coefficient, $C_{(\text{outlet})}$.

The following equations are used in this stage: $Q = CIA$ $I = 7.44P_6D^{-0.645}$

Where:

$Q_{(\text{out of the detention structure})}$ = runoff (cfs), known value

$Tc_{(\text{inflow})}$ = detention structure inflow time of concentration (D) (minutes)

TΔ = time lag between $Q_{(\text{inflow})}$ & $Q_{(\text{out of the detention structure})}$

(minutes) $Tc_{(\text{out of the detention structure})} = Tc_{(\text{inflow})} + T\Delta$ (minutes)
P_6 = 6 hour precipitation (inches), known value.
I = intensity (inches/hour), calculated based on the value of $Tc_{(\text{out of the detention structure})}$
A = tributary area of the detention structure (acres),
known value $C_{(\text{outflow})}$ = runoff coefficient (unitless),
value to be solved

CALCULATIONS For Nodes 802 to 802; BMP-802			
LINE	**ITEM**	**AT THE OUTFLOW OF NODE 802**	**REMARKS**
1	P6 inch	3.5	KNOWN VALUE
2	TC (inflow) mins	14.06	KNOWN VALUE
3	TC (lag) mins	0	FROM THE OUTFLOW HYDROGRAPH
4	TC (ouflow) mins	14.06	LINE 2+3
5	I inches/hour	4.734	FROM THE INTENSITY FORMULA
6	Q(outflow)	1.801	KNOWN VALUE
7	A (inflow=outflow)	0.97	KNOWN VALUE
8	c(inflow)	0.582	KNOWN VALUE FROM THE CONTRIBUTING BASIN(S)
9	c(outflow)	0.392	CALCULATED FROM C=Q/IA

CALCULATIONS For Nodes 3003 to 103; BMP-103			
LINE	**ITEM**	**AT THE OUTFLOW OF NODE 802**	**REMARKS**
1	P6 inch	3.5	KNOWN VALUE
2	TC (inflow) mins	7.36	KNOWN VALUE
3	TC (lag) mins	0	FROM THE OUTFLOW HYDROGRAPH
4	TC (ouflow) mins	7.36	LINE 2+3
5	I inches/hour	7.186	FROM THE INTENSITY FORMULA
6	Q(outflow)	2.02	KNOWN VALUE
7	A (inflow=outflow)	0.78	KNOWN VALUE
8	c(inflow)	0.461	KNOWN VALUE FROM THE CONTRIBUTING BASIN(S)
9	c(outflow)	0.360	CALCULATED FROM C=Q/IA

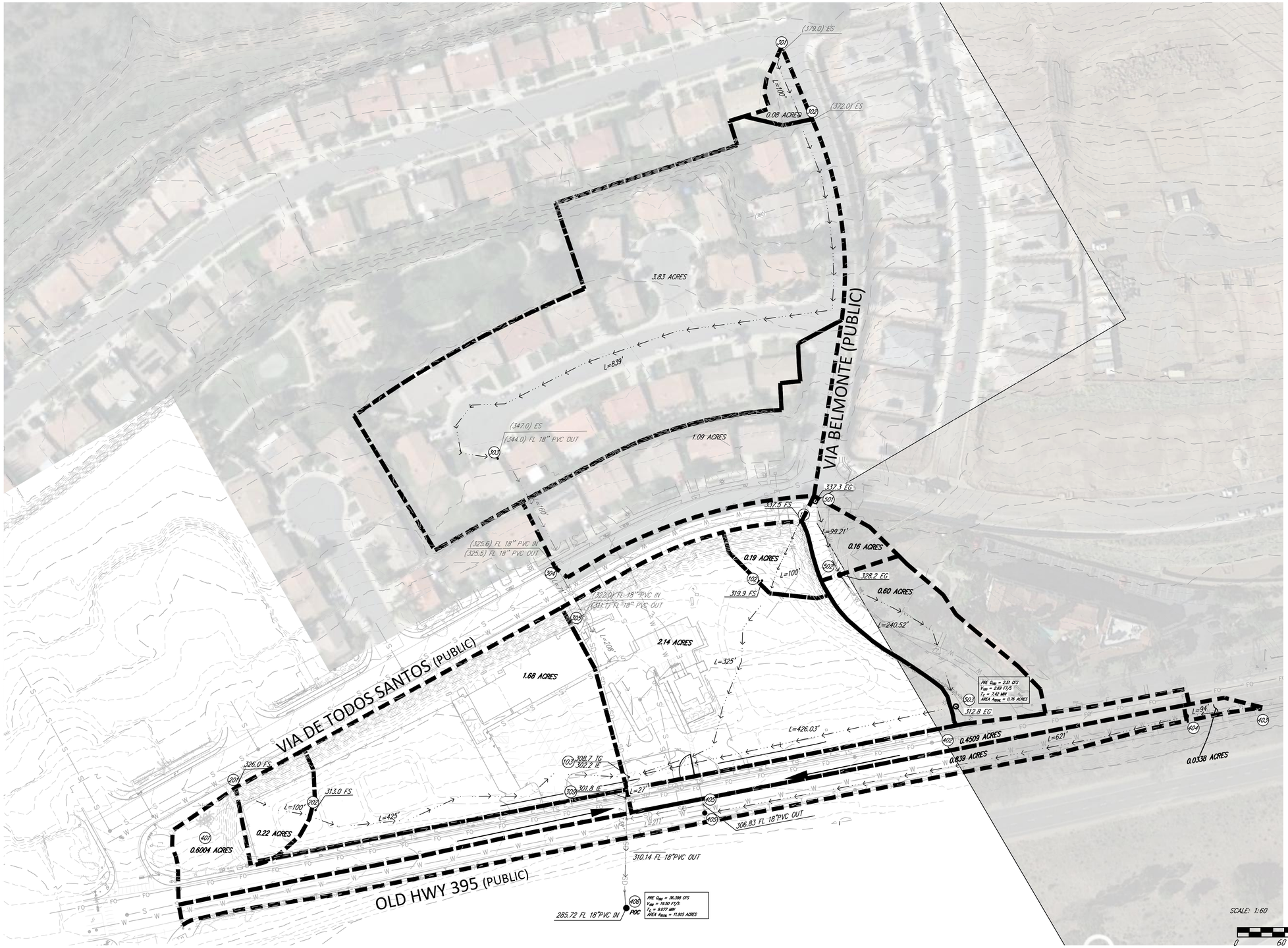
The preceding highlighted data are then used to continue the calculations downstream of the detention structure.

In summary these are the steps of the calculations presented here:

1. Hydrologic methods of calculation as laid out in the 2003 San Diego Hydrology Manual was used upstream of the detention structure. These includes the methods of determining c, Tc and confluence of a junction. The c values used in the proposed conditions range from “undisturbed natural terrain” to “low & high density residential” whichever is

appropriate for the contributing basin.

2. At the outflow of the detention structure, the c value was recalculated using the resulting values of the outflow hydrograph. This method preserves the values of $Tc_{(\text{out of the detention structure})}$, A & $Q_{(\text{outflow})}$. Methods and software satisfy the formula Q=cIA & the 2003 San Diego Hydrology Manual. This step shows that in order to maintain mathematical integrity of the rational equation (Q=CIA), the detention structure alters the runoff coefficient which is the only unknown in the equation.
3. The values determined in step 2 were used in the continuation of the calculations using the Hydrologic methods of calculation as laid out in the 2003 San Diego Hydrology Manual downstream of the detention structure. These includes the methods of determining c, Tc and confluence of a junction. The c values used in the proposed conditions range from “undisturbed natural terrain” to “low & high density residential” whichever is appropriate for the contributing basin.



LEGEND

- HYD BASIN BOUNDARY
- NODE NUMBER (101)
- SURFACE FLOW
- PIPE FLOW
- STREET FLOW

HYDROLOGIC SOIL GROUP

THE HYROLOGICAL SOIL GROUPS FOR THIS SITE ARE TYPE (A & C)

NOTE:
APPROXIMATE DEPTH TO GROUNDWATER IS GREATER THAN 20'

EXCEL ENGINEERING
LAND PLANNING • ENGINEERING • SURVEYING
440 STATE PLACE, ESCONDIDO, CA 92029
PH (760)745-8118 FX (760)745-1890

PALA MESA PLAZA
HYDROLOGY PRE DEVELOPMENT EXHIBIT

K:\19\19025\Engineering\SDP\SDP 01\Storm Working Files\Street trees\Hyd\Pre-current.dwg 4/26/2024 3:00 PM ORIGINAL PLOT SIZE: ----



LEGEND

- HYD BASIN BOUNDARY
- NODE NUMBER (100)
- SURFACE FLOW
- PIPE FLOW
- STREET FLOW

SCALE 1:60

0 60 120 180 240

HYDROLOGIC SOIL GROUP

THE HYDROLOGICAL SOIL GROUPS FOR THIS SITE ARE TYPE (A & C)

NOTE:
APPROXIMATE DEPTH TO GROUNDWATER IS GREATER THAN 20'

PALA MESA PLAZA
HYDROLOGY POST DEVELOPMENT EXHIBIT

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V:\19\19025\Engineering\SDP\SDP 01\Storm Working Files\Street trees\Hyd\19025-Postdev-current-adjust.dwg 8/16/2024 3:14 PM ORIGINAL PLOT SIZE: ----

6h. CivilD Pre-Development Via Belmonte Calculations

```
        San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
    Rational Hydrology Study        Date: 04/22/24
--------------------------------------------------------------------------
19025 Pre Dev
100 yr study - Belmonte Addition
19025belmonte

--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 6332

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      501.000 to Point/Station      502.000
**** INITIAL AREA EVALUATION ****
___________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.410
Initial subarea total flow distance  =   99.210(Ft.)
Highest elevation =  337.300(Ft.)
Lowest elevation =  328.200(Ft.)
Elevation difference =    9.100(Ft.) Slope =  9.172 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   9.17 %, in a development type of
 4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.93 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(   9.172^(1/3)]=   5.93
Rainfall intensity (I) =      8.258(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff =      0.542(CFS)
Total initial stream area =        0.160(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      502.000 to Point/Station      503.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
___________________________________________________________________________
```

```
      Estimated mean flow rate at midpoint of channel =     1.557(CFS)
      Depth of flow =   0.143(Ft.), Average velocity =   2.690(Ft/s)
          ******* Irregular Channel Data **********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
          1              0.00              0.50
          2             26.00              0.00
          3             27.00              0.20
      Manning's 'N' friction factor =   0.024
      ------------------------------------------------------------------
      Sub-Channel flow  =     1.557(CFS)
        '     '    flow top width =     8.125(Ft.)
        '     '    velocity=    2.690(Ft/s)
        '     '    area =      0.579(Sq.Ft)
        '     '    Froude number =     1.776

      Upstream point elevation =   328.200(Ft.)
      Downstream point elevation =   312.800(Ft.)
      Flow length =   240.520(Ft.)
      Travel time  =    1.49 min.
      Time of concentration =    7.42 min.
      Depth of flow =   0.143(Ft.)
      Average velocity =   2.690(Ft/s)
      Total irregular channel flow =     1.557(CFS)
      Irregular channel normal depth above invert elev. =   0.143(Ft.)
      Average velocity of channel(s) =   2.690(Ft/s)
       Adding area flow to channel
      Rainfall intensity (I) =      7.146(In/Hr) for a   100.0 year storm
      Decimal fraction soil group A = 0.050
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.950
      Decimal fraction soil group D = 0.000
      [MEDIUM DENSITY RESIDENTIAL                 ]
      (4.3 DU/A or Less       )
      Impervious value, Ai = 0.300
      Sub-Area C Value = 0.476
      Rainfall intensity =      7.146(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.462  CA =      0.351
      Subarea runoff =      1.970(CFS) for      0.600(Ac.)
      Total runoff =      2.512(CFS)  Total area =       0.760(Ac.)
      Depth of flow =   0.171(Ft.), Average velocity =   3.031(Ft/s)
      End of computations, total study area =           0.760 (Ac.)
```

6i. CivilD Pre-Development Onsite Calculations

```
1
2
3                San Diego County Rational Hydrology Program
4
5       CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0
6
7       Rational method hydrology  program based on
8       San Diego County Flood Control Division 2003 hydrology manual
9           Rational Hydrology Study        Date: 04/24/24
10      --------------------------------------------------------------------------
11      19025 Pre Dev
12      100 Year Study Onsite
13      19025Pre100Onsite
14      offsite ud to onsite
15      --------------------------------------------------------------------------
16       *********   Hydrology Study Control Information **********
17
18      --------------------------------------------------------------------------
19
20
21      Program License Serial Number 6332
22
23      --------------------------------------------------------------------------
24      Rational hydrology study storm event year is   100.0
25      English (in-lb) input data Units used
26
27      Map data precipitation entered:
28      6 hour,  precipitation(inches) =  3.500
29      24 hour precipitation(inches) =  6.000
30      P6/P24 =    58.3%
31      San Diego hydrology manual 'C' values used
32
33
34      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
35      Process from Point/Station      101.000 to Point/Station      102.000
36      **** INITIAL AREA EVALUATION ****
37      ____________________________________________________________________________
38      Decimal fraction soil group A = 0.900
39      Decimal fraction soil group B = 0.000
40      Decimal fraction soil group C = 0.100
41      Decimal fraction soil group D = 0.000
42      [MEDIUM DENSITY RESIDENTIAL                  ]
43      (4.3 DU/A or Less       )
44      Impervious value, Ai = 0.300
45      Sub-Area C Value = 0.417
46      Initial subarea total flow distance  =  100.000(Ft.)
47      Highest elevation =  337.500(Ft.)
48      Lowest elevation =  319.900(Ft.)
49      Elevation difference =   17.600(Ft.) Slope = 17.600 %
50      Top of Initial Area Slope adjusted by User to 30.000 %
51      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
52      The maximum overland flow distance is 100.00 (Ft)
53      for the top area slope value of  30.00 %, in a development type of
54       4.3 DU/A or Less
55      In Accordance With Figure 3-3
56      Initial Area Time of Concentration =   3.96 minutes
57      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
58      TC = [1.8*(1.1-0.4170)*( 100.000^.5)/(  30.000^(1/3)]=   3.96
59      Calculated TC of    3.957 minutes is less than 5 minutes,
60       resetting TC to 5.0 minutes for rainfall intensity calculations
61      Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
62      Effective runoff coefficient used for area (Q=KCIA) is C = 0.417
63      Subarea runoff =      0.731(CFS)
64      Total initial stream area =        0.190(Ac.)
65
66
67      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
68      Process from Point/Station      102.000 to Point/Station      103.000
69      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

```
 ------------------------------------------------------------------------
 Estimated mean flow rate at midpoint of channel =      4.743(CFS)
 Depth of flow =   0.278(Ft.), Average velocity =   2.463(Ft/s)
     ******* Irregular Channel Data ***********
 ------------------------------------------------------------------------
 Information entered for subchannel number 1 :
 Point number      'X' coordinate     'Y' coordinate
     1              0.00              1.00
     2             25.00              0.00
     3             50.00              1.00
 Manning's 'N' friction factor =   0.030
 ------------------------------------------------------------------------
 Sub-Channel flow  =      4.743(CFS)
   '     '    flow top width =     13.876(Ft.)
   '     '    velocity=    2.463(Ft/s)
   '     '    area =      1.925(Sq.Ft)
   '     '    Froude number =     1.165

 Upstream point elevation =   319.900(Ft.)
 Downstream point elevation =   308.700(Ft.)
 Flow length =   325.000(Ft.)
 Travel time  =    2.20 min.
 Time of concentration =    6.16 min.
 Depth of flow =   0.278(Ft.)
 Average velocity =   2.463(Ft/s)
 Total irregular channel flow =     4.743(CFS)
 Irregular channel normal depth above invert elev. =   0.278(Ft.)
 Average velocity of channel(s) =   2.463(Ft/s)
  Adding area flow to channel
 Rainfall intensity (I) =      8.064(In/Hr) for a   100.0 year storm
 Decimal fraction soil group A = 0.200
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.800
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL                 ]
 (4.3 DU/A or Less       )
 Impervious value, Ai = 0.300
 Sub-Area C Value = 0.466
 Rainfall intensity =      8.064(In/Hr) for a   100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.462  CA =      1.076
 Subarea runoff =      7.950(CFS) for      2.140(Ac.)
 Total runoff =      8.681(CFS)  Total area =      2.330(Ac.)
 Depth of flow =   0.348(Ft.), Average velocity =   2.865(Ft/s)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station      103.000 to Point/Station      103.000
 **** CONFLUENCE OF MINOR STREAMS ****

 ------------------------------------------------------------------------
 Along Main Stream number: 1 in normal stream number 1
 Stream flow area =      2.330(Ac.)
 Runoff from this stream =      8.681(CFS)
 Time of concentration =    6.16 min.
 Rainfall intensity =     8.064(In/Hr)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station      201.000 to Point/Station      202.000
 **** INITIAL AREA EVALUATION ****

 ------------------------------------------------------------------------
 Decimal fraction soil group A = 0.550
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.450
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL                 ]
 (4.3 DU/A or Less       )
 Impervious value, Ai = 0.300
 Sub-Area C Value = 0.442
```

```
 Initial subarea total flow distance  =  100.000(Ft.)
 Highest elevation =  326.000(Ft.)
 Lowest elevation =  313.000(Ft.)
 Elevation difference =   13.000(Ft.) Slope = 13.000 %
 Top of Initial Area Slope adjusted by User to 30.000 %
 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
 The maximum overland flow distance is 100.00 (Ft)
 for the top area slope value of  30.00 %, in a development type of
  4.3 DU/A or Less
 In Accordance With Figure 3-3
 Initial Area Time of Concentration =   3.81 minutes
 TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
 TC = [1.8*(1.1-0.4415)*( 100.000^.5)/(  30.000^(1/3)]=   3.81
 Calculated TC of    3.815 minutes is less than 5 minutes,
  resetting TC to 5.0 minutes for rainfall intensity calculations
 Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.442
 Subarea runoff =      0.896(CFS)
 Total initial stream area =        0.220(Ac.)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station      202.000 to Point/Station      103.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

 ________________________________________________________________________
 Estimated mean flow rate at midpoint of channel =      3.310(CFS)
 Depth of flow =   0.305(Ft.), Average velocity =   1.422(Ft/s)
     ******* Irregular Channel Data ***********
 ------------------------------------------------------------------
 Information entered for subchannel number 1 :
 Point number      'X' coordinate     'Y' coordinate
     1              0.00              1.00
     2             25.00              0.00
     3             50.00              1.00
 Manning's 'N' friction factor =   0.030
 ------------------------------------------------------------------
 Sub-Channel flow  =      3.310(CFS)
   '     '    flow top width =     15.257(Ft.)
   '     '    velocity=    1.422(Ft/s)
   '     '    area =      2.328(Sq.Ft)
   '     '    Froude number =     0.641

 Upstream point elevation =   313.000(Ft.)
 Downstream point elevation =   308.700(Ft.)
 Flow length =   425.000(Ft.)
 Travel time  =    4.98 min.
 Time of concentration =    8.80 min.
 Depth of flow =   0.305(Ft.)
 Average velocity =   1.422(Ft/s)
 Total irregular channel flow =     3.310(CFS)
 Irregular channel normal depth above invert elev. =   0.305(Ft.)
 Average velocity of channel(s) =   1.422(Ft/s)
  Adding area flow to channel
 Rainfall intensity (I) =      6.406(In/Hr) for a   100.0 year storm
 Decimal fraction soil group A = 0.200
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.800
 Decimal fraction soil group D = 0.000
 [MEDIUM DENSITY RESIDENTIAL                  ]
 (4.3 DU/A or Less       )
 Impervious value, Ai = 0.300
 Sub-Area C Value = 0.466
 Rainfall intensity =      6.406(In/Hr) for a   100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.463  CA =      0.880
 Subarea runoff =      4.741(CFS) for      1.680(Ac.)
 Total runoff =      5.637(CFS)  Total area =      1.900(Ac.)
 Depth of flow =   0.373(Ft.), Average velocity =   1.624(Ft/s)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.900(Ac.)
Runoff from this stream =      5.637(CFS)
Time of concentration =    8.80 min.
Rainfall intensity =     6.406(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      305.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
____________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Rainfall intensity (I) =      6.428(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   8.75 min.  Rain intensity =       6.43(In/Hr)
Total area =        5.000(Ac.)  Total runoff =    13.794(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
____________________________________________________________________________
Upstream point/station elevation =   311.100(Ft.)
Downstream point/station elevation =   302.200(Ft.)
Pipe length  =   208.00(Ft.) Slope =   0.0428  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.794(CFS)
Given pipe size =     12.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    29.453(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     31.169(Ft.)
 Minor friction loss =      7.185(Ft.)  K-factor =   1.50
Pipe flow velocity =     17.56(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =     8.95 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      5.000(Ac.)
Runoff from this stream =     13.794(CFS)
Time of concentration =    8.95 min.
Rainfall intensity =     6.336(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      503.000 to Point/Station      103.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
____________________________________________________________________________
Decimal fraction soil group A = 0.270
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
```

```
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.461
Rainfall intensity (I) =      7.149(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   7.42 min.  Rain intensity =       7.15(In/Hr)
Total area =        0.760(Ac.)  Total runoff =     2.512(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 4
Stream flow area =      0.760(Ac.)
Runoff from this stream =      2.512(CFS)
Time of concentration =    7.42 min.
Rainfall intensity =     7.149(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        8.681      6.16             8.064
2        5.637      8.80             6.406
3       13.794      8.95             6.336
4        2.512      7.42             7.149
Qmax(1) =
       1.000 *    1.000 *     8.681) +
       1.000 *    0.700 *     5.637) +
       1.000 *    0.688 *    13.794) +
       1.000 *    0.830 *     2.512) + =      24.199
Qmax(2) =
       0.794 *    1.000 *     8.681) +
       1.000 *    1.000 *     5.637) +
       1.000 *    0.983 *    13.794) +
       0.896 *    1.000 *     2.512) + =      28.345
Qmax(3) =
       0.786 *    1.000 *     8.681) +
       0.989 *    1.000 *     5.637) +
       1.000 *    1.000 *    13.794) +
       0.886 *    1.000 *     2.512) + =      28.416
Qmax(4) =
       0.886 *    1.000 *     8.681) +
       1.000 *    0.844 *     5.637) +
       1.000 *    0.829 *    13.794) +
       1.000 *    1.000 *     2.512) + =      26.402

Total of 4 streams to confluence:
Flow rates before confluence point:
       8.681       5.637      13.794       2.512
Maximum flow rates at confluence using above data:
       24.199       28.345       28.416       26.402
Area of streams before confluence:
        2.330        1.900        5.000        0.760
Results of confluence:
Total flow rate =     28.416(CFS)
Time of concentration =     8.947 min.
Effective stream area after confluence =      9.990(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      309.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
____________________________________________________________________________
Upstream point/station elevation =   302.200(Ft.)
Downstream point/station elevation =   301.800(Ft.)
Pipe length  =    27.00(Ft.) Slope =   0.0148  Manning's N = 0.013
```

```
No. of pipes = 1  Required pipe flow  =    28.416(CFS)
Given pipe size =     18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     7.598(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      1.975(Ft.)
 Minor friction loss =      6.023(Ft.)  K-factor =   1.50
Pipe flow velocity =     16.08(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     8.98 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      309.000 to Point/Station      406.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

------------------------------------------------------------------------
Upstream point/station elevation =   301.800(Ft.)
Downstream point/station elevation =   285.720(Ft.)
Pipe length  =   137.00(Ft.) Slope =   0.1174  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.416(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    28.416(CFS)
Normal flow depth in pipe =   12.07(In.)
Flow top width inside pipe =   16.92(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.57(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     9.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      406.000 to Point/Station      406.000
**** CONFLUENCE OF MINOR STREAMS ****

------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      9.990(Ac.)
Runoff from this stream =     28.416(CFS)
Time of concentration =    9.08 min.
Rainfall intensity =     6.277(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      403.000 to Point/Station      404.000
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                    ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.810
Initial subarea total flow distance  =   94.000(Ft.)
Highest elevation =  318.000(Ft.)
Lowest elevation =  316.300(Ft.)
Elevation difference =    1.700(Ft.) Slope =  1.809 %
Top of Initial Area Slope adjusted by User to  1.400 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.40 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.61 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8100)*(  60.000^.5)/(   1.400^(1/3)]=   3.61
Calculated TC of    3.614 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =     9.222(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.810
Subarea runoff =      0.254(CFS)
Total initial stream area =        0.034(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      404.000 to Point/Station      405.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.197(CFS)
Depth of flow =   0.242(Ft.), Average velocity =   1.791(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.31
    2             26.00              0.13
    3             27.50              0.00
    4             27.50              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      2.197(CFS)
  '     '    flow top width =     17.814(Ft.)
  '     '    velocity=    1.791(Ft/s)
  '     '    area =      1.227(Sq.Ft)
  '     '    Froude number =     1.203

Upstream point elevation =   316.300(Ft.)
Downstream point elevation =   310.800(Ft.)
Flow length =   621.000(Ft.)
Travel time  =    5.78 min.
Time of concentration =    9.39 min.
Depth of flow =   0.242(Ft.)
Average velocity =   1.791(Ft/s)
Total irregular channel flow =     2.197(CFS)
Irregular channel normal depth above invert elev. =   0.242(Ft.)
Average velocity of channel(s) =   1.791(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      6.140(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.762 given for subarea
Rainfall intensity =      6.140(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.764  CA =      0.665
Subarea runoff =      3.831(CFS) for      0.837(Ac.)
Total runoff =      4.085(CFS)  Total area =       0.871(Ac.)
Depth of flow =   0.279(Ft.), Average velocity =   2.078(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      406.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Rainfall intensity (I) =      6.140(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(14.5 DU/A or Less      )
Impervious value, Ai = 0.500
Sub-Area C Value = 0.595
Time of concentration =     9.39 min.
Rainfall intensity =      6.140(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.695  CA =      1.022
Subarea runoff =      2.192(CFS) for      0.600(Ac.)
Total runoff =      6.277(CFS)  Total area =       1.471(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      402.000 to Point/Station      406.000
**** SUBAREA FLOW ADDITION ****

------------------------------------------------------------------------------
Rainfall intensity (I) =      6.140(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                          ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Time of concentration =     9.39 min.
Rainfall intensity =      6.140(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.715  CA =      1.374
Subarea runoff =      2.160(CFS) for      0.451(Ac.)
Total runoff =      8.437(CFS)  Total area =       1.922(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      405.000 to Point/Station      406.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

------------------------------------------------------------------------------
Upstream point/station elevation =   306.830(Ft.)
Downstream point/station elevation =   285.720(Ft.)
Pipe length  =   211.00(Ft.) Slope =   0.1000  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.437(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     8.437(CFS)
Normal flow depth in pipe =    6.19(In.)
Flow top width inside pipe =   17.10(In.)
Critical Depth =   13.50(In.)
Pipe flow velocity =     15.70(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =     9.62 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      406.000 to Point/Station      406.000
**** CONFLUENCE OF MINOR STREAMS ****

------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.922(Ac.)
Runoff from this stream =      8.437(CFS)
Time of concentration =    9.62 min.
Rainfall intensity =     6.047(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       28.416      9.08             6.277
2        8.437      9.62             6.047
Qmax(1) =
       1.000 *    1.000 *    28.416) +
       1.000 *    0.944 *     8.437) + =      36.378
Qmax(2) =
       0.963 *    1.000 *    28.416) +
       1.000 *    1.000 *     8.437) + =      35.811

Total of 2 streams to confluence:
Flow rates before confluence point:
      28.416       8.437
Maximum flow rates at confluence using above data:
       36.378       35.811
Area of streams before confluence:
```

```
              9.990        1.922
      Results of confluence:
      Total flow rate =     36.378(CFS)
      Time of concentration =     9.077 min.
      Effective stream area after confluence =     11.912(Ac.)
      End of computations, total study area =          11.912 (Ac.)
```

```
1
2                San Diego County Rational Hydrology Program
3
4       CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0
5
6       Rational method hydrology  program based on
7       San Diego County Flood Control Division 2003 hydrology manual
8           Rational Hydrology Study        Date: 04/24/24
9       --------------------------------------------------------------------------
10      19025 Post Dev
11      100 yr study - Belmonte Addition
12      19025belmontepost
13
14      --------------------------------------------------------------------------
15       *********   Hydrology Study Control Information **********
16
17      --------------------------------------------------------------------------
18
19
20      Program License Serial Number 6332
21
22      --------------------------------------------------------------------------
23      Rational hydrology study storm event year is   100.0
24      English (in-lb) input data Units used
25
26      Map data precipitation entered:
27      6 hour,  precipitation(inches) =  3.500
28      24 hour precipitation(inches) =  6.000
29      P6/P24 =    58.3%
30      San Diego hydrology manual 'C' values used
31
32
33      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
34      Process from Point/Station     3001.000 to Point/Station     3002.000
35      **** INITIAL AREA EVALUATION ****
36
37      Decimal fraction soil group A = 1.000
38      Decimal fraction soil group B = 0.000
39      Decimal fraction soil group C = 0.000
40      Decimal fraction soil group D = 0.000
41      [MEDIUM DENSITY RESIDENTIAL                  ]
42      (4.3 DU/A or Less       )
43      Impervious value, Ai = 0.300
44      Sub-Area C Value = 0.410
45      Initial subarea total flow distance  =   99.210(Ft.)
46      Highest elevation =  337.300(Ft.)
47      Lowest elevation =  328.200(Ft.)
48      Elevation difference =    9.100(Ft.) Slope =  9.172 %
49      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
50      The maximum overland flow distance is 100.00 (Ft)
51      for the top area slope value of   9.17 %, in a development type of
52       4.3 DU/A or Less
53      In Accordance With Figure 3-3
54      Initial Area Time of Concentration =   5.93 minutes
55      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
56      TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(   9.172^(1/3)]=   5.93
57      Rainfall intensity (I) =      8.258(In/Hr) for a   100.0 year storm
58      Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
59      Subarea runoff =      0.599(CFS)
60      Total initial stream area =        0.177(Ac.)
61
62
63      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
64      Process from Point/Station     3002.000 to Point/Station     3003.000
65      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
66
67      Estimated mean flow rate at midpoint of channel =      1.615(CFS)
68      Depth of flow =   0.142(Ft.), Average velocity =   2.802(Ft/s)
69          ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.50
    2             26.00              0.00
    3             27.00              0.20
Manning's 'N' friction factor =   0.023
------------------------------------------------------------------
Sub-Channel flow  =      1.615(CFS)
  '     '    flow top width =      8.106(Ft.)
  '     '    velocity=    2.802(Ft/s)
  '     '    area =      0.576(Sq.Ft)
  '     '    Froude number =     1.852

Upstream point elevation =   328.200(Ft.)
Downstream point elevation =   312.800(Ft.)
Flow length =   240.520(Ft.)
Travel time  =    1.43 min.
Time of concentration =    7.36 min.
Depth of flow =   0.142(Ft.)
Average velocity =   2.802(Ft/s)
Total irregular channel flow =     1.615(CFS)
Irregular channel normal depth above invert elev. =   0.142(Ft.)
Average velocity of channel(s) =   2.802(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      7.184(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.050
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.476
Rainfall intensity =      7.184(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.461  CA =      0.358
Subarea runoff =      1.976(CFS) for      0.600(Ac.)
Total runoff =      2.575(CFS)  Total area =       0.777(Ac.)
Depth of flow =   0.169(Ft.), Average velocity =   3.149(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3003.000 to Point/Station     3003.000
**** 6 HOUR HYDROGRAPH ****

________________________________________________________________________
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003


Time of Concentration =   7.36
Basin Area =     0.78 Acres
6 Hour Rainfall =  3.500 Inches
Runoff Coefficient =  0.461
Peak Discharge =     2.58 CFS
     Time (Min)     Discharge (CFS)
       0               0.000
       7               0.075
       14              0.076
       21              0.078
       28              0.079
       35              0.082
       42              0.083
       49              0.085
       56              0.087
       63              0.090
       70              0.091
       77              0.094
       84              0.096
```

91	0.100	
98	0.102	
105	0.106	
112	0.109	
119	0.114	
126	0.117	
133	0.123	
140	0.127	
147	0.135	
154	0.139	
161	0.149	
168	0.155	
175	0.168	
182	0.176	
189	0.196	
196	0.207	
203	0.238	
210	0.258	
217	0.315	
224	0.359	
231	0.527	
238	0.742	
245	2.575	
252	0.423	
259	0.283	
266	0.221	
273	0.185	
280	0.161	
287	0.144	
294	0.131	
301	0.120	
308	0.111	
315	0.104	
322	0.098	
329	0.093	
336	0.088	
343	0.084	
350	0.081	
357	0.077	
364	0.074	

++

6 - 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

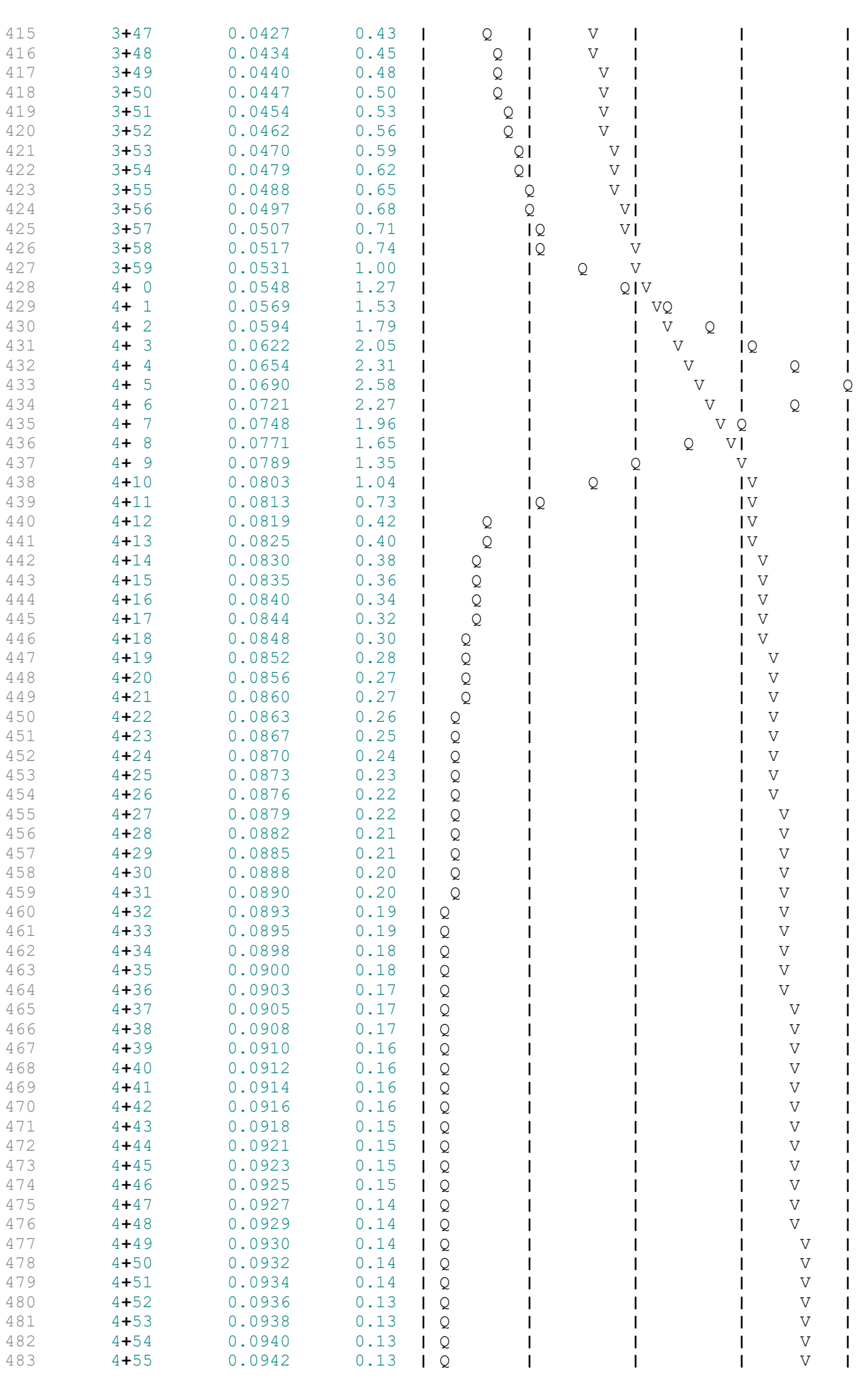
Hydrograph in 1 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	0.6	1.3	1.9	2.6
0+ 0	0.0000	0.00	Q	|	|	|	|
0+ 1	0.0000	0.01	Q	|	|	|	|
0+ 2	0.0000	0.02	Q	|	|	|	|
0+ 3	0.0001	0.03	Q	|	|	|	|
0+ 4	0.0001	0.04	Q	|	|	|	|
0+ 5	0.0002	0.05	Q	|	|	|	|
0+ 6	0.0003	0.06	VQ	|	|	|	|
0+ 7	0.0004	0.08	VQ	|	|	|	|
0+ 8	0.0005	0.08	VQ	|	|	|	|
0+ 9	0.0006	0.08	VQ	|	|	|	|
0+10	0.0007	0.08	VQ	|	|	|	|
0+11	0.0008	0.08	VQ	|	|	|	|
0+12	0.0009	0.08	VQ	|	|	|	|
0+13	0.0010	0.08	VQ	|	|	|	|
0+14	0.0011	0.08	VQ	|	|	|	|
0+15	0.0013	0.08	VQ	|	|	|	|
0+16	0.0014	0.08	VQ	|	|	|	|
0+17	0.0015	0.08	VQ	|	|	|	|
0+18	0.0016	0.08	VQ	|	|	|	|
0+19	0.0017	0.08	VQ	|	|	|	|

208	0+20	0.0018	0.08	VQ	|	|	|	|
209	0+21	0.0019	0.08	VQ	|	|	|	|
210	0+22	0.0020	0.08	VQ	|	|	|	|
211	0+23	0.0021	0.08	VQ	|	|	|	|
212	0+24	0.0022	0.08	VQ	|	|	|	|
213	0+25	0.0023	0.08	VQ	|	|	|	|
214	0+26	0.0024	0.08	VQ	|	|	|	|
215	0+27	0.0025	0.08	VQ	|	|	|	|
216	0+28	0.0027	0.08	|Q	|	|	|	|
217	0+29	0.0028	0.08	|Q	|	|	|	|
218	0+30	0.0029	0.08	|Q	|	|	|	|
219	0+31	0.0030	0.08	|Q	|	|	|	|
220	0+32	0.0031	0.08	|Q	|	|	|	|
221	0+33	0.0032	0.08	|Q	|	|	|	|
222	0+34	0.0033	0.08	|Q	|	|	|	|
223	0+35	0.0034	0.08	|Q	|	|	|	|
224	0+36	0.0035	0.08	|Q	|	|	|	|
225	0+37	0.0037	0.08	|Q	|	|	|	|
226	0+38	0.0038	0.08	|Q	|	|	|	|
227	0+39	0.0039	0.08	|Q	|	|	|	|
228	0+40	0.0040	0.08	|Q	|	|	|	|
229	0+41	0.0041	0.08	|Q	|	|	|	|
230	0+42	0.0042	0.08	|Q	|	|	|	|
231	0+43	0.0043	0.08	|Q	|	|	|	|
232	0+44	0.0045	0.08	|Q	|	|	|	|
233	0+45	0.0046	0.08	|Q	|	|	|	|
234	0+46	0.0047	0.08	|Q	|	|	|	|
235	0+47	0.0048	0.08	|Q	|	|	|	|
236	0+48	0.0049	0.09	|Q	|	|	|	|
237	0+49	0.0050	0.09	|Q	|	|	|	|
238	0+50	0.0052	0.09	|Q	|	|	|	|
239	0+51	0.0053	0.09	|QV	|	|	|	|
240	0+52	0.0054	0.09	|QV	|	|	|	|
241	0+53	0.0055	0.09	|QV	|	|	|	|
242	0+54	0.0056	0.09	|QV	|	|	|	|
243	0+55	0.0058	0.09	|QV	|	|	|	|
244	0+56	0.0059	0.09	|QV	|	|	|	|
245	0+57	0.0060	0.09	|QV	|	|	|	|
246	0+58	0.0061	0.09	|QV	|	|	|	|
247	0+59	0.0062	0.09	|QV	|	|	|	|
248	1+ 0	0.0064	0.09	|QV	|	|	|	|
249	1+ 1	0.0065	0.09	|QV	|	|	|	|
250	1+ 2	0.0066	0.09	|QV	|	|	|	|
251	1+ 3	0.0067	0.09	|QV	|	|	|	|
252	1+ 4	0.0068	0.09	|QV	|	|	|	|
253	1+ 5	0.0070	0.09	|QV	|	|	|	|
254	1+ 6	0.0071	0.09	|QV	|	|	|	|
255	1+ 7	0.0072	0.09	|QV	|	|	|	|
256	1+ 8	0.0073	0.09	|QV	|	|	|	|
257	1+ 9	0.0075	0.09	|QV	|	|	|	|
258	1+10	0.0076	0.09	|QV	|	|	|	|
259	1+11	0.0077	0.09	|QV	|	|	|	|
260	1+12	0.0078	0.09	|Q V	|	|	|	|
261	1+13	0.0080	0.09	|Q V	|	|	|	|
262	1+14	0.0081	0.09	|Q V	|	|	|	|
263	1+15	0.0082	0.09	|Q V	|	|	|	|
264	1+16	0.0084	0.09	|Q V	|	|	|	|
265	1+17	0.0085	0.09	|Q V	|	|	|	|
266	1+18	0.0086	0.09	|Q V	|	|	|	|
267	1+19	0.0088	0.09	|Q V	|	|	|	|
268	1+20	0.0089	0.10	|Q V	|	|	|	|
269	1+21	0.0090	0.10	|Q V	|	|	|	|
270	1+22	0.0091	0.10	|Q V	|	|	|	|
271	1+23	0.0093	0.10	|Q V	|	|	|	|
272	1+24	0.0094	0.10	|Q V	|	|	|	|
273	1+25	0.0095	0.10	|Q V	|	|	|	|
274	1+26	0.0097	0.10	|Q V	|	|	|	|
275	1+27	0.0098	0.10	|Q V	|	|	|	|
276	1+28	0.0100	0.10	|Q V	|	|	|	|

277	1+29	0.0101	0.10	|Q V |	|	|	|
278	1+30	0.0102	0.10	|Q V |	|	|	|
279	1+31	0.0104	0.10	|Q V |	|	|	|
280	1+32	0.0105	0.10	|Q V |	|	|	|
281	1+33	0.0106	0.10	|Q V |	|	|	|
282	1+34	0.0108	0.10	|Q V |	|	|	|
283	1+35	0.0109	0.10	|Q V |	|	|	|
284	1+36	0.0111	0.10	|Q V |	|	|	|
285	1+37	0.0112	0.10	|Q V |	|	|	|
286	1+38	0.0113	0.10	|Q V |	|	|	|
287	1+39	0.0115	0.10	|Q V |	|	|	|
288	1+40	0.0116	0.10	|Q V |	|	|	|
289	1+41	0.0118	0.10	|Q V |	|	|	|
290	1+42	0.0119	0.10	|Q V |	|	|	|
291	1+43	0.0121	0.11	|Q V |	|	|	|
292	1+44	0.0122	0.11	|Q V |	|	|	|
293	1+45	0.0123	0.11	|Q V |	|	|	|
294	1+46	0.0125	0.11	|Q V |	|	|	|
295	1+47	0.0126	0.11	|Q V |	|	|	|
296	1+48	0.0128	0.11	|Q V |	|	|	|
297	1+49	0.0129	0.11	|Q V |	|	|	|
298	1+50	0.0131	0.11	|Q V |	|	|	|
299	1+51	0.0132	0.11	|Q V |	|	|	|
300	1+52	0.0134	0.11	|Q V |	|	|	|
301	1+53	0.0135	0.11	|Q V |	|	|	|
302	1+54	0.0137	0.11	|Q V |	|	|	|
303	1+55	0.0138	0.11	|Q V |	|	|	|
304	1+56	0.0140	0.11	|Q V |	|	|	|
305	1+57	0.0142	0.11	|Q V |	|	|	|
306	1+58	0.0143	0.11	|Q V |	|	|	|
307	1+59	0.0145	0.11	|Q V |	|	|	|
308	2+ 0	0.0146	0.11	|Q V |	|	|	|
309	2+ 1	0.0148	0.11	|Q V |	|	|	|
310	2+ 2	0.0149	0.12	|Q V |	|	|	|
311	2+ 3	0.0151	0.12	|Q V |	|	|	|
312	2+ 4	0.0153	0.12	|Q V |	|	|	|
313	2+ 5	0.0154	0.12	|Q V |	|	|	|
314	2+ 6	0.0156	0.12	|Q V |	|	|	|
315	2+ 7	0.0157	0.12	|Q V |	|	|	|
316	2+ 8	0.0159	0.12	|Q V |	|	|	|
317	2+ 9	0.0161	0.12	|Q V |	|	|	|
318	2+10	0.0162	0.12	|Q V |	|	|	|
319	2+11	0.0164	0.12	|Q V |	|	|	|
320	2+12	0.0166	0.12	|Q V |	|	|	|
321	2+13	0.0167	0.12	|Q V |	|	|	|
322	2+14	0.0169	0.12	|Q V |	|	|	|
323	2+15	0.0171	0.12	|Q V |	|	|	|
324	2+16	0.0173	0.12	|Q V |	|	|	|
325	2+17	0.0174	0.13	|Q V |	|	|	|
326	2+18	0.0176	0.13	|Q V |	|	|	|
327	2+19	0.0178	0.13	|Q V |	|	|	|
328	2+20	0.0180	0.13	|Q V |	|	|	|
329	2+21	0.0181	0.13	|Q V |	|	|	|
330	2+22	0.0183	0.13	| Q V |	|	|	|
331	2+23	0.0185	0.13	| Q V |	|	|	|
332	2+24	0.0187	0.13	| Q V |	|	|	|
333	2+25	0.0188	0.13	| Q V |	|	|	|
334	2+26	0.0190	0.13	| Q V |	|	|	|
335	2+27	0.0192	0.13	| Q V |	|	|	|
336	2+28	0.0194	0.14	| Q V |	|	|	|
337	2+29	0.0196	0.14	| Q V |	|	|	|
338	2+30	0.0198	0.14	| Q V |	|	|	|
339	2+31	0.0200	0.14	| Q V |	|	|	|
340	2+32	0.0202	0.14	| Q V |	|	|	|
341	2+33	0.0203	0.14	| Q V |	|	|	|
342	2+34	0.0205	0.14	| Q V |	|	|	|
343	2+35	0.0207	0.14	| Q V |	|	|	|
344	2+36	0.0209	0.14	| Q V |	|	|	|
345	2+37	0.0211	0.14	| Q V |	|	|	|

346	2+38	0.0213	0.14	Q	V			
347	2+39	0.0215	0.15	Q	V			
348	2+40	0.0217	0.15	Q	V			
349	2+41	0.0219	0.15	Q	V			
350	2+42	0.0221	0.15	Q	V			
351	2+43	0.0223	0.15	Q	V			
352	2+44	0.0226	0.15	Q	V			
353	2+45	0.0228	0.15	Q	V			
354	2+46	0.0230	0.15	Q	V			
355	2+47	0.0232	0.15	Q	V			
356	2+48	0.0234	0.15	Q	V			
357	2+49	0.0236	0.16	Q	V			
358	2+50	0.0238	0.16	Q	V			
359	2+51	0.0241	0.16	Q	V			
360	2+52	0.0243	0.16	Q	V			
361	2+53	0.0245	0.16	Q	V			
362	2+54	0.0247	0.17	Q	V			
363	2+55	0.0250	0.17	Q	V			
364	2+56	0.0252	0.17	Q	V			
365	2+57	0.0254	0.17	Q	V			
366	2+58	0.0257	0.17	Q	V			
367	2+59	0.0259	0.17	Q	V			
368	3+ 0	0.0262	0.17	Q	V			
369	3+ 1	0.0264	0.18	Q	V			
370	3+ 2	0.0266	0.18	Q	V			
371	3+ 3	0.0269	0.18	Q	V			
372	3+ 4	0.0271	0.18	Q	V			
373	3+ 5	0.0274	0.18	Q	V			
374	3+ 6	0.0276	0.19	Q	V			
375	3+ 7	0.0279	0.19	Q	V			
376	3+ 8	0.0282	0.19	Q	V			
377	3+ 9	0.0284	0.20	Q	V			
378	3+10	0.0287	0.20	Q	V			
379	3+11	0.0290	0.20	Q	V			
380	3+12	0.0293	0.20	Q	V			
381	3+13	0.0295	0.20	Q	V			
382	3+14	0.0298	0.20	Q	V			
383	3+15	0.0301	0.21	Q	V			
384	3+16	0.0304	0.21	Q	V			
385	3+17	0.0307	0.21	Q	V			
386	3+18	0.0310	0.22	Q	V			
387	3+19	0.0313	0.22	Q	V			
388	3+20	0.0316	0.22	Q	V			
389	3+21	0.0319	0.23	Q	V			
390	3+22	0.0322	0.23	Q	V			
391	3+23	0.0326	0.24	Q	V			
392	3+24	0.0329	0.24	Q	V			
393	3+25	0.0332	0.24	Q	V			
394	3+26	0.0336	0.25	Q	V			
395	3+27	0.0339	0.25	Q	V			
396	3+28	0.0343	0.25	Q	V			
397	3+29	0.0346	0.25	Q	V			
398	3+30	0.0350	0.26	Q	V			
399	3+31	0.0353	0.27	Q	V			
400	3+32	0.0357	0.27	Q	V			
401	3+33	0.0361	0.28	Q	V			
402	3+34	0.0365	0.29	Q	V			
403	3+35	0.0369	0.30	Q	V			
404	3+36	0.0373	0.31	Q	V			
405	3+37	0.0378	0.32	Q	V			
406	3+38	0.0382	0.32	Q	V			
407	3+39	0.0387	0.33	Q	V			
408	3+40	0.0391	0.33	Q	V			
409	3+41	0.0396	0.34	Q	V			
410	3+42	0.0401	0.35	Q	V			
411	3+43	0.0406	0.35	Q	V			
412	3+44	0.0410	0.36	Q	V			
413	3+45	0.0416	0.38	Q	V			
414	3+46	0.0421	0.41	Q	V			



484	4+56	0.0943	0.13	Q				V
485	4+57	0.0945	0.13	Q				V
486	4+58	0.0947	0.12	Q				V
487	4+59	0.0948	0.12	Q				V
488	5+ 0	0.0950	0.12	Q				V
489	5+ 1	0.0952	0.12	Q				V
490	5+ 2	0.0953	0.12	Q				V
491	5+ 3	0.0955	0.12	Q				V
492	5+ 4	0.0957	0.12	Q				V
493	5+ 5	0.0958	0.12	Q				V
494	5+ 6	0.0960	0.11	Q				V
495	5+ 7	0.0961	0.11	Q				V
496	5+ 8	0.0963	0.11	Q				V
497	5+ 9	0.0964	0.11	Q				V
498	5+10	0.0966	0.11	Q				V
499	5+11	0.0967	0.11	Q				V
500	5+12	0.0969	0.11	Q				V
501	5+13	0.0970	0.11	Q				V
502	5+14	0.0972	0.11	Q				V
503	5+15	0.0973	0.10	Q				V
504	5+16	0.0975	0.10	Q				V
505	5+17	0.0976	0.10	Q				V
506	5+18	0.0977	0.10	Q				V
507	5+19	0.0979	0.10	Q				V
508	5+20	0.0980	0.10	Q				V
509	5+21	0.0982	0.10	Q				V
510	5+22	0.0983	0.10	Q				V
511	5+23	0.0984	0.10	Q				V
512	5+24	0.0986	0.10	Q				V
513	5+25	0.0987	0.10	Q				V
514	5+26	0.0988	0.10	Q				V
515	5+27	0.0990	0.09	Q				V
516	5+28	0.0991	0.09	Q				V
517	5+29	0.0992	0.09	Q				V
518	5+30	0.0993	0.09	Q				V
519	5+31	0.0995	0.09	Q				V
520	5+32	0.0996	0.09	Q				V
521	5+33	0.0997	0.09	Q				V
522	5+34	0.0998	0.09	Q				V
523	5+35	0.1000	0.09	Q				V
524	5+36	0.1001	0.09	Q				V
525	5+37	0.1002	0.09	Q				V
526	5+38	0.1003	0.09	Q				V
527	5+39	0.1004	0.09	Q				V
528	5+40	0.1006	0.09	Q				V
529	5+41	0.1007	0.09	Q				V
530	5+42	0.1008	0.08	Q				V
531	5+43	0.1009	0.08	Q				V
532	5+44	0.1010	0.08	Q				V
533	5+45	0.1011	0.08	Q				V
534	5+46	0.1012	0.08	Q				V
535	5+47	0.1014	0.08	Q				V
536	5+48	0.1015	0.08	Q				V
537	5+49	0.1016	0.08	Q				V
538	5+50	0.1017	0.08	Q				V
539	5+51	0.1018	0.08	Q				V
540	5+52	0.1019	0.08	Q				V
541	5+53	0.1020	0.08	Q				V
542	5+54	0.1021	0.08	Q				V
543	5+55	0.1022	0.08	Q				V
544	5+56	0.1023	0.08	Q				V
545	5+57	0.1025	0.08	Q				V
546	5+58	0.1026	0.08	Q				V
547	5+59	0.1027	0.08	Q				V
548	6+ 0	0.1028	0.08	Q				V
549	6+ 1	0.1029	0.08	Q				V
550	6+ 2	0.1030	0.08	Q				V
551	6+ 3	0.1031	0.07	Q				V
552	6+ 4	0.1032	0.07	Q				V

```
553   ----------------------------------------------------------------------
554
555
556
557
558       End of computations, total study area =           0.777 (Ac.)
559
560
561
```

6j. CivilD Post Development Via Belmonte Calculations

```
1
2                San Diego County Rational Hydrology Program
3
4       CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0
5
6       Rational method hydrology  program based on
7       San Diego County Flood Control Division 2003 hydrology manual
8           Rational Hydrology Study        Date: 04/24/24
9       --------------------------------------------------------------------------
10      19025 Post Dev
11      100 yr study - Belmonte Addition
12      19025belmontepost
13
14      --------------------------------------------------------------------------
15       *********   Hydrology Study Control Information **********
16
17      --------------------------------------------------------------------------
18
19
20      Program License Serial Number 6332
21
22      --------------------------------------------------------------------------
23      Rational hydrology study storm event year is   100.0
24      English (in-lb) input data Units used
25
26      Map data precipitation entered:
27      6 hour,  precipitation(inches) =  3.500
28      24 hour precipitation(inches) =  6.000
29      P6/P24 =    58.3%
30      San Diego hydrology manual 'C' values used
31
32
33      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
34      Process from Point/Station     3001.000 to Point/Station     3002.000
35      **** INITIAL AREA EVALUATION ****
36
37      Decimal fraction soil group A = 1.000
38      Decimal fraction soil group B = 0.000
39      Decimal fraction soil group C = 0.000
40      Decimal fraction soil group D = 0.000
41      [MEDIUM DENSITY RESIDENTIAL                  ]
42      (4.3 DU/A or Less       )
43      Impervious value, Ai = 0.300
44      Sub-Area C Value = 0.410
45      Initial subarea total flow distance  =   99.210(Ft.)
46      Highest elevation =  337.300(Ft.)
47      Lowest elevation =  328.200(Ft.)
48      Elevation difference =    9.100(Ft.) Slope =  9.172 %
49      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
50      The maximum overland flow distance is 100.00 (Ft)
51      for the top area slope value of   9.17 %, in a development type of
52       4.3 DU/A or Less
53      In Accordance With Figure 3-3
54      Initial Area Time of Concentration =   5.93 minutes
55      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
56      TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(   9.172^(1/3)]=   5.93
57      Rainfall intensity (I) =      8.258(In/Hr) for a   100.0 year storm
58      Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
59      Subarea runoff =      0.599(CFS)
60      Total initial stream area =        0.177(Ac.)
61
62
63      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
64      Process from Point/Station     3002.000 to Point/Station     3003.000
65      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
66
67      Estimated mean flow rate at midpoint of channel =      1.615(CFS)
68      Depth of flow =   0.142(Ft.), Average velocity =   2.802(Ft/s)
69          ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.50
    2             26.00              0.00
    3             27.00              0.20
Manning's 'N' friction factor =   0.023
------------------------------------------------------------------
Sub-Channel flow  =      1.615(CFS)
  '     '    flow top width =      8.106(Ft.)
  '     '    velocity=    2.802(Ft/s)
  '     '    area =      0.576(Sq.Ft)
  '     '    Froude number =     1.852

Upstream point elevation =   328.200(Ft.)
Downstream point elevation =   312.800(Ft.)
Flow length =   240.520(Ft.)
Travel time  =    1.43 min.
Time of concentration =    7.36 min.
Depth of flow =   0.142(Ft.)
Average velocity =   2.802(Ft/s)
Total irregular channel flow =     1.615(CFS)
Irregular channel normal depth above invert elev. =   0.142(Ft.)
Average velocity of channel(s) =   2.802(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      7.184(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.050
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.476
Rainfall intensity =      7.184(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.461  CA =      0.358
Subarea runoff =      1.976(CFS) for      0.600(Ac.)
Total runoff =      2.575(CFS)  Total area =       0.777(Ac.)
Depth of flow =   0.169(Ft.), Average velocity =   3.149(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3003.000 to Point/Station     3003.000
**** 6 HOUR HYDROGRAPH ****

________________________________________________________________________
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003


Time of Concentration =   7.36
Basin Area =     0.78 Acres
6 Hour Rainfall =  3.500 Inches
Runoff Coefficient =  0.461
Peak Discharge =     2.58 CFS
     Time (Min)     Discharge (CFS)
       0               0.000
       7               0.075
       14              0.076
       21              0.078
       28              0.079
       35              0.082
       42              0.083
       49              0.085
       56              0.087
       63              0.090
       70              0.091
       77              0.094
       84              0.096
```

91	0.100	
98	0.102	
105	0.106	
112	0.109	
119	0.114	
126	0.117	
133	0.123	
140	0.127	
147	0.135	
154	0.139	
161	0.149	
168	0.155	
175	0.168	
182	0.176	
189	0.196	
196	0.207	
203	0.238	
210	0.258	
217	0.315	
224	0.359	
231	0.527	
238	0.742	
245	2.575	
252	0.423	
259	0.283	
266	0.221	
273	0.185	
280	0.161	
287	0.144	
294	0.131	
301	0.120	
308	0.111	
315	0.104	
322	0.098	
329	0.093	
336	0.088	
343	0.084	
350	0.081	
357	0.077	
364	0.074	

++

6 - 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

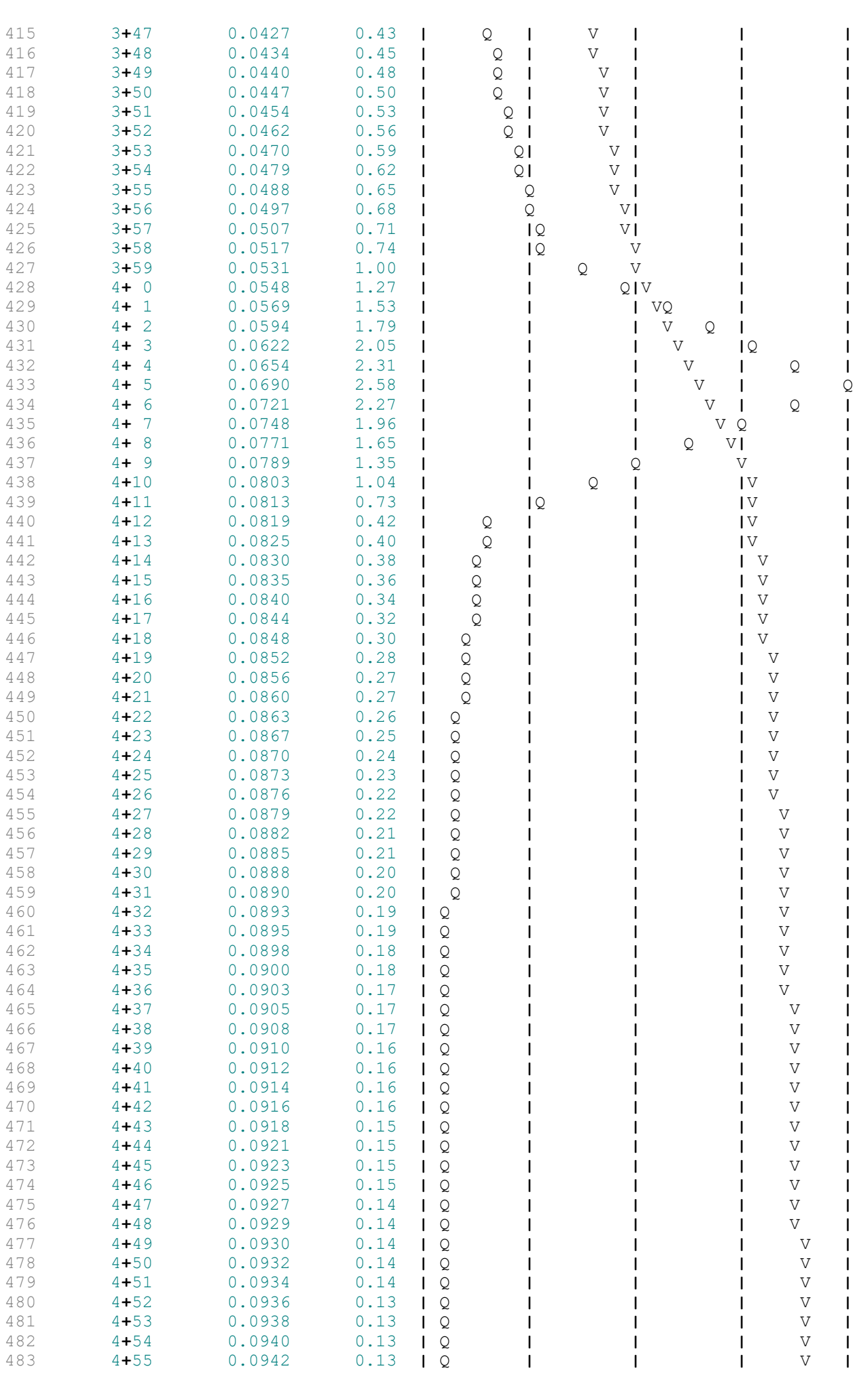
Hydrograph in 1 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	0.6	1.3	1.9	2.6
0+ 0	0.0000	0.00	Q	|	|	|	|
0+ 1	0.0000	0.01	Q	|	|	|	|
0+ 2	0.0000	0.02	Q	|	|	|	|
0+ 3	0.0001	0.03	Q	|	|	|	|
0+ 4	0.0001	0.04	Q	|	|	|	|
0+ 5	0.0002	0.05	Q	|	|	|	|
0+ 6	0.0003	0.06	VQ	|	|	|	|
0+ 7	0.0004	0.08	VQ	|	|	|	|
0+ 8	0.0005	0.08	VQ	|	|	|	|
0+ 9	0.0006	0.08	VQ	|	|	|	|
0+10	0.0007	0.08	VQ	|	|	|	|
0+11	0.0008	0.08	VQ	|	|	|	|
0+12	0.0009	0.08	VQ	|	|	|	|
0+13	0.0010	0.08	VQ	|	|	|	|
0+14	0.0011	0.08	VQ	|	|	|	|
0+15	0.0013	0.08	VQ	|	|	|	|
0+16	0.0014	0.08	VQ	|	|	|	|
0+17	0.0015	0.08	VQ	|	|	|	|
0+18	0.0016	0.08	VQ	|	|	|	|
0+19	0.0017	0.08	VQ	|	|	|	|

208	0+20	0.0018	0.08	VQ	|	|	|	|
209	0+21	0.0019	0.08	VQ	|	|	|	|
210	0+22	0.0020	0.08	VQ	|	|	|	|
211	0+23	0.0021	0.08	VQ	|	|	|	|
212	0+24	0.0022	0.08	VQ	|	|	|	|
213	0+25	0.0023	0.08	VQ	|	|	|	|
214	0+26	0.0024	0.08	VQ	|	|	|	|
215	0+27	0.0025	0.08	VQ	|	|	|	|
216	0+28	0.0027	0.08	|Q	|	|	|	|
217	0+29	0.0028	0.08	|Q	|	|	|	|
218	0+30	0.0029	0.08	|Q	|	|	|	|
219	0+31	0.0030	0.08	|Q	|	|	|	|
220	0+32	0.0031	0.08	|Q	|	|	|	|
221	0+33	0.0032	0.08	|Q	|	|	|	|
222	0+34	0.0033	0.08	|Q	|	|	|	|
223	0+35	0.0034	0.08	|Q	|	|	|	|
224	0+36	0.0035	0.08	|Q	|	|	|	|
225	0+37	0.0037	0.08	|Q	|	|	|	|
226	0+38	0.0038	0.08	|Q	|	|	|	|
227	0+39	0.0039	0.08	|Q	|	|	|	|
228	0+40	0.0040	0.08	|Q	|	|	|	|
229	0+41	0.0041	0.08	|Q	|	|	|	|
230	0+42	0.0042	0.08	|Q	|	|	|	|
231	0+43	0.0043	0.08	|Q	|	|	|	|
232	0+44	0.0045	0.08	|Q	|	|	|	|
233	0+45	0.0046	0.08	|Q	|	|	|	|
234	0+46	0.0047	0.08	|Q	|	|	|	|
235	0+47	0.0048	0.08	|Q	|	|	|	|
236	0+48	0.0049	0.09	|Q	|	|	|	|
237	0+49	0.0050	0.09	|Q	|	|	|	|
238	0+50	0.0052	0.09	|Q	|	|	|	|
239	0+51	0.0053	0.09	|QV	|	|	|	|
240	0+52	0.0054	0.09	|QV	|	|	|	|
241	0+53	0.0055	0.09	|QV	|	|	|	|
242	0+54	0.0056	0.09	|QV	|	|	|	|
243	0+55	0.0058	0.09	|QV	|	|	|	|
244	0+56	0.0059	0.09	|QV	|	|	|	|
245	0+57	0.0060	0.09	|QV	|	|	|	|
246	0+58	0.0061	0.09	|QV	|	|	|	|
247	0+59	0.0062	0.09	|QV	|	|	|	|
248	1+ 0	0.0064	0.09	|QV	|	|	|	|
249	1+ 1	0.0065	0.09	|QV	|	|	|	|
250	1+ 2	0.0066	0.09	|QV	|	|	|	|
251	1+ 3	0.0067	0.09	|QV	|	|	|	|
252	1+ 4	0.0068	0.09	|QV	|	|	|	|
253	1+ 5	0.0070	0.09	|QV	|	|	|	|
254	1+ 6	0.0071	0.09	|QV	|	|	|	|
255	1+ 7	0.0072	0.09	|QV	|	|	|	|
256	1+ 8	0.0073	0.09	|QV	|	|	|	|
257	1+ 9	0.0075	0.09	|QV	|	|	|	|
258	1+10	0.0076	0.09	|QV	|	|	|	|
259	1+11	0.0077	0.09	|QV	|	|	|	|
260	1+12	0.0078	0.09	|Q V	|	|	|	|
261	1+13	0.0080	0.09	|Q V	|	|	|	|
262	1+14	0.0081	0.09	|Q V	|	|	|	|
263	1+15	0.0082	0.09	|Q V	|	|	|	|
264	1+16	0.0084	0.09	|Q V	|	|	|	|
265	1+17	0.0085	0.09	|Q V	|	|	|	|
266	1+18	0.0086	0.09	|Q V	|	|	|	|
267	1+19	0.0088	0.09	|Q V	|	|	|	|
268	1+20	0.0089	0.10	|Q V	|	|	|	|
269	1+21	0.0090	0.10	|Q V	|	|	|	|
270	1+22	0.0091	0.10	|Q V	|	|	|	|
271	1+23	0.0093	0.10	|Q V	|	|	|	|
272	1+24	0.0094	0.10	|Q V	|	|	|	|
273	1+25	0.0095	0.10	|Q V	|	|	|	|
274	1+26	0.0097	0.10	|Q V	|	|	|	|
275	1+27	0.0098	0.10	|Q V	|	|	|	|
276	1+28	0.0100	0.10	|Q V	|	|	|	|

277	1+29	0.0101	0.10	|Q V |	|	|	|
278	1+30	0.0102	0.10	|Q V |	|	|	|
279	1+31	0.0104	0.10	|Q V |	|	|	|
280	1+32	0.0105	0.10	|Q V |	|	|	|
281	1+33	0.0106	0.10	|Q V |	|	|	|
282	1+34	0.0108	0.10	|Q V |	|	|	|
283	1+35	0.0109	0.10	|Q V |	|	|	|
284	1+36	0.0111	0.10	|Q V |	|	|	|
285	1+37	0.0112	0.10	|Q V |	|	|	|
286	1+38	0.0113	0.10	|Q V |	|	|	|
287	1+39	0.0115	0.10	|Q V |	|	|	|
288	1+40	0.0116	0.10	|Q V |	|	|	|
289	1+41	0.0118	0.10	|Q V |	|	|	|
290	1+42	0.0119	0.10	|Q V |	|	|	|
291	1+43	0.0121	0.11	|Q V |	|	|	|
292	1+44	0.0122	0.11	|Q V |	|	|	|
293	1+45	0.0123	0.11	|Q V |	|	|	|
294	1+46	0.0125	0.11	|Q V |	|	|	|
295	1+47	0.0126	0.11	|Q V |	|	|	|
296	1+48	0.0128	0.11	|Q V |	|	|	|
297	1+49	0.0129	0.11	|Q V |	|	|	|
298	1+50	0.0131	0.11	|Q V |	|	|	|
299	1+51	0.0132	0.11	|Q V |	|	|	|
300	1+52	0.0134	0.11	|Q V |	|	|	|
301	1+53	0.0135	0.11	|Q V |	|	|	|
302	1+54	0.0137	0.11	|Q V |	|	|	|
303	1+55	0.0138	0.11	|Q V |	|	|	|
304	1+56	0.0140	0.11	|Q V |	|	|	|
305	1+57	0.0142	0.11	|Q V |	|	|	|
306	1+58	0.0143	0.11	|Q V |	|	|	|
307	1+59	0.0145	0.11	|Q V |	|	|	|
308	2+ 0	0.0146	0.11	|Q V |	|	|	|
309	2+ 1	0.0148	0.11	|Q V |	|	|	|
310	2+ 2	0.0149	0.12	|Q V |	|	|	|
311	2+ 3	0.0151	0.12	|Q V |	|	|	|
312	2+ 4	0.0153	0.12	|Q V |	|	|	|
313	2+ 5	0.0154	0.12	|Q V |	|	|	|
314	2+ 6	0.0156	0.12	|Q V |	|	|	|
315	2+ 7	0.0157	0.12	|Q V |	|	|	|
316	2+ 8	0.0159	0.12	|Q V |	|	|	|
317	2+ 9	0.0161	0.12	|Q V |	|	|	|
318	2+10	0.0162	0.12	|Q V |	|	|	|
319	2+11	0.0164	0.12	|Q V |	|	|	|
320	2+12	0.0166	0.12	|Q V |	|	|	|
321	2+13	0.0167	0.12	|Q V |	|	|	|
322	2+14	0.0169	0.12	|Q V |	|	|	|
323	2+15	0.0171	0.12	|Q V |	|	|	|
324	2+16	0.0173	0.12	|Q V |	|	|	|
325	2+17	0.0174	0.13	|Q V |	|	|	|
326	2+18	0.0176	0.13	|Q V |	|	|	|
327	2+19	0.0178	0.13	|Q V |	|	|	|
328	2+20	0.0180	0.13	|Q V |	|	|	|
329	2+21	0.0181	0.13	|Q V |	|	|	|
330	2+22	0.0183	0.13	| Q V |	|	|	|
331	2+23	0.0185	0.13	| Q V |	|	|	|
332	2+24	0.0187	0.13	| Q V |	|	|	|
333	2+25	0.0188	0.13	| Q V |	|	|	|
334	2+26	0.0190	0.13	| Q V |	|	|	|
335	2+27	0.0192	0.13	| Q V |	|	|	|
336	2+28	0.0194	0.14	| Q V |	|	|	|
337	2+29	0.0196	0.14	| Q V |	|	|	|
338	2+30	0.0198	0.14	| Q V |	|	|	|
339	2+31	0.0200	0.14	| Q V |	|	|	|
340	2+32	0.0202	0.14	| Q V |	|	|	|
341	2+33	0.0203	0.14	| Q V |	|	|	|
342	2+34	0.0205	0.14	| Q V |	|	|	|
343	2+35	0.0207	0.14	| Q V |	|	|	|
344	2+36	0.0209	0.14	| Q V |	|	|	|
345	2+37	0.0211	0.14	| Q V |	|	|	|

346	2+38	0.0213	0.14	Q	V			
347	2+39	0.0215	0.15	Q	V			
348	2+40	0.0217	0.15	Q	V			
349	2+41	0.0219	0.15	Q	V			
350	2+42	0.0221	0.15	Q	V			
351	2+43	0.0223	0.15	Q	V			
352	2+44	0.0226	0.15	Q	V			
353	2+45	0.0228	0.15	Q	V			
354	2+46	0.0230	0.15	Q	V			
355	2+47	0.0232	0.15	Q	V			
356	2+48	0.0234	0.15	Q	V			
357	2+49	0.0236	0.16	Q	V			
358	2+50	0.0238	0.16	Q	V			
359	2+51	0.0241	0.16	Q	V			
360	2+52	0.0243	0.16	Q	V			
361	2+53	0.0245	0.16	Q	V			
362	2+54	0.0247	0.17	Q	V			
363	2+55	0.0250	0.17	Q	V			
364	2+56	0.0252	0.17	Q	V			
365	2+57	0.0254	0.17	Q	V			
366	2+58	0.0257	0.17	Q	V			
367	2+59	0.0259	0.17	Q	V			
368	3+ 0	0.0262	0.17	Q	V			
369	3+ 1	0.0264	0.18	Q	V			
370	3+ 2	0.0266	0.18	Q	V			
371	3+ 3	0.0269	0.18	Q	V			
372	3+ 4	0.0271	0.18	Q	V			
373	3+ 5	0.0274	0.18	Q	V			
374	3+ 6	0.0276	0.19	Q	V			
375	3+ 7	0.0279	0.19	Q	V			
376	3+ 8	0.0282	0.19	Q	V			
377	3+ 9	0.0284	0.20	Q	V			
378	3+10	0.0287	0.20	Q	V			
379	3+11	0.0290	0.20	Q	V			
380	3+12	0.0293	0.20	Q	V			
381	3+13	0.0295	0.20	Q	V			
382	3+14	0.0298	0.20	Q	V			
383	3+15	0.0301	0.21	Q	V			
384	3+16	0.0304	0.21	Q	V			
385	3+17	0.0307	0.21	Q	V			
386	3+18	0.0310	0.22	Q	V			
387	3+19	0.0313	0.22	Q	V			
388	3+20	0.0316	0.22	Q	V			
389	3+21	0.0319	0.23	Q	V			
390	3+22	0.0322	0.23	Q	V			
391	3+23	0.0326	0.24	Q	V			
392	3+24	0.0329	0.24	Q	V			
393	3+25	0.0332	0.24	Q	V			
394	3+26	0.0336	0.25	Q	V			
395	3+27	0.0339	0.25	Q	V			
396	3+28	0.0343	0.25	Q	V			
397	3+29	0.0346	0.25	Q	V			
398	3+30	0.0350	0.26	Q	V			
399	3+31	0.0353	0.27	Q	V			
400	3+32	0.0357	0.27	Q	V			
401	3+33	0.0361	0.28	Q	V			
402	3+34	0.0365	0.29	Q	V			
403	3+35	0.0369	0.30	Q	V			
404	3+36	0.0373	0.31	Q	V			
405	3+37	0.0378	0.32	Q	V			
406	3+38	0.0382	0.32	Q	V			
407	3+39	0.0387	0.33	Q	V			
408	3+40	0.0391	0.33	Q	V			
409	3+41	0.0396	0.34	Q	V			
410	3+42	0.0401	0.35	Q	V			
411	3+43	0.0406	0.35	Q	V			
412	3+44	0.0410	0.36	Q	V			
413	3+45	0.0416	0.38	Q	V			
414	3+46	0.0421	0.41	Q	V			



484	4+56	0.0943	0.13	Q				V
485	4+57	0.0945	0.13	Q				V
486	4+58	0.0947	0.12	Q				V
487	4+59	0.0948	0.12	Q				V
488	5+ 0	0.0950	0.12	Q				V
489	5+ 1	0.0952	0.12	Q				V
490	5+ 2	0.0953	0.12	Q				V
491	5+ 3	0.0955	0.12	Q				V
492	5+ 4	0.0957	0.12	Q				V
493	5+ 5	0.0958	0.12	Q				V
494	5+ 6	0.0960	0.11	Q				V
495	5+ 7	0.0961	0.11	Q				V
496	5+ 8	0.0963	0.11	Q				V
497	5+ 9	0.0964	0.11	Q				V
498	5+10	0.0966	0.11	Q				V
499	5+11	0.0967	0.11	Q				V
500	5+12	0.0969	0.11	Q				V
501	5+13	0.0970	0.11	Q				V
502	5+14	0.0972	0.11	Q				V
503	5+15	0.0973	0.10	Q				V
504	5+16	0.0975	0.10	Q				V
505	5+17	0.0976	0.10	Q				V
506	5+18	0.0977	0.10	Q				V
507	5+19	0.0979	0.10	Q				V
508	5+20	0.0980	0.10	Q				V
509	5+21	0.0982	0.10	Q				V
510	5+22	0.0983	0.10	Q				V
511	5+23	0.0984	0.10	Q				V
512	5+24	0.0986	0.10	Q				V
513	5+25	0.0987	0.10	Q				V
514	5+26	0.0988	0.10	Q				V
515	5+27	0.0990	0.09	Q				V
516	5+28	0.0991	0.09	Q				V
517	5+29	0.0992	0.09	Q				V
518	5+30	0.0993	0.09	Q				V
519	5+31	0.0995	0.09	Q				V
520	5+32	0.0996	0.09	Q				V
521	5+33	0.0997	0.09	Q				V
522	5+34	0.0998	0.09	Q				V
523	5+35	0.1000	0.09	Q				V
524	5+36	0.1001	0.09	Q				V
525	5+37	0.1002	0.09	Q				V
526	5+38	0.1003	0.09	Q				V
527	5+39	0.1004	0.09	Q				V
528	5+40	0.1006	0.09	Q				V
529	5+41	0.1007	0.09	Q				V
530	5+42	0.1008	0.08	Q				V
531	5+43	0.1009	0.08	Q				V
532	5+44	0.1010	0.08	Q				V
533	5+45	0.1011	0.08	Q				V
534	5+46	0.1012	0.08	Q				V
535	5+47	0.1014	0.08	Q				V
536	5+48	0.1015	0.08	Q				V
537	5+49	0.1016	0.08	Q				V
538	5+50	0.1017	0.08	Q				V
539	5+51	0.1018	0.08	Q				V
540	5+52	0.1019	0.08	Q				V
541	5+53	0.1020	0.08	Q				V
542	5+54	0.1021	0.08	Q				V
543	5+55	0.1022	0.08	Q				V
544	5+56	0.1023	0.08	Q				V
545	5+57	0.1025	0.08	Q				V
546	5+58	0.1026	0.08	Q				V
547	5+59	0.1027	0.08	Q				V
548	6+ 0	0.1028	0.08	Q				V
549	6+ 1	0.1029	0.08	Q				V
550	6+ 2	0.1030	0.08	Q				V
551	6+ 3	0.1031	0.07	Q				V
552	6+ 4	0.1032	0.07	Q				V

```
553   ----------------------------------------------------------------------
554
555
556
557
558       End of computations, total study area =           0.777 (Ac.)
559
560
561
```

6k. CivilD Post Development Onsite Reach 1 Calculations

```
1
2                San Diego County Rational Hydrology Program
3
4       CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0
5
6       Rational method hydrology  program based on
7       San Diego County Flood Control Division 2003 hydrology manual
8           Rational Hydrology Study        Date: 04/26/24
9       ------------------------------------------------------------------------
10      19025 Post Dev
11      100 Year Study Reach 1
12      PostDev100R1.rd3
13      offiste ud to onsite w/main confulence
14      ------------------------------------------------------------------------
15       *********   Hydrology Study Control Information **********
16
17      ------------------------------------------------------------------------
18
19
20      Program License Serial Number 6332
21
22      ------------------------------------------------------------------------
23      Rational hydrology study storm event year is   100.0
24      English (in-lb) input data Units used
25
26      Map data precipitation entered:
27      6 hour,  precipitation(inches) =  3.500
28      24 hour precipitation(inches) =  6.000
29      P6/P24 =    58.3%
30      San Diego hydrology manual 'C' values used
31
32
33      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
34      Process from Point/Station      100.000 to Point/Station      101.000
35      **** INITIAL AREA EVALUATION ****
36
37      Decimal fraction soil group A = 1.000
38      Decimal fraction soil group B = 0.000
39      Decimal fraction soil group C = 0.000
40      Decimal fraction soil group D = 0.000
41      [MEDIUM DENSITY RESIDENTIAL                  ]
42      (7.3 DU/A or Less       )
43      Impervious value, Ai = 0.400
44      Sub-Area C Value = 0.480
45      Initial subarea total flow distance  =   53.000(Ft.)
46      Highest elevation =  316.800(Ft.)
47      Lowest elevation =  316.700(Ft.)
48      Elevation difference =    0.100(Ft.) Slope =  0.189 %
49      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
50      The maximum overland flow distance is 50.00 (Ft)
51      for the top area slope value of   0.19 %, in a development type of
52       7.3 DU/A or Less
53      In Accordance With Figure 3-3
54      Initial Area Time of Concentration =  13.75 minutes
55      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
56      TC = [1.8*(1.1-0.4800)*(  50.000^.5)/(   0.189^(1/3)]=  13.75
57      The initial area total distance of   53.00 (Ft.) entered leaves a
58      remaining distance of    3.00 (Ft.)
59      Using Figure 3-4, the travel time for this distance is   0.20 minutes
60      for a distance of   3.00 (Ft.) and a slope of  0.19 %
61      with an elevation difference of   0.01(Ft.) from the end of the top area
62      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
63       =    0.203 Minutes
64      Tt=[(11.9*0.0006^3)/(  0.01)]^.385=  0.20
65      Total initial area Ti =  13.75 minutes from Figure 3-3 formula plus
66        0.20 minutes from the Figure 3-4 formula =  13.95 minutes
67      Rainfall intensity (I) =      4.757(In/Hr) for a   100.0 year storm
68      Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
69      Subarea runoff =      0.068(CFS)
```

```
 Total initial stream area =        0.030(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.228(CFS)
Depth of flow =   0.095(Ft.), Average velocity =   0.591(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.33
    2             23.00              0.00
    3             28.50              0.33
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      0.228(CFS)
  '     '    flow top width =      8.130(Ft.)
  '     '    velocity=    0.591(Ft/s)
  '     '    area =      0.386(Sq.Ft)
  '     '    Froude number =     0.478

Upstream point elevation =   316.700(Ft.)
Downstream point elevation =   316.300(Ft.)
Flow length =   193.000(Ft.)
Travel time  =    5.44 min.
Time of concentration =   19.39 min.
Depth of flow =   0.095(Ft.)
Average velocity =   0.591(Ft/s)
Total irregular channel flow =     0.228(CFS)
Irregular channel normal depth above invert elev. =   0.095(Ft.)
Average velocity of channel(s) =   0.591(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      3.847(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Rainfall intensity =      3.847(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.480  CA =      0.082
Subarea runoff =      0.245(CFS) for      0.140(Ac.)
Total runoff =      0.314(CFS)  Total area =      0.170(Ac.)
Depth of flow =   0.107(Ft.), Average velocity =   0.640(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****

______________________________________________________________________________
Rainfall intensity (I) =      3.847(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Time of concentration =    19.39 min.
Rainfall intensity =      3.847(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.393  CA =      0.114
```

```
Subarea runoff =      0.125(CFS) for      0.120(Ac.)
Total runoff =      0.439(CFS)  Total area =       0.290(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   310.200(Ft.)
Downstream point/station elevation =   309.000(Ft.)
Pipe length  =   250.00(Ft.) Slope =   0.0048  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.439(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     0.439(CFS)
Normal flow depth in pipe =    3.42(In.)
Flow top width inside pipe =   10.84(In.)
Critical Depth =    3.28(In.)
Pipe flow velocity =      2.37(Ft/s)
Travel time through pipe =    1.76 min.
Time of concentration (TC) =    21.15 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.290(Ac.)
Runoff from this stream =      0.439(CFS)
Time of concentration =   21.15 min.
Rainfall intensity =     3.637(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1100.000 to Point/Station     1101.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Initial subarea total flow distance  =   59.000(Ft.)
Highest elevation =  336.700(Ft.)
Lowest elevation =  321.600(Ft.)
Elevation difference =   15.100(Ft.) Slope = 25.593 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  25.59 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.07 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2700)*( 100.000^.5)/(  25.593^(1/3)]=   5.07
Rainfall intensity (I) =      9.140(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
Subarea runoff =      0.173(CFS)
Total initial stream area =       0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1101.000 to Point/Station      103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.544(CFS)
Depth of flow =   0.128(Ft.), Average velocity =   3.658(Ft/s)
```

```
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.60
    2             16.00              0.00
    3             46.00              1.20
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      1.544(CFS)
  '     '    flow top width =      6.605(Ft.)
  '     '    velocity=    3.658(Ft/s)
  '     '    area =      0.422(Sq.Ft)
  '     '    Froude number =     2.549

Upstream point elevation =   321.600(Ft.)
Downstream point elevation =   309.000(Ft.)
Flow length =   236.000(Ft.)
Travel time  =    1.08 min.
Time of concentration =    6.15 min.
Depth of flow =   0.128(Ft.)
Average velocity =   3.658(Ft/s)
Total irregular channel flow =     1.544(CFS)
Irregular channel normal depth above invert elev. =   0.128(Ft.)
Average velocity of channel(s) =   3.658(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      8.073(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.534
Rainfall intensity =      8.073(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.509  CA =      0.371
Subarea runoff =      2.825(CFS) for      0.660(Ac.)
Total runoff =      2.998(CFS)  Total area =       0.730(Ac.)
Depth of flow =   0.164(Ft.), Average velocity =   4.317(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****

____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.730(Ac.)
Runoff from this stream =      2.998(CFS)
Time of concentration =    6.15 min.
Rainfall intensity =     8.073(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3003.000 to Point/Station      103.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

____________________________________________________________________________
Decimal fraction soil group A = 0.270
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.730
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.461
Rainfall intensity (I) =      7.186(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   7.36 min.  Rain intensity =       7.19(In/Hr)
```

```
Total area =        0.777(Ac.)  Total runoff =     2.575(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.777(Ac.)
Runoff from this stream =      2.575(CFS)
Time of concentration =    7.36 min.
Rainfall intensity =     7.186(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        0.439     21.15             3.637
2        2.998      6.15             8.073
3        2.575      7.36             7.186
Qmax(1) =
       1.000 *    1.000 *     0.439) +
       0.451 *    1.000 *     2.998) +
       0.506 *    1.000 *     2.575) + =       3.093
Qmax(2) =
       1.000 *    0.291 *     0.439) +
       1.000 *    1.000 *     2.998) +
       1.000 *    0.835 *     2.575) + =       5.275
Qmax(3) =
       1.000 *    0.348 *     0.439) +
       0.890 *    1.000 *     2.998) +
       1.000 *    1.000 *     2.575) + =       5.396

Total of 3 streams to confluence:
Flow rates before confluence point:
       0.439       2.998       2.575
Maximum flow rates at confluence using above data:
        3.093       5.275       5.396
Area of streams before confluence:
        0.290       0.730       0.777
Results of confluence:
Total flow rate =      5.396(CFS)
Time of concentration =     7.360 min.
Effective stream area after confluence =      1.797(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   304.200(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =   189.00(Ft.) Slope =   0.0048  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.396(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     5.396(CFS)
Normal flow depth in pipe =   11.58(In.)
Flow top width inside pipe =   17.25(In.)
Critical Depth =   10.74(In.)
Pipe flow velocity =      4.50(Ft/s)
Travel time through pipe =    0.70 min.
Time of concentration (TC) =     8.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
```

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.797(Ac.)
Runoff from this stream =      5.396(CFS)
Time of concentration =    8.06 min.
Rainfall intensity =     6.777(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------
Decimal fraction soil group A = 0.050
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                         ]
(Office Professional    )
Impervious value, Ai = 0.900
Sub-Area C Value = 0.839
Initial subarea total flow distance  =   50.000(Ft.)
Highest elevation =  316.800(Ft.)
Lowest elevation =  316.200(Ft.)
Elevation difference =    0.600(Ft.) Slope =  1.200 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.20 %, in a development type of
 Office Professional
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.42 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8395)*(  60.000^.5)/(   1.200^(1/3)]=   3.42
Calculated TC of    3.418 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.839
Subarea runoff =      0.310(CFS)
Total initial stream area =        0.040(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      2.245(CFS)
Depth of flow =   0.209(Ft.), Average velocity =   2.102(Ft/s)
    ******* Irregular Channel Data ***********
-------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.30
    2              1.50              0.00
    3             45.50              1.00
    4             61.50              1.50
Manning's 'N' friction factor =   0.015
-------------------------------------------------------------
Sub-Channel flow  =      2.245(CFS)
  '     '    flow top width =     10.230(Ft.)
  '     '    velocity=    2.102(Ft/s)
  '     '    area =      1.068(Sq.Ft)
  '     '    Froude number =     1.147

Upstream point elevation =   316.200(Ft.)
Downstream point elevation =   314.500(Ft.)
Flow length =   185.000(Ft.)
Travel time  =    1.47 min.
Time of concentration =    4.88 min.
Depth of flow =   0.209(Ft.)
Average velocity =   2.102(Ft/s)
Total irregular channel flow =     2.245(CFS)
```

```
Irregular channel normal depth above invert elev. =   0.209(Ft.)
Average velocity of channel(s) =   2.102(Ft/s)
 Adding area flow to channel
Calculated TC of    4.885 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                         ]
(Office Professional    )
Impervious value, Ai = 0.900
Sub-Area C Value = 0.840
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.840  CA =      0.454
Subarea runoff =      3.873(CFS) for      0.500(Ac.)
Total runoff =      4.183(CFS)  Total area =       0.540(Ac.)
Depth of flow =   0.264(Ft.), Average velocity =   2.456(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   308.500(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =    48.00(Ft.) Slope =   0.1083  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.183(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     4.183(CFS)
Normal flow depth in pipe =    4.95(In.)
Flow top width inside pipe =   11.82(In.)
Critical Depth =   10.36(In.)
Pipe flow velocity =     13.68(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     4.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.540(Ac.)
Runoff from this stream =      4.183(CFS)
Time of concentration =    4.94 min.
Rainfall intensity =     9.222(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                         ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Initial subarea total flow distance  =   42.000(Ft.)
Highest elevation =  316.000(Ft.)
Lowest elevation =  314.700(Ft.)
Elevation difference =    1.300(Ft.) Slope =  3.095 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 85.00 (Ft)
```

```
for the top area slope value of   3.10 %, in a development type of
 Neighborhod Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.64 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7800)*(  85.000^.5)/(   3.095^(1/3)]=   3.64
Calculated TC of    3.644 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
Subarea runoff =      0.288(CFS)
Total initial stream area =        0.040(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

____________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.259(CFS)
Depth of flow =   0.087(Ft.), Average velocity =   2.583(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.50
    2              0.00              0.00
    3             64.00              0.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      1.259(CFS)
  '     '    flow top width =     11.169(Ft.)
  '     '    velocity=    2.583(Ft/s)
  '     '    area =      0.487(Sq.Ft)
  '     '    Froude number =     2.180

Upstream point elevation =   314.700(Ft.)
Downstream point elevation =   313.000(Ft.)
Flow length =    38.000(Ft.)
Travel time  =    0.25 min.
Time of concentration =    3.89 min.
Depth of flow =   0.087(Ft.)
Average velocity =   2.583(Ft/s)
Total irregular channel flow =     1.259(CFS)
Irregular channel normal depth above invert elev. =   0.087(Ft.)
Average velocity of channel(s) =   2.583(Ft/s)
 Adding area flow to channel
Calculated TC of    3.889 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                        ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.780  CA =      0.242
Subarea runoff =      1.942(CFS) for      0.270(Ac.)
Total runoff =      2.230(CFS)  Total area =       0.310(Ac.)
Depth of flow =   0.108(Ft.), Average velocity =   2.980(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

____________________________________________________________________
```

```
Upstream point/station elevation =   306.000(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =    30.00(Ft.) Slope =   0.0900  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.230(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     2.230(CFS)
Normal flow depth in pipe =    3.72(In.)
Flow top width inside pipe =   11.10(In.)
Critical Depth =    7.66(In.)
Pipe flow velocity =     10.75(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     3.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.310(Ac.)
Runoff from this stream =      2.230(CFS)
Time of concentration =    3.94 min.
Rainfall intensity =     9.222(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1         5.396      8.06             6.777
2         4.183      4.94             9.222
3         2.230      3.94             9.222
Qmax(1) =
       1.000 *    1.000 *     5.396) +
       0.735 *    1.000 *     4.183) +
       0.735 *    1.000 *     2.230) + =      10.109
Qmax(2) =
       1.000 *    0.613 *     5.396) +
       1.000 *    1.000 *     4.183) +
       1.000 *    1.000 *     2.230) + =       9.722
Qmax(3) =
       1.000 *    0.488 *     5.396) +
       1.000 *    0.796 *     4.183) +
       1.000 *    1.000 *     2.230) + =       8.195

Total of 3 streams to confluence:
Flow rates before confluence point:
       5.396       4.183       2.230
Maximum flow rates at confluence using above data:
       10.109        9.722        8.195
Area of streams before confluence:
        1.797        0.540        0.310
Results of confluence:
Total flow rate =     10.109(CFS)
Time of concentration =     8.061 min.
Effective stream area after confluence =      2.647(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   303.300(Ft.)
Downstream point/station elevation =   303.000(Ft.)
Pipe length  =    71.00(Ft.) Slope =   0.0042  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.109(CFS)
Given pipe size =     18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
```

```
     1.119(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      0.657(Ft.)
 Minor friction loss =      0.762(Ft.)  K-factor =   1.50
Pipe flow velocity =      5.72(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =     8.27 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      2.647(Ac.)
Runoff from this stream =     10.109(CFS)
Time of concentration =    8.27 min.
Rainfall intensity =     6.667(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      401.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  316.100(Ft.)
Lowest elevation =  312.600(Ft.)
Elevation difference =    3.500(Ft.) Slope =  3.500 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   3.50 %, in a development type of
 43.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.50 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7800)*(  85.000^.5)/(   3.500^(1/3)]=   3.50
The initial area total distance of  100.00 (Ft.) entered leaves a
remaining distance of   15.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   0.23 minutes
for a distance of  15.00 (Ft.) and a slope of  3.50 %
with an elevation difference of   0.53(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    0.228 Minutes
Tt=[(11.9*0.0028^3)/(  0.53)]^.385=  0.23
Total initial area Ti =   3.50 minutes from Figure 3-3 formula plus
  0.23 minutes from the Figure 3-4 formula =   3.73 minutes
Calculated TC of    3.726 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
Subarea runoff =      0.791(CFS)
Total initial stream area =       0.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      402.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      1.043(CFS)
Depth of flow =   0.351(Ft.), Average velocity =   4.504(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
```

```
 Information entered for subchannel number 1 :
 Point number      'X' coordinate     'Y' coordinate
     1              0.00              1.10
     2             34.00              0.40
     3             35.50              0.00
     4             35.50              0.50
 Manning's 'N' friction factor =   0.015
-----------------------------------------------------------------
 Sub-Channel flow  =      1.043(CFS)
   '     '    flow top width =      1.318(Ft.)
   '     '    velocity=    4.504(Ft/s)
   '     '    area =      0.232(Sq.Ft)
   '     '    Froude number =     1.894

 Upstream point elevation =   312.600(Ft.)
 Downstream point elevation =   310.600(Ft.)
 Flow length =    67.000(Ft.)
 Travel time  =    0.25 min.
 Time of concentration =    3.97 min.
 Depth of flow =   0.351(Ft.)
 Average velocity =   4.504(Ft/s)
 Total irregular channel flow =     1.043(CFS)
 Irregular channel normal depth above invert elev. =   0.351(Ft.)
 Average velocity of channel(s) =   4.504(Ft/s)
  Adding area flow to channel
 Calculated TC of    3.974 minutes is less than 5 minutes,
  resetting TC to 5.0 minutes for rainfall intensity calculations
 Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 [HIGH DENSITY RESIDENTIAL                    ]
 (43.0 DU/A or Less      )
 Impervious value, Ai = 0.800
 Sub-Area C Value = 0.780
 Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.780  CA =      0.140
 Subarea runoff =      0.503(CFS) for      0.070(Ac.)
 Total runoff =      1.295(CFS)  Total area =      0.180(Ac.)
 Depth of flow =   0.381(Ft.), Average velocity =   4.754(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station      105.000 to Point/Station      105.000
 **** CONFLUENCE OF MINOR STREAMS ****

________________________________________________________________________
 Along Main Stream number: 1 in normal stream number 2
 Stream flow area =      0.180(Ac.)
 Runoff from this stream =      1.295(CFS)
 Time of concentration =    3.97 min.
 Rainfall intensity =     9.222(In/Hr)
 Summary of stream data:

 Stream   Flow rate      TC            Rainfall Intensity
  No.       (CFS)       (min)                 (In/Hr)


 1       10.109      8.27             6.667
 2        1.295      3.97             9.222
 Qmax(1) =
        1.000 *    1.000 *    10.109) +
        0.723 *    1.000 *     1.295) + =      11.045
 Qmax(2) =
        1.000 *    0.481 *    10.109) +
        1.000 *    1.000 *     1.295) + =       6.154

 Total of 2 streams to confluence:
```

```
Flow rates before confluence point:
      10.109       1.295
Maximum flow rates at confluence using above data:
       11.045        6.154
Area of streams before confluence:
        2.647        0.180
Results of confluence:
Total flow rate =     11.045(CFS)
Time of concentration =     8.268 min.
Effective stream area after confluence =      2.827(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      106.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

------------------------------------------------------------------------
Upstream point/station elevation =   303.000(Ft.)
Downstream point/station elevation =   302.500(Ft.)
Pipe length  =    77.00(Ft.) Slope =   0.0065  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.045(CFS)
Given pipe size =     12.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    11.503(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      7.397(Ft.)
 Minor friction loss =      4.606(Ft.)  K-factor =   1.50
Pipe flow velocity =     14.06(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     8.36 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** CONFLUENCE OF MAIN STREAMS ****

------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      2.827(Ac.)
Runoff from this stream =     11.045(CFS)
Time of concentration =    8.36 min.
Rainfall intensity =     6.620(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      804.000 to Point/Station      106.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity (I) =      5.826(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  10.19 min.  Rain intensity =       5.83(In/Hr)
Total area =        2.170(Ac.)  Total runoff =     6.593(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** CONFLUENCE OF MAIN STREAMS ****

------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.170(Ac.)
```

```
Runoff from this stream =      6.593(CFS)
Time of concentration =   10.19 min.
Rainfall intensity =     5.826(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1004.000 to Point/Station     1005.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Initial subarea total flow distance  =   30.000(Ft.)
Highest elevation =  334.800(Ft.)
Lowest elevation =  327.500(Ft.)
Elevation difference =    7.300(Ft.) Slope = 24.333 %
Top of Initial Area Slope adjusted by User to  0.189 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 50.00 (Ft)
for the top area slope value of   0.19 %, in a development type of
 1.0 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =  12.20 minutes
 (for slope value of   0.50 %)
Rainfall intensity (I) =      5.187(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
Subarea runoff =      0.014(CFS)
Total initial stream area =        0.010(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1005.000 to Point/Station     1003.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.042(CFS)
Depth of flow =   0.111(Ft.), Average velocity =   3.401(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      0.042(CFS)
  '     '    flow top width =      0.222(Ft.)
  '     '    velocity=    3.401(Ft/s)
  '     '    area =      0.012(Sq.Ft)
  '     '    Froude number =     2.543

Upstream point elevation =   327.500(Ft.)
Downstream point elevation =   324.500(Ft.)
Flow length =    34.000(Ft.)
Travel time  =    0.17 min.
Time of concentration =   12.37 min.
Depth of flow =   0.111(Ft.)
Average velocity =   3.401(Ft/s)
Total irregular channel flow =     0.042(CFS)
Irregular channel normal depth above invert elev. =   0.111(Ft.)
Average velocity of channel(s) =   3.401(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.142(In/Hr) for a   100.0 year storm
```

```
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Rainfall intensity =      5.142(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.270  CA =      0.014
Subarea runoff =      0.055(CFS) for      0.040(Ac.)
Total runoff =      0.069(CFS)  Total area =       0.050(Ac.)
Depth of flow =   0.134(Ft.), Average velocity =   3.856(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1003.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      0.050(Ac.)
Runoff from this stream =      0.069(CFS)
Time of concentration =   12.37 min.
Rainfall intensity =     5.142(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1003.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Rainfall intensity (I) =      6.428(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   8.75 min.  Rain intensity =       6.43(In/Hr)
Total area =       5.000(Ac.)  Total runoff =    13.794(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1003.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      5.000(Ac.)
Runoff from this stream =     13.794(CFS)
Time of concentration =    8.75 min.
Rainfall intensity =     6.428(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        0.069     12.37             5.142
2       13.794      8.75             6.428
Qmax(1) =
       1.000 *    1.000 *     0.069) +
       0.800 *    1.000 *    13.794) + =      11.105
Qmax(2) =
       1.000 *    0.708 *     0.069) +
       1.000 *    1.000 *    13.794) + =      13.843
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
       0.069      13.794
Maximum flow rates at confluence using above data:
       11.105       13.843
Area of streams before confluence:
        0.050        5.000
Results of confluence:
Total flow rate =     13.843(CFS)
Time of concentration =     8.750 min.
Effective stream area after confluence =      5.050(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station      106.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   311.100(Ft.)
Downstream point/station elevation =   302.600(Ft.)
Pipe length  =   209.00(Ft.) Slope =   0.0407  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.843(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    13.843(CFS)
Normal flow depth in pipe =   10.61(In.)
Flow top width inside pipe =   17.71(In.)
Critical Depth =   16.52(In.)
Pipe flow velocity =     12.78(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =     9.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      5.050(Ac.)
Runoff from this stream =     13.843(CFS)
Time of concentration =    9.02 min.
Rainfall intensity =     6.302(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       11.045      8.36             6.620
2        6.593     10.19             5.826
3       13.843      9.02             6.302
Qmax(1) =
       1.000 *    1.000 *    11.045) +
       1.000 *    0.820 *     6.593) +
       1.000 *    0.926 *    13.843) + =      29.277
Qmax(2) =
       0.880 *    1.000 *    11.045) +
       1.000 *    1.000 *     6.593) +
       0.925 *    1.000 *    13.843) + =      29.111
Qmax(3) =
       0.952 *    1.000 *    11.045) +
       1.000 *    0.885 *     6.593) +
       1.000 *    1.000 *    13.843) + =      30.194

Total of 3 main streams to confluence:
Flow rates before confluence point:
      11.045       6.593      13.843
Maximum flow rates at confluence using above data:
       29.277       29.111       30.194
Area of streams before confluence:
```

```
            2.827       2.170       5.050


 Results of confluence:
 Total flow rate =     30.194(CFS)
 Time of concentration =     9.023 min.
 Effective stream area after confluence  =     10.047(Ac.)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station      106.000 to Point/Station      107.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****
 ________________________________________________________________________
 Upstream point/station elevation =   302.500(Ft.)
 Downstream point/station elevation =   302.100(Ft.)
 Pipe length  =    31.00(Ft.) Slope =   0.0129  Manning's N = 0.013
 No. of pipes = 1  Required pipe flow  =    30.194(CFS)
 Given pipe size =     18.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
      8.961(Ft.)  at the headworks or inlet of the pipe(s)
  Pipe friction loss =      2.561(Ft.)
  Minor friction loss =      6.800(Ft.)  K-factor =   1.50
 Pipe flow velocity =     17.09(Ft/s)
 Travel time through pipe =    0.03 min.
 Time of concentration (TC) =     9.05 min.


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station      107.000 to Point/Station      109.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****
 ________________________________________________________________________
 Upstream point/station elevation =   302.100(Ft.)
 Downstream point/station elevation =   285.720(Ft.)
 Pipe length  =   137.00(Ft.) Slope =   0.1196  Manning's N = 0.013
 No. of pipes = 1  Required pipe flow  =    30.194(CFS)
 Given pipe size =     18.00(In.)
 Calculated individual pipe flow  =    30.194(CFS)
 Normal flow depth in pipe =   12.54(In.)
 Flow top width inside pipe =   16.55(In.)
 Critical depth could not be calculated.
 Pipe flow velocity =     22.99(Ft/s)
 Travel time through pipe =    0.10 min.
 Time of concentration (TC) =     9.15 min.


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station      109.000 to Point/Station      109.000
 **** CONFLUENCE OF MINOR STREAMS ****
 ________________________________________________________________________
 Along Main Stream number: 1 in normal stream number 1
 Stream flow area =     10.047(Ac.)
 Runoff from this stream =     30.194(CFS)
 Time of concentration =    9.15 min.
 Rainfall intensity =     6.244(In/Hr)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station     2002.000 to Point/Station     2003.000
 **** INITIAL AREA EVALUATION ****
 ________________________________________________________________________
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 [COMMERCIAL area type                        ]
 (General Commercial    )
 Impervious value, Ai = 0.850
 Sub-Area C Value = 0.810
```

```
Initial subarea total flow distance  =   93.000(Ft.)
Highest elevation =  318.000(Ft.)
Lowest elevation =  316.300(Ft.)
Elevation difference =    1.700(Ft.) Slope =  1.828 %
Top of Initial Area Slope adjusted by User to  1.400 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.40 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.61 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8100)*(  60.000^.5)/(   1.400^(1/3)]=   3.61
Calculated TC of    3.614 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.810
Subarea runoff =      0.254(CFS)
Total initial stream area =        0.034(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2003.000 to Point/Station     2004.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

____________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.206(CFS)
Depth of flow =   0.250(Ft.), Average velocity =   1.603(Ft/s)
    ******* Irregular Channel Data ***********
--------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.31
    2             26.00              0.13
    3             27.50              0.00
    4             27.50              0.50
Manning's 'N' friction factor =   0.015
--------------------------------------------------------------
Sub-Channel flow  =      2.206(CFS)
  '     '    flow top width =     18.940(Ft.)
  '     '    velocity=    1.603(Ft/s)
  '     '    area =      1.376(Sq.Ft)
  '     '    Froude number =     1.048

Upstream point elevation =   316.300(Ft.)
Downstream point elevation =   310.800(Ft.)
Flow length =   625.000(Ft.)
Travel time  =    6.50 min.
Time of concentration =   10.11 min.
Depth of flow =   0.250(Ft.)
Average velocity =   1.603(Ft/s)
Total irregular channel flow =     2.206(CFS)
Irregular channel normal depth above invert elev. =   0.250(Ft.)
Average velocity of channel(s) =   1.603(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.855(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.804 given for subarea
Rainfall intensity =      5.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.804  CA =      0.700
Subarea runoff =      3.848(CFS) for      0.837(Ac.)
Total runoff =      4.102(CFS)  Total area =       0.871(Ac.)
Depth of flow =   0.289(Ft.), Average velocity =   1.862(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2000.000 to Point/Station      109.000
**** SUBAREA FLOW ADDITION ****

____________________________________________________________________
Rainfall intensity (I) =      5.855(In/Hr) for a   100.0 year storm
```

```
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(14.5 DU/A or Less      )
Impervious value, Ai = 0.500
Sub-Area C Value = 0.595
Time of concentration =    10.11 min.
Rainfall intensity =      5.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.719  CA =      1.057
Subarea runoff =      2.090(CFS) for      0.600(Ac.)
Total runoff =      6.192(CFS)  Total area =       1.471(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2001.000 to Point/Station      109.000
**** SUBAREA FLOW ADDITION ****

____________________________________________________________________________
Rainfall intensity (I) =      5.855(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                       ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Time of concentration =    10.11 min.
Rainfall intensity =      5.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.733  CA =      1.409
Subarea runoff =      2.060(CFS) for      0.451(Ac.)
Total runoff =      8.252(CFS)  Total area =       1.922(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2004.000 to Point/Station      109.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

____________________________________________________________________________
Upstream point/station elevation =   306.830(Ft.)
Downstream point/station elevation =   285.720(Ft.)
Pipe length  =   211.00(Ft.) Slope =   0.1000  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.252(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     8.252(CFS)
Normal flow depth in pipe =    6.11(In.)
Flow top width inside pipe =   17.05(In.)
Critical Depth =   13.35(In.)
Pipe flow velocity =     15.60(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =    10.34 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      109.000
**** CONFLUENCE OF MINOR STREAMS ****

____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.922(Ac.)
Runoff from this stream =      8.252(CFS)
Time of concentration =   10.34 min.
Rainfall intensity =     5.773(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)

```

```
1243
1244        1       30.194       9.15              6.244
1245        2        8.252      10.34              5.773
1246        Qmax(1) =
1247               1.000 *    1.000 *    30.194) +
1248               1.000 *    0.885 *     8.252) + =      37.500
1249        Qmax(2) =
1250               0.925 *    1.000 *    30.194) +
1251               1.000 *    1.000 *     8.252) + =      36.167
1252
1253        Total of 2 streams to confluence:
1254        Flow rates before confluence point:
1255              30.194       8.252
1256        Maximum flow rates at confluence using above data:
1257               37.500       36.167
1258        Area of streams before confluence:
1259               10.047        1.922
1260        Results of confluence:
1261        Total flow rate =     37.500(CFS)
1262        Time of concentration =     9.152 min.
1263        Effective stream area after confluence =     11.969(Ac.)
1264        End of computations, total study area =          11.969 (Ac.)
1265
1266
1267
```

6l. CivilD Mitigated Onsite Reach 1 Calculations

```
1
2               San Diego County Rational Hydrology Program
3
4       CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0
5
6       Rational method hydrology  program based on
7       San Diego County Flood Control Division 2003 hydrology manual
8           Rational Hydrology Study        Date: 04/26/24
9       ------------------------------------------------------------------------
10      19025 Post Dev Mitigated
11      100 Year Study Reach 1
12      post100r1mit.rd3
13
14      ------------------------------------------------------------------------
15       *********   Hydrology Study Control Information **********
16
17      ------------------------------------------------------------------------
18
19
20      Program License Serial Number 6332
21
22      ------------------------------------------------------------------------
23      Rational hydrology study storm event year is   100.0
24      English (in-lb) input data Units used
25
26      Map data precipitation entered:
27      6 hour,  precipitation(inches) =  3.500
28      24 hour precipitation(inches) =  6.000
29      P6/P24 =    58.3%
30      San Diego hydrology manual 'C' values used
31
32
33      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
34      Process from Point/Station      100.000 to Point/Station      101.000
35      **** INITIAL AREA EVALUATION ****
36
37      Decimal fraction soil group A = 1.000
38      Decimal fraction soil group B = 0.000
39      Decimal fraction soil group C = 0.000
40      Decimal fraction soil group D = 0.000
41      [MEDIUM DENSITY RESIDENTIAL                  ]
42      (7.3 DU/A or Less       )
43      Impervious value, Ai = 0.400
44      Sub-Area C Value = 0.480
45      Initial subarea total flow distance  =   53.000(Ft.)
46      Highest elevation =  316.800(Ft.)
47      Lowest elevation =  316.700(Ft.)
48      Elevation difference =    0.100(Ft.) Slope =  0.189 %
49      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
50      The maximum overland flow distance is 50.00 (Ft)
51      for the top area slope value of   0.19 %, in a development type of
52       7.3 DU/A or Less
53      In Accordance With Figure 3-3
54      Initial Area Time of Concentration =  13.75 minutes
55      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
56      TC = [1.8*(1.1-0.4800)*(  50.000^.5)/(   0.189^(1/3)]=  13.75
57      The initial area total distance of   53.00 (Ft.) entered leaves a
58      remaining distance of    3.00 (Ft.)
59      Using Figure 3-4, the travel time for this distance is   0.20 minutes
60      for a distance of   3.00 (Ft.) and a slope of  0.19 %
61      with an elevation difference of   0.01(Ft.) from the end of the top area
62      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
63       =    0.203 Minutes
64      Tt=[(11.9*0.0006^3)/(  0.01)]^.385=  0.20
65      Total initial area Ti =  13.75 minutes from Figure 3-3 formula plus
66        0.20 minutes from the Figure 3-4 formula =  13.95 minutes
67      Rainfall intensity (I) =      4.757(In/Hr) for a   100.0 year storm
68      Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
69      Subarea runoff =      0.068(CFS)
```

```
 Total initial stream area =        0.030(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.228(CFS)
Depth of flow =   0.095(Ft.), Average velocity =   0.591(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.33
    2             23.00              0.00
    3             28.50              0.33
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      0.228(CFS)
  '     '    flow top width =      8.130(Ft.)
  '     '    velocity=    0.591(Ft/s)
  '     '    area =      0.386(Sq.Ft)
  '     '    Froude number =     0.478

Upstream point elevation =   316.700(Ft.)
Downstream point elevation =   316.300(Ft.)
Flow length =   193.000(Ft.)
Travel time  =    5.44 min.
Time of concentration =   19.39 min.
Depth of flow =   0.095(Ft.)
Average velocity =   0.591(Ft/s)
Total irregular channel flow =     0.228(CFS)
Irregular channel normal depth above invert elev. =   0.095(Ft.)
Average velocity of channel(s) =   0.591(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      3.847(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Rainfall intensity =      3.847(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.480  CA =      0.082
Subarea runoff =      0.245(CFS) for      0.140(Ac.)
Total runoff =      0.314(CFS)  Total area =      0.170(Ac.)
Depth of flow =   0.107(Ft.), Average velocity =   0.640(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****

______________________________________________________________________________
Rainfall intensity (I) =      3.847(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Time of concentration =    19.39 min.
Rainfall intensity =      3.847(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.393  CA =      0.114
```

```
Subarea runoff =      0.125(CFS) for      0.120(Ac.)
Total runoff =      0.439(CFS)  Total area =       0.290(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   310.200(Ft.)
Downstream point/station elevation =   309.000(Ft.)
Pipe length  =   250.00(Ft.) Slope =   0.0048  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.439(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     0.439(CFS)
Normal flow depth in pipe =    3.42(In.)
Flow top width inside pipe =   10.84(In.)
Critical Depth =    3.28(In.)
Pipe flow velocity =      2.37(Ft/s)
Travel time through pipe =    1.76 min.
Time of concentration (TC) =    21.15 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.290(Ac.)
Runoff from this stream =      0.439(CFS)
Time of concentration =   21.15 min.
Rainfall intensity =     3.637(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1100.000 to Point/Station     1101.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Initial subarea total flow distance  =   59.000(Ft.)
Highest elevation =  336.700(Ft.)
Lowest elevation =  321.600(Ft.)
Elevation difference =   15.100(Ft.) Slope = 25.593 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  25.59 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.07 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2700)*( 100.000^.5)/(  25.593^(1/3)]=   5.07
Rainfall intensity (I) =      9.140(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
Subarea runoff =      0.173(CFS)
Total initial stream area =       0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1101.000 to Point/Station      103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.544(CFS)
Depth of flow =   0.128(Ft.), Average velocity =   3.658(Ft/s)
```

```
      ******* Irregular Channel Data ***********
-------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.60
    2             16.00              0.00
    3             46.00              1.20
Manning's 'N' friction factor =   0.015
-------------------------------------------------------------
Sub-Channel flow  =      1.544(CFS)
  '     '    flow top width =      6.605(Ft.)
  '     '    velocity=    3.658(Ft/s)
  '     '    area =      0.422(Sq.Ft)
  '     '    Froude number =     2.549

Upstream point elevation =   321.600(Ft.)
Downstream point elevation =   309.000(Ft.)
Flow length =   236.000(Ft.)
Travel time  =    1.08 min.
Time of concentration =    6.15 min.
Depth of flow =   0.128(Ft.)
Average velocity =   3.658(Ft/s)
Total irregular channel flow =     1.544(CFS)
Irregular channel normal depth above invert elev. =   0.128(Ft.)
Average velocity of channel(s) =   3.658(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      8.073(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.534
Rainfall intensity =      8.073(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.509  CA =      0.371
Subarea runoff =      2.825(CFS) for      0.660(Ac.)
Total runoff =      2.998(CFS)  Total area =       0.730(Ac.)
Depth of flow =   0.164(Ft.), Average velocity =   4.317(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****

____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.730(Ac.)
Runoff from this stream =      2.998(CFS)
Time of concentration =    6.15 min.
Rainfall intensity =     8.073(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3003.000 to Point/Station      103.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

____________________________________________________________________________
User specified 'C' value of 0.360 given for subarea
Rainfall intensity (I) =      7.186(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   7.36 min.  Rain intensity =       7.19(In/Hr)
Total area =       0.777(Ac.)  Total runoff =     2.020(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****

____________________________________________________________________________
```

```
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.777(Ac.)
Runoff from this stream =      2.020(CFS)
Time of concentration =    7.36 min.
Rainfall intensity =     7.186(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        0.439     21.15             3.637
2        2.998      6.15             8.073
3        2.020      7.36             7.186
Qmax(1) =
       1.000 *    1.000 *     0.439) +
       0.451 *    1.000 *     2.998) +
       0.506 *    1.000 *     2.020) + =       2.812
Qmax(2) =
       1.000 *    0.291 *     0.439) +
       1.000 *    1.000 *     2.998) +
       1.000 *    0.835 *     2.020) + =       4.812
Qmax(3) =
       1.000 *    0.348 *     0.439) +
       0.890 *    1.000 *     2.998) +
       1.000 *    1.000 *     2.020) + =       4.841

Total of 3 streams to confluence:
Flow rates before confluence point:
       0.439       2.998       2.020
Maximum flow rates at confluence using above data:
        2.812        4.812        4.841
Area of streams before confluence:
        0.290        0.730        0.777
Results of confluence:
Total flow rate =      4.841(CFS)
Time of concentration =     7.360 min.
Effective stream area after confluence =      1.797(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   304.200(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =   189.00(Ft.) Slope =   0.0048  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.841(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     4.841(CFS)
Normal flow depth in pipe =   10.76(In.)
Flow top width inside pipe =   17.65(In.)
Critical Depth =   10.14(In.)
Pipe flow velocity =      4.39(Ft/s)
Travel time through pipe =    0.72 min.
Time of concentration (TC) =     8.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.797(Ac.)
Runoff from this stream =      4.841(CFS)
Time of concentration =    8.08 min.
Rainfall intensity =     6.768(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------------
Decimal fraction soil group A = 0.050
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                         ]
(Office Professional    )
Impervious value, Ai = 0.900
Sub-Area C Value = 0.839
Initial subarea total flow distance  =   50.000(Ft.)
Highest elevation =  316.800(Ft.)
Lowest elevation =  316.200(Ft.)
Elevation difference =    0.600(Ft.) Slope =  1.200 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.20 %, in a development type of
 Office Professional
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.42 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8395)*(  60.000^.5)/(   1.200^(1/3)]=   3.42
Calculated TC of    3.418 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.839
Subarea runoff =      0.310(CFS)
Total initial stream area =        0.040(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

------------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      2.245(CFS)
Depth of flow =   0.209(Ft.), Average velocity =   2.102(Ft/s)
    ******* Irregular Channel Data ***********
-------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.30
    2              1.50              0.00
    3             45.50              1.00
    4             61.50              1.50
Manning's 'N' friction factor =   0.015
-------------------------------------------------------------
Sub-Channel flow  =      2.245(CFS)
  '     '    flow top width =     10.230(Ft.)
  '     '    velocity=    2.102(Ft/s)
  '     '    area =      1.068(Sq.Ft)
  '     '    Froude number =     1.147

Upstream point elevation =   316.200(Ft.)
Downstream point elevation =   314.500(Ft.)
Flow length =   185.000(Ft.)
Travel time  =    1.47 min.
Time of concentration =    4.88 min.
Depth of flow =   0.209(Ft.)
Average velocity =   2.102(Ft/s)
Total irregular channel flow =     2.245(CFS)
Irregular channel normal depth above invert elev. =   0.209(Ft.)
Average velocity of channel(s) =   2.102(Ft/s)
 Adding area flow to channel
Calculated TC of    4.885 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
```

```
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                        ]
(Office Professional    )
Impervious value, Ai = 0.900
Sub-Area C Value = 0.840
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.840  CA =      0.454
Subarea runoff =      3.873(CFS) for      0.500(Ac.)
Total runoff =      4.183(CFS)  Total area =      0.540(Ac.)
Depth of flow =   0.264(Ft.), Average velocity =   2.456(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

____________________________________________________________________________
Upstream point/station elevation =   308.500(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =    48.00(Ft.) Slope =   0.1083  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.183(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     4.183(CFS)
Normal flow depth in pipe =    4.95(In.)
Flow top width inside pipe =   11.82(In.)
Critical Depth =   10.36(In.)
Pipe flow velocity =     13.68(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     4.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****

____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.540(Ac.)
Runoff from this stream =      4.183(CFS)
Time of concentration =    4.94 min.
Rainfall intensity =     9.222(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****

____________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                        ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Initial subarea total flow distance  =   42.000(Ft.)
Highest elevation =  316.000(Ft.)
Lowest elevation =  314.700(Ft.)
Elevation difference =    1.300(Ft.) Slope =  3.095 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   3.10 %, in a development type of
 Neighborhod Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.64 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7800)*(  85.000^.5)/(   3.095^(1/3)]=   3.64
Calculated TC of    3.644 minutes is less than 5 minutes,
```

```
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
Subarea runoff =      0.288(CFS)
Total initial stream area =        0.040(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.259(CFS)
Depth of flow =   0.087(Ft.), Average velocity =   2.583(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.50
    2              0.00              0.00
    3             64.00              0.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      1.259(CFS)
  '     '    flow top width =     11.169(Ft.)
  '     '    velocity=    2.583(Ft/s)
  '     '    area =      0.487(Sq.Ft)
  '     '    Froude number =     2.180

Upstream point elevation =   314.700(Ft.)
Downstream point elevation =   313.000(Ft.)
Flow length =    38.000(Ft.)
Travel time  =    0.25 min.
Time of concentration =    3.89 min.
Depth of flow =   0.087(Ft.)
Average velocity =   2.583(Ft/s)
Total irregular channel flow =     1.259(CFS)
Irregular channel normal depth above invert elev. =   0.087(Ft.)
Average velocity of channel(s) =   2.583(Ft/s)
 Adding area flow to channel
Calculated TC of    3.889 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                         ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.780  CA =      0.242
Subarea runoff =      1.942(CFS) for      0.270(Ac.)
Total runoff =      2.230(CFS)  Total area =       0.310(Ac.)
Depth of flow =   0.108(Ft.), Average velocity =   2.980(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

________________________________________________________________________
Upstream point/station elevation =   306.000(Ft.)
Downstream point/station elevation =   303.300(Ft.)
Pipe length  =    30.00(Ft.) Slope =   0.0900  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.230(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     2.230(CFS)
Normal flow depth in pipe =    3.72(In.)
```

```
Flow top width inside pipe =   11.10(In.)
Critical Depth =    7.66(In.)
Pipe flow velocity =     10.75(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     3.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.310(Ac.)
Runoff from this stream =      2.230(CFS)
Time of concentration =    3.94 min.
Rainfall intensity =     9.222(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                  (In/Hr)


1        4.841      8.08             6.768
2        4.183      4.94             9.222
3        2.230      3.94             9.222
Qmax(1) =
       1.000 *    1.000 *     4.841) +
       0.734 *    1.000 *     4.183) +
       0.734 *    1.000 *     2.230) + =       9.548
Qmax(2) =
       1.000 *    0.612 *     4.841) +
       1.000 *    1.000 *     4.183) +
       1.000 *    1.000 *     2.230) + =       9.375
Qmax(3) =
       1.000 *    0.487 *     4.841) +
       1.000 *    0.796 *     4.183) +
       1.000 *    1.000 *     2.230) + =       7.919

Total of 3 streams to confluence:
Flow rates before confluence point:
       4.841       4.183       2.230
Maximum flow rates at confluence using above data:
        9.548        9.375        7.919
Area of streams before confluence:
        1.797        0.540        0.310
Results of confluence:
Total flow rate =      9.548(CFS)
Time of concentration =     8.077 min.
Effective stream area after confluence =      2.647(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
____________________________________________________________________________
Upstream point/station elevation =   303.300(Ft.)
Downstream point/station elevation =   303.000(Ft.)
Pipe length  =    71.00(Ft.) Slope =   0.0042  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.548(CFS)
Given pipe size =     18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     0.966(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      0.586(Ft.)
 Minor friction loss =      0.680(Ft.)  K-factor =   1.50
Pipe flow velocity =      5.40(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =     8.30 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****

____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      2.647(Ac.)
Runoff from this stream =      9.548(CFS)
Time of concentration =    8.30 min.
Rainfall intensity =     6.652(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      401.000
**** INITIAL AREA EVALUATION ****

____________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  316.100(Ft.)
Lowest elevation =  312.600(Ft.)
Elevation difference =    3.500(Ft.) Slope =  3.500 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   3.50 %, in a development type of
 43.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.50 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7800)*(  85.000^.5)/(   3.500^(1/3)]=   3.50
The initial area total distance of  100.00 (Ft.) entered leaves a
remaining distance of   15.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   0.23 minutes
for a distance of  15.00 (Ft.) and a slope of  3.50 %
with an elevation difference of   0.53(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    0.228 Minutes
Tt=[(11.9*0.0028^3)/(  0.53)]^.385=  0.23
Total initial area Ti =   3.50 minutes from Figure 3-3 formula plus
  0.23 minutes from the Figure 3-4 formula =   3.73 minutes
Calculated TC of    3.726 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
Subarea runoff =      0.791(CFS)
Total initial stream area =        0.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      402.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

____________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.043(CFS)
Depth of flow =   0.351(Ft.), Average velocity =   4.504(Ft/s)
    ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.10
    2             34.00              0.40
    3             35.50              0.00
    4             35.50              0.50
Manning's 'N' friction factor =   0.015
```

```
------------------------------------------------------------------
Sub-Channel flow  =      1.043(CFS)
  '     '    flow top width =      1.318(Ft.)
  '     '    velocity=    4.504(Ft/s)
  '     '    area =      0.232(Sq.Ft)
  '     '    Froude number =     1.894

Upstream point elevation =   312.600(Ft.)
Downstream point elevation =   310.600(Ft.)
Flow length =    67.000(Ft.)
Travel time  =    0.25 min.
Time of concentration =    3.97 min.
Depth of flow =   0.351(Ft.)
Average velocity =   4.504(Ft/s)
Total irregular channel flow =     1.043(CFS)
Irregular channel normal depth above invert elev. =   0.351(Ft.)
Average velocity of channel(s) =   4.504(Ft/s)
 Adding area flow to channel
Calculated TC of    3.974 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.780  CA =      0.140
Subarea runoff =      0.503(CFS) for      0.070(Ac.)
Total runoff =      1.295(CFS)  Total area =       0.180(Ac.)
Depth of flow =   0.381(Ft.), Average velocity =   4.754(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      105.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.180(Ac.)
Runoff from this stream =      1.295(CFS)
Time of concentration =    3.97 min.
Rainfall intensity =     9.222(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        9.548      8.30             6.652
2        1.295      3.97             9.222
Qmax(1) =
       1.000 *    1.000 *     9.548) +
       0.721 *    1.000 *     1.295) + =      10.482
Qmax(2) =
       1.000 *    0.479 *     9.548) +
       1.000 *    1.000 *     1.295) + =       5.868

Total of 2 streams to confluence:
Flow rates before confluence point:
       9.548       1.295
Maximum flow rates at confluence using above data:
      10.482        5.868
Area of streams before confluence:
       2.647        0.180
Results of confluence:
```

```
Total flow rate =     10.482(CFS)
Time of concentration =     8.296 min.
Effective stream area after confluence =      2.827(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      106.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   303.000(Ft.)
Downstream point/station elevation =   302.500(Ft.)
Pipe length  =    77.00(Ft.) Slope =   0.0065  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.482(CFS)
Given pipe size =     12.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    10.310(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      6.662(Ft.)
 Minor friction loss =      4.148(Ft.)  K-factor =   1.50
Pipe flow velocity =     13.35(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     8.39 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      2.827(Ac.)
Runoff from this stream =     10.482(CFS)
Time of concentration =    8.39 min.
Rainfall intensity =     6.603(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      804.000 to Point/Station      106.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL                    ]
(43.0 DU/A or Less      )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Rainfall intensity (I) =      5.819(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  10.21 min.  Rain intensity =       5.82(In/Hr)
Total area =       2.170(Ac.)  Total runoff =     5.047(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.170(Ac.)
Runoff from this stream =      5.047(CFS)
Time of concentration =   10.21 min.
Rainfall intensity =     5.819(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
Process from Point/Station     1004.000 to Point/Station     1005.000
**** INITIAL AREA EVALUATION ****

----------------------------------------------------------------------
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Initial subarea total flow distance  =   30.000(Ft.)
Highest elevation =  334.800(Ft.)
Lowest elevation =  327.500(Ft.)
Elevation difference =    7.300(Ft.) Slope = 24.333 %
Top of Initial Area Slope adjusted by User to  0.189 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 50.00 (Ft)
for the top area slope value of   0.19 %, in a development type of
 1.0 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =  12.20 minutes
 (for slope value of   0.50 %)
Rainfall intensity (I) =      5.187(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
Subarea runoff =      0.014(CFS)
Total initial stream area =        0.010(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1005.000 to Point/Station     1003.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      0.042(CFS)
Depth of flow =   0.111(Ft.), Average velocity =   3.401(Ft/s)
    ******* Irregular Channel Data ***********
---------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              1.00
    2              1.00              0.00
    3              2.00              1.00
Manning's 'N' friction factor =   0.015
---------------------------------------------------------------
Sub-Channel flow  =      0.042(CFS)
  '     '    flow top width =      0.222(Ft.)
  '     '    velocity=    3.401(Ft/s)
  '     '    area =      0.012(Sq.Ft)
  '     '    Froude number =     2.543

Upstream point elevation =   327.500(Ft.)
Downstream point elevation =   324.500(Ft.)
Flow length =    34.000(Ft.)
Travel time  =    0.17 min.
Time of concentration =   12.37 min.
Depth of flow =   0.111(Ft.)
Average velocity =   3.401(Ft/s)
Total irregular channel flow =     0.042(CFS)
Irregular channel normal depth above invert elev. =   0.111(Ft.)
Average velocity of channel(s) =   3.401(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.142(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
```

```
Sub-Area C Value = 0.270
Rainfall intensity =      5.142(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.270  CA =      0.014
Subarea runoff =      0.055(CFS) for      0.040(Ac.)
Total runoff =      0.069(CFS)  Total area =       0.050(Ac.)
Depth of flow =   0.134(Ft.), Average velocity =   3.856(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1003.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      0.050(Ac.)
Runoff from this stream =      0.069(CFS)
Time of concentration =   12.37 min.
Rainfall intensity =     5.142(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1003.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(7.3 DU/A or Less       )
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Rainfall intensity (I) =      6.428(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   8.75 min.  Rain intensity =       6.43(In/Hr)
Total area =        5.000(Ac.)  Total runoff =    13.794(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station     1003.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      5.000(Ac.)
Runoff from this stream =     13.794(CFS)
Time of concentration =    8.75 min.
Rainfall intensity =     6.428(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1         0.069     12.37             5.142
2        13.794      8.75             6.428
Qmax(1) =
       1.000 *    1.000 *     0.069) +
       0.800 *    1.000 *    13.794) + =      11.105
Qmax(2) =
       1.000 *    0.708 *     0.069) +
       1.000 *    1.000 *    13.794) + =      13.843

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.069      13.794
Maximum flow rates at confluence using above data:
       11.105       13.843
Area of streams before confluence:
        0.050        5.000
```

```
Results of confluence:
Total flow rate =     13.843(CFS)
Time of concentration =     8.750 min.
Effective stream area after confluence =      5.050(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1003.000 to Point/Station      106.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   311.100(Ft.)
Downstream point/station elevation =   302.600(Ft.)
Pipe length  =   209.00(Ft.) Slope =   0.0407  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.843(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    13.843(CFS)
Normal flow depth in pipe =   10.61(In.)
Flow top width inside pipe =   17.71(In.)
Critical Depth =   16.52(In.)
Pipe flow velocity =     12.78(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =     9.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      106.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      5.050(Ac.)
Runoff from this stream =     13.843(CFS)
Time of concentration =    9.02 min.
Rainfall intensity =     6.302(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                  (In/Hr)


1       10.482      8.39             6.603
2        5.047     10.21             5.819
3       13.843      9.02             6.302
Qmax(1) =
       1.000 *    1.000 *    10.482) +
       1.000 *    0.822 *     5.047) +
       1.000 *    0.930 *    13.843) + =      27.506
Qmax(2) =
       0.881 *    1.000 *    10.482) +
       1.000 *    1.000 *     5.047) +
       0.923 *    1.000 *    13.843) + =      27.065
Qmax(3) =
       0.954 *    1.000 *    10.482) +
       1.000 *    0.884 *     5.047) +
       1.000 *    1.000 *    13.843) + =      28.306

Total of 3 main streams to confluence:
Flow rates before confluence point:
      10.482       5.047      13.843
Maximum flow rates at confluence using above data:
       27.506       27.065       28.306
Area of streams before confluence:
        2.827        2.170        5.050


Results of confluence:
Total flow rate =     28.306(CFS)
Time of concentration =     9.023 min.
Effective stream area after confluence  =     10.047(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   302.500(Ft.)
Downstream point/station elevation =   302.100(Ft.)
Pipe length  =    31.00(Ft.) Slope =   0.0129  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.306(CFS)
Given pipe size =     18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     7.827(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      2.250(Ft.)
 Minor friction loss =      5.976(Ft.)  K-factor =   1.50
Pipe flow velocity =     16.02(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     9.05 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      109.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   302.100(Ft.)
Downstream point/station elevation =   285.720(Ft.)
Pipe length  =   137.00(Ft.) Slope =   0.1196  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.306(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    28.306(CFS)
Normal flow depth in pipe =   11.95(In.)
Flow top width inside pipe =   17.00(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.73(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     9.16 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      109.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     10.047(Ac.)
Runoff from this stream =     28.306(CFS)
Time of concentration =    9.16 min.
Rainfall intensity =     6.243(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2002.000 to Point/Station     2003.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.810
Initial subarea total flow distance  =   93.000(Ft.)
Highest elevation =  318.000(Ft.)
Lowest elevation =  316.300(Ft.)
Elevation difference =    1.700(Ft.) Slope =  1.828 %
Top of Initial Area Slope adjusted by User to  1.400 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
```

```
for the top area slope value of   1.40 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.61 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8100)*(  60.000^.5)/(   1.400^(1/3)]=   3.61
Calculated TC of    3.614 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.810
Subarea runoff =      0.254(CFS)
Total initial stream area =        0.034(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2003.000 to Point/Station     2004.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.206(CFS)
Depth of flow =   0.250(Ft.), Average velocity =   1.603(Ft/s)
    ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              0.31
    2             26.00              0.13
    3             27.50              0.00
    4             27.50              0.50
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =      2.206(CFS)
  '     '    flow top width =     18.940(Ft.)
  '     '    velocity=    1.603(Ft/s)
  '     '    area =      1.376(Sq.Ft)
  '     '    Froude number =     1.048

Upstream point elevation =   316.300(Ft.)
Downstream point elevation =   310.800(Ft.)
Flow length =   625.000(Ft.)
Travel time  =    6.50 min.
Time of concentration =   10.11 min.
Depth of flow =   0.250(Ft.)
Average velocity =   1.603(Ft/s)
Total irregular channel flow =     2.206(CFS)
Irregular channel normal depth above invert elev. =   0.250(Ft.)
Average velocity of channel(s) =   1.603(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.855(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.804 given for subarea
Rainfall intensity =      5.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.804  CA =      0.700
Subarea runoff =      3.848(CFS) for      0.837(Ac.)
Total runoff =      4.102(CFS)  Total area =       0.871(Ac.)
Depth of flow =   0.289(Ft.), Average velocity =   1.862(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2000.000 to Point/Station      109.000
**** SUBAREA FLOW ADDITION ****

________________________________________________________________________
Rainfall intensity (I) =      5.855(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(14.5 DU/A or Less      )
Impervious value, Ai = 0.500
```

```
Sub-Area C Value = 0.595
Time of concentration =    10.11 min.
Rainfall intensity =      5.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.719  CA =      1.057
Subarea runoff =      2.090(CFS) for      0.600(Ac.)
Total runoff =      6.192(CFS)  Total area =       1.471(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2001.000 to Point/Station      109.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Rainfall intensity (I) =      5.855(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                          ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.780
Time of concentration =    10.11 min.
Rainfall intensity =      5.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.733  CA =      1.409
Subarea runoff =      2.060(CFS) for      0.451(Ac.)
Total runoff =      8.252(CFS)  Total area =       1.922(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2004.000 to Point/Station      109.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   306.830(Ft.)
Downstream point/station elevation =   285.720(Ft.)
Pipe length  =   211.00(Ft.) Slope =   0.1000  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.252(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     8.252(CFS)
Normal flow depth in pipe =    6.11(In.)
Flow top width inside pipe =   17.05(In.)
Critical Depth =   13.35(In.)
Pipe flow velocity =     15.60(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =    10.34 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      109.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.922(Ac.)
Runoff from this stream =      8.252(CFS)
Time of concentration =   10.34 min.
Rainfall intensity =     5.773(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       28.306      9.16             6.243
2        8.252     10.34             5.773
Qmax(1) =
       1.000 *    1.000 *    28.306) +
       1.000 *    0.886 *     8.252) + =      35.615
Qmax(2) =
```

```
            0.925 *    1.000 *    28.306) +
            1.000 *    1.000 *     8.252) + =      34.427

      Total of 2 streams to confluence:
      Flow rates before confluence point:
            28.306       8.252
      Maximum flow rates at confluence using above data:
            35.615       34.427
      Area of streams before confluence:
            10.047        1.922
      Results of confluence:
      Total flow rate =     35.615(CFS)
      Time of concentration =     9.155 min.
      Effective stream area after confluence =     11.969(Ac.)
      End of computations, total study area =          11.969 (Ac.)
```

6.0 General Requirements

- Use this attachment to document all proposed (1) self-mitigating, (2) de minimis, and (3) self-retaining DMAs. Indicate under "DMA Compliance Option" below which design options will be used to satisfy structural performance requirements for one or more DMA.

DMA Compliance Option	Required Sub-attachments or Printouts	BMPDM Design Resources
☒ **Self-mitigating**	• Sub-attachment 6.1	• BMPDM Section 5.2.1
☐ **De minimis**	• Sub-attachment 6.2	• BMPDM Section 5.2.2
☒ **Self-retaining**[1] **SSD-BMP Type(s)**	• Sub-attachment 6.3	• BMPDM Section 5.2.3 (all options)
☐ **Impervious Area Dispersion**	• DCV calculations from SSD-BMP tool • Dispersion Areas calculations from SSD-BMP tool	• Fact Sheet SD-B (Appendix E.8) • Appendix I
☒ **Tree Wells**	• DCV calculations from SSD-BMP tool • Tree Well calculations from SSD-BMP tool	• Fact Sheet SD-A (Appendix E.7) • Appendix I

- Submit this cover page and all "Required Sub-attachments or Printouts" listed for each selected DMA compliance option.
- See the BMPDM sections and appendices listed under "BMPDM Design Resources" for additional explanation of design requirements. Each constructed feature must fully satisfy the requirements described in these resources, and any other guidance identified by the County.
- DMA Exhibits and Construction Plans: DMAs, features, and BMPs identified and described in this attachment must be shown on DMA Exhibits and all applicable construction plans submitted for the project. See Attachment 2 for additional instruction on exhibits and plans.

[1] If "Self-retaining" is selected, also choose the types of Significant Site Design BMPs (SSD-BMPs) to be used. SSD-BMPs are Site Design BMPs that are sized and constructed to fully satisfy all applicable Structural Performance Standards for a DMA.

6.3 Self-retaining DMAs using Significant Site Design BMPs

Self-retaining DMAs use Site Design BMPs to fully-retain the entire DCV, at a minimum. Site Design BMPs that fully retain the DCV, at a minimum, therefore replacing the need for a Structural BMP (S-BMP), are classified as Significant Site Design BMPs (SSD-BMPs). To satisfy pollutant control requirements only, self-retaining means retention of the entire DCV. However, under some circumstances, a self-retaining DMA can also satisfy hydromodification management requirements by implementing BMPs that retain a greater volume of runoff.

- Provide the information requested below for each proposed self-retaining DMA. Add rows or copy the table if additional entries are needed.

DMA #	**DMA Area (ft^2)**	**BMP Type** (choose one per DMA)		***Permit # and Sheet #***
		Dispersion Area (Att. 6.3.1)	**Tree Wells (Att. 6.3.2)**	
DMA-3001	7,303	☐	☒	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	

Copy and Paste table here for additional DMAs

- "DMA #", "DMA Area", and "Permit # and Sheet #" are required.
- Select one BMP Type per DMA. Provide detailed documentation for each DMA in Attachments 6.3.1 (Impervious Dispersion Areas) and/or 6.3.2 (Tree Wells) below.
- Each self-retaining DMA must fully satisfy all design requirements and restrictions described in BMPDM Section 5.2.3, applicable BMPDM Appendix E Fact Sheets, BMPDM Appendix I, and any other guidance or instruction identified by the County.

County of San Diego Automated Worksheets for Significant Site Design BMPs (SSD-BMPs)
SD-A Tree Wells and SD-B Impervious Area Dispersion (Dispersion Areas)
(Version 1.0)

WELCOME:

Welcome to the County of San Diego Automated Worksheets for Significant Site Design BMPs. These worksheets may be used to demonstrate compliance with stormwater pollutant control standards and hydromodification flow control standards set forth in the 2013 MS4 Permit for Priority Development Projects (PDPs).

This workbook is intended for use to demonstrate compliance when significant site design BMPs (SSD-BMPs) are proposed. SSD-BMPs are passive treatment systems that include SD-A Tree Wells and SD-B Dispersion Areas. This worksheet does not support the use of underdrains in SD-A or SD-B. If underdrains are proposed, then continuous simlation modeling should be performed.

When structural BMPs (INF-1, INF-2, INF-3, PR-1, BF-1, BF-2) are proposed, a different workbook, "County of San Diego Automated Stormwater Pollutant Control Worksheets" must be used.

INSTRUCTIONS:

General: To use this workbook, navigate to each of the worksheet tabs below and populate all light green cells with project specific information. Light green cells require user input, white cells are locked for editing and are automatically calculated, bright green cells are also locked for editing and are automatically populated based on results from previous worksheet tabs, grey cells are items that do not require user input because of previous user inputs, orange cells represent warnings where supplemental information and/or revisions may be required for compliance. The worksheets are formatted to accommodate calculations for up to 10 drainage areas and associated BMPs. Each drainage area and BMP is represented as a discrete column with corresponding user inputs and calculations appearing in the rows below. Please note that projects with more than 10 drainage areas may need to use more than one workbook to accommodate the entire project.

Step 1. DCV: Provide the required inputs to determine the design capture volume (DCV) for each PDP drainage management area (DMA). The calculations in this worksheet determine the initial design capture volume and also apply any applicable reductions associated with dispersion to pervious surfaces and incorporation of rain barrels. For DMAs intended to satisfy pollutant control and hydromodification control (when applicable) requirements using Dispersion Areas alone (i.e., not in combination with Tree Wells), the data entered in this tab must provide sufficient pervious area to reduce the remaining DCV in Line 37 to zero. Note that the use of semi-pervious surfaces as dispersion area will not reduce DCV to zero, but the use of engineered pervious surfaces and/or natural pervious surfaces can. For DMAs intended to incorporate Tree Wells, the remaining DCV in Line 37 is the amount to be managed by Tree Wells.

Step 2. Dispersion Areas: [Projects that do not use Dispersion Areas skip this step and go on to Step 3.] When the project includes Dispersion Areas per SD-B, provide required inputs to demonstrate that the requirements for Dispersion Areas are satisfied. If the DMA will also use SD-A Tree Wells downstream of the Dispersion Area to satisfy pollutant control and hydromodification control (when applicable), continue to Step 3. Tree Wells.

Step 3. Tree Wells: [Projects that do not use Tree Wells do not use this Step.] When the project includes Tree Wells per SD-A, provide required inputs to demonstrate that the requirements for Tree Wells are satisfied.

DISCLAIMER:

The County of San Diego has developed this tool in an effort to streamline traditionally complex efforts associated with planning, design, submittal, and review of PDPs. While the calculations performed herein are deemed to be in compliance with 2013 MS4 Permit requirements, applicants may elect to provide their own calculations. Use of this tool is optional and the County will not be held liable for any errors or other negative impacts associated with its use. In the event that the County performs updates to these worksheets, applicants that have not established reliance on previous versions of the worksheet via discretionary approval may be required to utilize the latest version of the worksheets. A summary of version releases is included below.

QUESTIONS:

-Questions relating to specific projects, submittal requirements, approval process, and/or policy-related issues should be directed your PDS Land Development Project Manager (link below).

PDS Land Development Project Manager

-General questions/comments on this worksheet may be directed via email to BMP.Program@sdcounty.ca.gov with the subject line "SSD-BMP assistance."

SSD-BMP Automated Worksheet I-1: Step 1. Calculation of Design Capture Volume (V1.0)				
Category	**#**	**Description**	***i***	**Units**
Standard Drainage Basin Inputs	1	Drainage Basin ID or Name	DMA-3001	unitless
	2	85th Percentile 24-hr Storm Depth	0.74	inches
	3	Is Hydromodification Control Applicable?	Yes	yes/no
	4	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	4,790	sq-ft
	5	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)		sq-ft
	6	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)		sq-ft
	7	Natural Type A Soil Not Serving as Dispersion Area (C=0.10)	503	sq-ft
	8	Natural Type B Soil Not Serving as Dispersion Area (C=0.14)		sq-ft
	9	Natural Type C Soil Not Serving as Dispersion Area (C=0.23)	2,011	sq-ft
	10	Natural Type D Soil Not Serving as Dispersion Area (C=0.30)		sq-ft
SSD-BMPs Proposed	11	Does Tributary Incorporate Dispersion and/or Rain Barrels?	No	yes/no
	12	Does Tributary Incorporate Tree Wells?	Yes	yes/no
Dispersion Area & Rain Barrel Inputs (Optional)	13	Impervious Surfaces **Directed to Dispersion Area** per SD-B (Ci=0.90)		sq-ft
	14	Semi-Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.30)		sq-ft
	15	Engineered Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.10)		sq-ft
	16	Natural Type A Soil **Serving as Dispersion Area** per SD-B (Ci=0.10)		sq-ft
	17	Natural Type B Soil **Serving as Dispersion Area** per SD-B (Ci=0.14)		sq-ft
	18	Natural Type C Soil **Serving as Dispersion Area** per SD-B (Ci=0.23)		sq-ft
	19	Natural Type D Soil **Serving as Dispersion Area** per SD-B (Ci=0.30)		sq-ft
	20	Number of Rain Barrels Proposed per SD-E		#
	21	Average Rain Barrel Size		gal
Initial Runoff Factor Calculation	22	Total Tributary Area	7,303	sq-ft
	23	Initial Runoff Factor for Standard Drainage Areas	0.66	unitless
	24	Initial Runoff Factor for Dispersed & Dispersion Areas	0.00	unitless
	25	Initial Weighted Runoff Factor	0.66	unitless
	26	Initial Design Capture Volume	297	cubic-feet
Dispersion Area Adjustment & Rain Barrel Adjustment	27	Total Impervious Area Dispersed to Pervious Surface	0	sq-ft
	28	Total Pervious Dispersion Area	0	sq-ft
	29	Ratio of Dispersed Impervious Area to Pervious Dispersion Area for DCV Reduction	n/a	ratio
	30	Adjustment Factor for Dispersed & Dispersion Areas	1.00	ratio
	31	Runoff Factor After Dispersion Techniques	0.66	unitless
	32	Design Capture Volume After Dispersion Techniques	297	cubic-feet
	33	Total Rain Barrel Volume Reduction	0	cubic-feet
Results	34	Final Adjusted Runoff Factor	0.66	unitless
	35	Final Effective Tributary Area	4,820	sq-ft
	36	Initial Design Capture Volume Retained by Dispersion Area and Rain Barrel(s)	0	cubic-feet
	37	Remaining Design Capture Volume Tributary to Tree Well(s)	297	cubic-feet

No Warning Messages

SSD-BMP Automated Worksheet I-2: Step 2. Dispersion Area Validation (V1.0)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Standard Dispersion Area Inputs	1	Drainage Basin ID or Name	-	-	-	-	-	-	-	-	-	-	unitless
	2	Final Design Capture Volume (DCV)	-	-	-	-	-	-	-	-	-	-	cubic-feet
	3	Is Hydromodification Control Applicable?	-	-	-	-	-	-	-	-	-	-	yes/no
	4	Total Impervious Area Dispersed to Pervious Surface	-	-	-	-	-	-	-	-	-	-	sq-ft
	5	Total Engineered Pervious Surface and/or Natural Soil Dispersion Area (Does Not Include Semi-Pervious Surfaces Serving as Dispersion Area)	-	-	-	-	-	-	-	-	-	-	sq-ft
	6	Ratio of Dispersed Impervious Area to Total Engineered Pervious Surface and/or Natural Soil Dispersion Area	-	-	-	-	-	-	-	-	-	-	unitless
	7	Dispersion Area Length (Length of Sheet Flow Across Dispersion Area)					10						feet
	8	Dispersion Area Slope					0.5						%
	9	Thickness of Amended Soil					18						inches
	10	How is Flow Dispersed Across Width of Dispersion Area (definitions below*)?					Sheet Flow						unitless
Results	11	Is DCV Requirement Fully Satisfied by Dispersion Area?	-	-	-	-	-	-	-	-	-	-	yes/no
	12	Is Hydromodification Control Requirement Satisfied by Dispersion Area?	-	-	-	-	-	-	-	-	-	-	yes/no
	13	Are Dispersion Area Length, Slope, and Thickness of Amended Soil (when applicable) Adequate?	-	-	-	-	-	-	-	-	-	-	yes/no

No Warning Messages

Notes:

***How is Flow Dispersed Across Width of Pervious Dispersion Area?**

Sheet Flow:	Flow arrives as sheet flow across the width of the adjacent impervious area
Spreader(s):	Flow is discharged from flow spreader(s) across the width of the pervious area
Roof Drains:	Discharge from roof drains distributed across the width of the pervious area
Curb Cuts:	Discharge from curb cuts distributed across the width of the pervious area
Other:	Other (Describe in PDP SWQMP)

SSD-BMP Automated Worksheet I-3: Step 3. Tree Well Sizing (V1.0)				
Category	**#**	**Description**	***i***	**Units**
Standard Tree Well Inputs	1	Drainage Basin ID or Name	DMA-3001	unitless
	2	Design Capture Volume Tributary to BMP	297	cubic-feet
	3	Is Hydromodification Control Applicable?	Yes	yes/no
	4	Predominant NRCS Soil Type Within Tree Well(s) Location	C	unitless
	5	Select a Tree Species for the Tree Well(s) Consistent with SD-A Tree Palette Table Note: Numbers shown in list are Tree Species Mature Canopy Diameters	15' - Other	unitless
	6	Tree Well(s) Soil Depth (Installation Depth) Must be 30, 36, 42, or 48 Inches; Select from Standard Depths**	42	inches
	7	Number of Identical* Tree Wells Proposed for this DMA	11	trees
	8	Proposed Width of Tree Well(s) Soil Installation for One (1) Tree	5.0	feet
	9	Proposed Length of Tree Well(s) Soil Installation for One (1) Tree	22.5	feet
Tree Data	10	Botanical Name of Tree Species	Provide in PDP SWQMP	unitless
	11	Tree Species Mature Height per SD-A	Provide in PDP SWQMP	feet
	12	Tree Species Mature Canopy Diameter per SD-A	15	feet
	13	Minimum Soil Volume Required In Tree Well (2 Cubic Feet Per Square Foot of Mature Tree Canopy Projection Area)	353	cubic-feet
	14	Credit Volume Per Tree	100	cubic-feet
Tree Well Sizing Calculations	15	DCV Multiplier To Meet Flow Control Requirements	3.17	unitless
	16	Required Retention Volume (RRV) To Meet Flow Control Requirements	941	cubic-feet
	17	Number of Trees Required	10	trees
	18	Total Area of Tree Well Soil Required for Each Tree	101	sq-ft
	19	Approximate Required Width of Tree Well Soil Area for Each Tree	11	feet
	20	Approximate Required Length of Tree Well Soil Area for Each Tree	11	feet
	21	Number of Trees Proposed for this DMA	11	trees
	22	Total Area of Tree Well Soil Proposed for Each Tree	113	sq-ft
	23	Minimum Spacing Between Multiple Trees To Meet Soil Area Requirements (when applicable)***	22.5	feet
Results	24	Are Tree Well Soil Installation Requirements Met?	Yes	yes/no
	25	Is Remaining DCV Requirement Fully Satisfied by Tree Well(s)?	Yes	yes/no
	26	Is Hydromodification Control Requirement Satisfied by Tree Well(s)?	Yes	yes/no

Attention!

-[Line 12] Applicant to provide supporting documentation for tree species in PDP SWQMP.

Notes:

*If using more than one mature canopy diameter within the same DMA, only the smallest mature canopy diameter should be entered. Alternatively, if more than one matur

**If the actual proposed installation depth is not available in the table of standard depths, select the next lower depth.

***Tree Canopy or Agency Requirements May Also Influence the Minimum Spacing of Trees.