Priority Development Project (PDP)
Storm Water Quality Management Plan (SWQMP)

Majestic Airway

[Insert Permit Application Number]

[Insert Drawing Number (if applicable) and Internal Order Number (if applicable)]

☐ **Check if electing for offsite alternative compliance**

Engineer of Work:

Erin Lee, PE RCE#92949

Provide Wet Signature and Stamp Above Line

Prepared For:

Majestic Realty Co.

13191 Crossroads Parkway North, 6th Floor

City of Industry, CA 91746

[Insert Applicant Phone Number]

Prepared By:

Kimley-Horn

401 B Street, Suite 600

San Diego, CA 92101

619-234-9411

Date:

December 2022

Approved by: City of San Diego Date

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Project Name: Majestic Airway

Table of Contents

- Attachment 3: Structural BMP Maintenance Plan
    - Maintenance Agreement (Form DS-3247) (when applicable)
- Attachment 4: Copy of Plan Sheets Showing Permanent Storm Water BMPs
- Attachment 5: Project's Drainage Report
- Attachment 6: Project's Geotechnical and Groundwater Investigation Report

Acronyms

APN	Assessor's Parcel Number
ASBS	Area of Special Biological Significance
BMP	Best Management Practice
CEQA	California Environmental Quality Act
CGP	Construction General Permit
DCV	Design Capture Volume
DMA	Drainage Management Areas
ESA	Environmentally Sensitive Area
GLU	Geomorphic Landscape Unit
GW	Ground Water
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
HU	Harvest and Use
INF	Infiltration
LID	Low Impact Development
LUP	Linear Underground/Overhead Projects
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PDP	Priority Development Project
PE	Professional Engineer
POC	Pollutant of Concern
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWPPP	Stormwater Pollutant Protection Plan
SWQMP	Storm Water Quality Management Plan
TMDL	Total Maximum Daily Load
WMAA	Watershed Management Area Analysis
WPCP	Water Pollution Control Program
WQIP	Water Quality Improvement Plan

Certification Page

Project Name: Majestic Airway
Permit Application 632813

I hereby declare that I am the Engineer in Responsible Charge of design of storm water BMPs for this project, and that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the requirements of the Storm Water Standards, which is based on the requirements of SDRWQCB Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 (MS4 Permit).

I have read and understand that the City Engineer has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the Storm Water Standards. 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 source control and site design 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 the City Engineer is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of storm water BMPs for this project, of my responsibilities for project design.

Engineer of Work's Signature

92949

PE#

12/31/23

Expiration Date

Erin Lee, PE

Print Name

Kimley-Horn

Company

12/21/2022

Date

Engineer's Stamp

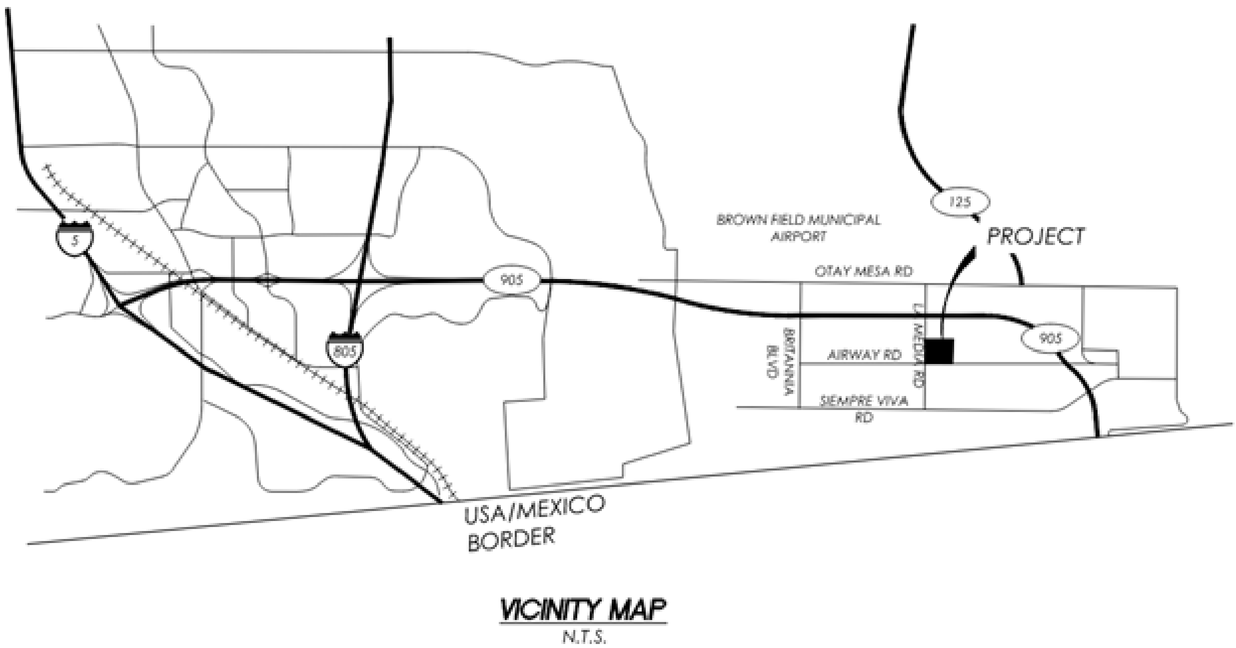
Submittal Record

Use this Table to keep a record of submittals of this PDP SWQMP. Each time the PDP SWQMP is re-submitted, provide the date and status of the project. In last column indicate changes that have been made or indicate if response to plancheck comments is included. When applicable, insert response to plancheck comments.

Submittal Number	Date	Project Status	Changes
1	08/2021	☑ Preliminary Design/Planning/CEQA ☐ Final Design	**Initial Submittal**
2	8/19/2022	☑ Preliminary Design/Planning/CEQA ☐ Final Design	3rd Submittal
3	12/21/2022	☑ Preliminary Design/Planning/CEQA ☐ Final Design	4th Submittal
4		☐ Preliminary Design/Planning/CEQA ☐ Final Design	

Project Vicinity Map

Project Name: Majestic Airway
Permit Application 632813



City of San Diego Form DS-560 Storm Water Requirements Applicability Checklist

Attach DS-560 form.

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Development Services

THE CITY OF SAN DIEGO

FORM
DS-560
September 2021

Stormwater Requirements Applicability Checklist

Project Address: La Media Rd & Airway Rd **Project Number:** 632813

SECTION 1: Construction Stormwater Best Management Practices (BMP) Requirements

All construction sites are required to implement construction BMPs per the performance standards in the Stormwater Standards Manual. Some sites are also required to obtain coverage under the State Construction General Permit (CGP)[1], administered by the California State Water Resources Control Board.

For all projects, complete Part A - If the project is required to submit a Stormwater Pollution Prevention Plan (SWPPP) or Water Pollution Control Plan (WPCP), continue to Part B.

PART A – Determine Construction Phase Stormwater Requirements

1. Is the project subject to California's statewide General National Pollutant Discharge Elimination System (NPDES) permit for Stormwater Discharges Associated with Construction Activities, also known as the State Construction General Permit (CGP)? (Typically projects with land disturbance greater than or equal to 1 acre.)

   ◉ Yes, SWPPP is required; skip questions 2-4. ○ No; proceed to the next question.

2. Does the project propose construction or demolition activity, including but not limited to, clearing, grading, grubbing, excavation, or any other activity resulting in ground disturbance and/or contact with stormwater?

   ○ Yes, WPCP is required; skip questions 3-4. ○ No; proceed to the next question.

3. Does the project propose routine maintenance to maintain the original line and grade, hydraulic capacity, or original purpose of the facility? (Projects such as pipeline/utility replacement)

   ○ Yes, WPCP is required; skip question 4. ○ No; proceed to the next question.

4. Does the project only include the following Permit types listed below?

   - Electrical Permit, Fire Alarm Permit, Fire Sprinkler Permit, Plumbing Permit, Sign Permit, Mechanical Permit, Spa Permit.
   - Individual Right of Way Permits that exclusively include only ONE of the following activities: water service, sewer lateral, or utility service.
   - Right of Way Permits with a project footprint less than 150 linear feet that exclusively include only ONE of the following activities: curb ramp, sidewalk and driveway apron replacement, potholing, curb and gutter replacement, and retaining wall encroachments.

   ☐ Yes, no document is required.

Check one of the boxes below and continue to Part B

◉ **If you checked "Yes" for question 1**, an SWPPP is REQUIRED – **continue to Part B**

○ **If you checked "No" for question 1 and checked "Yes" for question 2 or 3**, a WPCP is REQUIRED. If the project proposes less than 5,000 square feet of ground disturbance AND has less than a 5-foot elevation change over the entire project area, a Minor WPCP may be required instead. **Continue to Part B**

○ **If you check "No" for all questions 1-3 and checked "Yes" for question 4,** Part B does not apply, and no document is required. **Continue to Section 2.**

[1] More information on the City's construction BMP requirements as well as CGP requirements can be found at http://www.sandiego.gov/stormwater/regulations/index.shtml

CLEAR FORM

PART B – Determine Construction Site Priority

This prioritization must be completed within this form, noted on the plans, and included in the SWPPP or WPCP. The city reserves the right to adjust the priority of projects both before and after construction. Construction projects are assigned an inspection frequency based on if the project has a "high threat to water quality." The City has aligned the local definition of "high threat to water quality" to the risk determination approach of the State Construction General Permit (CGP). The CGP determines risk level based on project specific sediment risk and receiving water risk. Additional inspection is required for projects within the Areas of Special Biological Significance (ASBS) watershed. **NOTE:** The construction priority does **NOT** change construction BMP requirements that apply to projects; rather, it determines the frequency of inspections that will be conducted by city staff.

Complete Part B and continue to Section 2

☐ **1. ASBS**

A. Projects located in the ASBS watershed.

☑ **2. High Priority**

A. Projects that qualify as Risk Level 2 or Risk Level 3 per the Construction General Permit (CGP) and are not located in the ASBS watershed.
B. Projects that qualify as LUP Type 2 or LUP Type 3 per the CGP and are not located in the ASBS watershed.

☐ **3. Medium Priority**

A. Projects that are not located in an ASBS watershed or designated as a High priority site.
B. Projects that qualify as Risk Level 1 or LUP Type 1 per the CGP and are not located in an ASBS watershed.
C. WPCP projects (>5,000 square feet of ground disturbance) located within the Los Peñasquitos watershed management area.

☐ **4. Low Priority**

A. Projects not subject to a Medium or High site priority designation and are not located in an ASBS watershed.

Section 2: Construction Stormwater BMP Requirements

Additional information for determining the requirements is found in the Stormwater Standards Manual.

PART C – Determine if Not Subject to Permanent Stormwater Requirements

Projects that are considered maintenance or otherwise not categorized as "new development projects" or "redevelopment projects" according to the Stormwater Standards Manual are not subject to Permanent Stormwater BMPs.

- **If "yes" is checked for any number in Part C**: Proceed to Part F and check "Not Subject to Permanent Stormwater BMP Requirements."
- **If "no" is checked for all the numbers in Part C:** Continue to Part D.

1. Does the project only include interior remodels and/or is the project entirely within an existing enclosed structure and does not have the potential to contact stormwater?

   ○ Yes ◉ No

2. Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces?

   ○ Yes ◉ No

3. Does the project fall under routine maintenance? Examples include but are not limited to roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (grinding, overlay and pothole repair).

   ○ Yes ◉ No

CLEAR FORM

PART D – PDP Exempt Requirements

PDP Exempt projects are required to implement site design and source control BMPs.

- **If "yes" is checked for any questions in Part D**, continue to Part F and check the box labeled "PDP Exempt."
- **If "no" is checked for all questions in Part D**, continue to Part E.

1. Does the project ONLY include new or retrofit sidewalks, bicycle lanes, or trails that:
   - Are designed and constructed to direct stormwater runoff to adjacent vegetated areas, or other non-erodible permeable areas? Or;
   - Are designed and constructed to be hydraulically disconnected from paved streets and roads? Or;
   - Are designed and constructed with permeable pavements or surfaces in accordance with the Green Streets guidance in the City's Stormwater Standards manual?

   ○ Yes, PDP exempt requirements apply ◉ No, proceed to next question

2. Does the project ONLY include retrofitting or redeveloping existing paved alleys, streets or roads designed and constructed in accordance with the Green Streets guidance in the City's Stormwater Standards Manual?

   ○ Yes, PDP exempt requirements apply ◉ No, proceed to next question

PART E – Determine if Project is a Priority Development Project (PDP)

Projects that match one of the definitions below are subject to additional requirements, including preparation of a Stormwater Quality Management Plan (SWQMP).

- **If "yes" is checked for any number in Part E**, continue to Part F and check the box labeled "Priority Development Project."
- **If "no" is checked for every number in Part E**, continue to Part F and check the box labeled "Standard Development Project."

1. **New development that creates 10,000 square feet or more of impervious surfaces collectively over the project site.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ◉ Yes ○ No

2. **Redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surfaces on an existing site of 10,000 square feet or more of impervious surfaces.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ○ Yes ◉ No

3. **New development or redevelopment of a restaurant.** Facilities that sell prepared foods and beverages for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (Standard Industrial Classification (SIC) 5812), and where the land development creates and/or replaces 5,000 square feet or more of impervious surface. ○ Yes ◉ No

4. **New development or redevelopment on a hillside.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater. ○ Yes ◉ No

5. **New development or redevelopment of a parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).** ◉ Yes ○ No

6. **New development or redevelopment of streets, roads, highways, freeways, and driveways.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site). ◉ Yes ○ No

CLEAR FORM

7. **New development or redevelopment discharging directly to an environmentally sensitive area.** The project creates and/or replaces 2,500 square feet of impervious surface (collectively over the project site), and discharges directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). ○ Yes ◉ No

8. **New development or redevelopment projects of retail gasoline outlet (RGO) that create and/or replaces 5,000 square feet of impervious surface.** The development project meets the following criteria: (a) 5,000 square feet or more or (b) has a projected Average Daily Traffic (ADT) of 100 or more vehicles per day. ○ Yes ◉ No

9. **New development or redevelopment projects of an automotive repair shop that creates and/or replaces 5,000 square feet or more of impervious surfaces.** Development projects categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534 or 7536-7539. ○ Yes ◉ No

10. **Other Pollutant Generating Project.** These projects are not covered in any of the categories above but involve the disturbance of one or more acres of land and are expected to generate post-construction phase pollutants, including fertilizers and pesticides. This category does not include projects creating less than 5,000 square feet of impervious area and projects containing landscaping without a requirement for the regular use of fertilizers and pesticides (such as a slope stabilization project using native plants). Impervious area calculations need not include linear pathways for infrequent vehicle use, such as emergency maintenance access or bicycle and pedestrian paths if the linear pathways are built with pervious surfaces or if runoff from the pathway sheet flows to adjacent pervious areas. ○ Yes ◉ No

PART F – Select the appropriate category based on the outcomes of Part C through Part E

1. The project is **NOT SUBJECT TO PERMANENT STORMWATER REQUIREMENTS** ○ Yes ○ No
2. The project is a **STANDARD DEVELOPMENT PROJECT**. Site design and source control BMP requirements apply. See the Stormwater Standards Manual for guidance. ○ Yes ○ No
3. The Project is **PDP EXEMPT**. Site design and source control BMP requirements apply. Refer to the Stormwater Standards Manual for guidance. ○ Yes ○ No
4. The project is a **PRIORITY DEVELOPMENT PROJECT**. Site design, source control and structural pollutant control BMP requirements apply. Refer to the Stormwater Standards Manual for guidance on determining if the project requires hydromodification plan management. ◉ Yes ○ No

Erin Lee

Name of Owner or Agent

Civil Engineer

Title

Signature

12/21/2022

Date

CLEAR FORM

Applicability of Permanent, Post-Construction Storm Water BMP Requirements			Form I-1
Project Identification			
Project Name: Majestic Airway			
Permit Application Number: 632813			Date: December 2022
Determination of Requirements			
The purpose of this form is to identify permanent, post-construction requirements that apply to the project. This form serves as a short summary of applicable requirements, in some cases referencing separate forms that will serve as the backup for the determination of requirements. Answer each step below, starting with **Step 1** and progressing through each step until reaching "Stop". Refer to the manual sections and/or separate forms referenced in each step below.			
Step	**Answer**	**Progression**	
Step 1: Is the project a "development project"? See Section 1.3 of the manual (Part 1 of Storm Water Standards) for guidance.	☑ Yes	Go to **Step 2**.	
	☐ No	**Stop**. Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.	
Discussion / justification if the project is not a "development project" (e.g., the project includes *only* interior remodels within an existing building): N/A			
Step 2: Is the project a Standard Project, PDP, or PDP Exempt? To answer this item, see Section 1.4 of the manual in its entirety for guidance AND complete Form DS-560, Storm Water Requirements Applicability Checklist.	☐ Standard Project	**Stop.** Standard Project requirements apply	
	☑ PDP	PDP requirements apply, including PDP SWQMP. Go to **Step 3**.	
	☐ PDP Exempt	**Stop.** Standard Project requirements apply. Provide discussion and list any additional requirements below.	
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable: N/A			

Project Name: Majestic Airway

Form I-1 Page 2 of 2			
Step	**Answer**		**Progression**
Step 3. Is the project subject to earlier PDP requirements due to a prior lawful approval? See Section 1.10 of the manual (Part 1 of Storm Water Standards) for guidance.	☐ Yes		Consult the City Engineer to determine requirements. Provide discussion and identify requirements below. Go to **Step 4**.
	☑ No		BMP Design Manual PDP requirements apply. Go to **Step 4**.
Discussion / justification of prior lawful approval, and identify requirements (<u>not required if prior lawful approval does not apply</u>): N/A			
Step 4. Do hydromodification control requirements apply? See Section 1.6 of the manual (Part 1 of Storm Water Standards) for guidance.	☑ Yes		PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6). Go to **Step 5**.
	☐ No		**Stop**. PDP structural BMPs required for pollutant control (Chapter 5) only. Provide brief discussion of exemption to hydromodification control below.
Discussion / justification if hydromodification control requirements do <u>not</u> apply: N/A			
Step 5. Does protection of critical coarse sediment yield areas apply? See Section 6.2 of the manual (Part 1 of Storm Water Standards) for guidance.	☐ Yes		Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2). **Stop**.
	☑ No		Management measures not required for protection of critical coarse sediment yield areas. Provide brief discussion below. **Stop**.
Discussion / justification if protection of critical coarse sediment yield areas does <u>not</u> apply: There is no CCSYA onsite or upstream.			

HMP Exemption Exhibit

Attach a HMP Exemption Exhibit that shows direct storm water runoff discharge from the project site to HMP exempt area. Include project area, applicable underground storm drain line and/or concrete lined channels, outfall information and exempt waterbody.
Reference applicable drawing number(s).

Exhibit must be provided on 11"x17" or larger paper.

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Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	Majestic Airway
Project Address	La Media Rd at Airway Rd San Diego, CA 92154
Assessor's Parcel Number(s) (APN(s))	646-121-35
Permit Application Number	632813
Project Watershed	Select One: ☐ San Dieguito River ☐ Penasquitos ☐ Mission Bay ☐ San Diego River ☐ San Diego Bay ☑ Tijuana River
Hydrologic subarea name with Numeric Identifier up to two decimal places (9XX.XX)	Hydrologic Unit Tijuana 911, Subarea Tijuana Valley 911.1
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	30.42 Acres (1,325,095 Square Feet)
Area to be disturbed by the project (Project Footprint)	24.82 Acres (1,080,942 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	21.77 Acres (948,195 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	3.05 Acres (132,747 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Project Area.	
The proposed increase or decrease in impervious area in the proposed condition as compared to the pre-project condition	100 %

Project Name: Majestic Airway

Form I-3B Page 2 of 11
Description of Existing Site Condition and Drainage Patterns
Current Status of the Site (select all that apply): ☐Existing development ☐Previously graded but not built out ☐Agricultural or other non-impervious use ☑Vacant, undeveloped/natural Description / Additional Information:
Existing Land Cover Includes (select all that apply): ☑Vegetative Cover ☐Non-Vegetated Pervious Areas ☐Impervious Areas Description / Additional Information:
Underlying Soil belongs to Hydrologic Soil Group (select all that apply): ☐NRCS Type A ☐NRCS Type B ☐NRCS Type C ☑NRCS Type D
Approximate Depth to Groundwater: ☐Groundwater Depth < 5 feet ☐5 feet < Groundwater Depth < 10 feet ☐10 feet < Groundwater Depth < 20 feet ☑Groundwater Depth > 20 feet
Existing Natural Hydrologic Features (select all that apply): ☑Watercourses ☐Seeps ☐Springs ☐Wetlands ☐None Description / Additional Information: The La Media Channel flows along the north and west property lines.

Form I-3B Page 3 of 11
Description of Existing Site Topography and Drainage
How is storm water runoff conveyed from the site? At a minimum, this description should answer: 1. Whether existing drainage conveyance is natural or urban; 2. If runoff from offsite is conveyed through the site? If yes, quantification of all offsite drainage areas, design flows, and locations where offsite flows enter the project site and summarize how such flows are conveyed through the site; 3. Provide details regarding existing project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, and natural and constructed channels; 4. Identify all discharge locations from the existing project along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide summary of the pre-project drainage areas and design flows to each of the existing runoff discharge locations.
Descriptions/Additional Information
The existing drainage of the site is natural. Runoff from offsite is conveyed through the site along the northern and western property lines in an existing channel. The existing channel is within a drainage easement to the State of CA. The existing project site stormwater runoff overland flows west to discharge into the existing channel which then flows south where it's collected in 18" culverts and enters the City of San Diego Storm drain system. The project site has one discharge location along the western property line where stormwater flows are collected in 18" culverts that run under La Media Road. Drainage Area 1 22.9 AC Q50 = 21.6cfs Drainage Area 2 6.7 AC Q50 = 7.8cfs For more information on existing conditions, reference the project drainage study, see Attachment 5.

Project Name: Majestic Airway

Form I-3B Page 4 of 11
Description of Proposed Site Development and Drainage Patterns
Project Description / Proposed Land Use and/or Activities: The Majestic Airway project consists of three industrial distribution centers on an approximately 32.5-acre area located within the Otay Mesa community of San Diego, California. The project includes the grading of the existing parcel for three industrial distribution centers along with parking areas, loading docks, and driveways.
List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features): Three industrial buildings, parking areas, loading docks, and sidewalks.
List/describe proposed pervious features of the project (e.g., landscape areas): Landscape areas and three biofiltration basins.
Does the project include grading and changes to site topography? ☑ Yes ☐ No Description / Additional Information: The project is proposed to generally drain from the east to the west, as it does today. Topography will be sloped to capture stormwater runoff to the proposed biofiltration basins for treatment and hydromodification control.

Form I-3B Page 5 of 11

Does the project include changes to site drainage (e.g., installation of new storm water conveyance systems)?

☑ Yes

☐ No

If yes, provide details regarding the proposed project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural and constructed channels, and the method for conveying offsite flows through or around the proposed project site. Identify all discharge locations from the proposed project site along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide a summary of pre and post-project drainage areas and design flows to each of the runoff discharge locations. Reference the drainage study for detailed calculations.

Description / Additional Information:

The project site generally flows from east to west. A majority of the runoff will be directed through the center proprietary biofiltration basins and underground stormwater detention tank.

The project has four discharge locations. Discharge locations 1&2 will discharge to the future channel to the west of the site. Discharge locations 3&4 will discharge into the storm drain system in Airway Road. The proposed biofiltration basins (standard and proprietary) and underground detention tank will provide pollutant control, hydromodification control, and detention per the Otay Mesa Community Plan Update.

See below excerpts from the Majestic Airway Drainage Study summarizing the existing and proposed conditions hydrology. Reference the drainage study for more detailed calculations.

Table 3–1 Existing Conditions Hydrology

Basin ID	Runoff Coefficient	Area (acres)	Flow Rate (cfs)				
			5 Year	10 Year	25 Year	50 Year	100 Year
1	0.35	22.9	13.6	15.6	17.8	21.6	23.9
2	0.35	6.7	4.8	5.6	6.5	7.8	8.6
Total		29.6	18.4	21.2	24.3	29.4	32.5

Table 4–1 Proposed Detention Basin Summary

Storm Event	Existing Runoff	Proposed Runoff	Proposed Released	Runoff Detained	Maximum Water Surface Elevation			
					Basin 1	Basin 2	Basin 3	Basin 4
(yr)	Q (cfs)	Q (cfs)	Q (cfs)	Q (cfs)	ft	ft	ft	ft
5	18.4	64.9	15.3	49.6	475.21	477.73	479.21	479.49
10	21.2	74.9	18.5	56.4	475.42	477.78	479.23	479.50
25	24.4	85.3	20.7	64.6	475.58**	477.84	479.26	479.52
50	29.4	100.6	22.9	77.7	476.03*	477.92	479.30	479.54
100	32.6	110.9	24.4	86.5	476.22*	477.97	479.33	479.56
Top of Basin					476.25	479.0	480.5	480.82
100 Year Freeboard (feet)					0.03	1.03	1.17	1.26
Basin Volume Provided (cubic feet)					85,517	46,636	26,924	11,218
*25-yr TW at 475.6' elevation condition applied to analysis								
**100-yr TW at 476' elevation condition applied to analysis								

Form I-3B Page 6 of 11
Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply): ☑Onsite storm drain inlets ☐Interior floor drains and elevator shaft sump pumps ☐Interior parking garages ☐Need for future indoor & structural pest control ☑Landscape/outdoor pesticide use ☐Pools, spas, ponds, decorative fountains, and other water features ☐Food service ☑Refuse areas ☑Industrial processes ☐Outdoor storage of equipment or materials ☐Vehicle and equipment cleaning ☐Vehicle/equipment repair and maintenance ☐Fuel dispensing areas ☑Loading docks ☑Fire sprinkler test water ☐Miscellaneous drain or wash water ☑Plazas, sidewalks, and parking lots Description/Additional Information:

Form I-3B Page 7 of 11
Identification and Narrative of Receiving Water
Narrative describing flow path from discharge location(s), through urban storm conveyance system, to receiving creeks, rivers, and lagoons and ultimate discharge location to Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable) Runoff from the project will enter the existing storm conveyance system located near the southwest corner of the property which discharges indirectly to the Tijuana River, leads to the Tijuana River Estuary, and discharges out to the Pacific Ocean.
Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations Industrial service supply, contact water recreation, non-contact water recreation, preservation of biological habitats of special significance, warm freshwater habitat, wildlife habitat, rare, threatened, or endangered species, commercial and sport fishing, estuarine habitat, marine habitat, migration of aquatic organisms, spawning, reproduction, and/ or early development, and shellfish harvesting.
Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations None.
Provide distance from project outfall location to impaired or sensitive receiving waters The project is approximately 3.1 miles north of the Tijuana River.
Summarize information regarding the proximity of the permanent, post-construction storm water BMPs to the City's Multi-Habitat Planning Area and environmentally sensitive lands The project is across the street from a grassland Multi-Habitat Planning Area located southwest of the project site at the corner of La Media Road and Airway Road.

Project Name: Majestic Airway

Form I-3B Page 8 of 11

Identification of Receiving Water Pollutants of Concern

List any 303(d) impaired water bodies within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:

303(d) Impaired Water Body (Refer to Appendix K)	Pollutant(s)/Stressor(s) (Refer to Appendix K)	TMDLs/WQIP Highest Priority Pollutant (Refer to Table 1-4 in Chapter 1)
Tijuana River	Eutrophic, Indicator Bacteria, Low Dissolved Oxygen, Pesticides, Phosphorus, Sedimentation/siltation, Selenium, Solids, Surfactants, Synthetic Organics, Total Nitrogen as N, Toxicity, Trace Elements, Trash	Nutrients- Oxygen Demanding, Bacteria, Pesticides, Sediment, Uncategorized, Other Organics - Oxygen Demanding, Heavy Metals, Trash & Debris
Tijuana River Estuary	Eutrophic, Indicator Bacteria, Lead, Low Dissolved Oxygen, Nickel, Pesticides, pH, Solids, Synthetic Organics, Thallium, Trash, Turbidity	Eutrophic, Lead, Low Dissolved Oxygen, Nickel, Pesticides, Thallium, Trash, Turbidity
Pacific Ocean Shoreline, Tijuana HU at Tijuana River Mouth	Enterococcus, Fecal Coliform, Total Coliform	Enterococcus, Fecal Coliform, Total Coliform

Identification of Project Site Pollutants*

*Identification of project site pollutants is only required if flow-thru treatment BMPs are implemented onsite in lieu of retention or biofiltration BMPs (note the project must also participate in an alternative compliance program unless prior lawful approval to meet earlier PDP requirements is demonstrated)

Identify pollutants anticipated from the project site based on all proposed use(s) of the site (see Appendix B.6):

Pollutant	Not Applicable to the Project Site	Anticipated from the Project Site	Also a Receiving Water Pollutant of Concern
Sediment	☐	☐	☐
Nutrients	☐	☐	☐
Heavy Metals	☐	☐	☐
Organic Compounds	☐	☐	☐
Trash & Debris	☐	☐	☐
Oxygen Demanding Substances	☐	☐	☐
Oil & Grease	☐	☐	☐
Bacteria & Viruses	☐	☐	☐
Pesticides	☐	☐	☐

Form I-3B Page 9 of 11
Hydromodification Management Requirements
Do hydromodification management requirements apply (see Section 1.6)? ☑ Yes, hydromodification management flow control structural BMPs required. ☐ No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean. ☐ No, the 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. ☐ No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA for the watershed in which the project resides. Description / Additional Information (to be provided if a 'No' answer has been selected above): Note: If "No" answer has been selected the SWQMP must include an exhibit that shows the storm water conveyance system from the project site to an exempt water body. The exhibit should include details about the conveyance system and the outfall to the exempt water body.
Critical Coarse Sediment Yield Areas* ***This Section only required if hydromodification management requirements apply**
Based on Section 6.2 and Appendix H does CCSYA exist on the project footprint or in the upstream area draining through the project footprint? ☐ Yes ☑ No Discussion / Additional Information: No CCSYAs exist on or upstream of the project site.

Form I-3B Page 10 of 11
Flow Control for Post-Project Runoff* ***This Section only required if hydromodification management requirements apply**
List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit. The Project Site has four POCs. POC 1&2 are located on the western property line and discharge into the future channel. POC 3&4 are located on the southern property line and discharge into the future storm drain system in Airway Road.
Has a geomorphic assessment been performed for the receiving channel(s)? ☑ No, the low flow threshold is $0.1Q_2$ (default low flow threshold) ☐ Yes, the result is the low flow threshold is $0.1Q_2$ ☐ Yes, the result is the low flow threshold is $0.3Q_2$ ☐ Yes, the result is the low flow threshold is $0.5Q_2$ If a geomorphic assessment has been performed, provide title, date, and preparer:
Discussion / Additional Information: (optional)

Form I-3B Page 11 of 11
Other Site Requirements and Constraints
When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements. The project is located within a light industrial zone. Setback requirements are 15' minimum for the front (20' standard), 10' minimum for the sides, 15' minimum from the streets (20' standard), and no minimum for the rear (15' standard). The western channel will have a tailwater condition for POCs 1&2 in the 100-year storm event. There is also a Riparian buffer zone along the northern property line that does not allow any grading within the limits.
Optional Additional Information or Continuation of Previous Sections As Needed
This space provided for additional information or continuation of information from previous sections as needed.

Source Control BMP Checklist for PDPs			Form I-4B
Source Control BMPs			
All development projects must implement source control BMPs where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of the Storm Water Standards) for information to implement source control BMPs shown in this checklist. Answer each category below pursuant to the following. • "Yes" means the project will implement the source control BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required. • "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided. • "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion / justification may be provided.			
Source Control Requirement	**Applied?**		
4.2.1 Prevention of Illicit Discharges into the MS4	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.1 not implemented:			
4.2.2 Storm Drain Stenciling or Signage	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.2 not implemented:			
4.2.3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.3 not implemented:			
4.2.4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.4 not implemented:			
4.2.5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.5 not implemented:			

Project Name: Majestic Airway

Form I-4B Page 2 of 2			
Source Control Requirement	**Applied?**		
4.2.6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below)			
On-site storm drain inlets	☑ Yes	☐ No	☐ N/A
Interior floor drains and elevator shaft sump pumps	☐ Yes	☐ No	☑ N/A
Interior parking garages	☐ Yes	☐ No	☑ N/A
Need for future indoor & structural pest control	☐ Yes	☐ No	☑ N/A
Landscape/Outdoor Pesticide Use	☑ Yes	☐ No	☐ N/A
Pools, spas, ponds, decorative fountains, and other water features	☐ Yes	☐ No	☑ N/A
Food service	☐ Yes	☐ No	☑ N/A
Refuse areas	☑ Yes	☐ No	☐ N/A
Industrial processes	☑ Yes	☐ No	☐ N/A
Outdoor storage of equipment or materials	☑ Yes	☐ No	☐ N/A
Vehicle/Equipment Repair and Maintenance	☐ Yes	☐ No	☑ N/A
Fuel Dispensing Areas	☐ Yes	☐ No	☑ N/A
Loading Docks	☑ Yes	☐ No	☐ N/A
Fire Sprinkler Test Water	☑ Yes	☐ No	☐ N/A
Miscellaneous Drain or Wash Water	☐ Yes	☐ No	☑ N/A
Plazas, sidewalks, and parking lots	☑ Yes	☐ No	☐ N/A
SC-6A: Large Trash Generating Facilities	☐ Yes	☐ No	☑ N/A
SC-6B: Animal Facilities	☐ Yes	☐ No	☑ N/A
SC-6C: Plant Nurseries and Garden Centers	☐ Yes	☐ No	☑ N/A
SC-6D: Automotive Facilities	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.2.6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for all "No" answers shown above.			

Project Name: Majestic Airway

Site Design BMP Checklist for PDPs			Form I-5B
Site Design BMPs			
All development projects must implement site design BMPs where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of Storm Water Standards) for information to implement site design BMPs shown in this checklist. Answer each category below pursuant to the following. • "Yes" means the project will implement the site design BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required. • "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided. • "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification may be provided. A site map with implemented site design BMPs must be included at the end of this checklist.			
Site Design Requirement	**Applied?**		
4.3.1 Maintain Natural Drainage Pathways and Hydrologic Features	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.1 not implemented:			
1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map?	☑ Yes	☐ No	☐ N/A
1-2 Are trees implemented? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
1-3 Implemented trees meet the design criteria in 4.3.1 Fact Sheet (e.g. soil volume, maximum credit, etc.)?	☐ Yes	☐ No	☑ N/A
1-4 Is tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A
4.3.2 Have natural areas, soils and vegetation been conserved?	☐ Yes	☑ No	☐ N/A
Discussion / justification if 4.3.2 not implemented: Site is to be fully developed besides the riparian buffer zone which will be left in its natural, existing condition.			

Project Name: Majestic Airway

Form I-5B Page 2 of 4			
Site Design Requirement	**Applied?**		
4.3.3 Minimize Impervious Area	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.3 not implemented:			
4.3.4 Minimize Soil Compaction	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.4 not implemented:			
4.3.5 Impervious Area Dispersion	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.5 not implemented:			
5-1 Is the pervious area receiving runon from impervious area identified on the site map?	☐ Yes	☐ No	☑ N/A
5-2 Does the pervious area satisfy the design criteria in 4.3.5 Fact Sheet in Appendix E (e.g. maximum slope, minimum length, etc.)	☐ Yes	☐ No	☑ N/A
5-3 Is impervious area dispersion credit volume calculated using Appendix B.2.1.1 and 4.3.5 Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A

Project Name: Majestic Airway

Form I-5B Page 3 of 4			
Site Design Requirement	**Applied?**		
4.3.6 Runoff Collection	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.6 not implemented:			
6a-1 Are green roofs implemented in accordance with design criteria in 4.3.6A Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
6a-2 Is the green roof credit volume calculated using Appendix B.2.1.2 and 4.3.6A Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A
6b-1 Are permeable pavements implemented in accordance with design criteria in 4.3.6B Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
6b-2 Is the permeable pavement credit volume calculated using Appendix B.2.1.3 and 4.3.6B Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A
4.3.7 Landscaping with Native or Drought Tolerant Species	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.7 not implemented:			
4.3.8 Harvest and Use Precipitation	☐ Yes	☑ No	☐ N/A
Discussion / justification if 4.3.8 not implemented: Irrigation demand is not sufficient for rainwater harvesting because drought tolerant landscape is proposed on the project site.			
8-1 Are rain barrels implemented in accordance with design criteria in 4.3.8 Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
8-2 Is the rain barrel credit volume calculated using Appendix B.2.2.2 and 4.3.8 Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A

Project Name: Majestic Airway

Form I-5B Page 4 of 4
Insert Site Map with all site design BMPs identified:

Project Name: Majestic Airway

Summary of PDP Structural BMPs	Form I-6
PDP Structural BMPs	
All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual, Part 1 of Storm Water Standards). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the BMP Design Manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s). PDP structural BMPs must be verified by the City at the completion of construction. This includes requiring the project owner or project owner's representative to certify construction of the structural BMPs (complete Form DS-563). PDP structural BMPs must be maintained into perpetuity (see Chapter 7 of the BMP Design Manual). Use this form to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet (page 3 of this form) for each structural BMP within the project (copy the BMP summary information page as many times as needed to provide summary information for each individual structural BMP).	
Describe the general strategy for structural BMP implementation at the site. This information must describe how the steps for selecting and designing storm water pollutant control BMPs presented in Section 5.1 of the BMP Design Manual were followed, and the results (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 the site is to collect and treat each DMA separately for water quality and hydromodification. DMA 1 has a proprietary biofiltration system that discharges into an underground stormwater tank because of lack of space for a standard biofiltration basin in landscaping. Worksheet B.6-1 was used to size BMPs 1a and 1b, MWS units, and then Worksheets B.5-2 and B.5-7 were used to calculate volume retention requirements. BMP 1, the underground stormwater tank was sized using the criteria in Appendix G of the Stormwater Standards Manual. The unit sizing factors from Table G.2-5 for biofiltration were used. The other BMPs are standard biofiltration basins. Biofiltration BMPs 2, 3, & 4 provide the minimum surface area per Worksheet B.5-1. The project combines pollutant treatment and hydromodification flow control within BMPs 2, 3, & 4. BMPs 2, 3, & 4 were sized using the criteria in Appendix G of the Stormwater Standards Manual. The unit sizing factors from Table G.2-5 for biofiltration were used. See associated BMP water quality sizing worksheets in Attachment 1 and the hydromodification sizing in Attachment 2. Infiltration considered infeasible, see Form I-8. (Continue on page 2 as necessary.)	

Project Name: Majestic Airway

Form I-6 Page 2 of
(Continued from page 1)

Project Name: Majestic Airway

Form I-6 Page of (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. 1a	
Construction Plan Sheet No. C5	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☒ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☒ Pollutant control only ☐ Hydromodification control only ☐ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Kimley-Horn Erin Lee, PE Kimley-Horn
Who will be the final owner of this BMP?	COMMERCE CONSTRUCTION CO, L.P.
Who will maintain this BMP into perpetuity?	COMMERCE CONSTRUCTION CO, L.P.
What is the funding mechanism for maintenance?	COMMERCE CONSTRUCTION CO, L.P.

Project Name: Majestic Airway

Form I-6 Page of (Copy as many as needed)
Structural BMP ID No. 1a
Construction Plan Sheet No. C5
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): BMP 1A is 3 Modular Wetlands MWS-L-8-24. See attachment 1 for Sizing Calculations.

Project Name: Majestic Airway

Form I-6 Page of (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. 1b	
Construction Plan Sheet No. C5	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☒ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☒ Pollutant control only ☐ Hydromodification control only ☐ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Kimley-Horn Erin Lee, PE Kimley-Horn
Who will be the final owner of this BMP?	COMMERCE CONSTRUCTION CO, L.P.
Who will maintain this BMP into perpetuity?	COMMERCE CONSTRUCTION CO, L.P.
What is the funding mechanism for maintenance?	COMMERCE CONSTRUCTION CO, L.P.

Project Name: Majestic Airway

Form I-6 Page of (Copy as many as needed)
Structural BMP ID No. 1b
Construction Plan Sheet No. C5
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): BMP 1b is 3 Modular Wetlands MWS-L-8-24. See attachment 1 for Sizing Calculations.

Project Name: Majestic Airway

Form I-6 Page of (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. 1	
Construction Plan Sheet No. C5	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☐ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☒ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☒ Hydromodification control only ☐ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Kimley-Horn Erin Lee, PE Kimley-Horn
Who will be the final owner of this BMP?	COMMERCE CONSTRUCTION CO, L.P.
Who will maintain this BMP into perpetuity?	COMMERCE CONSTRUCTION CO, L.P.
What is the funding mechanism for maintenance?	COMMERCE CONSTRUCTION CO, L.P.

Project Name: Majestic Airway

Form I-6 Page of (Copy as many as needed)
Structural BMP ID No. 1
Construction Plan Sheet No. C5
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): BMP 1 is a 85,500 CF of under ground storage vault with 3.8 inch diameter orifice. The vault is 3' tall and has an over flow weir at 2.5' leaving 0.5' of freeboard. The vault was sized using Appendix G of the City Storm Water Standards Manual. See attachment 2 for calculations and details.

Project Name: Majestic Airway

Form I-6 Page of (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. 2	
Construction Plan Sheet No. C5	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☒ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☒ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Kimley-Horn Erin Lee, PE Kimley-Horn
Who will be the final owner of this BMP?	COMMERCE CONSTRUCTION CO, L.P.
Who will maintain this BMP into perpetuity?	COMMERCE CONSTRUCTION CO, L.P.
What is the funding mechanism for maintenance?	COMMERCE CONSTRUCTION CO, L.P.

Project Name: Majestic Airway

Form I-6 Page of (Copy as many as needed)
Structural BMP ID No. 2
Construction Plan Sheet No. C5
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): BMP 2 is a Biofiltration Basin with a basin bottom area of 18,464 SF. The outlet structure is a riser that provides 12" of ponding and has a 2.3 in orifice 3" from the bottom of the aggregate storage layer. See Attachments 1 and 2 for calculations and details.

Project Name: Majestic Airway

Form I-6 Page of (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. 3	
Construction Plan Sheet No. C5	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☒ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☒ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Kimley-Horn Erin Lee, PE Kimley-Horn
Who will be the final owner of this BMP?	COMMERCE CONSTRUCTION CO, L.P.
Who will maintain this BMP into perpetuity?	COMMERCE CONSTRUCTION CO, L.P.
What is the funding mechanism for maintenance?	COMMERCE CONSTRUCTION CO, L.P.

Project Name: Majestic Airway

Form I-6 Page of (Copy as many as needed)
Structural BMP ID No. 3
Construction Plan Sheet No. C5
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): BMP 3 is a Biofiltration Basin with a basin bottom area of 8,588 SF. The outlet structure is a riser that provides 12" of ponding and has a 1.5 in orifice 3" from the bottom of the aggregate storage layer. See Attachments 1 and 2 for calculations and details.

Project Name: Majestic Airway

Form I-6 Page of (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. 4	
Construction Plan Sheet No. C5	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☒ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☒ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Kimley-Horn Erin Lee, PE Kimley-Horn
Who will be the final owner of this BMP?	COMMERCE CONSTRUCTION CO, L.P.
Who will maintain this BMP into perpetuity?	COMMERCE CONSTRUCTION CO, L.P.
What is the funding mechanism for maintenance?	COMMERCE CONSTRUCTION CO, L.P.

Form I-6 Page of (Copy as many as needed)
Structural BMP ID No. 4
Construction Plan Sheet No. C5
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): BMP 4 is a Biofiltration Basin with a basin bottom area of 3,770 SF. The outlet structure is a riser that provides 12" of ponding and has a 1.1 in orifice 3" from the bottom of the aggregate storage layer. See Attachments 1 and 2 for calculations and details.

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Attachment 1
Backup For PDP Pollutant Control BMPs

This is the cover sheet for Attachment 1.

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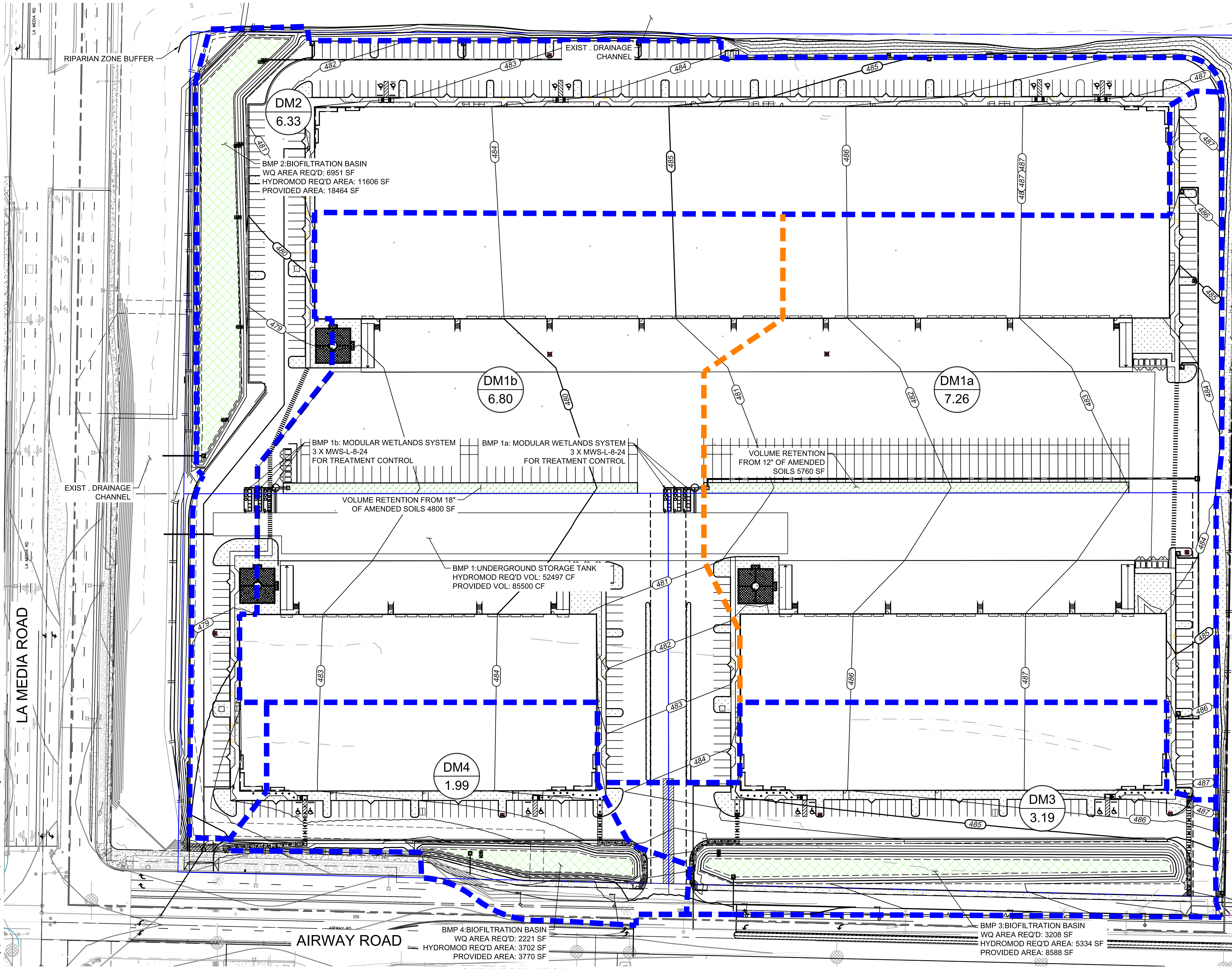
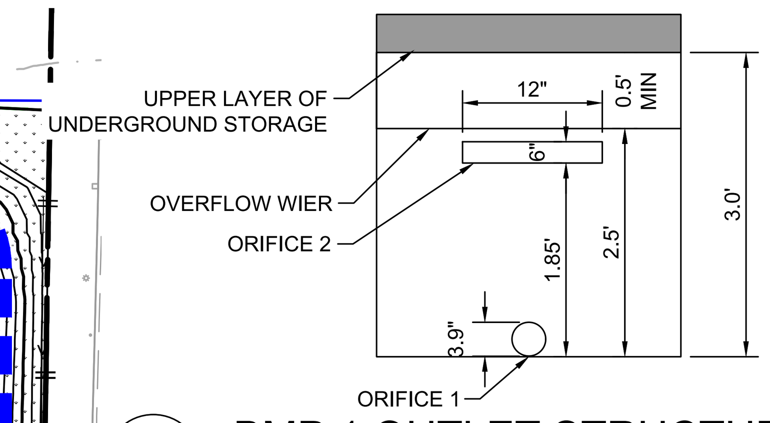
Project Name: Majestic Airway

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	☒ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	☐ Included on DMA Exhibit in Attachment 1a ☑ Included as Attachment 1b, separate from DMA Exhibit
Attachment 1c	Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs) Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7.	☑ Included ☐ Not included because the entire project will use infiltration BMPs
Attachment 1d	Infiltration Feasibility Information. Contents of Attachment 1d depend on the infiltration condition: • No Infiltration Condition: ○ Infiltration Feasibility Condition Letter (*Note: must be stamped and signed by licensed geotechnical engineer*) ○ Form I-8A (optional) ○ Form I-8B (optional) • Partial Infiltration Condition: ○ Infiltration Feasibility Condition Letter (*Note: must be stamped and signed by licensed geotechnical engineer*) ○ Form I-8A ○ Form I-8B • Full Infiltration Condition: ○ Form I-8A ○ Form I-8B ○ Worksheet C.4-3 ○ Form I-9 Refer to Appendices C and D of the BMP Design Manual for guidance.	☑ Included ☐ Not included because the entire project will use harvest and use BMPs
Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines and site design credit calculations	☑ Included



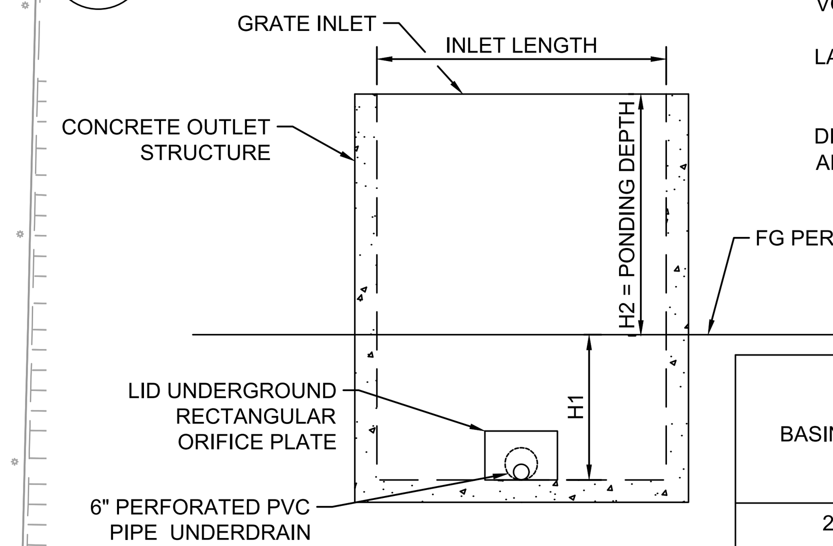


3 BMP 1 OUTLET STRUCTURE

NOT TO SCALE

LEGEND

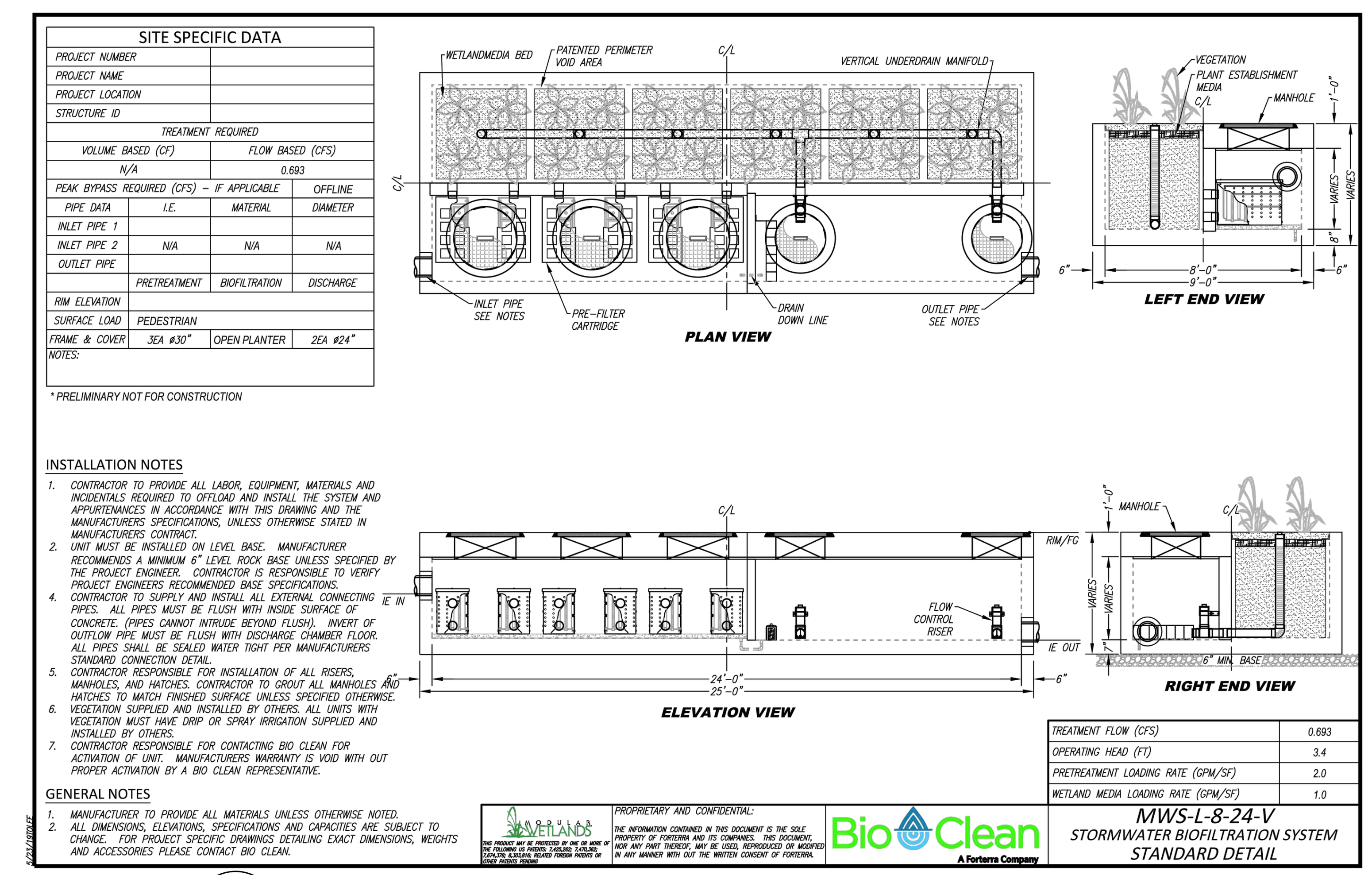
- PROPERTY BOUNDARY
- DRAINAGE MANAGEMENT AREA BOUNDARY
- DRAINAGE MANAGEMENT SUBAREA BOUNDARY
- EXISTING CONTOUR — XXXX
- PROPOSED CONTOUR — XXXX
- STORM DRAIN
- BIOFILTRATION BMP AREA
- VOLUME RETENTION AREA
- LANDSCAPE AREA
- DRAINAGE MANAGEMENT AREA LABEL — DMA / AREA — ACRES



BASIN ID	LID ORIFICE PLATE		GRATE INLET	
	H1	DIAMETER	H2	LENGTH
	INCHES	INCHES	INCHES	FEET
2	36	2.3	12	4
3	42	1.5	12	4
4	42	1.1	12	4

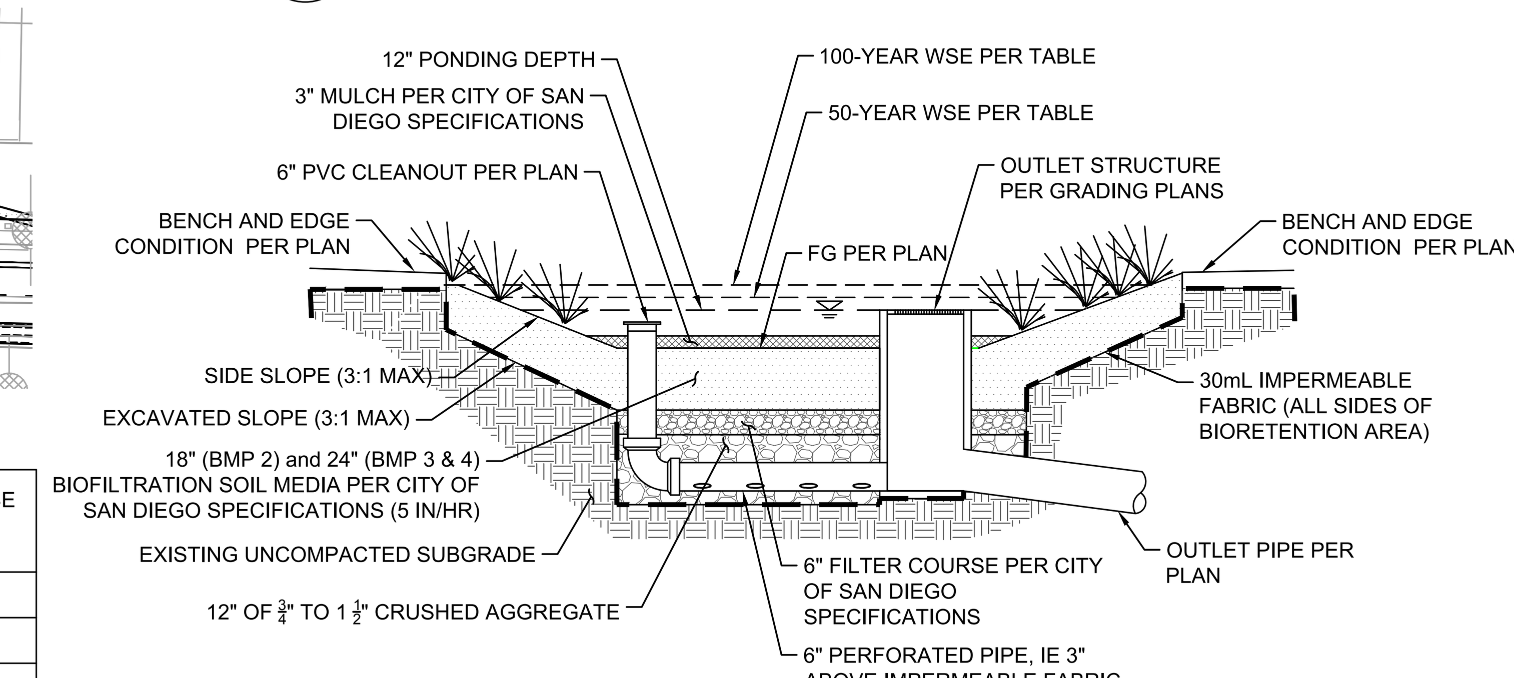
4 BMP 2, 3, 4 OUTLET STRUCTURE

NOT TO SCALE



2 TYPICAL MODULAR WETLANDS DETAIL

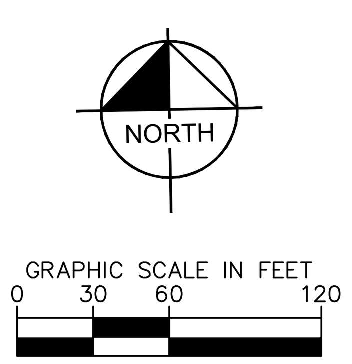
NOT TO SCALE



1 TYPICAL BIOFILTRATION WITH UNDERDRAIN

NOT TO SCALE

BASIN ID	WQ PONDING DEPTH	FG ELEVATION OF BASIN	50-YEAR WSE	100-YEAR WSE
	INCHES	FEET	FEET	FEET
2	12	476.50	477.92	477.97
3	12	478.00	479.30	479.33
4	12	478.32	479.54	479.56



DMA	TYPE	AREA (AC)
1a	DRAINS TO MWS BMP 1a & BMP 1	7.26
1b	DRAINS TO MWS BMP 1b & BMP 1	6.80
2	DRAINS TO BIOFILTRATION BMP 2	6.33
3	DRAINS TO BIOFILTRATION BMP 3	3.19
4	DRAINS TO BIOFILTRATION BMP 4	1.99

SITE INFORMATION

1. HYDROLOGICAL SOIL GROUP: TYPE D
2. EXISTING CONDITION HAS NO IMPERVIOUS AREAS
3. DEPTH TO GROUNDWATER: 16' - 36'
4. ALL BMPS ARE BIOFILTRATION
5. THERE ARE NO EXISTING CCYSA'S ONSITE OR UPSTREAM OF THE PROJECT SITE
6. AREAS NOT SHOWN AS LANDSCAPE ARE IMPERVIOUS

K:\SND_LDEV\195208002 - Majestic Airway\Stormwater\Exhibits\WQMP BMP EXHIBIT.dwg 12-21-22-8:30 AM

Kimley»Horn

21 December 2022

DMA EXHIBIT

MAJESTIC AIRWAY - SAN DIEGO, CALIFORNIA

Project Name: Majestic Airway

Tabular Summary of DMAs							Worksheet B-1		
DMA Unique Identifier	Area (acres)	Impervious Area (acres)	% Imp	HSG	Area Weighted Runoff Coefficient	DCV (cubic feet)	Treated By (BMP ID)	Pollutant Control Type	Drains to (POC ID)
1a	7.26	6.86	94.5	D	.86	10432	1a	MWS	1
1b	6.80	6.45	94.9	D	.86	9766	1b	MWS	1
2	6.33	5.22	82.5	D	.84	8882	2	Biofiltration Basin	2
3	3.19	2.37	74.3	D	.77	4099	3	Biofiltration Basin	3
4	1.99	1.62	81.4	D	.87	2837	4	Biofiltration Basin	4
Summary of DMA Information (Must match project description and SWQMP Narrative)									
No. of DMAs	Total DMA Area (acres)	Total Impervious Area (acres)	% Imp		Area Weighted Runoff Coefficient	Total DCV (cubic feet)	Total Area Treated (acres)		No. of POCs
5	25.57	22.52	88.1		.84	36016	25.57		4

<u>Where</u>: DMA = Drainage Management Area; Imp = Imperviousness; HSG = Hydrologic Soil Group; DCV= Design Capture Volume; BMP = Best Management Practice; POC = Point of Compliance; ID = identifier; No. = Number

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Harvest and Use Feasibility Checklist	Worksheet B.3-1 : Form I-7

1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?

☐ Toilet and urinal flushing
☑ Landscape irrigation
☐ Other:___________

2. If there is a demand; estimate the anticipated average wet season demand over a period of 36 hours. Guidance for planning level demand calculations for toilet/urinal flushing and landscape irrigation is provided in Section B.3.2.

[Provide a summary of calculations here]

ETWU = ETo(wet) * [[Sum(PF * HA) / IE] + SLA] * 0.015
= 2.8 * [[(0.1 * 185,550) / 0.9] + 0] * 0.015 = 866 gallons
(866 gallons) * (1 cf /7.481gallons) = 116 cf

3. Calculate the DCV using worksheet B-2.1.

DCV = 36,400 (cubic feet)

[Provide a summary of calculations here]

C=.87 A=1,091,473sf 85th percentile=.46 in
DCV= 0.87* 1,091,473 * (.46/12) = 36,400 CF

3a. Is the 36-hour demand greater than or equal to the DCV? ☐ Yes / ☑ No ⇨	3b. Is the 36-hour demand greater than 0.25DCV but less than the full DCV? ☐ Yes / ☑ No ⇨	3c. Is the 36-hour demand less than 0.25DCV? ☑ Yes
⇩	⇩	⇩
Harvest and use appears to be feasible. Conduct more detailed evaluation and sizing calculations to confirm that DCV can be used at an adequate rate to meet drawdown criteria.	Harvest and use may be feasible. Conduct more detailed evaluation and sizing calculations to determine feasibility. Harvest and use may only be able to be used for a portion of the site, or (optionally) the storage may need to be upsized to meet long term capture targets while draining in longer than 36 hours.	Harvest and use is considered to be infeasible.

Is harvest and use feasible based on further evaluation?

☐ Yes, refer to Appendix E to select and size harvest and use BMPs.
☑ No, select alternate BMPs.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions[1]	Worksheet C.4-1: Form I-8A[2]
Part 1 - Full Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	**Project Phase:**
Criteria 1: Infiltration Rate Screening	
1A	Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper Type A or B and corroborated by available site soil data[3]? ○ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result or continue to Step 1B if the applicant elects to perform infiltration testing. ○ No; the mapped soil types are A or B but is not corroborated by available site soil data (continue to Step 1B). ○ No; the mapped soil types are C, D, or "urban/unclassified" and is corroborated by available site soil data. Answer "No" to Criteria 1 Result. ○ No; the mapped soil types are C, D, or "urban/unclassified" but is not corroborated by available site soil data (continue to Step 1B).
1B	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1? ○ Yes; Continue to Step 1C. ○ No; Skip to Step 1D.
1C	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1 greater than 0.5 inches per hour? ○ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result. ○ No; full infiltration is not required. Answer "No" to Criteria 1 Result.
1D	**Infiltration Testing Method.** Is the selected infiltration testing method suitable during the design phase (see Appendix D.3)? Note: Alternative testing standards may be allowed with appropriate rationales and documentation. ○ Yes; continue to Step 1E. ○ No; select an appropriate infiltration testing method.

[1] Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, Part 3, or Part 4 determines a full, partial, or no infiltration condition.

[2] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site storm water design.

[3] Available data includes site-specific sampling or observation of soil types or texture classes, such as obtained from borings or test pits necessary to support other design elements.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[2]
1E	**Number of Percolation/Infiltration Tests.** Does the infiltration testing method performed satisfy the minimum number of tests specified in Table D.3-2? ◯ Yes; continue to Step 1F. ◯ No; conduct appropriate number of tests.
IF	**Factor of Safety.** Is the suitable Factor of Safety selected for full infiltration design? See guidance in D.5; Tables D.5-1 and D.5-2; and Worksheet D.5-1 (Form I-9). ◯ Yes; continue to Step 1G. ◯ No; select appropriate factor of safety.
1G	**Full Infiltration Feasibility.** Is the average measured infiltration rate divided by the Factor of Safety greater than 0.5 inches per hour? ◯ Yes; answer "Yes" to Criteria 1 Result. ◯ No; answer "No" to Criteria 1 Result.
Criteria 1 Result	Is the estimated reliable infiltration rate greater than 0.5 inches per hour within the DMA where runoff can reasonably be routed to a BMP? ◯ Yes; the DMA may feasibly support full infiltration. Continue to Criteria 2. ◯ No; full infiltration is not required. Skip to Part 1 Result.

Summarize infiltration testing methods, testing locations, replicates, and results and summarize estimates of reliable infiltration rates according to procedures outlined in D.5. Documentation should be included in project geotechnical report.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions			Worksheet C.4-1: Form I-8A[2]
Criteria 2: Geologic/Geotechnical Screening			
2A	If all questions in Step 2A are answered "Yes," continue to Step 2B. For any "No" answer in Step 2A answer "No" to Criteria 2, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
2A-1	Can the proposed full infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick below the infiltrating surface?	○ Yes	○ No
2A-2	Can the proposed full infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	○ Yes	○ No
2A-3	Can the proposed full infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	○ Yes	○ No
2B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1. If all questions in Step 2B are answered "Yes," then answer "Yes" to Criteria 2 Result. If there are any "No" answers continue to Step 2C.		
2B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can full infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	○ Yes	○ No
2B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can full infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	○ Yes	○ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
2B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011 or most recent edition). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can full infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	○Yes	○ No
2B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can full infiltration BMPs be proposed within the DMA without increasing slope stability risks?	○Yes	○ No
2B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can full infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	○Yes	○ No
2B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can full infiltration BMPs be proposed within the DMA using established setbacks from underground utilities, structures, and/or retaining walls?	○Yes	○ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
2C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 2B. Provide a discussion of geologic/geotechnical hazards that would prevent full infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for full infiltration BMPs? If the question in Step 2 is answered "Yes," then answer "Yes" to Criteria 2 Result. If the question in Step 2C is answered "No," then answer "No" to Criteria 2 Result.	○ Yes	○ No
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	○ Yes	○ No
Summarize findings and basis; provide references to related reports or exhibits.			

Part 1 Result – Full Infiltration Geotechnical Screening[4]	Result
If answers to both Criteria 1 and Criteria 2 are "Yes", a full infiltration design is potentially feasible based on Geotechnical conditions only. If either answer to Criteria 1 or Criteria 2 is "No", a full infiltration design is not required.	○ Full infiltration Condition ○ Complete Part 2

[4] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[2]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	Project Phase:
Criteria 3 : Infiltration Rate Screening	

3A	**NRCS Type C, D, or "urban/unclassified":** Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper is Type C, D, or "urban/unclassified" and corroborated by available site soil data? ○ Yes; the site is mapped as C soils and a reliable infiltration rate of 0.15 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ○ Yes; the site is mapped as D soils or "urban/unclassified" and a reliable infiltration rate of 0.05 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ○ No; infiltration testing is conducted (refer to Table D.3-1), continue to Step 3B.
3B	**Infiltration Testing Result:** Is the reliable infiltration rate (i.e. average measured infiltration rate/2) greater than 0.05 in/hr. and less than or equal to 0.5 in/hr? ○ Yes; the site may support partial infiltration. Answer "Yes" to Criteria 3 Result. ○ No; the reliable infiltration rate (i.e. average measured rate/2) is less than 0.05 in/hr., partial infiltration is not required. Answer "No" to Criteria 3 Result.
Criteria 3 Result	Is the estimated reliable infiltration rate (i.e., average measured infiltration rate/2) greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour at any location within each DMA where runoff can reasonably be routed to a BMP? ○ Yes; Continue to Criteria 4. ○ No: Skip to Part 2 Result.
Summarize infiltration testing and/or mapping results (i.e. soil maps and series description used for infiltration rate).	

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
Criteria 4: Geologic/Geotechnical Screening			
4A	If all questions in Step 4A are answered "Yes," continue to Step 2B. For any "No" answer in Step 4A answer "No" to Criteria 4 Result, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
4A-1	Can the proposed partial infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick?	○ Yes	○ No
4A-2	Can the proposed partial infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	○ Yes	○ No
4A-3	Can the proposed partial infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	○ Yes	○ No
4B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1. If all questions in Step 4B are answered "Yes," then answer "Yes" to Criteria 4 Result. If there are any "No" answers continue to Step 4C.		
4B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can partial infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	○ Yes	○ No
4B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can partial infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	○ Yes	○ No
4B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can partial infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	○ Yes	○ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
4B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can partial infiltration BMPs be proposed within the DMA without increasing slope stability risks?	○ Yes	○ No
4B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can partial infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	○ Yes	○ No
4B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can partial infiltration BMPs be proposed within the DMA using recommended setbacks from underground utilities, structures, and/or retaining walls?	○ Yes	○ No
4C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 4B. Provide a discussion on geologic/geotechnical hazards that would prevent partial infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for partial infiltration BMPs? If the question in Step 4C is answered "Yes," then answer "Yes" to Criteria 4 Result. If the question in Step 4C is answered "No," then answer "No" to Criteria 4 Result.	○ Yes	○ No
Criteria 4 Result	Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing the risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	○ Yes	○ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[2]
Summarize findings and basis; provide references to related reports or exhibits.	

to be provided during final design

Part 2 – Partial Infiltration Geotechnical Screening Result[5]	Result
If answers to both Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible based on geotechnical conditions only. If answers to either Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site.	○ Partial Infiltration Condition ○ No Infiltration Condition

[5] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Part 1 - Full Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	Project Phase:
Criteria 1: Groundwater Screening	

1A	**Groundwater Depth.** Is the depth to seasonally high groundwater tables (normal high depth during the wet season) beneath the base of any full infiltration BMP greater than 10 feet? ○ Yes; continue to Step 1B. ○ No; The depth to groundwater is less than or equal to 10 feet, but site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to step 1B. ○ No; The depth to groundwater is less than or equal to 10 feet and site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" for Criteria 1 Result.
1B	**Contaminated Soil/Groundwater.** Are proposed full infiltration BMPs at least 250 feet away from contaminated soil or groundwater sites? This can be confirmed using GeoTracker (geotracker.waterboards.ca.gov) to identify open contaminated sites. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP. ○ Yes; continue to Step 1C. ○ No; However, site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to Step 1C. ○ No; Site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" to Criteria 1 Result.

[1] Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, part 3, or Part 4 determines a full, partial, or no infiltration condition.

[2] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site storm water design.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
1C	**Inadequate Soil Treatment Capacity.** Are full infiltration BMPs proposed in DMA soils that have adequate soil treatment capacity? The DMA has adequate soil treatment capacity if **ALL** of the following criteria (detailed in C.2.2.1) for all soil layers beneath the infiltrating surface are met: • USDA texture class is sandy loam or loam or silt loam or silt or sandy clay loam or clay loam or silty clay loam or sandy clay or silty clay or clay; and • Cation Exchange Capacity (CEC) greater than 5 milliequivalents/100g; and • Soil organic matter is greater than 1%; and • Groundwater table is equal to or greater than 10 feet beneath the base of the full infiltration BMP. ○ Yes; continue to Step 1D. ○ No; However, site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to Step 1D. ○ No; Site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" to Criteria 1 Result.
1D	**Other Groundwater Contamination Hazards.** Are there site-specific groundwater contamination hazards not already mentioned (refer to Appendix C.2.2) that can be reasonably mitigated to support full infiltration BMPs? ○ Yes; there are other contamination hazards identified that can be mitigated. Answer "Yes" to Criteria 1 Result. ○ No; there are other contamination hazards identified that cannot be mitigated. Answer "No" to Criteria 1 Result. ○ N/A; no contamination hazards are identified. Answer "Yes" to Criteria 1 Result.
Criteria 1 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination that cannot be reasonably mitigated to an acceptable level? See Appendix C.2.2.8 for a list of typically reasonable and typically unreasonable mitigation measures. ○ Yes; Continue to Part 1, Criteria 2. ○ No; Continue to Part 1 Result.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Summarize groundwater quality and any mitigation measures proposed. Documentation should focus on groundwater table, mapped soil types and contaminated site locations. to be provided during final design	

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Criteria 2: Water Balance Screening	
2A	**Ephemeral Stream Setback.** Does the proposed full infiltration BMP meet both the following? • The full infiltration BMP is located at least 250 feet away from an ephemeral stream; **AND** • The bottom surface of the full infiltration BMP is at a depth 20 feet or greater from seasonally high groundwater tables. ○ Yes; Answer "Yes" to Criteria 2 Result. ○ No; Continue to Step 2B.
2B	**Mitigation Measures.** Can site layout changes be proposed to support full infiltration BMPs? ○ Yes; the site can be reconfigured to mitigate potential water balance issues. Answer "Yes" to Criteria 2 Result. ○ No; the site cannot be reconfigured to mitigate potential water balance issues. Continue to Step 2C and provide discussion.
2C	**Additional studies.** Do additional studies support full infiltration BMPs? In the event that water balance effects are used to reject full infiltration (anticipated to be rare), additional analysis shall be completed and documented by a qualified professional indicating the site-specific information evaluated and the technical basis for this finding. ○ Yes; Answer "Yes" to Criteria 2 Result. ○ No; Answer "No" to Criteria 2 Result.
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams? ○ Yes; Continue to Part 1 Result. ○ No; Continue to Part 1 Result.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Summarize potential water balance effects. Documentation should focus on mapping and soil data regarding proximity to ephemeral streams and groundwater depth.	

to be provided during final design

Part 1 – Full Infiltration Groundwater and Water Balance Screening Result[3]	Result
If answers to Criteria 1 and 2 are "Yes", a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration based on groundwater conditions. If answer to Criteria 1 or Criteria 2 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design based on groundwater conditions. Proceed to Part 2.	○ Full Infiltration ○ Complete Part 2

[3] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	Project Phase:
Criteria 3: Groundwater Screening	

Contaminated Soil/Groundwater. Are partial infiltration BMPs proposed at least 100 feet away from contaminated soil or groundwater sites? This can be confirmed using GeoTracker (geotracker.waterboards.ca.gov) to identify open contaminated sites. This criteria is intentionally a smaller radius than full infiltration, as the potential quantity of infiltration from partial infiltration BMPs is smaller.

○ Yes; Answer "Yes" to Criteria 3 Result.

○ No; However, site layout changes can be proposed to avoid contaminated soils or soils that lack adequate treatment capacity. Select "Yes" to Criteria 3 Result. It is a requirement for the SWQMP preparer to identify potential mitigation measures.

○ No; Contaminated soils or soils that lack adequate treatment capacity cannot be avoided and partial infiltration BMPs are not feasible. Select "No" to Criteria 3 Result.

Criteria 3 Result: Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing risk of groundwater contamination that cannot be reasonably mitigated to an acceptable level?

○ Yes; Continue to Part 2, Criteria 4.

○ No; Skip to Part 2 Result.

Summarize findings and basis. Documentation should focus on mapped soil types and contaminated site locations.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]

Criteria 4: Water Balance Screening

Additional studies. In the event that water balance effects are used to reject partial infiltration (anticipated to be rare), a qualified professional must provide an analysis of the incremental effects of partial infiltration BMPs on the water balance compared to incidental infiltration under a no infiltration scenario (e.g. precipitation, irrigation, etc.).

Criteria 4 Result: Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams?

◯ Yes: Continue to Part 2 Result.

◯ No: Continue to Part 2 Result.

Summarize potential water balance effects. Documentation should focus on mapping and soil data regarding proximity to ephemeral streams and groundwater depth.

Part 2 – Partial Infiltration Groundwater and Water Balance Screening Result[4]	Result
If answers to Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration based on groundwater and water balance conditions. If answer to Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site. The feasibility screening category is No Infiltration based on groundwater or water balance condition.	◯ Partial Infiltration Condition ◯ No Infiltration Condition

[4] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Factor of Safety and Design Infiltration Rate Worksheet				Worksheet D.5-1: Form I-9	
Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25		
		Predominant soil texture	0.25		
		Site soil variability	0.25		
		Depth to groundwater / impervious layer	0.25		
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			
B	Design	Level of pretreatment/ expected sediment loads	0.5		
		Redundancy/resiliency	0.25		
		Compaction during construction	0.25		
		Design Safety Factor, $S_B = \Sigma p$			
Combined Safety Factor, $S_{total} = S_A \times S_B$ [Minimum of 2 and Maximum of 9]					
Observed Infiltration Rate, inch/hr., $K_{observed}$ (corrected for test-specific bias) Note: This worksheet is only applicable when the observed infiltration rate is greater than or equal to 1 inch/hr.					
Design Infiltration Rate, in/hr., $K_{design} = K_{observed} / S_{total}$ Note: If the estimated design infiltration rate is less than or equal to 0.5 inch/hr. then the applicant may choose to implement partial infiltration BMPs.					
Supporting Data					
Briefly describe infiltration test and provide reference to test forms:					

Note: Worksheet D.5-1: Form I-9 is only applicable to design BMPs in "full infiltration condition". This form is not applicable for categorization of infiltration feasibility (Worksheet C.4-1: Form I-8) and/or for designing BMPs in "partial infiltration condition" or "no infiltration condition".

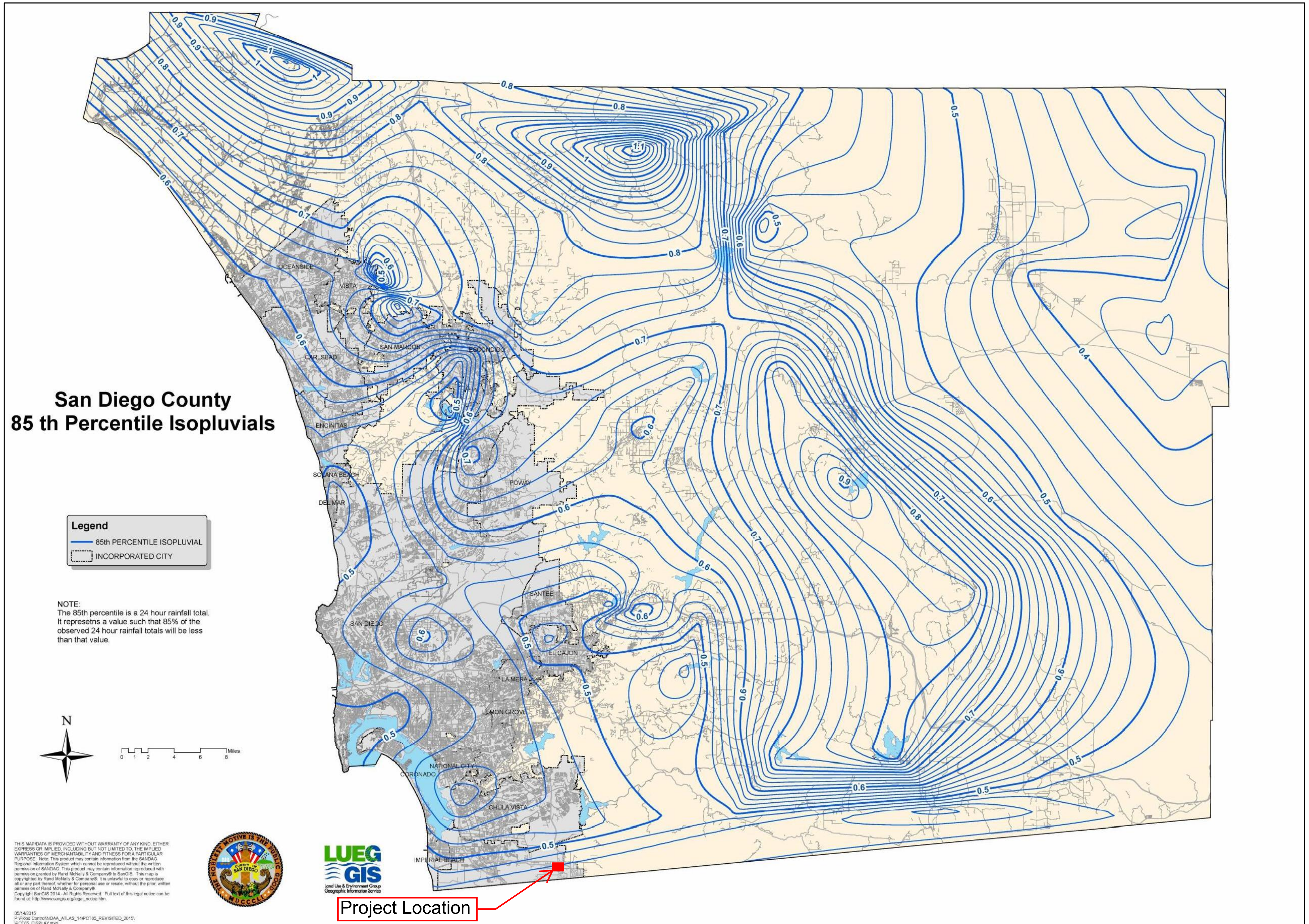

Figure B.1-1: 85th Percentile 24-hour Isopluvial Map

The City of SAN DIEGO	Project Name	Majestic Airway		
	BMP ID	1a		
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**		
1	Area draining to the BMP		316455	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)		0.86	
3	85th percentile 24-hour rainfall depth		0.46	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]		10432	cu. ft.
Volume Retention Requirement				
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or		0	in/hr.
6	Factor of safety		2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]		0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%		3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = $0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line 8 ≤ 8% = 0.023		0.023	
10	Target volume retention [Line 9 x Line 4]		240	cu. ft.

The City of SAN DIEGO	Project Name	Majestic Airway	
	BMP ID	1a	
Volume Retention From Amended Soils		**Worksheet B.5-7**	

1	Impervious area draining to the pervious area	158272	sq. ft.
2	Pervious area (must meet the requirements in SD-B and SD-F Fact Sheets)	5760	sq. ft.
3	Dispersion Ratio [Line 1/Line 2] Note: This worksheet is not applicable when Line 3 > 50 or Line 3 < 0.25	27.48	
4	Adjusted runoff factor [(Line 1 * 0.9 + Line 2 * 0.1) / (Line 1 + Line 2)]	0.87	
5	85th percentile 24-hour rainfall depth	0.46	inches
6	Design capture volume [(Line 1 + Line 2) x Line 4 x (Line 5/12)]	5470	cu. ft.
7	Amendment Depth (Choose from 3", 6", 9", 12", 15" and 18")	12	inches
8	Storage [(porosity – field capacity) + 0.5 * (field capacity – wilting point)]	0.25	in./in.
9	Pervious Storage [Line 2 * (Line 7/12) * Line 8]	1440	cu. ft.
10	Fraction of DCV [Line 9 / Line 6]	0.26	
11	Measured Infiltration Rate When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0	in/hr.
12	Factor of Safety	2	
13	Reliable Infiltration Rate [Line 11/Line 12]	0	in/hr.
14	Dispersion Credit (Based on Figures B.5.6 to B.5.11; Line 10 and Line 13)	0.042	
15	Volume retention due to amendment [Line 1 * (Line 5/12) * Line 14]	255	cu. ft.

BMP 1A

Worksheet B.6-1: Flow-Thru Design Flows

Flow-thru Design Flows		Worksheet B.6-1		
1	DCV	DCV	10432	cubic-feet
2	DCV retained	$DCV_{retained}$		cubic-feet
3	DCV biofiltered	$DCV_{biofiltered}$		cubic-feet
4	DCV requiring flow-thru (Line 1 – Line 2 – 0.67*Line 3)	$DCV_{flow-thru}$	10432	cubic-feet
5	Adjustment factor (Line 4 / Line 1)	AF=	1	unitless
6	Design rainfall intensity	i=	0.20	in/hr.
7	Area tributary to BMP (s)	A=	7.26	acres
8	Area-weighted runoff factor (estimate using Appendix B.2)	C=	0.9	unitless
9	Calculate Flow Rate = AF x (C x i x A)	Q=	1.31	cfs
10	Q*1.5 (Per F.2.2)	Q=	1.97	cfs

1. Adjustment factor shall be estimated considering only retention and biofiltration BMPs located upstream of flow-thru BMPs. That is, if the flow-thru BMP is upstream of the project's retention and biofiltration BMPs then the flow-thru BMP shall be sized using an adjustment factor of 1.
2. Volume based (e.g., dry extended detention basin) flow-thru treatment control BMPs shall be sized to the volume in Line 4 and flow based (e.g., vegetated swales) shall be sized to flow rate in Line 9. Sand filter and media filter can be designed either by volume in Line 4 or flow rate in Line 9.
3. Proprietary BMPs, if used, shall provide certified treatment capacity equal to or greater than the calculated flow rate in Line 9; certified treatment capacity per unit shall be consistent with third party certifications.

MODEL #	DIMENSIONS	WETLANDMEDIA SURFACE AREA (sq. ft.)	TREATMENT FLOW RATE (cfs)
MWS-L-4-4	4' x 4'	23	0.052
MWS-L-4-6	4' x 6'	32	0.073
MWS-L-4-8	4' x 8'	50	0.115
MWS-L-4-13	4' x 13'	63	0.144
MWS-L-4-15	4' x 15'	76	0.175
MWS-L-4-17	4' x 17'	90	0.206
MWS-L-4-19	4' x 19'	103	0.237
MWS-L-4-21	4' x 21'	117	0.268
MWS-L-6-8	7' x 9'	64	0.147
MWS-L-8-8	8' x 8'	100	0.230
MWS-L-8-12	8' x 12'	151	0.346
MWS-L-8-16	8' x 16'	201	0.462
MWS-L-8-20	9' x 21'	252	0.577
MWS-L-8-24	9' x 25'	302	0.693
MWS-L-10-20	10' x 20'	302	0.693

0.693 cfs * 3 units = 2.08 cfs

The City of SAN DIEGO	Project Name	Majestic Airway	
	BMP ID	1b	
Sizing Method for Volume Retention Criteria		Worksheet B.5-2	

1	Area draining to the BMP	296242	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.86	
3	85^{th} percentile 24-hour rainfall depth	0.46	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	9766	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = 0.0000013 x Line 8^3 - 0.000057 x Line 8^2 + 0.0086 x Line 8 - 0.014 When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	225	cu. ft.

The City of SAN DIEGO	Project Name	Majestic Airway	
	BMP ID	1b	
Volume Retention From Amended Soils		Worksheet B.5-7	

1	Impervious area draining to the pervious area	148121	sq. ft.
2	Pervious area (must meet the requirements in SD-B and SD-F Fact Sheets)	4800	sq. ft.
3	Dispersion Ratio [Line 1/Line 2] Note: This worksheet is not applicable when Line 3 > 50 or Line 3 < 0.25	30.86	
4	Adjusted runoff factor [(Line 1 * 0.9 + Line 2 * 0.1) / (Line 1 + Line 2)]	0.87	
5	85th percentile 24-hour rainfall depth	0.46	inches
6	Design capture volume [(Line 1 + Line 2) x Line 4 x (Line 5/12)]	5100	cu. ft.
7	Amendment Depth (Choose from 3", 6", 9", 12", 15" and 18")	18	inches
8	Storage [(porosity – field capacity) + 0.5 * (field capacity – wilting point)]	0.25	in./in.
9	Pervious Storage [Line 2 * (Line 7/12) * Line 8]	1800	cu. ft.
10	Fraction of DCV [Line 9 / Line 6]	0.35	
11	Measured Infiltration Rate When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0	in/hr.
12	Factor of Safety	2	
13	Reliable Infiltration Rate [Line 11/Line 12]	0	in/hr.
14	Dispersion Credit (Based on Figures B.5.6 to B.5.11; Line 10 and Line 13)	0.052	
15	Volume retention due to amendment [Line 1 * (Line 5/12) * Line 14]	295	cu. ft.

BMP 1B

Worksheet B.6-1: Flow-Thru Design Flows

	Flow-thru Design Flows	Worksheet B.6-1		
1	DCV	DCV	9766	cubic-feet
2	DCV retained	$DCV_{retained}$		cubic-feet
3	DCV biofiltered	$DCV_{biofiltered}$		cubic-feet
4	DCV requiring flow-thru (Line 1 – Line 2 – 0.67*Line 3)	$DCV_{flow-thru}$	9766	cubic-feet
5	Adjustment factor (Line 4 / Line 1)	AF=	1	unitless
6	Design rainfall intensity	i=	0.20	in/hr.
7	Area tributary to BMP (s)	A=	6.80	acres
8	Area-weighted runoff factor (estimate using Appendix B.2)	C=	0.9	unitless
9	Calculate Flow Rate = AF x (C x i x A)	Q=	1.22	cfs
10	Q*1.5 (Per F.2.2)	Q=	1.83	cfs

1. Adjustment factor shall be estimated considering only retention and biofiltration BMPs located upstream of flow-thru BMPs. That is, if the flow-thru BMP is upstream of the project's retention and biofiltration BMPs then the flow-thru BMP shall be sized using an adjustment factor of 1.
2. Volume based (e.g., dry extended detention basin) flow-thru treatment control BMPs shall be sized to the volume in Line 4 and flow based (e.g., vegetated swales) shall be sized to flow rate in Line 9. Sand filter and media filter can be designed either by volume in Line 4 or flow rate in Line 9.
3. Proprietary BMPs, if used, shall provide certified treatment capacity equal to or greater than the calculated flow rate in Line 9; certified treatment capacity per unit shall be consistent with third party certifications.

MODEL #	DIMENSIONS	WETLANDMEDIA SURFACE AREA (sq. ft.)	TREATMENT FLOW RATE (cfs)
MWS-L-4-4	4' x 4'	23	0.052
MWS-L-4-6	4' x 6'	32	0.073
MWS-L-4-8	4' x 8'	50	0.115
MWS-L-4-13	4' x 13'	63	0.144
MWS-L-4-15	4' x 15'	76	0.175
MWS-L-4-17	4' x 17'	90	0.206
MWS-L-4-19	4' x 19'	103	0.237
MWS-L-4-21	4' x 21'	117	0.268
MWS-L-6-8	7' x 9'	64	0.147
MWS-L-8-8	8' x 8'	100	0.230
MWS-L-8-12	8' x 12'	151	0.346
MWS-L-8-16	8' x 16'	201	0.462
MWS-L-8-20	9' x 21'	252	0.577
MWS-L-8-24	9' x 25'	302	0.693
MWS-L-10-20	10' x 20'	302	0.693

0.693 cfs * 3 units = 2.08 cfs

The City of SAN DIEGO	Project Name	Majsetic Airway	
	BMP ID	2	
Sizing Method for Pollutant Removal Criteria		Worksheet B.5-1	

1	Area draining to the BMP	275839	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.84	
3	85th percentile 24-hour rainfall depth	0.46	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	8882	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	12	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	18	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	9	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	5	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	30	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	20.4	inches
15	Total Depth Treated [Line 13 + Line 14]	50.4	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	13323	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	3172	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	6662	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	3919	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	6951	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	6951	sq. ft.
23	Provided BMP Footprint	18464	sq. ft.
24	Is Line 23 ≥ Line 22?	Yes, Performance Standard is Met	

The City of SAN DIEGO

	Project Name	Majsetic Sunroad 50	
	BMP ID	3	
Sizing Method for Pollutant Removal Criteria		Worksheet B.5-1	
1	Area draining to the BMP	138861	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.77	
3	85th percentile 24-hour rainfall depth	0.46	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	4099	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	12	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	24	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	9	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	5	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	30	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	21.6	inches
15	Total Depth Treated [Line 13 + Line 14]	51.6	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	6148	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	1430	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	3074	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	1708	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	3208	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	3208	sq. ft.
23	Provided BMP Footprint	8588	sq. ft.
24	Is Line 23 ≥ Line 22?	Yes, Performance Standard is Met	

The City of SAN DIEGO

	Project Name	Majsetic Sunroad 50	
	BMP ID	4	
Sizing Method for Pollutant Removal Criteria		Worksheet B.5-1	
1	Area draining to the BMP	85077	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.87	
3	85th percentile 24-hour rainfall depth	0.46	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	2837	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	12	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	24	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	9	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	5	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	30	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	21.6	inches
15	Total Depth Treated [Line 13 + Line 14]	51.6	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	4256	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	990	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	2128	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	1182	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	2221	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	2221	sq. ft.
23	Provided BMP Footprint	3770	sq. ft.
24	Is Line 23 ≥ Line 22?	Yes, Performance Standard is Met	

Compact (high rate) Biofiltration BMP Checklist	Form I-10

Compact (high rate) biofiltration BMPs have a media filtration rate greater than 5 in/hr. and a media surface area smaller than 3% of contributing area times adjusted runoff factor. Compact biofiltration BMPs are typically proprietary BMPs that may qualify as biofiltration.

A compact biofiltration BMP may satisfy the pollutant control requirements for a DMA onsite in some cases. This depends on the characteristics of the DMA **and** the performance certification/data of the BMP. If the pollutant control requirements for a DMA are met onsite, then the DMA is not required to participate in an offsite storm water alternative compliance program to meet its pollutant control obligations.

An applicant using a compact biofiltration BMP to meet the pollutant control requirements onsite must complete Section 1 of this form and include it in the PDP SWQMP. A separate form must be completed for each DMA. In instances where the City Engineer does not agree with the applicant's determination, Section 2 of this form will be completed by the City and returned to the applicant.

Section 1: Biofiltration Criteria Checklist (Appendix F)

Refer to Part 1 of the Storm Water Standards to complete this section. When separate forms/worksheets are referenced below, the applicant must also complete these separate forms/worksheets (as applicable) and include in the PDP SWQMP. The criteria numbers below correspond to the criteria numbers in Appendix F.

Criteria	Answer	Progression
Criteria 1 and 3: What is the infiltration condition of the DMA? Refer to Section 5.4.2 and Appendix C of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance. Applicant must complete and include the following in the PDP SWQMP submittal to support the feasibility determination: • Infiltration Feasibility Condition Letter; or • Worksheet C.4-1: Form I-8A and Worksheet C.4-2: Form I-8B. Applicant must complete and include all applicable sizing worksheets in the SWQMP submittal	○ Full Infiltration Condition	**Stop**. Compact biofiltration BMP is not allowed.
	○ Partial Infiltration Condition	Compact biofiltration BMP is only allowed, if the target volume retention is met onsite (Refer to Table B.5-1 in Appendix B.5). Use Worksheet B.5-2 in Appendix B.5 to estimate the target volume retention (Note: retention in this context means reduction). If the required volume reduction is achieved **proceed to Criteria 2**. If the required volume reduction is not achieved, compact biofiltration BMP is not allowed. **Stop**.
	☒ No Infiltration Condition	Compact biofiltration BMP is allowed if volume retention criteria in Table B.5-1 in Appendix B.5 for the no infiltration condition is met. Compliance with this criterion must be documented in the PDP SWQMP. If the criteria in Table B.5-1 is met **proceed to Criteria 2**. If the criteria in Table B.5-1 is not met, compact biofiltration BMP is not allowed. **Stop**.

Compact (high rate) Biofiltration BMP Checklist	Form I-10

Provide basis for Criteria 1 and 3:

Feasibility Analysis:

Summarize findings and include either infiltration feasibility condition letter or Worksheet C.4-1: Form I-8A and Worksheet C.4-2: Form I-8B in the PDP SWQMP submittal.

If Partial Infiltration Condition:

Provide documentation that target volume retention is met (include Worksheet B.5-2 in the PDP SWQMP submittal). Worksheet B.5-7 in Appendix B.5 can be used to estimate volume retention benefits from landscape areas.

If No Infiltration Condition:

Provide documentation that the volume retention performance standard is met (include Worksheet B.5-2 in the PDP SWQMP submittal) in the PDP SWQMP submittal. Worksheet B.5-6 in Appendix B.5 can be used to document that the performance standard is met.

See completed Worksheet B.5-6 in this report.

Criteria	Answer	Progression
Criteria 2: Is the compact biofiltration BMP sized to meet the performance standard from the MS4 Permit? Refer to Appendix B.5 and Appendix F.2 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☒ Meets Flow based Criteria	Use guidance from **Appendix F.2.2** to size the compact biofiltration BMP to meet the flow based criteria. Include the calculations in the PDP SWQMP. Use parameters for sizing consistent with manufacturer guidelines and conditions of its third party certifications (i.e. a BMP certified at a loading rate of 1 gpm/sq. ft. cannot be designed using a loading rate of 1.5 gpm/sq. ft.) **Proceed to Criteria 4.**
	○ Meets Volume based Criteria	Provide documentation that the compact biofiltration BMP has a total static (i.e. non-routed) storage volume, including pore-spaces and pre-filter detention volume (Refer to Appendix B.5 for a schematic) of at least 0.75 times the portion of the DCV not reliably retained onsite. **Proceed to Criteria 4.**
	○ Does not Meet either criteria	**Stop**. Compact biofiltration BMP is not allowed.

Compact (high rate) Biofiltration BMP Checklist	Form I-10

Provide basis for Criteria 2:

Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., loading rate, etc., as applicable).

See BMP Flow Rate Calculation as part of this report.

Criteria	Answer	Progression
Criteria 4: Does the compact biofiltration BMP meet the pollutant treatment performance standard for the projects most significant pollutants of concern? Refer to Appendix B.6 and Appendix F.1 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☒ Yes, meets the TAPE certification.	Provide documentation that the compact BMP has an appropriate TAPE certification for the projects most significant pollutants of concern. **Proceed to Criteria 5.**
	○ Yes, through other third-party documentation	Acceptance of third-party documentation is at the discretion of the City Engineer. The City engineer will consider, (a) the data submitted; (b) representativeness of the data submitted; and (c) consistency of the BMP performance claims with pollutant control objectives in Table F.1-2 and Table F.1-1 while making this determination. If a compact biofiltration BMP is not accepted, a written explanation/ reason will be provided in Section 2. **Proceed to Criteria 5.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 4:

Provide documentation that identifies the projects most significant pollutants of concern and TAPE certification or other third party documentation that shows that the compact biofiltration BMP meets the pollutant treatment performance standard for the projects most significant pollutants of concern.

See attached TAPE certification following Form I-10

Compact (high rate) Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
<u>Criteria 5</u>: Is the compact biofiltration BMP designed to promote appropriate biological activity to support and maintain treatment process? Refer to Appendix F of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☒ Yes	Provide documentation that the compact biofiltration BMP support appropriate biological activity. Refer to Appendix F for guidance. **Proceed to Criteria 6.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 5:

Provide documentation that appropriate biological activity is supported by the compact biofiltration BMP to maintain treatment process.

Documentation provided following Form I-10.

Criteria	Answer	Progression
<u>Criteria 6</u>: Is the compact biofiltration BMP designed with a hydraulic loading rate to prevent erosion, scour and channeling within the BMP?	☒ Yes	Provide documentation that the compact biofiltration BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification. **Proceed to Criteria 7.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 6:

Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., maximum tributary area, maximum inflow velocities, etc., as applicable).

Internal and external components of the proposed compact biofiltration BMP are designed to withstand the typical forces imposed by stormwater.

Compact (high rate) Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
Criteria 7: Is the compact biofiltration BMP maintenance plan consistent with manufacturer guidelines and conditions of its third-party certification (i.e., maintenance activities, frequencies)?	☒ Yes, and the compact BMP is privately owned, operated and not in the public right of way.	Submit a maintenance agreement that will also include a statement that the BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification. **Stop**. The compact biofiltration BMP meets the required criteria.
	○ Yes, and the BMP is either owned or operated by the City or in the public right of way.	Approval is at the discretion of the City Engineer. The city engineer will consider maintenance requirements, cost of maintenance activities, relevant previous local experience with operation and maintenance of the BMP type, ability to continue to operate the system in event that the vending company is no longer operating as a business or other relevant factors while making the determination. **Stop**. Consult the City Engineer for a determination.
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 7:

Include copy of manufacturer guidelines and conditions of third-party certification in the maintenance agreement. PDP SWQMP must include a statement that the compact BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification.

Please see Attachment 3 for BMP maintenance information

Compact (high rate) Biofiltration BMP Checklist	Form I-10
Section 2: Verification (For City Use Only)	
Is the proposed compact BMP accepted by the City Engineer for onsite pollutant control compliance for the DMA?	○ Yes ○ No, See explanation below
Explanation/reason if the compact BMP is not accepted by the City for onsite pollutant control compliance:	

WASHINGTON STATE DEPARTMENT OF ECOLOGY

December 2019

GENERAL USE LEVEL DESIGNATION FOR BASIC, ENHANCED, AND PHOSPHORUS TREATMENT

For the

MWS-Linear Modular Wetland

Ecology's Decision:

Based on Modular Wetland Systems, Inc. application submissions, including the Technical Evaluation Report, dated April 1, 2014, Ecology hereby issues the following use level designation:

1. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Basic treatment
   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.
2. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Phosphorus treatment
   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.
3. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Enhanced treatment
   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

4. Ecology approves the MWS - Linear Modular Wetland Stormwater Treatment System units for Basic, Phosphorus, and Enhanced treatment at the hydraulic loading rate listed above. Designers shall calculate the water quality design flow rates using the following procedures:

- Western Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.
- Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
- Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.

5. These use level designations have no expiration date but may be revoked or amended by Ecology, and are subject to the conditions specified below.

Ecology's Conditions of Use:

Applicants shall comply with the following conditions:

1. Design, assemble, install, operate, and maintain the MWS – Linear Modular Wetland Stormwater Treatment System units, in accordance with Modular Wetland Systems, Inc. applicable manuals and documents and the Ecology Decision.
2. Each site plan must undergo Modular Wetland Systems, Inc. review and approval before site installation. This ensures that site grading and slope are appropriate for use of a MWS – Linear Modular Wetland Stormwater Treatment System unit.
3. MWS – Linear Modular Wetland Stormwater Treatment System media shall conform to the specifications submitted to, and approved by, Ecology.
4. The applicant tested the MWS – Linear Modular Wetland Stormwater Treatment System with an external bypass weir. This weir limited the depth of water flowing through the media, and therefore the active treatment area, to below the root zone of the plants. This GULD applies to MWS – Linear Modular Wetland Stormwater Treatment Systems whether plants are included in the final product or not.
5. Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured filter treatment device.

- Typically, Modular Wetland Systems, Inc. designs MWS - Linear Modular Wetland systems for a target prefilter media life of 6 to 12 months.
- Indications of the need for maintenance include effluent flow decreasing to below the design flow rate or decrease in treatment below required levels.
- Owners/operators must inspect MWS - Linear Modular Wetland systems for a minimum of twelve months from the start of post-construction operation to determine site-specific

maintenance schedules and requirements. You must conduct inspections monthly during the wet season, and every other month during the dry season. (According to the SWMMWW, the wet season in western Washington is October 1 to April 30. According to SWMMEW, the wet season in eastern Washington is October 1 to June 30). After the first year of operation, owners/operators must conduct inspections based on the findings during the first year of inspections.

- Conduct inspections by qualified personnel, follow manufacturer's guidelines, and use methods capable of determining either a decrease in treated effluent flowrate and/or a decrease in pollutant removal ability.
- When inspections are performed, the following findings typically serve as maintenance triggers:
    - Standing water remains in the vault between rain events, or
    - Bypass occurs during storms smaller than the design storm.
    - If excessive floatables (trash and debris) are present (but no standing water or excessive sedimentation), perform a minor maintenance consisting of gross solids removal, not prefilter media replacement.
    - Additional data collection will be used to create a correlation between pretreatment chamber sediment depth and pre-filter clogging (see *Issues to be Addressed by the Company* section below)

6. Discharges from the MWS - Linear Modular Wetland Stormwater Treatment System units shall not cause or contribute to water quality standards violations in receiving waters.

Applicant:	Modular Wetland Systems, Inc.
Applicant's Address:	5796 Armada Drive, Suite 250 Carlsbad, CA 92008

Application Documents:

- *Original Application for Conditional Use Level Designation*, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., January 2011
- *Quality Assurance Project Plan*: Modular Wetland system – Linear Treatment System performance Monitoring Project, draft, January 2011.
- *Revised Application for Conditional Use Level Designation*, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., May 2011
- *Memorandum: Modular Wetland System-Linear GULD Application Supplementary Data, April 2014*
- *Technical Evaluation Report: Modular Wetland System Stormwater Treatment System Performance Monitoring, April 2014.*

Field Testing

- Modular Wetland Systems, Inc. conducted monitoring of an MWS-Linear (Model # MWS-L-4-13) from April 2012 through May 2013, at a transportation maintenance facility in Portland, Oregon. The manufacturer collected flow-weighted composite samples of the system's influent and effluent during 28 separate storm events. The system treated approximately 75 percent of the runoff from 53.5 inches of rainfall during the monitoring period. The applicant sized the system at 1 gpm/sq ft. (wetland media) and 3gpm/sq ft. (prefilter).
- Influent TSS concentrations for qualifying sampled storm events ranged from 20 to 339 mg/L. Average TSS removal for influent concentrations greater than 100 mg/L (n=7) averaged 85 percent. For influent concentrations in the range of 20-100 mg/L (n=18), the upper 95 percent confidence interval about the mean effluent concentration was 12.8 mg/L.
- Total phosphorus removal for 17 events with influent TP concentrations in the range of 0.1 to 0.5 mg/L averaged 65 percent. A bootstrap estimate of the lower 95 percent confidence limit (LCL95) of the mean total phosphorus reduction was 58 percent.
- The lower 95 percent confidence limit of the mean percent removal was 60.5 percent for dissolved zinc for influent concentrations in the range of 0.02 to 0.3 mg/L (n=11). The lower 95 percent confidence limit of the mean percent removal was 32.5 percent for dissolved copper for influent concentrations in the range of 0.005 to 0.02 mg/L (n=14) at flow rates up to 28 gpm (design flow rate 41 gpm). Laboratory test data augmented the data set, showing dissolved copper removal at the design flow rate of 41 gpm (93 percent reduction in influent dissolved copper of 0.757 mg/L).

Issues to be addressed by the Company:

1. Modular Wetland Systems, Inc. should collect maintenance and inspection data for the first year on all installations in the Northwest in order to assess standard maintenance requirements for various land uses in the region. Modular Wetland Systems, Inc. should use these data to establish required maintenance cycles.
2. Modular Wetland Systems, Inc. should collect pre-treatment chamber sediment depth data for the first year of operation for all installations in the Northwest. Modular Wetland Systems, Inc. will use these data to create a correlation between sediment depth and pre-filter clogging.

Technology Description:
Download at http://www.modularwetlands.com/

Contact Information:

Applicant: Zach Kent
BioClean A Forterra Company.
5796 Armada Drive, Suite 250
Carlsbad, CA 92008
zach.kent@forterrabp.com

2018

Project: All Related

Subject: MWS Linear BMP Classification Per San Diego Manual

To Whom it May Concern:

Based upon definitions of Biofiltration as found in Section 2.2.1 and Appendix F of the Manual the MWS Linear meets the criteria to be classified as biofiltration and therefore is not flow through treatment and thus does not trigger the need for alternative compliance. The MWS Linear has GULD approval for basic, phosphorus and enhanced treatment under the TAPE approval. The system is certified under the TAPE approval at a loading rate of 1 gpm/sq ft for all three pollutant categories. This is consistent with the performance criteria related to the performance of Appendix F.

Let us first address the comment regarding the MWS (referring to the Modular Wetland System Linear) being flow through treatment. To do so let us look at the definition of biofiltration as provided by the Design Manual which states:

> *"For situations where onsite retention of the 85th percentile storm volume is not feasible, biofiltration must be provided to satisfy specific "biofiltration standards" i.e. a set of selection, sizing, design and operation and maintenance (O&M) criteria that must be met for a BMP to be considered a "biofiltration BMP" – see Section 2.2.1 and Appendix F."*

If we look at section 2.2.2 Storm Water Pollutant Control Performance Standard it states:

> *"(i) If it is not technically feasible to implement retention BMPs for the full DCV onsite for a PDP, then the PDP shall utilize biofiltration BMPs for the remaining volume not reliably retained. Biofiltration BMPs must be designed as described in Appendix F to have an appropriate hydraulic loading rate to maximize storm water retention and pollutant removal, as well as to prevent erosion, scour, and channeling within the BMP, and must be sized to:*
>
> > *[a]. Treat 1.5 times the DCV not reliably retained onsite, OR*
> >
> > *[b]. Treat the DCV not reliably retained onsite with a flow-thru design that has a total volume, including pore spaces and pre-filter detention volume, sized to hold at least 0.75 times the portion of the DCV not reliably retained onsite."*

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As the manual states Biofiltration BMPs must be designed as described in Appendix F which states:

> *"A project applicant must be able to affirmatively demonstrate that a given BMP is designed and sized in a manner consistent with this definition to be considered as a "biofiltration BMP" as part of a compliant storm water management plan."*
>
> *"This appendix contains a checklist of the key underlying criteria that must be met for a BMP to be considered a biofiltration BMP. The purpose of this checklist is to facilitate consistent review and approval of biofiltration BMPs that meet the "biofiltration standard" defined by the MS4 Permit."*
>
> *"This checklist includes specific design criteria that are essential to defining a system as a biofiltration BMP; however it does not present a complete design basis. This checklist was used to develop BMP Fact Sheets for PR-1 biofiltration with partial retention and BF-1 biofiltration, which do present a complete design basis. Therefore, biofiltration BMPs that substantially meet all aspects of the Fact sheets PR-1 or BF-1 should be able to complete this checklist without additional documentation beyond what would already be required for a project submittal."*
>
> *"Other biofiltration BMP designs (including both non-proprietary and proprietary designs) may also meet the underlying MS4 Permit requirements to be considered biofiltration BMPs. These BMPs may be classified as biofiltration BMPs if they (1) meet the minimum design criteria listed in this appendix, including the pollutant treatment performance standard in Appendix F.1, (2) are designed and maintained in a manner consistent with their performance certifications (See explanation in Appendix F.2), if applicable, and (3) are acceptable at the discretion of the [City Engineer]. The applicant may be required to provide additional studies and/or required to meet additional design criteria beyond the scope of this document in order to demonstrate that these criteria are met."*

As stated the Biofiltration BMP must meet three objectives. The following outlines how the Modular Wetland System Linear meets these criteria.

Minimum Design Criteria

1. Biofiltration BMPs shall be allowed only as described in the BMP selection process in this manual (i.e., retention feasibility hierarchy).

    a. The Modular Wetland System Linear (MWS Linear) is only being proposed on plans when retention via infiltration or reuse is proven infeasible. Conditions such as soils with little to no infiltration rate or sites in which insufficient landscaping warrant to successful implementation of reuse systems.

2. Biofiltration BMPs must be sized using acceptable sizing methods described in this manual.

   a. Section B.5.2 Basis for Minimum Sizing Factor for Biofiltration BMPs states:

      "The MS4 Permit describes conceptual performance goals for biofiltration BMPs and specifies numeric criteria for sizing biofiltration BMPs (See Section 2.2.1 of this Manual). However, the MS4 Permit does not define a specific footprint sizing factor or design profile that must be provided for the BMP to be considered "biofiltration."

      "Additionally, it does not apply to alternative biofiltration designs that utilize the checklist in Appendix F (Biofiltration Standard and Checklist). Acceptable alternative designs (such as proprietary systems meeting Appendix F criteria) typically include design features intended to allow acceptable performance with a smaller footprint and have undergone field scale testing to evaluate performance and required O&M frequency."

      As stated in the Manual alternative biofiltration designs are allowed. The MWS Linear therefore qualifies as a biofiltration BMP under this definition as it has both undergone field scale testing (TAPE tested and approved with a GULD) and provides requirements on O&M frequency. In addition, the MWS Linear can be sized to treat either 1.5 times the DCV not reliably retained onsite OR 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 to at least 0.75 times the portion of the DCV not reliably retained onsite.

3. Biofiltration BMPs must be sited and designed to achieve maximum feasible infiltration and evapotranspiration.

   a. The MWS Linear is utilized and placed in the same manner as other types of biofiltration systems. As with other biofiltration systems the MWS Linear includes and underdrain for the remaining portion of the DCV that is not retained via incidental infiltration (as biofiltration if infiltration is not feasible due to poor soils) and evapotranspiration. The MWS Linear can be design with an open bottom to maximize this incidental infiltration. The only exception to this, as with other biofiltration BMPs, is when the geotechnical consultant recommends an impervious liner be used due to specific soil conditions such as expansive clays. Additionally, the MWS Linear utilizes an amended media that is much more porous than the standard prescribed biofiltration media which is a mix of sand and compost. 100% of the media uses in the MWS Linear has interparticle voids of 48% plus and 24% internal void space for each media particle. This is much greater than the sand which has interparticle voids of 35% and internal voids of 0%. As such, the MWS Linear retains greater moisture which allows for greater volume retention and ultimately evapotranspiration via respiration of the contained vegetation.

4. Biofiltration BMPs must be designed with a hydraulic loading rate to maximize pollutant retention, preserve pollutant control/sequestration processes, and minimize potential for pollutant washout.

   a. The manual states:

      "Alternatively, for proprietary designs and custom media mixes not meeting the media specifications contained in the City or County LID Manual, field scale testing data are provided to demonstrate that proposed media meets the pollutant treatment performance criteria in Section F.1 below."

      The MWS Linear has been tested under the Washington State TAPE protocol which is full scale field testing and has received General Use Level Designation under that protocol. Table F.1-1, as shown below, requires a biofiltration BMP to have Basic Treatment, Phosphorus Treatment, and Enhanced Treatment under this protocol. The MWS Linear has GULD approval for all three and therefore meets this minimum requirement 4. A copy of the TAPE approval has been attached to this document.

Table F.1-1: Required Technology Acceptance Protocol-Ecology Certifications for Polltuants of Concern for Biofiltration Performance Standard

Project Pollutant of Concern	Required Technology Acceptance Protocol-Ecology Certification for Biofiltration Performance Standard
Trash	Basic Treatment, Phosphorus Treatment, Enhanced Treatment
Sediments	Basic Treatment, Phosphorus Treatment, Enhanced Treatment
Oil and Grease	Basic Treatment, Phosphorus Treatment, Enhanced Treatment
Nutrients	Phosphorus Treatment[1]
Metals	Enhanced Treatment
Pesticides	Basic Treatment (including filtration)[2] Phosphorus Treatment, Enhanced Treatment
Organics	Basic Treatment (including filtration)[2] Phosphorus Treatment, Enhanced Treatment
Bacteria and Viruses	Basic Treatment (including bacteria removal processes)[3] , Phosphorus Treatment, Enhanced Treatment
Basic Treatment (including filtration)[2] Phosphorus Treatment, Enhanced Treatment	Basic Treatment (including filtration)[2] Phosphorus Treatment, Enhanced Treatment

5. Biofiltration BMPs must be designed to promote appropriate biological activity to support and maintain treatment processes.

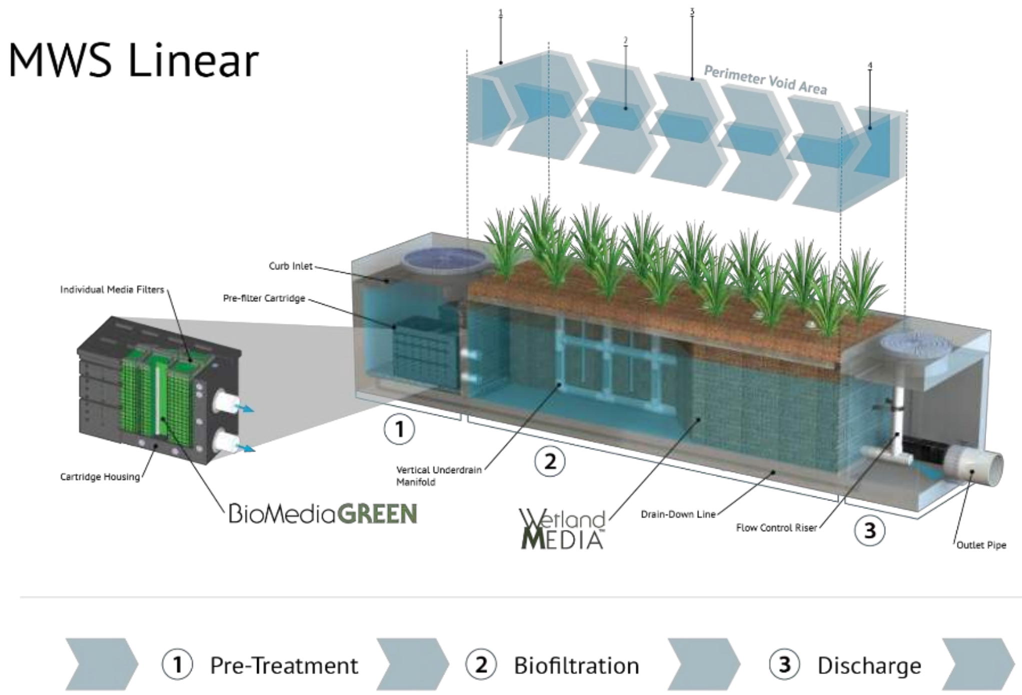
    a. The MWS Linear an advanced vegetated biofiltration system based that promote biological processes found in both upland bioretention systems and wetlands. The system utilizes an advanced horizontal flow design to ensure maximum contact with the vegetation root mass. Bacterial growth, supported by the root system in the wetland chamber, performs a number of treatment processes. These vary as a function of moisture, temperature, pH, salinity, and pollutant concentrations. Biologically available forms of nitrogen, phosphorus, and carbon are actively taken into the cells of vegetation and bacteria, and used for metabolic processes (i.e., energy production and growth). Nitrogen and phosphorus are actively taken up as nutrients that are vital for a number of cell functions, growth, and energy production. These processes remove metabolites from the media during and between storm events, making the media available to capture more nutrients from subsequent storms.

    b. Soil organisms in the wetland chamber can break down a wide array of organic compounds into less toxic forms or completely break them down into carbon dioxide and water (Means and Hinchee 1994). Bacteria can also cause metals to precipitate out as salts, bind them within organic material, and accumulate metals in nodules within the cells. Finally, plant growth may metabolize many pollutants, sequester them or rendering them less toxic (Reeves and Baker 2000).

    c. Following are pictures from the plants pulled from a MWS Linear after only 14 months of growth. The media used in the system is designed to maximize biological activity:


6. Biofiltration BMPs must be designed to prevent erosion, scour, and channeling within the BMP.

    a. The MWS Linear is a self-contained system with a pre-treatment chamber. Unlike other biofiltration BMPs erosion, scour, and channeling with in the BMP is not an issue. Following is a diagram of the BMP. The system pre-treatment chamber prevent any erosion or scour. The system downstream orifice control prevents channeling of the media:



7. Biofiltration BMP must include operations and maintenance design features and planning considerations to provide for continued effectiveness of pollutant and flow control functions.

    a. The MWS Linear provides activation along with the first year of maintenance and inspection free on all installation in the county of San Diego. Unlike other biofiltration BMPs the City and Co-permitees can be assured the system is being properly installed and maintained. The first year of inspections is used the gauge the amount of loading in the system and this information is used to set appropriate maintenance interval for subsequent years. Attached is a copy of the maintenance manual for the MWS Linear.

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Designed & Maintained Consistent with their Performance Certifications

We are in agreement that all BMPs should be designed in a manner consistent with the TAPE certification. The MWS Linear is sized in accordance with the TAPE GULD approval which provides certification at a loading rate of 1 gpm/sq ft (100 in/hr) for Basic, Phosphorus and Enhanced treatment. In addition, as stated previously, Modular Wetland System, Inc. provide activation of all system installed in San Diego County along with the first year of inspections and maintenance to ensure appropriate function. As previously stated, a copy of the TAPE GULD approval is attached to support this claim.

Additionally, it should be noted that the manual allows for biofiltration BMPs to be sized in either volume based (DCV) or flow based design. The manual states in section F.2.2 Sizing of Flow-Based Biofiltration *BMPs:*

> *"This sizing method is only available when the BMP meets the pollutant treatment performance standard in Appendix F.1."*
>
> *"Proprietary biofiltration BMPs are typically designed as a flow-based BMPs (i.e., a constant treatment capacity with negligible storage volume). Additionally, proprietary biofiltration is only acceptable if no infiltration is feasible and where site-specific documentation demonstrates that the use of larger footprint biofiltration BMPs would be infeasible. The applicable sizing method for biofiltration is therefore reduced to: Treat 1.5 times the DCV."*
>
> *"The following steps should be followed to demonstrate that the system is sized to treat 1.5 times the DCV."*
>
> > *1. Calculate the flow rate required to meet the pollutant treatment performance standard without scaling for the 1.5 factor. Options include either:*
> >
> > - *Calculate the runoff flow rate from a 0.2 inch per hour uniform intensity precipitation event (See methodology Appendix B.6.3), or*
> >
> > - *Conduct a continuous simulation analysis to compute the size required to capture and treat 80 percent of average annual runoff; for small catchments, 5-minute precipitation data should be used to account for short time of concentration. Nearest rain gage with 5-minute precipitation data is allowed for this analysis.*

2. Multiply the flow rate from Step 1 by 1.5 to compute the design flow rate for the biofiltration system.

3. Based on the conditions of certification/verification (discussed above), establish the design capacity, as a flow rate, of a given sized unit.

4. Demonstrates that an appropriate unit size and number of units is provided to provide a flow rate that meets the required flow rate from Step 2.

In conclusion, we have closely followed the process and protocol for showing the MWS Linear meets all the criteria to be accepted as Biofiltration as found in Appendix F.

If you have any questions please feel free to contact us directly.

Sincerely,

Sean M. Hasan

Manager San Diego/Riverside, CA

Bio Clean Environmental Services, Inc.

P O Box 869   Oceanside CA 92049
(760) 433-7640 • Fax (760) 433-3176
www.BioCleanEnvironmental.net

To Whom It May Concern,

The Modular Wetland System – Linear (MWS – Linear) is an advanced stormwater treatment system which utilizes several filtration and pretreatment processes to effectively remove particulate and dissolved stormwater pollutants. The system is based upon subsurface flow wetland technology that has been proven effective for several decades.

The MWS – Linear can be installed at grade with the wetland filter portion planted with various types of vegetation. The system can also be installed underground with lids and risers. When the system is installed underground the wetland filter is not planted.
Here are the effects of not having plants:

- The absence of plants only has a marginal effect on only one pollutant, nitrogen, especially the dissolved nitrogen species.

- In general, plants play a secondary role to the filter media and the indigenous bacteria and microorganisms that populate the system. These beneficial bacteria establish within the biofiltration media with or with plants.

- Plants utilize the nitrogen and phosphorus that is captured on the filter media (soil particles). In doing so, the plants continually replenish the media's ability to absorb nutrients through physical and chemical means.

- The plant root systems transfer oxygen subsurface that increases the populations of beneficial indigenous bacteria and microorganisms which play the primary role in biological filtration.

- Biological filtration is the primary unit process in the removal of soluble nitrogen species. The absence of plants can decrease the removal of soluble nitrogen marginally.

However, biological filtration is not the primary means for the removal of TSS, oils & grease, TPH, particulate nitrogen, particulate and dissolved phosphorus, particulate and dissolved metals, pathogens and oxygen demanding substances.

A performance report titled "Vegetated Rock Filter Treats Stormwater Pollutants in Florida" studied subsurface wetland cells with and without plants. The study concluded that the filter media itself was much more important than the plants. The study said "in addition, the unplanted crushed concrete cells performed better than any other planted cells, suggesting that wetland vegetation had no discernible influence on pollutant removal."

P O Box 869 Oceanside CA 92049
(760) 433-7640 • Fax (760) 433-3176
www.BioCleanEnvironmental.net

The Modular Wetland System Linear has been approved by the Washington Department of Ecology under the TAPE protocol for treatment for all three pollutant categories that the agency provides approval for: TSS, nutrients and metals. It is the only system (proprietary or non) that has received approval for all three during the same independent third party multi-year field study. The unit was able to achieve these removal efficiencies with the absence of any vegetation in the active biofiltration media. The system is approved by TAPE without plants. Below is a performance summary from:

- TSS – 85%
- Phosphorus – 65%
- Ortho-phosphorus – 67%
- Nitrogen – 45%
- Dissolved Copper – 38%
- Total Copper – 50%
- Dissolved Zinc – 66%
- Total Zinc – 69%
- Motor Oil – 95%
- Turbidity – 99.19%
- Fecal Coliform – 55%

In addition, the MWS – Linear has been tested in other third party field studies with similar results on installations without plants or vegetation. Based on these test results the MWS – Linear when placed underground will provide the same performance for all pollutants of concern.

If you have any questions regarding MWS - Linear or the information contained in this letter please feel free to contact us.

Sincerely,

Zach J Kent

Stormwater Engineer

zkent@biocleanenvironmental.net

Applicant website: http://www.modularwetlands.com/

Ecology web link: http://www.ecy.wa.gov/programs/wg/stormwater/newtech/index.html

Ecology: Douglas C. Howie, P.E.
Department of Ecology
Water Quality Program
(360) 407-6444
douglas.howie@ecy.wa.gov

Revision History

Date	Revision
June 2011	Original use-level-designation document
September 2012	Revised dates for TER and expiration
January 2013	Modified Design Storm Description, added Revision Table, added maintenance discussion, modified format in accordance with Ecology standard
December 2013	Updated name of Applicant
April 2014	Approved GULD designation for Basic, Phosphorus, and Enhanced treatment
December 2015	Updated GULD to document the acceptance of MWS-Linear Modular Wetland installations with or without the inclusion of plants
July 2017	Revised Manufacturer Contact Information (name, address, and email)
December 2019	Revised Manufacturer Contact Address

Attachment 2
Backup for PDP Hydromodification Control Measures

This is the cover sheet for Attachment 2.

☐ Mark this box if this attachment is empty because the project is exempt from PDP hydromodification management requirements.

Project Name: Majestic Airway

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 2a	Hydromodification Management Exhibit (Required)	☐ Included See Hydromodification Management Exhibit Checklist.
Attachment 2b	Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional) See Section 6.2 of the BMP Design Manual.	☐ Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required) Optional analyses for Critical Coarse Sediment Yield Area Determination ☐ 6.2.1 Verification of Geomorphic Landscape Units Onsite ☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment ☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
Attachment 2c	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	☐ Not Performed ☐ Included ☐ Submitted as separate stand-alone document
Attachment 2d	Flow Control Facility Design and Structural BMP Drawdown Calculations (Required) Overflow Design Summary for each structural BMP See Chapter 6 and Appendix G of the BMP Design Manual	☐ Included ☐ Submitted as separate stand-alone document

Project Name: Majestic Airway

Use this checklist to ensure the required information has been included on the Hydromodification Management Exhibit:

The Hydromodification Management Exhibit must identify:

- ☑ Underlying hydrologic soil group
- ☑ Approximate depth to groundwater
- ☑ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
- ☑ Critical coarse sediment yield areas to be protected OR provide a separate map showing that the project site is outside of any critical coarse sediment yield areas
- ☑ Existing topography
- ☑ Existing and proposed site drainage network and connections to drainage offsite
- ☑ Proposed grading
- ☑ Proposed impervious features
- ☑ Proposed design features and surface treatments used to minimize imperviousness
- ☑ Point(s) of Compliance (POC) for Hydromodification Management
  Existing and proposed drainage boundary and drainage area to each POC (when necessary, create separate exhibits for pre-development and post-project conditions)
- ☑ Structural BMPs for hydromodification management (identify location, type of BMP, and size/detail).

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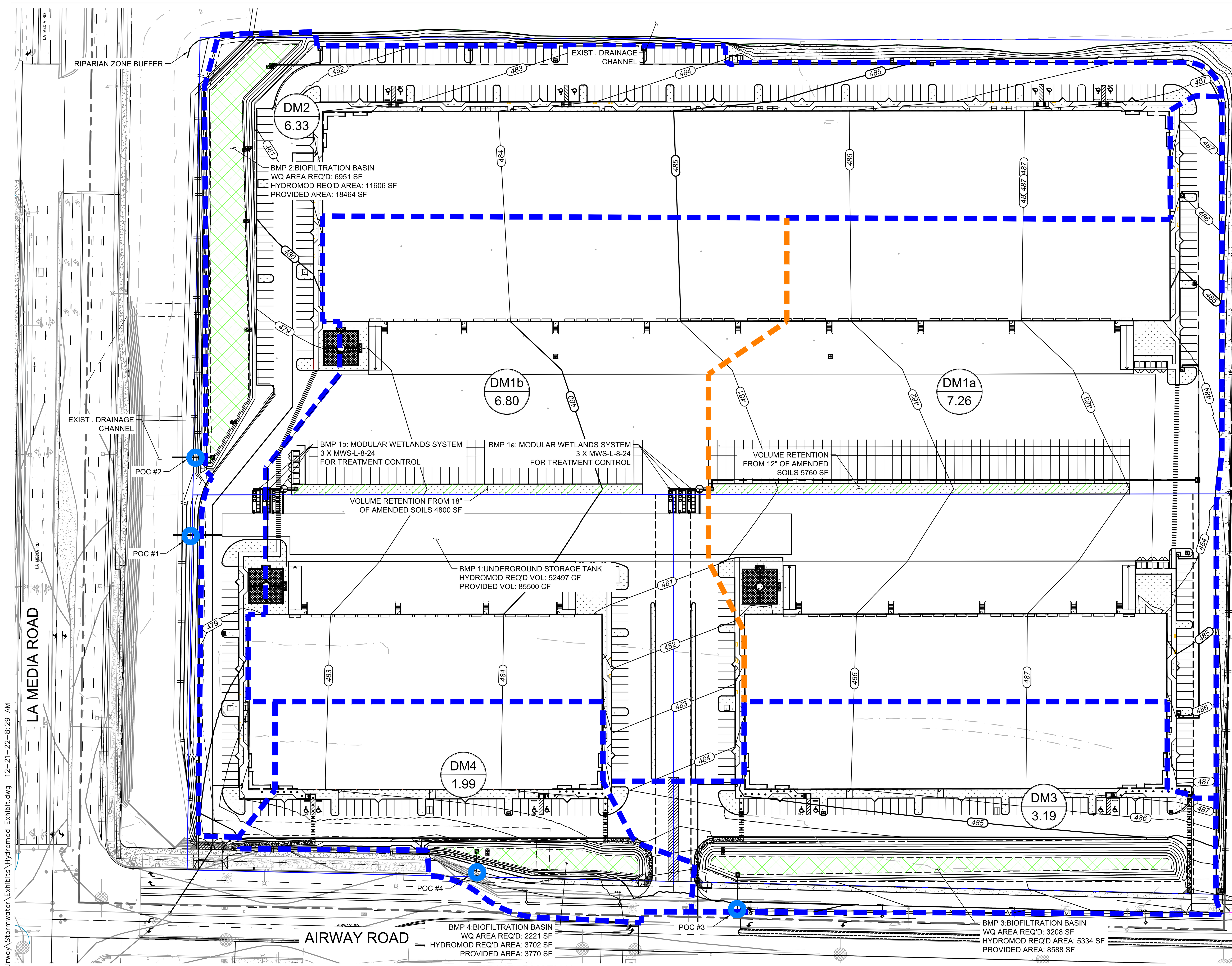
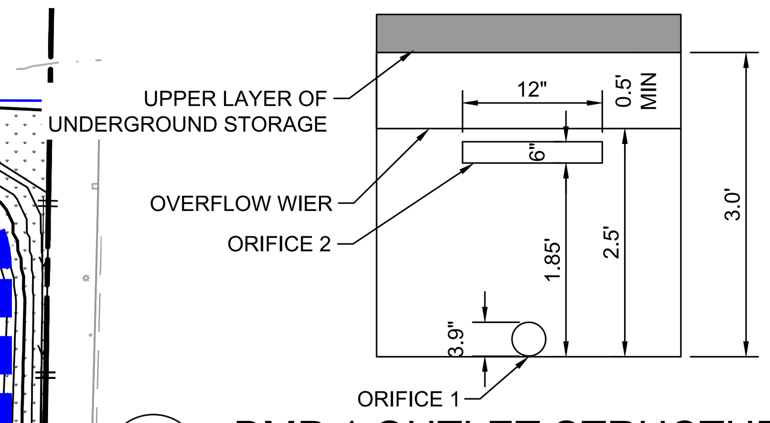
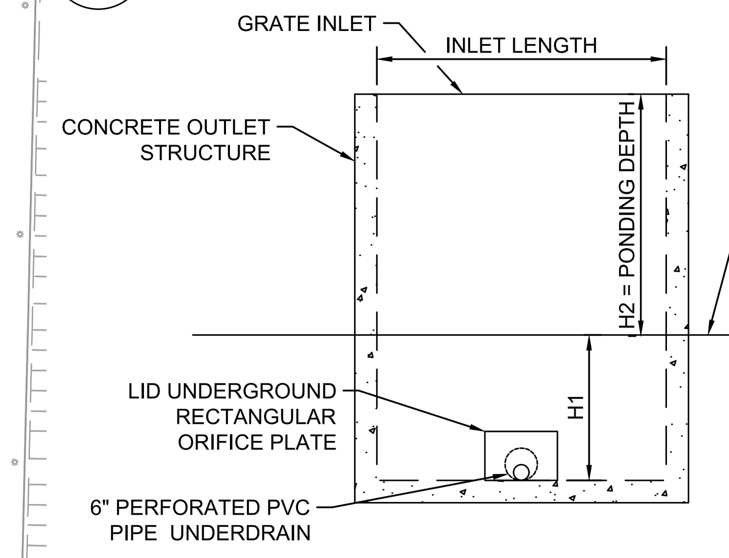




3 BMP 1 OUTLET STRUCTURE
NOT TO SCALE

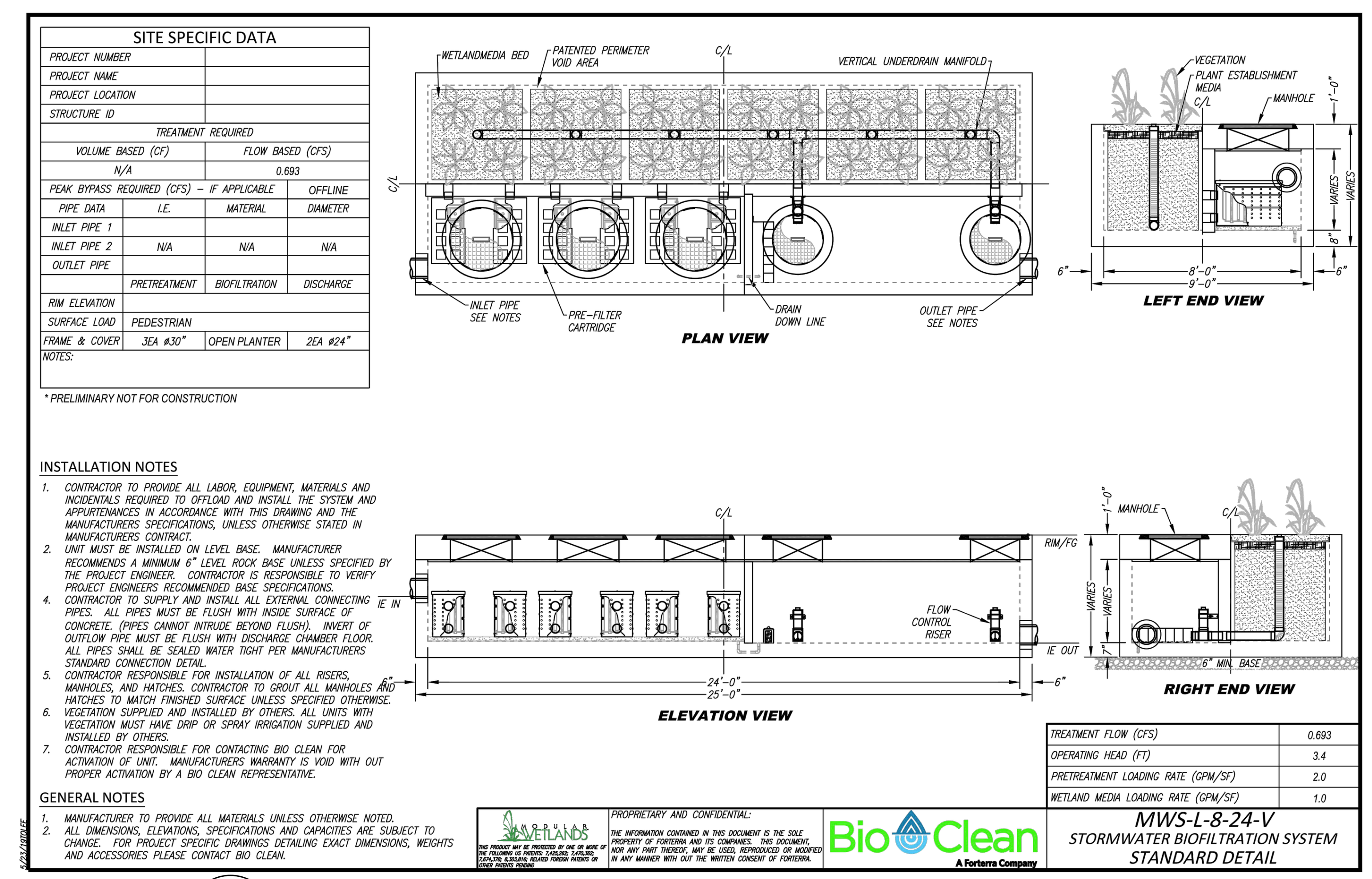


LEGEND

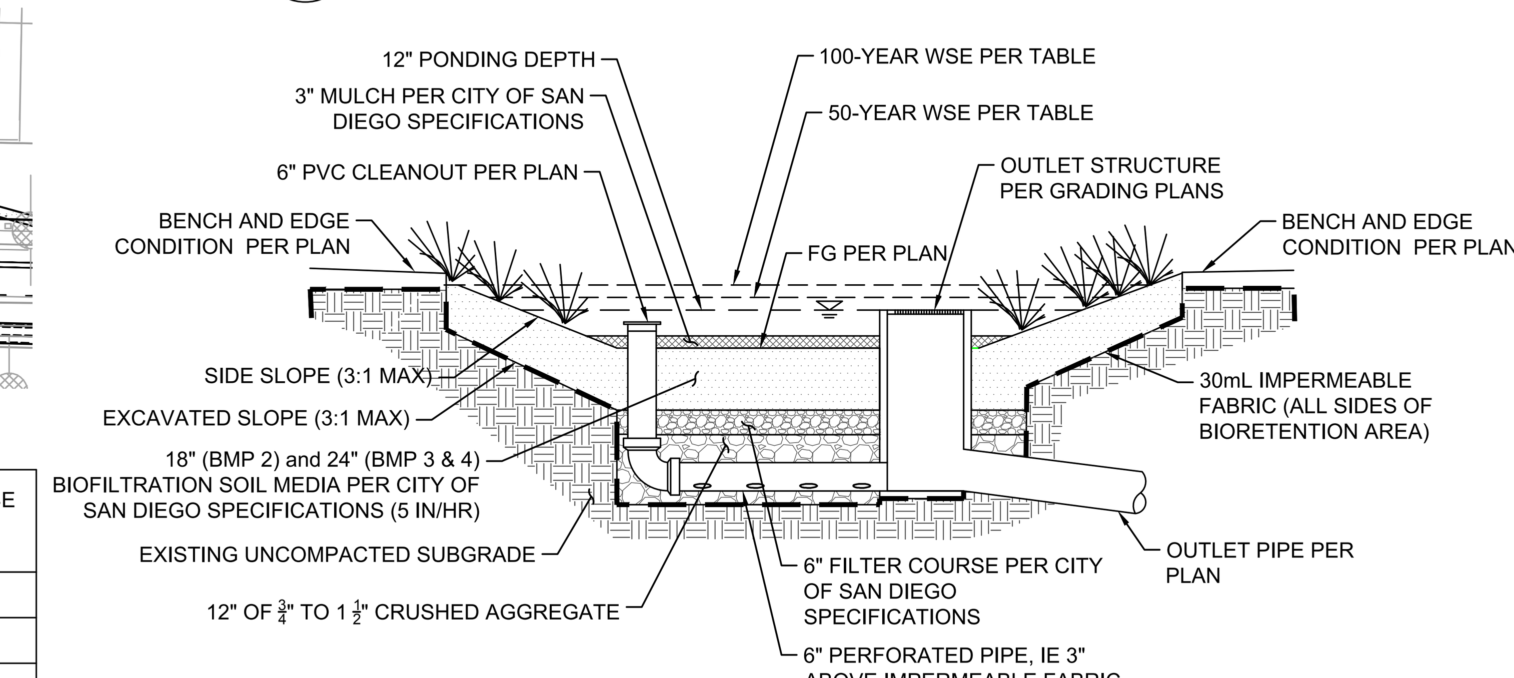
- PROPERTY BOUNDARY
- DRAINAGE MANAGEMENT AREA BOUNDARY
- DRAINAGE MANAGEMENT SUBAREA BOUNDARY
- EXISTING CONTOUR — XXXX
- PROPOSED CONTOUR — XXXX
- STORM DRAIN
- BIOFILTRATION BMP AREA
- VOLUME RETENTION AREA
- LANDSCAPE AREA
- DRAINAGE MANAGEMENT AREA LABEL — DMA / AREA — ACRES
- POINT OF COMPLIANCE (POC)

BASIN ID	LID ORIFICE PLATE		GRATE INLET	
	H1	DIAMETER	H2	LENGTH
	INCHES	INCHES	INCHES	FEET
2	36	2.3	12	4
3	42	1.5	12	4
4	42	1.1	12	4

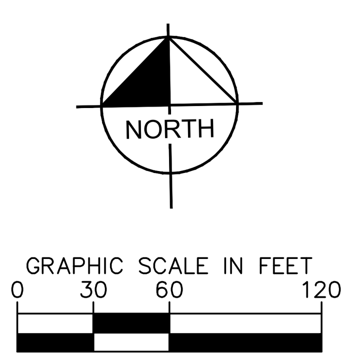
4 BMP 2, 3, 4 OUTLET STRUCTURE
NOT TO SCALE



2 TYPICAL MODULAR WETLANDS DETAIL
NOT TO SCALE



1 TYPICAL BIOFILTRATION WITH UNDERDRAIN
NOT TO SCALE



DMA	TYPE	AREA (AC)
1a	DRAINS TO MWS BMP 1a & BMP 1	7.26
1b	DRAINS TO MWS BMP 1b & BMP 1	6.80
2	DRAINS TO BIOFILTRATION BMP 2	6.33
3	DRAINS TO BIOFILTRATION BMP 3	3.19
4	DRAINS TO BIOFILTRATION BMP 4	1.99

SITE INFORMATION

1. HYDROLOGICAL SOIL GROUP: TYPE D
2. EXISTING CONDITION HAS NO IMPERVIOUS AREAS
3. DEPTH TO GROUNDWATER: 16' - 36'
4. ALL BMPS ARE BIOFILTRATION
5. THERE ARE NO EXISTING CCYSA'S ONSITE OR UPSTREAM OF THE PROJECT SITE
6. AREAS NOT SHOWN AS LANDSCAPE ARE IMPERVIOUS

BASIN ID	WQ PONDING DEPTH	FG ELEVATION OF BASIN	50-YEAR WSE	100-YEAR WSE
	INCHES	FEET	FEET	FEET
2	12	476.50	477.92	477.97
3	12	478.00	479.30	479.33
4	12	478.32	479.54	479.56

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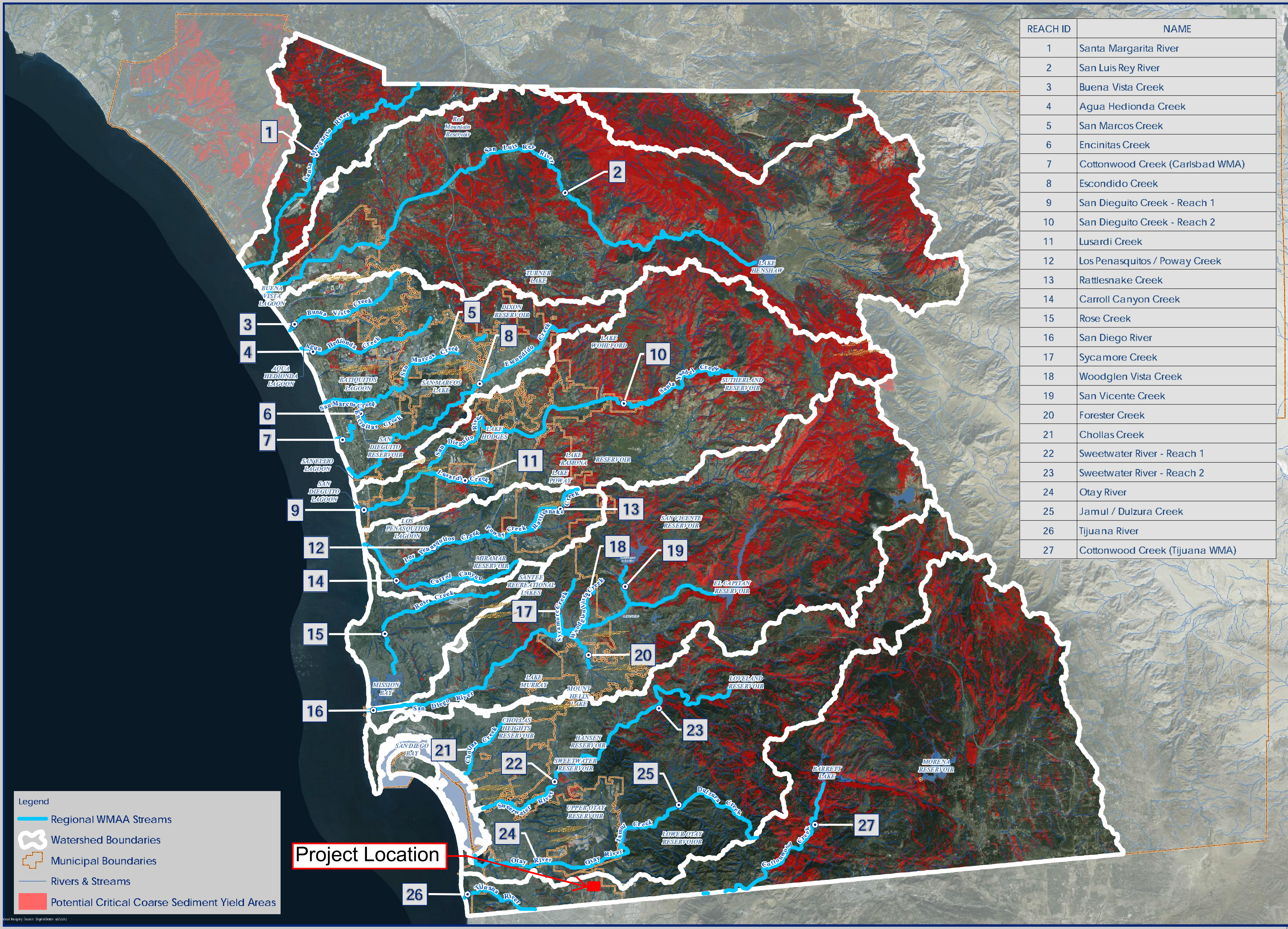
Kimley»Horn

21 December 2022

HYDROMODIFICATION EXHIBIT
MAJESTIC AIRWAY - SAN DIEGO, CALIFORNIA



REACH ID	NAME
1	Santa Margarita River
2	San Luis Rey River
3	Buena Vista Creek
4	Agua Hedionda Creek
5	San Marcos Creek
6	Encinitas Creek
7	Cottonwood Creek (Carlsbad WMA)
8	Escondido Creek
9	San Dieguito Creek - Reach 1
10	San Dieguito Creek - Reach 2
11	Lusardi Creek
12	Los Penasquitos / Poway Creek
13	Rattlesnake Creek
14	Carroll Canyon Creek
15	Rose Creek
16	San Diego River
17	Sycamore Creek
18	Woodglen Vista Creek
19	San Vicente Creek
20	Forester Creek
21	Chollas Creek
22	Sweetwater River - Reach 1
23	Sweetwater River - Reach 2
24	Otay River
25	Jamul / Dulzura Creek
26	Tijuana River
27	Cottonwood Creek (Tijuana WMA)

Potential Critical Coarse Sediment Yield Areas

Regional San Diego County Watersheds

Exhibit Date: Sept. 8, 2014

G.2.1 Unit Runoff Ratios

Table G.2-2 presents unit runoff ratios for calculating pre-development Q_2, to be used when applicable to determine the lower flow threshold for low flow orifice sizing for biofiltration with partial retention, biofiltration, or cistern BMPs. There is no low flow orifice in the infiltration BMP. The unit runoff ratios are updated from the previously reported BMP Sizing Calculator methodology ratios to account for changes in modeling methodologies. Unit runoff ratios for "urban" and "impervious" cover categories were not transferred to this manual due to the requirement to control runoff to pre-development condition (see Chapter 6.3.3).

How to use the unit runoff ratios:

Obtain unit runoff ratio from Table G.2-2 based on the project's rainfall basin, hydrologic soil group, and pre-development slope (for redevelopment projects, pre-development slope may be considered if historic topographic information is available, otherwise use pre-project slope). Multiply the area tributary to the structural BMP (A, acres) by the unit runoff ratio (Q_2, cfs/acre) to determine the pre-development Q_2 to determine the lower flow threshold, to use for low flow orifice sizing.

Table G.2-2: Unit Runoff Ratios for Sizing Factor Method

Rain Gauge	Soil	Slope	Q_2 (cfs/acre)	Q_{10} (cfs/ac)
Lake Wohlford	A	Low	0.256	0.518
Lake Wohlford	A	Moderate	0.275	0.528
Lake Wohlford	A	Steep	0.283	0.531
Lake Wohlford	B	Low	0.371	0.624
Lake Wohlford	B	Moderate	0.389	0.631
Lake Wohlford	B	Steep	0.393	0.633
Lake Wohlford	C	Low	0.490	0.729
Lake Wohlford	C	Moderate	0.495	0.733
Lake Wohlford	C	Steep	0.496	0.735
Lake Wohlford	D	Low	0.548	0.784
Lake Wohlford	D	Moderate	0.554	0.788
Lake Wohlford	D	Steep	0.556	0.788
Oceanside	A	Low	0.256	0.679
Oceanside	A	Moderate	0.277	0.694
Oceanside	A	Steep	0.285	0.700

Rain Gauge	Soil	Slope	Q_2 (cfs/acre)	Q_{10} (cfs/ac)
Oceanside	B	Low	0.377	0.875
Oceanside	B	Moderate	0.391	0.879
Oceanside	B	Steep	0.395	0.881
Oceanside	C	Low	0.488	0.981
Oceanside	C	Moderate	0.497	0.985
Oceanside	C	Steep	0.499	0.986
Oceanside	D	Low	0.571	0.998
Oceanside	D	Moderate	0.575	0.999
Oceanside	D	Steep	0.576	0.999
Lindbergh	A	Low	0.057	0.384
Lindbergh	A	Moderate	0.073	0.399
Lindbergh	A	Steep	0.082	0.403
Lindbergh	B	Low	0.199	0.496
Lindbergh	B	Moderate	0.220	0.509
Lindbergh	B	Steep	0.230	0.513
Lindbergh	C	Low	0.335	0.601
Lindbergh	C	Moderate	0.349	0.610
Lindbergh	C	Steep	0.354	0.613
Lindbergh	D	Low	0.429	0.751
Lindbergh	D	Moderate	0.437	0.753
Lindbergh	D	Steep	0.439	0.753

Additional steps to use this BMP as a combined pollutant control and flow control BMP:

The BMP sized using the sizing factors in Table G.2-5 meets both pollutant control and flow control requirements except for surface drawdown requirements. Applicant must perform surface drawdown calculations and if needed develop a vector management plan (Refer to Section 6.3.7) or revise the BMP design to meet the drawdown requirements. If changes are made to the BMP design applicants must perform site specific continuous simulation modeling (Refer to Appendix G).

Table G.2-5: Sizing Factors for Hydromodification Flow Control Biofiltration BMPs Designed Using Sizing Factor Method

Lower Flow Threshold	Soil Group	Slope	Rain Gauge	A
$0.1Q_2$	A	Flat	Lindbergh	0.320
$0.1Q_2$	A	Moderate	Lindbergh	0.300
$0.1Q_2$	A	Steep	Lindbergh	0.285
$0.1Q_2$	B	Flat	Lindbergh	0.105
$0.1Q_2$	B	Moderate	Lindbergh	0.100
$0.1Q_2$	B	Steep	Lindbergh	0.095
$0.1Q_2$	C	Flat	Lindbergh	0.055
$0.1Q_2$	C	Moderate	Lindbergh	0.050
$0.1Q_2$	C	Steep	Lindbergh	0.050
$0.1Q_2$	D	Flat	Lindbergh	0.050
$0.1Q_2$	D	Moderate	Lindbergh	0.050
$0.1Q_2$	D	Steep	Lindbergh	0.050
$0.1Q_2$	A	Flat	Oceanside	0.150
$0.1Q_2$	A	Moderate	Oceanside	0.140
$0.1Q_2$	A	Steep	Oceanside	0.135
$0.1Q_2$	B	Flat	Oceanside	0.085
$0.1Q_2$	B	Moderate	Oceanside	0.085
$0.1Q_2$	B	Steep	Oceanside	0.085
$0.1Q_2$	C	Flat	Oceanside	0.075
$0.1Q_2$	C	Moderate	Oceanside	0.075
$0.1Q_2$	C	Steep	Oceanside	0.075
$0.1Q_2$	D	Flat	Oceanside	0.070
$0.1Q_2$	D	Moderate	Oceanside	0.070
$0.1Q_2$	D	Steep	Oceanside	0.070
$0.1Q_2$	A	Flat	L Wohlford	0.285
$0.1Q_2$	A	Moderate	L Wohlford	0.275

Worksheet G.2-1: Sizing Factors Worksheet

Site Information			
Project Name:	Majestic Airway	**Hydrologic Unit**	SAN DIEGO
Project Applicant:	KIMLEY-HORN	**Rain Gauge:**	LINDBERGH
Jurisdiction:	CITY OF SAN DIEGO	**Total Project Area:**	32.48 AC
Assessor's Parcel Number:	646-121-35	**Low Flow Threshold:**	**$0.1Q_2$**
BMP Name:	BMP 1	**BMP Type:**	Underground Detention Tank

Areas Draining to BMP						Sizing Factors		Minimum BMP Size	
DMA Name	**Area (sf)**	**Soil Type**	**Slope**	**Post Project Surface Type**	**Runoff Factor (From Table G.2-1)**	**Surface Area**	**Volume**	**Surface Area (sf)**	**Volume (cf)**
1a	316455	D	LOW	ASPHALT	0.95	----	0.09	----	27060
1b	296242	D	LOW	ASPHALT	0.95	----	0.09	----	25437
Total DMA Area	612697						**Minimum BMP Size***	----	52,497
							Proposed BMP Size*	----	85,500

***Minimum BMP Size = Total of rows above.**

***Proposed BMP Size ≥ Minimum BMP size.**

Worksheet G.2-1: Sizing Factors Worksheet

Site Information			
Project Name:	Majestic Airway	**Hydrologic Unit**	SAN DIEGO
Project Applicant:	KIMLEY-HORN	**Rain Gauge:**	LINDBERGH
Jurisdiction:	CITY OF SAN DIEGO	**Total Project Area:**	32.48 AC
Assessor's Parcel Number:	646-121-35	**Low Flow Threshold:**	**$0.1Q_2$**
BMP Name:	BMP 2	**BMP Type:**	BIOFILTRATION BASIN

Areas Draining to BMP						Sizing Factors		Minimum BMP Size	
DMA Name	**Area (sf)**	**Soil Type**	**Slope**	**Post Project Surface Type**	**Runoff Factor (From Table G.2-1)**	**Surface Area**	**Volume**	**Surface Area (sf)**	**Volume (cf)**
2	275839	D	LOW	ASPHALT	0.84	0.05	------	11606	-----
Total DMA Area	275839						**Minimum BMP Size***	11606	-----
							Proposed BMP Size*	18464	------

***Minimum BMP Size = Total of rows above.**

***Proposed BMP Size ≥ Minimum BMP size.**

Worksheet G.2-1: Sizing Factors Worksheet

Site Information			
Project Name:	Majestic Airway	**Hydrologic Unit**	SAN DIEGO
Project Applicant:	KIMLEY-HORN	**Rain Gauge:**	LINDBERGH
Jurisdiction:	CITY OF SAN DIEGO	**Total Project Area:**	32.48 AC
Assessor's Parcel Number:	646-121-35	**Low Flow Threshold:**	**$0.1Q_2$**
BMP Name:	BMP 3	**BMP Type:**	BIOFILTRATION BASIN

Areas Draining to BMP						Sizing Factors		Minimum BMP Size	
DMA Name	**Area (sf)**	**Soil Type**	**Slope**	**Post Project Surface Type**	**Runoff Factor (From Table G.2-1)**	**Surface Area**	**Volume**	**Surface Area (sf)**	**Volume (cf)**
3	138861	D	LOW	ASPHALT	0.77	0.05	------	5334	-----
Total DMA Area	138861						**Minimum BMP Size***	5334	-----
							Proposed BMP Size*	8588	------

***Minimum BMP Size = Total of rows above.**

***Proposed BMP Size ≥ Minimum BMP size.**

Worksheet G.2-1: Sizing Factors Worksheet

Site Information			
Project Name:	Majestic Airway	**Hydrologic Unit**	SAN DIEGO
Project Applicant:	KIMLEY-HORN	**Rain Gauge:**	LINDBERGH
Jurisdiction:	CITY OF SAN DIEGO	**Total Project Area:**	32.48 AC
Assessor's Parcel Number:	646-121-35	**Low Flow Threshold:**	**$0.1Q_2$**
BMP Name:	BMP 4	**BMP Type:**	BIOFILTRATION BASIN

Areas Draining to BMP						Sizing Factors		Minimum BMP Size	
DMA Name	**Area (sf)**	**Soil Type**	**Slope**	**Post Project Surface Type**	**Runoff Factor (From Table G.2-1)**	**Surface Area**	**Volume**	**Surface Area (sf)**	**Volume (cf)**
4	85077	D	LOW	ASPHALT	0.87	0.05	------	3702	-----
Total DMA Area	85077						**Minimum BMP Size***	3702	-----
							Proposed BMP Size*	3770	------

***Minimum BMP Size = Total of rows above.**

***Proposed BMP Size ≥ Minimum BMP size.**

Circular Orifice - Basin 1

Project Description	
Solve For	Diameter

Input Data	
Discharge	0.60 cfs
Headwater Elevation	2.50 ft
Centroid Elevation	0.00 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600

Results	
Diameter	3.8 in
Headwater Height Above Centroid	2.50 ft
Tailwater Height Above Centroid	0.00 ft
Flow Area	0.1 ft²
Velocity	7.61 ft/s

Circular Orifice - Basin 2

Project Description	
Solve For	Diameter

Input Data		
Discharge	0.27	cfs
Headwater Elevation	4.00	ft
Centroid Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.600	

Results		
Diameter	2.3	in
Headwater Height Above Centroid	4.00	ft
Tailwater Height Above Centroid	0.00	ft
Flow Area	0.0	ft²
Velocity	9.63	ft/s

Circular Orifice - Basin 3

Project Description	
Solve For	Diameter

Input Data	
Discharge	0.14 cfs
Headwater Elevation	4.50 ft
Centroid Elevation	0.00 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600

Results	
Diameter	1.6 in
Headwater Height Above Centroid	4.50 ft
Tailwater Height Above Centroid	0.00 ft
Flow Area	0.0 ft²
Velocity	10.21 ft/s

Circular Orifice - Basin 4

Project Description	
Solve For	Diameter

Input Data	
Discharge	0.08 cfs
Headwater Elevation	4.50 ft
Centroid Elevation	0.00 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600

Results	
Diameter	1.2 in
Headwater Height Above Centroid	4.50 ft
Tailwater Height Above Centroid	0.00 ft
Flow Area	0.0 ft²
Velocity	10.21 ft/s

Attachment 3
Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

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Project Name: Majestic Airway

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 3	Maintenance Agreement (Form DS-3247) (when applicable)	☑ Included ☐ Not applicable

The City of SAN DIEGO

RECORDING REQUESTED BY:
THE CITY OF SAN DIEGO AND
WHEN RECORDED MAIL TO:
MAJESTIC REALTY
13191 CROSSROADS PKWY, 6FLR
CITY OF INDUSTRY, CA 91746

(THIS SPACE IS FOR RECORDER'S USE ONLY)

STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT

APPROVAL NUMBER:	ASSESSORS PARCEL NUMBER:	PROJECT NUMBER:
	646-121-35	

This agreement is made by and between the City of San Diego, a municipal corporation [City] and MAJESTIC REALTY, the owner or duly authorized representative of the owner [Property Owner] of property located at

northeast corner of La Media Rd and Airway Rd, San Diego, CA 92154
(PROPERTY ADDRESS)

and more particularly described as: Parcels 2 of Parcel Map No. 21010

(LEGAL DESCRIPTION OF PROPERTY)

in the City of San Diego, County of San Diego, State of California.

Property Owner is required pursuant to the City of San Diego Municipal Code, Chapter 4, Article 3, Division 3, Chapter 14, Article 2, Division 2, and the Land Development Manual, Storm Water Standards to enter into a Storm Water Management and Discharge Control Maintenance Agreement [Maintenance Agreement] for the installation and maintenance of Permanent Storm Water Best Management Practices [Permanent Storm Water BMP's] prior to the issuance of construction permits. The Maintenance Agreement is intended to ensure the establishment and maintenance of Permanent Storm Water BMP's onsite, as described in the attached exhibit(s), the project's Storm Water Quality Management Plan [SWQMP] and Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s): ______________________.

Property Owner wishes to obtain a building or engineering permit according to the Grading and/or Improvement Plan Drawing No(s) or Building Plan Project No(s): ______________________.

Continued on Page 2

NOW, THEREFORE, the parties agree as follows:

1. Property Owner shall have prepared, or if qualified, shall prepare an Operation and Maintenance Procedure [OMP] for Permanent Storm Water BMP's, satisfactory to the City, according to the attached exhibit(s), consistent with the Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s): ___________.

2. Property Owner shall install, maintain and repair or replace all Permanent Storm Water BMP's within their property, according to the OMP guidelines as described in the attached exhibit(s), the project's SWQMP and Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s) ____________.

3. Property Owner shall maintain operation and maintenance records for at least five (5) years. These records shall be made available to the City for inspection upon request at any time.

This Maintenance Agreement shall commence upon execution of this document by all parties named hereon, and shall run with the land.

Executed by the City of San Diego and by Property Owner in San Diego, California.

See Attached Exhibit(s): ______________________________

____
(Owner Signature)

____
(Print Name and Title)

MAJESTIC REALTY
(Company/Organization Name)

____
(Date)

THE CITY OF SAN DIEGO

APPROVED:

____
(City Control Engineer Signature)

____
(Print Name)

____
(Date)

NOTE: ALL SIGNATURES MUST INCLUDE NOTARY ACKNOWLEDGMENTS PER CIVIL CODE SEC. 1180 ET.SEQ.

Reset Button Page 2

Use this checklist to ensure the required information has been included in the Structural BMP Maintenance Information Attachment:

Attachment 3: For private entity operation and maintenance, Attachment 3 must include a Storm Water Management and Discharge Control Maintenance Agreement (Form DS-3247). The following information must be included in the exhibits attached to the maintenance agreement:

- ☐ Vicinity map
- ☐ Site design BMPs for which DCV reduction is claimed for meeting the pollutant control obligations.
- ☐ BMP and HMP location and dimensions
- ☐ BMP and HMP specifications/cross section/model
- ☐ Maintenance recommendations and frequency
- ☐ LID features such as (permeable paver and LS location, dim, SF).

to be provided during final design

Table 7-2. Maintenance Indicators and Actions for Vegetated BMPs

Typical Maintenance Indicator(s) for Vegetated BMPs	Maintenance Actions
Accumulation of sediment, litter, or debris	Remove and properly dispose of accumulated materials, without damage to the vegetation.
Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans.
Overgrown vegetation	Mow or trim as appropriate, but not less than the design height of the vegetation per original plans when applicable (e.g. a vegetated swale may require a minimum vegetation height).
Erosion due to concentrated irrigation flow	Repair/re-seed/re-plant eroded areas and adjust the irrigation system.
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.
Standing water in vegetated swales	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, loosening or replacing top soil to allow for better infiltration, or minor re-grading for proper drainage. 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 bioretention, biofiltration with partial retention, or biofiltration areas, or flow-through planter boxes for longer than 96 hours following a storm event*	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains (where applicable), or repairing/replacing clogged or compacted soils.
Obstructed inlet or outlet structure	Clear obstructions.
Damage to structural components such as weirs, inlet or outlet structures	Repair or replace as applicable.
*These BMPs typically include a surface ponding layer as part of their function which may take 96 hours to drain following a storm event.	

E.18 BF-1 Biofiltration

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

MS4 Permit Category	
Biofiltration	
Manual Category	
Biofiltration	
Applicable Performance Standard	
Pollutant Control Flow Control	
Primary Benefits	
Treatment Volume Reduction (Incidental) Peak Flow Attenuation (Optional)	

Description

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. Bioretention with underdrain facilities are commonly incorporated into the site within parking lot landscaping, along roadsides, and in open spaces. Because these types of 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. Treatment is achieved through filtration, sedimentation, sorption, biochemical processes and plant uptake.

Typical bioretention with underdrain 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 expected climate and ponding depth
- Non-floating mulch layer
- Media layer (planting mix or engineered media) capable of supporting vegetation growth
- Filter course layer (aka choking 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

Design Adaptations for Project Goals

Biofiltration Treatment BMP for storm water pollutant control. The system is lined or un-lined to provide incidental infiltration, and an underdrain is provided at the bottom to carry away filtered runoff. This configuration is considered to provide biofiltration treatment via flow through the media layer. Storage provided above the underdrain within surface ponding, media, and aggregate storage is considered included in the biofiltration treatment volume. Saturated storage within the aggregate storage layer can be added to this design by raising the underdrain above the bottom of the aggregate storage layer or via an internal weir structure designed to maintain a specific water level elevation.

Integrated storm water flow control and pollutant control configuration. The system can be designed to provide flow rate and duration control by primarily providing increased surface ponding and/or having a deeper aggregate storage layer above the underdrain. This will allow for significant detention storage, which can be controlled via inclusion of an outlet structure at the downstream end of the underdrain.

Recommended Siting Criteria

	Siting Criteria	Intent/Rationale
□	Placement observes geotechnical recommendations regarding potential hazards (e.g., slope stability, landslides, liquefaction zones) and setbacks (e.g., slopes, foundations, utilities).	Must not negatively impact existing site geotechnical concerns.
□	An impermeable liner or other hydraulic restriction layer is included if site constraints indicate that infiltration or lateral flows should not be allowed.	Lining prevents storm water from impacting groundwater and/or sensitive environmental or geotechnical features. Incidental infiltration, when allowable, can aid in pollutant removal and groundwater recharge.
□	Contributing tributary area shall be ≤ 5 acres (≤ 1 acre preferred).	Bigger BMPs require additional design features for proper performance. Contributing tributary area greater than 5 acres may be allowed at the discretion of the City Engineer if the following conditions are met: 1) incorporate design features (e.g. flow spreaders) to minimizing short circuiting of flows in the BMP and 2) incorporate additional design features requested by the City Engineer for proper performance of the regional BMP.
□	Finish grade of the facility is ≤ 2%.	Flatter surfaces reduce erosion and channelization within the facility.

Example Schematic Design – Plan and Section View

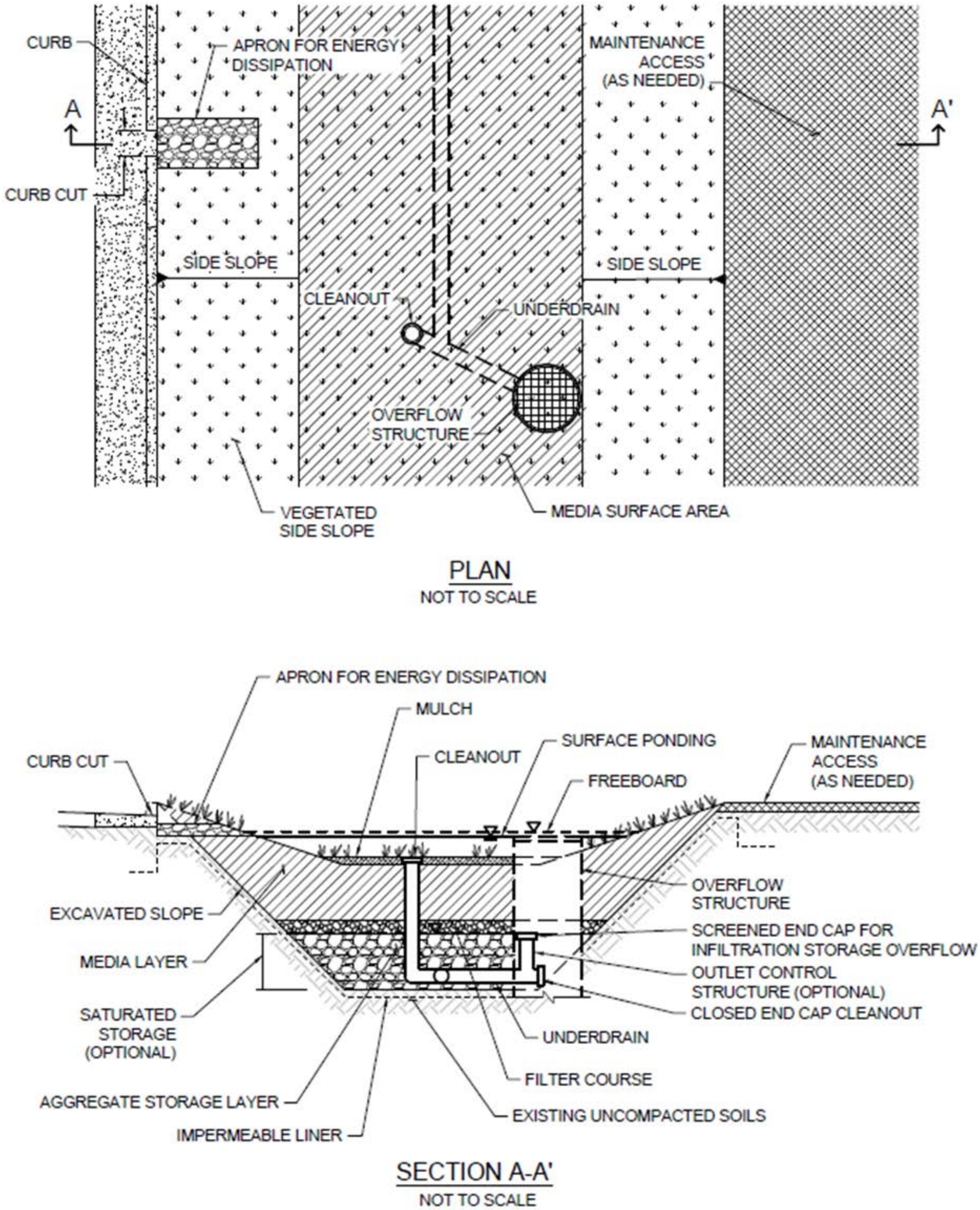

Figure E.18-1 : Typical Plan and Section View of a Biofiltration BMP

Recommended BMP Component Dimensions

BMP Component	Dimension	Intent/Rationale
Freeboard	≥ 2 inches	Freeboard provides room for head over overflow structures and minimizes risk of uncontrolled surface discharge.
Surface Ponding	≥ 6 and ≤ 12 inches	The minimum ponding depth is required so that the runoff is uniformly spread throughout the basin (minimizes the likelihood of short circuiting). Deep surface ponding raises safety concerns. When the BMP is adjoining walkways the minimum surface ponding depth can be reduced to 4 inches. Surface ponding depth greater than 12 inches (for additional pollutant control or surface outlet structures or flow-control orifices) may be allowed at the discretion of the City Engineer if the following conditions are met: 1) surface ponding depth drawdown time is less than 24 hours; and 2) safety issues and fencing requirements are considered (typically ponding greater than 18" will require a fence) and 3) potential for elevated clogging risk is evaluated (Worksheet B.5.4).
Ponding Area Side Slopes	3H:1V or shallower	Gentler side slopes are safer, less prone to erosion, able to establish vegetation more quickly and easier to maintain.
Mulch	≥ 3 inches	Mulch will suppress weeds and maintain moisture for plant growth.
Media Layer	≥ 18 inches	A deep media layer provides additional filtration and supports plants with deeper roots. Where the minimum depth of 18 inches is used, only shallow-rooted species shall be planted. A minimum 24-inch media layer shall typically be required to support vegetation, with a minimum 36-inch media layer depth required for trees.
Filter Course	6 inches	To reduce clogging potential, a two-layer filter course (aka choking stone system) is used consisting of one 3" layer of clean and washed ASTM 33 Fine Aggregate Sand overlying a 3" layer of ASTM No 8 Stone (Appendix F.4). This specification has been developed to maintain permeability while limiting the migration of media material into the stone reservoir and underdrain system.
Underdrain Diameter	≥ 8 inches	Minimum diameter required for maintenance by City crews. For privately maintained BMPs, a minimum underdrain diameter of 6 inches is allowed.
Cleanout Diameter	≥ 8 inches	Facilitates simpler cleaning, when needed. For privately maintained BMPs, cleanout diameter of 6 inches is allowed.

Deviations to the recommended BMP component dimensions may be approved at the discretion of the City Engineer if it is determined to be appropriate.

Design Criteria and Considerations

Bioretention with underdrain must meet the following design criteria. Deviations from the below criteria may be approved at the discretion of the City Engineer if it is determined to be appropriate:

	Design Criteria	Intent/Rationale
Surface Ponding		
☐	Surface ponding is limited to a 24-hour drawdown time.	Surface ponding limited to 24 hour for plant health. Surface ponding drawdown time greater than 24-hours but less than 96 hours may be allowed at the discretion of the City Engineer if certified by a landscape architect or agronomist.
Vegetation		
☐	Plantings are suitable for the climate and expected ponding depth. A plant list to aid in selection can be found in Appendix E.26.	Plants suited to the climate and ponding depth are more likely to survive.
☐	An irrigation system with a connection to water supply should be provided as needed.	Seasonal irrigation might be needed to keep plants healthy.
Mulch		
☐	A minimum of 3 inches of well-aged, shredded hardwood mulch that has been stockpiled or stored for at least 12 months is provided.	Mulch will suppress weeds and maintain moisture for plant growth. Aging mulch kills pathogens and weed seeds and allows the beneficial microbes to multiply.
Media Layer		
☐	Media maintains a minimum filtration rate of 5 in/hr. over lifetime of facility. Additional Criteria for media hydraulic conductivity described in the bioretention soil media model specification (Appendix F.3)	A filtration rate of at least 5 inches per hour allows soil to drain between events. The initial rate should be higher than long term target rate to account for clogging over time. However an excessively high initial rate can have a negative impact on treatment performance, therefore an upper limit is needed.

	Design Criteria	Intent/Rationale
☐	Media shall be a minimum 18 inches deep for filtration purposes, with a minimum 24-inch media layer depth typically required to support vegetation and a minimum 36-inch media layer depth required for trees. Media shall meet the following specifications. Model bioretention soil media specification provided in Appendix F.3 or County of San Diego Low Impact Development Handbook: Appendix G - Bioretention Soil Specification (June 2014, unless superseded by more recent edition). Alternatively, for proprietary designs and custom media mixes not meeting the media specifications, the media meets the pollutant treatment performance criteria in Section F.1.	A deep media layer provides additional filtration and supports plants with deeper roots. Standard specifications shall be followed. For non-standard or proprietary designs, compliance with Appendix F.1 ensures that adequate treatment performance will be provided.
☐	Media surface area is 3% of contributing area times adjusted runoff factor or greater. Unless demonstrated that the BMP surface area can be smaller than 3%.	Greater surface area to tributary area ratios: a) maximizes volume retention as required by the MS4 Permit and b) decrease loading rates per square foot and therefore increase longevity. Adjusted runoff factor is to account for site design BMPs implemented upstream of the BMP (such as rain barrels, impervious area dispersion, etc.). Refer to Appendix B.2 guidance. Refer to Appendix B.5 for guidance to support use of smaller than 3% footprint..
☐	Where receiving waters are impaired or have a TMDL for nutrients, the system is designed with nutrient sensitive media design (see fact sheet BF-2).	Potential for pollutant export is partly a function of media composition; media design must minimize potential for export of nutrients, particularly where receiving waters are impaired for nutrients.
Filter Course Layer		
☐	A filter course is used to prevent migration of fines through layers of the facility. Filter fabric is not used.	Migration of media can cause clogging of the aggregate storage layer void spaces or subgrade and can result in poor water quality performance for turbidity and suspended solids. Filter fabric is more likely to clog.
☐	Filter course is washed and free of fines.	Washing aggregate will help eliminate fines that could clog the facility and impede infiltration.
☐	To reduce clogging potential, a two-layer filter course (aka choking stone system) is used consisting of one 3” layer of clean and washed ASTM 33 Fine Aggregate Sand overlying a 3” layer of ASTM No 8 Stone (Appendix F.4).	This specification has been developed to maintain permeability while limiting the migration of media material into the stone reservoir and underdrain system.

	Design Criteria	Intent/Rationale
Aggregate Storage Layer		
☐	ASTM #57 open graded stone is used for the storage layer and a two layer filter course (detailed above) is used above this layer	This layer provides additional storage capacity. ASTM #8 stone provides an acceptable choking/bridging interface with the particles in ASTM #57 stone.
☐	The depth of aggregate provided (12-inch typical) and storage layer configuration is adequate for providing conveyance for underdrain flows to the outlet structure.	Proper storage layer configuration and underdrain placement will minimize facility drawdown time.
Inflow, Underdrain, and Outflow Structures		
☐	Inflow, underdrains and outflow structures are accessible for inspection and maintenance.	Maintenance will prevent clogging and ensure proper operation of the flow control structures.
☐	Inflow velocities are limited to 3 ft./s or less or use energy dissipation methods. (e.g., riprap, level spreader) for concentrated inflows.	High inflow velocities can cause erosion, scour and/or channeling.
☐	Curb cut inlets are at least 18 inches wide, have a 4-6 inch reveal (drop) and an apron and energy dissipation as needed.	Inlets must not restrict flow and apron prevents blockage from vegetation as it grows in. Energy dissipation prevents erosion.
☐	Underdrain outlet elevation should be a minimum of 3 inches above the bottom elevation of the aggregate storage layer.	A minimal separation from subgrade or the liner lessens the risk of fines entering the underdrain and can improve hydraulic performance by allowing perforations to remain unblocked.
☐	Minimum underdrain diameter is 8 inches.	Minimum diameter required for maintenance by City crews. For privately maintained BMPs, a minimum underdrain diameter of 6 inches is allowed.
☐	Underdrains are made of slotted, PVC pipe conforming to ASTM D 3034 or equivalent or corrugated, HDPE pipe conforming to AASHTO 252M or equivalent.	Slotted underdrains provide greater intake capacity, clog resistant drainage, and reduced entrance velocity into the pipe, thereby reducing the chances of solids migration.
☐	An underdrain cleanout with a minimum 8-inch diameter and lockable cap is placed every 50 feet as required based on underdrain length.	Properly spaced cleanouts will facilitate underdrain maintenance. For privately maintained BMPs, cleanout diameter of 6 inches is allowed.
☐	Overflow is safely conveyed to a downstream storm drain system or discharge point Size overflow structure to pass 100-year peak flow for on-line infiltration basins and water quality peak flow for off-line basins.	Planning for overflow lessens the risk of property damage due to flooding.

Conceptual Design and Sizing Approach for Storm Water Pollutant Control Only

To design bioretention with underdrain for storm water pollutant control only (no flow control required), the following steps should be taken:

1. Verify that siting and design criteria have been met, including placement requirements, contributing tributary area, maximum side and finish grade slopes, and the recommended media surface area tributary ratio.
2. Calculate the DCV per **Appendix B** based on expected site design runoff for tributary areas.
3. Use the sizing worksheet presented in **Appendix B.5** to size biofiltration BMPs.

Conceptual Design and Sizing Approach when Storm Water Flow Control is Applicable

Control of flow rates and/or durations will typically require significant surface ponding and/or aggregate storage volumes, and therefore the following steps should be taken prior to determination of storm water pollutant control design. Pre-development and allowable post-project flow rates and durations should be determined as discussed in **Chapter 6** of the manual.

1. Verify that siting and design criteria have been met, including placement requirements, contributing tributary area, maximum side and finish grade slopes, and the recommended media surface area tributary ratio.
2. Iteratively determine the facility footprint area, surface ponding and/or aggregate storage layer depth required to provide detention storage to reduce flow rates and durations to allowable limits. Flow rates and durations can be controlled from detention storage by altering outlet structure orifice size(s) and/or water control levels. Multi-level orifices can be used within an outlet structure to control the full range of flows.
3. If biofiltration with underdrain cannot fully provide the flow rate and duration control required by this manual, an upstream or downstream structure with significant storage volume such as an underground vault can be used to provide remaining controls.
4. After biofiltration with underdrain has been designed to meet flow control requirements, calculations must be completed to verify if storm water pollutant control requirements to treat the DCV have been met.

E.11 SD-F Amended Soils

Photo Credit: Orange County Technical Guidance Document

MS4 Permit Category
Site Design
Manual Category
Site Design
Applicable Performance Standard
Site Design
Primary Benefits
Volume Reduction Peak Flow Attenuation

Description

Amended soils are soils whose physical, chemical, and biological characteristics have been altered from the natural condition to promote beneficial storm water characteristics. Amended soils shall be used as part of SD-B Impervious Area Dispersion, where applicable. Typical storm water management benefits associated with amended soils include:

- **Improved hydrologic characteristics**—amended soils can promote infiltration, decrease runoff rates and volumes, and more effectively filter pollutants from storm water runoff
- **Improved vegetation health**—amended soils provide greater moisture retention, and altered chemical and biological characteristics that can result in healthier plant growth, reduced irrigation demands, and reduced need for fertilization and maintenance
- **Reduced erosion**—amended soils produce healthier plant growth and reduced runoff which results in reduced soil erosion

Design Adaptations for Project Goals

Varying categories of soil amendments have different benefits and applications. Mulch is a soil amendment that is added at grade, rather than mixed into the soil. Mulch reduces evaporation and improves retention. Shavings and compost are common soil amendments that improve biological and chemical properties of the soil. Sand can be used as an amendment to improve the drainage rates of amended soils. Native soil samples may need to be analyzed by a lab to determine the specific soil amendments needed to achieve the desired infiltration, retention, and/or filtration rates.

Important Considerations

Maintenance: Annual maintenance may be required to determine reapplication requirements of amended soils. Amended soils should be regularly inspected for signs of compaction, waterlogging, and unhealthy vegetation.

Limitations: Not all amended soils have the same storm water benefits, the soil amendment used should be suited for the design purpose and design period of the amended area.

Design Criteria and Considerations

Soil amendments must meet the following design criteria and considerations. Deviations from the below criteria may be approved at the discretion of the City Engineer if appropriate:

	Siting and Design	Intent/Rationale
☐	When mulch is used as an amendment, it is applied at grade over all planting areas to a depth of 3".	Mulch should be applied on top and not mixed into underlying soils
☐	When shavings or compost is used as an amendment, it is rototilled into the native soil to a minimum depth of 6" (12 inches preferred).	If soil is not completely mixed the overall benefit will be reduced.
☐	Compost meets the criteria in Appendix F.3.1.2	If poor quality compost is used, it will have negative impact to water quality.
☐	Soil amendments are free of stones, stumps, roots, glass, plastic, metal, and other deleterious materials.	Large debris in amended soils can cause localized erosion. Trash/harmful materials can result in personal injury or contamination.
☐	Mixing of soils are done prior to planting	Soil mixing before planting results in a more homogeneous mixing and will reduce the stress on plants.
☐	Care is taken around existing trees and shrubs to prevent root damage during construction and soil amendment application.	Preservation of existing established vegetation is an important part of site design and erosion control.
☐	Soil amendments are applied at the end of construction	Soil amendments applied too soon in the construction process may become over compacted reducing effectiveness.
☐	Soil amendments are compatible with planned vegetation	The soil amendments impact the pH and salinity of the soil. Some plants have sensitive pH and/or salinity tolerance ranges.

Conceptual Design and Sizing Approach for Site Design

- When soil amendments are used a runoff factor of 0.1 can be used for DCV calculation for the amended area.
- Amended soils should be used as part of SD-B Impervious Area Dispersion, and to increase the retention volume in infiltration and biofiltration BMPs.

Storm Drain Signage **SD-13**

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

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

Designing New Installations

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

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

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CALIFORNIA STORMWATER QUALITY ASSOCIATION

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

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

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

Redeveloping Existing Installations

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

Additional Information

Maintenance Considerations

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

Placement

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

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

Supplemental Information

Examples

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

Other Resources

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

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

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

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

PESTICIDES: SAFE AND EFFECTIVE USE IN THE HOME AND LANDSCAPE

Integrated Pest Management for Home Gardeners and Landscape Professionals

Pesticides are designed to be toxic to the pests they target—whether they are insects, cause plant disease, or are weeds or other unwanted home and garden invaders. When used properly, pesticides can protect your plants or home from damage. However, when the label instructions are not followed correctly, plant injury may occur, pests may not be controlled, health may be impaired, and pesticides may contribute to soil, air, or water pollution.

Before you purchase and use a pesticide, learn all you can about the material, how to use it, and how to properly dispose of the empty containers. Also, carefully consider whether or not a pesticide is necessary and if a nonchemical solution might be just as effective.

DEFINITION OF A PESTICIDE

A pesticide is any material (natural, organic, or synthetic) used to control, prevent, kill, suppress, or repel pests. "Pesticide" is a broad term that includes insecticides (insect killers), herbicides (weed or plant killers), fungicides (fungus killers), rodenticides (rodent killers), growth regulators, and other materials like miticides, which are used for mite control, or products that kill snails and slugs (molluscicides).

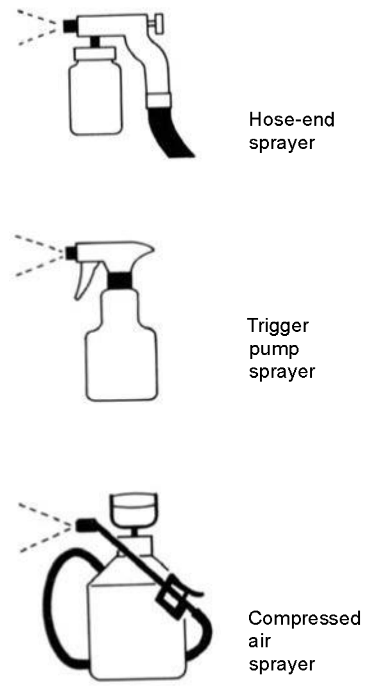
DECIDING TO USE A PESTICIDE

Before using any pesticide, be sure you need it. Verify that the organism you seek to control is really causing lasting damage, and research alternative management methods. Keep in mind that most pests cannot be entirely eliminated—even with pesticides. Some questions to ask before choosing to use a pesticide include:

Is a pest really the cause of your problem? More often than most people imagine, pesticide products are applied unnecessarily because the cause of damage has been misidentified. Damage can also be the result of other factors such as incorrect irrigation, poor drainage, herbicide toxicity, or physical damage.

How many pests are there and will a pesticide spray be justified? A few caterpillars on a plant might not be a problem that requires any pesticide action on your part, especially if natural enemies of the caterpillars are present. However, a very high population causing severe leaf loss or damage to edible fruits or nuts may mean you would want to control the pest. Be sure to base decisions on presence of pests—not damage levels—and on your knowledge of the pest's life cycle. For instance, often by the time a tree is defoliated (stripped of leaves), pests are gone and sprays will be of no use. In the case of foliar diseases, many fungicides must be applied preventatively before symptoms are noticeable.

Can you change the conditions which have caused the pest to become a problem? Prevention is always the best way to manage a pest problem. Will the conditions change due to the weather or other environmental factors? Is the problem due to gardening practices that can be changed? Each specific pest organism has optimum environmental conditions for causing damage. For instance, powdery mildew in many plants is favored by shade and conditions that favor off-season growth. Sometimes providing plants with a sunny location, opening up canopies to provide air circulation, and avoiding excessive fertilizing will keep the disease from becoming serious. Overhead sprinkling may also reduce powdery mildew problems on some plants.



Common types of home garden pesticide application equipment.

Other than a pesticide, what else might work? There are many ways to manage pests other than pesticides including:

- *Cultural control* (using the right pruning, fertilizing or watering regime, or selecting pest-resistant varieties or species)
- *Physical control* (for example, using mulches to keep weeds from growing, or solarization for soilborne pathogens or weed seeds)
- *Mechanical control* (hoeing weeds, spraying leaves forcefully with water to remove insects, or using traps or creating barriers to exclude pests)

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Agriculture and Natural Resources

April 2006

- *Biological control* (using beneficial organisms such as insects that eat or parasitize other insects)

- *Replant* (in extreme cases, where a plant requires regular pesticide treatment, consider replanting with a more pest-resistant species or variety)

If you decide to use a pesticide, use it in an integrated pest management (IPM) program that includes use of non-chemical methods. In almost all cases, a combination of measures will provide the most satisfactory and long-term pest control.

CHOOSING THE RIGHT PESTICIDE

The first step in choosing a pesticide is to accurately identify the organism (e.g., the specific insect, weed, or plant disease) that is causing the problem. If the pest is misidentified, you will not be able to choose an effective pesticide or other management strategy. If you aren't confident that you can do this using your own experience, get help from your University of California Cooperative Extension office or other reliable source. Use the plant problem-solving tables in the back of University of California Agriculture and Natural Resources publications, *Pests of the Garden and Small Farm* and *Pests of Landscape Trees and Shrubs* to identify major pests on most common garden plants.

If a pesticide is needed, select one that is effective against your pest and also poses the least risks to human health and the environment. A good source of information for identifying effective, least-toxic methods and pesticides for use against specific pests is the University of California (UC) *Pest Notes* series available at UC Cooperative Extension offices or on the UC Statewide IPM Program Website (www.ipm.ucdavis.edu). When shopping for a pesticide, it is important to consult the label to be sure the target pest and site is listed. However, don't use a label as your primary source for selecting the best control product. In addition to pests that are effectively controlled, pesticide labels often picture or list pests against which the product is only marginally effective. Getting information from University publications, UC Cooperative Extension offices, or other knowledgeable experts is a better strategy.

Before purchasing a pesticide, also check the label to be sure it is appropriate to use on your plants or treatment site. For instance:

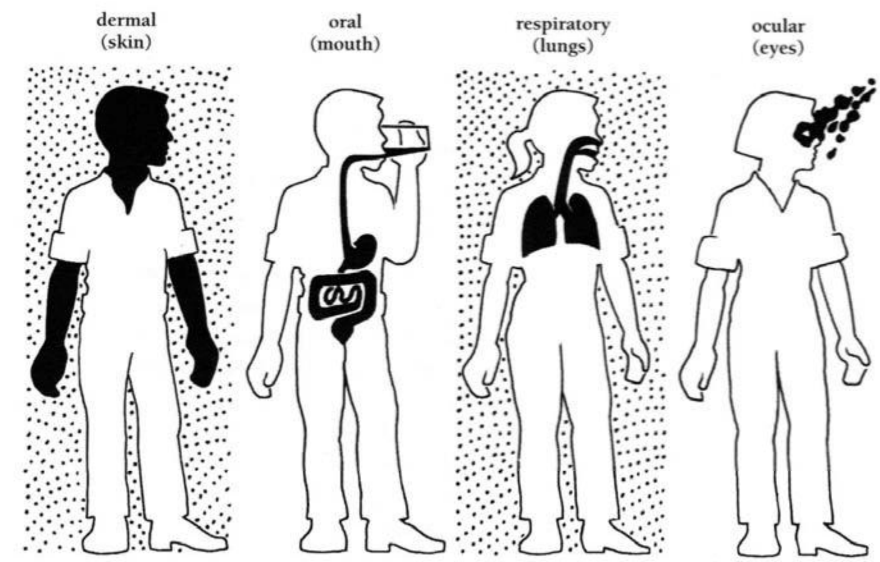
- Be sure the particular type of plant or site you plan to treat is listed on the label.
- Do not use pesticides labeled for use on ornamental plants on plants that will be eaten.
- Never use pesticides labeled for "outdoor use only" indoors.
- Pesticides can seriously damage some plants; read the label to be sure treated plants won't be injured.

Finally, when choosing pesticides, remember that most pesticides (even the more toxic ones) only control certain stages of the pest. Many insecticides kill only the larval (e.g., caterpillars) stage, not the eggs or pupae. Other insecticides target only adults. Many fungicides are preventive treatments and will not eliminate infections that have already started, although they may slow their spread. Likewise, some herbicides (preemergence herbicides) kill germinating weeds but not established ones, while others (postemergence herbicides) are effective against actively growing weeds.

LEAST TOXIC ALTERNATIVES

Choose the least toxic pesticide that will solve your problem. Least-toxic alternatives are usually suggested in the UC IPM *Pest Notes*. Examples of least-toxic insecticides include insecticidal petroleum or plant-based oils, soaps, and the microbial insecticide *Bacillus thuringiensis.*

Pesticides are used because they kill or control the target pest. "Selective" pesticides kill only a few closely related organisms. Others are broader spectrum, killing a range of pests but also nontarget organisms. Most pesticides are not without some negative impacts on the environment. For instance, some insecticides with low toxicity to people may have high toxicity to beneficial insects like parasitic wasps or other desirable organisms like honey bees, earthworms, or aquatic invertebrates. Most herbicides selectively kill some weeds, but



The most common ways for pesticide exposure to occur are through the skin (dermal), through the mouth (oral), through the lungs (respiratory), and through the eyes (ocular).

can also kill desirable garden plants if not used properly. Pesticide persistence—or how long it remains toxic in the environment—is also a factor in the safety of pesticides. Pesticides that break down rapidly usually have less negative impact on the environment, but are more difficult to use. Because they don't leave toxic residues that will kill pests arriving hours or days after the application, they must be applied precisely when the vulnerable stage of the pest is present.

The signal words Danger, Warning, or Caution on a pesticide label indicate the immediate toxicity of a single exposure of a product to humans. Over the years, these words have been the consumer's primary guide to relative safety of products. However, signal words do not give an indication of potential for causing chronic problems (e.g., cancer, reproductive problems or other long-term health effects). They also do not reflect potential hazards for wildlife, beneficial insects and many other nontarget organisms. However, most home and garden products are relatively safe and unlikely to cause injury to people if label directions are carefully followed. Precautionary statements on labels give additional information on harmful effects or additional safeguards that should be taken. For more information on hazards of specific pesticides, review the Material Safety Data Sheets (MSDS) available from the pesticide manufacturer or online see the National Pesticide Information Center: http://npic.orst.edu/gen.htm or telephone 800-858-7378.

PESTICIDE APPLICATION EQUIPMENT

Read the pesticide label carefully and be sure that you have the proper equipment for applying it safely. You will need protective clothing to protect yourself from exposure even when applying the safest pesticides. Minimally, protective gear should include rubber gloves, eye protection, a long-sleeved shirt, long pants, and closed shoes. Avoid using cotton gloves or lightweight dust masks that may absorb the spray and result in prolonged contact with your skin. Read the pesticide label carefully for additional protective requirements.

Required equipment varies according to your application site, your choice of pesticide, and your willingness to work with more complicated application devices. For many home and garden pesticide applications, the best choice is to purchase a ready-to-use product in a trigger pump type of sprayer. Ready-to-use products eliminate the need to dilute and mix pesticides or purchase special equipment and are excellent for spot treatments on small plants and shrubs. At the other end of the spectrum are compressed air sprayers, which require careful maintenance and operation as well as precise mixing of chemicals.

If you mix your own pesticides, keep a set of measuring spoons or cups for use *only* with pesticides. It is a good idea to write "PESTICIDE ONLY" on them to distinguish them from your kitchen utensils, and keep them well away from food preparation areas. A locked storage cabinet in a garden shed, garage, or well-ventilated utility area is the best place to store pesticides and equipment you use to mix or apply pesticides. If you are spraying for weed control, keep a sprayer specifically for that purpose and label it "WEEDS ONLY." Otherwise, herbicide residue in the sprayer may injure plants if the same sprayer is used for applying another type of pesticide or fertilizer.

Take a shower as soon after application as possible. Wash clothing separately from other laundry. Never smoke, drink, eat, or use the bathroom after pesticide application without washing first.

Measuring and Diluting Pesticide Concentrates

Properly measuring concentrated formulations of pesticides is essential for their effective and safe use. The application rate for most insecticides and fungicides is given on the label in ounces per gallon of water used in the spray applicator. It is essential that you follow these procedures properly and

Always Read the Pesticide Label.

Important information regarding the pesticide can be found on the product's label. The label is a legal document required for every pesticide registered in the United States. The U.S. Environmental Protection Agency must approve the label. Always keep the product in the original package. Some of the information that is contained on the label includes:

✓ Trade name or brand name
✓ Active ingredients and their percentage by weight
✓ Types of plants or sites where pesticide may be used
✓ Pests targeted
✓ How much to use
✓ How and when to apply
✓ Required protective clothing and equipment
✓ Signal word defining short-term toxicity to people (DANGER, WARNING, or CAUTION)
✓ Precautionary statements defining hazards to people, domestic animals, or the environment
✓ Emergency and first aid measures to take if someone has been exposed
✓ How to properly store and dispose of the pesticide and empty containers

Active Ingredient
Glyphosphate, isopropylamine salt........2.0%
Other Ingredients.................................98.0%

KEEP OUT OF REACH OF CHILDREN

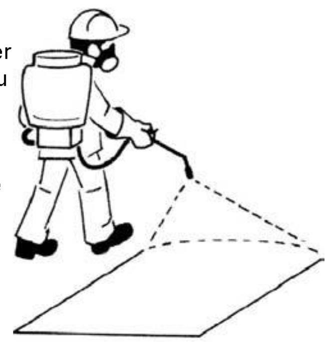
CAUTION

See back panel for
additional precautionary statements.

NET CONTENTS 32 FL OZ

(1QT) 946mL

Sidebar 1. How to Dilute an Herbicide.



For most herbicides, the application rate is stated in ounces per 100 square feet or 1000 square feet, so you need to know how large an area you are treating in order to determine the amount of product to use. Suppose you are trying to kill weeds in your lawn and the herbicide label states "use 2 oz. per 1000 square feet." After measuring, you find your lawn is only 600 square feet. Therefore, you would use (600 square feet/1000 square feet) x 2 oz. = 0.6 x 2 oz. = 1.2 oz. of herbicide to treat the entire lawn.

You also must calculate how much water you need to add to your sprayer. Insecticide and fungicide labels and many herbicide labels tell you how much water to add to dilute your spray. If a certain volume of water is not listed, you can determine how much you need by spraying a small area with the sprayer and a known quantity of clean water. Then divide by the fraction of the area where you plan to apply the herbicide. For example, if you found out that one quart of water covered 100 square feet, you can assume you will need 6 quarts to cover 600 square feet. Mix your 1.2 oz of herbicide in 6 quarts of water.

dilute and apply materials as required. For herbicides and some uses of insecticides and fungicides (such as applications on lawns), the label will indicate the amount of pesticide to use for a given area. In these cases, you'll need to measure the area you are treating to calculate how much to mix up. See Sidebar 1. How to Dilute an Herbicide.

Remember, if the label specifies a dilution rate, you need to follow the label directions precisely. Before mixing up your pesticide, test out your sprayer with water to assure you will cover the recommended area with the recommended amount of diluted spray. If not, you will need to adjust your application rate accordingly by walking or spraying slower or faster.

Insecticide or fungicide directions for fruit or ornamental trees often don't specify areas in square feet to be treated. They often say something such as "wet plants to dripping point, thoroughly cover both sides of leaves". For these applications or for spot treatments, it is also a good idea to test out your sprayer with water to see how much spray you need to cover a fruit or ornamental tree or other area. That way you'll know how much product to mix up.

Never use more than what the directions recommend. The pest will not be controlled any faster and you will be wasting the pesticide, your time, and money while potentially causing plant injury and contaminating the environment with excess chemicals. Mix up only as much as you need immediately; don't store leftover pesticide solutions. They may be susceptible to quality changes at high or very low temperatures or by settling out.

Minimizing Environmental Contamination

Use spot treatments where the pest is most prevalent; avoid widespread applications of the pesticide throughout your garden or home. For spot treatments, mix the pesticide according to label instructions, and apply the mixture only to the affected area. Bait stations for ants, wick or shielded applicators for some herbicides, and tree trunk treatments for certain insects are other ways of limiting environmental exposure.

Be sure pesticides are properly applied to the target plant or site and can't move onto other plants or areas. Pesticides can easily move off target with wind. Do not spray during windy conditions when pesticides can be carried into areas where they aren't needed or wanted. Be sure the application does not run off or blow into drains, creeks, or other water bodies so you can prevent contamination of water supplies. Avoid applying chemicals just before irrigation or rainy weather, unless labels specify post-application irrigation. Also avoid applying pesticides to hard surfaces such as sidewalks, driveways, and foundations, because they can easily be washed off and go into storm drains.

Follow the guidelines for protecting environmental quality and keeping pesticides out of our waterways.

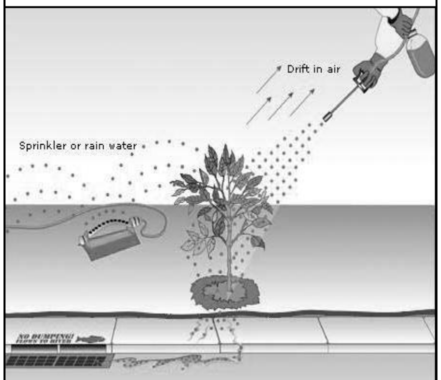
Disposing of Leftover Pesticides

Try to purchase only as much pesticide as you will use in the immediate future. This will eliminate the need to store the unused products. If you can't use up your pesticides in a timely manner, share them with a friend or neighbor who can use them, but always keep these materials in their original containers. Do not use an old soda bottle or anything that could be mistaken for a drink container. People have been poisoned and killed by inadvertently drinking from these containers. Don't dilute more pesticide than you can use right away. Diluted pesticide needs to be applied according to label directions to plants or sites listed on the label and at label rates until the spray tank is empty. Excess diluted pesticide should be disposed of at a household hazardous waste facility.

Do not dump excess, unwanted, or old material down the drain, onto the soil, or into open waterways, gutters, storm drains or sewers, or in the trash. The only legal way to dispose of pesticides is to take them to your local household hazardous waste disposal facility. In California, call the California Environmental Hotline 1-800-253-2687, to find the hazardous waste disposal site closest to you or check on-line at www.earth911.org.

Empty containers of concentrated home use pesticides in the possession of a homeowner on his/her property may

Keep Pesticides Out of Our Waterways by Following These Guidelines.



Pesticides applied in the garden can move off target by drifting in the air or washing off into storm drains or creeks.

✓ Be aware of weather patterns and do not apply pesticides just prior to rainfall or during windy conditions.

✓ Avoid applying pesticides to hard surfaces such as sidewalks or driveways, where they can easily be washed off.

✓ Check pesticide labels for warnings regarding use near bodies of water such as streams, rivers, and lakes.

✓ Never dispose of pesticides in storm drains, sinks, or toilets.

✓ Under no circumstances should pest control equipment be cleaned in a location where rinse water could flow into gutters, storm drains, or open waterways.

✓ Never apply more than the rate listed on a pesticide label.

✓ Be aware that some pesticides are more easily carried in surface runoff than others and therefore have a greater potential to move off site during irrigation or storms. The leaching and runoff risks of specific pesticides can be obtained from the UC IPM Website WaterTox database, www.ipm.ucdavis.edu/TOX/simplewatertox.html

be disposed of in the trash without rinsing. Empty containers of ready-to-use products may also be disposed of in the trash. Professionals who use concentrated liuquid pesticides must rinse the container three times before disposal. The best time to rinse is when you are using up the last remaining pesticide in the container. Add the remaining pesticide to the sprayer. Add water to the empty pesticide container, put the cap on, swirl the water around the container, and transfer the liquid to the spray tank. Repeat two times. If necessary, add more water to the spray tank to reach the correct concentration. This way, you will have rinsed the bottle three times and used the rinse water to make the pesticide application.

Don't pour unused rinse liquid down any drain or sewer or in the trash. Unused rinse liquid is considered hazardous waste and must be disposed of properly at a hazardous waste facility or as suggested above.

Indoor Versus Outdoor Pesticides

Use only pesticides specifically labeled for indoor use inside the house. Many outdoor pesticides are designed to break down into less toxic substances with ventilation and in the daylight and the rain. Without these conditions the pesticides may linger and cause toxic conditions for humans or pets.

Hiring a Pest Control Company

If you do not have the time or ability to research your pest problem and safely apply the appropriate material to control it, you may want to hire a pest control service to do the job for you. See the *Pest Note: Hiring a Pest Control Company* for information on how to select a contractor.

Licensed pesticide operators also have access to some products not available in retail stores. Many pest problems, such as termites or management of problems on large trees, require special pesticides or equipment and technical training for most effective management. Although professional services may be expensive, the investment may be worth it to solve a serious problem.

SUGGESTED READING

Flint, M. L. *Pests of the Garden and Small Farm.* 1998. Oakland: Univ. Calif. Div. Agric. Nat. Res. Publ. 3332.

Dreistadt, S. H. *Pests of Landscape Trees and Shrubs.* 2004. Oakland: Univ. Calif. Div. Agric. Nat. Res. Publ. 3359.

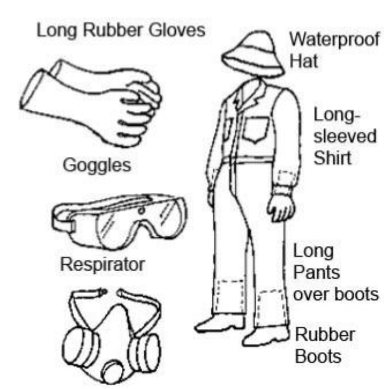
O'Connor-Marer, P. J. *Safe and Effective Use of Pesticides.* 2000. Oakland: Univ. Calif. Div. Agric. Nat. Res. Publ. 3324.

Pittenger, D. R., ed. *California Master Gardener Handbook.* 2002. Oakland:

Use Pesticides Safely.

- Be sure plant and site is on the label.
- Be sure pest is on the label.
- Follow label directions for mixing.
- Follow label directions about wearing protective clothing.
- Check label for other precautions.

Protective Clothing and Equipment.



Univ. Calif. Div. Agric. Nat. Res. Publ. 3382.

Wilen, C.A., et al. 2006. *Pest Note: Hiring a Pest Control Company.* Oakland: Univ. Calif. Div. Agric. Nat. Res. Publ. 74125. Also available online, www.ipm.ucdavis.edu.

Online: Check out more Pest Notes at www.ipm.ucdavis.edu. ❖

For more information contact the University of California Cooperative Extension or agricultural commissioner's office in your county. See your telephone directory for addresses and phone numbers.

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COORDINATION & PRODUCTION: P. N. Galin
ILLUSTRATIONS: Keep Pesticides Out of Waterway illustration by C. Rusconi. All other illustrations by D. Kidd.

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This publication has been anonymously peer reviewed for technical accuracy by University of California scientists and other qualified professionals. This review process was managed by the ANR Associate Editor for Pest Management.

To simplify information, trade names of products have been used. No endorsement of named products is intended, nor is criticism implied of similar products that are not mentioned.

This material is partially based upon work supported by the Extension Service, U.S. Department of Agriculture, under special project Section 3(d), Integrated Pest Management.

Funding for this publication was made possible through a grant from the Elvenia J. Slosson Fund.

C. Wilen and D. Havers' contributions partially supported by a California State Water Resources Control Board PRISM grant.

WARNING ON THE USE OF CHEMICALS

Pesticides are poisonous. Always read and carefully follow all precautions and safety recommendations given on the container label. Store all chemicals in the original labeled containers in a locked cabinet or shed, away from food or feeds, and out of the reach of children, unauthorized persons, pets, and livestock.

Confine chemicals to the property being treated. Avoid drift onto neighboring properties, especially gardens containing fruits or vegetables ready to be picked.

Do not place containers containing pesticide in the trash or pour pesticides down sink or toilet. Either use the pesticide according to the label or take unwanted pesticides to a Household Hazardous Waste Collection site. Contact your county agricultural commissioner for additional information on safe container disposal and for the location of the Household Hazardous Waste Collection site nearest you. Dispose of empty containers by following label directions. Never reuse or burn the containers or dispose of them in such a manner that they may contaminate water supplies or natural waterways.

Operation & Maintenance Plan

The operational and maintenance needs of volume retention **Landscape Areas** are as follows:

- Maintain landscaping using a minimum amount of or no pesticides (consider the use of organic techniques).
- Review and adhere to applicable operational BMPs in Fact Sheet SC-41, “Building and Grounds Maintenance,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
- Review Vegetated Swale BMP information and provide to landscape and maintenance personnel.

Maintenance Guidelines for Modular Wetland System - Linear

Maintenance Summary

- Remove Trash from Screening Device – average maintenance interval is 6 to 12 months.
  - (*5 minute average service time*).
- Remove Sediment from Separation Chamber – average maintenance interval is 12 to 24 months.
  - (*10 minute average service time*).
- Replace Cartridge Filter Media – average maintenance interval 12 to 24 months.
  - (*10-15 minute per cartridge average service time*).
- Replace Drain Down Filter Media – average maintenance interval is 12 to 24 months.
  - (*5 minute average service time*).
- Trim Vegetation – average maintenance interval is 6 to 12 months.
  - (*Service time varies*).

System Diagram

Maintenance Procedures

Screening Device

1. Remove grate or manhole cover to gain access to the screening device in the Pre-Treatment Chamber. Vault type units do not have screening device. Maintenance can be performed without entry.
2. Remove all pollutants collected by the screening device. Removal can be done manually or with the use of a vacuum truck. The hose of the vacuum truck will not damage the screening device.
3. Screening device can easily be removed from the Pre-Treatment Chamber to gain access to separation chamber and media filters below. Replace grate or manhole cover when completed.

Separation Chamber

1. Perform maintenance procedures of screening device listed above before maintaining the separation chamber.
2. With a pressure washer spray down pollutants accumulated on walls and cartridge filters.
3. Vacuum out Separation Chamber and remove all accumulated pollutants. Replace screening device, grate or manhole cover when completed.

Cartridge Filters

1. Perform maintenance procedures on screening device and separation chamber before maintaining cartridge filters.
2. Enter separation chamber.
3. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.
4. Remove each of 4 to 8 media cages holding the media in place.
5. Spray down the cartridge filter to remove any accumulated pollutants.
6. Vacuum out old media and accumulated pollutants.
7. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase.
8. Replace the lid and tighten down bolts. Replace screening device, grate or manhole cover when completed.

Drain Down Filter

1. Remove hatch or manhole cover over discharge chamber and enter chamber.
2. Unlock and lift drain down filter housing and remove old media block. Replace with new media block. Lower drain down filter housing and lock into place.
3. Exit chamber and replace hatch or manhole cover.

Maintenance Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.

2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.

3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

4. Entry into chambers may require confined space training based on state and local regulations.

5. No fertilizer shall be used in the Biofiltration Chamber.

6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may require irrigation.

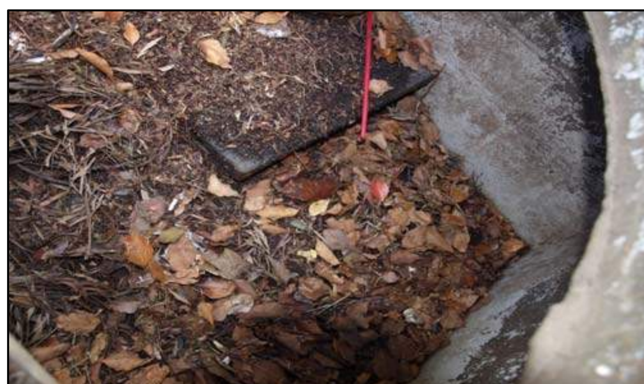
Maintenance Procedure Illustration

Screening Device

The screening device is located directly under the manhole or grate over the Pre-Treatment Chamber. It's mounted directly underneath for easy access and cleaning. Device can be cleaned by hand or with a vacuum truck.

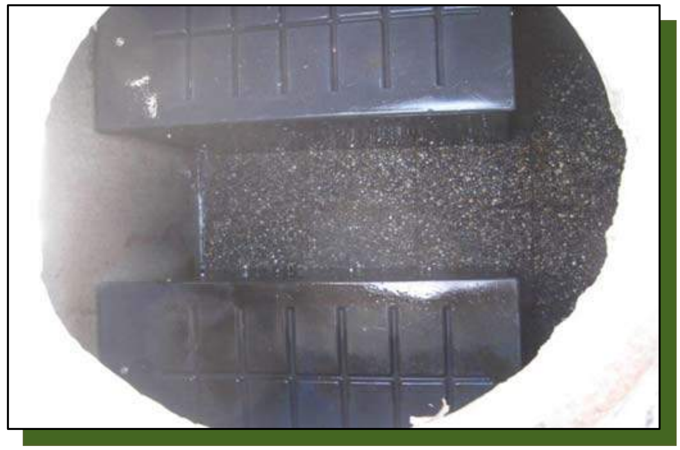
Separation Chamber

The separation chamber is located directly beneath the screening device. It can be quickly cleaned using a vacuum truck or by hand. A pressure washer is useful to assist in the cleaning process.



Cartridge Filters

The cartridge filters are located in the Pre-Treatment chamber connected to the wall adjacent to the biofiltration chamber. The cartridges have removable tops to access the individual media filters. Once the cartridge is open media can be easily removed and replaced by hand or a vacuum truck.



Drain Down Filter

The drain down filter is located in the Discharge Chamber. The drain filter unlocks from the wall mount and hinges up. Remove filter block and replace with new block.

Trim Vegetation

Vegetation should be maintained in the same manner as surrounding vegetation and trimmed as needed. No fertilizer shall be used on the plants. Irrigation per the recommendation of the manufacturer and or landscape architect. Different types of vegetation requires different amounts of irrigation.

Inspection Form

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

Inspection Report
Modular Wetlands System

For Office Use Only
(Reviewed By)
(Date) Office personnel to complete section to the left.

Project Name ______________________________

Project Address ______________________________ (city) (Zip Code)

Owner / Management Company ______________________________

Contact ______________________________ Phone ( ) –

Inspector Name ______________________________ Date ____/____/______ Time ____________ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition ______________________________ Additional Notes ______________________________

Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): ____________ Size (22', 14' or etc.): ____________

Structural Integrity:	**Yes**	**No**	**Comments**	
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?				
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?				
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?				
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?				
Working Condition:				
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?				
Is there standing water in inappropriate areas after a dry period?				
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?				
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes, specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.				Depth:
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber:	
Any signs of improper functioning in the discharge chamber? Note issues in comments section.				
Other Inspection Items:				
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?				
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.				
Is there a septic or foul odor coming from inside the system?				

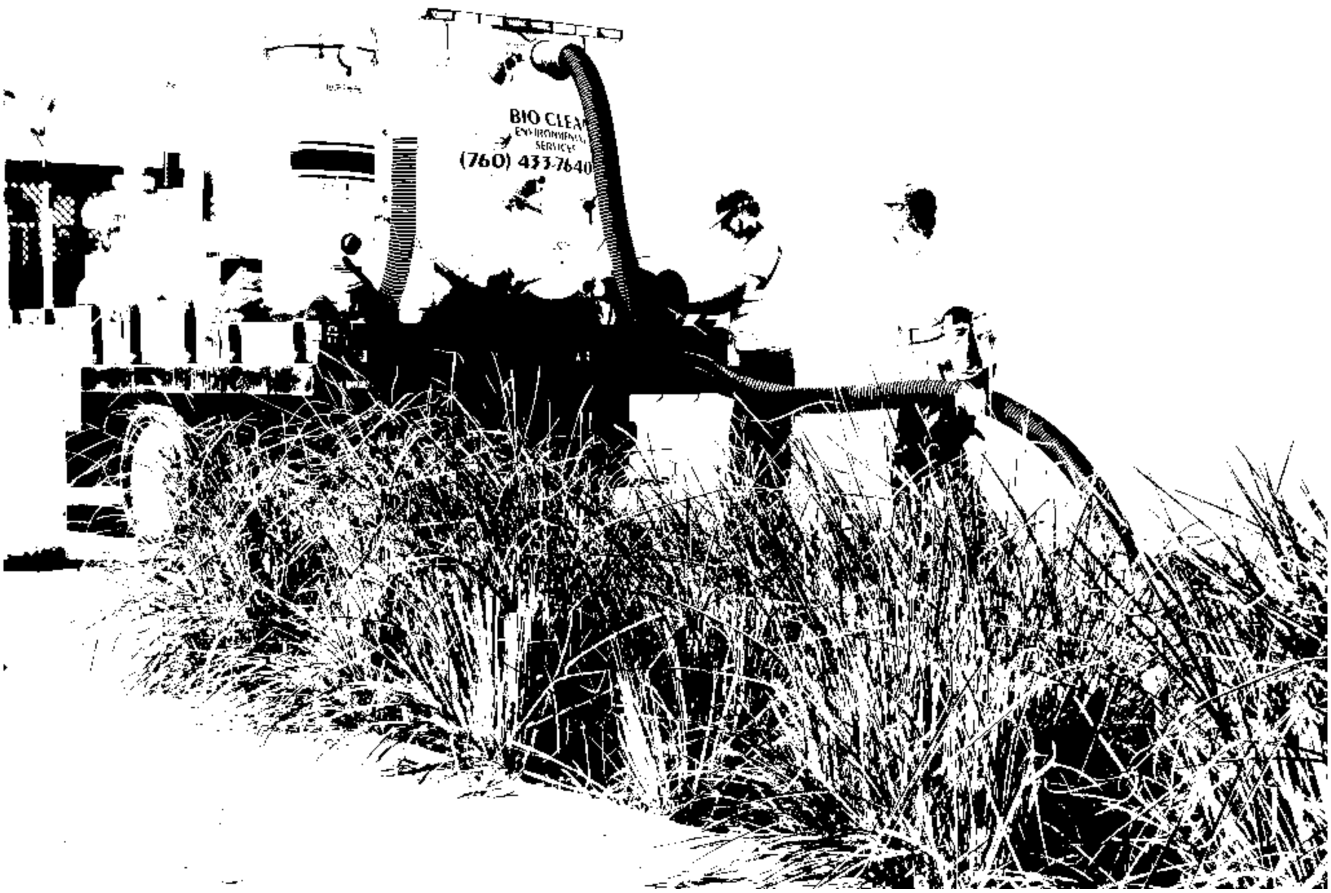
Waste:	**Yes**	**No**
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes: ______________________________

Maintenance Report



Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

Cleaning and Maintenance Report
Modular Wetlands System

Project Name ______________________________

Project Address ______________________________
(city) (Zip Code)

Owner / Management Company ______________________________

Contact ______________________ Phone ( ) –

Inspector Name ______________________ Date ___/___/_____ Time ________ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition ______________________ Additional Notes ______________________

For Office Use Only
(Reviewed By)
(Date) Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:	MWS Catch Basins						
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments:

2972 San Luis Rey Road, Oceanside, CA 92058 P. 760.433.7640 F. 760.433.3176

Attachment 4
Copy of Plan Sheets Showing Permanent Storm Water BMPs

This is the cover sheet for Attachment 4.

Project Name: Majestic Airway

Use this checklist to ensure the required information has been included on the plans:

The plans must identify:

- ☐ Structural BMP(s) with ID numbers matching Form I-6 Summary of PDP Structural BMPs
- ☐ 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)
- ☐ Signage indicating the location and boundary of structural BMP(s) as required by the City Engineer
- ☐ 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)
- ☐ 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
- ☐ Include landscaping plan sheets 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 model number shall be provided. Broucher photocopies are not allowed.

to be provided during final design

Attachment 5
Drainage Report

Attach project's drainage report. Refer to Drainage Design Manual to determine the reporting requirements.

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MAJESTIC AIRWAY

PTS 632813

Preliminary Drainage Report

LA MEDIA ROAD AT AIRWAY ROAD
SAN DIEGO, CA 92154
APN: 646-121-35

DECEMBER 2022

Applicant:

MAJESTIC REALTY CO.
13191 CROSSROADS PARKWAY NORTH, 6TH FLOOR
CITY OF INDUSTRY, CA 91746
CONTACT: TOM SIMMONS

Prepared By:

Kimley»Horn

KIMLEY-HORN AND ASSOCIATES, INC.
401 B STREET, SUITE 600
SAN DIEGO, CA 92101
(619)234-9411

This Drainage Report has been prepared by Kimley-Horn and Associates, Inc. under the direct supervision of the following Registered Civil engineer. The undersigned attests to the technical data contained in this study, and to the qualifications of technical specialists providing engineering computations upon which the recommendations and conclusions are based.

12.20.2022

Registered Civil Engineer | Date

Contents

Figures

Tables

Appendices

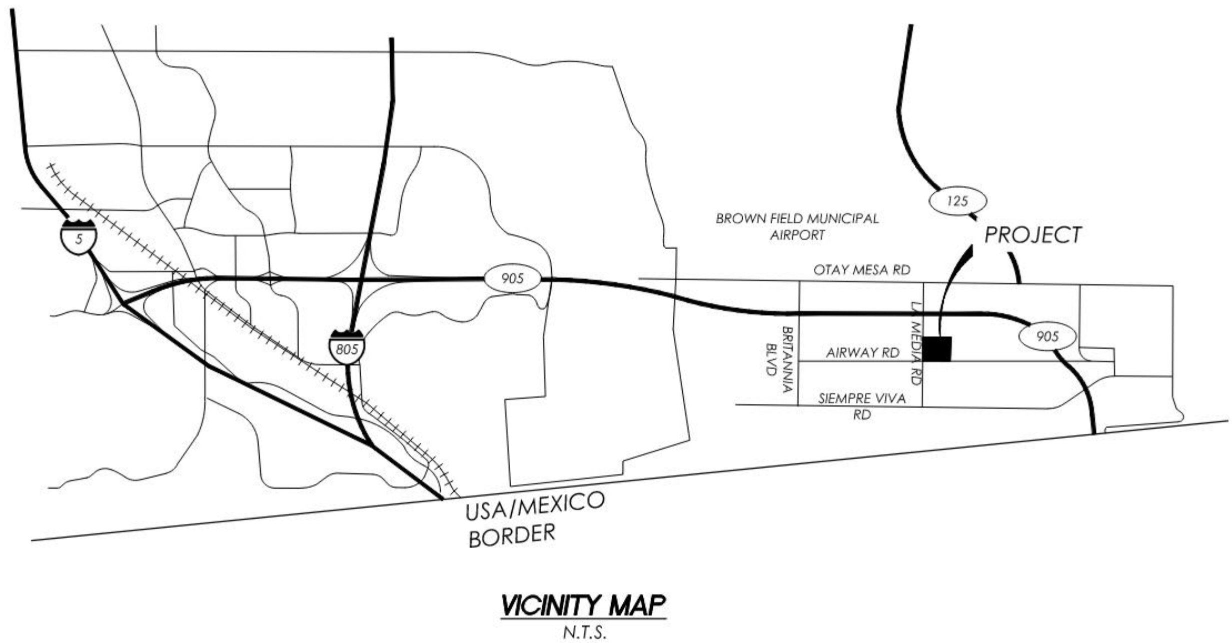
Exhibits

1 INTRODUCTION

1.1 PROJECT DESCRIPTION

The Majestic Airway project consists of industrial distribution centers on an approximately 32.5-acre area located within the Otay Mesa community of San Diego, California. The 32.5-acre property is bounded by La Media Road to the west, CA Route 905 to the north, Airway Road to the south, and a developed industrial lot to the east, see **Figure 1-1** for the Vicinity Map. The property's Assessor Parcel Number is 646-121-35. The project includes the grading of the existing parcel for industrial distribution centers along with parking areas, loading docks, and driveways. The purpose of this report is to present the hydrology analysis and drainage calculations for the design of the Majestic Airway project.

Figure 1–1 Vicinity Map



2 PROJECT SETTING

2.1 TOPOGRAPHY

Topographic information for the project was obtained from a land survey by Kimley-Horn in August 2019 and aerial survey done by photo geodetic in September 2019. The project is located on the USGS Otay Mesa quadrangle map, see **Appendix A**. The project is located within the Tijuana Valley watershed with onsite slopes starting in the northeast corner (approximate elevation 482) flowing west towards La Media Rd (approximate elevation 473) where runoff enters the existing storm drain system by culverts under La Media Rd.

2.2 PRECIPITATION

Storm intensity values were taken from the County of San Diego Hydrology Manual, 2003. The design storm was the 50-year and 100-year rainfall event calculated from the County of San Diego Hydrology Manual Rainfall Isopluvials and Figure 3-1 (see **Appendix C**) and determined to be 2.1 inches for the 50-year 6-hour event and 2.3 for the 100-year 6-hour event.

2.3 SOIL TYPES

The condition and type of soil are major factors affecting infiltration and runoff. The Natural Resources Conservation Service (NRCS) has classified soils into four general categories for comparing infiltration and runoff rates. The categories are based on properties that influence runoff, such as water infiltration rate, texture, natural discharge and moisture condition. The runoff potential is based on the amount storm water runoff at the end of a long duration storm that occurs after the soil is saturated.

Soil types were determined using the United States Department of Agriculture (USDA) Web Soil Survey. The project site consists of a mix of type C and type D soils. Hydrologic soil group D soils have a very slow infiltration rate 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. See **Appendix B** for soils information.

2.4 LAND USE

The project site location is within the Otay Mesa community of San Diego, California. The zoning is Light Industrial (IL-3-1) for urbanized communities. The land use designation is Commercial Employment, Retail, and Services.

2.5 GROUNDWATER

Based on the Geotechnical Investigation dated March 18, 2020 by Geocon, Inc., groundwater was not encountered onsite. Groundwater elevations may fluctuate seasonally.

2.6 FEMA MAPPING

The project site is not located in a flood zone mapped by the FEMA Flood Insurance Rate Map (FIRM). See **Appendix G** for FEMA map.

2.7 CLEAN WATER ACT SECTION 404 PERMIT AND 401 CERTIFICATION

The physical alteration of water bodies, including wetlands and streams, are regulated by federal and state statues under Section 401 (Certification) and Section 404 (Permits) of the Federal Clean Water Act. This project does not propose any discharge of dredged and/or fill material within any Waters of the U.S., therefore, is not subject to the Clean Water Act Sections 404 Permit and 401 Certification.

3 HYDROLOGIC ANALYSIS

3.1 METHODOLOGY

The Modified Rational Method was used to analyze the hydrology for the project. This methodology is typically used for small basins less than 500 acres in size because a uniform rainfall distribution is assumed for the entire duration. Drainage calculations comply with the requirements outlined in the County of San Diego Hydrology Manual, 2003. The San Diego County Advanced Engineering Software (AES) computer program was used for the Modified Rational Method analysis to calculate peak flow for the 5, 10, 25, 50, and 100-year storm events under existing and proposed conditions. This program uses parameters from the County of San Diego Hydrology Manual to estimate times of concentration and peak flow rates.

3.1.1 GEOMETRY

Sub-basin boundaries, initial subareas, and flow paths were delineated for each sub-basin with AutoCAD Civil 3D software. These hydrologic parameters are shown for existing conditions and proposed conditions in **Exhibit A** and **Exhibit B**. Point elevations and surfaces within Civil 3D were also used to determine flow path slopes and estimate the shape of routing reaches. A summary of the existing condition and proposed condition inputs into the AES models are included in **Appendix A.** Topography for the project area was obtained from a land survey by Kimley-Horn in 2019 and is based on the mean sea level (NAVD 29).

3.1.2 INTENSITY AND TIME OF CONCENTRATION

Rainfall data for frequency events were taken from the County of San Diego Hydrology Manual Rainfall Isopluvials to determine the appropriate precipitation for the project site. This duration precipitation value was then inputted directly into AES for each frequency event. AES software was used to calculate the appropriate time of concentration for each sub-basin The AES software then calculates an intensity based on the calculated time of concentration.

3.1.3 RUNOFF COEFFICIENT AND LOSS RATES

AES software was used to calculate loss rates and subsequent runoff coefficients for each sub-basin based on land use type, and hydrologic soil group. The existing conditions land utilized for the model was undeveloped natural grass. The proposed conditions land use is general industrial, which is defined as 95% impervious and a runoff coefficient of 0.87. Hydrologic soil group D was used for the entire site.

3.2 EXISTING CONDITIONS

The project site overland flows from the northeast corner flowing west towards La Media Rd where runoff enters the existing storm drain system by culverts under La Media Rd.

Runoff coefficients for the existing site was based on the County of San Diego Hydrology Manual and is identified below in **Table 3-1** for undeveloped sites. See **Exhibit A** for **Existing Drainage Exhibit.** The hydrology model results are presented in **Appendix D.**

Table 3–1 Existing Conditions Hydrology

Basin ID	Runoff Coefficient	Area (acres)	Flow Rate (cfs)				
			5 Year	10 Year	25 Year	50 Year	100 Year
1	0.35	22.9	13.6	15.6	17.8	21.6	23.9
2	0.35	6.7	4.8	5.6	6.5	7.8	8.6
Total		29.6	18.4	21.2	24.3	29.4	32.5

3.3 PROPOSED CONDITIONS

Proposed hydrologic calculations have been prepared for the project. Tributary areas were delineated based on proposed grading for the project. The final development will be approximately 83% impervious area and 17% landscape. The San Diego County Advanced Engineering Software (AES) computer program was used for the Modified Rational Method analysis to calculate peak flow for the 5, 10, 25 50, and 100-year storm events under proposed conditions. Runoff generated from the site will be collected by onsite inlets, conveyed through an underground storm drain system, and discharge into onsite detention basins for treatment and detention. These basins will be designed to filter and treat the water quality storm event volume by means of biofiltration (standard and proprietary) as documented in the project specific SWQMP.

The project will have four discharge locations – one for each drainage area. There are two discharge points to the existing channel on the west side of the site, one to the existing public storm drain in Airway Road, and one to an existing curb inlet in Airway Road.

With the project site being 83% impervious the Runoff Coefficient used in the AES calculations was 0.87 which matches closely to the Table A-1 of the San Diego Drainage Design Manual Commercial land use with 80% impervious carrying a runoff coefficient of 0.85. See **Exhibit B** for **Proposed Drainage Exhibit.** The hydrology model results are presented in **Appendix E.**

4 HYDRAULIC ANALYSIS

4.1 METHODOLOGY

Drainage structures were designed for the Majestic Airway project according to the procedures and methodologies outlined in the County of San Diego Drainage Design Manual, 2005. The proposed drainage network is included on the **Proposed Drainage Exhibit**, **Exhibit B**.

4.1.1 STORM DRAIN DESIGN

The storm drain network pipe sizes were estimated for preliminary design utilizing the AES computer program for non-pressure pipe flow included in the **Proposed Condition Hydrology Calculations**, see **Appendix E**. The Modified Rational Method was used to calculate peak flow for the 50-year storm event.

4.1.2 CHANNEL HYDRAULICS

The open channel west of the project site will be the discharge location of Drainage Areas 1 and 2. Based on the Rick Engineering HEC-RAS model for the future open channel peak flow of 871 cfs, a new HEC-RAS model was designed to show the water surface elevation of the open channel, see **Appendix H** for results. The 100-year TW for the Channel is 476.0'. The project site is at the very downstream end of the East Watershed according to the Drainage Study for the Otay Mesa Community Plan Update. Thus, the 100-year peak flow in the open channel is unlikely to hit during the 100-year peak flow of the site. To analyze this difference, the dual analysis approach was used in the 2014 County of San Diego Hydraulic Design Manual, Section 3.3.5. It was determined that the ratio of the whole East Watershed to the project site is 150:1. According to Section 3.3.5, this would require an analysis of the 100-year onsite, using the Q25 TW elevation of the open channel, as well as the 25-year onsite, using the Q100 TW elevation of the open channel.

To find the TW elevation of the open channel in the 25-year storm, the ratio between the 100-year intensity and the 25-year intensity was calculated and applied to the channels 100-year flow, 871cfs. The 25-year peak flow was determined to be 682cfs. This 682 cfs was input into the HEC-RAS model to determine the TW elevation. The TW elevation for the 25-year peak storm is 475.6'. See **Appendix H** for the HEC-RAS print outs.

4.1.3 DETENTION BASIN CALCULATIONS

The development of this site results in an increase of peak discharge runoff. Four detention basins are proposed to mitigate peak flows by storing stormwater runoff and controlling the release of flow. The project is required to mitigate for downstream hydromodification and detain for the 50-year peak flow rate. The project specific Stormwater Quality Management Plan (SWQMP) determined the storage volume and outlet orifice required to mitigate for hydromodification. Orifice calculations were prepared to determine the size of the outlets to meet hydromodification requirements and are used in the flood routing for the peak storm events. See **Appendix F** for the outlet rating curves for each basin. See project specific SWQMP for hydromodification compliance documentation.

Per the City of San Diego memo to Industry in the early 1980's, the Otay Mesa drainage watersheds were required to detain developed flow to pre-existing conditions for the 5, 10, 25- and 50-year storm events with the 100-year storm passing undetained over the spillway. The Otay Mesa Community Plan Update

Drainage Study also provides this design criteria. This project adheres to those design criteria for detention basin sizing and detains the 100-year storm event as well as the other storm events.

To size the peak attenuation volume required, the Rational Method hydrology results were input into Rick Rat Hydrographs to develop a hydrograph. The proposed hydrograph was routed using Hydraflow Hydrographs Computer Software with the calculated orifice sizes and a riser structure to determine peak flow rates and maximum elevation of each basin. Detention routing starts at 6" above basin FG in order to comply with the conjunctive use requirements of the County of San Diego. The tailwater mentioned above, was included for the 50- and 100-year storm events for Basins 1 only as Basin 2 detention is higher than the TW elevation of the channel. See **Appendix F** for detention basin calculations and **Table 4-1** summarizing the basin routing results. The project peak flow rates are less than the pre-project flow rate for all storm events per the criteria above.

Table 4–1 Proposed Detention Basin Summary

					Maximum Water Surface Elevation			
Storm Event	Existing Runoff	Proposed Runoff	Proposed Released	Runoff Detained	Basin 1	Basin 2	Basin 3	Basin 4
(yr)	Q (cfs)	Q (cfs)	Q (cfs)	Q (cfs)	ft	ft	ft	ft
5	18.4	64.9	15.3	49.6	475.21	477.73	479.21	479.49
10	21.2	74.9	18.5	56.4	475.42	477.78	479.23	479.50
25	24.4	85.3	20.7	64.6	475.58**	477.84	479.26	479.52
50	29.4	100.6	22.9	77.7	476.03*	477.92	479.30	479.54
100	32.6	110.9	24.4	86.5	476.22*	477.97	479.33	479.56
Top of Basin					476.25	479.0	480.5	480.82
100 Year Freeboard (feet)					0.03	1.03	1.17	1.26
Basin Volume Provided (cubic feet)					85,517	46,636	26,924	11,218
*25-yr TW at 475.6' elevation condition applied to analysis								
**100-yr TW at 476' elevation condition applied to analysis								

Drawdown times for the detention basins are required to drawdown the surface ponding within 96 hours per section 6.3.7 Drawdown Time of the 2016 Storm Water Standards Part 1: BMP Design Manual for Permanent Site Design, Storm Water Treatment and Hydromodification Management. See **Table 4-2** Below for a summary of storm event drawdown times for the four basins. To be conservative, flows routed through the overflow inlet and upper orifice openings were ignored; only the flow exiting through the hydromodification orifice was accounted for. These drawdown times represent the duration it takes to drain the surface storage area after the end of the storm event for each basin and are supported by the hydrographs and hydraflow results in **Appendix F**.

Table 4–2 Proposed Detention Basin Drawdown Summary

	Basin 1		Basin 2		Basin 3		Basin 4	
Storm Event	Max WSEL	Drawdown Time	Max WSEL	Drawdown Time	Max WSEL	Drawdown Time	Max WSEL	Drawdown Time
(yr)	ft	hrs	ft	hrs	ft	hrs	ft	hrs
5	475.21	28.67	477.73	13.93	479.21	17.33	479.49	12.74
10	475.42	30.08	477.78	14.98	479.23	18.07	479.5	13.11
25	475.58	31.30	477.84	16.19	479.26	18.71	479.52	13.46
50	476.03	33.89	477.92	17.84	479.3	19.79	479.54	13.97
100	476.22	35.11	477.97	18.31	479.33	20.79	479.56	14.30

4.1.4 INLET DESIGN

Inlet design will be provided during final design.

5 WATER QUALITY

5.1 POST CONSTRUCTION BMP

A project specific Storm Water Quality Management Plan (SWQMP) has been prepared. Biofiltration areas are proposed throughout the project to provide stormwater treatment for the pollutants discharged from the proposed improvements. Biofiltration areas (standard and proprietary) were incorporated into the project where it was practical. These biofiltration areas are a mitigation measure for stormwater runoff treatment. Biofiltration calculations are provided in the project specific SWQMP.

5.2 EROSION AND SEDIMENTATION

The proposed commercial site will be approximately 83% impervious with landscaped slopes and parkway landscaped areas. Graded and disturbed areas will be re-vegetated and landscaped to minimize erosion. The post construction site will have minimal risks of erosion occurring given proper plant establishment and transport of sediments downstream will be significantly reduced by means of pretreatment and onsite biofiltration basins. It will be critical to maintain construction site BMP's throughout the construction duration.

6 DRAINAGE IMPROVEMENTS

This drainage study was prepared to document the storm drain design for Majestic Airway. The project includes the construction of three industrial buildings, associated truck docks, parking, and utilities. The drainage improvements throughout the project consist of installing inlets, storm drain facilities, biofiltration basins (standard and proprietary), and an underground stormwater detention tank.

The proposed drainage improvements are designed to mitigate flood and water quality impacts such that no adjacent properties will be negatively impacted from runoff generated by the development of this project. This Drainage Study documents that this project does not create any negative drainage impacts to any adjacent properties.

APPENDICES

APPENDIX A

USGS MAP

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

OTAY MESA QUADRANGLE
CALIFORNIA-BAJA CALIFORNIA NORTE
7.5-MINUTE SERIES

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid: Universal Transverse Mercator, Zone 11S
10 000-foot ticks: California Coordinate System of 1983 (zone 6)

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery....................NAIP, May 2012
Roads....................HERE, ©2013 - 2014
Names....................GNIS, 2015
Hydrography....................National Hydrography Dataset, 2012
Contours....................National Elevation Dataset, 2012
Boundaries....................Multiple sources; see metadata file 1972 - 2015
Public Land Survey System....................BLM, 2011

UTM GRID AND 2015 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
(GN 0° 2′ 1 MILS; MN 11° 41′ 208 MILS)

U.S. National Grid
100,000-m Square ID: NS / NR
Grid Zone Designation 11S

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

CALIFORNIA
QUADRANGLE LOCATION

ADJOINING QUADRANGLES
1 National City
2 Jamul Mountains
3 Dulzura
4 Imperial Beach
5 Otay Mountain
6
7
8

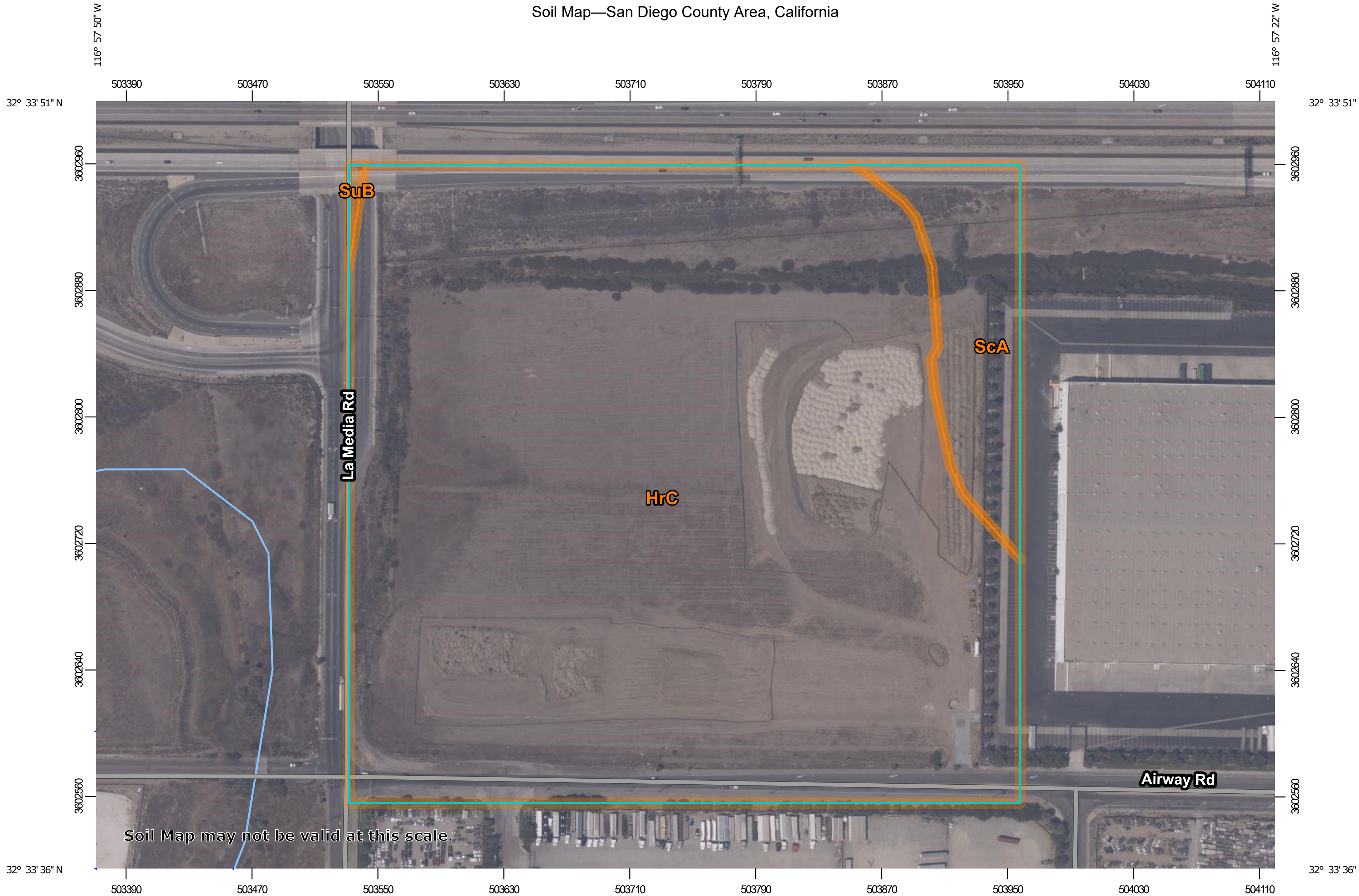
ROAD CLASSIFICATION
Expressway — Local Connector
Secondary Hwy — Local Road
Ramp — 4WD
Interstate Route — US Route — State Route

OTAY MESA, CA-BCN
2015

NSN. 7643016357281
NGA REF NO. USGSX24K33589

APPENDIX B

SOIL INFORMATION



Map Scale: 1:3,420 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 50, 100, 200, 300

Feet: 0, 150, 300, 600, 900

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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 15, May 27, 2020

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

Date(s) aerial images were photographed: Aug 18, 2018—Aug 22, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
HrC	Huerhuero loam, 2 to 9 percent slopes	39.4	92.4%
ScA	Salinas clay, 0 to 2 percent slopes	3.2	7.4%
SuB	Stockpen gravelly clay loam, 2 to 5 percent slopes	0.1	0.2%
Totals for Area of Interest		**42.7**	**100.0%**

San Diego County Area, California

HrC—Huerhuero loam, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: hbcm
Elevation: 1,100 feet
Mean annual precipitation: 12 to 20 inches
Mean annual air temperature: 57 degrees F
Frost-free period: 260 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Huerhuero

Setting

Landform: Marine terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 12 inches: loam
H2 - 12 to 55 inches: clay loam, clay
H2 - 12 to 55 inches: stratified sand to sandy loam
H3 - 55 to 72 inches:

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 25.0
Available water capacity: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D

Ecological site: R019XD061CA
Hydric soil rating: No

Minor Components

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

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

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

Unnamed, ponded
Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 15, May 27, 2020

San Diego County Area, California

ScA—Salinas clay, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hbgh
Elevation: 50 to 300 feet
Mean annual precipitation: 12 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Salinas

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, rise
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium derived from mixed sources

Typical profile

H1 - 0 to 22 inches: clay
H2 - 22 to 46 inches: clay loam, clay
H2 - 22 to 46 inches: loam, clay loam
H3 - 46 to 64 inches:
H3 - 46 to 64 inches:

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very high (about 16.2 inches)

Interpretive groups

Land capability classification (irrigated): 2s

Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

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

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

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

Data Source Information

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 15, May 27, 2020

APPENDIX C

HYDROLOGY MANUAL EXCERPTS

Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the "Regulating Agency" when submitted with a detailed study.

Table 3-2

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

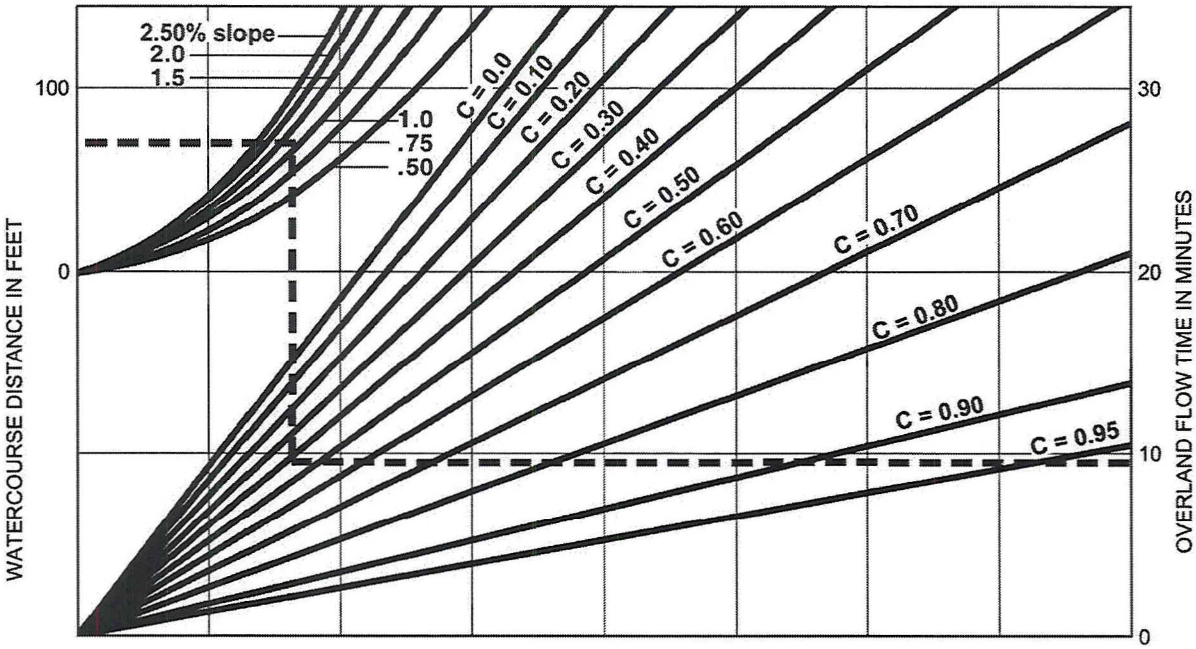
Element*	DU/	.5%		1%		2%		3%		5%		10%	
	Acre	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	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 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



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet

Slope (s) = 1.3%

Runoff Coefficient (C) = 0.41

Overland Flow Time (T) = 9.5 Minutes

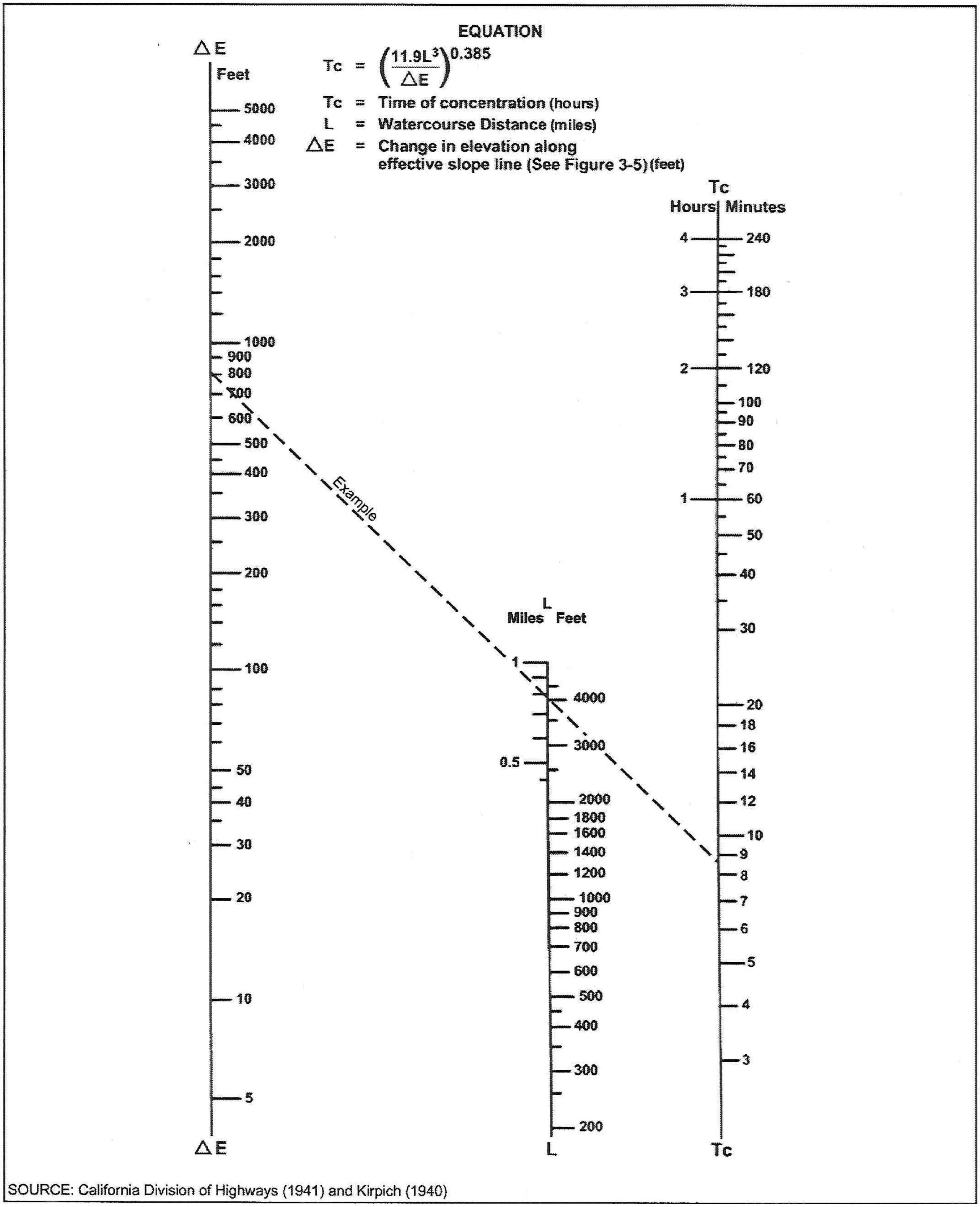
$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

OURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE

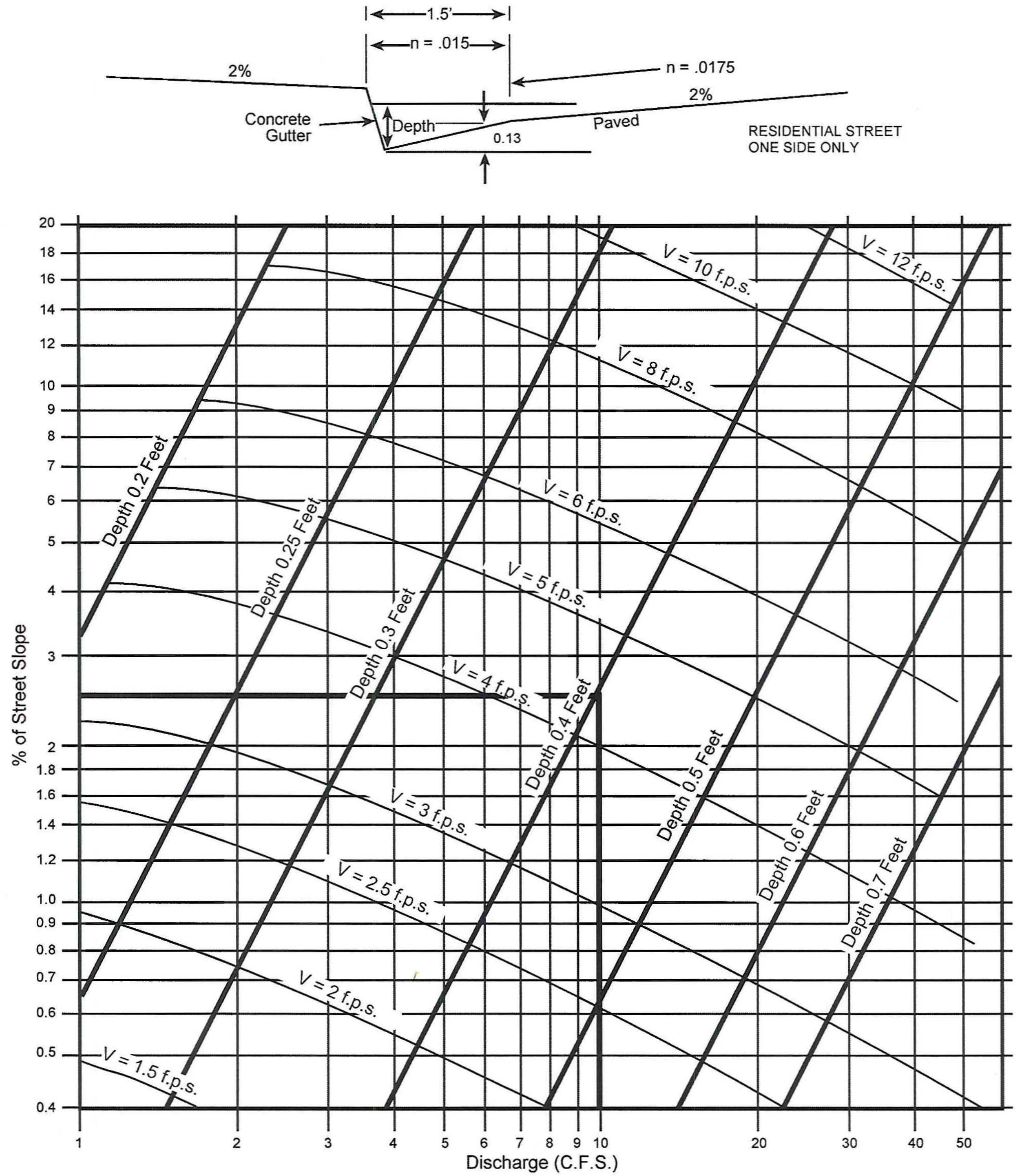
3-3

Rational Formula - Overland Time of Flow Nomograph



Nomograph for Determination of
Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds

FIGURE
3-4



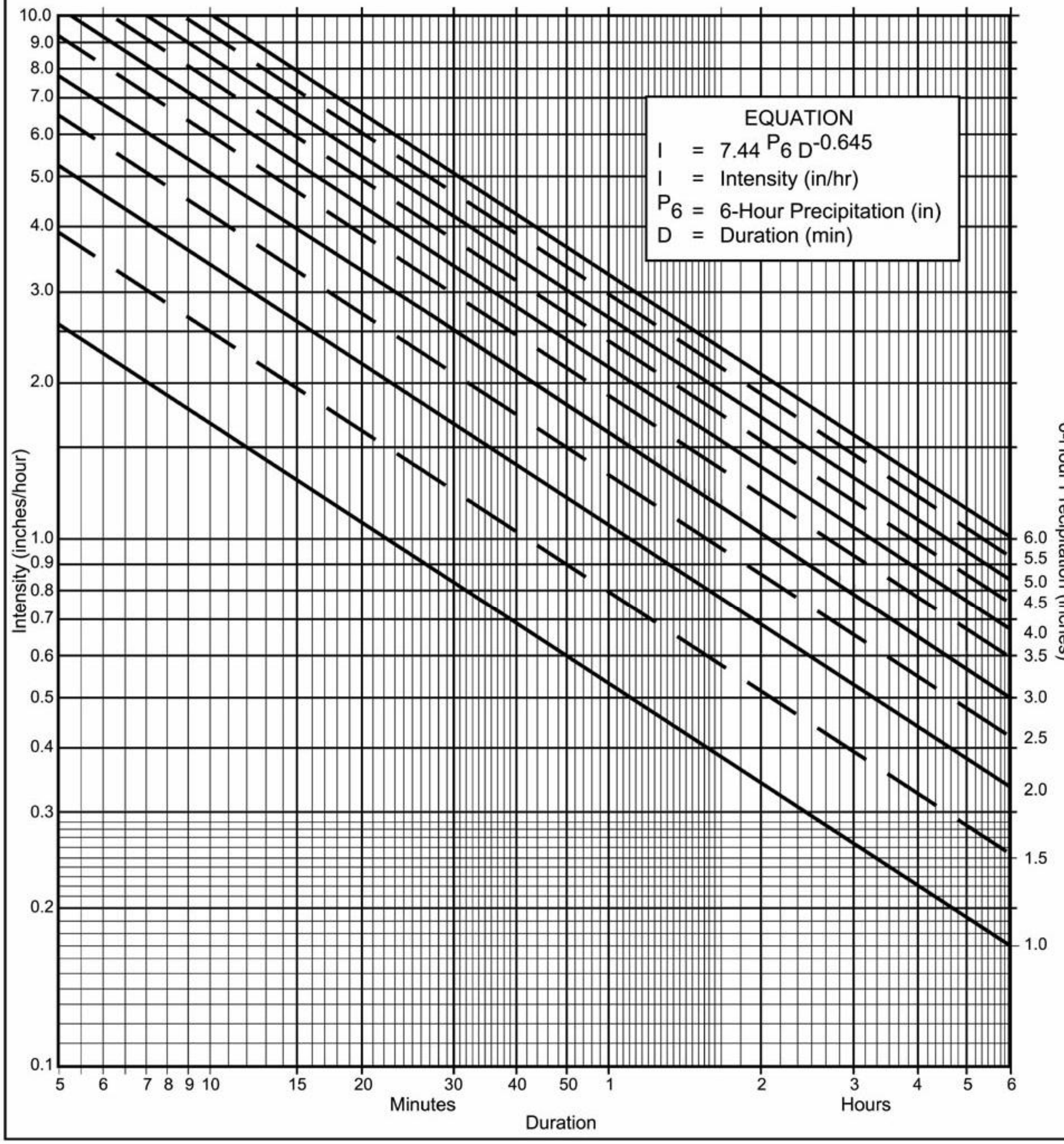
EXAMPLE:
Given: Q = 10 S = 2.5%
Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.

SOURCE: San Diego County Department of Special District Services Design Manual

Gutter and Roadway Discharge - Velocity Chart

FIGURE

3-6



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 applicable 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 50 year

(b) P_6 = 2.1 in., P_{24} = 4.5, $\frac{P_6}{P_{24}}$ = 47 %(2)

(c) Adjusted $P_6^{(2)}$ = 2.1 in.

(d) t_x = ______ min.

(e) I = ______ in./hr.

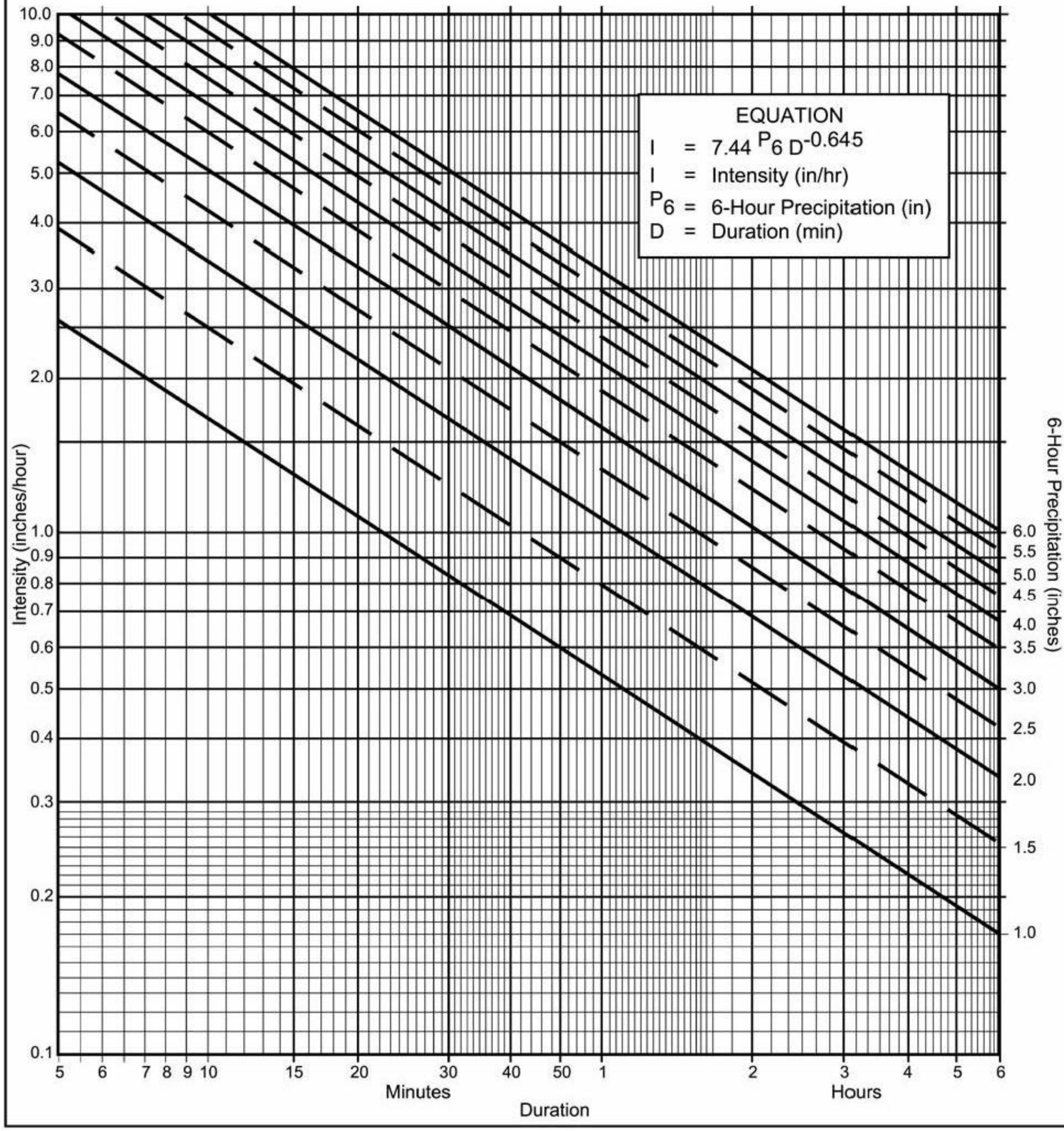
Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

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



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 applicable 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 100 year

(b) P_6 = 2.3 in., P_{24} = 4.5, $\frac{P_6}{P_{24}}$ = 51 %(2)

(c) Adjusted $P_6^{(2)}$ = 2.3 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

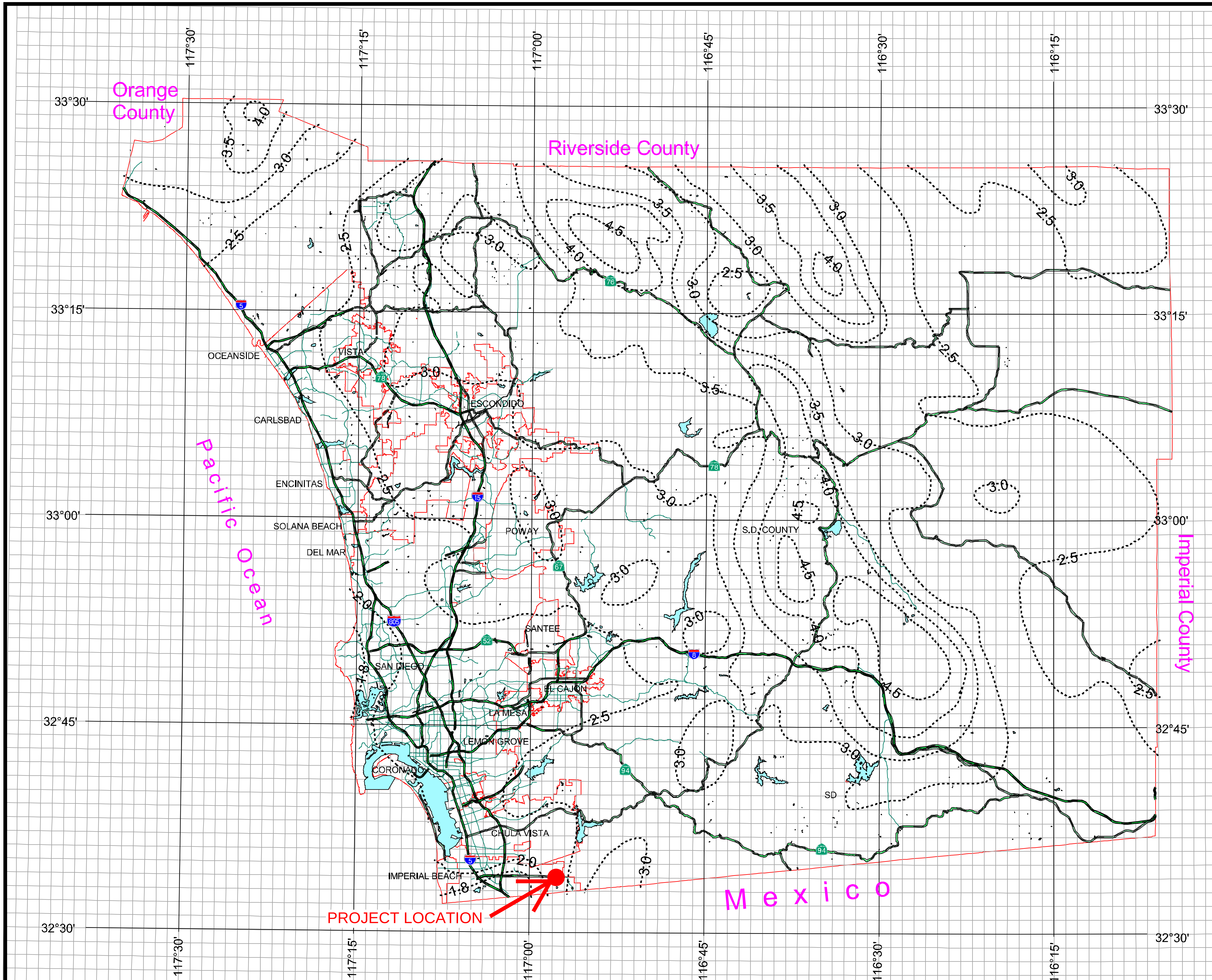
County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 6 Hours

....	Isopluvial (inches)

P6 = 2.1 INCHES



Department of Public Works Geographic Information Services

We Have San Diego Covered!

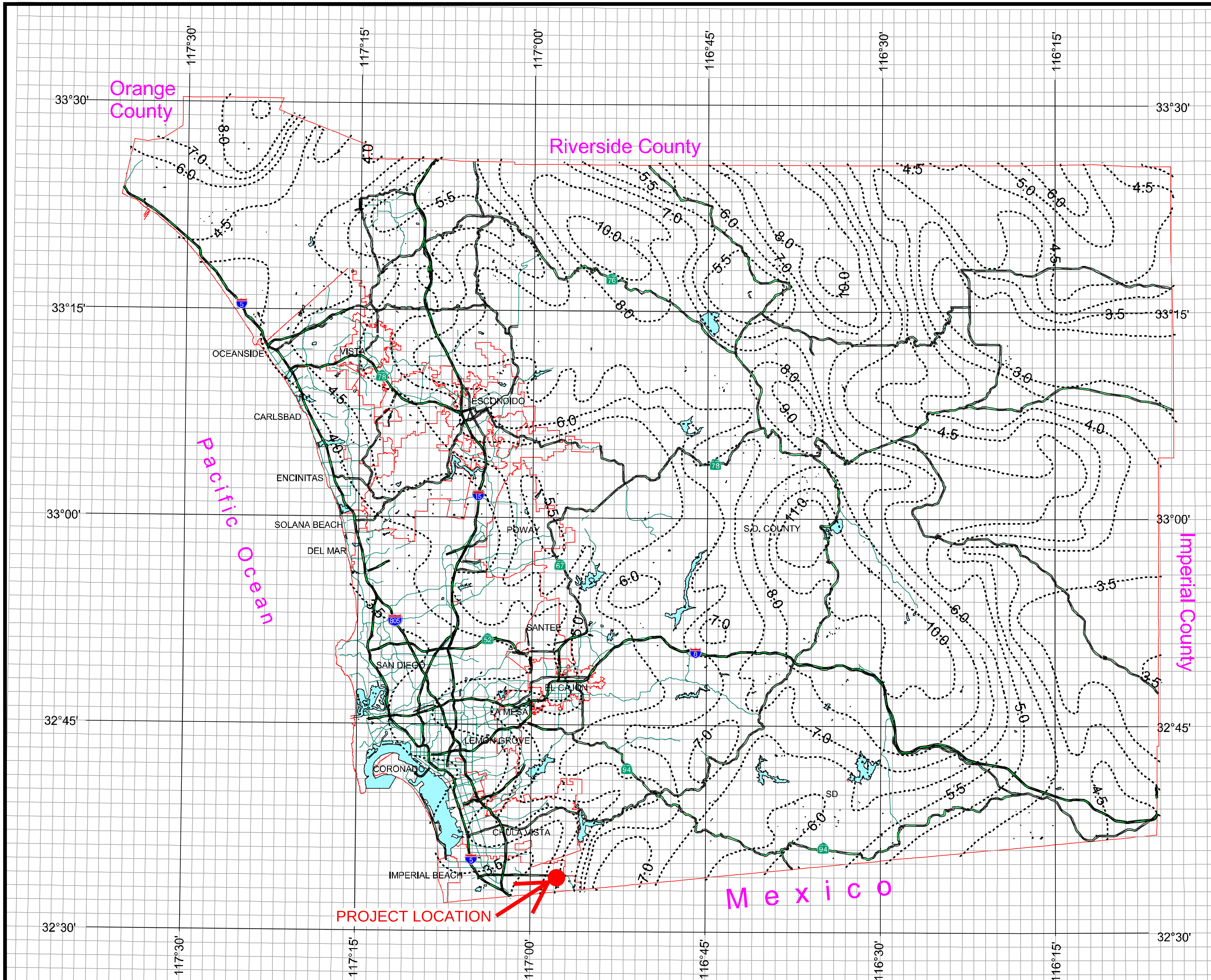
County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 24 Hours

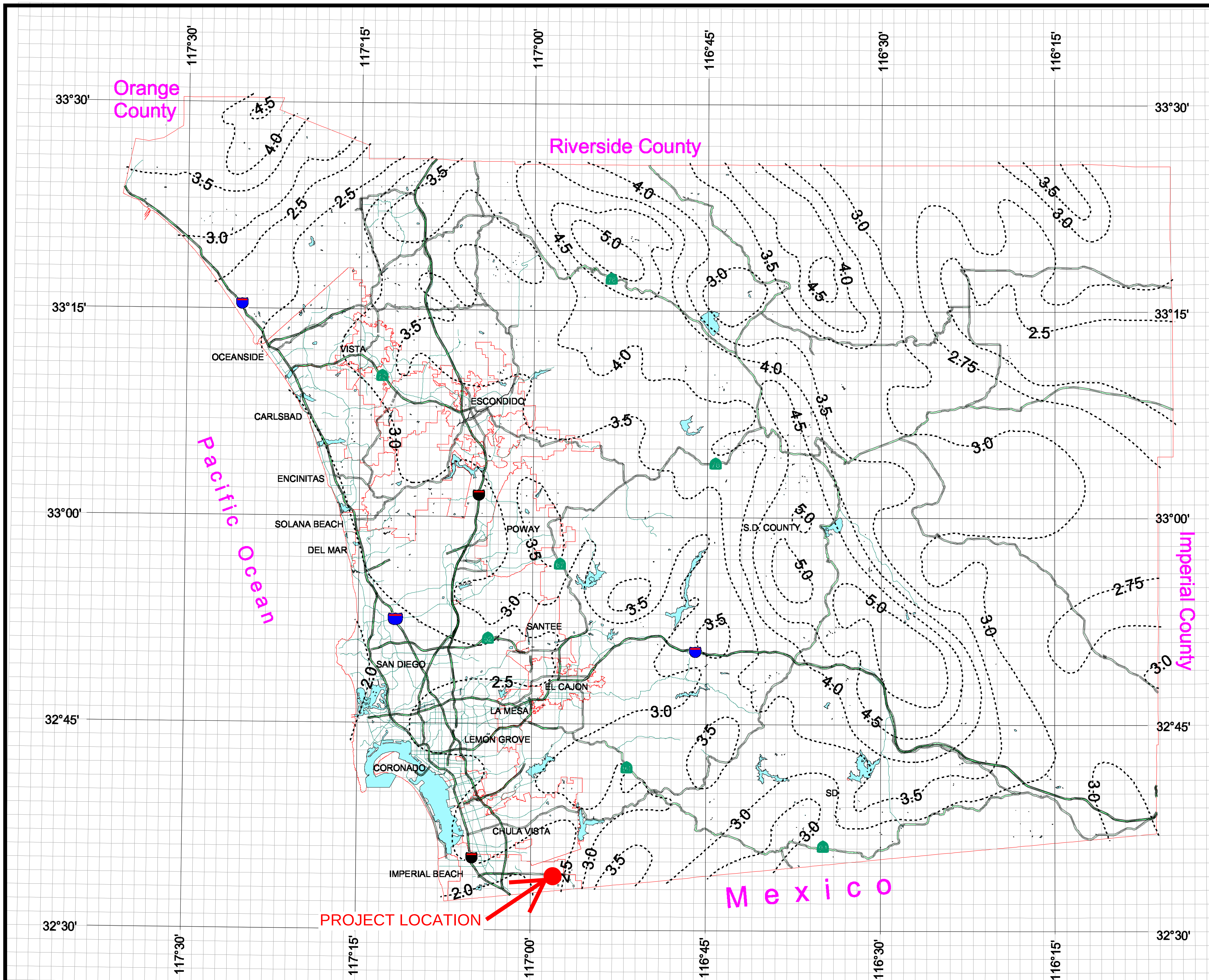
Isopluvial (inches)

P24 = 4.5 INCHES



DPW GIS Department of Public Works Geographic Information Services

SanGIS We Have San Diego Covered!



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

P6 = 2.3 INCHES

DPW GIS
Department of Public Works
Geographic Information Services

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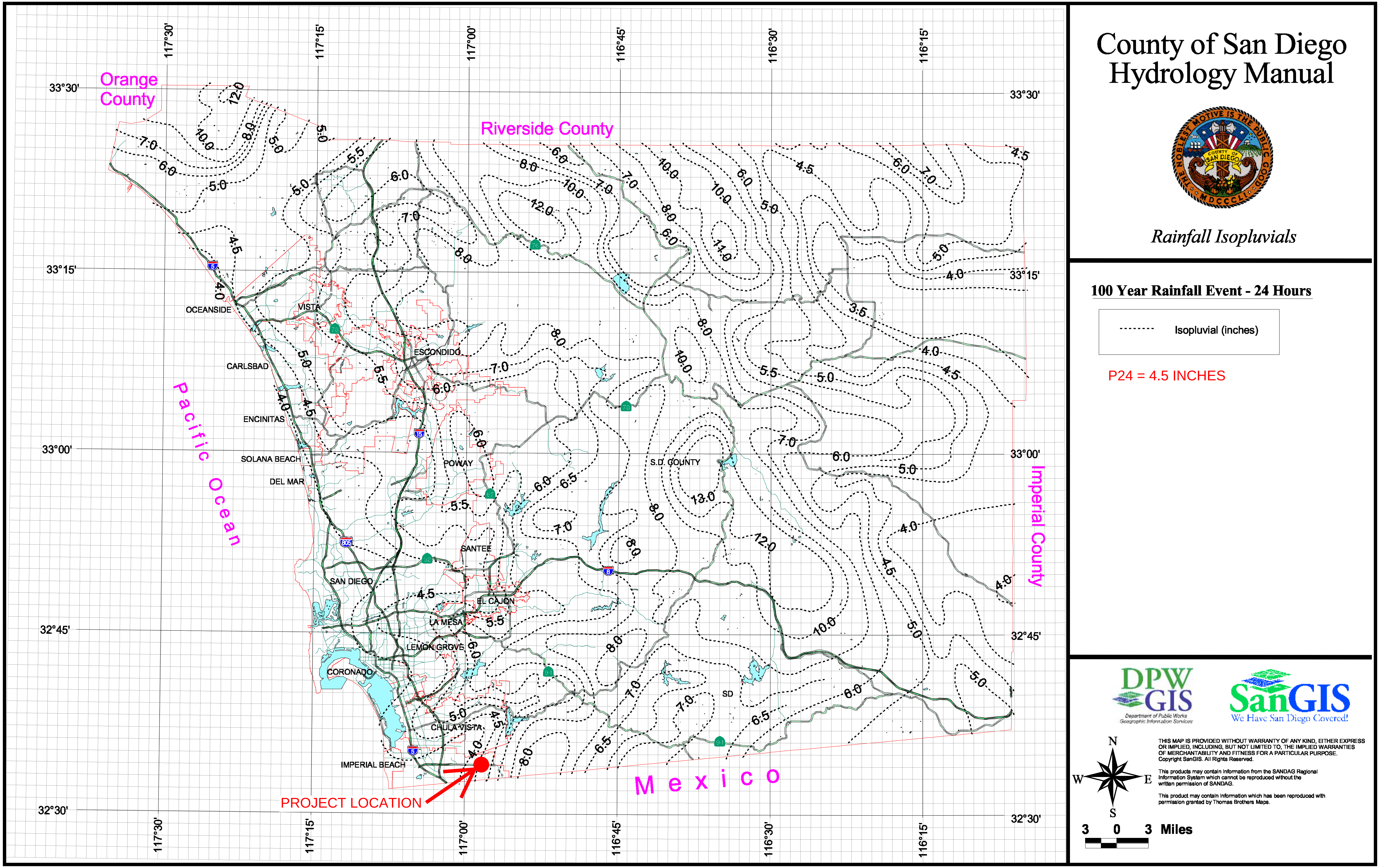
N
W E
S

3 0 3 Miles



County of San Diego
Hydrology Manual
Rainfall Isopluvials
100 Year Rainfall Event - 24 Hours
Isopluvial (inches)
P24 = 4.5 INCHES
PROJECT LOCATION
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
33°30'
33°15'
33°00'
32°45'
32°30'
117°30'
117°15'
117°00'
116°45'
116°30'
116°15'
DPW GIS
Department of Public Works Geographic Information Services
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S
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W
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This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.
3 0 3 Miles

APPENDIX D

EXISTING CONDITION HYDROLOGY CALCULATIONS

```
****************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2011 Advanced Engineering Software (aes)
             Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:

                      Kimley-Horn and Associates, Inc.
                             765 The City Drive
                                 Suite 200
                              Orange, CA 92868

 ************************** DESCRIPTION OF STUDY **************************
 * MAJESTIC AIRWAY                                                          *
 * EXISTING 5YR RATIONAL METHOD                                             *
 * APRIL 2021 ELL                                                           *
 **************************************************************************

  FILE NAME: AIR5E.DAT
  TIME/DATE OF STUDY: 14:45 04/14/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =   5.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   1.400
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    482.60
  DOWNSTREAM ELEVATION(FEET) =    482.10
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.890
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.000
  SUBAREA RUNOFF(CFS) =      0.18
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.18

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    482.10  DOWNSTREAM(FEET) =    473.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1817.00   CHANNEL SLOPE =  0.0048
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.988
  STREETS & ROADS (DIRT) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.81
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.96
  AVERAGE FLOW DEPTH(FEET) =   0.29   TRAVEL TIME(MIN.) =  31.64
  Tc(MIN.) =   38.53
  SUBAREA AREA(ACRES) =    22.83       SUBAREA RUNOFF(CFS) =   13.54
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.600
  TOTAL AREA(ACRES) =       22.9         PEAK FLOW RATE(CFS) =      13.60

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.36   FLOW VELOCITY(FEET/SEC.) =   1.09
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =    1872.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    488.00
  DOWNSTREAM ELEVATION(FEET) =    482.60
  ELEVATION DIFFERENCE(FEET) =      5.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.117
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.22
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.22

**************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  51
--------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    482.60  DOWNSTREAM(FEET) =    473.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1278.00   CHANNEL SLOPE =  0.0068
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.198
  STREETS & ROADS (DIRT) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.92
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.84
  AVERAGE FLOW DEPTH(FEET) =   0.19   TRAVEL TIME(MIN.) =  25.46
  Tc(MIN.) =   28.58
  SUBAREA AREA(ACRES) =     6.62       SUBAREA RUNOFF(CFS) =    4.76
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.600
  TOTAL AREA(ACRES) =        6.7         PEAK FLOW RATE(CFS) =       4.83

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.23   FLOW VELOCITY(FEET/SEC.) =   0.96
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    203.00 =    1333.00 FEET.
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.7  TC(MIN.) =     28.58
  PEAK FLOW RATE(CFS)   =       4.83
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
____________________________________________________________________________
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2011 Advanced Engineering Software (aes)
             Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:

                      Kimley-Horn and Associates, Inc.
                             765 The City Drive
                                 Suite 200
                              Orange, CA 92868

 ************************** DESCRIPTION OF STUDY **************************
* MAJESTIC AIRWAY                                                          *
* EXISTING 10YR RATIONAL METHOD                                            *
* APRIL 2021 ELL                                                           *
 **************************************************************************

  FILE NAME: AIR10E.DAT
  TIME/DATE OF STUDY: 15:15 04/14/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  10.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   1.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    482.60
  DOWNSTREAM ELEVATION(FEET) =    482.10
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.890
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.428
  SUBAREA RUNOFF(CFS) =      0.21
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.21

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    482.10  DOWNSTREAM(FEET) =    473.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1817.00   CHANNEL SLOPE =  0.0048
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.135
  STREETS & ROADS (DIRT) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.08
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.97
  AVERAGE FLOW DEPTH(FEET) =   0.31   TRAVEL TIME(MIN.) =  31.33
  Tc(MIN.) =   38.22
  SUBAREA AREA(ACRES) =    22.83       SUBAREA RUNOFF(CFS) =   15.55
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.600
  TOTAL AREA(ACRES) =       22.9         PEAK FLOW RATE(CFS) =      15.62

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.38   FLOW VELOCITY(FEET/SEC.) =   1.11
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =    1872.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    488.00
  DOWNSTREAM ELEVATION(FEET) =    482.60
  ELEVATION DIFFERENCE(FEET) =      5.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.117
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.25
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.25

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    482.60  DOWNSTREAM(FEET) =    473.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1278.00   CHANNEL SLOPE =  0.0068
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.393
  STREETS & ROADS (DIRT) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.45
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.86
  AVERAGE FLOW DEPTH(FEET) =   0.20   TRAVEL TIME(MIN.) =  24.73
  Tc(MIN.) =   27.84
  SUBAREA AREA(ACRES) =     6.62       SUBAREA RUNOFF(CFS) =    5.53
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.600
  TOTAL AREA(ACRES) =        6.7         PEAK FLOW RATE(CFS) =       5.62

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.24   FLOW VELOCITY(FEET/SEC.) =   0.99
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    203.00 =    1333.00 FEET.
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        6.7  TC(MIN.) =     27.84
  PEAK FLOW RATE(CFS)    =       5.62
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
____________________________________________________________________________
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
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             Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:

                      Kimley-Horn and Associates, Inc.
                             765 The City Drive
                                 Suite 200
                              Orange, CA 92868

 ************************** DESCRIPTION OF STUDY **************************
* MAJESTIC AIRWAY                                                          *
* EXISTING 25YR RATIONAL METHOD                                            *
* APRIL 2021 ELL                                                           *
 **************************************************************************

  FILE NAME: AIR25E.DAT
  TIME/DATE OF STUDY: 15:18 04/14/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  25.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   1.800
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    482.60
  DOWNSTREAM ELEVATION(FEET) =    482.10
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.890
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.857
  SUBAREA RUNOFF(CFS) =      0.23
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.23

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    482.10  DOWNSTREAM(FEET) =    473.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1817.00   CHANNEL SLOPE =  0.0048
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.297
  STREETS & ROADS (DIRT) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.29
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.99
  AVERAGE FLOW DEPTH(FEET) =   0.32   TRAVEL TIME(MIN.) =  30.44
  Tc(MIN.) =   37.33
  SUBAREA AREA(ACRES) =    22.83       SUBAREA RUNOFF(CFS) =   17.76
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.600
  TOTAL AREA(ACRES) =       22.9         PEAK FLOW RATE(CFS) =      17.84

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.39   FLOW VELOCITY(FEET/SEC.) =   1.16
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =    1872.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    488.00
  DOWNSTREAM ELEVATION(FEET) =    482.60
  ELEVATION DIFFERENCE(FEET) =      5.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.117
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.28

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    482.60  DOWNSTREAM(FEET) =    473.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1278.00   CHANNEL SLOPE =  0.0068
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.618
  STREETS & ROADS (DIRT) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.93
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.91
  AVERAGE FLOW DEPTH(FEET) =   0.21   TRAVEL TIME(MIN.) =  23.38
  Tc(MIN.) =   26.50
  SUBAREA AREA(ACRES) =     6.62       SUBAREA RUNOFF(CFS) =    6.42
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.600
  TOTAL AREA(ACRES) =        6.7         PEAK FLOW RATE(CFS) =       6.52

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.25   FLOW VELOCITY(FEET/SEC.) =   1.02
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    203.00 =    1333.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.7  TC(MIN.) =     26.50
  PEAK FLOW RATE(CFS)   =       6.52
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

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                           Analysis prepared by:

                      Kimley-Horn and Associates, Inc.
                             765 The City Drive
                                 Suite 200
                              Orange, CA 92868

 ************************** DESCRIPTION OF STUDY **************************
* MAJESTIC AIRWAY                                                          *
* EXISTING 50YR RATIONAL METHOD                                            *
* APRIL 2021 ELL                                                           *
 **************************************************************************

  FILE NAME: AIR50E.DAT
  TIME/DATE OF STUDY: 15:19 04/14/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  50.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.100
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)      (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    482.60
  DOWNSTREAM ELEVATION(FEET) =    482.10
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.890
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.499
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    482.10  DOWNSTREAM(FEET) =    473.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1817.00   CHANNEL SLOPE =  0.0048
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.573
  STREETS & ROADS (DIRT) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.30
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.07
  AVERAGE FLOW DEPTH(FEET) =   0.34   TRAVEL TIME(MIN.) =  28.25
  Tc(MIN.) =   35.14
  SUBAREA AREA(ACRES) =    22.83       SUBAREA RUNOFF(CFS) =   21.55
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.600
  TOTAL AREA(ACRES) =       22.9         PEAK FLOW RATE(CFS) =      21.64

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.42   FLOW VELOCITY(FEET/SEC.) =   1.21
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =    1872.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    488.00
  DOWNSTREAM ELEVATION(FEET) =    482.60
  ELEVATION DIFFERENCE(FEET) =      5.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.117
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.33
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.33

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    482.60  DOWNSTREAM(FEET) =    473.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1278.00   CHANNEL SLOPE =  0.0068
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.924
  STREETS & ROADS (DIRT) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.68
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.94
  AVERAGE FLOW DEPTH(FEET) =   0.22   TRAVEL TIME(MIN.) =  22.61
  Tc(MIN.) =   25.72
  SUBAREA AREA(ACRES) =     6.62       SUBAREA RUNOFF(CFS) =    7.64
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.600
  TOTAL AREA(ACRES) =        6.7         PEAK FLOW RATE(CFS) =       7.76

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.27   FLOW VELOCITY(FEET/SEC.) =   1.08
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    203.00 =    1333.00 FEET.
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.7  TC(MIN.) =     25.72
  PEAK FLOW RATE(CFS)   =       7.76
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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____________________________________________________________________________
****************************************************************************

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             Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:

                      Kimley-Horn and Associates, Inc.
                             765 The City Drive
                                 Suite 200
                              Orange, CA 92868

 ************************** DESCRIPTION OF STUDY **************************
* MAJESTIC AIRWAY                                                          *
* EXISTING 100YR RATIONAL METHOD                                           *
* APRIL 2021 ELL                                                           *
 **************************************************************************

  FILE NAME: AIR100E.DAT
  TIME/DATE OF STUDY: 15:20 04/14/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.300
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    482.60
  DOWNSTREAM ELEVATION(FEET) =    482.10
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.890
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.928
  SUBAREA RUNOFF(CFS) =      0.30
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.30

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    482.10  DOWNSTREAM(FEET) =    473.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1817.00   CHANNEL SLOPE =  0.0048
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50

         ==>>WARNING: FLOW IN CHANNEL EXCEEDS CHANNEL
             CAPACITY( NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
             ALLOWABLE DEPTH).
             AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
             ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.740
  STREETS & ROADS (DIRT) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      13.68
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.09
  AVERAGE FLOW DEPTH(FEET) =   0.36   TRAVEL TIME(MIN.) =  27.73
  Tc(MIN.) =   34.62
  SUBAREA AREA(ACRES) =    22.83       SUBAREA RUNOFF(CFS) =   23.83
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.600
  TOTAL AREA(ACRES) =       22.9         PEAK FLOW RATE(CFS) =      23.93

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.44   FLOW VELOCITY(FEET/SEC.) =   1.25
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =    1872.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  RESIDENTIAL (10.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    488.00
  DOWNSTREAM ELEVATION(FEET) =    482.60
  ELEVATION DIFFERENCE(FEET) =      5.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.117
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.36
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.36

**************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  51
--------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    482.60  DOWNSTREAM(FEET) =    473.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1278.00   CHANNEL SLOPE =  0.0068
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.140
  STREETS & ROADS (DIRT) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.15
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.97
  AVERAGE FLOW DEPTH(FEET) =   0.23   TRAVEL TIME(MIN.) =  22.00
  Tc(MIN.) =   25.11
  SUBAREA AREA(ACRES) =     6.62       SUBAREA RUNOFF(CFS) =    8.50
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.600
  TOTAL AREA(ACRES) =        6.7         PEAK FLOW RATE(CFS) =       8.63

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.28   FLOW VELOCITY(FEET/SEC.) =   1.12
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    203.00 =    1333.00 FEET.
```

```
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.7  TC(MIN.) =     25.11
  PEAK FLOW RATE(CFS)   =       8.63
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX E

PROPOSED CONDITION HYDROLOGY CALCULATIONS

```
____________________________________________________________________________
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2011 Advanced Engineering Software (aes)
             Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:

                      Kimley-Horn and Associates, Inc.
                             765 The City Drive
                                 Suite 200
                              Orange, CA 92868

 ************************** DESCRIPTION OF STUDY **************************
* MAJESTIC AIRWAY                                                          *
* PROPOSED 5YR RATIONAL METHOD                                             *
* AUGUST 2021 ELL                                                          *
 **************************************************************************

  FILE NAME: AIR5P.DAT
  TIME/DATE OF STUDY: 13:51 08/05/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =   5.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   1.400
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    489.30
  DOWNSTREAM ELEVATION(FEET) =    487.80
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.198
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
```

```
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    487.80  DOWNSTREAM(FEET) =    485.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =   361.00   CHANNEL SLOPE =  0.0075
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.976
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.72
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.26
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   4.78
  Tc(MIN.) =    6.97
  SUBAREA AREA(ACRES) =     1.06       SUBAREA RUNOFF(CFS) =    2.74
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       3.00

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.14   FLOW VELOCITY(FEET/SEC.) =   1.50
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     416.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   481.00  DOWNSTREAM(FEET) =   479.20
  FLOW LENGTH(FEET) =   327.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.30
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.00
  PIPE TRAVEL TIME(MIN.) =   1.27    Tc(MIN.) =    8.24
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    104.00 =     743.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.672
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.36   SUBAREA RUNOFF(CFS) =    3.16
  TOTAL AREA(ACRES) =        2.5   TOTAL RUNOFF(CFS) =       5.86
  TC(MIN.) =    8.24

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.20  DOWNSTREAM(FEET) =   478.20
  FLOW LENGTH(FEET) =   198.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.88
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.86
  PIPE TRAVEL TIME(MIN.) =   0.68    Tc(MIN.) =    8.92
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    105.00 =     941.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
```

```
    5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.540
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
 SUBAREA AREA(ACRES) =    0.89   SUBAREA RUNOFF(CFS) =    1.97
 TOTAL AREA(ACRES) =        3.4   TOTAL RUNOFF(CFS) =      7.53
 TC(MIN.) =    8.92

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   478.20  DOWNSTREAM(FEET) =   477.40
 FLOW LENGTH(FEET) =   170.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.91
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       7.53
 PIPE TRAVEL TIME(MIN.) =   0.58    Tc(MIN.) =    9.49
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    106.00 =    1111.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.439
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
 SUBAREA AREA(ACRES) =    0.76   SUBAREA RUNOFF(CFS) =    1.61
 TOTAL AREA(ACRES) =        4.2   TOTAL RUNOFF(CFS) =      8.85
 TC(MIN.) =    9.49

****************************************************************************
 FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   477.40  DOWNSTREAM(FEET) =   477.10
 FLOW LENGTH(FEET) =    52.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.71
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       8.85
 PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =    9.65
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    107.00 =    1163.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.65
 RAINFALL INTENSITY(INCH/HR) =   2.41
 TOTAL STREAM AREA(ACRES) =     4.17
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.85

****************************************************************************
 FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
```

```
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    482.80
  DOWNSTREAM ELEVATION(FEET) =    481.10
  ELEVATION DIFFERENCE(FEET) =      1.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.108
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    107.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    481.10  DOWNSTREAM(FEET) =    476.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   142.00   CHANNEL SLOPE =  0.0324
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.04
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.95
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   1.21
  Tc(MIN.) =    3.32
  SUBAREA AREA(ACRES) =     0.45       SUBAREA RUNOFF(CFS) =    1.44
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       1.77

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   2.27
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    107.00 =     197.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.32
  RAINFALL INTENSITY(INCH/HR) =   3.69
  TOTAL STREAM AREA(ACRES) =     0.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.77

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    484.10
  DOWNSTREAM ELEVATION(FEET) =    482.20
  ELEVATION DIFFERENCE(FEET) =      1.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.031
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    107.00 IS CODE =  61
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  482.20  DOWNSTREAM ELEVATION(FEET) =  476.50
  STREET LENGTH(FEET) =   494.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 47.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  42.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0130
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.50
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    7.17
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.37
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.64
  STREET FLOW TRAVEL TIME(MIN.) =   3.47   Tc(MIN.) =    5.50
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.469
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    0.78      SUBAREA RUNOFF(CFS) =    2.35
  TOTAL AREA(ACRES) =        0.9       PEAK FLOW RATE(CFS) =       2.66

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   9.31
  FLOW VELOCITY(FEET/SEC.) =  2.70   DEPTH*VELOCITY(FT*FT/SEC.) =   0.84
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    107.00 =     549.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.50
  RAINFALL INTENSITY(INCH/HR) =   3.47
  TOTAL STREAM AREA(ACRES) =     0.88
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.66

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        8.85     9.65        2.414         4.17
     2        1.77     3.32        3.689         0.55
     3        2.66     5.50        3.469         0.88

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1        6.41     3.32       3.689
     2        9.36     5.50       3.469
     3       11.85     9.65       2.414

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      11.85   Tc(MIN.) =    9.65
  TOTAL AREA(ACRES) =        5.6
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    107.00 =    1163.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    487.40
  DOWNSTREAM ELEVATION(FEET) =    486.60
  ELEVATION DIFFERENCE(FEET) =      0.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.710
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    486.60  DOWNSTREAM(FEET) =    486.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    36.00   CHANNEL SLOPE =  0.0167
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.39
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.23
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.49
  Tc(MIN.) =    3.20
  SUBAREA AREA(ACRES) =     0.04       SUBAREA RUNOFF(CFS) =    0.13
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.45

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   1.34
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    403.00 =      91.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    403.00 TO NODE    404.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   482.00  DOWNSTREAM(FEET) =   479.60
  FLOW LENGTH(FEET) =   207.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.38
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.45
  PIPE TRAVEL TIME(MIN.) =   1.02    Tc(MIN.) =    4.22
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    404.00 =     298.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    404.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
```

```
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.24   SUBAREA RUNOFF(CFS) =    0.77
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       1.22
  TC(MIN.) =    4.22

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    405.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.60  DOWNSTREAM(FEET) =   478.90
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.31
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.22
  PIPE TRAVEL TIME(MIN.) =   0.70    Tc(MIN.) =    4.92
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    405.00 =     438.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    405.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.92
  RAINFALL INTENSITY(INCH/HR) =   3.69
  TOTAL STREAM AREA(ACRES) =     0.38
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.22

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    487.20
  DOWNSTREAM ELEVATION(FEET) =    486.30
  ELEVATION DIFFERENCE(FEET) =      0.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.606
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    503.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    486.30  DOWNSTREAM(FEET) =    486.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    23.00   CHANNEL SLOPE =  0.0130
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.35
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.05
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.36
  Tc(MIN.) =    2.97
```

```
  SUBAREA AREA(ACRES) =     0.02       SUBAREA RUNOFF(CFS) =    0.06
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.39

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   1.15
  LONGEST FLOWPATH FROM NODE    501.00 TO NODE    503.00 =      78.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    503.00 TO NODE    504.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   481.90  DOWNSTREAM(FEET) =   479.50
  FLOW LENGTH(FEET) =   191.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.34
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.39
  PIPE TRAVEL TIME(MIN.) =   0.95    Tc(MIN.) =    3.92
  LONGEST FLOWPATH FROM NODE    501.00 TO NODE    504.00 =     269.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    504.00 TO NODE    504.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.21   SUBAREA RUNOFF(CFS) =    0.67
  TOTAL AREA(ACRES) =        0.3   TOTAL RUNOFF(CFS) =       1.06
  TC(MIN.) =    3.92

****************************************************************************
  FLOW PROCESS FROM NODE    504.00 TO NODE    405.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.50  DOWNSTREAM(FEET) =   478.90
  FLOW LENGTH(FEET) =   103.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.38
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.06
  PIPE TRAVEL TIME(MIN.) =   0.51    Tc(MIN.) =    4.43
  LONGEST FLOWPATH FROM NODE    501.00 TO NODE    405.00 =     372.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    405.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.43
  RAINFALL INTENSITY(INCH/HR) =   3.69
  TOTAL STREAM AREA(ACRES) =     0.33
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.06

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
```

```
     1        1.22     4.92        3.689          0.38
     2        1.06     4.43        3.689          0.33

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1        2.16     4.43       3.689
     2        2.28     4.92       3.689

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       2.28   Tc(MIN.) =    4.92
 TOTAL AREA(ACRES) =        0.7
 LONGEST FLOWPATH FROM NODE    401.00 TO NODE    405.00 =     438.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    405.00 TO NODE    406.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   478.90  DOWNSTREAM(FEET) =   474.40
 FLOW LENGTH(FEET) =   564.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.61
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.28
 PIPE TRAVEL TIME(MIN.) =   2.04    Tc(MIN.) =    6.97
 LONGEST FLOWPATH FROM NODE    401.00 TO NODE    406.00 =    1002.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    406.00 TO NODE    406.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.979
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
 SUBAREA AREA(ACRES) =    6.53   SUBAREA RUNOFF(CFS) =   16.92
 TOTAL AREA(ACRES) =        7.2   TOTAL RUNOFF(CFS) =      18.76
 TC(MIN.) =    6.97

****************************************************************************
 FLOW PROCESS FROM NODE    406.00 TO NODE    407.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   474.40  DOWNSTREAM(FEET) =   474.00
 FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.02
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      18.76
 PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    7.06
 LONGEST FLOWPATH FROM NODE    401.00 TO NODE    407.00 =    1047.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    407.00 TO NODE    407.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.06
 RAINFALL INTENSITY(INCH/HR) =   2.95
 TOTAL STREAM AREA(ACRES) =     7.24
```

```
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     18.76

****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    487.00
  DOWNSTREAM ELEVATION(FEET) =    485.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.198
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    485.50  DOWNSTREAM(FEET) =    478.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =   614.00   CHANNEL SLOPE =  0.0119
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.097
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.41
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.35
  AVERAGE FLOW DEPTH(FEET) =   0.20   TRAVEL TIME(MIN.) =   4.36
  Tc(MIN.) =    6.56
  SUBAREA AREA(ACRES) =     6.70       SUBAREA RUNOFF(CFS) =   18.05
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        6.8         PEAK FLOW RATE(CFS) =      18.32

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.26   FLOW VELOCITY(FEET/SEC.) =   2.81
  LONGEST FLOWPATH FROM NODE    601.00 TO NODE    603.00 =     669.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    603.00 TO NODE    407.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   474.30  DOWNSTREAM(FEET) =   474.10
  FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.14
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      18.32
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    6.68
  LONGEST FLOWPATH FROM NODE    601.00 TO NODE    407.00 =     714.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    407.00 TO NODE    407.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.68
  RAINFALL INTENSITY(INCH/HR) =   3.06
```

```
  TOTAL STREAM AREA(ACRES) =     6.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     18.32

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        18.76     7.06        2.953          7.24
     2        18.32     6.68        3.060          6.80

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1        36.43     6.68       3.060
     2        36.44     7.06       2.953

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      36.44   Tc(MIN.) =    7.06
  TOTAL AREA(ACRES) =       14.0
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    407.00 =    1047.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    701.00 TO NODE    702.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    489.30
  DOWNSTREAM ELEVATION(FEET) =    487.80
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.198
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    702.00 TO NODE    703.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    487.80  DOWNSTREAM(FEET) =    479.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    97.00   CHANNEL SLOPE =  0.0907
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.28
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.28
  AVERAGE FLOW DEPTH(FEET) =   0.11   TRAVEL TIME(MIN.) =   0.38
  Tc(MIN.) =    2.58
  SUBAREA AREA(ACRES) =     3.09       SUBAREA RUNOFF(CFS) =    9.92
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        3.2         PEAK FLOW RATE(CFS) =      10.24

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.14   FLOW VELOCITY(FEET/SEC.) =   5.12
  LONGEST FLOWPATH FROM NODE    701.00 TO NODE    703.00 =     152.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    801.00 TO NODE    802.00 IS CODE =  21
----------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    484.50
  DOWNSTREAM ELEVATION(FEET) =    483.00
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.198
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    802.00 TO NODE    803.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    483.00  DOWNSTREAM(FEET) =    479.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   311.00   CHANNEL SLOPE =  0.0119
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     5 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.689
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.35
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.87
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   2.77
  Tc(MIN.) =    4.96
  SUBAREA AREA(ACRES) =     1.89       SUBAREA RUNOFF(CFS) =    6.07
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        2.0         PEAK FLOW RATE(CFS) =       6.39

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.17   FLOW VELOCITY(FEET/SEC.) =   2.16
  LONGEST FLOWPATH FROM NODE    801.00 TO NODE    803.00 =     366.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.0  TC(MIN.) =      4.96
  PEAK FLOW RATE(CFS)   =       6.39
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2011 Advanced Engineering Software (aes)
             Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                          Analysis prepared by:

                      Kimley-Horn and Associates, Inc.
                             765 The City Drive
                                 Suite 200
                              Orange, CA 92868

 ************************** DESCRIPTION OF STUDY **************************
* MAJESTIC AIRWAY                                                          *
* PROPOSED 10YR RATIONAL METHOD                                            *
* AUGUST 2021 ELL                                                          *
 **************************************************************************

  FILE NAME: AIR10P.DAT
  TIME/DATE OF STUDY: 13:53 08/05/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  10.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   1.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

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  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    489.30
  DOWNSTREAM ELEVATION(FEET) =    487.80
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.198
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

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  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
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  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    487.80  DOWNSTREAM(FEET) =    485.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =   361.00   CHANNEL SLOPE =  0.0075
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.421
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.97
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.28
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   4.71
  Tc(MIN.) =    6.91
  SUBAREA AREA(ACRES) =     1.06       SUBAREA RUNOFF(CFS) =    3.15
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       3.45

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.15   FLOW VELOCITY(FEET/SEC.) =   1.56
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     416.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   481.00  DOWNSTREAM(FEET) =   479.20
  FLOW LENGTH(FEET) =   327.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.44
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.45
  PIPE TRAVEL TIME(MIN.) =   1.23    Tc(MIN.) =    8.14
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    104.00 =     743.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.078
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.36   SUBAREA RUNOFF(CFS) =    3.64
  TOTAL AREA(ACRES) =        2.5   TOTAL RUNOFF(CFS) =       6.75
  TC(MIN.) =    8.14

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.20  DOWNSTREAM(FEET) =   478.20
  FLOW LENGTH(FEET) =   198.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.01
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.75
  PIPE TRAVEL TIME(MIN.) =   0.66    Tc(MIN.) =    8.80
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    105.00 =     941.00 FEET.

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  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
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    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.928
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.89   SUBAREA RUNOFF(CFS) =    2.27
  TOTAL AREA(ACRES) =        3.4   TOTAL RUNOFF(CFS) =       8.69
  TC(MIN.) =    8.80

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   478.20  DOWNSTREAM(FEET) =   477.40
  FLOW LENGTH(FEET) =   170.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.24
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.69
  PIPE TRAVEL TIME(MIN.) =   0.54    Tc(MIN.) =    9.34
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    106.00 =    1111.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.817
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.76   SUBAREA RUNOFF(CFS) =    1.86
  TOTAL AREA(ACRES) =        4.2   TOTAL RUNOFF(CFS) =      10.22
  TC(MIN.) =    9.34

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   477.40  DOWNSTREAM(FEET) =   477.10
  FLOW LENGTH(FEET) =    52.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.88
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.22
  PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =    9.49
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    107.00 =    1163.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.49
  RAINFALL INTENSITY(INCH/HR) =   2.79
  TOTAL STREAM AREA(ACRES) =     4.17
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.22

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
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  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    482.80
  DOWNSTREAM ELEVATION(FEET) =    481.10
  ELEVATION DIFFERENCE(FEET) =      1.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.108
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    107.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    481.10  DOWNSTREAM(FEET) =    476.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   142.00   CHANNEL SLOPE =  0.0324
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.19
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.92
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   1.23
  Tc(MIN.) =    3.34
  SUBAREA AREA(ACRES) =     0.45       SUBAREA RUNOFF(CFS) =    1.65
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       2.02

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   2.29
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    107.00 =     197.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.34
  RAINFALL INTENSITY(INCH/HR) =   4.22
  TOTAL STREAM AREA(ACRES) =     0.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.02

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    484.10
  DOWNSTREAM ELEVATION(FEET) =    482.20
  ELEVATION DIFFERENCE(FEET) =      1.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.031
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    107.00 IS CODE =  61
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----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  482.20  DOWNSTREAM ELEVATION(FEET) =  476.50
  STREET LENGTH(FEET) =   494.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 47.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  42.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0130
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.73
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.67
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.45
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.69
  STREET FLOW TRAVEL TIME(MIN.) =   3.36   Tc(MIN.) =    5.39
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.017
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    0.78      SUBAREA RUNOFF(CFS) =    2.73
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       3.08

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =   9.96
  FLOW VELOCITY(FEET/SEC.) =  2.77   DEPTH*VELOCITY(FT*FT/SEC.) =   0.90
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    107.00 =     549.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.39
  RAINFALL INTENSITY(INCH/HR) =   4.02
  TOTAL STREAM AREA(ACRES) =     0.88
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.08

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       10.22     9.49        2.789          4.17
     2        2.02     3.34        4.216          0.55
     3        3.08     5.39        4.017          0.88

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1        7.52     3.34       4.216
     2       10.80     5.39       4.017
     3       13.69     9.49       2.789

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      13.69   Tc(MIN.) =    9.49
  TOTAL AREA(ACRES) =        5.6
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    107.00 =    1163.00 FEET.
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****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    487.40
  DOWNSTREAM ELEVATION(FEET) =    486.60
  ELEVATION DIFFERENCE(FEET) =      0.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.710
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    486.60  DOWNSTREAM(FEET) =    486.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    36.00   CHANNEL SLOPE =  0.0167
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.44
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.31
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.46
  Tc(MIN.) =    3.17
  SUBAREA AREA(ACRES) =     0.04       SUBAREA RUNOFF(CFS) =    0.15
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.51

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   1.27
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    403.00 =      91.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    403.00 TO NODE    404.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   482.00  DOWNSTREAM(FEET) =   479.60
  FLOW LENGTH(FEET) =   207.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.52
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.51
  PIPE TRAVEL TIME(MIN.) =   0.98    Tc(MIN.) =    4.15
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    404.00 =     298.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    404.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
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  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.24   SUBAREA RUNOFF(CFS) =    0.88
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       1.39
  TC(MIN.) =    4.15

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    405.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.60  DOWNSTREAM(FEET) =   478.90
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.42
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.39
  PIPE TRAVEL TIME(MIN.) =   0.68    Tc(MIN.) =    4.83
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    405.00 =     438.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    405.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.83
  RAINFALL INTENSITY(INCH/HR) =   4.22
  TOTAL STREAM AREA(ACRES) =     0.38
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.39

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    487.20
  DOWNSTREAM ELEVATION(FEET) =    486.30
  ELEVATION DIFFERENCE(FEET) =      0.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.606
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    503.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    486.30  DOWNSTREAM(FEET) =    486.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    23.00   CHANNEL SLOPE =  0.0130
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.40
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.20
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.32
  Tc(MIN.) =    2.92
  SUBAREA AREA(ACRES) =     0.02       SUBAREA RUNOFF(CFS) =    0.07
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.44

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   1.09
  LONGEST FLOWPATH FROM NODE    501.00 TO NODE    503.00 =      78.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    503.00 TO NODE    504.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   481.90  DOWNSTREAM(FEET) =   479.50
  FLOW LENGTH(FEET) =   191.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.47
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.44
  PIPE TRAVEL TIME(MIN.) =   0.92    Tc(MIN.) =    3.84
  LONGEST FLOWPATH FROM NODE    501.00 TO NODE    504.00 =     269.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    504.00 TO NODE    504.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.21   SUBAREA RUNOFF(CFS) =    0.77
  TOTAL AREA(ACRES) =        0.3   TOTAL RUNOFF(CFS) =       1.21
  TC(MIN.) =    3.84

****************************************************************************
  FLOW PROCESS FROM NODE    504.00 TO NODE    405.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.50  DOWNSTREAM(FEET) =   478.90
  FLOW LENGTH(FEET) =   103.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.50
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.21
  PIPE TRAVEL TIME(MIN.) =   0.49    Tc(MIN.) =    4.33
  LONGEST FLOWPATH FROM NODE    501.00 TO NODE    405.00 =     372.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    405.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.33
  RAINFALL INTENSITY(INCH/HR) =   4.22
  TOTAL STREAM AREA(ACRES) =     0.33
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.21

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        1.39     4.83        4.216          0.38
```

```
    2        1.21     4.33        4.216          0.33

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
    1        2.46     4.33       4.216
    2        2.60     4.83       4.216

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.60   Tc(MIN.) =    4.83
  TOTAL AREA(ACRES) =        0.7
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    405.00 =     438.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    406.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   478.90  DOWNSTREAM(FEET) =   474.40
  FLOW LENGTH(FEET) =   564.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.73
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.60
  PIPE TRAVEL TIME(MIN.) =   1.99    Tc(MIN.) =    6.81
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    406.00 =    1002.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    406.00 TO NODE    406.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.452
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    6.53   SUBAREA RUNOFF(CFS) =   19.61
  TOTAL AREA(ACRES) =        7.2   TOTAL RUNOFF(CFS) =      21.75
  TC(MIN.) =    6.81

****************************************************************************
  FLOW PROCESS FROM NODE    406.00 TO NODE    407.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   474.40  DOWNSTREAM(FEET) =   474.00
  FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  19.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.17
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      21.75
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    6.91
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    407.00 =    1047.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    407.00 TO NODE    407.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.91
  RAINFALL INTENSITY(INCH/HR) =   3.42
  TOTAL STREAM AREA(ACRES) =     7.24
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     21.75
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    487.00
  DOWNSTREAM ELEVATION(FEET) =    485.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.198
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    485.50  DOWNSTREAM(FEET) =    478.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =   614.00   CHANNEL SLOPE =  0.0119
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.631
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.96
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.49
  AVERAGE FLOW DEPTH(FEET) =   0.21   TRAVEL TIME(MIN.) =   4.10
  Tc(MIN.) =    6.30
  SUBAREA AREA(ACRES) =     6.70       SUBAREA RUNOFF(CFS) =   21.17
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        6.8         PEAK FLOW RATE(CFS) =      21.48

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.28   FLOW VELOCITY(FEET/SEC.) =   2.82
  LONGEST FLOWPATH FROM NODE    601.00 TO NODE    603.00 =     669.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    603.00 TO NODE    407.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   474.30  DOWNSTREAM(FEET) =   474.10
  FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  21.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.25
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      21.48
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    6.42
  LONGEST FLOWPATH FROM NODE    601.00 TO NODE    407.00 =     714.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    407.00 TO NODE    407.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.42
  RAINFALL INTENSITY(INCH/HR) =   3.59
  TOTAL STREAM AREA(ACRES) =     6.80
```

```
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     21.48

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       21.75     6.91        3.423          7.24
     2       21.48     6.42        3.587          6.80

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       42.23     6.42       3.587
     2       42.24     6.91       3.423

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      42.24   Tc(MIN.) =    6.91
  TOTAL AREA(ACRES) =       14.0
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    407.00 =    1047.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    701.00 TO NODE    702.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    489.30
  DOWNSTREAM ELEVATION(FEET) =    487.80
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.198
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE    702.00 TO NODE    703.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    487.80  DOWNSTREAM(FEET) =    479.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    97.00   CHANNEL SLOPE =  0.0907
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.03
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.43
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   0.37
  Tc(MIN.) =    2.56
  SUBAREA AREA(ACRES) =     3.09       SUBAREA RUNOFF(CFS) =   11.33
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        3.2         PEAK FLOW RATE(CFS) =      11.70

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.15   FLOW VELOCITY(FEET/SEC.) =   5.27
  LONGEST FLOWPATH FROM NODE    701.00 TO NODE    703.00 =     152.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    801.00 TO NODE    802.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
================================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    484.50
  DOWNSTREAM ELEVATION(FEET) =    483.00
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.198
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE    802.00 TO NODE    803.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    483.00  DOWNSTREAM(FEET) =    479.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   311.00   CHANNEL SLOPE =  0.0119
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      3.83
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.92
  AVERAGE FLOW DEPTH(FEET) =   0.14   TRAVEL TIME(MIN.) =   2.70
  Tc(MIN.) =    4.90
  SUBAREA AREA(ACRES) =     1.89       SUBAREA RUNOFF(CFS) =    6.93
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        2.0         PEAK FLOW RATE(CFS) =       7.30

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.19   FLOW VELOCITY(FEET/SEC.) =   2.13
  LONGEST FLOWPATH FROM NODE    801.00 TO NODE    803.00 =     366.00 FEET.
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.0  TC(MIN.) =      4.90
  PEAK FLOW RATE(CFS)   =       7.30
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
____________________________________________________________________________
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2011 Advanced Engineering Software (aes)
             Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:

                      Kimley-Horn and Associates, Inc.
                             765 The City Drive
                                 Suite 200
                              Orange, CA 92868

 ************************** DESCRIPTION OF STUDY **************************
* MAJESTIC AIRWAY                                                          *
* PROPOSED 25YR RATIONAL METHOD                                            *
* AUGUST 2021 ELL                                                          *
 **************************************************************************

  FILE NAME: AIR25P.DAT
  TIME/DATE OF STUDY: 13:56 08/05/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  25.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   1.800
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    489.30
  DOWNSTREAM ELEVATION(FEET) =    487.80
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.198
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
```

```
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    487.80  DOWNSTREAM(FEET) =    485.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =   361.00   CHANNEL SLOPE =  0.0075
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.051
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.29
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.44
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   4.19
  Tc(MIN.) =    6.38
  SUBAREA AREA(ACRES) =     1.06       SUBAREA RUNOFF(CFS) =    3.74
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       4.09

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   1.55
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     416.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  31
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   481.00  DOWNSTREAM(FEET) =   479.20
  FLOW LENGTH(FEET) =   327.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.59
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.09
  PIPE TRAVEL TIME(MIN.) =   1.19    Tc(MIN.) =    7.57
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    104.00 =     743.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.629
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.36   SUBAREA RUNOFF(CFS) =    4.29
  TOTAL AREA(ACRES) =        2.5   TOTAL RUNOFF(CFS) =       7.96
  TC(MIN.) =    7.57

**************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  31
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.20  DOWNSTREAM(FEET) =   478.20
  FLOW LENGTH(FEET) =   198.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.30
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.96
  PIPE TRAVEL TIME(MIN.) =   0.62    Tc(MIN.) =    8.19
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    105.00 =     941.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
```

```
   25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.448
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
 SUBAREA AREA(ACRES) =    0.89   SUBAREA RUNOFF(CFS) =    2.67
 TOTAL AREA(ACRES) =        3.4   TOTAL RUNOFF(CFS) =      10.23
 TC(MIN.) =    8.19

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   478.20  DOWNSTREAM(FEET) =   477.40
 FLOW LENGTH(FEET) =   170.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.39
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.23
 PIPE TRAVEL TIME(MIN.) =   0.53    Tc(MIN.) =    8.72
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    106.00 =    1111.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.313
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
 SUBAREA AREA(ACRES) =    0.76   SUBAREA RUNOFF(CFS) =    2.19
 TOTAL AREA(ACRES) =        4.2   TOTAL RUNOFF(CFS) =      12.02
 TC(MIN.) =    8.72

****************************************************************************
 FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   477.40  DOWNSTREAM(FEET) =   477.10
 FLOW LENGTH(FEET) =    52.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  16.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.01
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      12.02
 PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =    8.86
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    107.00 =    1163.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.86
 RAINFALL INTENSITY(INCH/HR) =   3.28
 TOTAL STREAM AREA(ACRES) =     4.17
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     12.02

****************************************************************************
 FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
```

```
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =     55.00
  UPSTREAM ELEVATION(FEET) =    482.80
  DOWNSTREAM ELEVATION(FEET) =    481.10
  ELEVATION DIFFERENCE(FEET) =      1.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.108
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    107.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    481.10  DOWNSTREAM(FEET) =    476.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   142.00   CHANNEL SLOPE =  0.0324
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.34
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.06
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   1.15
  Tc(MIN.) =    3.26
  SUBAREA AREA(ACRES) =     0.45       SUBAREA RUNOFF(CFS) =    1.86
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       2.27

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   2.47
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    107.00 =     197.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.26
  RAINFALL INTENSITY(INCH/HR) =   4.74
  TOTAL STREAM AREA(ACRES) =     0.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.27

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =     55.00
  UPSTREAM ELEVATION(FEET) =    484.10
  DOWNSTREAM ELEVATION(FEET) =    482.20
  ELEVATION DIFFERENCE(FEET) =      1.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.031
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    107.00 IS CODE =  61
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  482.20  DOWNSTREAM ELEVATION(FEET) =  476.50
  STREET LENGTH(FEET) =   494.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 47.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  42.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0130
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.97
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    8.16
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.51
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.73
  STREET FLOW TRAVEL TIME(MIN.) =   3.28   Tc(MIN.) =    5.31
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.561
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    0.78      SUBAREA RUNOFF(CFS) =    3.10
  TOTAL AREA(ACRES) =       0.9       PEAK FLOW RATE(CFS) =       3.49

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.54
  FLOW VELOCITY(FEET/SEC.) =  2.84   DEPTH*VELOCITY(FT*FT/SEC.) =   0.96
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    107.00 =     549.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.31
  RAINFALL INTENSITY(INCH/HR) =   4.56
  TOTAL STREAM AREA(ACRES) =     0.88
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.49

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       12.02     8.86        3.278          4.17
     2        2.27     3.26        4.743          0.55
     3        3.49     5.31        4.561          0.88

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1        8.82     3.26       4.743
     2       12.88     5.31       4.561
     3       16.10     8.86       3.278

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      16.10   Tc(MIN.) =    8.86
  TOTAL AREA(ACRES) =        5.6
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    107.00 =    1163.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    487.40
  DOWNSTREAM ELEVATION(FEET) =    486.60
  ELEVATION DIFFERENCE(FEET) =      0.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.710
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    486.60  DOWNSTREAM(FEET) =    486.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    36.00   CHANNEL SLOPE =  0.0167
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.50
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.22
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.49
  Tc(MIN.) =    3.20
  SUBAREA AREA(ACRES) =     0.04       SUBAREA RUNOFF(CFS) =    0.17
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.58

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.35
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    403.00 =      91.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    403.00 TO NODE    404.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   482.00  DOWNSTREAM(FEET) =   479.60
  FLOW LENGTH(FEET) =   207.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.63
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.58
  PIPE TRAVEL TIME(MIN.) =   0.95    Tc(MIN.) =    4.15
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    404.00 =     298.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    404.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
```

```
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.24   SUBAREA RUNOFF(CFS) =    0.99
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       1.57
  TC(MIN.) =    4.15

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    405.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.60  DOWNSTREAM(FEET) =   478.90
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.52
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.57
  PIPE TRAVEL TIME(MIN.) =   0.66    Tc(MIN.) =    4.81
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    405.00 =     438.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    405.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.81
  RAINFALL INTENSITY(INCH/HR) =   4.74
  TOTAL STREAM AREA(ACRES) =     0.38
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.57

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    487.20
  DOWNSTREAM ELEVATION(FEET) =    486.30
  ELEVATION DIFFERENCE(FEET) =      0.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.606
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    503.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    486.30  DOWNSTREAM(FEET) =    486.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    23.00   CHANNEL SLOPE =  0.0130
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.45
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.12
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.34
  Tc(MIN.) =    2.95
  SUBAREA AREA(ACRES) =     0.02       SUBAREA RUNOFF(CFS) =    0.08
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.50

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.15
  LONGEST FLOWPATH FROM NODE    501.00 TO NODE    503.00 =      78.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    503.00 TO NODE    504.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   481.90  DOWNSTREAM(FEET) =   479.50
  FLOW LENGTH(FEET) =   191.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.59
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.50
  PIPE TRAVEL TIME(MIN.) =   0.89    Tc(MIN.) =    3.83
  LONGEST FLOWPATH FROM NODE    501.00 TO NODE    504.00 =     269.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    504.00 TO NODE    504.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.21   SUBAREA RUNOFF(CFS) =    0.87
  TOTAL AREA(ACRES) =        0.3   TOTAL RUNOFF(CFS) =       1.36
  TC(MIN.) =    3.83

****************************************************************************
  FLOW PROCESS FROM NODE    504.00 TO NODE    405.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.50  DOWNSTREAM(FEET) =   478.90
  FLOW LENGTH(FEET) =   103.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.61
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.36
  PIPE TRAVEL TIME(MIN.) =   0.48    Tc(MIN.) =    4.31
  LONGEST FLOWPATH FROM NODE    501.00 TO NODE    405.00 =     372.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    405.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.31
  RAINFALL INTENSITY(INCH/HR) =   4.74
  TOTAL STREAM AREA(ACRES) =     0.33
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.36

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.57     4.81        4.743          0.38
      2        1.36     4.31        4.743          0.33
```

```
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        2.77     4.31       4.743
      2        2.93     4.81       4.743

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.93   Tc(MIN.) =    4.81
  TOTAL AREA(ACRES) =        0.7
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    405.00 =     438.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    406.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   478.90  DOWNSTREAM(FEET) =   474.40
  FLOW LENGTH(FEET) =   564.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.83
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.93
  PIPE TRAVEL TIME(MIN.) =   1.95    Tc(MIN.) =    6.76
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    406.00 =    1002.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    406.00 TO NODE    406.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.905
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    6.53   SUBAREA RUNOFF(CFS) =   22.18
  TOTAL AREA(ACRES) =        7.2   TOTAL RUNOFF(CFS) =      24.60
  TC(MIN.) =    6.76

****************************************************************************
  FLOW PROCESS FROM NODE    406.00 TO NODE    407.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   474.40  DOWNSTREAM(FEET) =   474.00
  FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.61
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      24.60
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    6.85
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    407.00 =    1047.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    407.00 TO NODE    407.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.85
  RAINFALL INTENSITY(INCH/HR) =   3.87
  TOTAL STREAM AREA(ACRES) =     7.24
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     24.60
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    487.00
  DOWNSTREAM ELEVATION(FEET) =    485.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.198
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    485.50  DOWNSTREAM(FEET) =    478.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =   614.00   CHANNEL SLOPE =  0.0119
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.112
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.59
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.53
  AVERAGE FLOW DEPTH(FEET) =   0.22   TRAVEL TIME(MIN.) =   4.04
  Tc(MIN.) =    6.24
  SUBAREA AREA(ACRES) =     6.70       SUBAREA RUNOFF(CFS) =   23.97
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        6.8         PEAK FLOW RATE(CFS) =      24.32

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.29   FLOW VELOCITY(FEET/SEC.) =   2.98
  LONGEST FLOWPATH FROM NODE    601.00 TO NODE    603.00 =     669.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    603.00 TO NODE    407.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   474.30  DOWNSTREAM(FEET) =   474.10
  FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  21.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.59
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      24.32
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    6.35
  LONGEST FLOWPATH FROM NODE    601.00 TO NODE    407.00 =     714.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    407.00 TO NODE    407.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.35
  RAINFALL INTENSITY(INCH/HR) =   4.06
  TOTAL STREAM AREA(ACRES) =     6.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     24.32
```

```
  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       24.60     6.85        3.873          7.24
      2       24.32     6.35        4.064          6.80

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       47.76     6.35       4.064
      2       47.77     6.85       3.873

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      47.77   Tc(MIN.) =     6.85
  TOTAL AREA(ACRES) =       14.0
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    407.00 =    1047.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    701.00 TO NODE    702.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    489.30
  DOWNSTREAM ELEVATION(FEET) =    487.80
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.198
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    702.00 TO NODE    703.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    487.80  DOWNSTREAM(FEET) =    479.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    97.00   CHANNEL SLOPE =  0.0907
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.79
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.82
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   0.34
  Tc(MIN.) =    2.53
  SUBAREA AREA(ACRES) =     3.09       SUBAREA RUNOFF(CFS) =   12.75
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        3.2         PEAK FLOW RATE(CFS) =      13.16

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   5.50
  LONGEST FLOWPATH FROM NODE    701.00 TO NODE    703.00 =     152.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    801.00 TO NODE    802.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
```

```
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    484.50
  DOWNSTREAM ELEVATION(FEET) =    483.00
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.198
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    802.00 TO NODE    803.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    483.00  DOWNSTREAM(FEET) =    479.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   311.00   CHANNEL SLOPE =  0.0119
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    25 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.743
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.31
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.94
  AVERAGE FLOW DEPTH(FEET) =   0.15   TRAVEL TIME(MIN.) =   2.67
  Tc(MIN.) =    4.87
  SUBAREA AREA(ACRES) =     1.89       SUBAREA RUNOFF(CFS) =    7.80
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        2.0         PEAK FLOW RATE(CFS) =       8.21

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.19   FLOW VELOCITY(FEET/SEC.) =   2.21
  LONGEST FLOWPATH FROM NODE    801.00 TO NODE    803.00 =     366.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.0  TC(MIN.) =      4.87
  PEAK FLOW RATE(CFS)   =       8.21
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2011 Advanced Engineering Software (aes)
             Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:

                      Kimley-Horn and Associates, Inc.
                             765 The City Drive
                                 Suite 200
                              Orange, CA 92868

 ************************** DESCRIPTION OF STUDY **************************
* MAJESTIC AIRWAY                                                          *
* PROPOSED 50YR RATIONAL METHOD                                            *
* AUGUST 2021 ELL                                                          *
 **************************************************************************

  FILE NAME: AIR50P.DAT
  TIME/DATE OF STUDY: 13:58 08/05/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  50.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.100
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    489.30
  DOWNSTREAM ELEVATION(FEET) =    487.80
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.198
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
```

```
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    487.80  DOWNSTREAM(FEET) =    485.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =   361.00   CHANNEL SLOPE =  0.0075
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.664
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.71
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.39
  AVERAGE FLOW DEPTH(FEET) =   0.14   TRAVEL TIME(MIN.) =   4.32
  Tc(MIN.) =    6.52
  SUBAREA AREA(ACRES) =     1.06       SUBAREA RUNOFF(CFS) =    4.30
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       4.71

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.17   FLOW VELOCITY(FEET/SEC.) =   1.63
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     416.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   481.00  DOWNSTREAM(FEET) =   479.20
  FLOW LENGTH(FEET) =   327.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.68
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.71
  PIPE TRAVEL TIME(MIN.) =   1.16    Tc(MIN.) =    7.68
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    104.00 =     743.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.195
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.36   SUBAREA RUNOFF(CFS) =    4.96
  TOTAL AREA(ACRES) =        2.5   TOTAL RUNOFF(CFS) =       9.20
  TC(MIN.) =    7.68

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.20  DOWNSTREAM(FEET) =   478.20
  FLOW LENGTH(FEET) =   198.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.46
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.20
  PIPE TRAVEL TIME(MIN.) =   0.60    Tc(MIN.) =    8.28
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    105.00 =     941.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.995
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.89   SUBAREA RUNOFF(CFS) =    3.09
  TOTAL AREA(ACRES) =        3.4   TOTAL RUNOFF(CFS) =      11.85
  TC(MIN.) =    8.28

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   478.20  DOWNSTREAM(FEET) =   477.40
  FLOW LENGTH(FEET) =   170.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.68
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.85
  PIPE TRAVEL TIME(MIN.) =   0.50    Tc(MIN.) =    8.78
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    106.00 =    1111.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.847
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.76   SUBAREA RUNOFF(CFS) =    2.54
  TOTAL AREA(ACRES) =        4.2   TOTAL RUNOFF(CFS) =      13.96
  TC(MIN.) =    8.78

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   477.40  DOWNSTREAM(FEET) =   477.10
  FLOW LENGTH(FEET) =    52.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.37
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.96
  PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =    8.92
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    107.00 =    1163.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.92
  RAINFALL INTENSITY(INCH/HR) =   3.81
  TOTAL STREAM AREA(ACRES) =     4.17
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.96

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
```

```
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    482.80
  DOWNSTREAM ELEVATION(FEET) =    481.10
  ELEVATION DIFFERENCE(FEET) =      1.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.108
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    107.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    481.10  DOWNSTREAM(FEET) =    476.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   142.00   CHANNEL SLOPE =  0.0324
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.56
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.10
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   1.13
  Tc(MIN.) =    3.24
  SUBAREA AREA(ACRES) =     0.45       SUBAREA RUNOFF(CFS) =    2.17
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       2.65

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   2.47
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    107.00 =     197.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.24
  RAINFALL INTENSITY(INCH/HR) =   5.53
  TOTAL STREAM AREA(ACRES) =     0.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.65

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    484.10
  DOWNSTREAM ELEVATION(FEET) =    482.20
  ELEVATION DIFFERENCE(FEET) =      1.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.031
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    107.00 IS CODE =  61
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  482.20  DOWNSTREAM ELEVATION(FEET) =  476.50
  STREET LENGTH(FEET) =   494.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 47.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  42.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0130
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.31
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.81
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.58
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.78
  STREET FLOW TRAVEL TIME(MIN.) =   3.19   Tc(MIN.) =    5.22
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.381
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    0.78      SUBAREA RUNOFF(CFS) =    3.65
  TOTAL AREA(ACRES) =        0.9       PEAK FLOW RATE(CFS) =       4.12

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  11.28
  FLOW VELOCITY(FEET/SEC.) =  2.96   DEPTH*VELOCITY(FT*FT/SEC.) =   1.04
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    107.00 =     549.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.22
  RAINFALL INTENSITY(INCH/HR) =   5.38
  TOTAL STREAM AREA(ACRES) =     0.88
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.12

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        13.96     8.92        3.809         4.17
     2         2.65     3.24        5.533         0.55
     3         4.12     5.22        5.381         0.88

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1        10.26     3.24       5.533
     2        14.86     5.22       5.381
     3        18.70     8.92       3.809

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      18.70   Tc(MIN.) =    8.92
  TOTAL AREA(ACRES) =        5.6
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    107.00 =    1163.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    487.40
  DOWNSTREAM ELEVATION(FEET) =    486.60
  ELEVATION DIFFERENCE(FEET) =      0.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.710
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    486.60  DOWNSTREAM(FEET) =    486.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    36.00   CHANNEL SLOPE =  0.0167
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.58
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.35
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.45
  Tc(MIN.) =    3.16
  SUBAREA AREA(ACRES) =     0.04       SUBAREA RUNOFF(CFS) =    0.19
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.67

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.33
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    403.00 =      91.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    403.00 TO NODE    404.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   482.00  DOWNSTREAM(FEET) =   479.60
  FLOW LENGTH(FEET) =   207.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.82
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.67
  PIPE TRAVEL TIME(MIN.) =   0.90    Tc(MIN.) =    4.06
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    404.00 =     298.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    404.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
```

```
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.24   SUBAREA RUNOFF(CFS) =    1.16
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       1.83
  TC(MIN.) =    4.06

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    405.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.60  DOWNSTREAM(FEET) =   478.90
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.65
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.83
  PIPE TRAVEL TIME(MIN.) =   0.64    Tc(MIN.) =    4.70
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    405.00 =     438.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    405.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.70
  RAINFALL INTENSITY(INCH/HR) =   5.53
  TOTAL STREAM AREA(ACRES) =     0.38
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.83

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    487.20
  DOWNSTREAM ELEVATION(FEET) =    486.30
  ELEVATION DIFFERENCE(FEET) =      0.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.606
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    503.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    486.30  DOWNSTREAM(FEET) =    486.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    23.00   CHANNEL SLOPE =  0.0130
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.53
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.24
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.31
  Tc(MIN.) =    2.92
  SUBAREA AREA(ACRES) =     0.02       SUBAREA RUNOFF(CFS) =    0.10
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.58

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.14
  LONGEST FLOWPATH FROM NODE    501.00 TO NODE    503.00 =      78.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    503.00 TO NODE    504.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   481.90  DOWNSTREAM(FEET) =   479.50
  FLOW LENGTH(FEET) =   191.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.75
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.58
  PIPE TRAVEL TIME(MIN.) =   0.85    Tc(MIN.) =    3.76
  LONGEST FLOWPATH FROM NODE    501.00 TO NODE    504.00 =     269.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    504.00 TO NODE    504.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.21   SUBAREA RUNOFF(CFS) =    1.01
  TOTAL AREA(ACRES) =        0.3   TOTAL RUNOFF(CFS) =       1.59
  TC(MIN.) =    3.76

****************************************************************************
  FLOW PROCESS FROM NODE    504.00 TO NODE    405.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.50  DOWNSTREAM(FEET) =   478.90
  FLOW LENGTH(FEET) =   103.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.75
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.59
  PIPE TRAVEL TIME(MIN.) =   0.46    Tc(MIN.) =    4.22
  LONGEST FLOWPATH FROM NODE    501.00 TO NODE    405.00 =     372.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    405.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.22
  RAINFALL INTENSITY(INCH/HR) =   5.53
  TOTAL STREAM AREA(ACRES) =     0.33
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.59

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.83     4.70        5.533          0.38
      2        1.59     4.22        5.533          0.33
```

```
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        3.23     4.22       5.533
      2        3.42     4.70       5.533

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.42   Tc(MIN.) =    4.70
  TOTAL AREA(ACRES) =        0.7
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    405.00 =     438.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    406.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   478.90  DOWNSTREAM(FEET) =   474.40
  FLOW LENGTH(FEET) =   564.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.10
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.42
  PIPE TRAVEL TIME(MIN.) =   1.84    Tc(MIN.) =    6.54
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    406.00 =    1002.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    406.00 TO NODE    406.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.654
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    6.53   SUBAREA RUNOFF(CFS) =   26.44
  TOTAL AREA(ACRES) =        7.2   TOTAL RUNOFF(CFS) =      29.31
  TC(MIN.) =    6.54

****************************************************************************
  FLOW PROCESS FROM NODE    406.00 TO NODE    407.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   474.40  DOWNSTREAM(FEET) =   474.00
  FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  21.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.82
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      29.31
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    6.62
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    407.00 =    1047.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    407.00 TO NODE    407.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.62
  RAINFALL INTENSITY(INCH/HR) =   4.62
  TOTAL STREAM AREA(ACRES) =     7.24
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     29.31
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    487.00
  DOWNSTREAM ELEVATION(FEET) =    485.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.198
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    485.50  DOWNSTREAM(FEET) =    478.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =   614.00   CHANNEL SLOPE =  0.0119
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.864
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      14.85
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.62
  AVERAGE FLOW DEPTH(FEET) =  0.24   TRAVEL TIME(MIN.) =   3.91
  Tc(MIN.) =    6.11
  SUBAREA AREA(ACRES) =     6.70       SUBAREA RUNOFF(CFS) =   28.35
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        6.8         PEAK FLOW RATE(CFS) =      28.78

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.31   FLOW VELOCITY(FEET/SEC.) =   3.06
  LONGEST FLOWPATH FROM NODE    601.00 TO NODE    603.00 =     669.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    603.00 TO NODE    407.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   474.30  DOWNSTREAM(FEET) =   474.10
  FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  24.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.70
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      28.78
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    6.22
  LONGEST FLOWPATH FROM NODE    601.00 TO NODE    407.00 =     714.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    407.00 TO NODE    407.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.22
  RAINFALL INTENSITY(INCH/HR) =   4.81
  TOTAL STREAM AREA(ACRES) =     6.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     28.78
```

```
 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       29.31     6.62        4.615          7.24
     2       28.78     6.22        4.807          6.80

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       56.92     6.22       4.807
     2       56.94     6.62       4.615

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      56.94   Tc(MIN.) =    6.62
 TOTAL AREA(ACRES) =       14.0
 LONGEST FLOWPATH FROM NODE    401.00 TO NODE    407.00 =    1047.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    701.00 TO NODE    702.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
 UPSTREAM ELEVATION(FEET) =    489.30
 DOWNSTREAM ELEVATION(FEET) =    487.80
 ELEVATION DIFFERENCE(FEET) =      1.50
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.198
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.48
 TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
 FLOW PROCESS FROM NODE    702.00 TO NODE    703.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    487.80  DOWNSTREAM(FEET) =    479.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =    97.00   CHANNEL SLOPE =  0.0907
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.92
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.97
 AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   0.33
 Tc(MIN.) =    2.52
 SUBAREA AREA(ACRES) =     3.09       SUBAREA RUNOFF(CFS) =   14.87
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
 TOTAL AREA(ACRES) =        3.2         PEAK FLOW RATE(CFS) =      15.36

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   5.70
 LONGEST FLOWPATH FROM NODE    701.00 TO NODE    703.00 =     152.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    801.00 TO NODE    802.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
```

```
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    484.50
  DOWNSTREAM ELEVATION(FEET) =    483.00
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.198
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE    802.00 TO NODE    803.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    483.00  DOWNSTREAM(FEET) =    479.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   311.00   CHANNEL SLOPE =  0.0119
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.533
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.03
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.05
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   2.53
  Tc(MIN.) =    4.72
  SUBAREA AREA(ACRES) =     1.89       SUBAREA RUNOFF(CFS) =    9.10
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        2.0         PEAK FLOW RATE(CFS) =       9.58

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   2.34
  LONGEST FLOWPATH FROM NODE    801.00 TO NODE    803.00 =     366.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.0  TC(MIN.) =      4.72
  PEAK FLOW RATE(CFS)   =       9.58
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2011 Advanced Engineering Software (aes)
              Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                            Analysis prepared by:

                      Kimley-Horn and Associates, Inc.
                             765 The City Drive
                                 Suite 200
                              Orange, CA 92868

 ************************** DESCRIPTION OF STUDY **************************
* MAJESTIC AIRWAY                                                          *
* PROPOSED 100YR RATIONAL METHOD                                           *
* AUGUST 2021 ELL                                                          *
 **************************************************************************

  FILE NAME: AIR100P.DAT
  TIME/DATE OF STUDY: 14:00 08/05/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.300
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    489.30
  DOWNSTREAM ELEVATION(FEET) =    487.80
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.198
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
```

```
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    487.80  DOWNSTREAM(FEET) =    485.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =   361.00   CHANNEL SLOPE =  0.0075
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.238
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.95
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.48
  AVERAGE FLOW DEPTH(FEET) =   0.14   TRAVEL TIME(MIN.) =   4.07
  Tc(MIN.) =    6.27
  SUBAREA AREA(ACRES) =     1.06       SUBAREA RUNOFF(CFS) =    4.83
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       5.29

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.18   FLOW VELOCITY(FEET/SEC.) =   1.68
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     416.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   481.00  DOWNSTREAM(FEET) =   479.20
  FLOW LENGTH(FEET) =   327.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.95
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.29
  PIPE TRAVEL TIME(MIN.) =   1.10    Tc(MIN.) =    7.37
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    104.00 =     743.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.718
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    1.36   SUBAREA RUNOFF(CFS) =    5.58
  TOTAL AREA(ACRES) =        2.5   TOTAL RUNOFF(CFS) =      10.34
  TC(MIN.) =    7.37

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.20  DOWNSTREAM(FEET) =   478.20
  FLOW LENGTH(FEET) =   198.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.57
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.34
  PIPE TRAVEL TIME(MIN.) =   0.59    Tc(MIN.) =    7.96
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    105.00 =     941.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
```

```
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.489
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.89   SUBAREA RUNOFF(CFS) =    3.48
  TOTAL AREA(ACRES) =        3.4   TOTAL RUNOFF(CFS) =      13.32
  TC(MIN.) =    7.96

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   478.20  DOWNSTREAM(FEET) =   477.40
  FLOW LENGTH(FEET) =   170.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.81
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.32
  PIPE TRAVEL TIME(MIN.) =   0.49    Tc(MIN.) =    8.45
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    106.00 =    1111.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.320
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.76   SUBAREA RUNOFF(CFS) =    2.86
  TOTAL AREA(ACRES) =        4.2   TOTAL RUNOFF(CFS) =      15.67
  TC(MIN.) =    8.45

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   477.40  DOWNSTREAM(FEET) =   477.10
  FLOW LENGTH(FEET) =    52.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.50
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      15.67
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    8.58
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    107.00 =    1163.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.58
  RAINFALL INTENSITY(INCH/HR) =   4.28
  TOTAL STREAM AREA(ACRES) =     4.17
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     15.67

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
```

```
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    482.80
  DOWNSTREAM ELEVATION(FEET) =    481.10
  ELEVATION DIFFERENCE(FEET) =      1.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.108
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    107.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    481.10  DOWNSTREAM(FEET) =    476.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   142.00   CHANNEL SLOPE =  0.0324
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.71
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.20
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   1.08
  Tc(MIN.) =    3.18
  SUBAREA AREA(ACRES) =     0.45       SUBAREA RUNOFF(CFS) =    2.37
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       2.90

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.11   FLOW VELOCITY(FEET/SEC.) =   2.44
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    107.00 =     197.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.18
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     0.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.90

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    484.10
  DOWNSTREAM ELEVATION(FEET) =    482.20
  ELEVATION DIFFERENCE(FEET) =      1.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.031
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    107.00 IS CODE =  61
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  482.20  DOWNSTREAM ELEVATION(FEET) =  476.50
  STREET LENGTH(FEET) =   494.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 47.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  42.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0130
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.55
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =    9.14
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.68
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.83
  STREET FLOW TRAVEL TIME(MIN.) =   3.08   Tc(MIN.) =    5.11
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.976
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    0.78      SUBAREA RUNOFF(CFS) =    4.06
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       4.58

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  11.77
  FLOW VELOCITY(FEET/SEC.) =  3.04   DEPTH*VELOCITY(FT*FT/SEC.) =   1.10
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    107.00 =     549.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.11
  RAINFALL INTENSITY(INCH/HR) =   5.98
  TOTAL STREAM AREA(ACRES) =     0.88
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.58

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       15.67     8.58        4.276         4.17
     2        2.90     3.18        6.060         0.55
     3        4.58     5.11        5.976         0.88

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       11.56     3.18       6.060
     2       16.76     5.11       5.976
     3       20.99     8.58       4.276

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      20.99   Tc(MIN.) =    8.58
  TOTAL AREA(ACRES) =        5.6
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    107.00 =    1163.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    487.40
  DOWNSTREAM ELEVATION(FEET) =    486.60
  ELEVATION DIFFERENCE(FEET) =      0.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.710
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    486.60  DOWNSTREAM(FEET) =    486.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    36.00   CHANNEL SLOPE =  0.0167
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.63
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.25
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.48
  Tc(MIN.) =    3.19
  SUBAREA AREA(ACRES) =     0.04       SUBAREA RUNOFF(CFS) =    0.21
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.74

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.38
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    403.00 =      91.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    403.00 TO NODE    404.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   482.00  DOWNSTREAM(FEET) =   479.60
  FLOW LENGTH(FEET) =   207.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.91
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.74
  PIPE TRAVEL TIME(MIN.) =   0.88    Tc(MIN.) =    4.07
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    404.00 =     298.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    404.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
```

```
 S.C.S. CURVE NUMBER (AMC II) =  97
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
 SUBAREA AREA(ACRES) =    0.24   SUBAREA RUNOFF(CFS) =    1.27
 TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       2.00
 TC(MIN.) =    4.07

****************************************************************************
 FLOW PROCESS FROM NODE    404.00 TO NODE    405.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   479.60  DOWNSTREAM(FEET) =   478.90
 FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.72
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.00
 PIPE TRAVEL TIME(MIN.) =   0.63    Tc(MIN.) =    4.70
 LONGEST FLOWPATH FROM NODE    401.00 TO NODE    405.00 =     438.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    405.00 TO NODE    405.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    4.70
 RAINFALL INTENSITY(INCH/HR) =   6.06
 TOTAL STREAM AREA(ACRES) =     0.38
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.00

****************************************************************************
 FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
 UPSTREAM ELEVATION(FEET) =    487.20
 DOWNSTREAM ELEVATION(FEET) =    486.30
 ELEVATION DIFFERENCE(FEET) =      0.90
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.606
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.53
 TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
 FLOW PROCESS FROM NODE    502.00 TO NODE    503.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    486.30  DOWNSTREAM(FEET) =    486.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =    23.00   CHANNEL SLOPE =  0.0130
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.58
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.15
 AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.33
 Tc(MIN.) =    2.94
 SUBAREA AREA(ACRES) =     0.02       SUBAREA RUNOFF(CFS) =    0.11
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =         0.1         PEAK FLOW RATE(CFS) =       0.63

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.25
  LONGEST FLOWPATH FROM NODE    501.00 TO NODE    503.00 =      78.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    503.00 TO NODE    504.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   481.90  DOWNSTREAM(FEET) =   479.50
  FLOW LENGTH(FEET) =   191.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.86
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.63
  PIPE TRAVEL TIME(MIN.) =   0.83    Tc(MIN.) =    3.77
  LONGEST FLOWPATH FROM NODE    501.00 TO NODE    504.00 =     269.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    504.00 TO NODE    504.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    0.21   SUBAREA RUNOFF(CFS) =    1.11
  TOTAL AREA(ACRES) =         0.3   TOTAL RUNOFF(CFS) =       1.74
  TC(MIN.) =    3.77

****************************************************************************
  FLOW PROCESS FROM NODE    504.00 TO NODE    405.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.50  DOWNSTREAM(FEET) =   478.90
  FLOW LENGTH(FEET) =   103.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.83
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.74
  PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =    4.21
  LONGEST FLOWPATH FROM NODE    501.00 TO NODE    405.00 =     372.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    405.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.21
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     0.33
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.74

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        2.00     4.70        6.060          0.38
      2        1.74     4.21        6.060          0.33
```

```
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1        3.54     4.21       6.060
     2        3.74     4.70       6.060

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.74   Tc(MIN.) =    4.70
  TOTAL AREA(ACRES) =        0.7
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    405.00 =     438.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    406.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   478.90  DOWNSTREAM(FEET) =   474.40
  FLOW LENGTH(FEET) =   564.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.22
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.74
  PIPE TRAVEL TIME(MIN.) =   1.80    Tc(MIN.) =    6.50
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    406.00 =    1002.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    406.00 TO NODE    406.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.116
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8700
  SUBAREA AREA(ACRES) =    6.53   SUBAREA RUNOFF(CFS) =   29.06
  TOTAL AREA(ACRES) =        7.2   TOTAL RUNOFF(CFS) =      32.22
  TC(MIN.) =    6.50

****************************************************************************
  FLOW PROCESS FROM NODE    406.00 TO NODE    407.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   474.40  DOWNSTREAM(FEET) =   474.00
  FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.22
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      32.22
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    6.58
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    407.00 =    1047.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    407.00 TO NODE    407.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.58
  RAINFALL INTENSITY(INCH/HR) =   5.07
  TOTAL STREAM AREA(ACRES) =     7.24
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     32.22
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    487.00
  DOWNSTREAM ELEVATION(FEET) =    485.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.198
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    485.50  DOWNSTREAM(FEET) =    478.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =   614.00   CHANNEL SLOPE =  0.0119
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.382
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      16.46
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.68
  AVERAGE FLOW DEPTH(FEET) =   0.25   TRAVEL TIME(MIN.) =   3.81
  Tc(MIN.) =    6.01
  SUBAREA AREA(ACRES) =     6.70       SUBAREA RUNOFF(CFS) =   31.37
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        6.8         PEAK FLOW RATE(CFS) =      31.84

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.32   FLOW VELOCITY(FEET/SEC.) =   3.19
  LONGEST FLOWPATH FROM NODE    601.00 TO NODE    603.00 =     669.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    603.00 TO NODE    407.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   474.30  DOWNSTREAM(FEET) =   474.10
  FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  23.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.04
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      31.84
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    6.12
  LONGEST FLOWPATH FROM NODE    601.00 TO NODE    407.00 =     714.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    407.00 TO NODE    407.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.12
  RAINFALL INTENSITY(INCH/HR) =   5.32
  TOTAL STREAM AREA(ACRES) =     6.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     31.84
```

```
 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       32.22     6.58        5.075          7.24
     2       31.84     6.12        5.321          6.80

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       62.57     6.12       5.321
     2       62.59     6.58       5.075

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      62.59   Tc(MIN.) =     6.58
 TOTAL AREA(ACRES) =       14.0
 LONGEST FLOWPATH FROM NODE    401.00 TO NODE    407.00 =    1047.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    701.00 TO NODE    702.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
 UPSTREAM ELEVATION(FEET) =    489.30
 DOWNSTREAM ELEVATION(FEET) =    487.80
 ELEVATION DIFFERENCE(FEET) =      1.50
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.198
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.53
 TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
 FLOW PROCESS FROM NODE    702.00 TO NODE    703.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    487.80  DOWNSTREAM(FEET) =    479.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =    97.00   CHANNEL SLOPE =  0.0907
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  97
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.67
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.84
 AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   0.33
 Tc(MIN.) =    2.53
 SUBAREA AREA(ACRES) =     3.09       SUBAREA RUNOFF(CFS) =   16.29
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
 TOTAL AREA(ACRES) =        3.2         PEAK FLOW RATE(CFS) =      16.82

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.17   FLOW VELOCITY(FEET/SEC.) =   5.83
 LONGEST FLOWPATH FROM NODE    701.00 TO NODE    703.00 =     152.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    801.00 TO NODE    802.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
```

```
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    484.50
  DOWNSTREAM ELEVATION(FEET) =    483.00
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.198
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE    802.00 TO NODE    803.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    483.00  DOWNSTREAM(FEET) =    479.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   311.00   CHANNEL SLOPE =  0.0119
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8700
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  97
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.51
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.04
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   2.54
  Tc(MIN.) =    4.73
  SUBAREA AREA(ACRES) =     1.89       SUBAREA RUNOFF(CFS) =    9.96
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  TOTAL AREA(ACRES) =        2.0        PEAK FLOW RATE(CFS) =      10.49

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.21   FLOW VELOCITY(FEET/SEC.) =   2.39
  LONGEST FLOWPATH FROM NODE    801.00 TO NODE    803.00 =     366.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.0  TC(MIN.) =      4.73
  PEAK FLOW RATE(CFS)   =      10.49
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX F

DETENTION BASINS CALCULATIONS

RATIONAL METHOD HYDROGRAPH PROGRAM

DMA1 5YR HYDROGRAPH

RUN DATE 8/5/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 1.4 INCHES
BASIN AREA 14 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 36.4 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 1
TIME (MIN) = 10	DISCHARGE (CFS) = 1
TIME (MIN) = 15	DISCHARGE (CFS) = 1
TIME (MIN) = 20	DISCHARGE (CFS) = 1.1
TIME (MIN) = 25	DISCHARGE (CFS) = 1.1
TIME (MIN) = 30	DISCHARGE (CFS) = 1.1
TIME (MIN) = 35	DISCHARGE (CFS) = 1.1
TIME (MIN) = 40	DISCHARGE (CFS) = 1.1
TIME (MIN) = 45	DISCHARGE (CFS) = 1.1
TIME (MIN) = 50	DISCHARGE (CFS) = 1.2
TIME (MIN) = 55	DISCHARGE (CFS) = 1.2
TIME (MIN) = 60	DISCHARGE (CFS) = 1.2
TIME (MIN) = 65	DISCHARGE (CFS) = 1.2
TIME (MIN) = 70	DISCHARGE (CFS) = 1.2
TIME (MIN) = 75	DISCHARGE (CFS) = 1.3
TIME (MIN) = 80	DISCHARGE (CFS) = 1.3
TIME (MIN) = 85	DISCHARGE (CFS) = 1.3
TIME (MIN) = 90	DISCHARGE (CFS) = 1.3
TIME (MIN) = 95	DISCHARGE (CFS) = 1.4
TIME (MIN) = 100	DISCHARGE (CFS) = 1.4
TIME (MIN) = 105	DISCHARGE (CFS) = 1.4
TIME (MIN) = 110	DISCHARGE (CFS) = 1.5
TIME (MIN) = 115	DISCHARGE (CFS) = 1.5
TIME (MIN) = 120	DISCHARGE (CFS) = 1.5
TIME (MIN) = 125	DISCHARGE (CFS) = 1.6
TIME (MIN) = 130	DISCHARGE (CFS) = 1.6
TIME (MIN) = 135	DISCHARGE (CFS) = 1.7
TIME (MIN) = 140	DISCHARGE (CFS) = 1.7
TIME (MIN) = 145	DISCHARGE (CFS) = 1.8
TIME (MIN) = 150	DISCHARGE (CFS) = 1.8
TIME (MIN) = 155	DISCHARGE (CFS) = 1.9
TIME (MIN) = 160	DISCHARGE (CFS) = 2
TIME (MIN) = 165	DISCHARGE (CFS) = 2.1
TIME (MIN) = 170	DISCHARGE (CFS) = 2.1
TIME (MIN) = 175	DISCHARGE (CFS) = 2.3
TIME (MIN) = 180	DISCHARGE (CFS) = 2.3
TIME (MIN) = 185	DISCHARGE (CFS) = 2.5
TIME (MIN) = 190	DISCHARGE (CFS) = 2.6
TIME (MIN) = 195	DISCHARGE (CFS) = 2.8
TIME (MIN) = 200	DISCHARGE (CFS) = 3
TIME (MIN) = 205	DISCHARGE (CFS) = 3.3
TIME (MIN) = 210	DISCHARGE (CFS) = 3.5
TIME (MIN) = 215	DISCHARGE (CFS) = 4
TIME (MIN) = 220	DISCHARGE (CFS) = 4.4
TIME (MIN) = 225	DISCHARGE (CFS) = 5.3
TIME (MIN) = 230	DISCHARGE (CFS) = 6.1
TIME (MIN) = 235	DISCHARGE (CFS) = 8.9
TIME (MIN) = 240	DISCHARGE (CFS) = 21.1
TIME (MIN) = 245	DISCHARGE (CFS) = 36.4
TIME (MIN) = 250	DISCHARGE (CFS) = 7.1
TIME (MIN) = 255	DISCHARGE (CFS) = 4.8
TIME (MIN) = 260	DISCHARGE (CFS) = 3.7
TIME (MIN) = 265	DISCHARGE (CFS) = 3.1
TIME (MIN) = 270	DISCHARGE (CFS) = 2.7
TIME (MIN) = 275	DISCHARGE (CFS) = 2.4
TIME (MIN) = 280	DISCHARGE (CFS) = 2.2
TIME (MIN) = 285	DISCHARGE (CFS) = 2
TIME (MIN) = 290	DISCHARGE (CFS) = 1.9
TIME (MIN) = 295	DISCHARGE (CFS) = 1.8
TIME (MIN) = 300	DISCHARGE (CFS) = 1.7
TIME (MIN) = 305	DISCHARGE (CFS) = 1.6
TIME (MIN) = 310	DISCHARGE (CFS) = 1.5
TIME (MIN) = 315	DISCHARGE (CFS) = 1.4
TIME (MIN) = 320	DISCHARGE (CFS) = 1.4
TIME (MIN) = 325	DISCHARGE (CFS) = 1.3
TIME (MIN) = 330	DISCHARGE (CFS) = 1.3
TIME (MIN) = 335	DISCHARGE (CFS) = 1.2
TIME (MIN) = 340	DISCHARGE (CFS) = 1.2
TIME (MIN) = 345	DISCHARGE (CFS) = 1.1
TIME (MIN) = 350	DISCHARGE (CFS) = 1.1
TIME (MIN) = 355	DISCHARGE (CFS) = 1.1
TIME (MIN) = 360	DISCHARGE (CFS) = 1

RATIONAL METHOD HYDROGRAPH PROGRAM

DMA1 10YR HYDROGRAPH

RUN DATE 8/5/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 1.6 INCHES
BASIN AREA 14 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 42.2 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 1.2
TIME (MIN) = 10	DISCHARGE (CFS) = 1.2
TIME (MIN) = 15	DISCHARGE (CFS) = 1.2
TIME (MIN) = 20	DISCHARGE (CFS) = 1.2
TIME (MIN) = 25	DISCHARGE (CFS) = 1.2
TIME (MIN) = 30	DISCHARGE (CFS) = 1.2
TIME (MIN) = 35	DISCHARGE (CFS) = 1.3
TIME (MIN) = 40	DISCHARGE (CFS) = 1.3
TIME (MIN) = 45	DISCHARGE (CFS) = 1.3
TIME (MIN) = 50	DISCHARGE (CFS) = 1.3
TIME (MIN) = 55	DISCHARGE (CFS) = 1.4
TIME (MIN) = 60	DISCHARGE (CFS) = 1.4
TIME (MIN) = 65	DISCHARGE (CFS) = 1.4
TIME (MIN) = 70	DISCHARGE (CFS) = 1.4
TIME (MIN) = 75	DISCHARGE (CFS) = 1.5
TIME (MIN) = 80	DISCHARGE (CFS) = 1.5
TIME (MIN) = 85	DISCHARGE (CFS) = 1.5
TIME (MIN) = 90	DISCHARGE (CFS) = 1.5
TIME (MIN) = 95	DISCHARGE (CFS) = 1.6
TIME (MIN) = 100	DISCHARGE (CFS) = 1.6
TIME (MIN) = 105	DISCHARGE (CFS) = 1.6
TIME (MIN) = 110	DISCHARGE (CFS) = 1.7
TIME (MIN) = 115	DISCHARGE (CFS) = 1.7
TIME (MIN) = 120	DISCHARGE (CFS) = 1.8
TIME (MIN) = 125	DISCHARGE (CFS) = 1.8
TIME (MIN) = 130	DISCHARGE (CFS) = 1.9
TIME (MIN) = 135	DISCHARGE (CFS) = 1.9
TIME (MIN) = 140	DISCHARGE (CFS) = 2
TIME (MIN) = 145	DISCHARGE (CFS) = 2.1
TIME (MIN) = 150	DISCHARGE (CFS) = 2.1
TIME (MIN) = 155	DISCHARGE (CFS) = 2.2
TIME (MIN) = 160	DISCHARGE (CFS) = 2.3
TIME (MIN) = 165	DISCHARGE (CFS) = 2.4
TIME (MIN) = 170	DISCHARGE (CFS) = 2.4
TIME (MIN) = 175	DISCHARGE (CFS) = 2.6
TIME (MIN) = 180	DISCHARGE (CFS) = 2.7
TIME (MIN) = 185	DISCHARGE (CFS) = 2.9
TIME (MIN) = 190	DISCHARGE (CFS) = 3
TIME (MIN) = 195	DISCHARGE (CFS) = 3.2
TIME (MIN) = 200	DISCHARGE (CFS) = 3.4
TIME (MIN) = 205	DISCHARGE (CFS) = 3.8
TIME (MIN) = 210	DISCHARGE (CFS) = 4
TIME (MIN) = 215	DISCHARGE (CFS) = 4.6
TIME (MIN) = 220	DISCHARGE (CFS) = 5
TIME (MIN) = 225	DISCHARGE (CFS) = 6.1
TIME (MIN) = 230	DISCHARGE (CFS) = 6.9
TIME (MIN) = 235	DISCHARGE (CFS) = 10.2
TIME (MIN) = 240	DISCHARGE (CFS) = 23.5
TIME (MIN) = 245	DISCHARGE (CFS) = 42.2
TIME (MIN) = 250	DISCHARGE (CFS) = 8.2
TIME (MIN) = 255	DISCHARGE (CFS) = 5.5
TIME (MIN) = 260	DISCHARGE (CFS) = 4.3
TIME (MIN) = 265	DISCHARGE (CFS) = 3.6
TIME (MIN) = 270	DISCHARGE (CFS) = 3.1
TIME (MIN) = 275	DISCHARGE (CFS) = 2.8
TIME (MIN) = 280	DISCHARGE (CFS) = 2.5
TIME (MIN) = 285	DISCHARGE (CFS) = 2.3
TIME (MIN) = 290	DISCHARGE (CFS) = 2.1
TIME (MIN) = 295	DISCHARGE (CFS) = 2
TIME (MIN) = 300	DISCHARGE (CFS) = 1.9
TIME (MIN) = 305	DISCHARGE (CFS) = 1.8
TIME (MIN) = 310	DISCHARGE (CFS) = 1.7
TIME (MIN) = 315	DISCHARGE (CFS) = 1.6
TIME (MIN) = 320	DISCHARGE (CFS) = 1.6
TIME (MIN) = 325	DISCHARGE (CFS) = 1.5
TIME (MIN) = 330	DISCHARGE (CFS) = 1.4
TIME (MIN) = 335	DISCHARGE (CFS) = 1.4
TIME (MIN) = 340	DISCHARGE (CFS) = 1.3
TIME (MIN) = 345	DISCHARGE (CFS) = 1.3
TIME (MIN) = 350	DISCHARGE (CFS) = 1.3
TIME (MIN) = 355	DISCHARGE (CFS) = 1.2
TIME (MIN) = 360	DISCHARGE (CFS) = 1.2

RATIONAL METHOD HYDROGRAPH PROGRAM

DMA1 25YR HYDROGRAPH

RUN DATE 8/5/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 1.8 INCHES
BASIN AREA 14 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 47.8 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 1.3
TIME (MIN) = 10	DISCHARGE (CFS) = 1.3
TIME (MIN) = 15	DISCHARGE (CFS) = 1.3
TIME (MIN) = 20	DISCHARGE (CFS) = 1.4
TIME (MIN) = 25	DISCHARGE (CFS) = 1.4
TIME (MIN) = 30	DISCHARGE (CFS) = 1.4
TIME (MIN) = 35	DISCHARGE (CFS) = 1.4
TIME (MIN) = 40	DISCHARGE (CFS) = 1.4
TIME (MIN) = 45	DISCHARGE (CFS) = 1.5
TIME (MIN) = 50	DISCHARGE (CFS) = 1.5
TIME (MIN) = 55	DISCHARGE (CFS) = 1.5
TIME (MIN) = 60	DISCHARGE (CFS) = 1.5
TIME (MIN) = 65	DISCHARGE (CFS) = 1.6
TIME (MIN) = 70	DISCHARGE (CFS) = 1.6
TIME (MIN) = 75	DISCHARGE (CFS) = 1.6
TIME (MIN) = 80	DISCHARGE (CFS) = 1.7
TIME (MIN) = 85	DISCHARGE (CFS) = 1.7
TIME (MIN) = 90	DISCHARGE (CFS) = 1.7
TIME (MIN) = 95	DISCHARGE (CFS) = 1.8
TIME (MIN) = 100	DISCHARGE (CFS) = 1.8
TIME (MIN) = 105	DISCHARGE (CFS) = 1.9
TIME (MIN) = 110	DISCHARGE (CFS) = 1.9
TIME (MIN) = 115	DISCHARGE (CFS) = 1.9
TIME (MIN) = 120	DISCHARGE (CFS) = 2
TIME (MIN) = 125	DISCHARGE (CFS) = 2.1
TIME (MIN) = 130	DISCHARGE (CFS) = 2.1
TIME (MIN) = 135	DISCHARGE (CFS) = 2.2
TIME (MIN) = 140	DISCHARGE (CFS) = 2.2
TIME (MIN) = 145	DISCHARGE (CFS) = 2.3
TIME (MIN) = 150	DISCHARGE (CFS) = 2.4
TIME (MIN) = 155	DISCHARGE (CFS) = 2.5
TIME (MIN) = 160	DISCHARGE (CFS) = 2.5
TIME (MIN) = 165	DISCHARGE (CFS) = 2.7
TIME (MIN) = 170	DISCHARGE (CFS) = 2.8
TIME (MIN) = 175	DISCHARGE (CFS) = 2.9
TIME (MIN) = 180	DISCHARGE (CFS) = 3
TIME (MIN) = 185	DISCHARGE (CFS) = 3.2
TIME (MIN) = 190	DISCHARGE (CFS) = 3.4
TIME (MIN) = 195	DISCHARGE (CFS) = 3.7
TIME (MIN) = 200	DISCHARGE (CFS) = 3.8
TIME (MIN) = 205	DISCHARGE (CFS) = 4.2
TIME (MIN) = 210	DISCHARGE (CFS) = 4.5
TIME (MIN) = 215	DISCHARGE (CFS) = 5.2
TIME (MIN) = 220	DISCHARGE (CFS) = 5.6
TIME (MIN) = 225	DISCHARGE (CFS) = 6.8
TIME (MIN) = 230	DISCHARGE (CFS) = 7.8
TIME (MIN) = 235	DISCHARGE (CFS) = 11.4
TIME (MIN) = 240	DISCHARGE (CFS) = 26.1
TIME (MIN) = 245	DISCHARGE (CFS) = 47.8
TIME (MIN) = 250	DISCHARGE (CFS) = 9.2
TIME (MIN) = 255	DISCHARGE (CFS) = 6.1
TIME (MIN) = 260	DISCHARGE (CFS) = 4.8
TIME (MIN) = 265	DISCHARGE (CFS) = 4
TIME (MIN) = 270	DISCHARGE (CFS) = 3.5
TIME (MIN) = 275	DISCHARGE (CFS) = 3.1
TIME (MIN) = 280	DISCHARGE (CFS) = 2.8
TIME (MIN) = 285	DISCHARGE (CFS) = 2.6
TIME (MIN) = 290	DISCHARGE (CFS) = 2.4
TIME (MIN) = 295	DISCHARGE (CFS) = 2.3
TIME (MIN) = 300	DISCHARGE (CFS) = 2.1
TIME (MIN) = 305	DISCHARGE (CFS) = 2
TIME (MIN) = 310	DISCHARGE (CFS) = 1.9
TIME (MIN) = 315	DISCHARGE (CFS) = 1.8
TIME (MIN) = 320	DISCHARGE (CFS) = 1.7
TIME (MIN) = 325	DISCHARGE (CFS) = 1.7
TIME (MIN) = 330	DISCHARGE (CFS) = 1.6
TIME (MIN) = 335	DISCHARGE (CFS) = 1.6
TIME (MIN) = 340	DISCHARGE (CFS) = 1.5
TIME (MIN) = 345	DISCHARGE (CFS) = 1.5
TIME (MIN) = 350	DISCHARGE (CFS) = 1.4
TIME (MIN) = 355	DISCHARGE (CFS) = 1.4
TIME (MIN) = 360	DISCHARGE (CFS) = 1.3

RATIONAL METHOD HYDROGRAPH PROGRAM

DMA1 50YR HYDROGRAPH

RUN DATE 8/5/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 2.1 INCHES
BASIN AREA 14 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 56.9 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 1.5
TIME (MIN) = 10	DISCHARGE (CFS) = 1.5
TIME (MIN) = 15	DISCHARGE (CFS) = 1.6
TIME (MIN) = 20	DISCHARGE (CFS) = 1.6
TIME (MIN) = 25	DISCHARGE (CFS) = 1.6
TIME (MIN) = 30	DISCHARGE (CFS) = 1.6
TIME (MIN) = 35	DISCHARGE (CFS) = 1.7
TIME (MIN) = 40	DISCHARGE (CFS) = 1.7
TIME (MIN) = 45	DISCHARGE (CFS) = 1.7
TIME (MIN) = 50	DISCHARGE (CFS) = 1.7
TIME (MIN) = 55	DISCHARGE (CFS) = 1.8
TIME (MIN) = 60	DISCHARGE (CFS) = 1.8
TIME (MIN) = 65	DISCHARGE (CFS) = 1.8
TIME (MIN) = 70	DISCHARGE (CFS) = 1.9
TIME (MIN) = 75	DISCHARGE (CFS) = 1.9
TIME (MIN) = 80	DISCHARGE (CFS) = 1.9
TIME (MIN) = 85	DISCHARGE (CFS) = 2
TIME (MIN) = 90	DISCHARGE (CFS) = 2
TIME (MIN) = 95	DISCHARGE (CFS) = 2.1
TIME (MIN) = 100	DISCHARGE (CFS) = 2.1
TIME (MIN) = 105	DISCHARGE (CFS) = 2.2
TIME (MIN) = 110	DISCHARGE (CFS) = 2.2
TIME (MIN) = 115	DISCHARGE (CFS) = 2.3
TIME (MIN) = 120	DISCHARGE (CFS) = 2.3
TIME (MIN) = 125	DISCHARGE (CFS) = 2.4
TIME (MIN) = 130	DISCHARGE (CFS) = 2.4
TIME (MIN) = 135	DISCHARGE (CFS) = 2.5
TIME (MIN) = 140	DISCHARGE (CFS) = 2.6
TIME (MIN) = 145	DISCHARGE (CFS) = 2.7
TIME (MIN) = 150	DISCHARGE (CFS) = 2.8
TIME (MIN) = 155	DISCHARGE (CFS) = 2.9
TIME (MIN) = 160	DISCHARGE (CFS) = 3
TIME (MIN) = 165	DISCHARGE (CFS) = 3.1
TIME (MIN) = 170	DISCHARGE (CFS) = 3.2
TIME (MIN) = 175	DISCHARGE (CFS) = 3.4
TIME (MIN) = 180	DISCHARGE (CFS) = 3.5
TIME (MIN) = 185	DISCHARGE (CFS) = 3.8
TIME (MIN) = 190	DISCHARGE (CFS) = 3.9
TIME (MIN) = 195	DISCHARGE (CFS) = 4.3
TIME (MIN) = 200	DISCHARGE (CFS) = 4.5
TIME (MIN) = 205	DISCHARGE (CFS) = 5
TIME (MIN) = 210	DISCHARGE (CFS) = 5.3
TIME (MIN) = 215	DISCHARGE (CFS) = 6
TIME (MIN) = 220	DISCHARGE (CFS) = 6.5
TIME (MIN) = 225	DISCHARGE (CFS) = 8
TIME (MIN) = 230	DISCHARGE (CFS) = 9.1
TIME (MIN) = 235	DISCHARGE (CFS) = 13.3
TIME (MIN) = 240	DISCHARGE (CFS) = 29.3
TIME (MIN) = 245	DISCHARGE (CFS) = 56.9
TIME (MIN) = 250	DISCHARGE (CFS) = 10.7
TIME (MIN) = 255	DISCHARGE (CFS) = 7.2
TIME (MIN) = 260	DISCHARGE (CFS) = 5.6
TIME (MIN) = 265	DISCHARGE (CFS) = 4.7
TIME (MIN) = 270	DISCHARGE (CFS) = 4.1
TIME (MIN) = 275	DISCHARGE (CFS) = 3.6
TIME (MIN) = 280	DISCHARGE (CFS) = 3.3
TIME (MIN) = 285	DISCHARGE (CFS) = 3
TIME (MIN) = 290	DISCHARGE (CFS) = 2.8
TIME (MIN) = 295	DISCHARGE (CFS) = 2.6
TIME (MIN) = 300	DISCHARGE (CFS) = 2.5
TIME (MIN) = 305	DISCHARGE (CFS) = 2.4
TIME (MIN) = 310	DISCHARGE (CFS) = 2.2
TIME (MIN) = 315	DISCHARGE (CFS) = 2.1
TIME (MIN) = 320	DISCHARGE (CFS) = 2
TIME (MIN) = 325	DISCHARGE (CFS) = 2
TIME (MIN) = 330	DISCHARGE (CFS) = 1.9
TIME (MIN) = 335	DISCHARGE (CFS) = 1.8
TIME (MIN) = 340	DISCHARGE (CFS) = 1.8
TIME (MIN) = 345	DISCHARGE (CFS) = 1.7
TIME (MIN) = 350	DISCHARGE (CFS) = 1.6
TIME (MIN) = 355	DISCHARGE (CFS) = 1.6
TIME (MIN) = 360	DISCHARGE (CFS) = 1.6

RATIONAL METHOD HYDROGRAPH PROGRAM

DMA1 100YR HYDROGRAPH

RUN DATE 8/5/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 2.3 INCHES
BASIN AREA 14 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 62.6 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 1.7
TIME (MIN) = 10	DISCHARGE (CFS) = 1.7
TIME (MIN) = 15	DISCHARGE (CFS) = 1.7
TIME (MIN) = 20	DISCHARGE (CFS) = 1.7
TIME (MIN) = 25	DISCHARGE (CFS) = 1.8
TIME (MIN) = 30	DISCHARGE (CFS) = 1.8
TIME (MIN) = 35	DISCHARGE (CFS) = 1.8
TIME (MIN) = 40	DISCHARGE (CFS) = 1.8
TIME (MIN) = 45	DISCHARGE (CFS) = 1.9
TIME (MIN) = 50	DISCHARGE (CFS) = 1.9
TIME (MIN) = 55	DISCHARGE (CFS) = 1.9
TIME (MIN) = 60	DISCHARGE (CFS) = 2
TIME (MIN) = 65	DISCHARGE (CFS) = 2
TIME (MIN) = 70	DISCHARGE (CFS) = 2
TIME (MIN) = 75	DISCHARGE (CFS) = 2.1
TIME (MIN) = 80	DISCHARGE (CFS) = 2.1
TIME (MIN) = 85	DISCHARGE (CFS) = 2.2
TIME (MIN) = 90	DISCHARGE (CFS) = 2.2
TIME (MIN) = 95	DISCHARGE (CFS) = 2.3
TIME (MIN) = 100	DISCHARGE (CFS) = 2.3
TIME (MIN) = 105	DISCHARGE (CFS) = 2.4
TIME (MIN) = 110	DISCHARGE (CFS) = 2.4
TIME (MIN) = 115	DISCHARGE (CFS) = 2.5
TIME (MIN) = 120	DISCHARGE (CFS) = 2.5
TIME (MIN) = 125	DISCHARGE (CFS) = 2.6
TIME (MIN) = 130	DISCHARGE (CFS) = 2.7
TIME (MIN) = 135	DISCHARGE (CFS) = 2.8
TIME (MIN) = 140	DISCHARGE (CFS) = 2.8
TIME (MIN) = 145	DISCHARGE (CFS) = 3
TIME (MIN) = 150	DISCHARGE (CFS) = 3
TIME (MIN) = 155	DISCHARGE (CFS) = 3.2
TIME (MIN) = 160	DISCHARGE (CFS) = 3.2
TIME (MIN) = 165	DISCHARGE (CFS) = 3.4
TIME (MIN) = 170	DISCHARGE (CFS) = 3.5
TIME (MIN) = 175	DISCHARGE (CFS) = 3.7
TIME (MIN) = 180	DISCHARGE (CFS) = 3.9
TIME (MIN) = 185	DISCHARGE (CFS) = 4.1
TIME (MIN) = 190	DISCHARGE (CFS) = 4.3
TIME (MIN) = 195	DISCHARGE (CFS) = 4.7
TIME (MIN) = 200	DISCHARGE (CFS) = 4.9
TIME (MIN) = 205	DISCHARGE (CFS) = 5.4
TIME (MIN) = 210	DISCHARGE (CFS) = 5.8
TIME (MIN) = 215	DISCHARGE (CFS) = 6.6
TIME (MIN) = 220	DISCHARGE (CFS) = 7.1
TIME (MIN) = 225	DISCHARGE (CFS) = 8.7
TIME (MIN) = 230	DISCHARGE (CFS) = 10
TIME (MIN) = 235	DISCHARGE (CFS) = 14.6
TIME (MIN) = 240	DISCHARGE (CFS) = 31.8
TIME (MIN) = 245	DISCHARGE (CFS) = 62.6
TIME (MIN) = 250	DISCHARGE (CFS) = 11.7
TIME (MIN) = 255	DISCHARGE (CFS) = 7.8
TIME (MIN) = 260	DISCHARGE (CFS) = 6.1
TIME (MIN) = 265	DISCHARGE (CFS) = 5.1
TIME (MIN) = 270	DISCHARGE (CFS) = 4.5
TIME (MIN) = 275	DISCHARGE (CFS) = 4
TIME (MIN) = 280	DISCHARGE (CFS) = 3.6
TIME (MIN) = 285	DISCHARGE (CFS) = 3.3
TIME (MIN) = 290	DISCHARGE (CFS) = 3.1
TIME (MIN) = 295	DISCHARGE (CFS) = 2.9
TIME (MIN) = 300	DISCHARGE (CFS) = 2.7
TIME (MIN) = 305	DISCHARGE (CFS) = 2.6
TIME (MIN) = 310	DISCHARGE (CFS) = 2.4
TIME (MIN) = 315	DISCHARGE (CFS) = 2.3
TIME (MIN) = 320	DISCHARGE (CFS) = 2.2
TIME (MIN) = 325	DISCHARGE (CFS) = 2.1
TIME (MIN) = 330	DISCHARGE (CFS) = 2.1
TIME (MIN) = 335	DISCHARGE (CFS) = 2
TIME (MIN) = 340	DISCHARGE (CFS) = 1.9
TIME (MIN) = 345	DISCHARGE (CFS) = 1.9
TIME (MIN) = 350	DISCHARGE (CFS) = 1.8
TIME (MIN) = 355	DISCHARGE (CFS) = 1.7
TIME (MIN) = 360	DISCHARGE (CFS) = 1.7

RATIONAL METHOD HYDROGRAPH PROGRAM

DMA2 5YR HYDROGRAPH

RUN DATE 8/5/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 1.4 INCHES
BASIN AREA 5.6 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 11.9 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 0.4
TIME (MIN) = 10	DISCHARGE (CFS) = 0.4
TIME (MIN) = 15	DISCHARGE (CFS) = 0.4
TIME (MIN) = 20	DISCHARGE (CFS) = 0.4
TIME (MIN) = 25	DISCHARGE (CFS) = 0.4
TIME (MIN) = 30	DISCHARGE (CFS) = 0.4
TIME (MIN) = 35	DISCHARGE (CFS) = 0.4
TIME (MIN) = 40	DISCHARGE (CFS) = 0.4
TIME (MIN) = 45	DISCHARGE (CFS) = 0.5
TIME (MIN) = 50	DISCHARGE (CFS) = 0.5
TIME (MIN) = 55	DISCHARGE (CFS) = 0.5
TIME (MIN) = 60	DISCHARGE (CFS) = 0.5
TIME (MIN) = 65	DISCHARGE (CFS) = 0.5
TIME (MIN) = 70	DISCHARGE (CFS) = 0.5
TIME (MIN) = 75	DISCHARGE (CFS) = 0.5
TIME (MIN) = 80	DISCHARGE (CFS) = 0.5
TIME (MIN) = 85	DISCHARGE (CFS) = 0.5
TIME (MIN) = 90	DISCHARGE (CFS) = 0.5
TIME (MIN) = 95	DISCHARGE (CFS) = 0.6
TIME (MIN) = 100	DISCHARGE (CFS) = 0.6
TIME (MIN) = 105	DISCHARGE (CFS) = 0.6
TIME (MIN) = 110	DISCHARGE (CFS) = 0.6
TIME (MIN) = 115	DISCHARGE (CFS) = 0.6
TIME (MIN) = 120	DISCHARGE (CFS) = 0.6
TIME (MIN) = 125	DISCHARGE (CFS) = 0.6
TIME (MIN) = 130	DISCHARGE (CFS) = 0.7
TIME (MIN) = 135	DISCHARGE (CFS) = 0.7
TIME (MIN) = 140	DISCHARGE (CFS) = 0.7
TIME (MIN) = 145	DISCHARGE (CFS) = 0.7
TIME (MIN) = 150	DISCHARGE (CFS) = 0.7
TIME (MIN) = 155	DISCHARGE (CFS) = 0.8
TIME (MIN) = 160	DISCHARGE (CFS) = 0.8
TIME (MIN) = 165	DISCHARGE (CFS) = 0.8
TIME (MIN) = 170	DISCHARGE (CFS) = 0.9
TIME (MIN) = 175	DISCHARGE (CFS) = 0.9
TIME (MIN) = 180	DISCHARGE (CFS) = 0.9
TIME (MIN) = 185	DISCHARGE (CFS) = 1
TIME (MIN) = 190	DISCHARGE (CFS) = 1
TIME (MIN) = 195	DISCHARGE (CFS) = 1.1
TIME (MIN) = 200	DISCHARGE (CFS) = 1.2
TIME (MIN) = 205	DISCHARGE (CFS) = 1.3
TIME (MIN) = 210	DISCHARGE (CFS) = 1.4
TIME (MIN) = 215	DISCHARGE (CFS) = 1.6
TIME (MIN) = 220	DISCHARGE (CFS) = 1.7
TIME (MIN) = 225	DISCHARGE (CFS) = 2.1
TIME (MIN) = 230	DISCHARGE (CFS) = 2.4
TIME (MIN) = 235	DISCHARGE (CFS) = 3.6
TIME (MIN) = 240	DISCHARGE (CFS) = 11.1
TIME (MIN) = 245	DISCHARGE (CFS) = 11.9
TIME (MIN) = 250	DISCHARGE (CFS) = 2.9
TIME (MIN) = 255	DISCHARGE (CFS) = 1.9
TIME (MIN) = 260	DISCHARGE (CFS) = 1.5
TIME (MIN) = 265	DISCHARGE (CFS) = 1.3
TIME (MIN) = 270	DISCHARGE (CFS) = 1.1
TIME (MIN) = 275	DISCHARGE (CFS) = 1
TIME (MIN) = 280	DISCHARGE (CFS) = 0.9
TIME (MIN) = 285	DISCHARGE (CFS) = 0.8
TIME (MIN) = 290	DISCHARGE (CFS) = 0.8
TIME (MIN) = 295	DISCHARGE (CFS) = 0.7
TIME (MIN) = 300	DISCHARGE (CFS) = 0.7
TIME (MIN) = 305	DISCHARGE (CFS) = 0.6
TIME (MIN) = 310	DISCHARGE (CFS) = 0.6
TIME (MIN) = 315	DISCHARGE (CFS) = 0.6
TIME (MIN) = 320	DISCHARGE (CFS) = 0.5
TIME (MIN) = 325	DISCHARGE (CFS) = 0.5
TIME (MIN) = 330	DISCHARGE (CFS) = 0.5
TIME (MIN) = 335	DISCHARGE (CFS) = 0.5
TIME (MIN) = 340	DISCHARGE (CFS) = 0.5
TIME (MIN) = 345	DISCHARGE (CFS) = 0.5
TIME (MIN) = 350	DISCHARGE (CFS) = 0.4
TIME (MIN) = 355	DISCHARGE (CFS) = 0.4
TIME (MIN) = 360	DISCHARGE (CFS) = 0.4

RATIONAL METHOD HYDROGRAPH PROGRAM

DMA2 10YR HYDROGRAPH

RUN DATE 8/5/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 1.6 INCHES
BASIN AREA 5.6 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 13.7 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 0.5
TIME (MIN) = 10	DISCHARGE (CFS) = 0.5
TIME (MIN) = 15	DISCHARGE (CFS) = 0.5
TIME (MIN) = 20	DISCHARGE (CFS) = 0.5
TIME (MIN) = 25	DISCHARGE (CFS) = 0.5
TIME (MIN) = 30	DISCHARGE (CFS) = 0.5
TIME (MIN) = 35	DISCHARGE (CFS) = 0.5
TIME (MIN) = 40	DISCHARGE (CFS) = 0.5
TIME (MIN) = 45	DISCHARGE (CFS) = 0.5
TIME (MIN) = 50	DISCHARGE (CFS) = 0.5
TIME (MIN) = 55	DISCHARGE (CFS) = 0.5
TIME (MIN) = 60	DISCHARGE (CFS) = 0.5
TIME (MIN) = 65	DISCHARGE (CFS) = 0.6
TIME (MIN) = 70	DISCHARGE (CFS) = 0.6
TIME (MIN) = 75	DISCHARGE (CFS) = 0.6
TIME (MIN) = 80	DISCHARGE (CFS) = 0.6
TIME (MIN) = 85	DISCHARGE (CFS) = 0.6
TIME (MIN) = 90	DISCHARGE (CFS) = 0.6
TIME (MIN) = 95	DISCHARGE (CFS) = 0.6
TIME (MIN) = 100	DISCHARGE (CFS) = 0.6
TIME (MIN) = 105	DISCHARGE (CFS) = 0.7
TIME (MIN) = 110	DISCHARGE (CFS) = 0.7
TIME (MIN) = 115	DISCHARGE (CFS) = 0.7
TIME (MIN) = 120	DISCHARGE (CFS) = 0.7
TIME (MIN) = 125	DISCHARGE (CFS) = 0.7
TIME (MIN) = 130	DISCHARGE (CFS) = 0.7
TIME (MIN) = 135	DISCHARGE (CFS) = 0.8
TIME (MIN) = 140	DISCHARGE (CFS) = 0.8
TIME (MIN) = 145	DISCHARGE (CFS) = 0.8
TIME (MIN) = 150	DISCHARGE (CFS) = 0.8
TIME (MIN) = 155	DISCHARGE (CFS) = 0.9
TIME (MIN) = 160	DISCHARGE (CFS) = 0.9
TIME (MIN) = 165	DISCHARGE (CFS) = 1
TIME (MIN) = 170	DISCHARGE (CFS) = 1
TIME (MIN) = 175	DISCHARGE (CFS) = 1
TIME (MIN) = 180	DISCHARGE (CFS) = 1.1
TIME (MIN) = 185	DISCHARGE (CFS) = 1.2
TIME (MIN) = 190	DISCHARGE (CFS) = 1.2
TIME (MIN) = 195	DISCHARGE (CFS) = 1.3
TIME (MIN) = 200	DISCHARGE (CFS) = 1.4
TIME (MIN) = 205	DISCHARGE (CFS) = 1.5
TIME (MIN) = 210	DISCHARGE (CFS) = 1.6
TIME (MIN) = 215	DISCHARGE (CFS) = 1.8
TIME (MIN) = 220	DISCHARGE (CFS) = 2
TIME (MIN) = 225	DISCHARGE (CFS) = 2.4
TIME (MIN) = 230	DISCHARGE (CFS) = 2.8
TIME (MIN) = 235	DISCHARGE (CFS) = 4.1
TIME (MIN) = 240	DISCHARGE (CFS) = 12.6
TIME (MIN) = 245	DISCHARGE (CFS) = 13.7
TIME (MIN) = 250	DISCHARGE (CFS) = 3.3
TIME (MIN) = 255	DISCHARGE (CFS) = 2.2
TIME (MIN) = 260	DISCHARGE (CFS) = 1.7
TIME (MIN) = 265	DISCHARGE (CFS) = 1.4
TIME (MIN) = 270	DISCHARGE (CFS) = 1.2
TIME (MIN) = 275	DISCHARGE (CFS) = 1.1
TIME (MIN) = 280	DISCHARGE (CFS) = 1
TIME (MIN) = 285	DISCHARGE (CFS) = 0.9
TIME (MIN) = 290	DISCHARGE (CFS) = 0.9
TIME (MIN) = 295	DISCHARGE (CFS) = 0.8
TIME (MIN) = 300	DISCHARGE (CFS) = 0.8
TIME (MIN) = 305	DISCHARGE (CFS) = 0.7
TIME (MIN) = 310	DISCHARGE (CFS) = 0.7
TIME (MIN) = 315	DISCHARGE (CFS) = 0.6
TIME (MIN) = 320	DISCHARGE (CFS) = 0.6
TIME (MIN) = 325	DISCHARGE (CFS) = 0.6
TIME (MIN) = 330	DISCHARGE (CFS) = 0.6
TIME (MIN) = 335	DISCHARGE (CFS) = 0.6
TIME (MIN) = 340	DISCHARGE (CFS) = 0.5
TIME (MIN) = 345	DISCHARGE (CFS) = 0.5
TIME (MIN) = 350	DISCHARGE (CFS) = 0.5
TIME (MIN) = 355	DISCHARGE (CFS) = 0.5
TIME (MIN) = 360	DISCHARGE (CFS) = 0.5

RATIONAL METHOD HYDROGRAPH PROGRAM

DMA2 25YR HYDROGRAPH

RUN DATE 8/5/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 1.8 INCHES
BASIN AREA 5.6 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 16.1 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 0.5
TIME (MIN) = 10	DISCHARGE (CFS) = 0.5
TIME (MIN) = 15	DISCHARGE (CFS) = 0.5
TIME (MIN) = 20	DISCHARGE (CFS) = 0.5
TIME (MIN) = 25	DISCHARGE (CFS) = 0.6
TIME (MIN) = 30	DISCHARGE (CFS) = 0.6
TIME (MIN) = 35	DISCHARGE (CFS) = 0.6
TIME (MIN) = 40	DISCHARGE (CFS) = 0.6
TIME (MIN) = 45	DISCHARGE (CFS) = 0.6
TIME (MIN) = 50	DISCHARGE (CFS) = 0.6
TIME (MIN) = 55	DISCHARGE (CFS) = 0.6
TIME (MIN) = 60	DISCHARGE (CFS) = 0.6
TIME (MIN) = 65	DISCHARGE (CFS) = 0.6
TIME (MIN) = 70	DISCHARGE (CFS) = 0.6
TIME (MIN) = 75	DISCHARGE (CFS) = 0.7
TIME (MIN) = 80	DISCHARGE (CFS) = 0.7
TIME (MIN) = 85	DISCHARGE (CFS) = 0.7
TIME (MIN) = 90	DISCHARGE (CFS) = 0.7
TIME (MIN) = 95	DISCHARGE (CFS) = 0.7
TIME (MIN) = 100	DISCHARGE (CFS) = 0.7
TIME (MIN) = 105	DISCHARGE (CFS) = 0.7
TIME (MIN) = 110	DISCHARGE (CFS) = 0.8
TIME (MIN) = 115	DISCHARGE (CFS) = 0.8
TIME (MIN) = 120	DISCHARGE (CFS) = 0.8
TIME (MIN) = 125	DISCHARGE (CFS) = 0.8
TIME (MIN) = 130	DISCHARGE (CFS) = 0.8
TIME (MIN) = 135	DISCHARGE (CFS) = 0.9
TIME (MIN) = 140	DISCHARGE (CFS) = 0.9
TIME (MIN) = 145	DISCHARGE (CFS) = 0.9
TIME (MIN) = 150	DISCHARGE (CFS) = 0.9
TIME (MIN) = 155	DISCHARGE (CFS) = 1
TIME (MIN) = 160	DISCHARGE (CFS) = 1
TIME (MIN) = 165	DISCHARGE (CFS) = 1.1
TIME (MIN) = 170	DISCHARGE (CFS) = 1.1
TIME (MIN) = 175	DISCHARGE (CFS) = 1.2
TIME (MIN) = 180	DISCHARGE (CFS) = 1.2
TIME (MIN) = 185	DISCHARGE (CFS) = 1.3
TIME (MIN) = 190	DISCHARGE (CFS) = 1.3
TIME (MIN) = 195	DISCHARGE (CFS) = 1.5
TIME (MIN) = 200	DISCHARGE (CFS) = 1.5
TIME (MIN) = 205	DISCHARGE (CFS) = 1.7
TIME (MIN) = 210	DISCHARGE (CFS) = 1.8
TIME (MIN) = 215	DISCHARGE (CFS) = 2.1
TIME (MIN) = 220	DISCHARGE (CFS) = 2.2
TIME (MIN) = 225	DISCHARGE (CFS) = 2.7
TIME (MIN) = 230	DISCHARGE (CFS) = 3.1
TIME (MIN) = 235	DISCHARGE (CFS) = 4.6
TIME (MIN) = 240	DISCHARGE (CFS) = 13.5
TIME (MIN) = 245	DISCHARGE (CFS) = 16.1
TIME (MIN) = 250	DISCHARGE (CFS) = 3.7
TIME (MIN) = 255	DISCHARGE (CFS) = 2.5
TIME (MIN) = 260	DISCHARGE (CFS) = 1.9
TIME (MIN) = 265	DISCHARGE (CFS) = 1.6
TIME (MIN) = 270	DISCHARGE (CFS) = 1.4
TIME (MIN) = 275	DISCHARGE (CFS) = 1.2
TIME (MIN) = 280	DISCHARGE (CFS) = 1.1
TIME (MIN) = 285	DISCHARGE (CFS) = 1
TIME (MIN) = 290	DISCHARGE (CFS) = 1
TIME (MIN) = 295	DISCHARGE (CFS) = 0.9
TIME (MIN) = 300	DISCHARGE (CFS) = 0.9
TIME (MIN) = 305	DISCHARGE (CFS) = 0.8
TIME (MIN) = 310	DISCHARGE (CFS) = 0.8
TIME (MIN) = 315	DISCHARGE (CFS) = 0.7
TIME (MIN) = 320	DISCHARGE (CFS) = 0.7
TIME (MIN) = 325	DISCHARGE (CFS) = 0.7
TIME (MIN) = 330	DISCHARGE (CFS) = 0.6
TIME (MIN) = 335	DISCHARGE (CFS) = 0.6
TIME (MIN) = 340	DISCHARGE (CFS) = 0.6
TIME (MIN) = 345	DISCHARGE (CFS) = 0.6
TIME (MIN) = 350	DISCHARGE (CFS) = 0.6
TIME (MIN) = 355	DISCHARGE (CFS) = 0.5
TIME (MIN) = 360	DISCHARGE (CFS) = 0.5

RATIONAL METHOD HYDROGRAPH PROGRAM

DMA2 50YR HYDROGRAPH

RUN DATE 8/5/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 2.1 INCHES
BASIN AREA 5.6 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 18.7 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 0.6
TIME (MIN) = 10	DISCHARGE (CFS) = 0.6
TIME (MIN) = 15	DISCHARGE (CFS) = 0.6
TIME (MIN) = 20	DISCHARGE (CFS) = 0.6
TIME (MIN) = 25	DISCHARGE (CFS) = 0.6
TIME (MIN) = 30	DISCHARGE (CFS) = 0.7
TIME (MIN) = 35	DISCHARGE (CFS) = 0.7
TIME (MIN) = 40	DISCHARGE (CFS) = 0.7
TIME (MIN) = 45	DISCHARGE (CFS) = 0.7
TIME (MIN) = 50	DISCHARGE (CFS) = 0.7
TIME (MIN) = 55	DISCHARGE (CFS) = 0.7
TIME (MIN) = 60	DISCHARGE (CFS) = 0.7
TIME (MIN) = 65	DISCHARGE (CFS) = 0.7
TIME (MIN) = 70	DISCHARGE (CFS) = 0.7
TIME (MIN) = 75	DISCHARGE (CFS) = 0.8
TIME (MIN) = 80	DISCHARGE (CFS) = 0.8
TIME (MIN) = 85	DISCHARGE (CFS) = 0.8
TIME (MIN) = 90	DISCHARGE (CFS) = 0.8
TIME (MIN) = 95	DISCHARGE (CFS) = 0.8
TIME (MIN) = 100	DISCHARGE (CFS) = 0.8
TIME (MIN) = 105	DISCHARGE (CFS) = 0.9
TIME (MIN) = 110	DISCHARGE (CFS) = 0.9
TIME (MIN) = 115	DISCHARGE (CFS) = 0.9
TIME (MIN) = 120	DISCHARGE (CFS) = 0.9
TIME (MIN) = 125	DISCHARGE (CFS) = 1
TIME (MIN) = 130	DISCHARGE (CFS) = 1
TIME (MIN) = 135	DISCHARGE (CFS) = 1
TIME (MIN) = 140	DISCHARGE (CFS) = 1
TIME (MIN) = 145	DISCHARGE (CFS) = 1.1
TIME (MIN) = 150	DISCHARGE (CFS) = 1.1
TIME (MIN) = 155	DISCHARGE (CFS) = 1.2
TIME (MIN) = 160	DISCHARGE (CFS) = 1.2
TIME (MIN) = 165	DISCHARGE (CFS) = 1.2
TIME (MIN) = 170	DISCHARGE (CFS) = 1.3
TIME (MIN) = 175	DISCHARGE (CFS) = 1.4
TIME (MIN) = 180	DISCHARGE (CFS) = 1.4
TIME (MIN) = 185	DISCHARGE (CFS) = 1.5
TIME (MIN) = 190	DISCHARGE (CFS) = 1.6
TIME (MIN) = 195	DISCHARGE (CFS) = 1.7
TIME (MIN) = 200	DISCHARGE (CFS) = 1.8
TIME (MIN) = 205	DISCHARGE (CFS) = 2
TIME (MIN) = 210	DISCHARGE (CFS) = 2.1
TIME (MIN) = 215	DISCHARGE (CFS) = 2.4
TIME (MIN) = 220	DISCHARGE (CFS) = 2.6
TIME (MIN) = 225	DISCHARGE (CFS) = 3.2
TIME (MIN) = 230	DISCHARGE (CFS) = 3.6
TIME (MIN) = 235	DISCHARGE (CFS) = 5.3
TIME (MIN) = 240	DISCHARGE (CFS) = 15.8
TIME (MIN) = 245	DISCHARGE (CFS) = 18.7
TIME (MIN) = 250	DISCHARGE (CFS) = 4.3
TIME (MIN) = 255	DISCHARGE (CFS) = 2.9
TIME (MIN) = 260	DISCHARGE (CFS) = 2.2
TIME (MIN) = 265	DISCHARGE (CFS) = 1.9
TIME (MIN) = 270	DISCHARGE (CFS) = 1.6
TIME (MIN) = 275	DISCHARGE (CFS) = 1.5
TIME (MIN) = 280	DISCHARGE (CFS) = 1.3
TIME (MIN) = 285	DISCHARGE (CFS) = 1.2
TIME (MIN) = 290	DISCHARGE (CFS) = 1.1
TIME (MIN) = 295	DISCHARGE (CFS) = 1.1
TIME (MIN) = 300	DISCHARGE (CFS) = 1
TIME (MIN) = 305	DISCHARGE (CFS) = 0.9
TIME (MIN) = 310	DISCHARGE (CFS) = 0.9
TIME (MIN) = 315	DISCHARGE (CFS) = 0.9
TIME (MIN) = 320	DISCHARGE (CFS) = 0.8
TIME (MIN) = 325	DISCHARGE (CFS) = 0.8
TIME (MIN) = 330	DISCHARGE (CFS) = 0.8
TIME (MIN) = 335	DISCHARGE (CFS) = 0.7
TIME (MIN) = 340	DISCHARGE (CFS) = 0.7
TIME (MIN) = 345	DISCHARGE (CFS) = 0.7
TIME (MIN) = 350	DISCHARGE (CFS) = 0.7
TIME (MIN) = 355	DISCHARGE (CFS) = 0.6
TIME (MIN) = 360	DISCHARGE (CFS) = 0.6

RATIONAL METHOD HYDROGRAPH PROGRAM

DMA2 100YR HYDROGRAPH

RUN DATE 8/5/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 2.3 INCHES
BASIN AREA 5.6 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 21 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 0.7
TIME (MIN) = 10	DISCHARGE (CFS) = 0.7
TIME (MIN) = 15	DISCHARGE (CFS) = 0.7
TIME (MIN) = 20	DISCHARGE (CFS) = 0.7
TIME (MIN) = 25	DISCHARGE (CFS) = 0.7
TIME (MIN) = 30	DISCHARGE (CFS) = 0.7
TIME (MIN) = 35	DISCHARGE (CFS) = 0.7
TIME (MIN) = 40	DISCHARGE (CFS) = 0.7
TIME (MIN) = 45	DISCHARGE (CFS) = 0.8
TIME (MIN) = 50	DISCHARGE (CFS) = 0.8
TIME (MIN) = 55	DISCHARGE (CFS) = 0.8
TIME (MIN) = 60	DISCHARGE (CFS) = 0.8
TIME (MIN) = 65	DISCHARGE (CFS) = 0.8
TIME (MIN) = 70	DISCHARGE (CFS) = 0.8
TIME (MIN) = 75	DISCHARGE (CFS) = 0.8
TIME (MIN) = 80	DISCHARGE (CFS) = 0.8
TIME (MIN) = 85	DISCHARGE (CFS) = 0.9
TIME (MIN) = 90	DISCHARGE (CFS) = 0.9
TIME (MIN) = 95	DISCHARGE (CFS) = 0.9
TIME (MIN) = 100	DISCHARGE (CFS) = 0.9
TIME (MIN) = 105	DISCHARGE (CFS) = 0.9
TIME (MIN) = 110	DISCHARGE (CFS) = 1
TIME (MIN) = 115	DISCHARGE (CFS) = 1
TIME (MIN) = 120	DISCHARGE (CFS) = 1
TIME (MIN) = 125	DISCHARGE (CFS) = 1
TIME (MIN) = 130	DISCHARGE (CFS) = 1.1
TIME (MIN) = 135	DISCHARGE (CFS) = 1.1
TIME (MIN) = 140	DISCHARGE (CFS) = 1.1
TIME (MIN) = 145	DISCHARGE (CFS) = 1.2
TIME (MIN) = 150	DISCHARGE (CFS) = 1.2
TIME (MIN) = 155	DISCHARGE (CFS) = 1.3
TIME (MIN) = 160	DISCHARGE (CFS) = 1.3
TIME (MIN) = 165	DISCHARGE (CFS) = 1.4
TIME (MIN) = 170	DISCHARGE (CFS) = 1.4
TIME (MIN) = 175	DISCHARGE (CFS) = 1.5
TIME (MIN) = 180	DISCHARGE (CFS) = 1.5
TIME (MIN) = 185	DISCHARGE (CFS) = 1.7
TIME (MIN) = 190	DISCHARGE (CFS) = 1.7
TIME (MIN) = 195	DISCHARGE (CFS) = 1.9
TIME (MIN) = 200	DISCHARGE (CFS) = 2
TIME (MIN) = 205	DISCHARGE (CFS) = 2.2
TIME (MIN) = 210	DISCHARGE (CFS) = 2.3
TIME (MIN) = 215	DISCHARGE (CFS) = 2.6
TIME (MIN) = 220	DISCHARGE (CFS) = 2.9
TIME (MIN) = 225	DISCHARGE (CFS) = 3.5
TIME (MIN) = 230	DISCHARGE (CFS) = 4
TIME (MIN) = 235	DISCHARGE (CFS) = 5.8
TIME (MIN) = 240	DISCHARGE (CFS) = 16.8
TIME (MIN) = 245	DISCHARGE (CFS) = 21
TIME (MIN) = 250	DISCHARGE (CFS) = 4.7
TIME (MIN) = 255	DISCHARGE (CFS) = 3.1
TIME (MIN) = 260	DISCHARGE (CFS) = 2.5
TIME (MIN) = 265	DISCHARGE (CFS) = 2.1
TIME (MIN) = 270	DISCHARGE (CFS) = 1.8
TIME (MIN) = 275	DISCHARGE (CFS) = 1.6
TIME (MIN) = 280	DISCHARGE (CFS) = 1.4
TIME (MIN) = 285	DISCHARGE (CFS) = 1.3
TIME (MIN) = 290	DISCHARGE (CFS) = 1.2
TIME (MIN) = 295	DISCHARGE (CFS) = 1.2
TIME (MIN) = 300	DISCHARGE (CFS) = 1.1
TIME (MIN) = 305	DISCHARGE (CFS) = 1
TIME (MIN) = 310	DISCHARGE (CFS) = 1
TIME (MIN) = 315	DISCHARGE (CFS) = 0.9
TIME (MIN) = 320	DISCHARGE (CFS) = 0.9
TIME (MIN) = 325	DISCHARGE (CFS) = 0.9
TIME (MIN) = 330	DISCHARGE (CFS) = 0.8
TIME (MIN) = 335	DISCHARGE (CFS) = 0.8
TIME (MIN) = 340	DISCHARGE (CFS) = 0.8
TIME (MIN) = 345	DISCHARGE (CFS) = 0.7
TIME (MIN) = 350	DISCHARGE (CFS) = 0.7
TIME (MIN) = 355	DISCHARGE (CFS) = 0.7
TIME (MIN) = 360	DISCHARGE (CFS) = 0.7

RATIONAL METHOD HYDROGRAPH PROGRAM

DMA3 5YR HYDROGRAPH

RUN DATE 8/5/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 1.4 INCHES
BASIN AREA 3.2 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 10.2 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 0.2
TIME (MIN) = 10	DISCHARGE (CFS) = 0.2
TIME (MIN) = 15	DISCHARGE (CFS) = 0.2
TIME (MIN) = 20	DISCHARGE (CFS) = 0.2
TIME (MIN) = 25	DISCHARGE (CFS) = 0.2
TIME (MIN) = 30	DISCHARGE (CFS) = 0.2
TIME (MIN) = 35	DISCHARGE (CFS) = 0.3
TIME (MIN) = 40	DISCHARGE (CFS) = 0.3
TIME (MIN) = 45	DISCHARGE (CFS) = 0.3
TIME (MIN) = 50	DISCHARGE (CFS) = 0.3
TIME (MIN) = 55	DISCHARGE (CFS) = 0.3
TIME (MIN) = 60	DISCHARGE (CFS) = 0.3
TIME (MIN) = 65	DISCHARGE (CFS) = 0.3
TIME (MIN) = 70	DISCHARGE (CFS) = 0.3
TIME (MIN) = 75	DISCHARGE (CFS) = 0.3
TIME (MIN) = 80	DISCHARGE (CFS) = 0.3
TIME (MIN) = 85	DISCHARGE (CFS) = 0.3
TIME (MIN) = 90	DISCHARGE (CFS) = 0.3
TIME (MIN) = 95	DISCHARGE (CFS) = 0.3
TIME (MIN) = 100	DISCHARGE (CFS) = 0.3
TIME (MIN) = 105	DISCHARGE (CFS) = 0.3
TIME (MIN) = 110	DISCHARGE (CFS) = 0.3
TIME (MIN) = 115	DISCHARGE (CFS) = 0.3
TIME (MIN) = 120	DISCHARGE (CFS) = 0.4
TIME (MIN) = 125	DISCHARGE (CFS) = 0.4
TIME (MIN) = 130	DISCHARGE (CFS) = 0.4
TIME (MIN) = 135	DISCHARGE (CFS) = 0.4
TIME (MIN) = 140	DISCHARGE (CFS) = 0.4
TIME (MIN) = 145	DISCHARGE (CFS) = 0.4
TIME (MIN) = 150	DISCHARGE (CFS) = 0.4
TIME (MIN) = 155	DISCHARGE (CFS) = 0.4
TIME (MIN) = 160	DISCHARGE (CFS) = 0.5
TIME (MIN) = 165	DISCHARGE (CFS) = 0.5
TIME (MIN) = 170	DISCHARGE (CFS) = 0.5
TIME (MIN) = 175	DISCHARGE (CFS) = 0.5
TIME (MIN) = 180	DISCHARGE (CFS) = 0.5
TIME (MIN) = 185	DISCHARGE (CFS) = 0.6
TIME (MIN) = 190	DISCHARGE (CFS) = 0.6
TIME (MIN) = 195	DISCHARGE (CFS) = 0.6
TIME (MIN) = 200	DISCHARGE (CFS) = 0.7
TIME (MIN) = 205	DISCHARGE (CFS) = 0.8
TIME (MIN) = 210	DISCHARGE (CFS) = 0.8
TIME (MIN) = 215	DISCHARGE (CFS) = 0.9
TIME (MIN) = 220	DISCHARGE (CFS) = 1
TIME (MIN) = 225	DISCHARGE (CFS) = 1.2
TIME (MIN) = 230	DISCHARGE (CFS) = 1.4
TIME (MIN) = 235	DISCHARGE (CFS) = 2
TIME (MIN) = 240	DISCHARGE (CFS) = 2.9
TIME (MIN) = 245	DISCHARGE (CFS) = 10.2
TIME (MIN) = 250	DISCHARGE (CFS) = 1.6
TIME (MIN) = 255	DISCHARGE (CFS) = 1.1
TIME (MIN) = 260	DISCHARGE (CFS) = 0.9
TIME (MIN) = 265	DISCHARGE (CFS) = 0.7
TIME (MIN) = 270	DISCHARGE (CFS) = 0.6
TIME (MIN) = 275	DISCHARGE (CFS) = 0.6
TIME (MIN) = 280	DISCHARGE (CFS) = 0.5
TIME (MIN) = 285	DISCHARGE (CFS) = 0.5
TIME (MIN) = 290	DISCHARGE (CFS) = 0.4
TIME (MIN) = 295	DISCHARGE (CFS) = 0.4
TIME (MIN) = 300	DISCHARGE (CFS) = 0.4
TIME (MIN) = 305	DISCHARGE (CFS) = 0.4
TIME (MIN) = 310	DISCHARGE (CFS) = 0.3
TIME (MIN) = 315	DISCHARGE (CFS) = 0.3
TIME (MIN) = 320	DISCHARGE (CFS) = 0.3
TIME (MIN) = 325	DISCHARGE (CFS) = 0.3
TIME (MIN) = 330	DISCHARGE (CFS) = 0.3
TIME (MIN) = 335	DISCHARGE (CFS) = 0.3
TIME (MIN) = 340	DISCHARGE (CFS) = 0.3
TIME (MIN) = 345	DISCHARGE (CFS) = 0.3
TIME (MIN) = 350	DISCHARGE (CFS) = 0.3
TIME (MIN) = 355	DISCHARGE (CFS) = 0.2
TIME (MIN) = 360	DISCHARGE (CFS) = 0.2

RATIONAL METHOD HYDROGRAPH PROGRAM

DMA3 10YR HYDROGRAPH

RUN DATE 8/5/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 1.6 INCHES
BASIN AREA 3.2 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 11.7 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 0.3
TIME (MIN) = 10	DISCHARGE (CFS) = 0.3
TIME (MIN) = 15	DISCHARGE (CFS) = 0.3
TIME (MIN) = 20	DISCHARGE (CFS) = 0.3
TIME (MIN) = 25	DISCHARGE (CFS) = 0.3
TIME (MIN) = 30	DISCHARGE (CFS) = 0.3
TIME (MIN) = 35	DISCHARGE (CFS) = 0.3
TIME (MIN) = 40	DISCHARGE (CFS) = 0.3
TIME (MIN) = 45	DISCHARGE (CFS) = 0.3
TIME (MIN) = 50	DISCHARGE (CFS) = 0.3
TIME (MIN) = 55	DISCHARGE (CFS) = 0.3
TIME (MIN) = 60	DISCHARGE (CFS) = 0.3
TIME (MIN) = 65	DISCHARGE (CFS) = 0.3
TIME (MIN) = 70	DISCHARGE (CFS) = 0.3
TIME (MIN) = 75	DISCHARGE (CFS) = 0.3
TIME (MIN) = 80	DISCHARGE (CFS) = 0.3
TIME (MIN) = 85	DISCHARGE (CFS) = 0.3
TIME (MIN) = 90	DISCHARGE (CFS) = 0.4
TIME (MIN) = 95	DISCHARGE (CFS) = 0.4
TIME (MIN) = 100	DISCHARGE (CFS) = 0.4
TIME (MIN) = 105	DISCHARGE (CFS) = 0.4
TIME (MIN) = 110	DISCHARGE (CFS) = 0.4
TIME (MIN) = 115	DISCHARGE (CFS) = 0.4
TIME (MIN) = 120	DISCHARGE (CFS) = 0.4
TIME (MIN) = 125	DISCHARGE (CFS) = 0.4
TIME (MIN) = 130	DISCHARGE (CFS) = 0.4
TIME (MIN) = 135	DISCHARGE (CFS) = 0.4
TIME (MIN) = 140	DISCHARGE (CFS) = 0.5
TIME (MIN) = 145	DISCHARGE (CFS) = 0.5
TIME (MIN) = 150	DISCHARGE (CFS) = 0.5
TIME (MIN) = 155	DISCHARGE (CFS) = 0.5
TIME (MIN) = 160	DISCHARGE (CFS) = 0.5
TIME (MIN) = 165	DISCHARGE (CFS) = 0.5
TIME (MIN) = 170	DISCHARGE (CFS) = 0.6
TIME (MIN) = 175	DISCHARGE (CFS) = 0.6
TIME (MIN) = 180	DISCHARGE (CFS) = 0.6
TIME (MIN) = 185	DISCHARGE (CFS) = 0.7
TIME (MIN) = 190	DISCHARGE (CFS) = 0.7
TIME (MIN) = 195	DISCHARGE (CFS) = 0.7
TIME (MIN) = 200	DISCHARGE (CFS) = 0.8
TIME (MIN) = 205	DISCHARGE (CFS) = 0.9
TIME (MIN) = 210	DISCHARGE (CFS) = 0.9
TIME (MIN) = 215	DISCHARGE (CFS) = 1
TIME (MIN) = 220	DISCHARGE (CFS) = 1.1
TIME (MIN) = 225	DISCHARGE (CFS) = 1.4
TIME (MIN) = 230	DISCHARGE (CFS) = 1.6
TIME (MIN) = 235	DISCHARGE (CFS) = 2.3
TIME (MIN) = 240	DISCHARGE (CFS) = 3.3
TIME (MIN) = 245	DISCHARGE (CFS) = 11.7
TIME (MIN) = 250	DISCHARGE (CFS) = 1.9
TIME (MIN) = 255	DISCHARGE (CFS) = 1.2
TIME (MIN) = 260	DISCHARGE (CFS) = 1
TIME (MIN) = 265	DISCHARGE (CFS) = 0.8
TIME (MIN) = 270	DISCHARGE (CFS) = 0.7
TIME (MIN) = 275	DISCHARGE (CFS) = 0.6
TIME (MIN) = 280	DISCHARGE (CFS) = 0.6
TIME (MIN) = 285	DISCHARGE (CFS) = 0.5
TIME (MIN) = 290	DISCHARGE (CFS) = 0.5
TIME (MIN) = 295	DISCHARGE (CFS) = 0.5
TIME (MIN) = 300	DISCHARGE (CFS) = 0.4
TIME (MIN) = 305	DISCHARGE (CFS) = 0.4
TIME (MIN) = 310	DISCHARGE (CFS) = 0.4
TIME (MIN) = 315	DISCHARGE (CFS) = 0.4
TIME (MIN) = 320	DISCHARGE (CFS) = 0.4
TIME (MIN) = 325	DISCHARGE (CFS) = 0.3
TIME (MIN) = 330	DISCHARGE (CFS) = 0.3
TIME (MIN) = 335	DISCHARGE (CFS) = 0.3
TIME (MIN) = 340	DISCHARGE (CFS) = 0.3
TIME (MIN) = 345	DISCHARGE (CFS) = 0.3
TIME (MIN) = 350	DISCHARGE (CFS) = 0.3
TIME (MIN) = 355	DISCHARGE (CFS) = 0.3
TIME (MIN) = 360	DISCHARGE (CFS) = 0.3

RATIONAL METHOD HYDROGRAPH PROGRAM

DMA3 25YR HYDROGRAPH

RUN DATE 8/5/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 1.8 INCHES
BASIN AREA 3.2 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 13.2 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 0.3
TIME (MIN) = 10	DISCHARGE (CFS) = 0.3
TIME (MIN) = 15	DISCHARGE (CFS) = 0.3
TIME (MIN) = 20	DISCHARGE (CFS) = 0.3
TIME (MIN) = 25	DISCHARGE (CFS) = 0.3
TIME (MIN) = 30	DISCHARGE (CFS) = 0.3
TIME (MIN) = 35	DISCHARGE (CFS) = 0.3
TIME (MIN) = 40	DISCHARGE (CFS) = 0.3
TIME (MIN) = 45	DISCHARGE (CFS) = 0.3
TIME (MIN) = 50	DISCHARGE (CFS) = 0.3
TIME (MIN) = 55	DISCHARGE (CFS) = 0.3
TIME (MIN) = 60	DISCHARGE (CFS) = 0.4
TIME (MIN) = 65	DISCHARGE (CFS) = 0.4
TIME (MIN) = 70	DISCHARGE (CFS) = 0.4
TIME (MIN) = 75	DISCHARGE (CFS) = 0.4
TIME (MIN) = 80	DISCHARGE (CFS) = 0.4
TIME (MIN) = 85	DISCHARGE (CFS) = 0.4
TIME (MIN) = 90	DISCHARGE (CFS) = 0.4
TIME (MIN) = 95	DISCHARGE (CFS) = 0.4
TIME (MIN) = 100	DISCHARGE (CFS) = 0.4
TIME (MIN) = 105	DISCHARGE (CFS) = 0.4
TIME (MIN) = 110	DISCHARGE (CFS) = 0.4
TIME (MIN) = 115	DISCHARGE (CFS) = 0.4
TIME (MIN) = 120	DISCHARGE (CFS) = 0.5
TIME (MIN) = 125	DISCHARGE (CFS) = 0.5
TIME (MIN) = 130	DISCHARGE (CFS) = 0.5
TIME (MIN) = 135	DISCHARGE (CFS) = 0.5
TIME (MIN) = 140	DISCHARGE (CFS) = 0.5
TIME (MIN) = 145	DISCHARGE (CFS) = 0.5
TIME (MIN) = 150	DISCHARGE (CFS) = 0.5
TIME (MIN) = 155	DISCHARGE (CFS) = 0.6
TIME (MIN) = 160	DISCHARGE (CFS) = 0.6
TIME (MIN) = 165	DISCHARGE (CFS) = 0.6
TIME (MIN) = 170	DISCHARGE (CFS) = 0.6
TIME (MIN) = 175	DISCHARGE (CFS) = 0.7
TIME (MIN) = 180	DISCHARGE (CFS) = 0.7
TIME (MIN) = 185	DISCHARGE (CFS) = 0.7
TIME (MIN) = 190	DISCHARGE (CFS) = 0.8
TIME (MIN) = 195	DISCHARGE (CFS) = 0.8
TIME (MIN) = 200	DISCHARGE (CFS) = 0.9
TIME (MIN) = 205	DISCHARGE (CFS) = 1
TIME (MIN) = 210	DISCHARGE (CFS) = 1
TIME (MIN) = 215	DISCHARGE (CFS) = 1.2
TIME (MIN) = 220	DISCHARGE (CFS) = 1.3
TIME (MIN) = 225	DISCHARGE (CFS) = 1.6
TIME (MIN) = 230	DISCHARGE (CFS) = 1.8
TIME (MIN) = 235	DISCHARGE (CFS) = 2.6
TIME (MIN) = 240	DISCHARGE (CFS) = 3.7
TIME (MIN) = 245	DISCHARGE (CFS) = 13.2
TIME (MIN) = 250	DISCHARGE (CFS) = 2.1
TIME (MIN) = 255	DISCHARGE (CFS) = 1.4
TIME (MIN) = 260	DISCHARGE (CFS) = 1.1
TIME (MIN) = 265	DISCHARGE (CFS) = 0.9
TIME (MIN) = 270	DISCHARGE (CFS) = 0.8
TIME (MIN) = 275	DISCHARGE (CFS) = 0.7
TIME (MIN) = 280	DISCHARGE (CFS) = 0.6
TIME (MIN) = 285	DISCHARGE (CFS) = 0.6
TIME (MIN) = 290	DISCHARGE (CFS) = 0.6
TIME (MIN) = 295	DISCHARGE (CFS) = 0.5
TIME (MIN) = 300	DISCHARGE (CFS) = 0.5
TIME (MIN) = 305	DISCHARGE (CFS) = 0.5
TIME (MIN) = 310	DISCHARGE (CFS) = 0.4
TIME (MIN) = 315	DISCHARGE (CFS) = 0.4
TIME (MIN) = 320	DISCHARGE (CFS) = 0.4
TIME (MIN) = 325	DISCHARGE (CFS) = 0.4
TIME (MIN) = 330	DISCHARGE (CFS) = 0.4
TIME (MIN) = 335	DISCHARGE (CFS) = 0.4
TIME (MIN) = 340	DISCHARGE (CFS) = 0.3
TIME (MIN) = 345	DISCHARGE (CFS) = 0.3
TIME (MIN) = 350	DISCHARGE (CFS) = 0.3
TIME (MIN) = 355	DISCHARGE (CFS) = 0.3
TIME (MIN) = 360	DISCHARGE (CFS) = 0.3

RATIONAL METHOD HYDROGRAPH PROGRAM

DMA3 50YR HYDROGRAPH

RUN DATE 8/5/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 2.1 INCHES
BASIN AREA 3.2 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 15.4 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 0.3
TIME (MIN) = 10	DISCHARGE (CFS) = 0.4
TIME (MIN) = 15	DISCHARGE (CFS) = 0.4
TIME (MIN) = 20	DISCHARGE (CFS) = 0.4
TIME (MIN) = 25	DISCHARGE (CFS) = 0.4
TIME (MIN) = 30	DISCHARGE (CFS) = 0.4
TIME (MIN) = 35	DISCHARGE (CFS) = 0.4
TIME (MIN) = 40	DISCHARGE (CFS) = 0.4
TIME (MIN) = 45	DISCHARGE (CFS) = 0.4
TIME (MIN) = 50	DISCHARGE (CFS) = 0.4
TIME (MIN) = 55	DISCHARGE (CFS) = 0.4
TIME (MIN) = 60	DISCHARGE (CFS) = 0.4
TIME (MIN) = 65	DISCHARGE (CFS) = 0.4
TIME (MIN) = 70	DISCHARGE (CFS) = 0.4
TIME (MIN) = 75	DISCHARGE (CFS) = 0.4
TIME (MIN) = 80	DISCHARGE (CFS) = 0.4
TIME (MIN) = 85	DISCHARGE (CFS) = 0.5
TIME (MIN) = 90	DISCHARGE (CFS) = 0.5
TIME (MIN) = 95	DISCHARGE (CFS) = 0.5
TIME (MIN) = 100	DISCHARGE (CFS) = 0.5
TIME (MIN) = 105	DISCHARGE (CFS) = 0.5
TIME (MIN) = 110	DISCHARGE (CFS) = 0.5
TIME (MIN) = 115	DISCHARGE (CFS) = 0.5
TIME (MIN) = 120	DISCHARGE (CFS) = 0.5
TIME (MIN) = 125	DISCHARGE (CFS) = 0.5
TIME (MIN) = 130	DISCHARGE (CFS) = 0.6
TIME (MIN) = 135	DISCHARGE (CFS) = 0.6
TIME (MIN) = 140	DISCHARGE (CFS) = 0.6
TIME (MIN) = 145	DISCHARGE (CFS) = 0.6
TIME (MIN) = 150	DISCHARGE (CFS) = 0.6
TIME (MIN) = 155	DISCHARGE (CFS) = 0.7
TIME (MIN) = 160	DISCHARGE (CFS) = 0.7
TIME (MIN) = 165	DISCHARGE (CFS) = 0.7
TIME (MIN) = 170	DISCHARGE (CFS) = 0.7
TIME (MIN) = 175	DISCHARGE (CFS) = 0.8
TIME (MIN) = 180	DISCHARGE (CFS) = 0.8
TIME (MIN) = 185	DISCHARGE (CFS) = 0.9
TIME (MIN) = 190	DISCHARGE (CFS) = 0.9
TIME (MIN) = 195	DISCHARGE (CFS) = 1
TIME (MIN) = 200	DISCHARGE (CFS) = 1
TIME (MIN) = 205	DISCHARGE (CFS) = 1.1
TIME (MIN) = 210	DISCHARGE (CFS) = 1.2
TIME (MIN) = 215	DISCHARGE (CFS) = 1.4
TIME (MIN) = 220	DISCHARGE (CFS) = 1.5
TIME (MIN) = 225	DISCHARGE (CFS) = 1.8
TIME (MIN) = 230	DISCHARGE (CFS) = 2.1
TIME (MIN) = 235	DISCHARGE (CFS) = 3.1
TIME (MIN) = 240	DISCHARGE (CFS) = 4.3
TIME (MIN) = 245	DISCHARGE (CFS) = 15.4
TIME (MIN) = 250	DISCHARGE (CFS) = 2.4
TIME (MIN) = 255	DISCHARGE (CFS) = 1.6
TIME (MIN) = 260	DISCHARGE (CFS) = 1.3
TIME (MIN) = 265	DISCHARGE (CFS) = 1.1
TIME (MIN) = 270	DISCHARGE (CFS) = 0.9
TIME (MIN) = 275	DISCHARGE (CFS) = 0.8
TIME (MIN) = 280	DISCHARGE (CFS) = 0.8
TIME (MIN) = 285	DISCHARGE (CFS) = 0.7
TIME (MIN) = 290	DISCHARGE (CFS) = 0.6
TIME (MIN) = 295	DISCHARGE (CFS) = 0.6
TIME (MIN) = 300	DISCHARGE (CFS) = 0.6
TIME (MIN) = 305	DISCHARGE (CFS) = 0.5
TIME (MIN) = 310	DISCHARGE (CFS) = 0.5
TIME (MIN) = 315	DISCHARGE (CFS) = 0.5
TIME (MIN) = 320	DISCHARGE (CFS) = 0.5
TIME (MIN) = 325	DISCHARGE (CFS) = 0.4
TIME (MIN) = 330	DISCHARGE (CFS) = 0.4
TIME (MIN) = 335	DISCHARGE (CFS) = 0.4
TIME (MIN) = 340	DISCHARGE (CFS) = 0.4
TIME (MIN) = 345	DISCHARGE (CFS) = 0.4
TIME (MIN) = 350	DISCHARGE (CFS) = 0.4
TIME (MIN) = 355	DISCHARGE (CFS) = 0.4
TIME (MIN) = 360	DISCHARGE (CFS) = 0.4

RATIONAL METHOD HYDROGRAPH PROGRAM

DMA3 100YR HYDROGRAPH

RUN DATE 8/5/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 2.3 INCHES
BASIN AREA 3.2 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 16.8 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 0.4
TIME (MIN) = 10	DISCHARGE (CFS) = 0.4
TIME (MIN) = 15	DISCHARGE (CFS) = 0.4
TIME (MIN) = 20	DISCHARGE (CFS) = 0.4
TIME (MIN) = 25	DISCHARGE (CFS) = 0.4
TIME (MIN) = 30	DISCHARGE (CFS) = 0.4
TIME (MIN) = 35	DISCHARGE (CFS) = 0.4
TIME (MIN) = 40	DISCHARGE (CFS) = 0.4
TIME (MIN) = 45	DISCHARGE (CFS) = 0.4
TIME (MIN) = 50	DISCHARGE (CFS) = 0.4
TIME (MIN) = 55	DISCHARGE (CFS) = 0.4
TIME (MIN) = 60	DISCHARGE (CFS) = 0.4
TIME (MIN) = 65	DISCHARGE (CFS) = 0.5
TIME (MIN) = 70	DISCHARGE (CFS) = 0.5
TIME (MIN) = 75	DISCHARGE (CFS) = 0.5
TIME (MIN) = 80	DISCHARGE (CFS) = 0.5
TIME (MIN) = 85	DISCHARGE (CFS) = 0.5
TIME (MIN) = 90	DISCHARGE (CFS) = 0.5
TIME (MIN) = 95	DISCHARGE (CFS) = 0.5
TIME (MIN) = 100	DISCHARGE (CFS) = 0.5
TIME (MIN) = 105	DISCHARGE (CFS) = 0.5
TIME (MIN) = 110	DISCHARGE (CFS) = 0.6
TIME (MIN) = 115	DISCHARGE (CFS) = 0.6
TIME (MIN) = 120	DISCHARGE (CFS) = 0.6
TIME (MIN) = 125	DISCHARGE (CFS) = 0.6
TIME (MIN) = 130	DISCHARGE (CFS) = 0.6
TIME (MIN) = 135	DISCHARGE (CFS) = 0.6
TIME (MIN) = 140	DISCHARGE (CFS) = 0.6
TIME (MIN) = 145	DISCHARGE (CFS) = 0.7
TIME (MIN) = 150	DISCHARGE (CFS) = 0.7
TIME (MIN) = 155	DISCHARGE (CFS) = 0.7
TIME (MIN) = 160	DISCHARGE (CFS) = 0.7
TIME (MIN) = 165	DISCHARGE (CFS) = 0.8
TIME (MIN) = 170	DISCHARGE (CFS) = 0.8
TIME (MIN) = 175	DISCHARGE (CFS) = 0.9
TIME (MIN) = 180	DISCHARGE (CFS) = 0.9
TIME (MIN) = 185	DISCHARGE (CFS) = 0.9
TIME (MIN) = 190	DISCHARGE (CFS) = 1
TIME (MIN) = 195	DISCHARGE (CFS) = 1.1
TIME (MIN) = 200	DISCHARGE (CFS) = 1.1
TIME (MIN) = 205	DISCHARGE (CFS) = 1.2
TIME (MIN) = 210	DISCHARGE (CFS) = 1.3
TIME (MIN) = 215	DISCHARGE (CFS) = 1.5
TIME (MIN) = 220	DISCHARGE (CFS) = 1.6
TIME (MIN) = 225	DISCHARGE (CFS) = 2
TIME (MIN) = 230	DISCHARGE (CFS) = 2.3
TIME (MIN) = 235	DISCHARGE (CFS) = 3.3
TIME (MIN) = 240	DISCHARGE (CFS) = 4.8
TIME (MIN) = 245	DISCHARGE (CFS) = 16.8
TIME (MIN) = 250	DISCHARGE (CFS) = 2.7
TIME (MIN) = 255	DISCHARGE (CFS) = 1.8
TIME (MIN) = 260	DISCHARGE (CFS) = 1.4
TIME (MIN) = 265	DISCHARGE (CFS) = 1.2
TIME (MIN) = 270	DISCHARGE (CFS) = 1
TIME (MIN) = 275	DISCHARGE (CFS) = 0.9
TIME (MIN) = 280	DISCHARGE (CFS) = 0.8
TIME (MIN) = 285	DISCHARGE (CFS) = 0.8
TIME (MIN) = 290	DISCHARGE (CFS) = 0.7
TIME (MIN) = 295	DISCHARGE (CFS) = 0.7
TIME (MIN) = 300	DISCHARGE (CFS) = 0.6
TIME (MIN) = 305	DISCHARGE (CFS) = 0.6
TIME (MIN) = 310	DISCHARGE (CFS) = 0.6
TIME (MIN) = 315	DISCHARGE (CFS) = 0.5
TIME (MIN) = 320	DISCHARGE (CFS) = 0.5
TIME (MIN) = 325	DISCHARGE (CFS) = 0.5
TIME (MIN) = 330	DISCHARGE (CFS) = 0.5
TIME (MIN) = 335	DISCHARGE (CFS) = 0.5
TIME (MIN) = 340	DISCHARGE (CFS) = 0.4
TIME (MIN) = 345	DISCHARGE (CFS) = 0.4
TIME (MIN) = 350	DISCHARGE (CFS) = 0.4
TIME (MIN) = 355	DISCHARGE (CFS) = 0.4
TIME (MIN) = 360	DISCHARGE (CFS) = 0.4

RATIONAL METHOD HYDROGRAPH PROGRAM

DMA4 5YR HYDROGRAPH

RUN DATE 8/5/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 1.4 INCHES
BASIN AREA 2 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 6.4 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 0.1
TIME (MIN) = 10	DISCHARGE (CFS) = 0.1
TIME (MIN) = 15	DISCHARGE (CFS) = 0.1
TIME (MIN) = 20	DISCHARGE (CFS) = 0.2
TIME (MIN) = 25	DISCHARGE (CFS) = 0.2
TIME (MIN) = 30	DISCHARGE (CFS) = 0.2
TIME (MIN) = 35	DISCHARGE (CFS) = 0.2
TIME (MIN) = 40	DISCHARGE (CFS) = 0.2
TIME (MIN) = 45	DISCHARGE (CFS) = 0.2
TIME (MIN) = 50	DISCHARGE (CFS) = 0.2
TIME (MIN) = 55	DISCHARGE (CFS) = 0.2
TIME (MIN) = 60	DISCHARGE (CFS) = 0.2
TIME (MIN) = 65	DISCHARGE (CFS) = 0.2
TIME (MIN) = 70	DISCHARGE (CFS) = 0.2
TIME (MIN) = 75	DISCHARGE (CFS) = 0.2
TIME (MIN) = 80	DISCHARGE (CFS) = 0.2
TIME (MIN) = 85	DISCHARGE (CFS) = 0.2
TIME (MIN) = 90	DISCHARGE (CFS) = 0.2
TIME (MIN) = 95	DISCHARGE (CFS) = 0.2
TIME (MIN) = 100	DISCHARGE (CFS) = 0.2
TIME (MIN) = 105	DISCHARGE (CFS) = 0.2
TIME (MIN) = 110	DISCHARGE (CFS) = 0.2
TIME (MIN) = 115	DISCHARGE (CFS) = 0.2
TIME (MIN) = 120	DISCHARGE (CFS) = 0.2
TIME (MIN) = 125	DISCHARGE (CFS) = 0.2
TIME (MIN) = 130	DISCHARGE (CFS) = 0.2
TIME (MIN) = 135	DISCHARGE (CFS) = 0.2
TIME (MIN) = 140	DISCHARGE (CFS) = 0.2
TIME (MIN) = 145	DISCHARGE (CFS) = 0.3
TIME (MIN) = 150	DISCHARGE (CFS) = 0.3
TIME (MIN) = 155	DISCHARGE (CFS) = 0.3
TIME (MIN) = 160	DISCHARGE (CFS) = 0.3
TIME (MIN) = 165	DISCHARGE (CFS) = 0.3
TIME (MIN) = 170	DISCHARGE (CFS) = 0.3
TIME (MIN) = 175	DISCHARGE (CFS) = 0.3
TIME (MIN) = 180	DISCHARGE (CFS) = 0.3
TIME (MIN) = 185	DISCHARGE (CFS) = 0.4
TIME (MIN) = 190	DISCHARGE (CFS) = 0.4
TIME (MIN) = 195	DISCHARGE (CFS) = 0.4
TIME (MIN) = 200	DISCHARGE (CFS) = 0.4
TIME (MIN) = 205	DISCHARGE (CFS) = 0.5
TIME (MIN) = 210	DISCHARGE (CFS) = 0.5
TIME (MIN) = 215	DISCHARGE (CFS) = 0.6
TIME (MIN) = 220	DISCHARGE (CFS) = 0.6
TIME (MIN) = 225	DISCHARGE (CFS) = 0.8
TIME (MIN) = 230	DISCHARGE (CFS) = 0.9
TIME (MIN) = 235	DISCHARGE (CFS) = 1.3
TIME (MIN) = 240	DISCHARGE (CFS) = 1.8
TIME (MIN) = 245	DISCHARGE (CFS) = 6.4
TIME (MIN) = 250	DISCHARGE (CFS) = 1
TIME (MIN) = 255	DISCHARGE (CFS) = 0.7
TIME (MIN) = 260	DISCHARGE (CFS) = 0.5
TIME (MIN) = 265	DISCHARGE (CFS) = 0.4
TIME (MIN) = 270	DISCHARGE (CFS) = 0.4
TIME (MIN) = 275	DISCHARGE (CFS) = 0.3
TIME (MIN) = 280	DISCHARGE (CFS) = 0.3
TIME (MIN) = 285	DISCHARGE (CFS) = 0.3
TIME (MIN) = 290	DISCHARGE (CFS) = 0.3
TIME (MIN) = 295	DISCHARGE (CFS) = 0.3
TIME (MIN) = 300	DISCHARGE (CFS) = 0.2
TIME (MIN) = 305	DISCHARGE (CFS) = 0.2
TIME (MIN) = 310	DISCHARGE (CFS) = 0.2
TIME (MIN) = 315	DISCHARGE (CFS) = 0.2
TIME (MIN) = 320	DISCHARGE (CFS) = 0.2
TIME (MIN) = 325	DISCHARGE (CFS) = 0.2
TIME (MIN) = 330	DISCHARGE (CFS) = 0.2
TIME (MIN) = 335	DISCHARGE (CFS) = 0.2
TIME (MIN) = 340	DISCHARGE (CFS) = 0.2
TIME (MIN) = 345	DISCHARGE (CFS) = 0.2
TIME (MIN) = 350	DISCHARGE (CFS) = 0.2
TIME (MIN) = 355	DISCHARGE (CFS) = 0.2
TIME (MIN) = 360	DISCHARGE (CFS) = 0.1

RATIONAL METHOD HYDROGRAPH PROGRAM

DMA4 10YR HYDROGRAPH

RUN DATE 8/5/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 1.6 INCHES
BASIN AREA 2 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 7.3 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 0.2
TIME (MIN) = 10	DISCHARGE (CFS) = 0.2
TIME (MIN) = 15	DISCHARGE (CFS) = 0.2
TIME (MIN) = 20	DISCHARGE (CFS) = 0.2
TIME (MIN) = 25	DISCHARGE (CFS) = 0.2
TIME (MIN) = 30	DISCHARGE (CFS) = 0.2
TIME (MIN) = 35	DISCHARGE (CFS) = 0.2
TIME (MIN) = 40	DISCHARGE (CFS) = 0.2
TIME (MIN) = 45	DISCHARGE (CFS) = 0.2
TIME (MIN) = 50	DISCHARGE (CFS) = 0.2
TIME (MIN) = 55	DISCHARGE (CFS) = 0.2
TIME (MIN) = 60	DISCHARGE (CFS) = 0.2
TIME (MIN) = 65	DISCHARGE (CFS) = 0.2
TIME (MIN) = 70	DISCHARGE (CFS) = 0.2
TIME (MIN) = 75	DISCHARGE (CFS) = 0.2
TIME (MIN) = 80	DISCHARGE (CFS) = 0.2
TIME (MIN) = 85	DISCHARGE (CFS) = 0.2
TIME (MIN) = 90	DISCHARGE (CFS) = 0.2
TIME (MIN) = 95	DISCHARGE (CFS) = 0.2
TIME (MIN) = 100	DISCHARGE (CFS) = 0.2
TIME (MIN) = 105	DISCHARGE (CFS) = 0.2
TIME (MIN) = 110	DISCHARGE (CFS) = 0.2
TIME (MIN) = 115	DISCHARGE (CFS) = 0.2
TIME (MIN) = 120	DISCHARGE (CFS) = 0.3
TIME (MIN) = 125	DISCHARGE (CFS) = 0.3
TIME (MIN) = 130	DISCHARGE (CFS) = 0.3
TIME (MIN) = 135	DISCHARGE (CFS) = 0.3
TIME (MIN) = 140	DISCHARGE (CFS) = 0.3
TIME (MIN) = 145	DISCHARGE (CFS) = 0.3
TIME (MIN) = 150	DISCHARGE (CFS) = 0.3
TIME (MIN) = 155	DISCHARGE (CFS) = 0.3
TIME (MIN) = 160	DISCHARGE (CFS) = 0.3
TIME (MIN) = 165	DISCHARGE (CFS) = 0.3
TIME (MIN) = 170	DISCHARGE (CFS) = 0.3
TIME (MIN) = 175	DISCHARGE (CFS) = 0.4
TIME (MIN) = 180	DISCHARGE (CFS) = 0.4
TIME (MIN) = 185	DISCHARGE (CFS) = 0.4
TIME (MIN) = 190	DISCHARGE (CFS) = 0.4
TIME (MIN) = 195	DISCHARGE (CFS) = 0.5
TIME (MIN) = 200	DISCHARGE (CFS) = 0.5
TIME (MIN) = 205	DISCHARGE (CFS) = 0.5
TIME (MIN) = 210	DISCHARGE (CFS) = 0.6
TIME (MIN) = 215	DISCHARGE (CFS) = 0.7
TIME (MIN) = 220	DISCHARGE (CFS) = 0.7
TIME (MIN) = 225	DISCHARGE (CFS) = 0.9
TIME (MIN) = 230	DISCHARGE (CFS) = 1
TIME (MIN) = 235	DISCHARGE (CFS) = 1.5
TIME (MIN) = 240	DISCHARGE (CFS) = 2.1
TIME (MIN) = 245	DISCHARGE (CFS) = 7.3
TIME (MIN) = 250	DISCHARGE (CFS) = 1.2
TIME (MIN) = 255	DISCHARGE (CFS) = 0.8
TIME (MIN) = 260	DISCHARGE (CFS) = 0.6
TIME (MIN) = 265	DISCHARGE (CFS) = 0.5
TIME (MIN) = 270	DISCHARGE (CFS) = 0.4
TIME (MIN) = 275	DISCHARGE (CFS) = 0.4
TIME (MIN) = 280	DISCHARGE (CFS) = 0.4
TIME (MIN) = 285	DISCHARGE (CFS) = 0.3
TIME (MIN) = 290	DISCHARGE (CFS) = 0.3
TIME (MIN) = 295	DISCHARGE (CFS) = 0.3
TIME (MIN) = 300	DISCHARGE (CFS) = 0.3
TIME (MIN) = 305	DISCHARGE (CFS) = 0.3
TIME (MIN) = 310	DISCHARGE (CFS) = 0.2
TIME (MIN) = 315	DISCHARGE (CFS) = 0.2
TIME (MIN) = 320	DISCHARGE (CFS) = 0.2
TIME (MIN) = 325	DISCHARGE (CFS) = 0.2
TIME (MIN) = 330	DISCHARGE (CFS) = 0.2
TIME (MIN) = 335	DISCHARGE (CFS) = 0.2
TIME (MIN) = 340	DISCHARGE (CFS) = 0.2
TIME (MIN) = 345	DISCHARGE (CFS) = 0.2
TIME (MIN) = 350	DISCHARGE (CFS) = 0.2
TIME (MIN) = 355	DISCHARGE (CFS) = 0.2
TIME (MIN) = 360	DISCHARGE (CFS) = 0.2

RATIONAL METHOD HYDROGRAPH PROGRAM

DMA4 25YR HYDROGRAPH

RUN DATE 8/5/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 1.8 INCHES
BASIN AREA 2 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 8.2 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 0.2
TIME (MIN) = 10	DISCHARGE (CFS) = 0.2
TIME (MIN) = 15	DISCHARGE (CFS) = 0.2
TIME (MIN) = 20	DISCHARGE (CFS) = 0.2
TIME (MIN) = 25	DISCHARGE (CFS) = 0.2
TIME (MIN) = 30	DISCHARGE (CFS) = 0.2
TIME (MIN) = 35	DISCHARGE (CFS) = 0.2
TIME (MIN) = 40	DISCHARGE (CFS) = 0.2
TIME (MIN) = 45	DISCHARGE (CFS) = 0.2
TIME (MIN) = 50	DISCHARGE (CFS) = 0.2
TIME (MIN) = 55	DISCHARGE (CFS) = 0.2
TIME (MIN) = 60	DISCHARGE (CFS) = 0.2
TIME (MIN) = 65	DISCHARGE (CFS) = 0.2
TIME (MIN) = 70	DISCHARGE (CFS) = 0.2
TIME (MIN) = 75	DISCHARGE (CFS) = 0.2
TIME (MIN) = 80	DISCHARGE (CFS) = 0.2
TIME (MIN) = 85	DISCHARGE (CFS) = 0.2
TIME (MIN) = 90	DISCHARGE (CFS) = 0.2
TIME (MIN) = 95	DISCHARGE (CFS) = 0.3
TIME (MIN) = 100	DISCHARGE (CFS) = 0.3
TIME (MIN) = 105	DISCHARGE (CFS) = 0.3
TIME (MIN) = 110	DISCHARGE (CFS) = 0.3
TIME (MIN) = 115	DISCHARGE (CFS) = 0.3
TIME (MIN) = 120	DISCHARGE (CFS) = 0.3
TIME (MIN) = 125	DISCHARGE (CFS) = 0.3
TIME (MIN) = 130	DISCHARGE (CFS) = 0.3
TIME (MIN) = 135	DISCHARGE (CFS) = 0.3
TIME (MIN) = 140	DISCHARGE (CFS) = 0.3
TIME (MIN) = 145	DISCHARGE (CFS) = 0.3
TIME (MIN) = 150	DISCHARGE (CFS) = 0.3
TIME (MIN) = 155	DISCHARGE (CFS) = 0.4
TIME (MIN) = 160	DISCHARGE (CFS) = 0.4
TIME (MIN) = 165	DISCHARGE (CFS) = 0.4
TIME (MIN) = 170	DISCHARGE (CFS) = 0.4
TIME (MIN) = 175	DISCHARGE (CFS) = 0.4
TIME (MIN) = 180	DISCHARGE (CFS) = 0.4
TIME (MIN) = 185	DISCHARGE (CFS) = 0.5
TIME (MIN) = 190	DISCHARGE (CFS) = 0.5
TIME (MIN) = 195	DISCHARGE (CFS) = 0.5
TIME (MIN) = 200	DISCHARGE (CFS) = 0.5
TIME (MIN) = 205	DISCHARGE (CFS) = 0.6
TIME (MIN) = 210	DISCHARGE (CFS) = 0.6
TIME (MIN) = 215	DISCHARGE (CFS) = 0.7
TIME (MIN) = 220	DISCHARGE (CFS) = 0.8
TIME (MIN) = 225	DISCHARGE (CFS) = 1
TIME (MIN) = 230	DISCHARGE (CFS) = 1.1
TIME (MIN) = 235	DISCHARGE (CFS) = 1.6
TIME (MIN) = 240	DISCHARGE (CFS) = 2.4
TIME (MIN) = 245	DISCHARGE (CFS) = 8.2
TIME (MIN) = 250	DISCHARGE (CFS) = 1.3
TIME (MIN) = 255	DISCHARGE (CFS) = 0.9
TIME (MIN) = 260	DISCHARGE (CFS) = 0.7
TIME (MIN) = 265	DISCHARGE (CFS) = 0.6
TIME (MIN) = 270	DISCHARGE (CFS) = 0.5
TIME (MIN) = 275	DISCHARGE (CFS) = 0.4
TIME (MIN) = 280	DISCHARGE (CFS) = 0.4
TIME (MIN) = 285	DISCHARGE (CFS) = 0.4
TIME (MIN) = 290	DISCHARGE (CFS) = 0.3
TIME (MIN) = 295	DISCHARGE (CFS) = 0.3
TIME (MIN) = 300	DISCHARGE (CFS) = 0.3
TIME (MIN) = 305	DISCHARGE (CFS) = 0.3
TIME (MIN) = 310	DISCHARGE (CFS) = 0.3
TIME (MIN) = 315	DISCHARGE (CFS) = 0.3
TIME (MIN) = 320	DISCHARGE (CFS) = 0.2
TIME (MIN) = 325	DISCHARGE (CFS) = 0.2
TIME (MIN) = 330	DISCHARGE (CFS) = 0.2
TIME (MIN) = 335	DISCHARGE (CFS) = 0.2
TIME (MIN) = 340	DISCHARGE (CFS) = 0.2
TIME (MIN) = 345	DISCHARGE (CFS) = 0.2
TIME (MIN) = 350	DISCHARGE (CFS) = 0.2
TIME (MIN) = 355	DISCHARGE (CFS) = 0.2
TIME (MIN) = 360	DISCHARGE (CFS) = 0.2

RATIONAL METHOD HYDROGRAPH PROGRAM

DMA4 50YR HYDROGRAPH

RUN DATE 8/5/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 2.1 INCHES
BASIN AREA 2 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 9.6 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 0.2
TIME (MIN) = 10	DISCHARGE (CFS) = 0.2
TIME (MIN) = 15	DISCHARGE (CFS) = 0.2
TIME (MIN) = 20	DISCHARGE (CFS) = 0.2
TIME (MIN) = 25	DISCHARGE (CFS) = 0.2
TIME (MIN) = 30	DISCHARGE (CFS) = 0.2
TIME (MIN) = 35	DISCHARGE (CFS) = 0.2
TIME (MIN) = 40	DISCHARGE (CFS) = 0.2
TIME (MIN) = 45	DISCHARGE (CFS) = 0.2
TIME (MIN) = 50	DISCHARGE (CFS) = 0.2
TIME (MIN) = 55	DISCHARGE (CFS) = 0.3
TIME (MIN) = 60	DISCHARGE (CFS) = 0.3
TIME (MIN) = 65	DISCHARGE (CFS) = 0.3
TIME (MIN) = 70	DISCHARGE (CFS) = 0.3
TIME (MIN) = 75	DISCHARGE (CFS) = 0.3
TIME (MIN) = 80	DISCHARGE (CFS) = 0.3
TIME (MIN) = 85	DISCHARGE (CFS) = 0.3
TIME (MIN) = 90	DISCHARGE (CFS) = 0.3
TIME (MIN) = 95	DISCHARGE (CFS) = 0.3
TIME (MIN) = 100	DISCHARGE (CFS) = 0.3
TIME (MIN) = 105	DISCHARGE (CFS) = 0.3
TIME (MIN) = 110	DISCHARGE (CFS) = 0.3
TIME (MIN) = 115	DISCHARGE (CFS) = 0.3
TIME (MIN) = 120	DISCHARGE (CFS) = 0.3
TIME (MIN) = 125	DISCHARGE (CFS) = 0.3
TIME (MIN) = 130	DISCHARGE (CFS) = 0.3
TIME (MIN) = 135	DISCHARGE (CFS) = 0.4
TIME (MIN) = 140	DISCHARGE (CFS) = 0.4
TIME (MIN) = 145	DISCHARGE (CFS) = 0.4
TIME (MIN) = 150	DISCHARGE (CFS) = 0.4
TIME (MIN) = 155	DISCHARGE (CFS) = 0.4
TIME (MIN) = 160	DISCHARGE (CFS) = 0.4
TIME (MIN) = 165	DISCHARGE (CFS) = 0.4
TIME (MIN) = 170	DISCHARGE (CFS) = 0.5
TIME (MIN) = 175	DISCHARGE (CFS) = 0.5
TIME (MIN) = 180	DISCHARGE (CFS) = 0.5
TIME (MIN) = 185	DISCHARGE (CFS) = 0.5
TIME (MIN) = 190	DISCHARGE (CFS) = 0.6
TIME (MIN) = 195	DISCHARGE (CFS) = 0.6
TIME (MIN) = 200	DISCHARGE (CFS) = 0.6
TIME (MIN) = 205	DISCHARGE (CFS) = 0.7
TIME (MIN) = 210	DISCHARGE (CFS) = 0.8
TIME (MIN) = 215	DISCHARGE (CFS) = 0.9
TIME (MIN) = 220	DISCHARGE (CFS) = 0.9
TIME (MIN) = 225	DISCHARGE (CFS) = 1.1
TIME (MIN) = 230	DISCHARGE (CFS) = 1.3
TIME (MIN) = 235	DISCHARGE (CFS) = 1.9
TIME (MIN) = 240	DISCHARGE (CFS) = 2.7
TIME (MIN) = 245	DISCHARGE (CFS) = 9.6
TIME (MIN) = 250	DISCHARGE (CFS) = 1.5
TIME (MIN) = 255	DISCHARGE (CFS) = 1
TIME (MIN) = 260	DISCHARGE (CFS) = 0.8
TIME (MIN) = 265	DISCHARGE (CFS) = 0.7
TIME (MIN) = 270	DISCHARGE (CFS) = 0.6
TIME (MIN) = 275	DISCHARGE (CFS) = 0.5
TIME (MIN) = 280	DISCHARGE (CFS) = 0.5
TIME (MIN) = 285	DISCHARGE (CFS) = 0.4
TIME (MIN) = 290	DISCHARGE (CFS) = 0.4
TIME (MIN) = 295	DISCHARGE (CFS) = 0.4
TIME (MIN) = 300	DISCHARGE (CFS) = 0.4
TIME (MIN) = 305	DISCHARGE (CFS) = 0.3
TIME (MIN) = 310	DISCHARGE (CFS) = 0.3
TIME (MIN) = 315	DISCHARGE (CFS) = 0.3
TIME (MIN) = 320	DISCHARGE (CFS) = 0.3
TIME (MIN) = 325	DISCHARGE (CFS) = 0.3
TIME (MIN) = 330	DISCHARGE (CFS) = 0.3
TIME (MIN) = 335	DISCHARGE (CFS) = 0.3
TIME (MIN) = 340	DISCHARGE (CFS) = 0.3
TIME (MIN) = 345	DISCHARGE (CFS) = 0.2
TIME (MIN) = 350	DISCHARGE (CFS) = 0.2
TIME (MIN) = 355	DISCHARGE (CFS) = 0.2
TIME (MIN) = 360	DISCHARGE (CFS) = 0.2

RATIONAL METHOD HYDROGRAPH PROGRAM

DMA4 100YR HYDROGRAPH

RUN DATE 8/5/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 2.3 INCHES
BASIN AREA 2 ACRES
RUNOFF COEFFICIENT 0.87
PEAK DISCHARGE 10.5 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 5	DISCHARGE (CFS) = 0.2
TIME (MIN) = 10	DISCHARGE (CFS) = 0.2
TIME (MIN) = 15	DISCHARGE (CFS) = 0.2
TIME (MIN) = 20	DISCHARGE (CFS) = 0.2
TIME (MIN) = 25	DISCHARGE (CFS) = 0.3
TIME (MIN) = 30	DISCHARGE (CFS) = 0.3
TIME (MIN) = 35	DISCHARGE (CFS) = 0.3
TIME (MIN) = 40	DISCHARGE (CFS) = 0.3
TIME (MIN) = 45	DISCHARGE (CFS) = 0.3
TIME (MIN) = 50	DISCHARGE (CFS) = 0.3
TIME (MIN) = 55	DISCHARGE (CFS) = 0.3
TIME (MIN) = 60	DISCHARGE (CFS) = 0.3
TIME (MIN) = 65	DISCHARGE (CFS) = 0.3
TIME (MIN) = 70	DISCHARGE (CFS) = 0.3
TIME (MIN) = 75	DISCHARGE (CFS) = 0.3
TIME (MIN) = 80	DISCHARGE (CFS) = 0.3
TIME (MIN) = 85	DISCHARGE (CFS) = 0.3
TIME (MIN) = 90	DISCHARGE (CFS) = 0.3
TIME (MIN) = 95	DISCHARGE (CFS) = 0.3
TIME (MIN) = 100	DISCHARGE (CFS) = 0.3
TIME (MIN) = 105	DISCHARGE (CFS) = 0.3
TIME (MIN) = 110	DISCHARGE (CFS) = 0.3
TIME (MIN) = 115	DISCHARGE (CFS) = 0.4
TIME (MIN) = 120	DISCHARGE (CFS) = 0.4
TIME (MIN) = 125	DISCHARGE (CFS) = 0.4
TIME (MIN) = 130	DISCHARGE (CFS) = 0.4
TIME (MIN) = 135	DISCHARGE (CFS) = 0.4
TIME (MIN) = 140	DISCHARGE (CFS) = 0.4
TIME (MIN) = 145	DISCHARGE (CFS) = 0.4
TIME (MIN) = 150	DISCHARGE (CFS) = 0.4
TIME (MIN) = 155	DISCHARGE (CFS) = 0.5
TIME (MIN) = 160	DISCHARGE (CFS) = 0.5
TIME (MIN) = 165	DISCHARGE (CFS) = 0.5
TIME (MIN) = 170	DISCHARGE (CFS) = 0.5
TIME (MIN) = 175	DISCHARGE (CFS) = 0.5
TIME (MIN) = 180	DISCHARGE (CFS) = 0.6
TIME (MIN) = 185	DISCHARGE (CFS) = 0.6
TIME (MIN) = 190	DISCHARGE (CFS) = 0.6
TIME (MIN) = 195	DISCHARGE (CFS) = 0.7
TIME (MIN) = 200	DISCHARGE (CFS) = 0.7
TIME (MIN) = 205	DISCHARGE (CFS) = 0.8
TIME (MIN) = 210	DISCHARGE (CFS) = 0.8
TIME (MIN) = 215	DISCHARGE (CFS) = 0.9
TIME (MIN) = 220	DISCHARGE (CFS) = 1
TIME (MIN) = 225	DISCHARGE (CFS) = 1.2
TIME (MIN) = 230	DISCHARGE (CFS) = 1.4
TIME (MIN) = 235	DISCHARGE (CFS) = 2.1
TIME (MIN) = 240	DISCHARGE (CFS) = 3
TIME (MIN) = 245	DISCHARGE (CFS) = 10.5
TIME (MIN) = 250	DISCHARGE (CFS) = 1.7
TIME (MIN) = 255	DISCHARGE (CFS) = 1.1
TIME (MIN) = 260	DISCHARGE (CFS) = 0.9
TIME (MIN) = 265	DISCHARGE (CFS) = 0.7
TIME (MIN) = 270	DISCHARGE (CFS) = 0.6
TIME (MIN) = 275	DISCHARGE (CFS) = 0.6
TIME (MIN) = 280	DISCHARGE (CFS) = 0.5
TIME (MIN) = 285	DISCHARGE (CFS) = 0.5
TIME (MIN) = 290	DISCHARGE (CFS) = 0.4
TIME (MIN) = 295	DISCHARGE (CFS) = 0.4
TIME (MIN) = 300	DISCHARGE (CFS) = 0.4
TIME (MIN) = 305	DISCHARGE (CFS) = 0.4
TIME (MIN) = 310	DISCHARGE (CFS) = 0.3
TIME (MIN) = 315	DISCHARGE (CFS) = 0.3
TIME (MIN) = 320	DISCHARGE (CFS) = 0.3
TIME (MIN) = 325	DISCHARGE (CFS) = 0.3
TIME (MIN) = 330	DISCHARGE (CFS) = 0.3
TIME (MIN) = 335	DISCHARGE (CFS) = 0.3
TIME (MIN) = 340	DISCHARGE (CFS) = 0.3
TIME (MIN) = 345	DISCHARGE (CFS) = 0.3
TIME (MIN) = 350	DISCHARGE (CFS) = 0.3
TIME (MIN) = 355	DISCHARGE (CFS) = 0.2
TIME (MIN) = 360	DISCHARGE (CFS) = 0.2

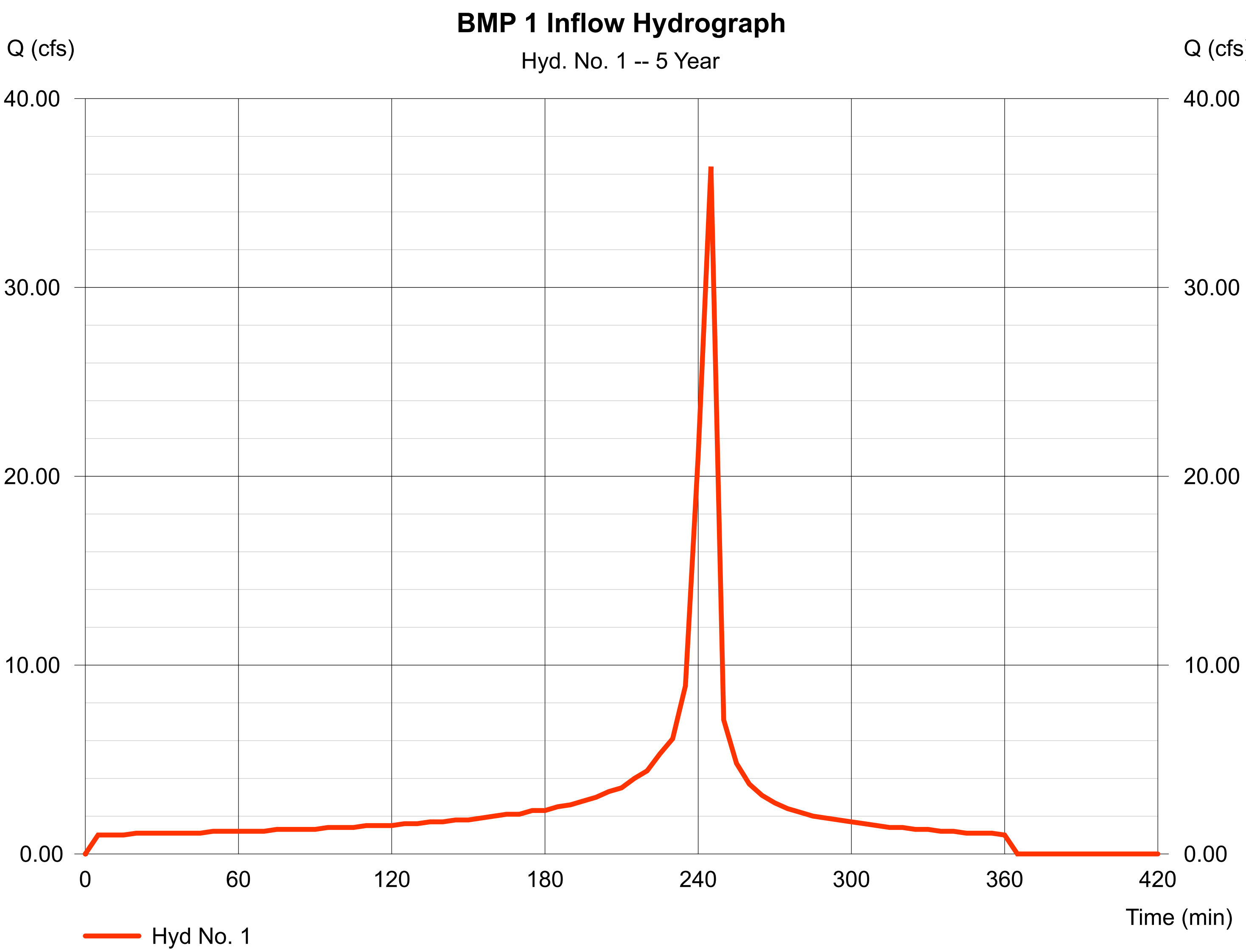
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 1

BMP 1 Inflow Hydrograph

Hydrograph type	= Manual	Peak discharge	= 36.40 cfs
Storm frequency	= 5 yrs	Time to peak	= 245 min
Time interval	= 5 min	Hyd. volume	= 61,470 cuft



Hydrograph Report

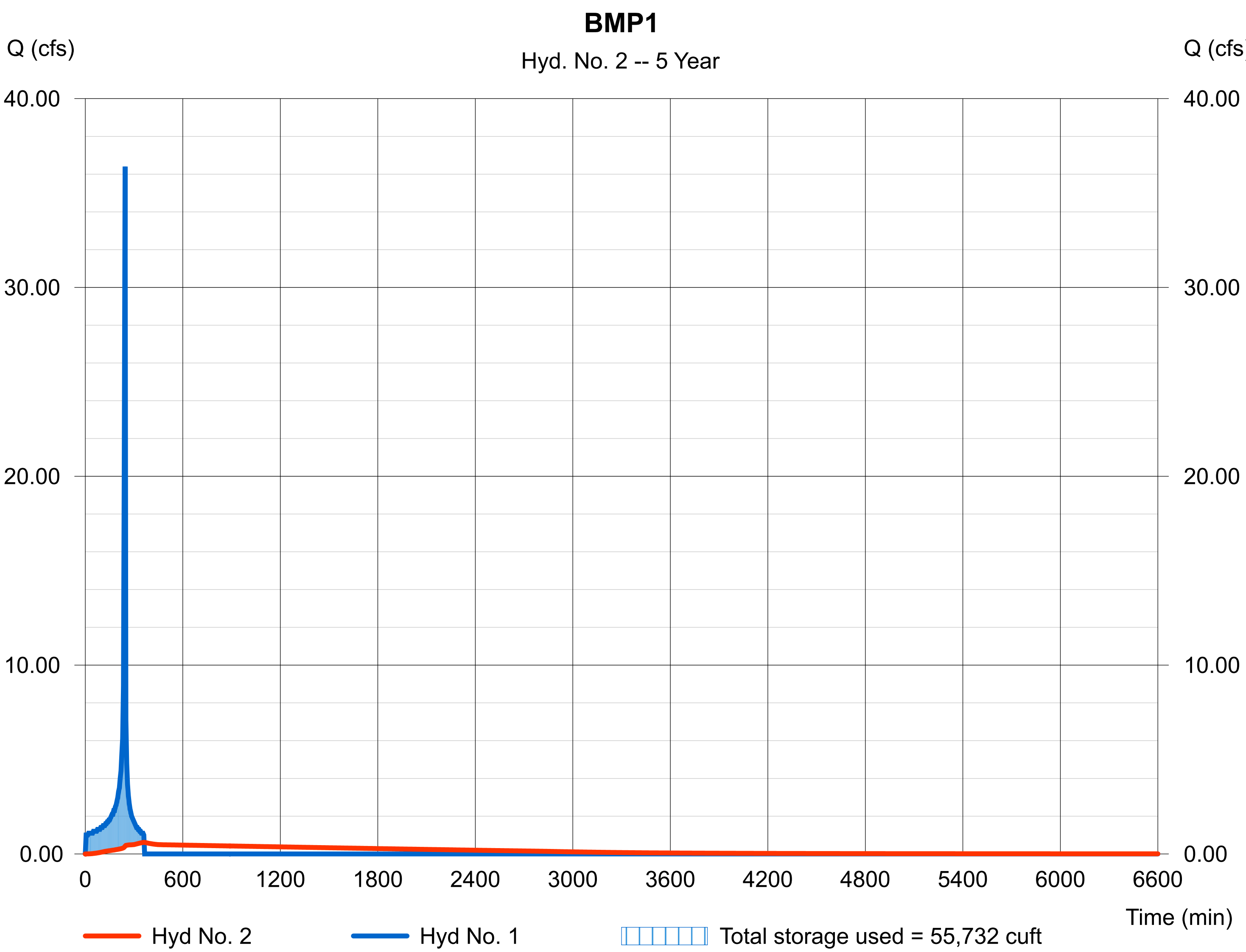
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 | Wednesday, 12 / 7 / 2022

Hyd. No. 2

BMP1

Hydrograph type	= Reservoir	Peak discharge	= 0.616 cfs
Storm frequency	= 5 yrs	Time to peak	= 360 min
Time interval	= 5 min	Hyd. volume	= 61,029 cuft
Inflow hyd. No.	= 1 - BMP 1 Inflow Hydrograph	Max. Elevation	= 475.21 ft
Reservoir name	= BMP 1	Max. Storage	= 55,732 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - BMP 1

Pond Data

UG Chambers -Invert elev. = 473.25 ft, Rise x Span = 3.00 x 100.00 ft, Barrel Len = 285.00 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	473.25	n/a	0	0
0.30	473.55	n/a	8,551	8,551
0.60	473.85	n/a	8,552	17,104
0.90	474.15	n/a	8,551	25,655
1.20	474.45	n/a	8,552	34,207
1.50	474.75	n/a	8,551	42,759
1.80	475.05	n/a	8,551	51,310
2.10	475.35	n/a	8,552	59,862
2.40	475.65	n/a	8,551	68,414
2.70	475.95	n/a	8,552	76,966
3.00	476.25	n/a	8,551	85,517

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	3.90	6.00	0.00
Span (in)	= 12.00	3.90	12.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 473.25	473.25	475.10	0.00
Length (ft)	= 0.00	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	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	0.00	0.00	0.00
Crest El. (ft)	= 475.75	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	473.25	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.03	855	473.28	0.00 ic	0.00 ic	0.00	---	0.00	---	---	---	---	---	0.002
0.06	1,710	473.31	0.01 ic	0.01 ic	0.00	---	0.00	---	---	---	---	---	0.007
0.09	2,565	473.34	0.02 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.016
0.12	3,421	473.37	0.03 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.028
0.15	4,276	473.40	0.04 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.043
0.18	5,131	473.43	0.06 ic	0.06 ic	0.00	---	0.00	---	---	---	---	---	0.058
0.21	5,986	473.46	0.08 ic	0.08 ic	0.00	---	0.00	---	---	---	---	---	0.077
0.24	6,841	473.49	0.10 ic	0.10 ic	0.00	---	0.00	---	---	---	---	---	0.097
0.27	7,696	473.52	0.12 ic	0.12 ic	0.00	---	0.00	---	---	---	---	---	0.116
0.30	8,551	473.55	0.14 ic	0.14 ic	0.00	---	0.00	---	---	---	---	---	0.136
0.33	9,407	473.58	0.16 ic	0.15 ic	0.00	---	0.00	---	---	---	---	---	0.151
0.36	10,262	473.61	0.17 ic	0.16 ic	0.00	---	0.00	---	---	---	---	---	0.163
0.39	11,117	473.64	0.18 ic	0.17 ic	0.00	---	0.00	---	---	---	---	---	0.174
0.42	11,972	473.67	0.19 ic	0.18 ic	0.00	---	0.00	---	---	---	---	---	0.185
0.45	12,827	473.70	0.20 ic	0.19 ic	0.00	---	0.00	---	---	---	---	---	0.195
0.48	13,683	473.73	0.21 ic	0.20 ic	0.00	---	0.00	---	---	---	---	---	0.204
0.51	14,538	473.76	0.21 ic	0.21 ic	0.00	---	0.00	---	---	---	---	---	0.214
0.54	15,393	473.79	0.22 ic	0.22 ic	0.00	---	0.00	---	---	---	---	---	0.224
0.57	16,248	473.82	0.24 ic	0.23 ic	0.00	---	0.00	---	---	---	---	---	0.232
0.60	17,104	473.85	0.25 ic	0.24 ic	0.00	---	0.00	---	---	---	---	---	0.240
0.63	17,959	473.88	0.25 ic	0.25 ic	0.00	---	0.00	---	---	---	---	---	0.249
0.66	18,814	473.91	0.26 ic	0.26 ic	0.00	---	0.00	---	---	---	---	---	0.257
0.69	19,669	473.94	0.26 ic	0.26 ic	0.00	---	0.00	---	---	---	---	---	0.265
0.72	20,524	473.97	0.28 ic	0.27 ic	0.00	---	0.00	---	---	---	---	---	0.273
0.75	21,379	474.00	0.28 ic	0.28 ic	0.00	---	0.00	---	---	---	---	---	0.280
0.78	22,234	474.03	0.29 ic	0.29 ic	0.00	---	0.00	---	---	---	---	---	0.288
0.81	23,090	474.06	0.31 ic	0.29 ic	0.00	---	0.00	---	---	---	---	---	0.295
0.84	23,945	474.09	0.31 ic	0.30 ic	0.00	---	0.00	---	---	---	---	---	0.303
0.87	24,800	474.12	0.31 ic	0.31 ic	0.00	---	0.00	---	---	---	---	---	0.309
0.90	25,655	474.15	0.32 ic	0.32 ic	0.00	---	0.00	---	---	---	---	---	0.316
0.93	26,510	474.18	0.32 ic	0.32 ic	0.00	---	0.00	---	---	---	---	---	0.323

Continues on next page...

BMP 1

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
0.96	27,365	474.21	0.34 ic	0.33 ic	0.00	---	0.00	---	---	---	---	---	0.329
0.99	28,221	474.24	0.34 ic	0.34 ic	0.00	---	0.00	---	---	---	---	---	0.336
1.02	29,076	474.27	0.35 ic	0.34 ic	0.00	---	0.00	---	---	---	---	---	0.342
1.05	29,931	474.30	0.35 ic	0.35 ic	0.00	---	0.00	---	---	---	---	---	0.349
1.08	30,786	474.33	0.35 ic	0.35 ic	0.00	---	0.00	---	---	---	---	---	0.355
1.11	31,642	474.36	0.37 ic	0.36 ic	0.00	---	0.00	---	---	---	---	---	0.361
1.14	32,497	474.39	0.37 ic	0.37 ic	0.00	---	0.00	---	---	---	---	---	0.367
1.17	33,352	474.42	0.37 ic	0.37 ic	0.00	---	0.00	---	---	---	---	---	0.372
1.20	34,207	474.45	0.39 ic	0.38 ic	0.00	---	0.00	---	---	---	---	---	0.379
1.23	35,062	474.48	0.39 ic	0.38 ic	0.00	---	0.00	---	---	---	---	---	0.385
1.26	35,917	474.51	0.39 ic	0.39 ic	0.00	---	0.00	---	---	---	---	---	0.390
1.29	36,773	474.54	0.40 ic	0.40 ic	0.00	---	0.00	---	---	---	---	---	0.396
1.32	37,628	474.57	0.40 ic	0.40 ic	0.00	---	0.00	---	---	---	---	---	0.402
1.35	38,483	474.60	0.41 ic	0.41 ic	0.00	---	0.00	---	---	---	---	---	0.406
1.38	39,338	474.63	0.42 ic	0.41 ic	0.00	---	0.00	---	---	---	---	---	0.412
1.41	40,193	474.66	0.42 ic	0.42 ic	0.00	---	0.00	---	---	---	---	---	0.418
1.44	41,048	474.69	0.42 ic	0.42 ic	0.00	---	0.00	---	---	---	---	---	0.423
1.47	41,903	474.72	0.44 ic	0.43 ic	0.00	---	0.00	---	---	---	---	---	0.428
1.50	42,759	474.75	0.44 ic	0.43 ic	0.00	---	0.00	---	---	---	---	---	0.433
1.53	43,614	474.78	0.44 ic	0.44 ic	0.00	---	0.00	---	---	---	---	---	0.439
1.56	44,469	474.81	0.44 ic	0.44 ic	0.00	---	0.00	---	---	---	---	---	0.443
1.59	45,324	474.84	0.46 ic	0.45 ic	0.00	---	0.00	---	---	---	---	---	0.448
1.62	46,179	474.87	0.46 ic	0.45 ic	0.00	---	0.00	---	---	---	---	---	0.453
1.65	47,034	474.90	0.46 ic	0.46 ic	0.00	---	0.00	---	---	---	---	---	0.458
1.68	47,889	474.93	0.48 ic	0.46 ic	0.00	---	0.00	---	---	---	---	---	0.463
1.71	48,745	474.96	0.48 ic	0.47 ic	0.00	---	0.00	---	---	---	---	---	0.468
1.74	49,600	474.99	0.48 ic	0.47 ic	0.00	---	0.00	---	---	---	---	---	0.473
1.77	50,455	475.02	0.48 ic	0.48 ic	0.00	---	0.00	---	---	---	---	---	0.478
1.80	51,310	475.05	0.50 ic	0.48 ic	0.00	---	0.00	---	---	---	---	---	0.482
1.83	52,165	475.08	0.50 ic	0.49 ic	0.00	---	0.00	---	---	---	---	---	0.487
1.86	53,020	475.11	0.50 ic	0.49 ic	0.00 ic	---	0.00	---	---	---	---	---	0.495
1.89	53,876	475.14	0.52 ic	0.49 ic	0.03 ic	---	0.00	---	---	---	---	---	0.521
1.92	54,731	475.17	0.56 ic	0.50 ic	0.06 ic	---	0.00	---	---	---	---	---	0.560
1.95	55,586	475.20	0.62 ic	0.50 ic	0.11 ic	---	0.00	---	---	---	---	---	0.606
1.98	56,441	475.23	0.67 ic	0.50 ic	0.16 ic	---	0.00	---	---	---	---	---	0.661
2.01	57,296	475.26	0.74 ic	0.50 ic	0.22 ic	---	0.00	---	---	---	---	---	0.720
2.04	58,152	475.29	0.79 ic	0.50 ic	0.28 ic	---	0.00	---	---	---	---	---	0.786
2.07	59,007	475.32	0.86 ic	0.51 ic	0.35 ic	---	0.00	---	---	---	---	---	0.857
2.10	59,862	475.35	0.94 ic	0.51 ic	0.43 ic	---	0.00	---	---	---	---	---	0.932
2.13	60,717	475.38	1.02 ic	0.51 ic	0.50 ic	---	0.00	---	---	---	---	---	1.012
2.16	61,572	475.41	1.10 ic	0.51 ic	0.59 ic	---	0.00	---	---	---	---	---	1.096
2.19	62,428	475.44	1.18 ic	0.51 ic	0.67 ic	---	0.00	---	---	---	---	---	1.184
2.22	63,283	475.47	1.29 ic	0.51 ic	0.77 ic	---	0.00	---	---	---	---	---	1.276
2.25	64,138	475.50	1.38 ic	0.51 ic	0.86 ic	---	0.00	---	---	---	---	---	1.372
2.28	64,993	475.53	1.47 ic	0.51 ic	0.96 ic	---	0.00	---	---	---	---	---	1.471
2.31	65,848	475.56	1.58 ic	0.51 ic	1.06 ic	---	0.00	---	---	---	---	---	1.574
2.34	66,703	475.59	1.69 ic	0.51 ic	1.17 ic	---	0.00	---	---	---	---	---	1.679
2.37	67,558	475.62	1.77 ic	0.51 ic	1.25 ic	---	0.00	---	---	---	---	---	1.764
2.40	68,414	475.65	1.85 ic	0.51 ic	1.32 ic	---	0.00	---	---	---	---	---	1.833
2.43	69,269	475.68	1.90 ic	0.52 ic	1.38 ic	---	0.00	---	---	---	---	---	1.900
2.46	70,124	475.71	1.97 ic	0.52 ic	1.44 ic	---	0.00	---	---	---	---	---	1.963
2.49	70,979	475.74	2.02 ic	0.52 ic	1.50 ic	---	0.00	---	---	---	---	---	2.024
2.52	71,834	475.77	2.12 ic	0.52 ic	1.56 ic	---	0.04	---	---	---	---	---	2.119
2.55	72,690	475.80	2.28 ic	0.52 ic	1.61 ic	---	0.15	---	---	---	---	---	2.283
2.58	73,545	475.83	2.48 ic	0.51 ic	1.67 ic	---	0.30	---	---	---	---	---	2.483
2.61	74,400	475.86	2.71 ic	0.50 ic	1.72 ic	---	0.49	---	---	---	---	---	2.710
2.64	75,255	475.89	2.96 ic	0.49 ic	1.77 ic	---	0.70	---	---	---	---	---	2.960
2.67	76,110	475.92	3.23 ic	0.48 ic	1.82 ic	---	0.93	---	---	---	---	---	3.230
2.70	76,966	475.95	3.52 ic	0.46 ic	1.86 ic	---	1.19	---	---	---	---	---	3.518
2.73	77,821	475.98	3.82 ic	0.44 ic	1.91 ic	---	1.47	---	---	---	---	---	3.820
2.76	78,676	476.01	4.13 ic	0.41 ic	1.96 ic	---	1.77	---	---	---	---	---	4.134
2.79	79,531	476.04	4.46 ic	0.38 ic	2.00 ic	---	2.08	---	---	---	---	---	4.459
2.82	80,386	476.07	4.79 ic	0.34 ic	2.04 ic	---	2.41	---	---	---	---	---	4.788
2.85	81,241	476.10	4.97 ic	0.31 ic	1.90 ic	---	2.76	---	---	---	---	---	4.971
2.88	82,097	476.13	5.15 ic	0.29 ic	1.74 ic	---	3.12	---	---	---	---	---	5.151
2.91	82,952	476.16	5.33 ic	0.26 ic	1.57 ic	---	3.50	---	---	---	---	---	5.327
2.94	83,807	476.19	5.45 ic	0.24 ic	1.44 ic	---	3.77 s	---	---	---	---	---	5.453
2.97	84,662	476.22	5.55 ic	0.22 ic	1.36 ic	---	3.97 s	---	---	---	---	---	5.548
3.00	85,517	476.25	5.63 ic	0.21 ic	1.28 ic	---	4.14 s	---	---	---	---	---	5.630

...End

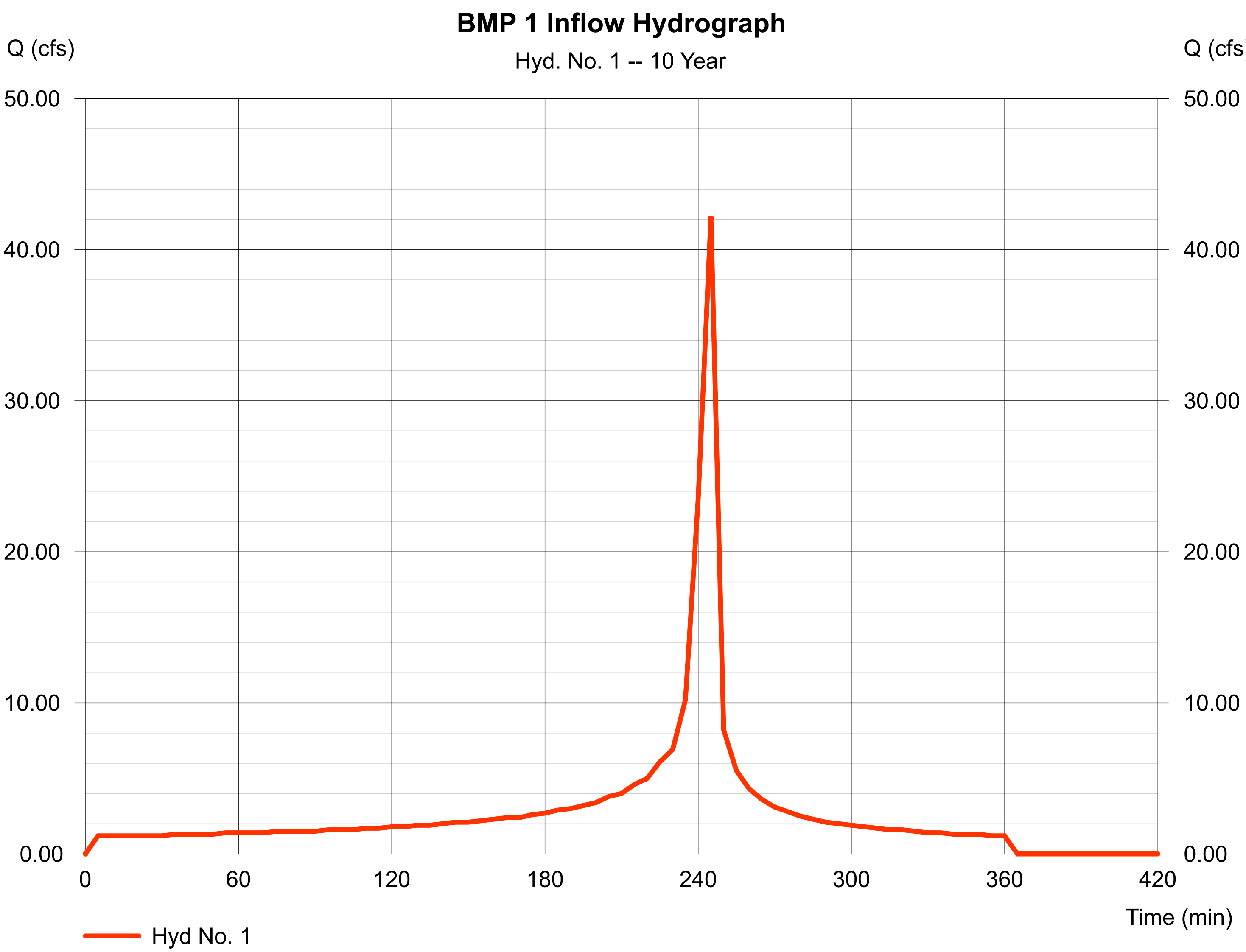
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 12 / 7 / 2022

Hyd. No. 1

BMP 1 Inflow Hydrograph

Hydrograph type	= Manual	Peak discharge	= 42.20 cfs
Storm frequency	= 10 yrs	Time to peak	= 245 min
Time interval	= 5 min	Hyd. volume	= 70,440 cuft



Hydrograph Report

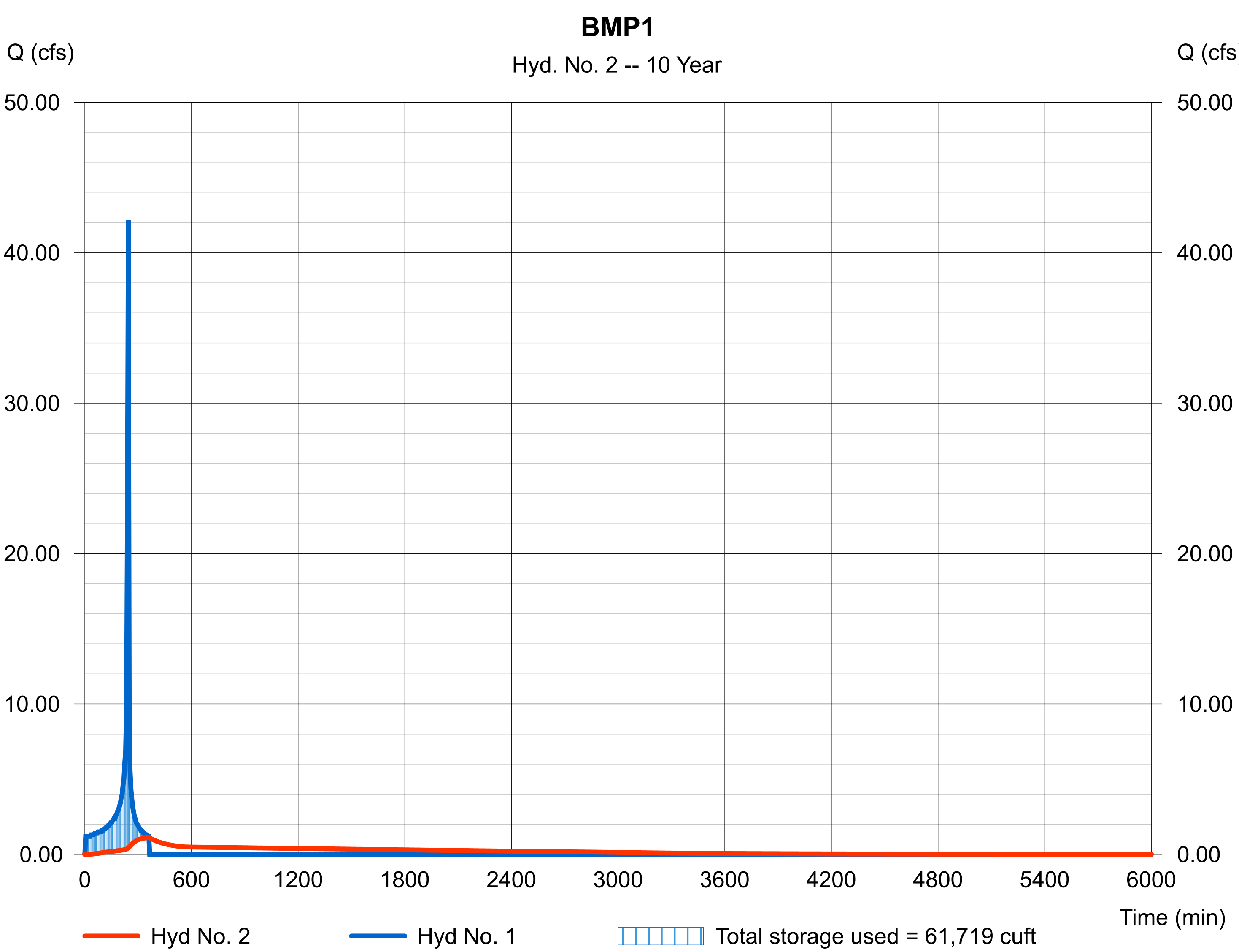
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 | Wednesday, 12 / 7 / 2022

Hyd. No. 2

BMP1

Hydrograph type	= Reservoir	Peak discharge	= 1.111 cfs
Storm frequency	= 10 yrs	Time to peak	= 360 min
Time interval	= 5 min	Hyd. volume	= 69,992 cuft
Inflow hyd. No.	= 1 - BMP 1 Inflow Hydrograph	Max. Elevation	= 475.42 ft
Reservoir name	= BMP 1	Max. Storage	= 61,719 cuft

Storage Indication method used.



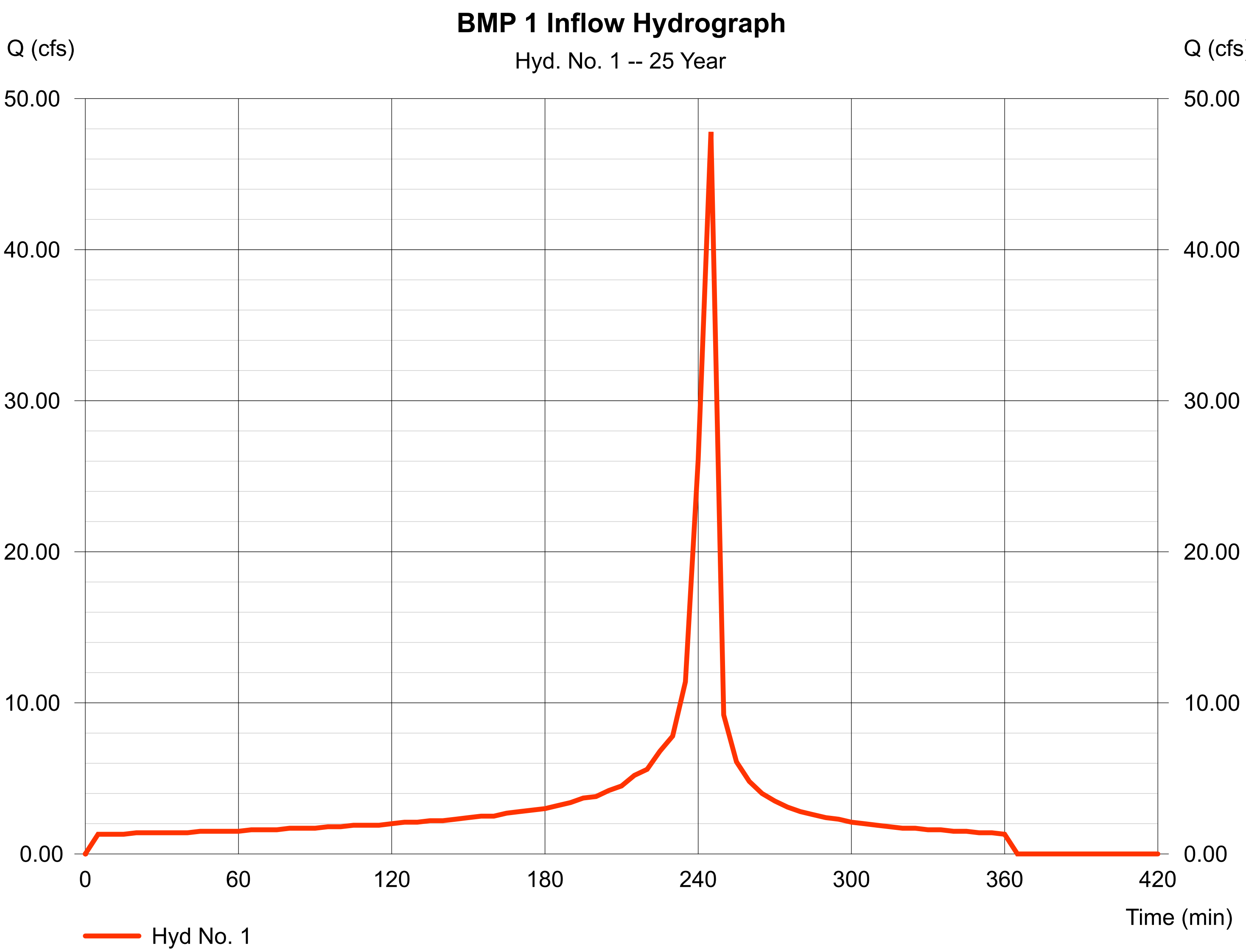
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 1

BMP 1 Inflow Hydrograph

Hydrograph type	= Manual	Peak discharge	= 47.80 cfs
Storm frequency	= 25 yrs	Time to peak	= 245 min
Time interval	= 5 min	Hyd. volume	= 79,080 cuft



Hydrograph Report

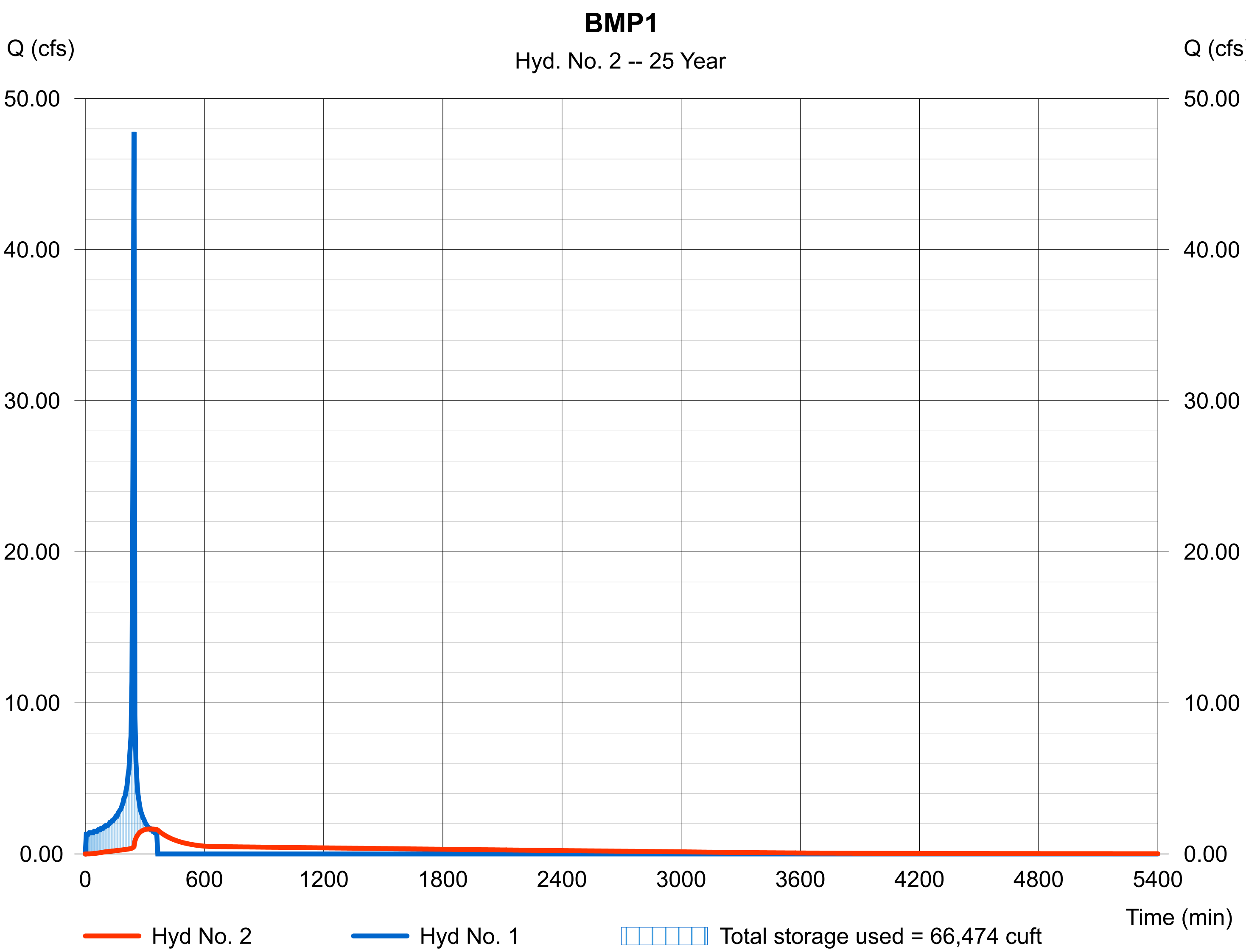
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 2

BMP1

Hydrograph type	= Reservoir	Peak discharge	= 1.651 cfs
Storm frequency	= 25 yrs	Time to peak	= 325 min
Time interval	= 5 min	Hyd. volume	= 78,628 cuft
Inflow hyd. No.	= 1 - BMP 1 Inflow Hydrograph	Max. Elevation	= 475.58 ft
Reservoir name	= BMP 1	Max. Storage	= 66,474 cuft

Storage Indication method used.



Hydrograph Report

Q25 analyzed with Q100 main channel TW 476.0

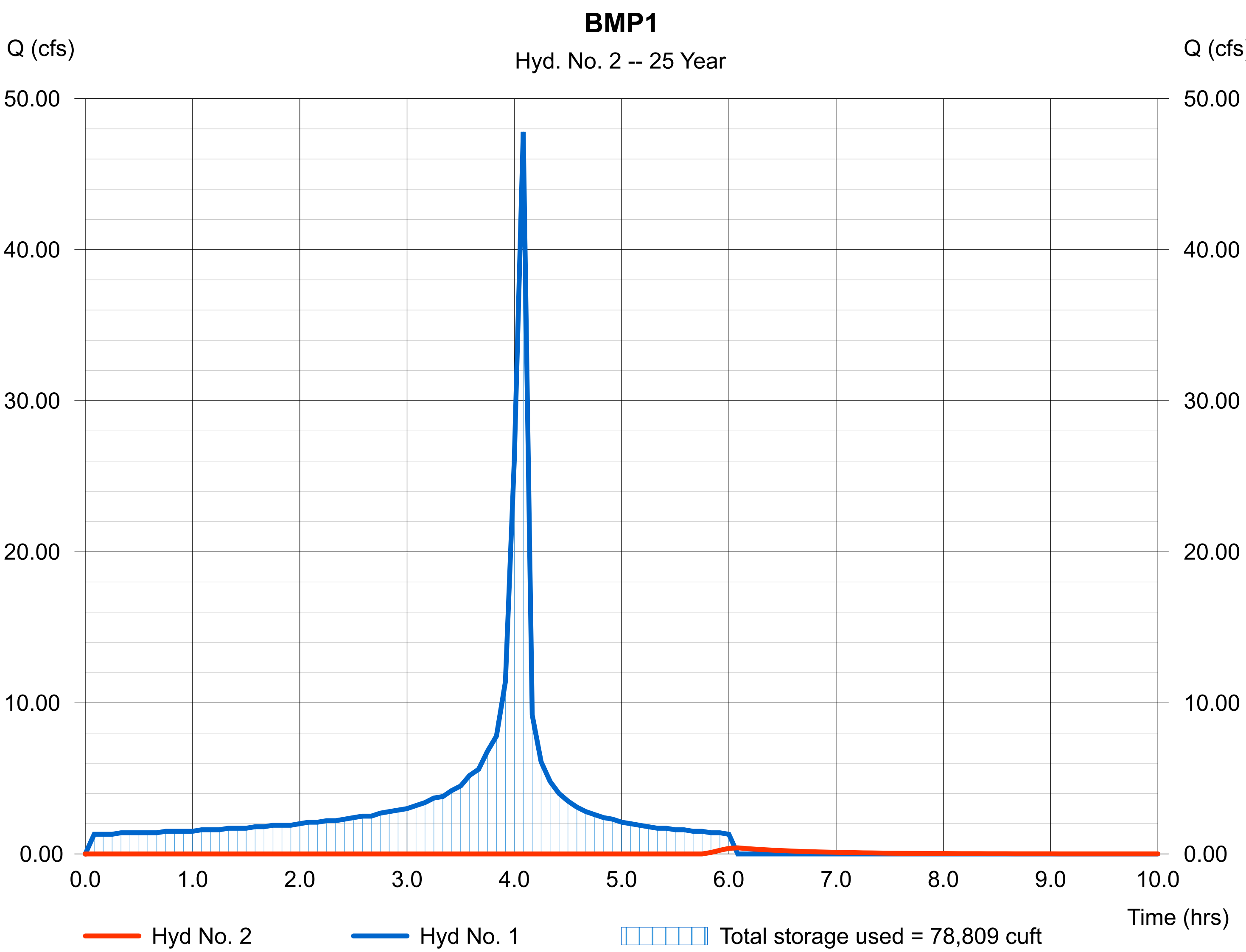
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 2

BMP1

Hydrograph type	= Reservoir	Peak discharge	= 0.402 cfs
Storm frequency	= 25 yrs	Time to peak	= 6.08 hrs
Time interval	= 5 min	Hyd. volume	= 1,257 cuft
Inflow hyd. No.	= 1 - BMP 1 Inflow Hydrograph	Max. Elevation	= 476.01 ft
Reservoir name	= BMP 1	Max. Storage	= 78,809 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Pond No. 1 - BMP 1

Pond Data

UG Chambers -Invert elev. = 473.25 ft, Rise x Span = 3.00 x 100.00 ft, Barrel Len = 285.00 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	473.25	n/a	0	0
0.30	473.55	n/a	8,551	8,551
0.60	473.85	n/a	8,552	17,104
0.90	474.15	n/a	8,551	25,655
1.20	474.45	n/a	8,552	34,207
1.50	474.75	n/a	8,551	42,759
1.80	475.05	n/a	8,551	51,310
2.10	475.35	n/a	8,552	59,862
2.40	475.65	n/a	8,551	68,414
2.70	475.95	n/a	8,552	76,966
3.00	476.25	n/a	8,551	85,517

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	3.90	6.00	0.00
Span (in)	= 12.00	3.90	12.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 473.25	473.25	475.10	0.00
Length (ft)	= 0.00	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	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	0.00	0.00	0.00
Crest El. (ft)	= 475.75	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) = 476.00

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	473.25	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.03	855	473.28	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.06	1,710	473.31	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.09	2,565	473.34	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.12	3,421	473.37	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.15	4,276	473.40	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.18	5,131	473.43	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.21	5,986	473.46	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.24	6,841	473.49	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.27	7,696	473.52	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.30	8,551	473.55	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.33	9,407	473.58	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.36	10,262	473.61	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.39	11,117	473.64	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.42	11,972	473.67	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.45	12,827	473.70	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.48	13,683	473.73	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.51	14,538	473.76	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.54	15,393	473.79	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.57	16,248	473.82	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.60	17,104	473.85	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.63	17,959	473.88	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.66	18,814	473.91	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.69	19,669	473.94	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.72	20,524	473.97	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.75	21,379	474.00	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.78	22,234	474.03	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.81	23,090	474.06	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.84	23,945	474.09	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.87	24,800	474.12	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.90	25,655	474.15	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.93	26,510	474.18	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000

Continues on next page...

BMP 1

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
0.96	27,365	474.21	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.99	28,221	474.24	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.02	29,076	474.27	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.05	29,931	474.30	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.08	30,786	474.33	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.11	31,642	474.36	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.14	32,497	474.39	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.17	33,352	474.42	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.20	34,207	474.45	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.23	35,062	474.48	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.26	35,917	474.51	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.29	36,773	474.54	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.32	37,628	474.57	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.35	38,483	474.60	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.38	39,338	474.63	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.41	40,193	474.66	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.44	41,048	474.69	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.47	41,903	474.72	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.50	42,759	474.75	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.53	43,614	474.78	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.56	44,469	474.81	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.59	45,324	474.84	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.62	46,179	474.87	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.65	47,034	474.90	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.68	47,889	474.93	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.71	48,745	474.96	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.74	49,600	474.99	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.77	50,455	475.02	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.80	51,310	475.05	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.83	52,165	475.08	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.86	53,020	475.11	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.89	53,876	475.14	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.92	54,731	475.17	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.95	55,586	475.20	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.98	56,441	475.23	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.01	57,296	475.26	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.04	58,152	475.29	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.07	59,007	475.32	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.10	59,862	475.35	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.13	60,717	475.38	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.16	61,572	475.41	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.19	62,428	475.44	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.22	63,283	475.47	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.25	64,138	475.50	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.28	64,993	475.53	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.31	65,848	475.56	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.34	66,703	475.59	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.37	67,558	475.62	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.40	68,414	475.65	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.43	69,269	475.68	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.46	70,124	475.71	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.49	70,979	475.74	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.52	71,834	475.77	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.55	72,690	475.80	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.58	73,545	475.83	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.61	74,400	475.86	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.64	75,255	475.89	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.67	76,110	475.92	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.70	76,966	475.95	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.73	77,821	475.98	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.76	78,676	476.01	0.36 ic	0.01 ic	0.08 ic	---	0.25 s	---	---	---	---	---	0.347
2.79	79,531	476.04	0.71 ic	0.03 ic	0.17 ic	---	0.51 s	---	---	---	---	---	0.703
2.82	80,386	476.07	0.94 ic	0.04 ic	0.22 ic	---	0.68 s	---	---	---	---	---	0.937
2.85	81,241	476.10	1.13 ic	0.04 ic	0.25 ic	---	0.84 s	---	---	---	---	---	1.127
2.88	82,097	476.13	1.30 ic	0.04 ic	0.27 ic	---	0.98 s	---	---	---	---	---	1.293
2.91	82,952	476.16	1.44 ic	0.05 ic	0.28 ic	---	1.11 s	---	---	---	---	---	1.441
2.94	83,807	476.19	1.58 ic	0.05 ic	0.30 ic	---	1.24 s	---	---	---	---	---	1.581
2.97	84,662	476.22	1.71 ic	0.05 ic	0.30 ic	---	1.35 s	---	---	---	---	---	1.706
3.00	85,517	476.25	1.83 ic	0.05 ic	0.31 ic	---	1.47 s	---	---	---	---	---	1.827

...End

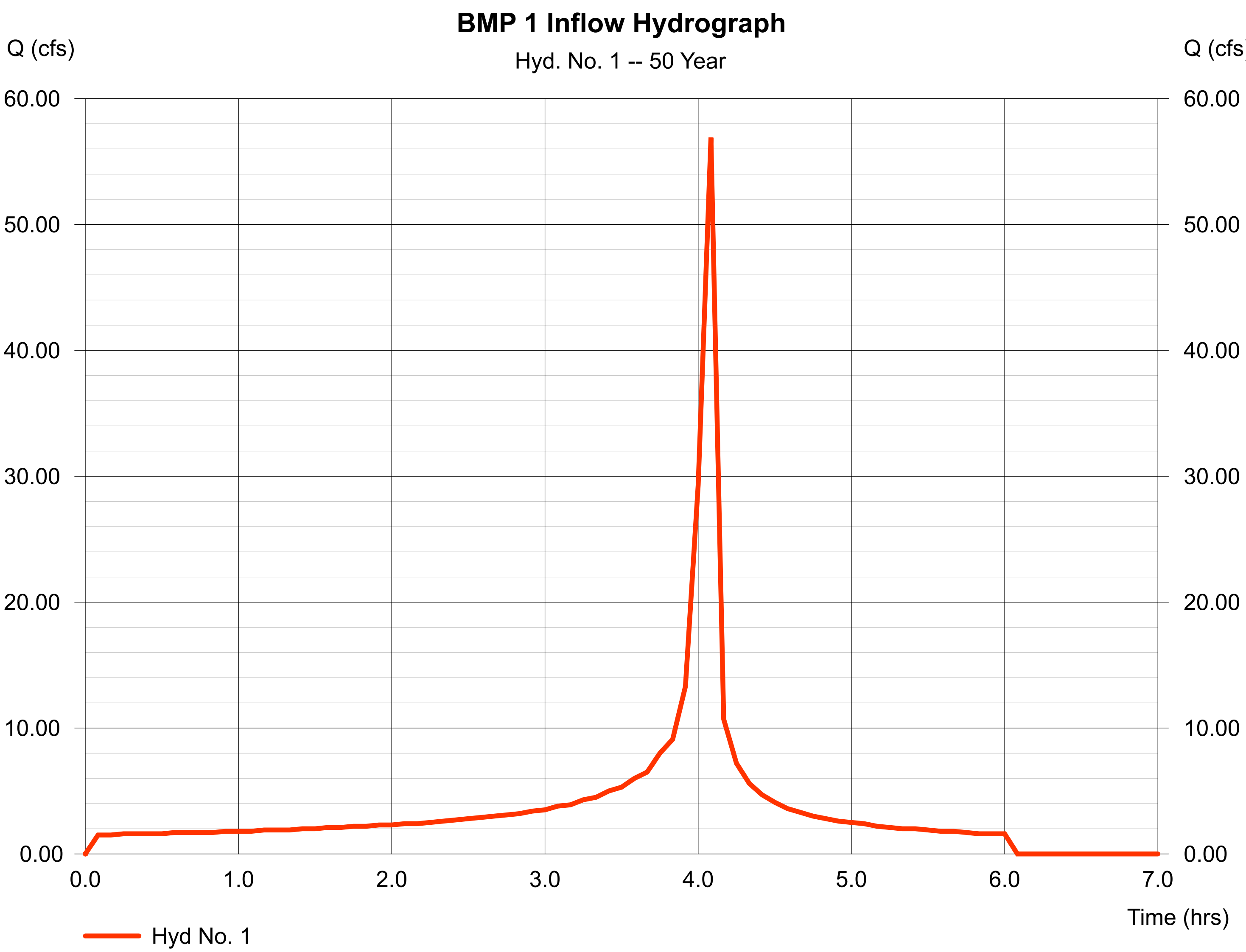
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 12 / 7 / 2022

Hyd. No. 1

BMP 1 Inflow Hydrograph

Hydrograph type	= Manual	Peak discharge	= 56.90 cfs
Storm frequency	= 50 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 92,310 cuft



Hydrograph Report

Q50 analyzed with Q25 main channel TW 475.6

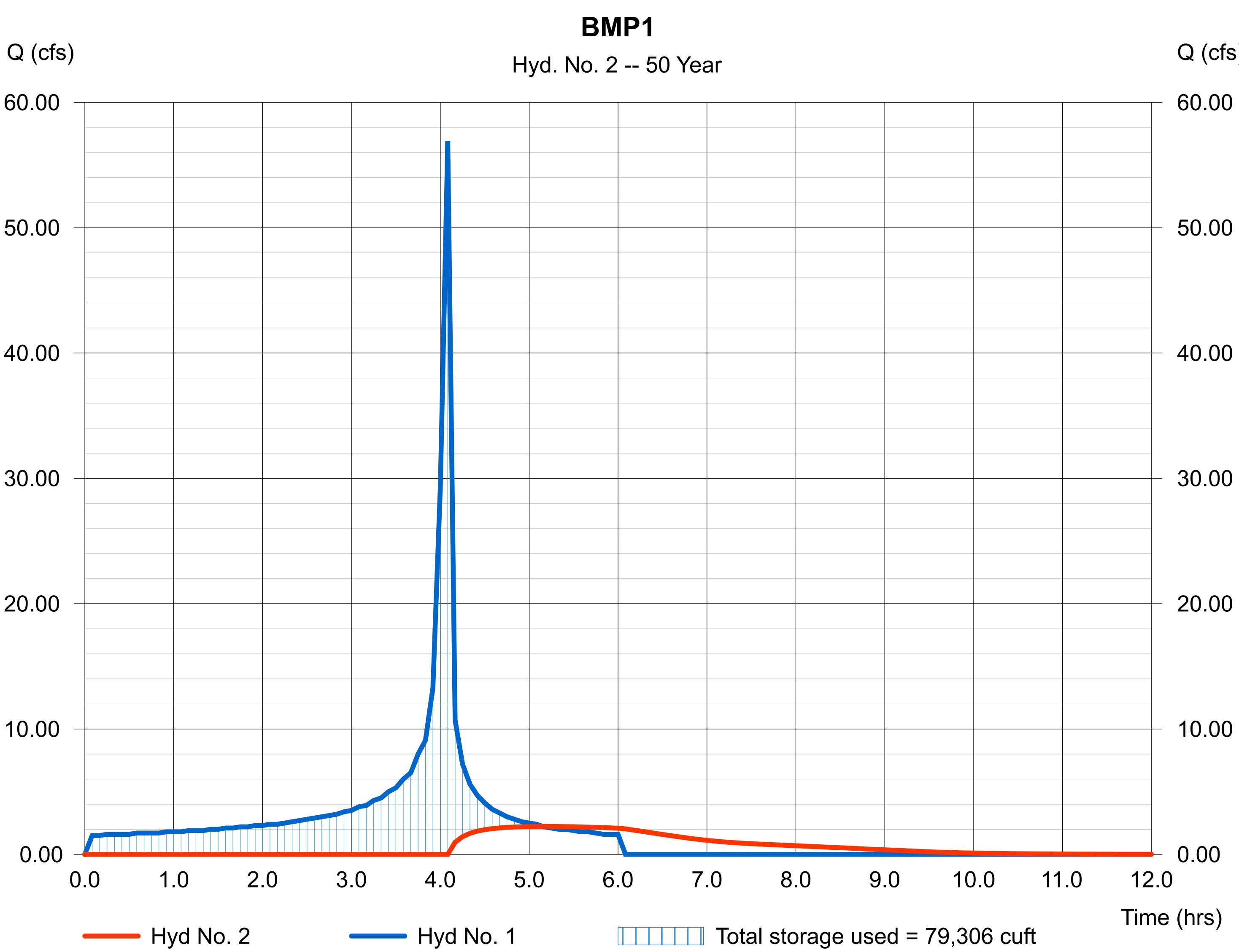
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 2

BMP1

Hydrograph type	= Reservoir	Peak discharge	= 2.230 cfs
Storm frequency	= 50 yrs	Time to peak	= 5.17 hrs
Time interval	= 5 min	Hyd. volume	= 25,604 cuft
Inflow hyd. No.	= 1 - BMP 1 Inflow Hydrograph	Max. Elevation	= 476.03 ft
Reservoir name	= BMP 1	Max. Storage	= 79,306 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Pond No. 1 - BMP 1

Pond Data

UG Chambers -Invert elev. = 473.25 ft, Rise x Span = 3.00 x 100.00 ft, Barrel Len = 285.00 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	473.25	n/a	0	0
0.30	473.55	n/a	8,551	8,551
0.60	473.85	n/a	8,552	17,104
0.90	474.15	n/a	8,551	25,655
1.20	474.45	n/a	8,552	34,207
1.50	474.75	n/a	8,551	42,759
1.80	475.05	n/a	8,551	51,310
2.10	475.35	n/a	8,552	59,862
2.40	475.65	n/a	8,551	68,414
2.70	475.95	n/a	8,552	76,966
3.00	476.25	n/a	8,551	85,517

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	3.90	6.00	0.00
Span (in)	= 12.00	3.90	12.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 473.25	473.25	475.10	0.00
Length (ft)	= 0.00	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	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	0.00	0.00	0.00
Crest El. (ft)	= 475.75	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) = 475.60

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	473.25	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.03	855	473.28	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.06	1,710	473.31	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.09	2,565	473.34	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.12	3,421	473.37	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.15	4,276	473.40	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.18	5,131	473.43	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.21	5,986	473.46	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.24	6,841	473.49	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.27	7,696	473.52	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.30	8,551	473.55	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.33	9,407	473.58	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.36	10,262	473.61	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.39	11,117	473.64	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.42	11,972	473.67	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.45	12,827	473.70	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.48	13,683	473.73	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.51	14,538	473.76	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.54	15,393	473.79	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.57	16,248	473.82	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.60	17,104	473.85	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.63	17,959	473.88	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.66	18,814	473.91	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.69	19,669	473.94	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.72	20,524	473.97	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.75	21,379	474.00	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.78	22,234	474.03	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.81	23,090	474.06	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.84	23,945	474.09	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.87	24,800	474.12	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.90	25,655	474.15	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.93	26,510	474.18	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000

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BMP 1

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
0.96	27,365	474.21	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.99	28,221	474.24	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.02	29,076	474.27	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.05	29,931	474.30	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.08	30,786	474.33	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.11	31,642	474.36	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.14	32,497	474.39	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.17	33,352	474.42	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.20	34,207	474.45	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.23	35,062	474.48	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.26	35,917	474.51	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.29	36,773	474.54	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.32	37,628	474.57	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.35	38,483	474.60	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.38	39,338	474.63	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.41	40,193	474.66	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.44	41,048	474.69	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.47	41,903	474.72	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.50	42,759	474.75	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.53	43,614	474.78	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.56	44,469	474.81	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.59	45,324	474.84	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.62	46,179	474.87	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.65	47,034	474.90	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.68	47,889	474.93	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.71	48,745	474.96	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.74	49,600	474.99	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.77	50,455	475.02	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.80	51,310	475.05	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.83	52,165	475.08	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.86	53,020	475.11	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.89	53,876	475.14	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.92	54,731	475.17	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.95	55,586	475.20	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.98	56,441	475.23	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.01	57,296	475.26	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.04	58,152	475.29	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.07	59,007	475.32	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.10	59,862	475.35	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.13	60,717	475.38	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.16	61,572	475.41	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.19	62,428	475.44	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.22	63,283	475.47	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.25	64,138	475.50	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.28	64,993	475.53	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.31	65,848	475.56	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.34	66,703	475.59	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.37	67,558	475.62	0.32 ic	0.05 ic	0.27 ic	---	0.00	---	---	---	---	---	0.318
2.40	68,414	475.65	0.50 ic	0.07 ic	0.43 ic	---	0.00	---	---	---	---	---	0.504
2.43	69,269	475.68	0.64 ic	0.09 ic	0.55 ic	---	0.00	---	---	---	---	---	0.637
2.46	70,124	475.71	0.75 ic	0.11 ic	0.64 ic	---	0.00	---	---	---	---	---	0.747
2.49	70,979	475.74	0.84 ic	0.12 ic	0.72 ic	---	0.00	---	---	---	---	---	0.843
2.52	71,834	475.77	0.95 ic	0.13 ic	0.79 ic	---	0.04	---	---	---	---	---	0.953
2.55	72,690	475.80	1.10 ic	0.14 ic	0.82 ic	---	0.15	---	---	---	---	---	1.101
2.58	73,545	475.83	1.27 ic	0.14 ic	0.83 ic	---	0.30	---	---	---	---	---	1.265
2.61	74,400	475.86	1.44 ic	0.14 ic	0.82 ic	---	0.49	---	---	---	---	---	1.438
2.64	75,255	475.89	1.60 ic	0.13 ic	0.80 ic	---	0.67 s	---	---	---	---	---	1.603
2.67	76,110	475.92	1.75 ic	0.13 ic	0.78 ic	---	0.84 s	---	---	---	---	---	1.752
2.70	76,966	475.95	1.89 ic	0.13 ic	0.76 ic	---	1.01 s	---	---	---	---	---	1.892
2.73	77,821	475.98	2.02 ic	0.12 ic	0.74 ic	---	1.16 s	---	---	---	---	---	2.022
2.76	78,676	476.01	2.15 ic	0.12 ic	0.71 ic	---	1.31 s	---	---	---	---	---	2.145
2.79	79,531	476.04	2.26 ic	0.11 ic	0.69 ic	---	1.45 s	---	---	---	---	---	2.260
2.82	80,386	476.07	2.37 ic	0.11 ic	0.67 ic	---	1.59 s	---	---	---	---	---	2.369
2.85	81,241	476.10	2.47 ic	0.11 ic	0.65 ic	---	1.72 s	---	---	---	---	---	2.472
2.88	82,097	476.13	2.57 ic	0.10 ic	0.63 ic	---	1.84 s	---	---	---	---	---	2.571
2.91	82,952	476.16	2.67 ic	0.10 ic	0.60 ic	---	1.96 s	---	---	---	---	---	2.664
2.94	83,807	476.19	2.75 ic	0.10 ic	0.59 ic	---	2.07 s	---	---	---	---	---	2.753
2.97	84,662	476.22	2.84 ic	0.09 ic	0.57 ic	---	2.18 s	---	---	---	---	---	2.840
3.00	85,517	476.25	2.92 ic	0.09 ic	0.55 ic	---	2.28 s	---	---	---	---	---	2.923

...End

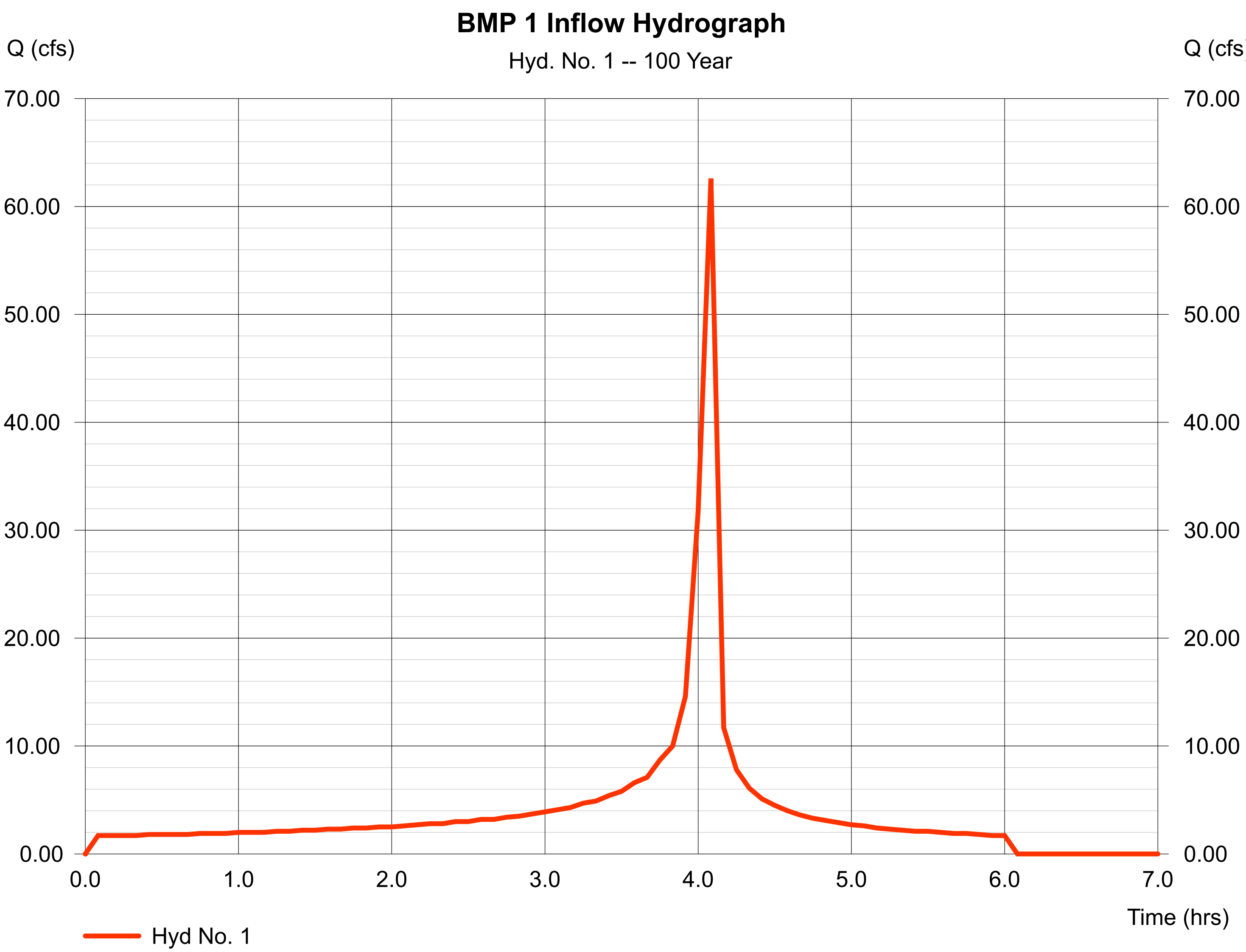
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 1

BMP 1 Inflow Hydrograph

Hydrograph type	= Manual	Peak discharge	= 62.60 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 100,980 cuft



Hydrograph Report

Q100 analyzed with Q25 main channel TW 475.6

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

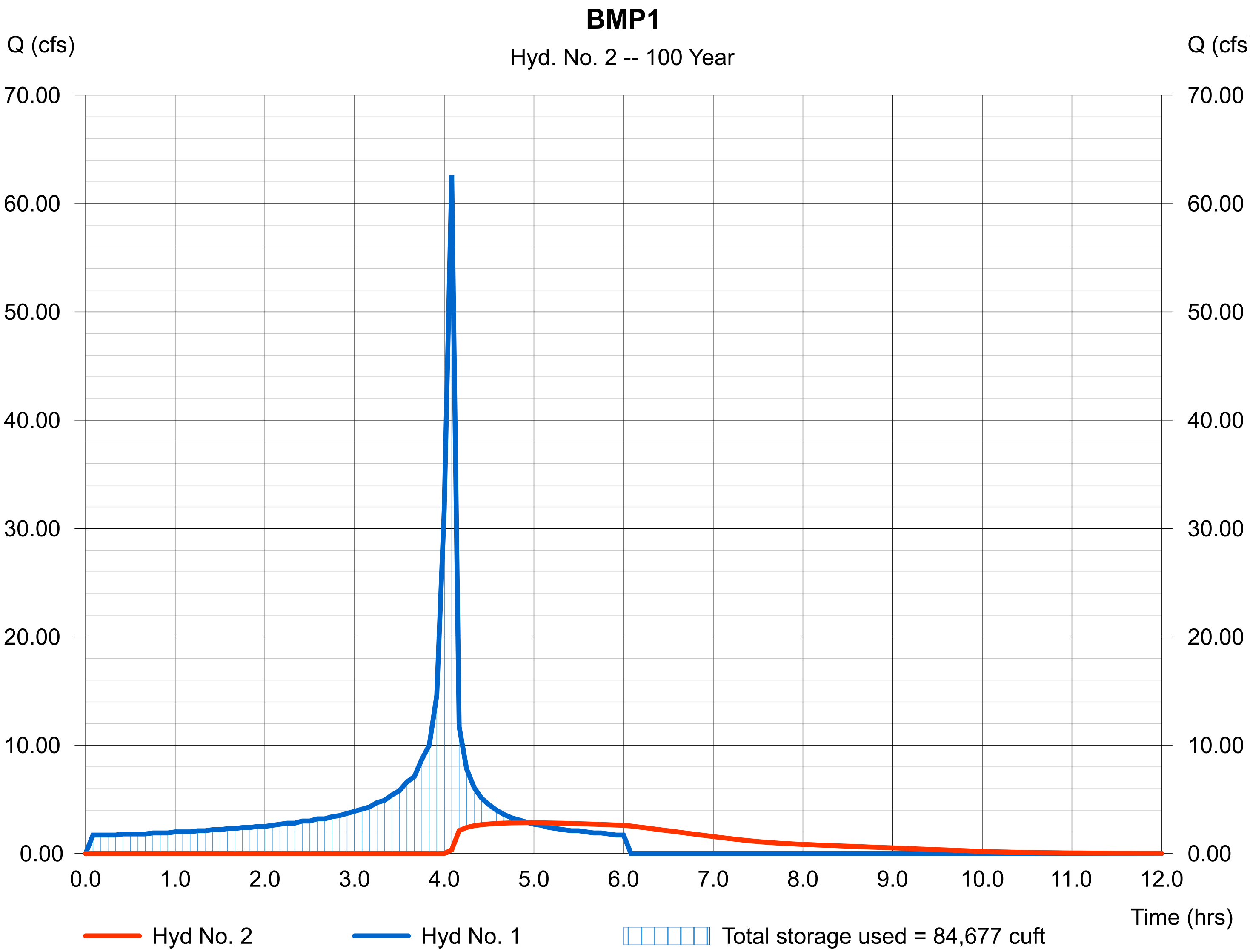
Wednesday, 12 / 7 / 2022

Hyd. No. 2

BMP1

Hydrograph type	= Reservoir	Peak discharge	= 2.842 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.92 hrs
Time interval	= 5 min	Hyd. volume	= 34,274 cuft
Inflow hyd. No.	= 1 - BMP 1 Inflow Hydrograph	Max. Elevation	= 476.22 ft
Reservoir name	= BMP 1	Max. Storage	= 84,677 cuft

Storage Indication method used.



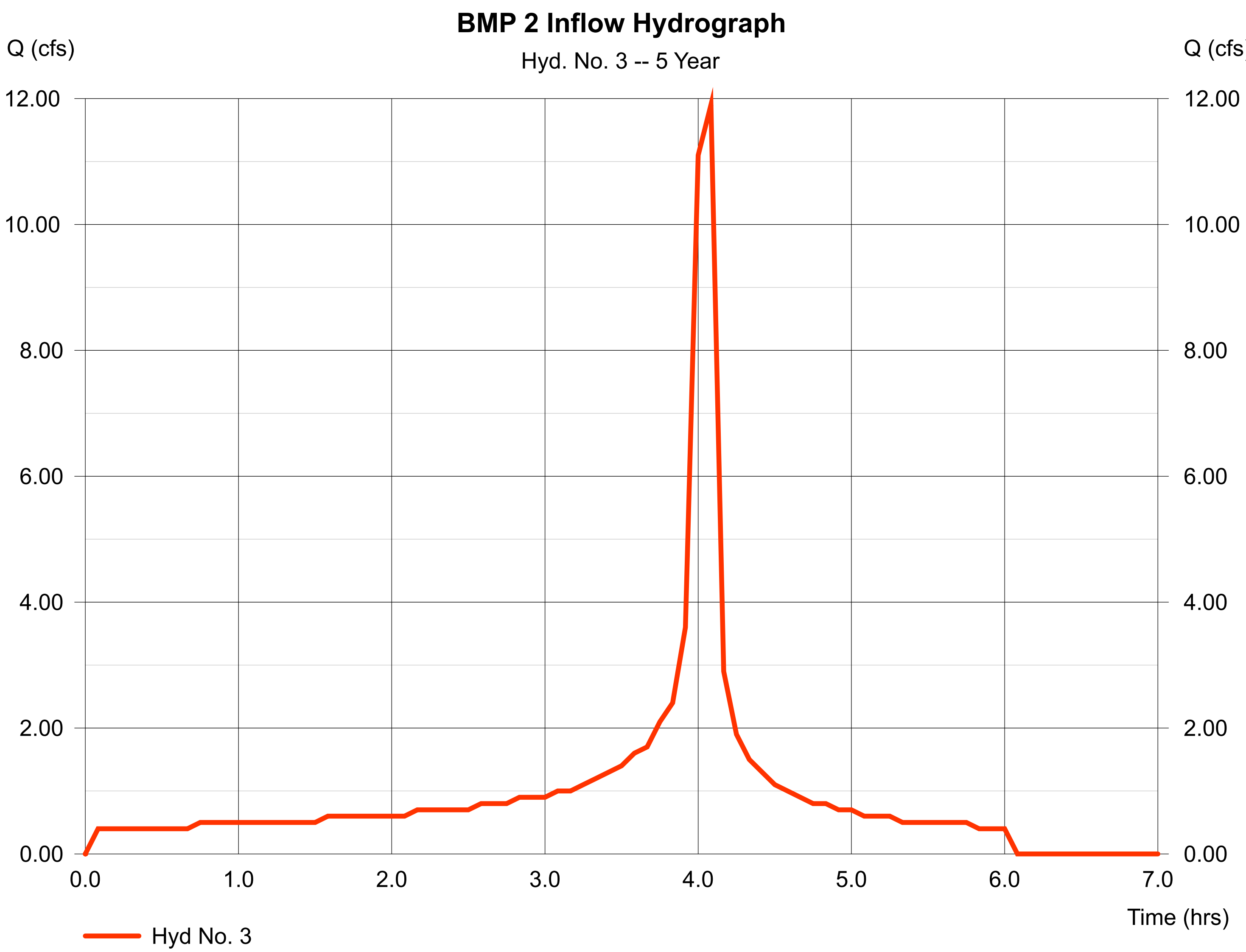
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 3

BMP 2 Inflow Hydrograph

Hydrograph type	= Manual	Peak discharge	= 11.90 cfs
Storm frequency	= 5 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 24,600 cuft



Hydrograph Report

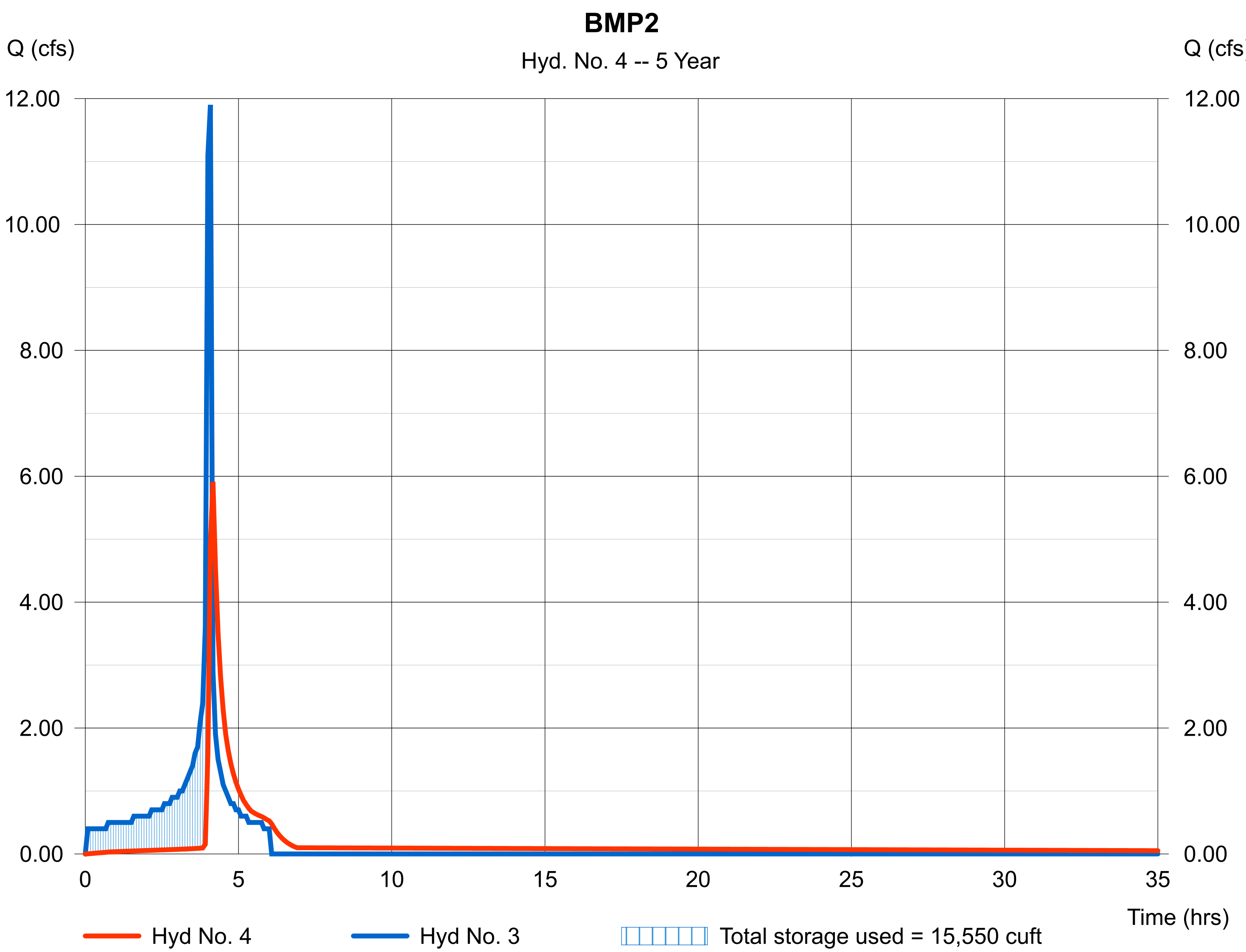
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 4

BMP2

Hydrograph type	= Reservoir	Peak discharge	= 5.912 cfs
Storm frequency	= 5 yrs	Time to peak	= 4.17 hrs
Time interval	= 5 min	Hyd. volume	= 24,566 cuft
Inflow hyd. No.	= 3 - BMP 2 Inflow Hydrograph	Max. Elevation	= 477.73 ft
Reservoir name	= BMP 2	Max. Storage	= 15,550 cuft

Storage Indication method used.



Pond Report

Pond No. 2 - BMP 2

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	477.00	n/a	0	0
0.50	477.50	n/a	10,435	10,435
1.00	478.00	n/a	11,245	21,680
1.50	478.50	n/a	12,065	33,745
2.00	479.00	n/a	12,891	46,636

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.30	Inactive	0.00
Span (in)	= 12.00	2.30	12.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 473.50	473.75	476.00	0.00
Length (ft)	= 0.00	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	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	0.00	0.00	0.00
Crest El. (ft)	= 477.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
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	477.00	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.05	1,044	477.05	6.55 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.031
0.10	2,087	477.10	6.55 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.044
0.15	3,131	477.15	6.55 ic	0.05 ic	0.00	---	0.00	---	---	---	---	---	0.054
0.20	4,174	477.20	6.55 ic	0.06 ic	0.00	---	0.00	---	---	---	---	---	0.062
0.25	5,218	477.25	6.55 ic	0.07 ic	0.00	---	0.00	---	---	---	---	---	0.069
0.30	6,261	477.30	6.55 ic	0.08 ic	0.00	---	0.00	---	---	---	---	---	0.076
0.35	7,305	477.35	6.55 ic	0.08 ic	0.00	---	0.00	---	---	---	---	---	0.082
0.40	8,348	477.40	6.55 ic	0.09 ic	0.00	---	0.00	---	---	---	---	---	0.088
0.45	9,392	477.45	6.55 ic	0.09 ic	0.00	---	0.00	---	---	---	---	---	0.093
0.50	10,435	477.50	6.55 ic	0.10 ic	0.00	---	0.00	---	---	---	---	---	0.098
0.55	11,560	477.55	6.55 ic	0.10 ic	0.00	---	0.60	---	---	---	---	---	0.698
0.60	12,684	477.60	6.55 ic	0.11 ic	0.00	---	1.68	---	---	---	---	---	1.792
0.65	13,809	477.65	6.55 ic	0.11 ic	0.00	---	3.09	---	---	---	---	---	3.206
0.70	14,933	477.70	6.55 ic	0.12 ic	0.00	---	4.76	---	---	---	---	---	4.880
0.75	16,058	477.75	6.76 ic	0.10 ic	0.00	---	6.66	---	---	---	---	---	6.761
0.80	17,182	477.80	7.24 ic	0.05 ic	0.00	---	7.18 s	---	---	---	---	---	7.236
0.85	18,307	477.85	7.34 ic	0.04 ic	0.00	---	7.29 s	---	---	---	---	---	7.334
0.90	19,431	477.90	7.41 ic	0.03 ic	0.00	---	7.38 s	---	---	---	---	---	7.410
0.95	20,556	477.95	7.48 ic	0.03 ic	0.00	---	7.45 s	---	---	---	---	---	7.475
1.00	21,680	478.00	7.53 ic	0.02 ic	0.00	---	7.50 s	---	---	---	---	---	7.529
1.05	22,887	478.05	7.59 ic	0.02 ic	0.00	---	7.57 s	---	---	---	---	---	7.587
1.10	24,093	478.10	7.64 ic	0.02 ic	0.00	---	7.61 s	---	---	---	---	---	7.628
1.15	25,300	478.15	7.69 ic	0.02 ic	0.00	---	7.65 s	---	---	---	---	---	7.671
1.20	26,506	478.20	7.74 ic	0.02 ic	0.00	---	7.71 s	---	---	---	---	---	7.729
1.25	27,713	478.25	7.79 ic	0.01 ic	0.00	---	7.76 s	---	---	---	---	---	7.770
1.30	28,919	478.30	7.83 ic	0.01 ic	0.00	---	7.81 s	---	---	---	---	---	7.822
1.35	30,126	478.35	7.88 ic	0.01 ic	0.00	---	7.85 s	---	---	---	---	---	7.861
1.40	31,332	478.40	7.93 ic	0.01 ic	0.00	---	7.91 s	---	---	---	---	---	7.919
1.45	32,539	478.45	7.97 ic	0.01 ic	0.00	---	7.92 s	---	---	---	---	---	7.930
1.50	33,745	478.50	8.02 ic	0.01 ic	0.00	---	7.97 s	---	---	---	---	---	7.977
1.55	35,034	478.55	8.06 ic	0.01 ic	0.00	---	7.99 s	---	---	---	---	---	8.000
1.60	36,323	478.60	8.11 ic	0.01 ic	0.00	---	8.09 s	---	---	---	---	---	8.101
1.65	37,612	478.65	8.15 ic	0.01 ic	0.00	---	8.05 s	---	---	---	---	---	8.062
1.70	38,901	478.70	8.19 ic	0.01 ic	0.00	---	8.13 s	---	---	---	---	---	8.140
1.75	40,191	478.75	8.24 ic	0.01 ic	0.00	---	8.17 s	---	---	---	---	---	8.178
1.80	41,480	478.80	8.28 ic	0.01 ic	0.00	---	8.16 s	---	---	---	---	---	8.162
1.85	42,769	478.85	8.33 ic	0.01 ic	0.00	---	8.22 s	---	---	---	---	---	8.230
1.90	44,058	478.90	8.37 ic	0.01 ic	0.00	---	8.24 s	---	---	---	---	---	8.248

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BMP 2

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
1.95	45,347	478.95	8.41 ic	0.01 ic	0.00	---	8.40 s	---	---	---	---	---	8.407
2.00	46,636	479.00	8.45 ic	0.01 ic	0.00	---	8.40 s	---	---	---	---	---	8.402

...End

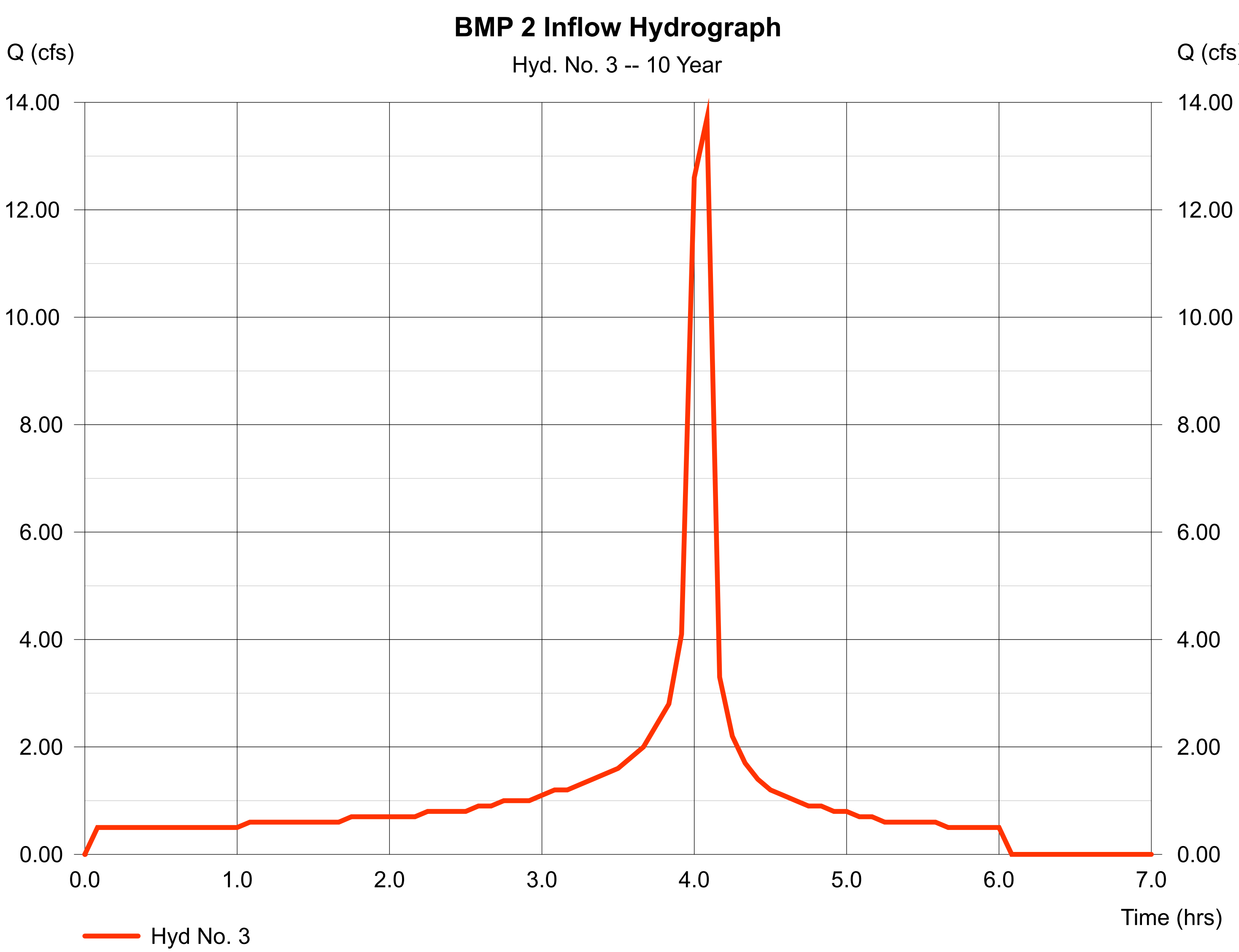
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 3

BMP 2 Inflow Hydrograph

Hydrograph type	= Manual	Peak discharge	= 13.70 cfs
Storm frequency	= 10 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 28,170 cuft



Hydrograph Report

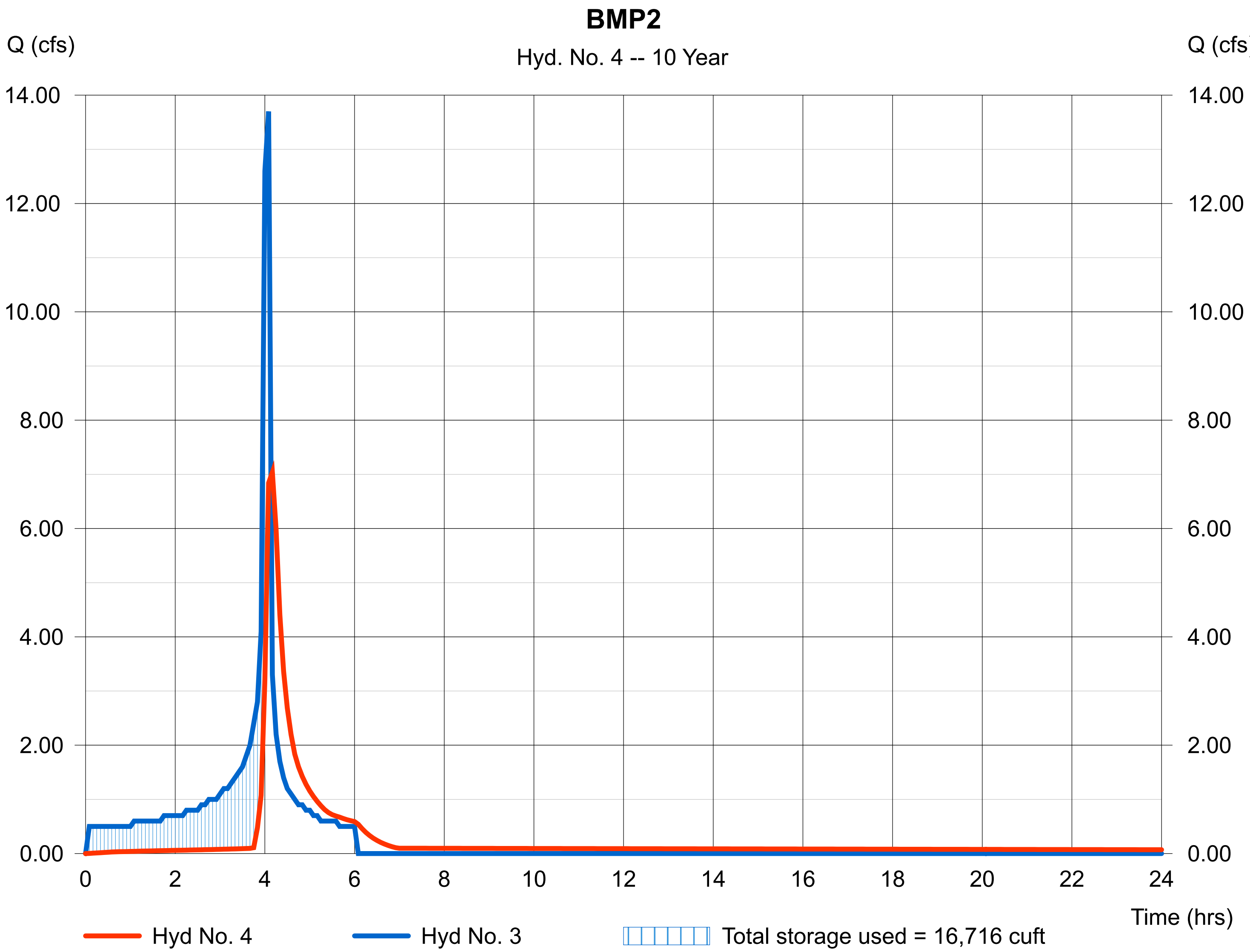
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 4

BMP2

Hydrograph type	= Reservoir	Peak discharge	= 7.039 cfs
Storm frequency	= 10 yrs	Time to peak	= 4.17 hrs
Time interval	= 5 min	Hyd. volume	= 28,137 cuft
Inflow hyd. No.	= 3 - BMP 2 Inflow Hydrograph	Max. Elevation	= 477.78 ft
Reservoir name	= BMP 2	Max. Storage	= 16,716 cuft

Storage Indication method used.



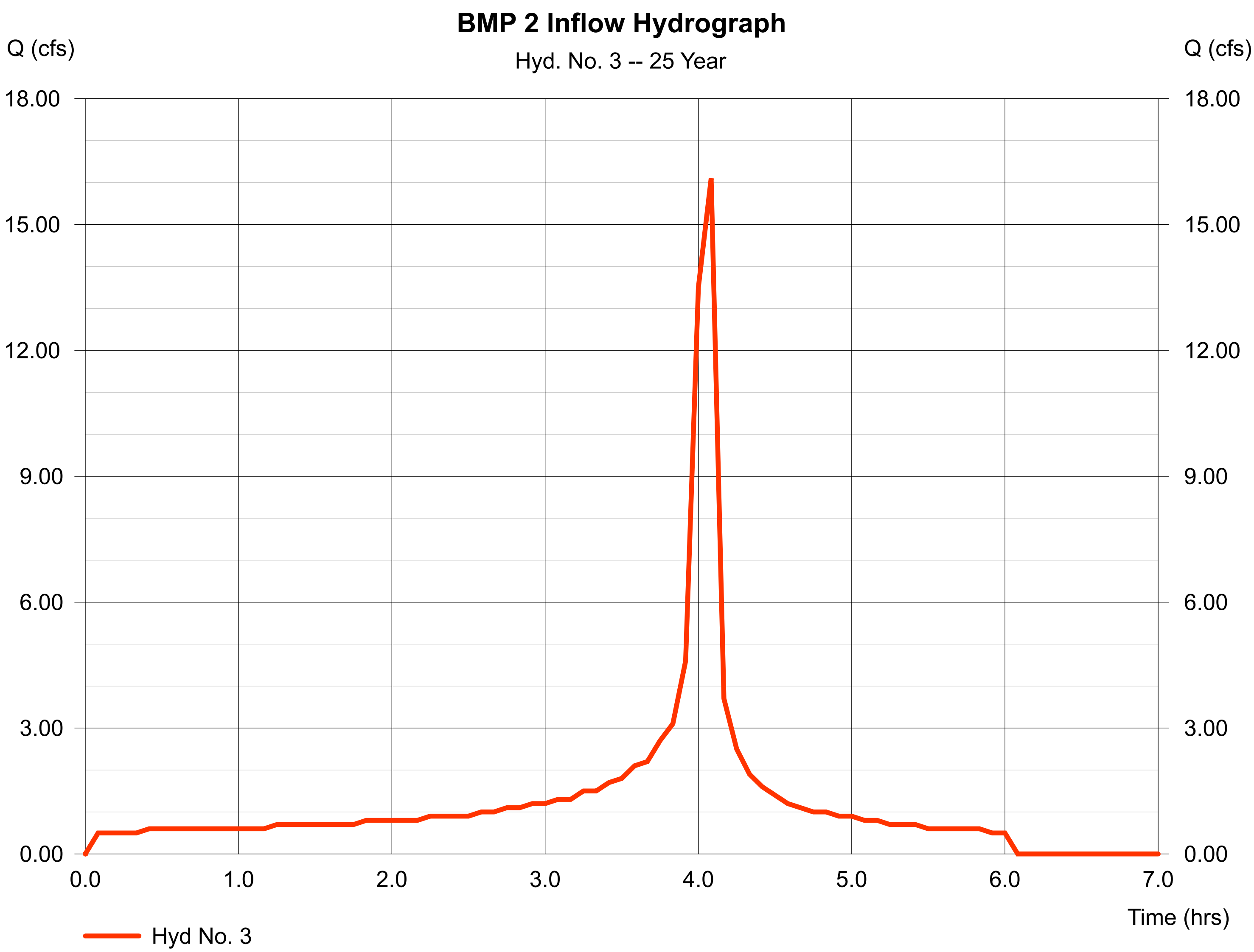
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 3

BMP 2 Inflow Hydrograph

Hydrograph type	= Manual	Peak discharge	= 16.10 cfs
Storm frequency	= 25 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 31,620 cuft



Hydrograph Report

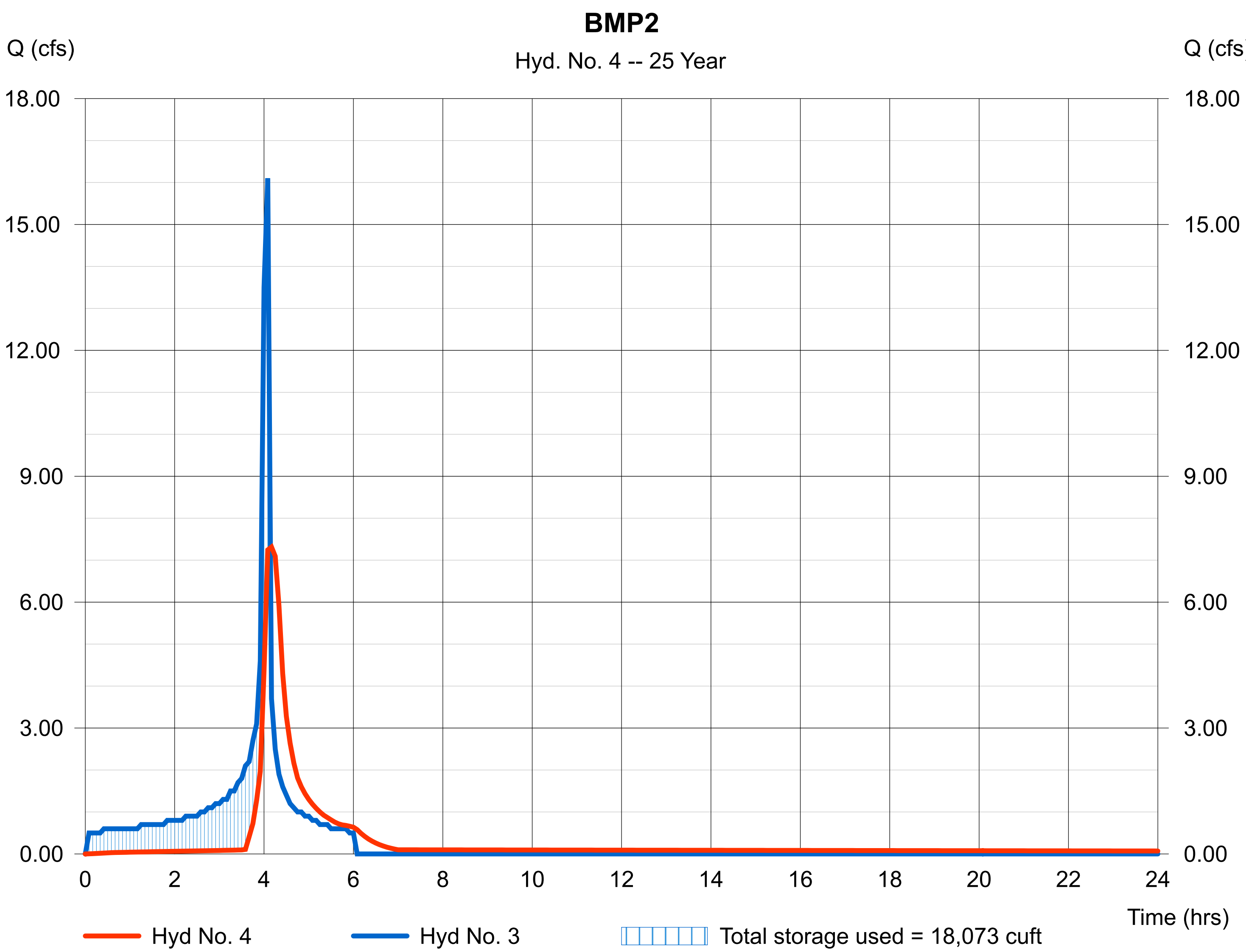
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 4

BMP2

Hydrograph type	= Reservoir	Peak discharge	= 7.314 cfs
Storm frequency	= 25 yrs	Time to peak	= 4.17 hrs
Time interval	= 5 min	Hyd. volume	= 31,586 cuft
Inflow hyd. No.	= 3 - BMP 2 Inflow Hydrograph	Max. Elevation	= 477.84 ft
Reservoir name	= BMP 2	Max. Storage	= 18,073 cuft

Storage Indication method used.



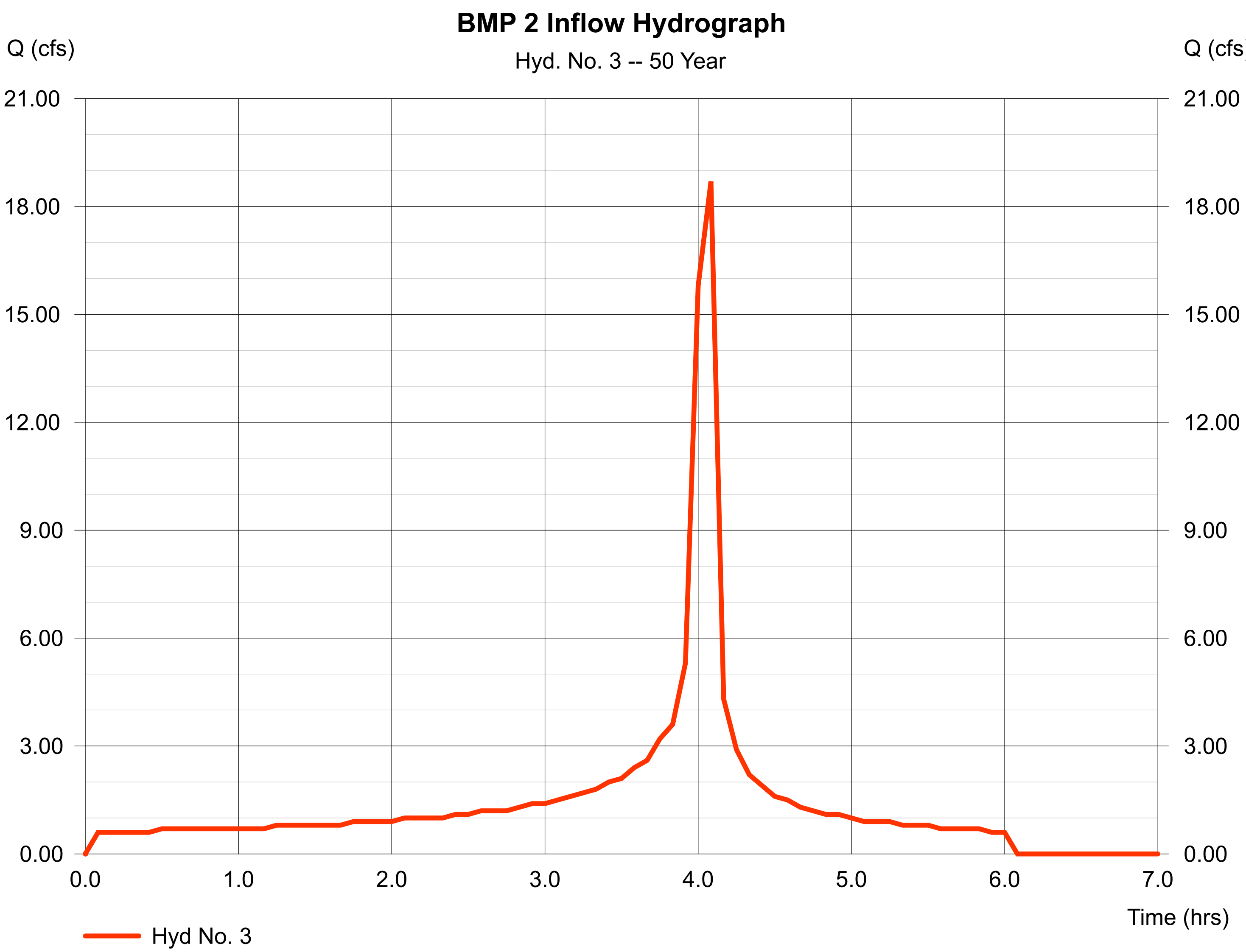
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 12 / 7 / 2022

Hyd. No. 3

BMP 2 Inflow Hydrograph

Hydrograph type	= Manual	Peak discharge	= 18.70 cfs
Storm frequency	= 50 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 36,930 cuft



Hydrograph Report

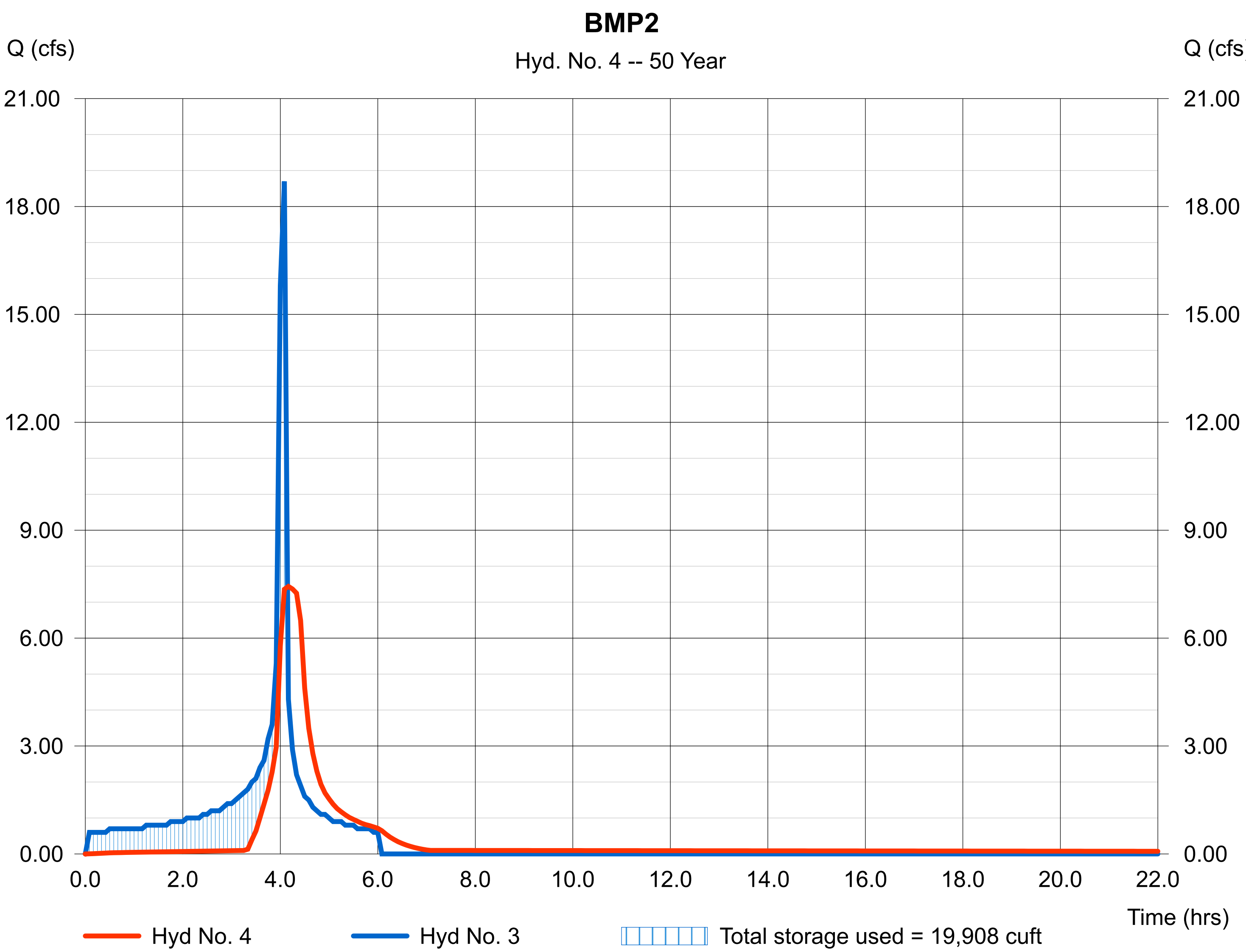
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 4

BMP2

Hydrograph type	= Reservoir	Peak discharge	= 7.437 cfs
Storm frequency	= 50 yrs	Time to peak	= 4.17 hrs
Time interval	= 5 min	Hyd. volume	= 36,896 cuft
Inflow hyd. No.	= 3 - BMP 2 Inflow Hydrograph	Max. Elevation	= 477.92 ft
Reservoir name	= BMP 2	Max. Storage	= 19,908 cuft

Storage Indication method used.



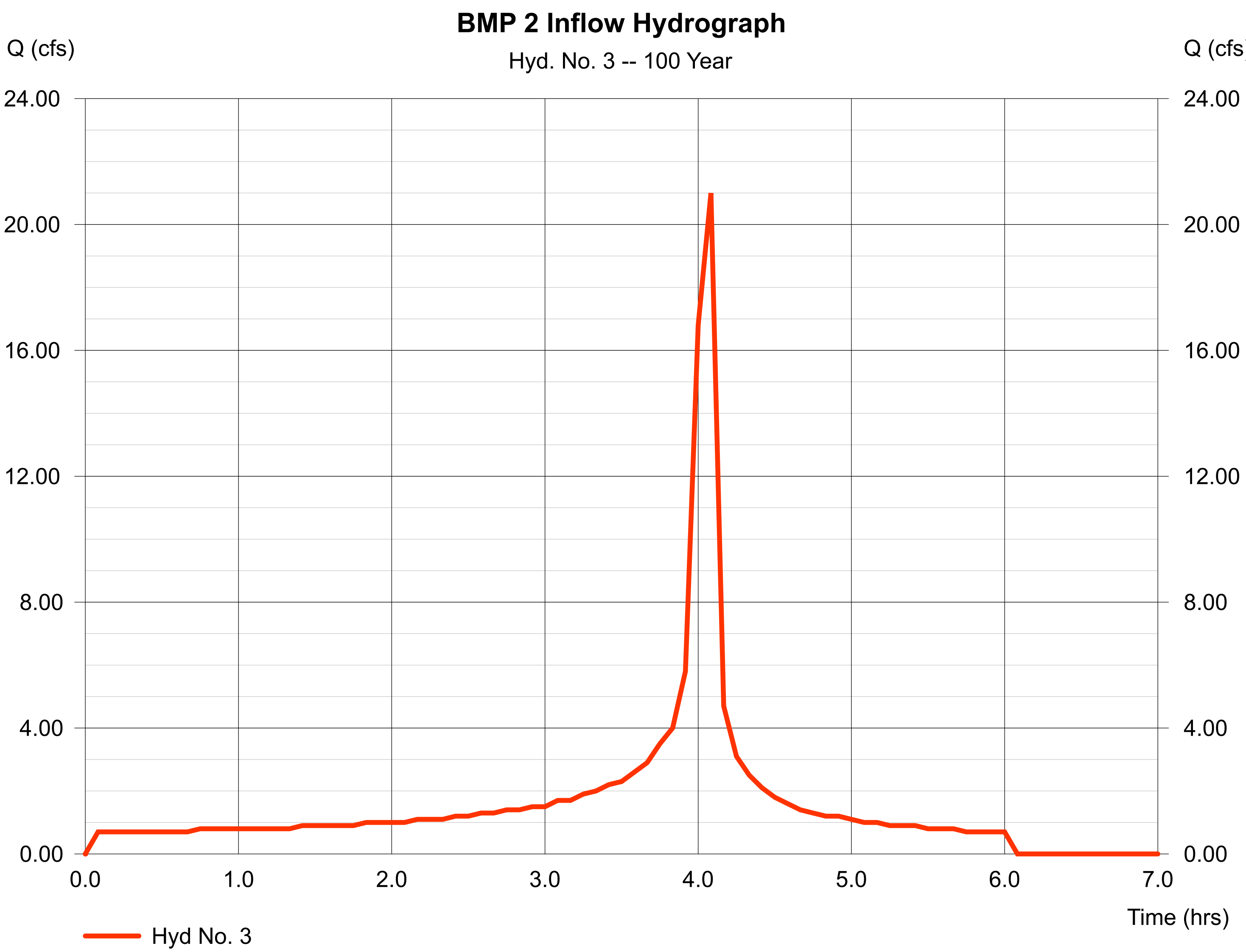
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 3

BMP 2 Inflow Hydrograph

Hydrograph type	= Manual	Peak discharge	= 21.00 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 40,470 cuft



Hydrograph Report

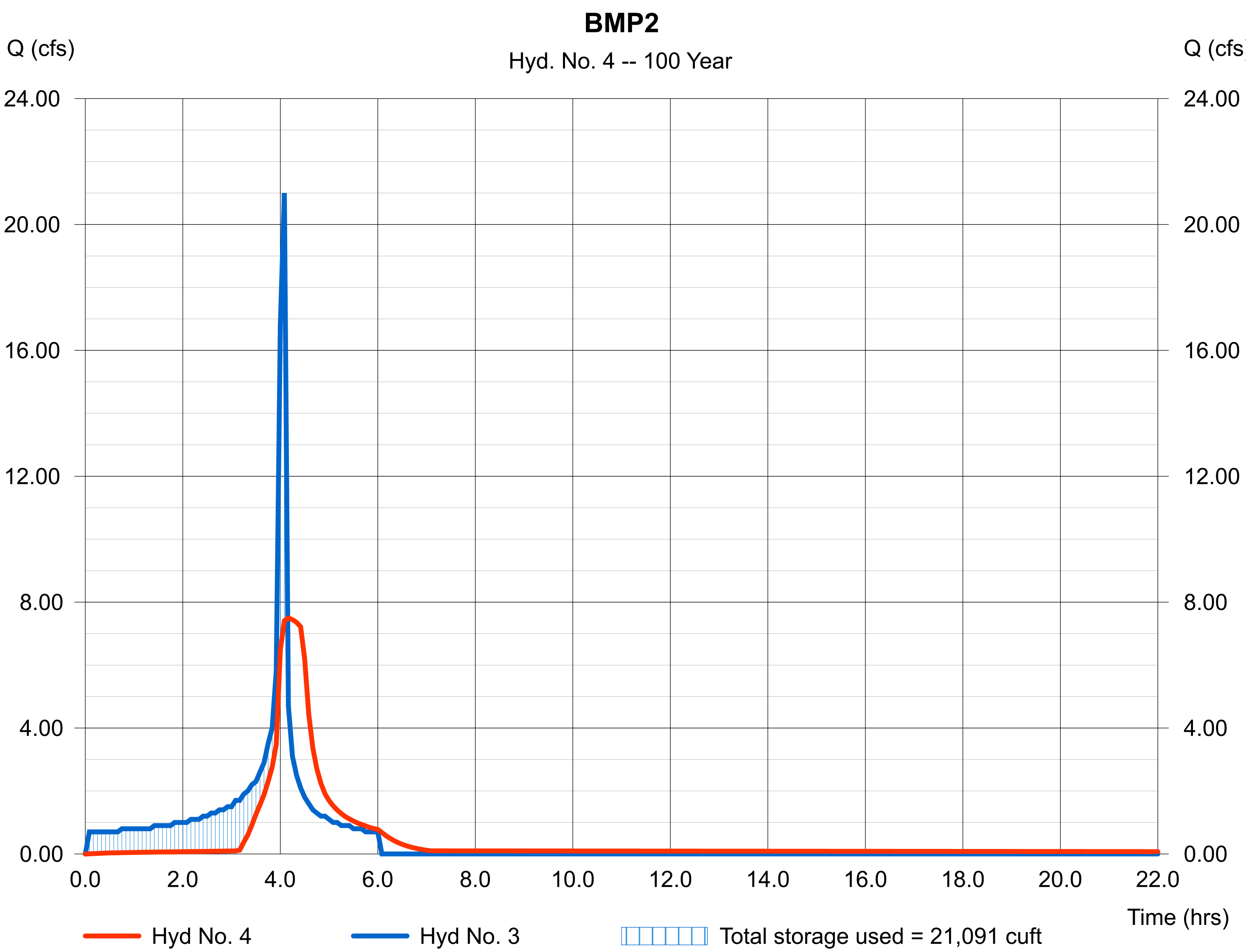
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 4

BMP2

Hydrograph type	= Reservoir	Peak discharge	= 7.501 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.17 hrs
Time interval	= 5 min	Hyd. volume	= 40,436 cuft
Inflow hyd. No.	= 3 - BMP 2 Inflow Hydrograph	Max. Elevation	= 477.97 ft
Reservoir name	= BMP 2	Max. Storage	= 21,091 cuft

Storage Indication method used.



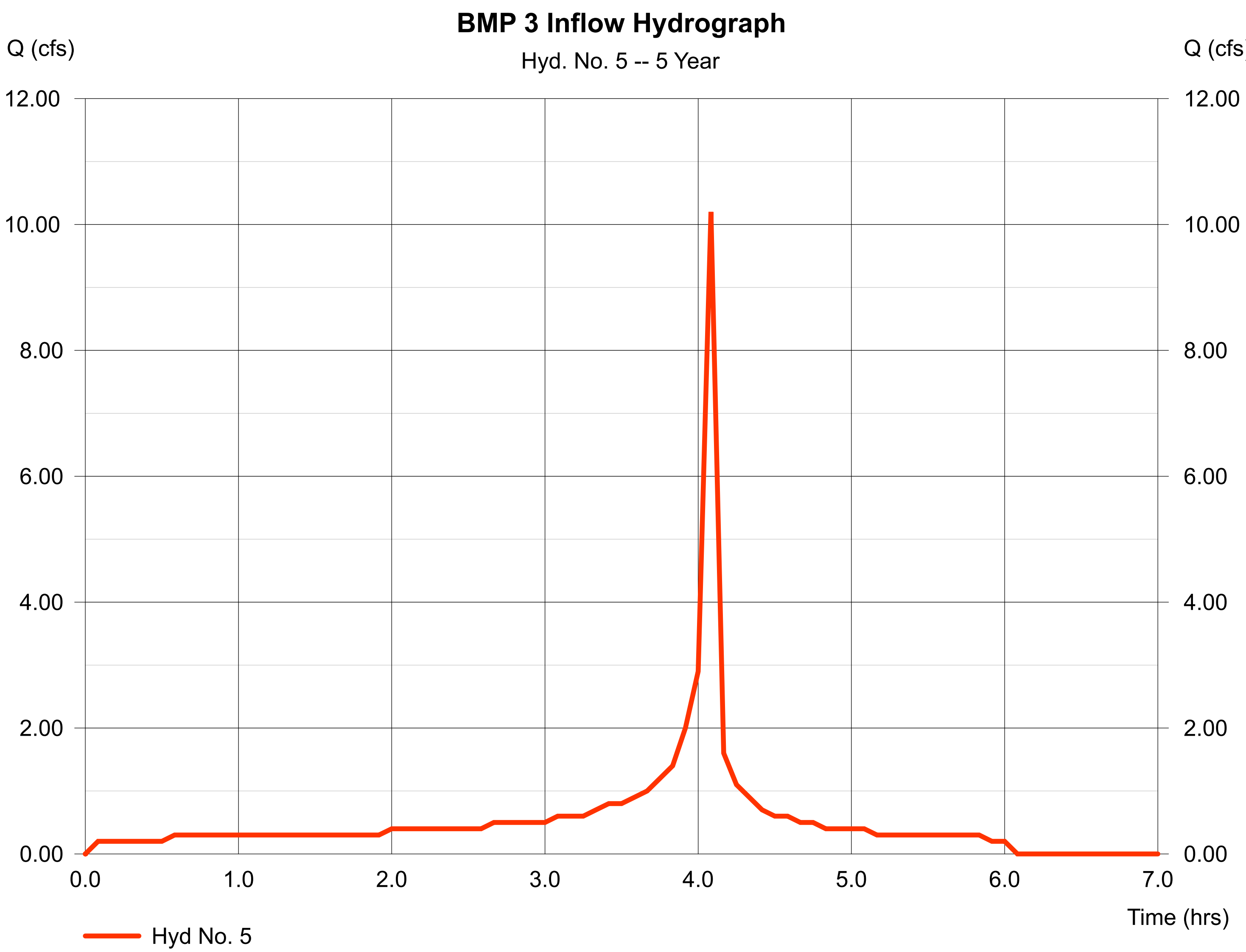
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 12 / 7 / 2022

Hyd. No. 5

BMP 3 Inflow Hydrograph

Hydrograph type	= Manual	Peak discharge	= 10.20 cfs
Storm frequency	= 5 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 14,070 cuft



Hydrograph Report

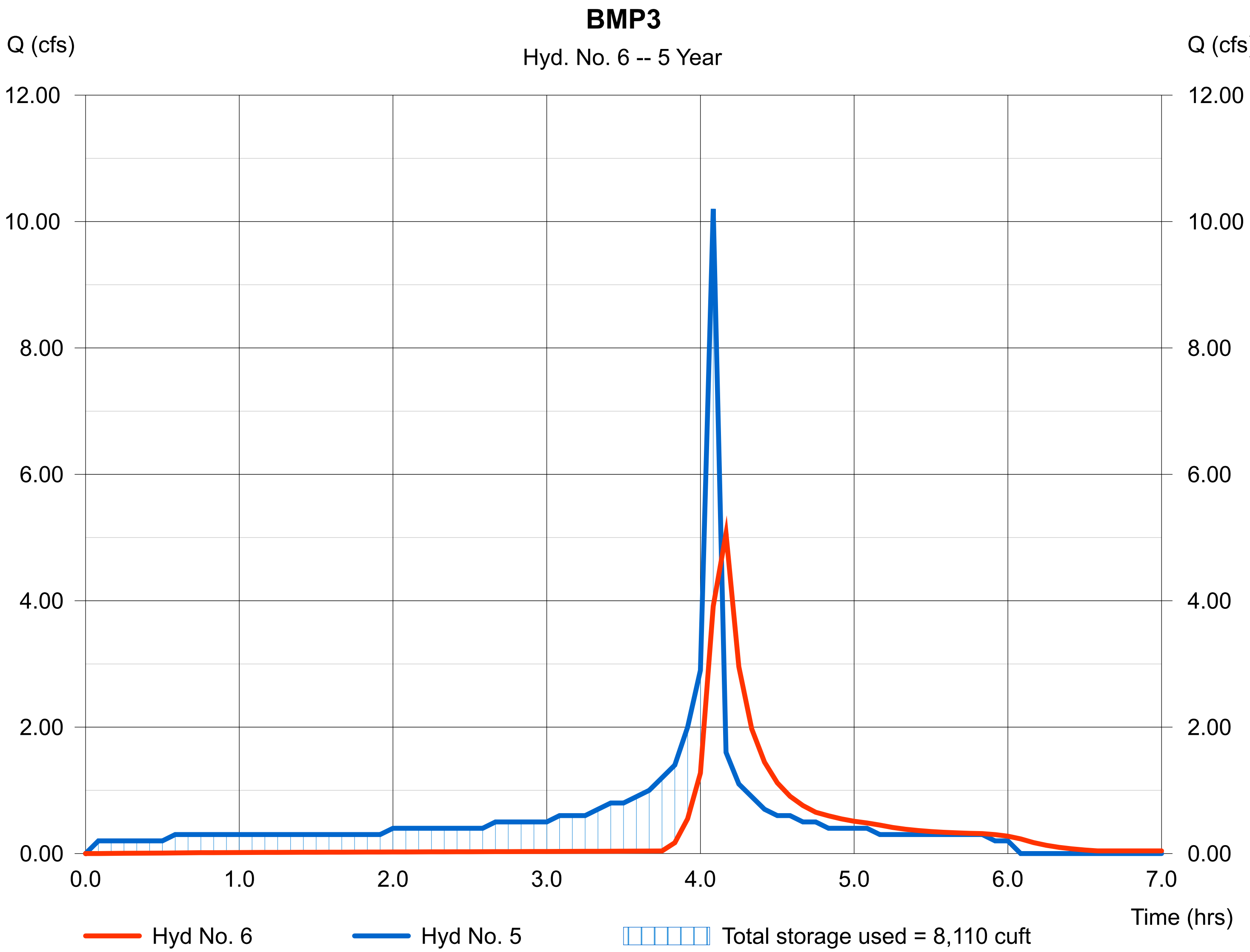
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 12 / 7 / 2022

Hyd. No. 6

BMP3

Hydrograph type	= Reservoir	Peak discharge	= 5.063 cfs
Storm frequency	= 5 yrs	Time to peak	= 4.17 hrs
Time interval	= 5 min	Hyd. volume	= 14,028 cuft
Inflow hyd. No.	= 5 - BMP 3 Inflow Hydrograph	Max. Elevation	= 479.21 ft
Reservoir name	= BMP 3	Max. Storage	= 8,110 cuft

Storage Indication method used.



Pond No. 3 - BMP 3

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	478.50	n/a	0	0
0.50	479.00	n/a	5,500	5,500
1.00	479.50	n/a	6,316	11,816
1.50	480.00	n/a	7,139	18,955
2.00	480.50	n/a	7,969	26,924

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	1.50	Inactive	0.00
Span (in)	= 12.00	1.50	12.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 474.50	474.75	477.40	0.00
Length (ft)	= 0.00	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	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	0.00	0.00	0.00
Crest El. (ft)	= 479.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

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	478.50	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.05	550	478.55	7.07 ic	0.01 ic	0.00	---	0.00	---	---	---	---	---	0.013
0.10	1,100	478.60	7.07 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.019
0.15	1,650	478.65	7.07 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.023
0.20	2,200	478.70	7.07 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.026
0.25	2,750	478.75	7.07 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.030
0.30	3,300	478.80	7.07 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.032
0.35	3,850	478.85	7.07 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.035
0.40	4,400	478.90	7.07 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.037
0.45	4,950	478.95	7.07 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.040
0.50	5,500	479.00	7.07 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.042
0.55	6,132	479.05	7.07 ic	0.04 ic	0.00	---	0.60	---	---	---	---	---	0.639
0.60	6,763	479.10	7.07 ic	0.05 ic	0.00	---	1.68	---	---	---	---	---	1.730
0.65	7,395	479.15	7.07 ic	0.05 ic	0.00	---	3.09	---	---	---	---	---	3.142
0.70	8,026	479.20	7.07 ic	0.05 ic	0.00	---	4.76	---	---	---	---	---	4.813
0.75	8,658	479.25	7.07 ic	0.05 ic	0.00	---	6.66	---	---	---	---	---	6.709
0.80	9,290	479.30	7.69 ic	0.02 ic	0.00	---	7.66 s	---	---	---	---	---	7.685
0.85	9,921	479.35	7.79 ic	0.02 ic	0.00	---	7.77 s	---	---	---	---	---	7.793
0.90	10,553	479.40	7.87 ic	0.02 ic	0.00	---	7.85 s	---	---	---	---	---	7.868
0.95	11,184	479.45	7.93 ic	0.01 ic	0.00	---	7.92 s	---	---	---	---	---	7.930
1.00	11,816	479.50	7.99 ic	0.01 ic	0.00	---	7.97 s	---	---	---	---	---	7.986
1.05	12,530	479.55	8.04 ic	0.01 ic	0.00	---	8.02 s	---	---	---	---	---	8.033
1.10	13,244	479.60	8.09 ic	0.01 ic	0.00	---	8.08 s	---	---	---	---	---	8.087
1.15	13,958	479.65	8.14 ic	0.01 ic	0.00	---	8.13 s	---	---	---	---	---	8.138
1.20	14,672	479.70	8.18 ic	0.01 ic	0.00	---	8.16 s	---	---	---	---	---	8.171
1.25	15,386	479.75	8.23 ic	0.01 ic	0.00	---	8.22 s	---	---	---	---	---	8.226
1.30	16,099	479.80	8.28 ic	0.01 ic	0.00	---	8.26 s	---	---	---	---	---	8.270
1.35	16,813	479.85	8.32 ic	0.01 ic	0.00	---	8.31 s	---	---	---	---	---	8.312
1.40	17,527	479.90	8.36 ic	0.01 ic	0.00	---	8.35 s	---	---	---	---	---	8.357
1.45	18,241	479.95	8.41 ic	0.00 ic	0.00	---	8.38 s	---	---	---	---	---	8.389
1.50	18,955	480.00	8.45 ic	0.00 ic	0.00	---	8.44 s	---	---	---	---	---	8.445
1.55	19,752	480.05	8.49 ic	0.00 ic	0.00	---	8.46 s	---	---	---	---	---	8.464
1.60	20,549	480.10	8.54 ic	0.00 ic	0.00	---	8.47 s	---	---	---	---	---	8.474
1.65	21,346	480.15	8.58 ic	0.00 ic	0.00	---	8.56 s	---	---	---	---	---	8.567
1.70	22,143	480.20	8.62 ic	0.00 ic	0.00	---	8.61 s	---	---	---	---	---	8.613
1.75	22,940	480.25	8.66 ic	0.00 ic	0.00	---	8.59 s	---	---	---	---	---	8.598
1.80	23,736	480.30	8.70 ic	0.00 ic	0.00	---	8.62 s	---	---	---	---	---	8.624
1.85	24,533	480.35	8.74 ic	0.00 ic	0.00	---	8.73 s	---	---	---	---	---	8.737
1.90	25,330	480.40	8.78 ic	0.00 ic	0.00	---	8.67 s	---	---	---	---	---	8.671

Continues on next page...

BMP 3

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
1.95	26,127	480.45	8.83 ic	0.00 ic	0.00	---	8.70 s	---	---	---	---	---	8.699
2.00	26,924	480.50	8.87 ic	0.00 ic	0.00	---	8.71 s	---	---	---	---	---	8.712

...End

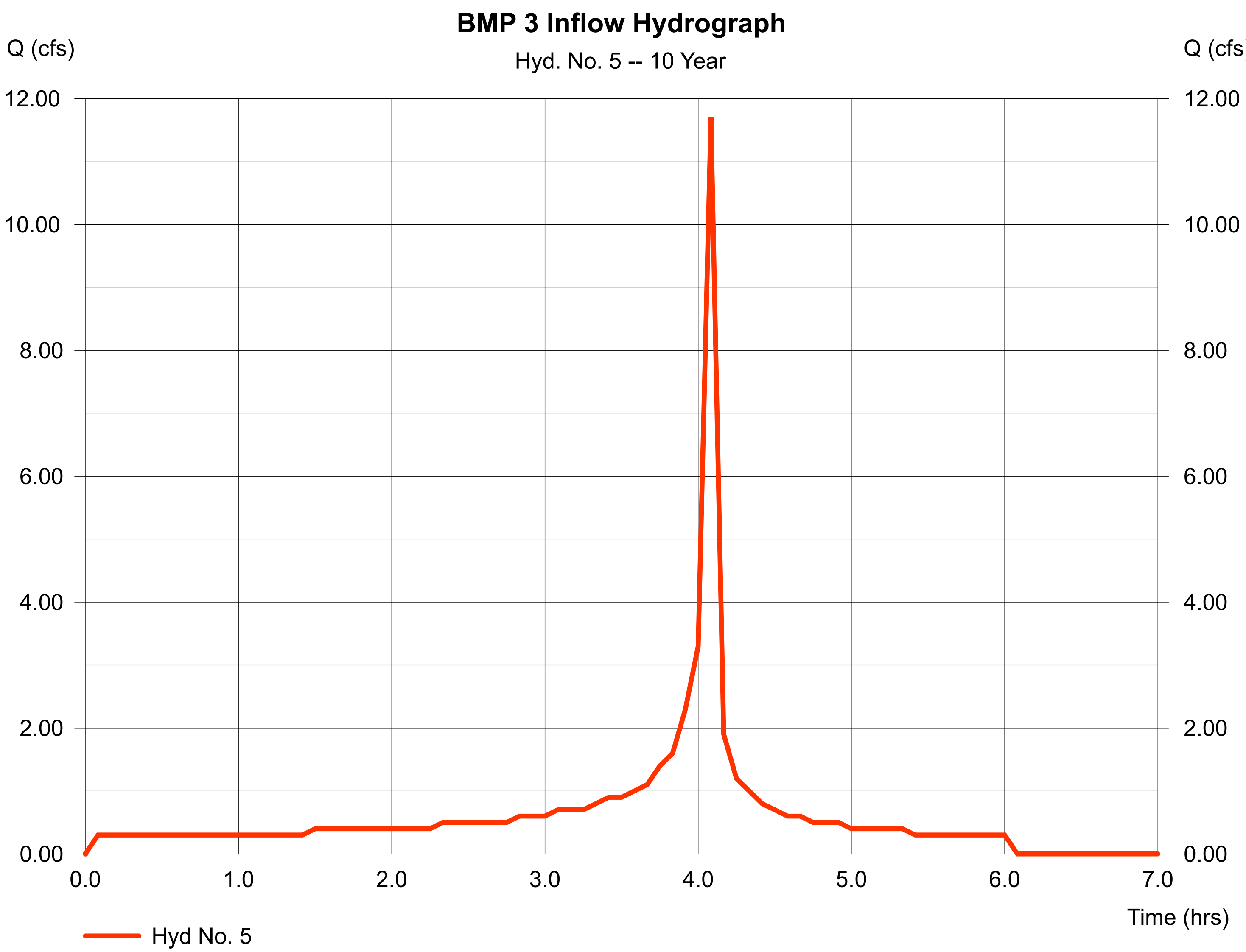
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 12 / 7 / 2022

Hyd. No. 5

BMP 3 Inflow Hydrograph

Hydrograph type	= Manual	Peak discharge	= 11.70 cfs
Storm frequency	= 10 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 16,110 cuft



Hydrograph Report

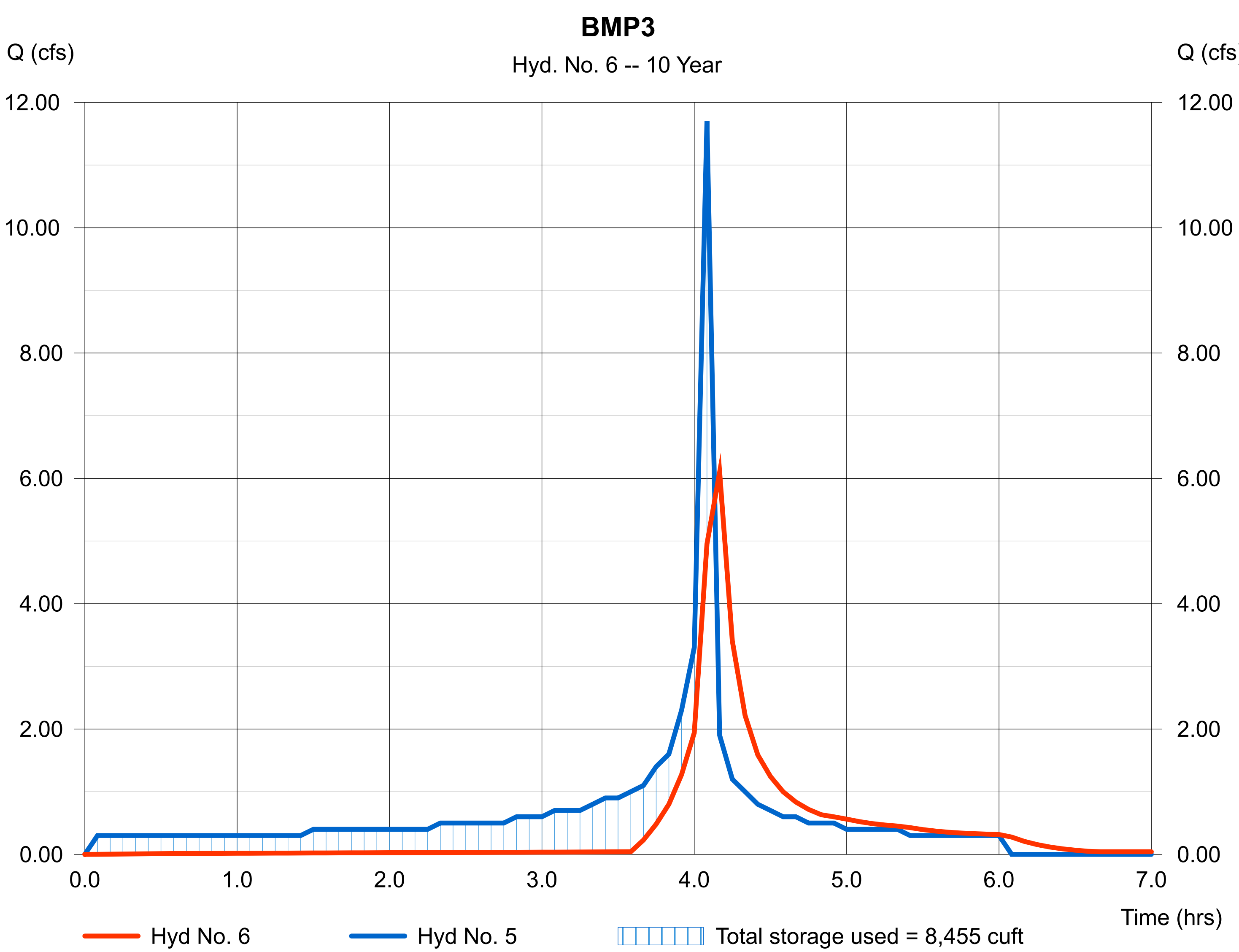
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 6

BMP3

Hydrograph type	= Reservoir	Peak discharge	= 6.100 cfs
Storm frequency	= 10 yrs	Time to peak	= 4.17 hrs
Time interval	= 5 min	Hyd. volume	= 16,068 cuft
Inflow hyd. No.	= 5 - BMP 3 Inflow Hydrograph	Max. Elevation	= 479.23 ft
Reservoir name	= BMP 3	Max. Storage	= 8,455 cuft

Storage Indication method used.



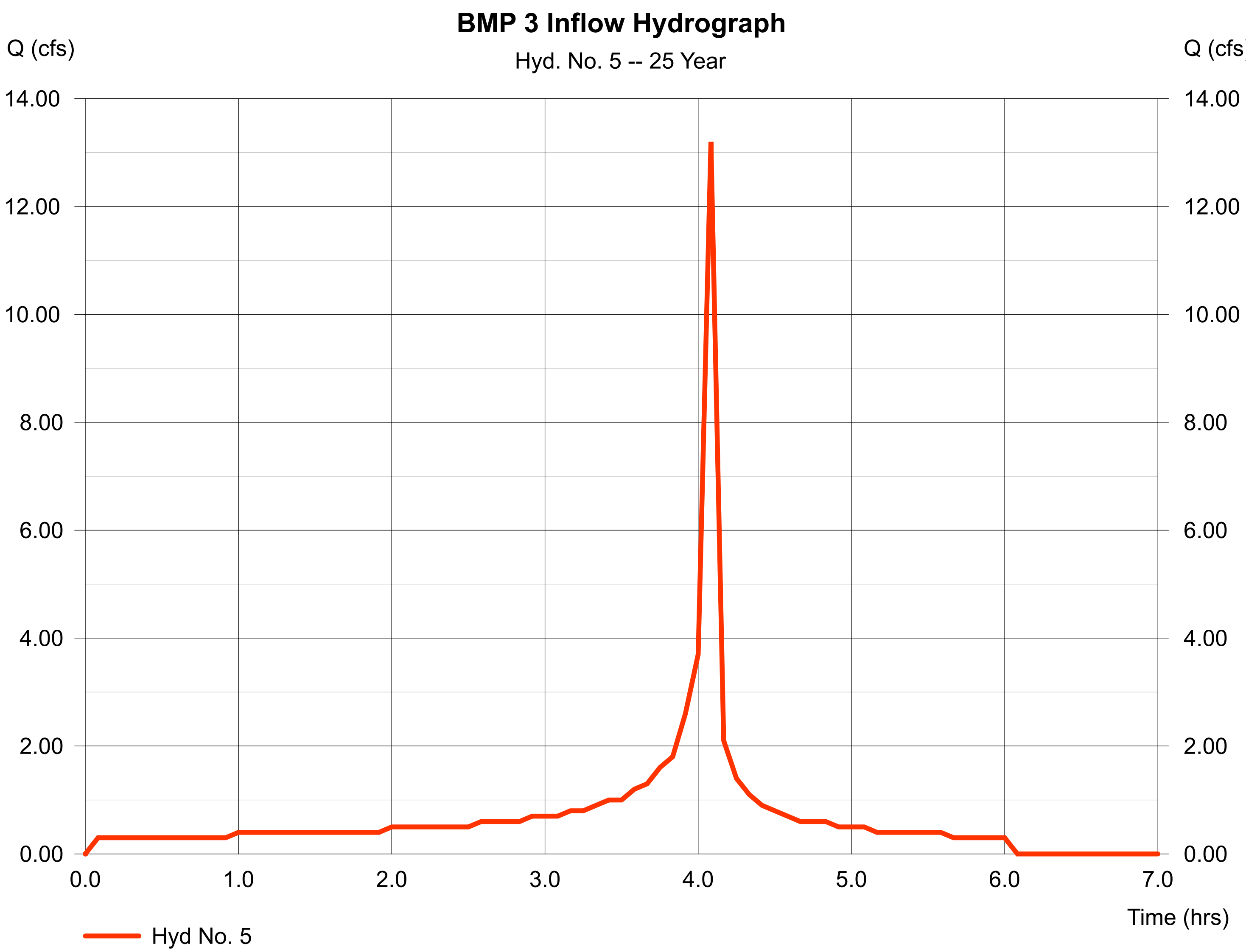
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 5

BMP 3 Inflow Hydrograph

Hydrograph type	= Manual	Peak discharge	= 13.20 cfs
Storm frequency	= 25 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 18,060 cuft



Hydrograph Report

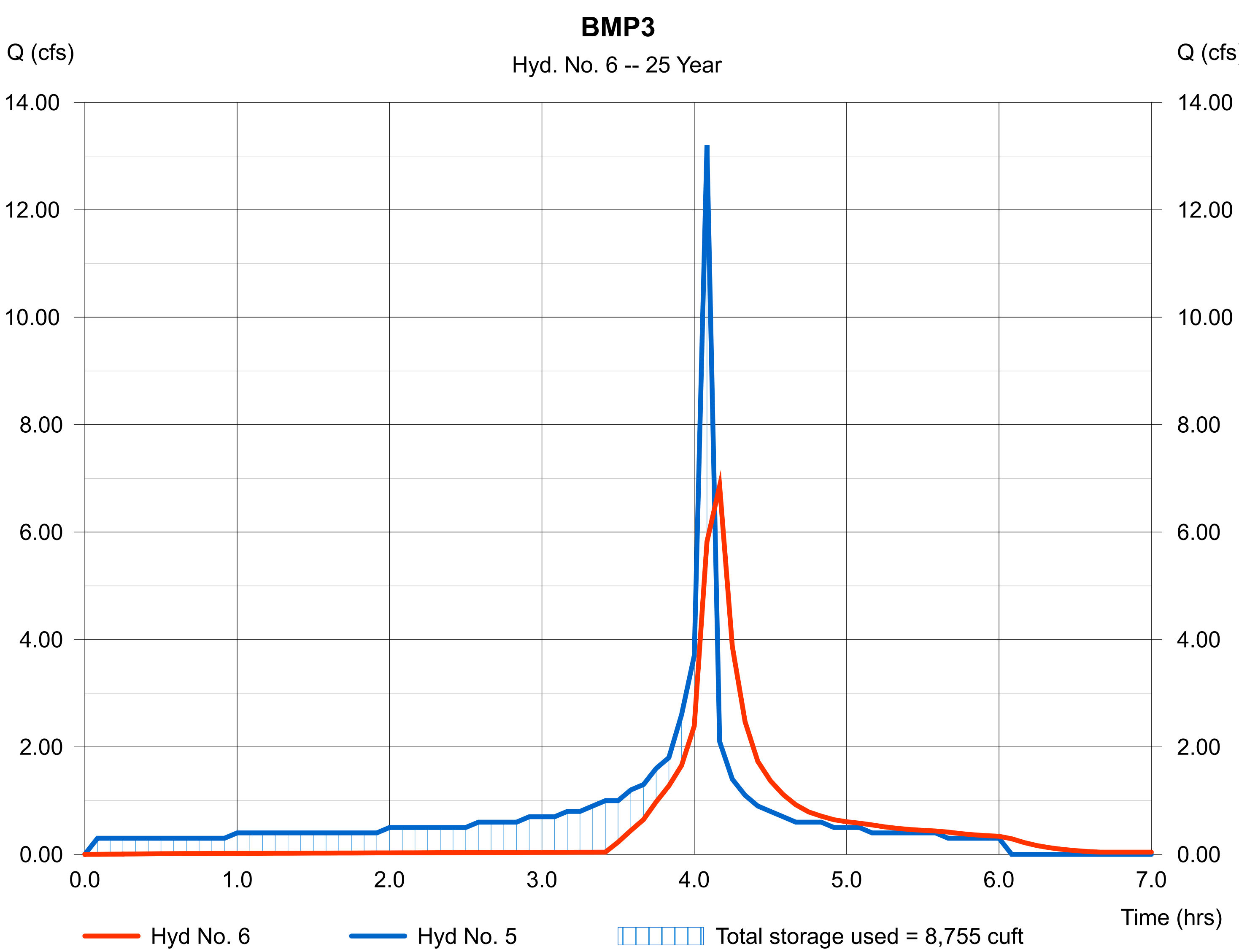
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 6

BMP3

Hydrograph type	= Reservoir	Peak discharge	= 6.859 cfs
Storm frequency	= 25 yrs	Time to peak	= 4.17 hrs
Time interval	= 5 min	Hyd. volume	= 18,018 cuft
Inflow hyd. No.	= 5 - BMP 3 Inflow Hydrograph	Max. Elevation	= 479.26 ft
Reservoir name	= BMP 3	Max. Storage	= 8,755 cuft

Storage Indication method used.



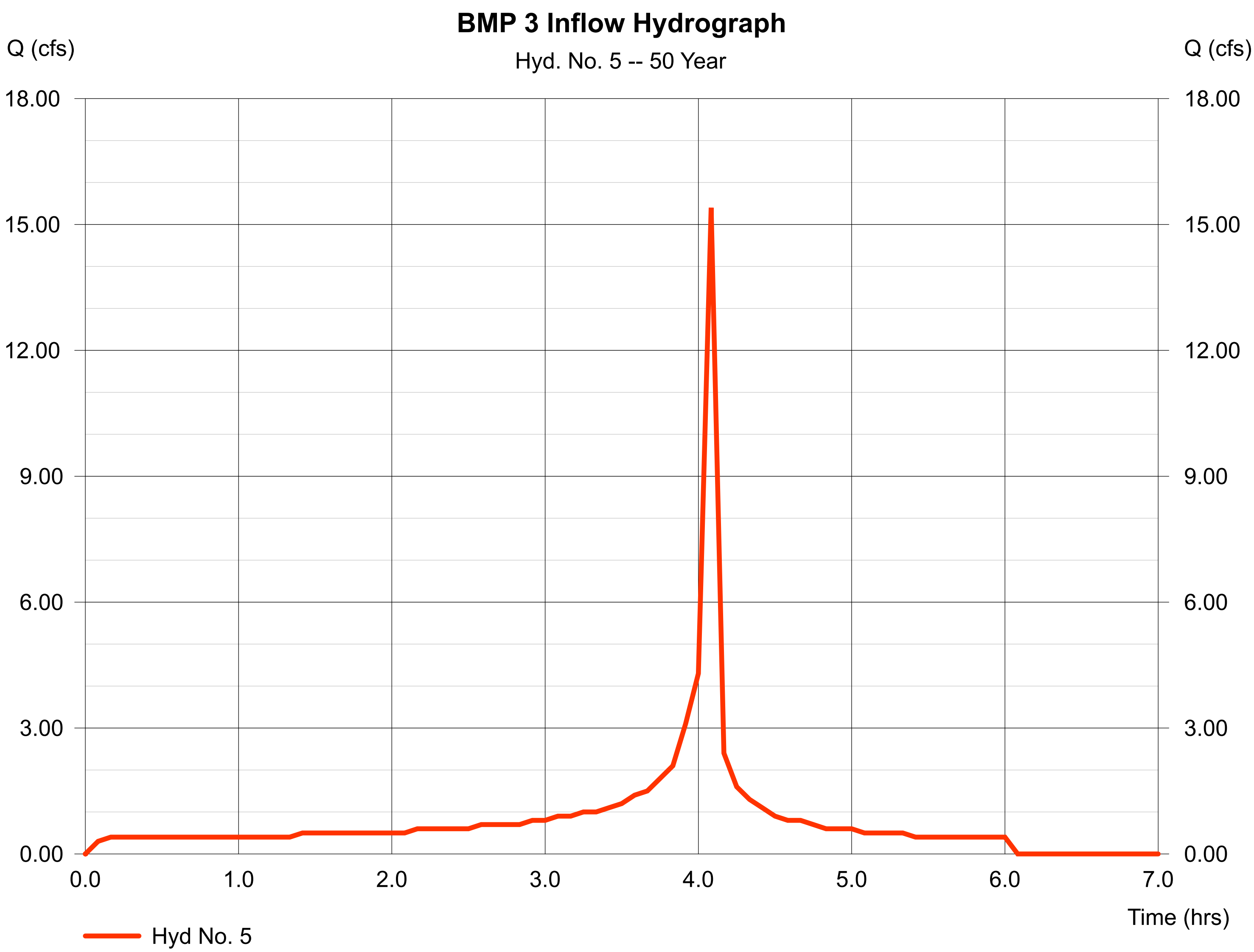
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 12 / 7 / 2022

Hyd. No. 5

BMP 3 Inflow Hydrograph

Hydrograph type	= Manual	Peak discharge	= 15.40 cfs
Storm frequency	= 50 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 21,150 cuft



Hydrograph Report

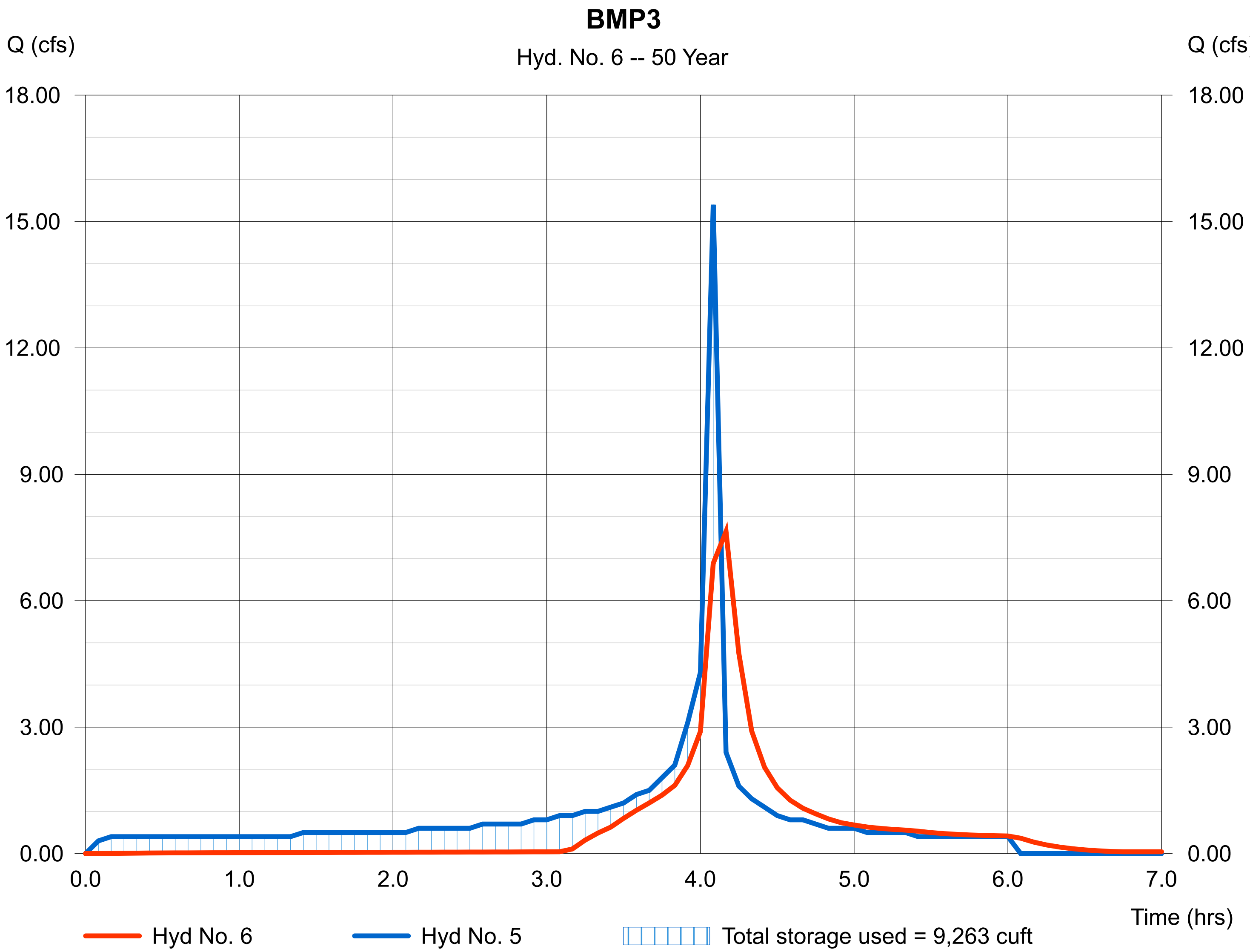
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 6

BMP3

Hydrograph type	= Reservoir	Peak discharge	= 7.644 cfs
Storm frequency	= 50 yrs	Time to peak	= 4.17 hrs
Time interval	= 5 min	Hyd. volume	= 21,108 cuft
Inflow hyd. No.	= 5 - BMP 3 Inflow Hydrograph	Max. Elevation	= 479.30 ft
Reservoir name	= BMP 3	Max. Storage	= 9,263 cuft

Storage Indication method used.



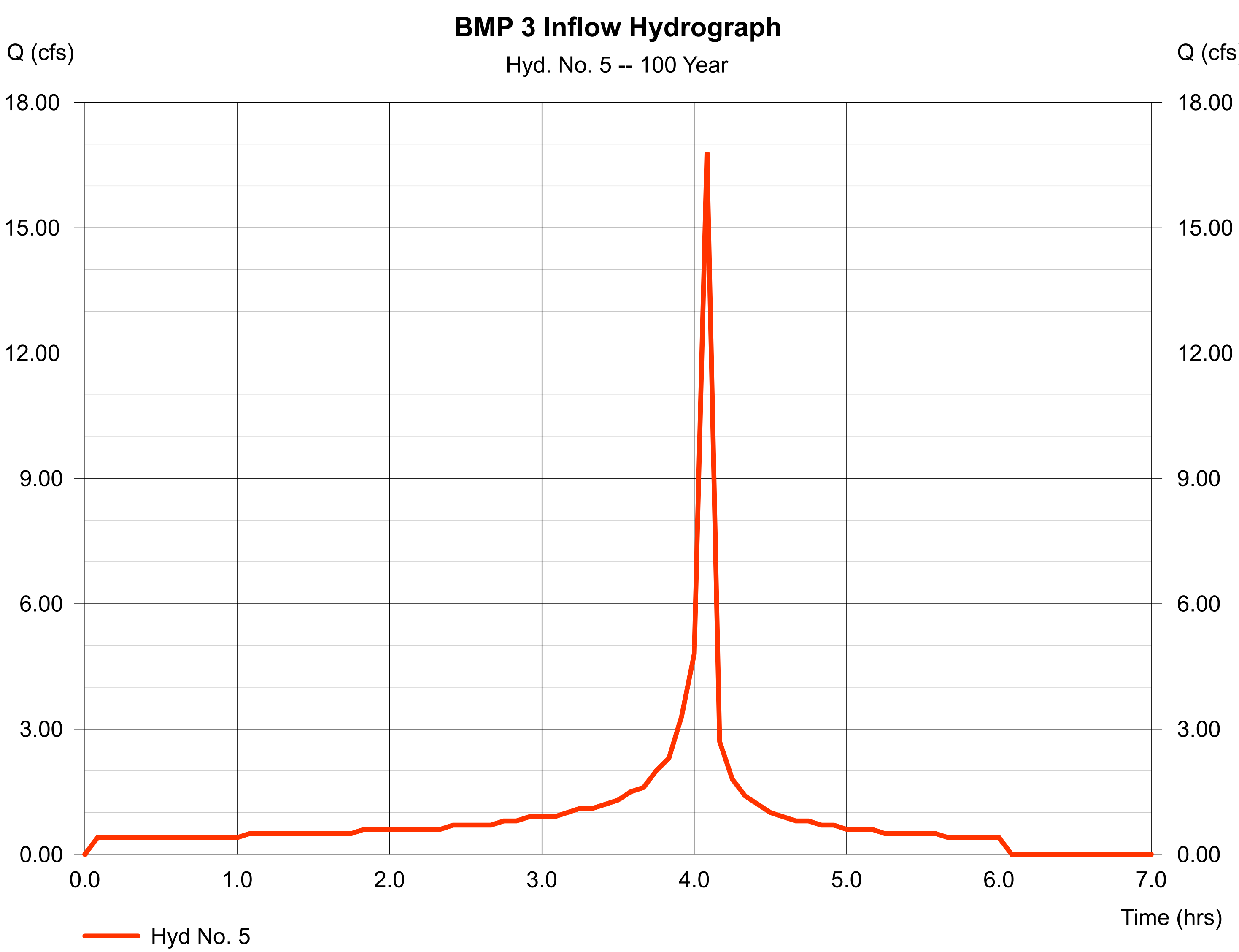
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 5

BMP 3 Inflow Hydrograph

Hydrograph type	= Manual	Peak discharge	= 16.80 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 23,070 cuft



Hydrograph Report

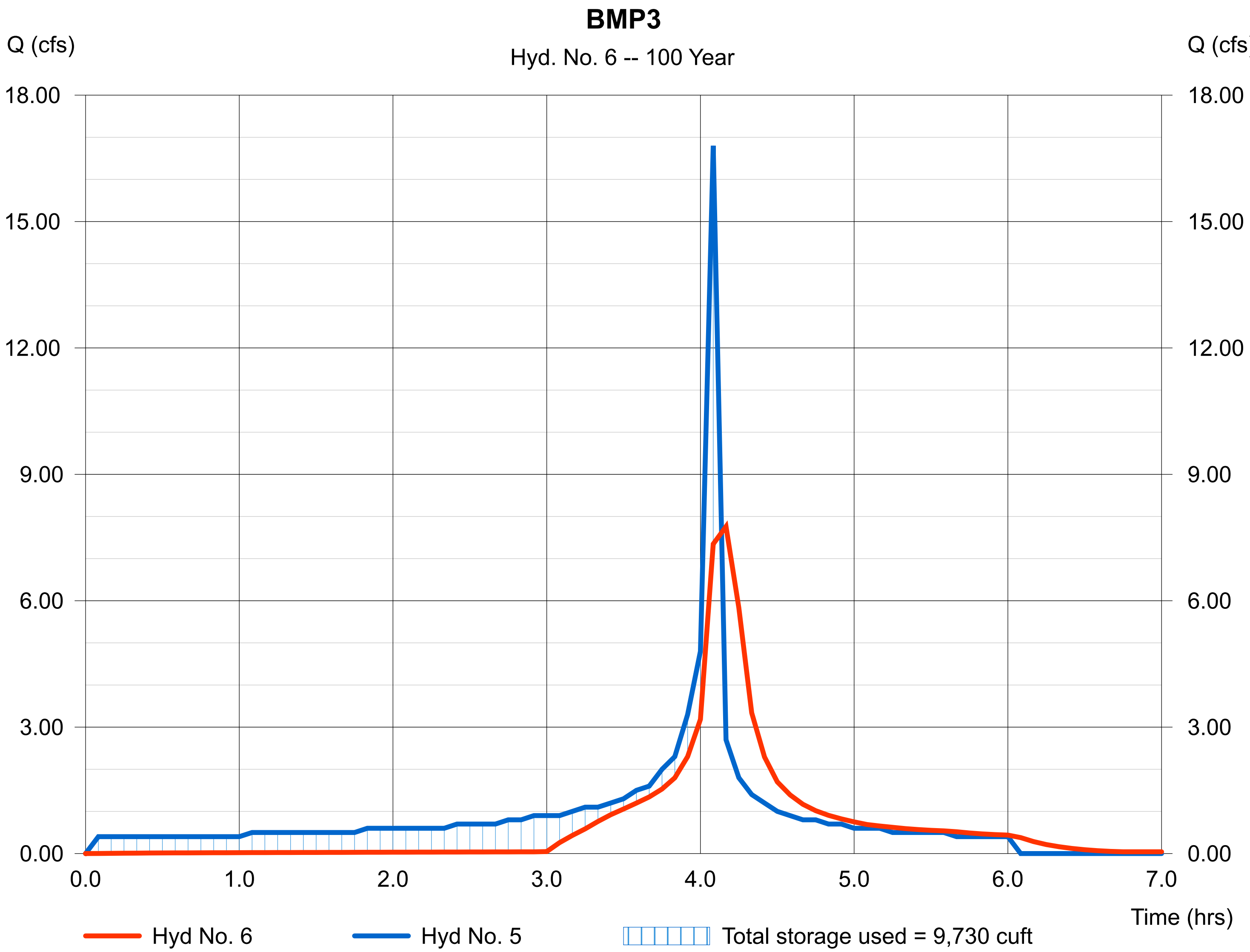
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Wednesday, 12 / 7 / 2022

Hyd. No. 6

BMP3

Hydrograph type	= Reservoir	Peak discharge	= 7.760 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.17 hrs
Time interval	= 5 min	Hyd. volume	= 23,028 cuft
Inflow hyd. No.	= 5 - BMP 3 Inflow Hydrograph	Max. Elevation	= 479.33 ft
Reservoir name	= BMP 3	Max. Storage	= 9,730 cuft

Storage Indication method used.



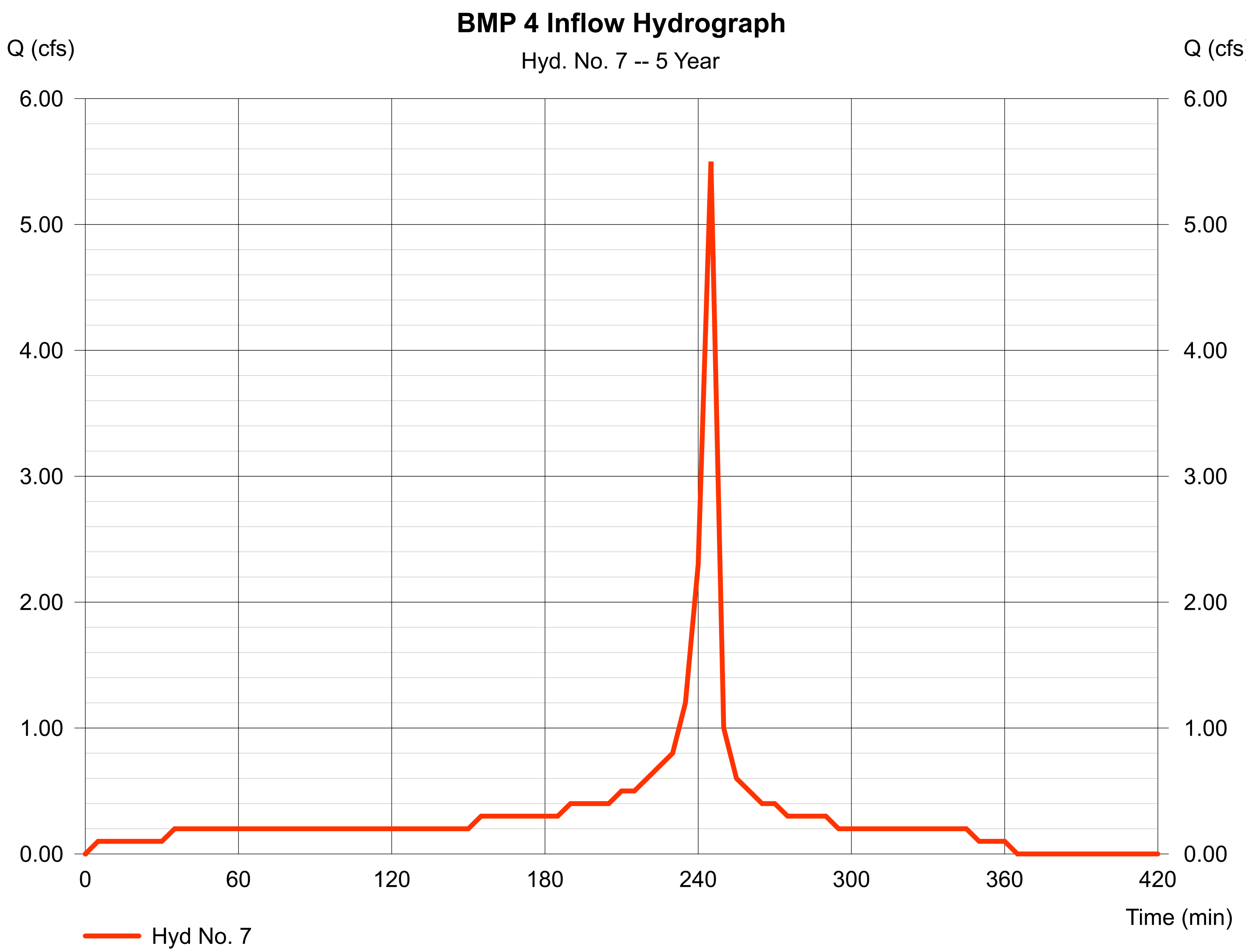
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Tuesday, 12 / 20 / 2022

Hyd. No. 7

BMP 4 Inflow Hydrograph

Hydrograph type	= Manual	Peak discharge	= 5.500 cfs
Storm frequency	= 5 yrs	Time to peak	= 245 min
Time interval	= 5 min	Hyd. volume	= 8,340 cuft



Hydrograph Report

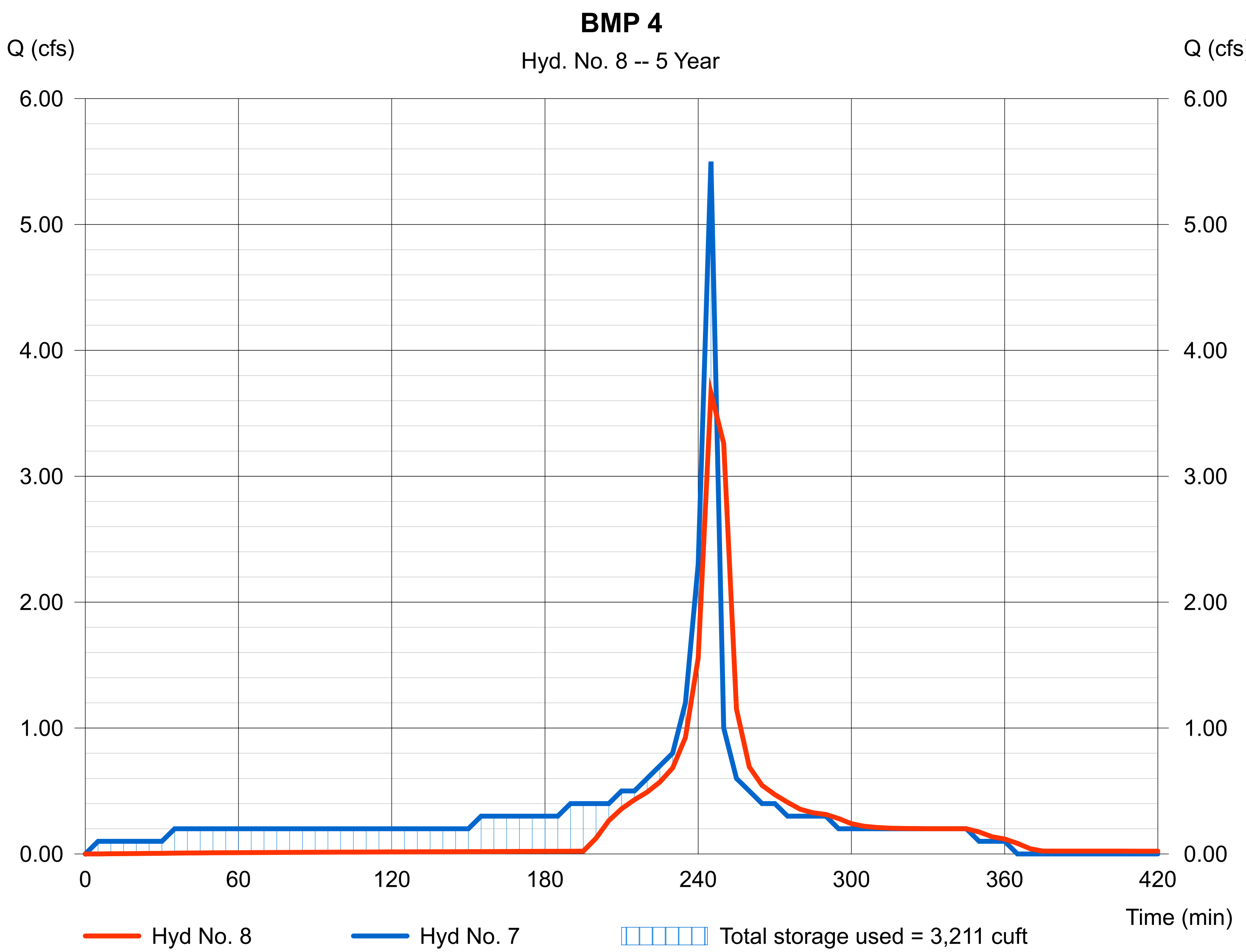
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Tuesday, 12 / 20 / 2022

Hyd. No. 8

BMP 4

Hydrograph type	= Reservoir	Peak discharge	= 3.662 cfs
Storm frequency	= 5 yrs	Time to peak	= 245 min
Time interval	= 5 min	Hyd. volume	= 8,307 cuft
Inflow hyd. No.	= 7 - BMP 4 Inflow Hydrograph	Max. Elevation	= 479.49 ft
Reservoir name	= BMP 4	Max. Storage	= 3,211 cuft

Storage Indication method used.



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Tuesday, 12 / 20 / 2022

Pond No. 4 - BMP 4

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	478.82	n/a	0	0
0.50	479.32	n/a	2,332	2,332
1.00	479.82	n/a	2,643	4,975
1.50	480.32	n/a	2,960	7,935
2.00	480.82	n/a	3,283	11,218

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	1.10	Inactive	0.00
Span (in)	= 12.00	1.10	12.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 474.82	475.07	479.60	0.00
Length (ft)	= 0.00	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	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	0.00	0.00	0.00
Crest El. (ft)	= 479.32	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

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	478.82	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.05	233	478.87	7.07 ic	0.01 ic	0.00	---	0.00	---	---	---	---	---	0.007
0.10	466	478.92	7.07 ic	0.01 ic	0.00	---	0.00	---	---	---	---	---	0.010
0.15	700	478.97	7.07 ic	0.01 ic	0.00	---	0.00	---	---	---	---	---	0.012
0.20	933	479.02	7.07 ic	0.01 ic	0.00	---	0.00	---	---	---	---	---	0.014
0.25	1,166	479.07	7.07 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.016
0.30	1,399	479.12	7.07 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.017
0.35	1,632	479.17	7.07 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.019
0.40	1,866	479.22	7.07 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.020
0.45	2,099	479.27	7.07 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.021
0.50	2,332	479.32	7.07 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.022
0.55	2,596	479.37	7.07 ic	0.02 ic	0.00	---	0.60	---	---	---	---	---	0.619
0.60	2,861	479.42	7.07 ic	0.02 ic	0.00	---	1.69	---	---	---	---	---	1.710
0.65	3,125	479.47	7.07 ic	0.03 ic	0.00	---	3.10	---	---	---	---	---	3.121
0.70	3,389	479.52	7.07 ic	0.03 ic	0.00	---	4.76	---	---	---	---	---	4.791
0.75	3,654	479.57	7.07 ic	0.03 ic	0.00	---	6.66	---	---	---	---	---	6.683
0.80	3,918	479.62	7.69 ic	0.01 ic	0.00	---	7.67 s	---	---	---	---	---	7.685
0.85	4,182	479.67	7.79 ic	0.01 ic	0.00	---	7.78 s	---	---	---	---	---	7.791
0.90	4,446	479.72	7.87 ic	0.01 ic	0.00	---	7.86 s	---	---	---	---	---	7.869
0.95	4,711	479.77	7.93 ic	0.01 ic	0.00	---	7.92 s	---	---	---	---	---	7.930
1.00	4,975	479.82	7.99 ic	0.01 ic	0.00	---	7.97 s	---	---	---	---	---	7.981
1.05	5,271	479.87	8.04 ic	0.01 ic	0.00	---	8.03 s	---	---	---	---	---	8.040
1.10	5,567	479.92	8.09 ic	0.00 ic	0.00	---	8.08 s	---	---	---	---	---	8.088
1.15	5,863	479.97	8.14 ic	0.00 ic	0.00	---	8.12 s	---	---	---	---	---	8.123
1.20	6,159	480.02	8.18 ic	0.00 ic	0.00	---	8.17 s	---	---	---	---	---	8.174
1.25	6,455	480.07	8.23 ic	0.00 ic	0.00	---	8.20 s	---	---	---	---	---	8.206
1.30	6,751	480.12	8.28 ic	0.00 ic	0.00	---	8.25 s	---	---	---	---	---	8.257
1.35	7,047	480.17	8.32 ic	0.00 ic	0.00	---	8.30 s	---	---	---	---	---	8.298
1.40	7,343	480.22	8.36 ic	0.00 ic	0.00	---	8.35 s	---	---	---	---	---	8.355
1.45	7,639	480.27	8.41 ic	0.00 ic	0.00	---	8.38 s	---	---	---	---	---	8.387
1.50	7,935	480.32	8.45 ic	0.00 ic	0.00	---	8.44 s	---	---	---	---	---	8.443
1.55	8,263	480.37	8.49 ic	0.00 ic	0.00	---	8.46 s	---	---	---	---	---	8.462
1.60	8,592	480.42	8.54 ic	0.00 ic	0.00	---	8.49 s	---	---	---	---	---	8.496
1.65	8,920	480.47	8.58 ic	0.00 ic	0.00	---	8.50 s	---	---	---	---	---	8.506
1.70	9,248	480.52	8.62 ic	0.00 ic	0.00	---	8.54 s	---	---	---	---	---	8.545
1.75	9,576	480.57	8.66 ic	0.00 ic	0.00	---	8.64 s	---	---	---	---	---	8.638
1.80	9,905	480.62	8.70 ic	0.00 ic	0.00	---	8.58 s	---	---	---	---	---	8.585
1.85	10,233	480.67	8.74 ic	0.00 ic	0.00	---	8.69 s	---	---	---	---	---	8.695
1.90	10,561	480.72	8.78 ic	0.00 ic	0.00	---	8.67 s	---	---	---	---	---	8.669

Continues on next page...

BMP 4

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
1.95	10,890	480.77	8.83 ic	0.00 ic	0.00	---	8.70 s	---	---	---	---	---	8.698
2.00	11,218	480.82	8.87 ic	0.00 ic	0.00	---	8.71 s	---	---	---	---	---	8.711

...End

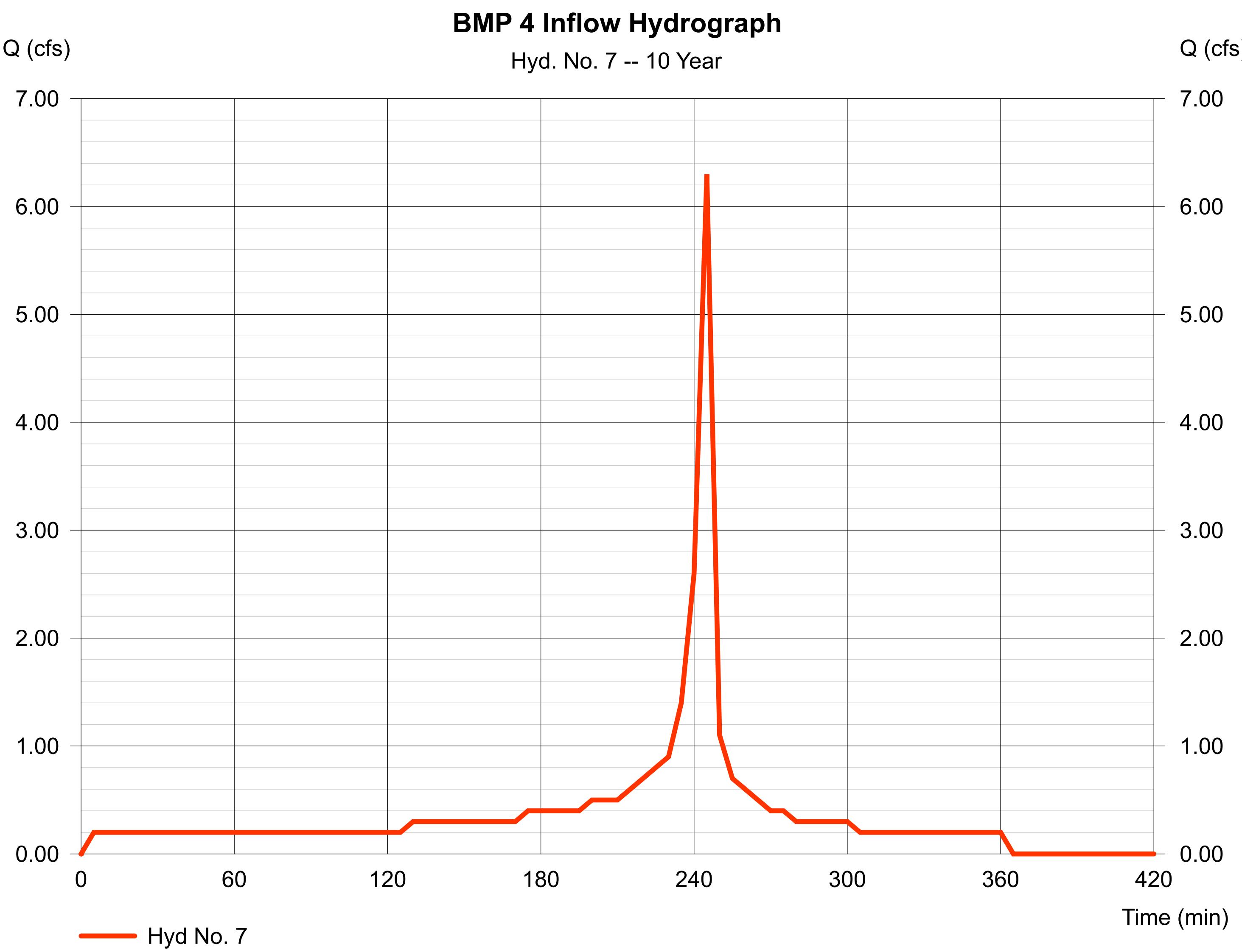
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Tuesday, 12 / 20 / 2022

Hyd. No. 7

BMP 4 Inflow Hydrograph

Hydrograph type	= Manual	Peak discharge	= 6.300 cfs
Storm frequency	= 10 yrs	Time to peak	= 245 min
Time interval	= 5 min	Hyd. volume	= 9,630 cuft



Hydrograph Report

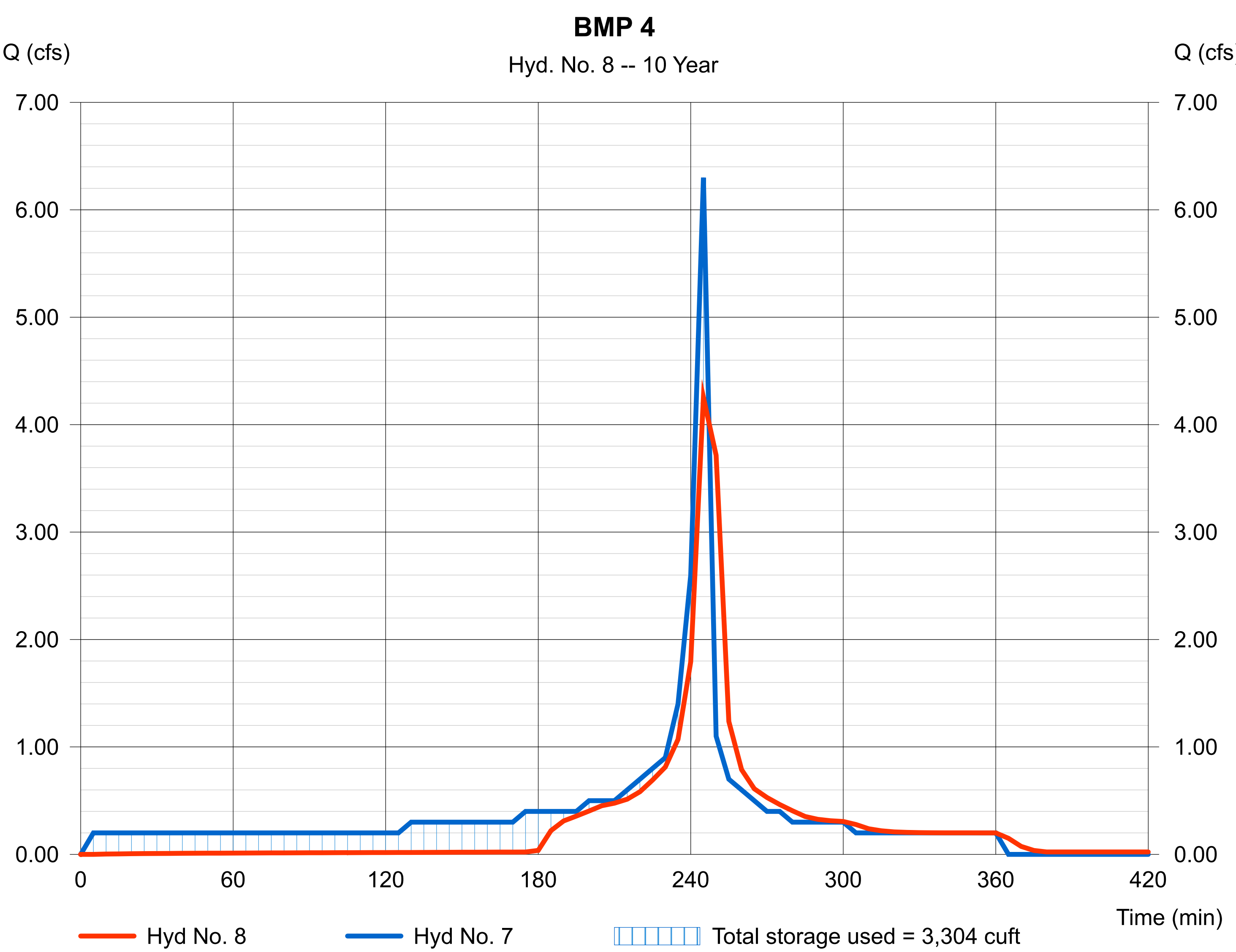
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Tuesday, 12 / 20 / 2022

Hyd. No. 8

BMP 4

Hydrograph type	= Reservoir	Peak discharge	= 4.254 cfs
Storm frequency	= 10 yrs	Time to peak	= 245 min
Time interval	= 5 min	Hyd. volume	= 9,597 cuft
Inflow hyd. No.	= 7 - BMP 4 Inflow Hydrograph	Max. Elevation	= 479.50 ft
Reservoir name	= BMP 4	Max. Storage	= 3,304 cuft

Storage Indication method used.



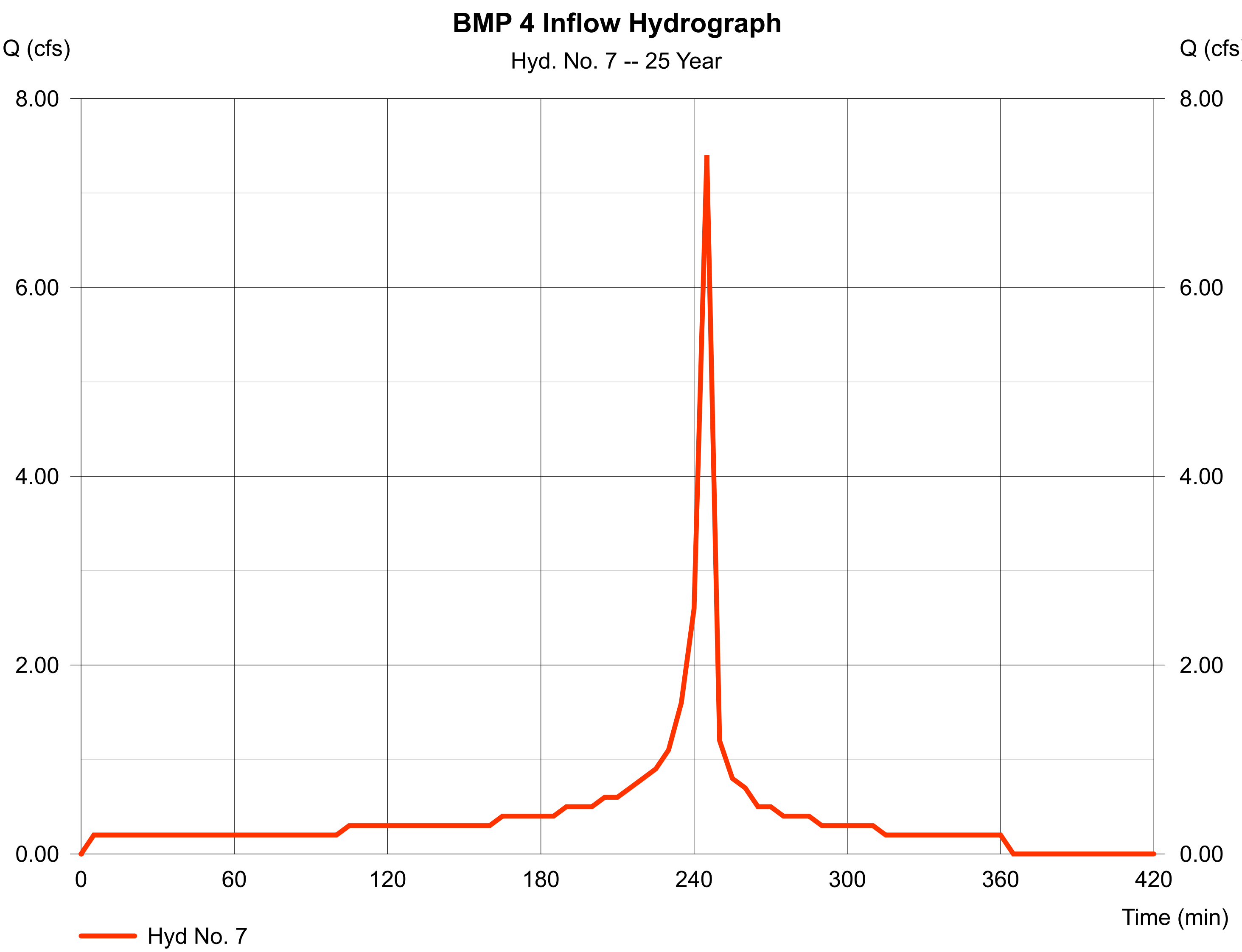
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Tuesday, 12 / 20 / 2022

Hyd. No. 7

BMP 4 Inflow Hydrograph

Hydrograph type	= Manual	Peak discharge	= 7.400 cfs
Storm frequency	= 25 yrs	Time to peak	= 245 min
Time interval	= 5 min	Hyd. volume	= 10,740 cuft



Hydrograph Report

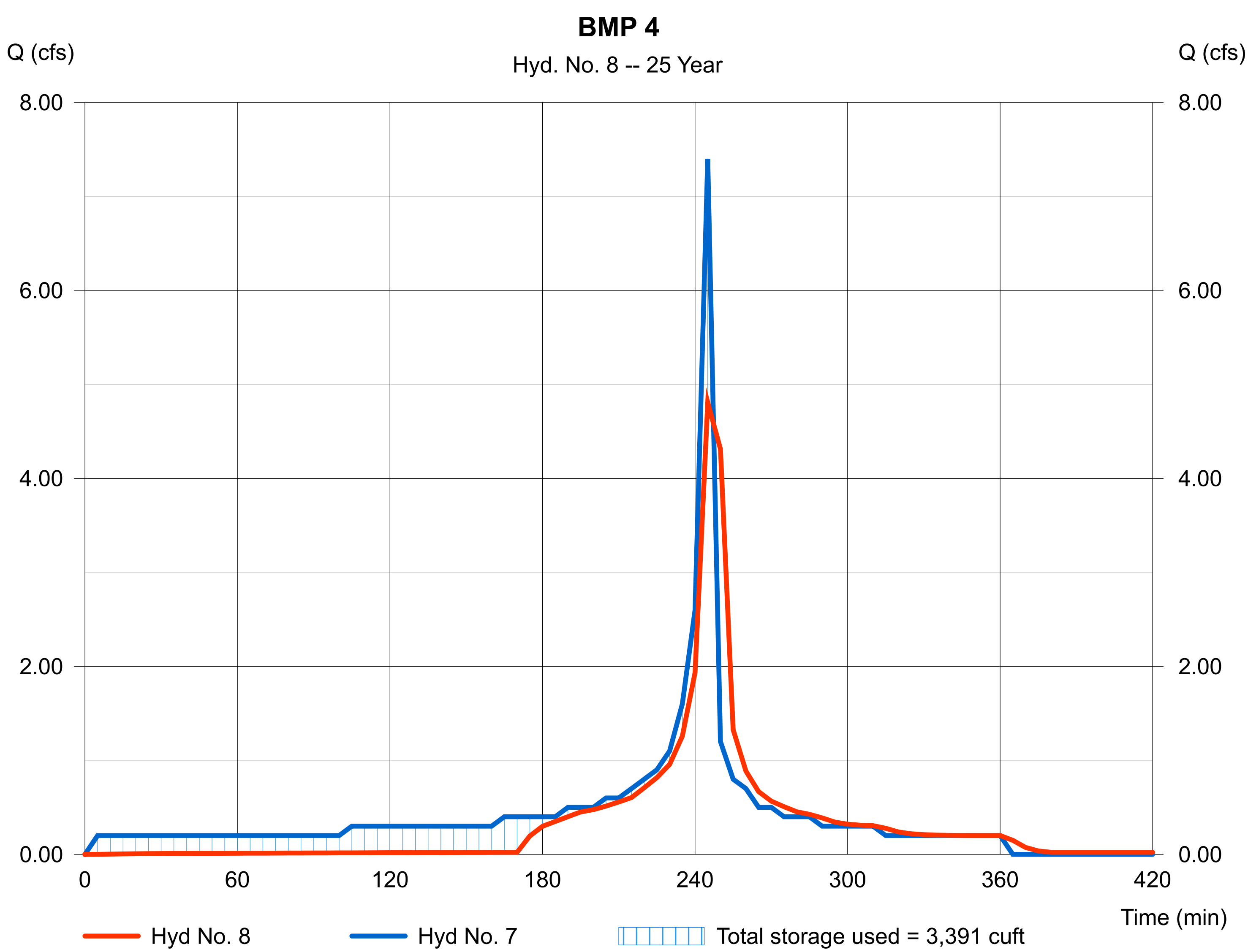
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Tuesday, 12 / 20 / 2022

Hyd. No. 8

BMP 4

Hydrograph type	= Reservoir	Peak discharge	= 4.807 cfs
Storm frequency	= 25 yrs	Time to peak	= 245 min
Time interval	= 5 min	Hyd. volume	= 10,707 cuft
Inflow hyd. No.	= 7 - BMP 4 Inflow Hydrograph	Max. Elevation	= 479.52 ft
Reservoir name	= BMP 4	Max. Storage	= 3,391 cuft

Storage Indication method used.



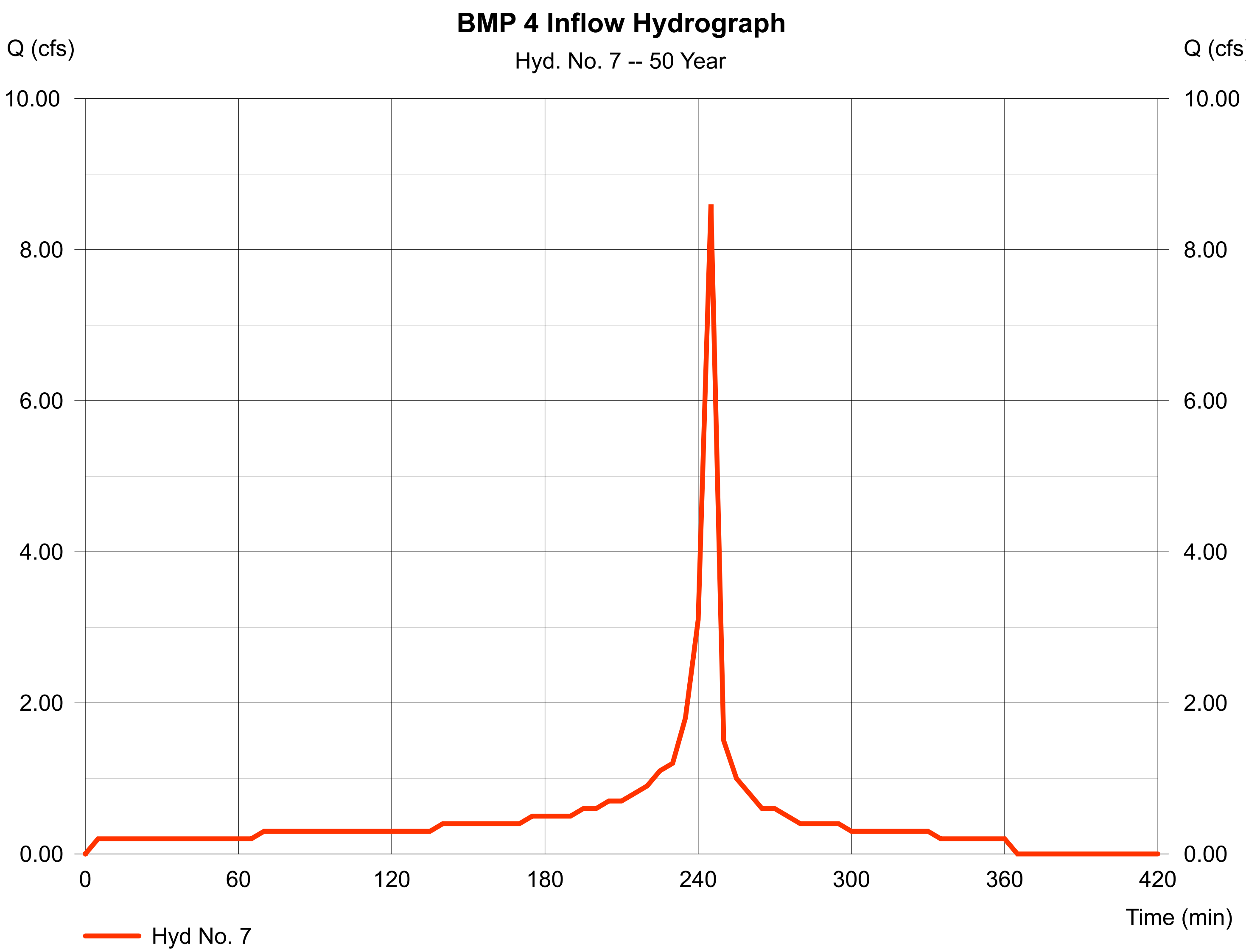
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Tuesday, 12 / 20 / 2022

Hyd. No. 7

BMP 4 Inflow Hydrograph

Hydrograph type	= Manual	Peak discharge	= 8.600 cfs
Storm frequency	= 50 yrs	Time to peak	= 245 min
Time interval	= 5 min	Hyd. volume	= 12,480 cuft



Hydrograph Report

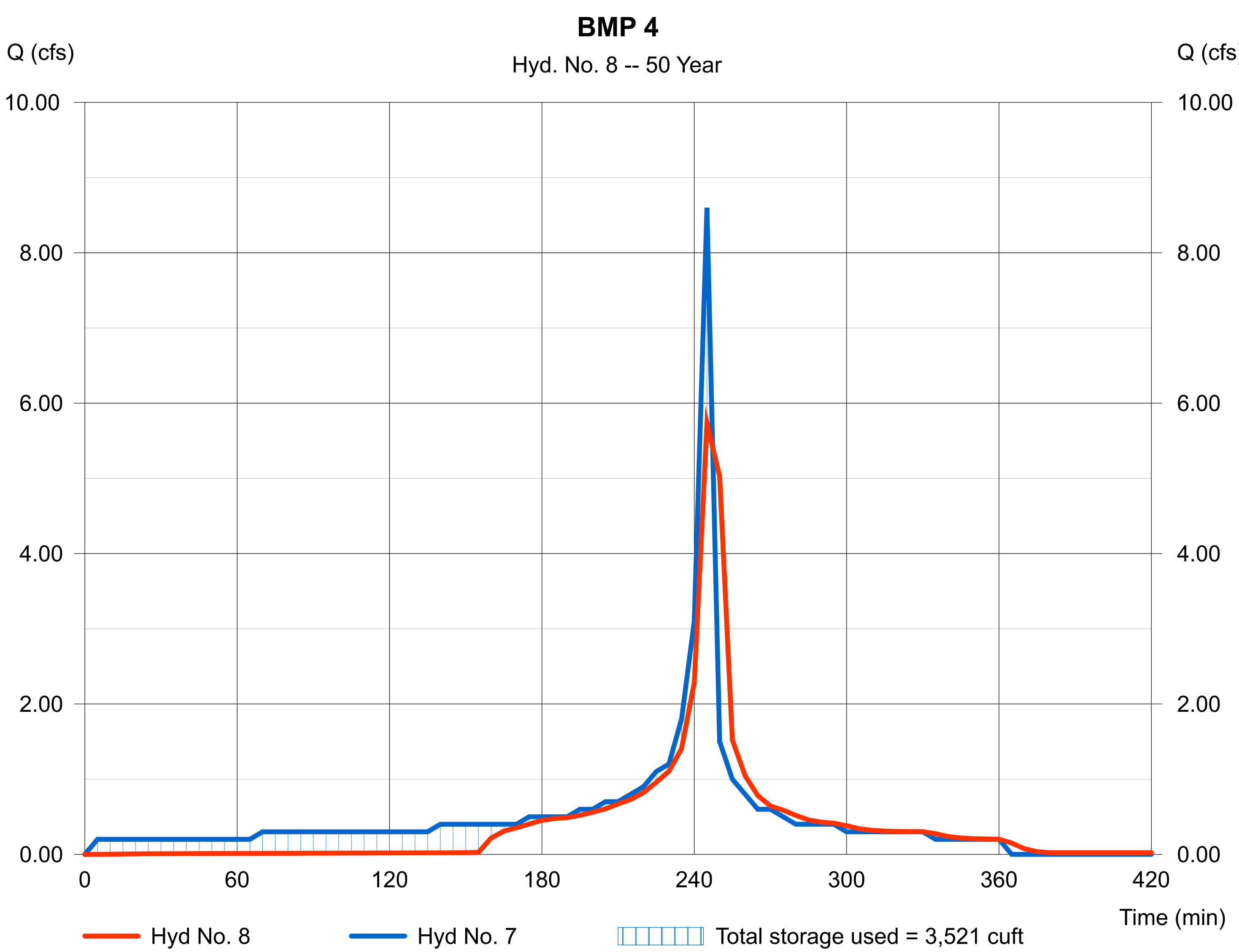
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Tuesday, 12 / 20 / 2022

Hyd. No. 8

BMP 4

Hydrograph type	= Reservoir	Peak discharge	= 5.733 cfs
Storm frequency	= 50 yrs	Time to peak	= 245 min
Time interval	= 5 min	Hyd. volume	= 12,447 cuft
Inflow hyd. No.	= 7 - BMP 4 Inflow Hydrograph	Max. Elevation	= 479.54 ft
Reservoir name	= BMP 4	Max. Storage	= 3,521 cuft

Storage Indication method used.



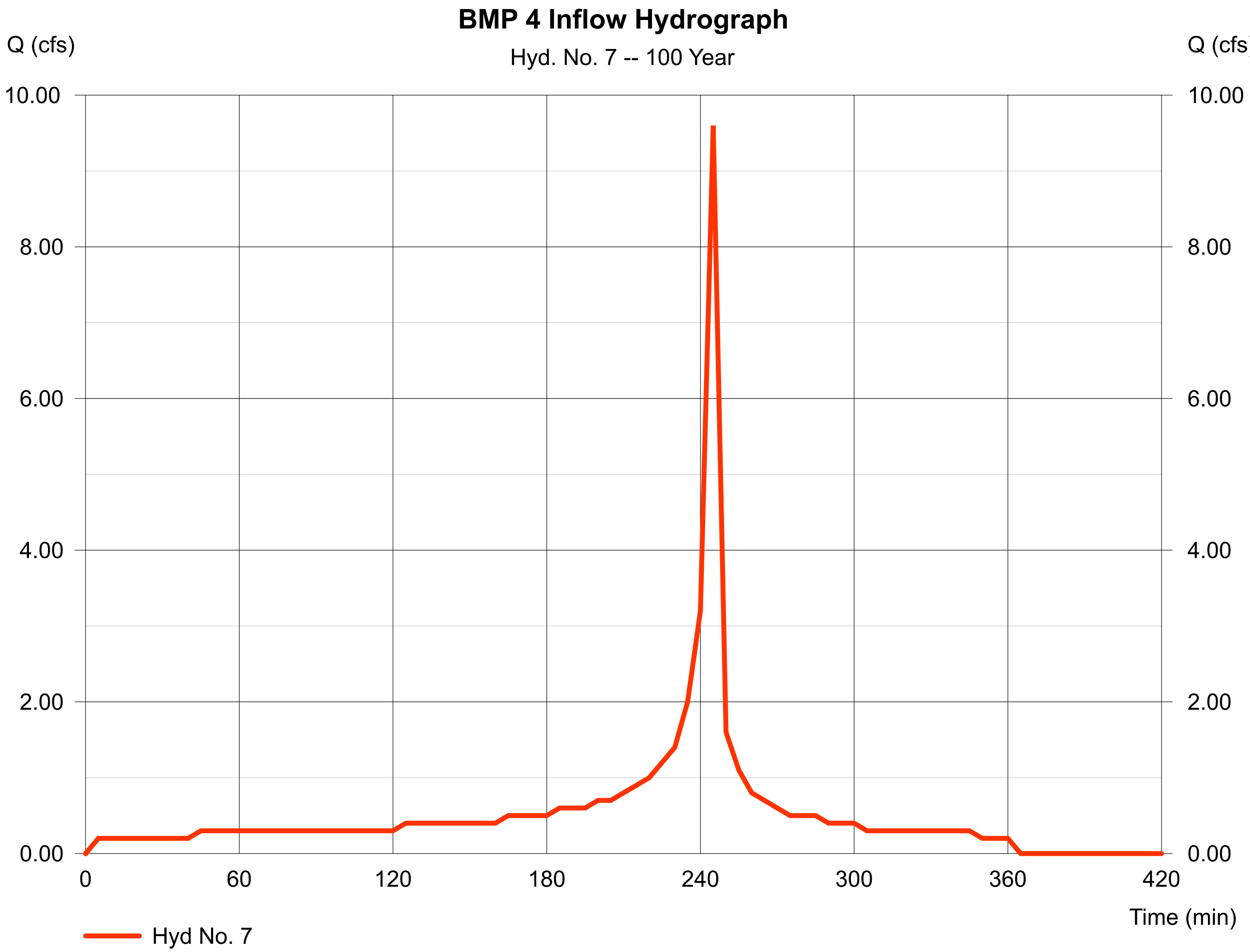
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Tuesday, 12 / 20 / 2022

Hyd. No. 7

BMP 4 Inflow Hydrograph

Hydrograph type	= Manual	Peak discharge	= 9.600 cfs
Storm frequency	= 100 yrs	Time to peak	= 245 min
Time interval	= 5 min	Hyd. volume	= 13,710 cuft



Hydrograph Report

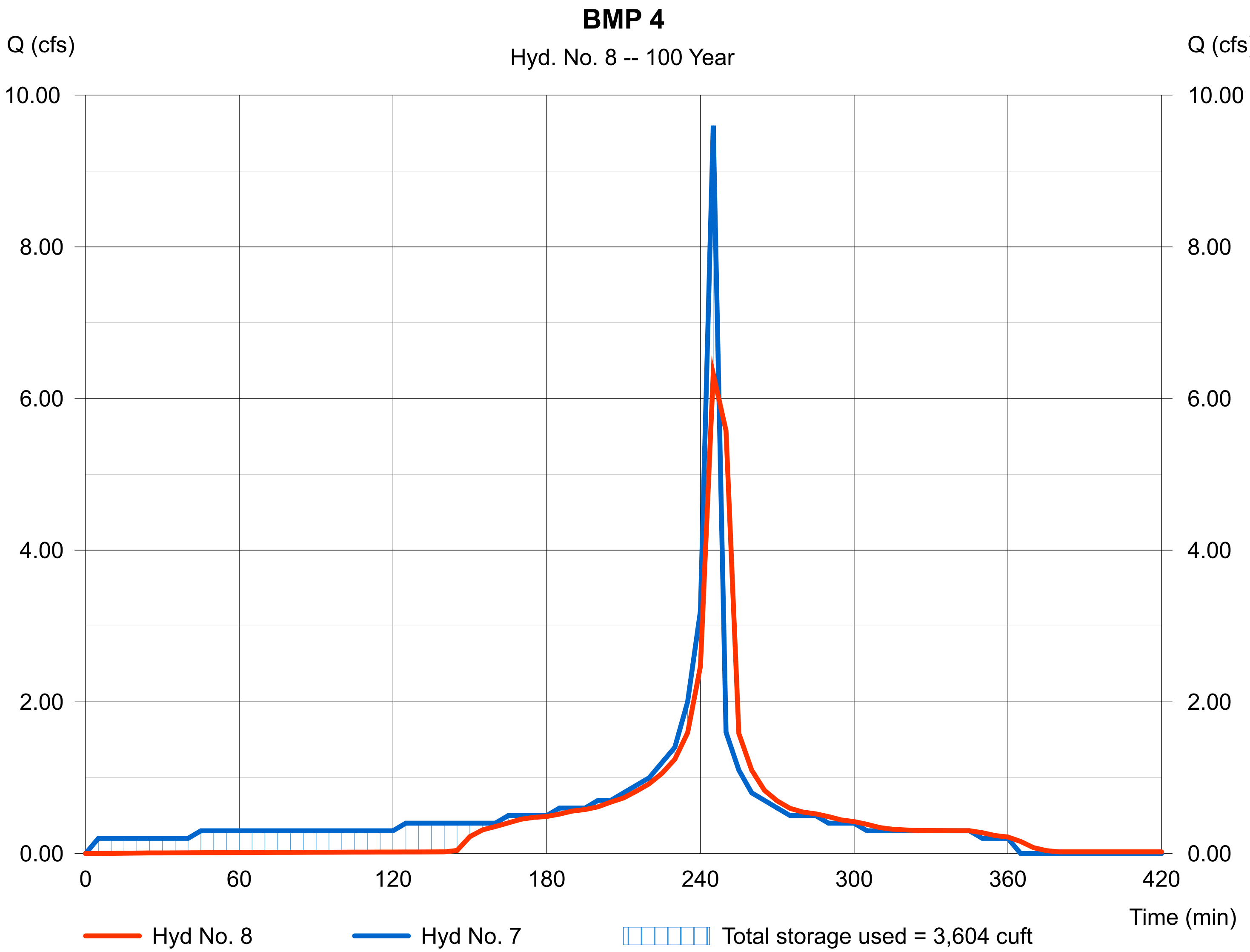
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Tuesday, 12 / 20 / 2022

Hyd. No. 8

BMP 4

Hydrograph type	= Reservoir	Peak discharge	= 6.326 cfs
Storm frequency	= 100 yrs	Time to peak	= 245 min
Time interval	= 5 min	Hyd. volume	= 13,677 cuft
Inflow hyd. No.	= 7 - BMP 4 Inflow Hydrograph	Max. Elevation	= 479.56 ft
Reservoir name	= BMP 4	Max. Storage	= 3,604 cuft

Storage Indication method used.



Circular Orifice - BMP1 5yr

Project Description	
Solve For	Discharge

Input Data	
Headwater Elevation	1.96 ft
Centroid Elevation	0.16 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600
Diameter	3.9 in

Results	
Discharge	0.54 cfs
Headwater Height Above Centroid	1.80 ft
Tailwater Height Above Centroid	-0.16 ft
Flow Area	0.1 ft²
Velocity	6.46 ft/s

Circular Orifice - BMP1 10yr

Project Description	
Solve For	Discharge

Input Data	
Headwater Elevation	2.17 ft
Centroid Elevation	0.16 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600
Diameter	3.9 in

Results	
Discharge	0.57 cfs
Headwater Height Above Centroid	2.01 ft
Tailwater Height Above Centroid	-0.16 ft
Flow Area	0.1 ft²
Velocity	6.83 ft/s

Circular Orifice - BMP1 25yr

Project Description	
Solve For	Discharge

Input Data	
Headwater Elevation	2.33 ft
Centroid Elevation	0.16 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600
Diameter	3.9 in

Results	
Discharge	0.59 cfs
Headwater Height Above Centroid	2.17 ft
Tailwater Height Above Centroid	-0.16 ft
Flow Area	0.1 ft²
Velocity	7.09 ft/s

Circular Orifice - BMP1 50yr

Project Description	
Solve For	Discharge

Input Data	
Headwater Elevation	2.78 ft
Centroid Elevation	0.16 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600
Diameter	3.9 in

Results	
Discharge	0.65 cfs
Headwater Height Above Centroid	2.62 ft
Tailwater Height Above Centroid	-0.16 ft
Flow Area	0.1 ft²
Velocity	7.79 ft/s

Circular Orifice - BMP1 100yr

Project Description	
Solve For	Discharge

Input Data	
Headwater Elevation	2.97 ft
Centroid Elevation	0.16 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600
Diameter	3.9 in

Results	
Discharge	0.67 cfs
Headwater Height Above Centroid	2.81 ft
Tailwater Height Above Centroid	-0.16 ft
Flow Area	0.1 ft²
Velocity	8.07 ft/s

Circular Orifice - BMP2 5yr

Project Description	
Solve For	Discharge

Input Data	
Headwater Elevation	4.23 ft
Centroid Elevation	0.10 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600
Diameter	2.4 in

Results	
Discharge	0.31 cfs
Headwater Height Above Centroid	4.13 ft
Tailwater Height Above Centroid	-0.10 ft
Flow Area	0.0 ft²
Velocity	9.79 ft/s

Circular Orifice - BMP2 10yr

Project Description		
Solve For	Discharge	

Input Data		
Headwater Elevation	4.28	ft
Centroid Elevation	0.10	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.600	
Diameter	2.4	in

Results		
Discharge	0.31	cfs
Headwater Height Above Centroid	4.18	ft
Tailwater Height Above Centroid	-0.10	ft
Flow Area	0.0	ft²
Velocity	9.85	ft/s

Circular Orifice - BMP2 25yr

Project Description	
Solve For	Discharge

Input Data	
Headwater Elevation	4.34 ft
Centroid Elevation	0.10 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600
Diameter	2.4 in

Results	
Discharge	0.31 cfs
Headwater Height Above Centroid	4.24 ft
Tailwater Height Above Centroid	-0.10 ft
Flow Area	0.0 ft²
Velocity	9.92 ft/s

Circular Orifice - BMP2 50yr

Project Description	
Solve For	Discharge

Input Data	
Headwater Elevation	4.42 ft
Centroid Elevation	0.10 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600
Diameter	2.4 in

Results	
Discharge	0.31 cfs
Headwater Height Above Centroid	4.32 ft
Tailwater Height Above Centroid	-0.10 ft
Flow Area	0.0 ft²
Velocity	10.01 ft/s

Circular Orifice - BMP2 100yr

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	4.47 ft
Centroid Elevation	0.10 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600
Diameter	2.4 in

Results

Discharge	0.32 cfs
Headwater Height Above Centroid	4.37 ft
Tailwater Height Above Centroid	-0.10 ft
Flow Area	0.0 ft²
Velocity	10.07 ft/s

Circular Orifice - BMP3 5yr

Project Description	
Solve For	Discharge

Input Data	
Headwater Elevation	4.71 ft
Centroid Elevation	0.00 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600
Diameter	1.5 in

Results	
Discharge	0.13 cfs
Headwater Height Above Centroid	4.71 ft
Tailwater Height Above Centroid	0.00 ft
Flow Area	0.0 ft²
Velocity	10.44 ft/s

Circular Orifice - BMP3 10yr

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	4.73 ft
Centroid Elevation	0.00 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600
Diameter	1.5 in

Results

Discharge	0.13 cfs
Headwater Height Above Centroid	4.73 ft
Tailwater Height Above Centroid	0.00 ft
Flow Area	0.0 ft²
Velocity	10.46 ft/s

Circular Orifice - BMP3 25yr

Project Description	
Solve For	Discharge

Input Data	
Headwater Elevation	4.76 ft
Centroid Elevation	0.00 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600
Diameter	1.5 in

Results	
Discharge	0.13 cfs
Headwater Height Above Centroid	4.76 ft
Tailwater Height Above Centroid	0.00 ft
Flow Area	0.0 ft²
Velocity	10.50 ft/s

Circular Orifice - BMP3 50yr

Project Description	
Solve For	Discharge

Input Data	
Headwater Elevation	4.80 ft
Centroid Elevation	0.00 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600
Diameter	1.5 in

Results	
Discharge	0.13 cfs
Headwater Height Above Centroid	4.80 ft
Tailwater Height Above Centroid	0.00 ft
Flow Area	0.0 ft²
Velocity	10.54 ft/s

Circular Orifice - BMP3 100yr

Project Description	
Solve For	Discharge

Input Data	
Headwater Elevation	4.83 ft
Centroid Elevation	0.00 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600
Diameter	1.5 in

Results	
Discharge	0.13 cfs
Headwater Height Above Centroid	4.83 ft
Tailwater Height Above Centroid	0.00 ft
Flow Area	0.0 ft²
Velocity	10.57 ft/s

Circular Orifice - BMP4 5yr

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	4.67 ft
Centroid Elevation	0.05 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600
Diameter	1.1 in

Results

Discharge	0.07 cfs
Headwater Height Above Centroid	4.62 ft
Tailwater Height Above Centroid	-0.05 ft
Flow Area	0.0 ft²
Velocity	10.35 ft/s

Circular Orifice - BMP4 10yr

Project Description	
Solve For	Discharge

Input Data	
Headwater Elevation	4.68 ft
Centroid Elevation	0.05 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600
Diameter	1.1 in

Results	
Discharge	0.07 cfs
Headwater Height Above Centroid	4.63 ft
Tailwater Height Above Centroid	-0.05 ft
Flow Area	0.0 ft²
Velocity	10.36 ft/s

Circular Orifice - BMP4 25yr

Project Description	
Solve For	Discharge

Input Data	
Headwater Elevation	4.70 ft
Centroid Elevation	0.05 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600
Diameter	1.1 in

Results	
Discharge	0.07 cfs
Headwater Height Above Centroid	4.65 ft
Tailwater Height Above Centroid	-0.05 ft
Flow Area	0.0 ft²
Velocity	10.38 ft/s

Circular Orifice - BMP4 50yr

Project Description	
Solve For	Discharge

Input Data		
Headwater Elevation	4.72	ft
Centroid Elevation	0.05	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.600	
Diameter	1.1	in

Results		
Discharge	0.07	cfs
Headwater Height Above Centroid	4.67	ft
Tailwater Height Above Centroid	-0.05	ft
Flow Area	0.0	ft²
Velocity	10.40	ft/s

Circular Orifice - BMP4 100yr

Project Description	
Solve For	Discharge

Input Data	
Headwater Elevation	4.74 ft
Centroid Elevation	0.05 ft
Tailwater Elevation	0.00 ft
Discharge Coefficient	0.600
Diameter	1.1 in

Results	
Discharge	0.07 cfs
Headwater Height Above Centroid	4.69 ft
Tailwater Height Above Centroid	-0.05 ft
Flow Area	0.0 ft²
Velocity	10.42 ft/s

BASIN 1 DRAWDOWN						
STORM EVENT	WSE (HYDRAFLOW)	ORIFICE ELEVATION	HEADWATER ELEVATION	VOLUME (HYDRAFLOW)	Q_{OUT} (FLOWMASTER)	TIME (HRS)
5	475.21	473.25	1.96	55732	0.54	28.67
10	475.42	473.25	2.17	61719	0.57	30.08
25	475.58	473.25	2.33	66474	0.59	31.30
50	476.03	473.25	2.78	79306	0.65	33.89
100	476.22	473.25	2.97	84677	0.67	35.11

BASIN 2 DRAWDOWN						
STORM EVENT	WSE (HYDRAFLOW)	ORIFICE ELEVATION	HEADWATER ELEVATION	VOLUME (HYDRAFLOW)	Q_{OUT} (FLOWMASTER)	TIME (HRS)
5	477.73	473.5	4.23	15550	0.31	13.93
10	477.78	473.5	4.28	16716	0.31	14.98
25	477.84	473.5	4.34	18073	0.31	16.19
50	477.92	473.5	4.42	19908	0.31	17.84
100	477.97	473.5	4.47	21091	0.32	18.31

BASIN 3 DRAWDOWN						
STORM EVENT	WSE (HYDRAFLOW)	ORIFICE ELEVATION	HEADWATER ELEVATION	VOLUME (HYDRAFLOW)	Q_{OUT} (FLOWMASTER)	TIME (HRS)
5	479.21	474.5	4.71	8110	0.13	17.33
10	479.23	474.5	4.73	8455	0.13	18.07
25	479.26	474.5	4.76	8755	0.13	18.71
50	479.3	474.5	4.8	9263	0.13	19.79
100	479.33	474.5	4.83	9730	0.13	20.79

BASIN 4 DRAWDOWN						
STORM EVENT	WSE (HYDRAFLOW)	ORIFICE ELEVATION	HEADWATER ELEVATION	VOLUME (HYDRAFLOW)	Q_{OUT} (FLOWMASTER)	TIME (HRS)
5	479.49	474.82	4.67	3211	0.07	12.74
10	479.5	474.82	4.68	3304	0.07	13.11
25	479.52	474.82	4.7	3391	0.07	13.46
50	479.54	474.82	4.72	3521	0.07	13.97
100	479.56	474.82	4.74	3604	0.07	14.30

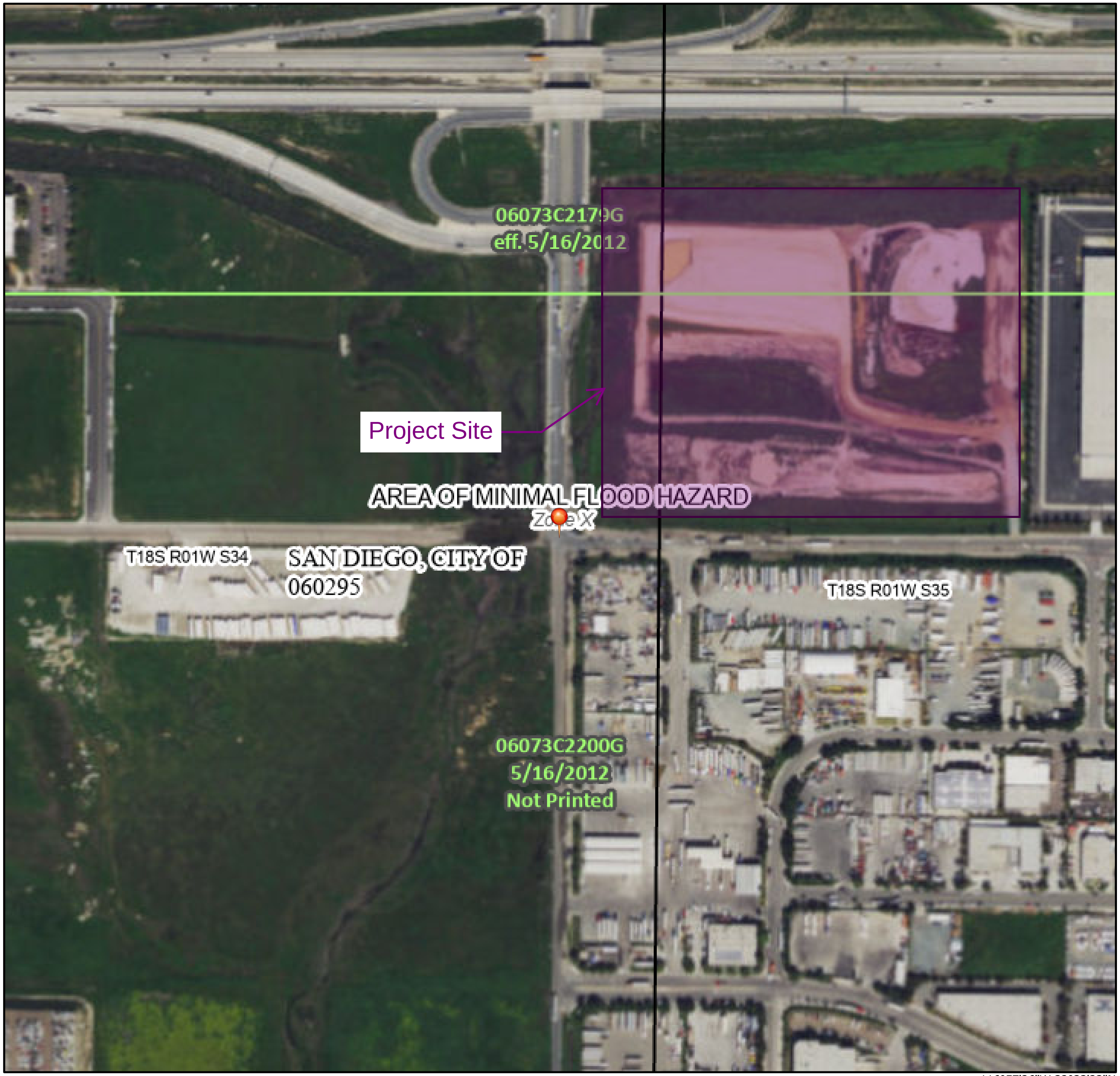
APPENDIX G

FEMA MAP

National Flood Hazard Layer FIRMette

FEMA

116°58'4"W 32°33'53"N



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1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

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The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

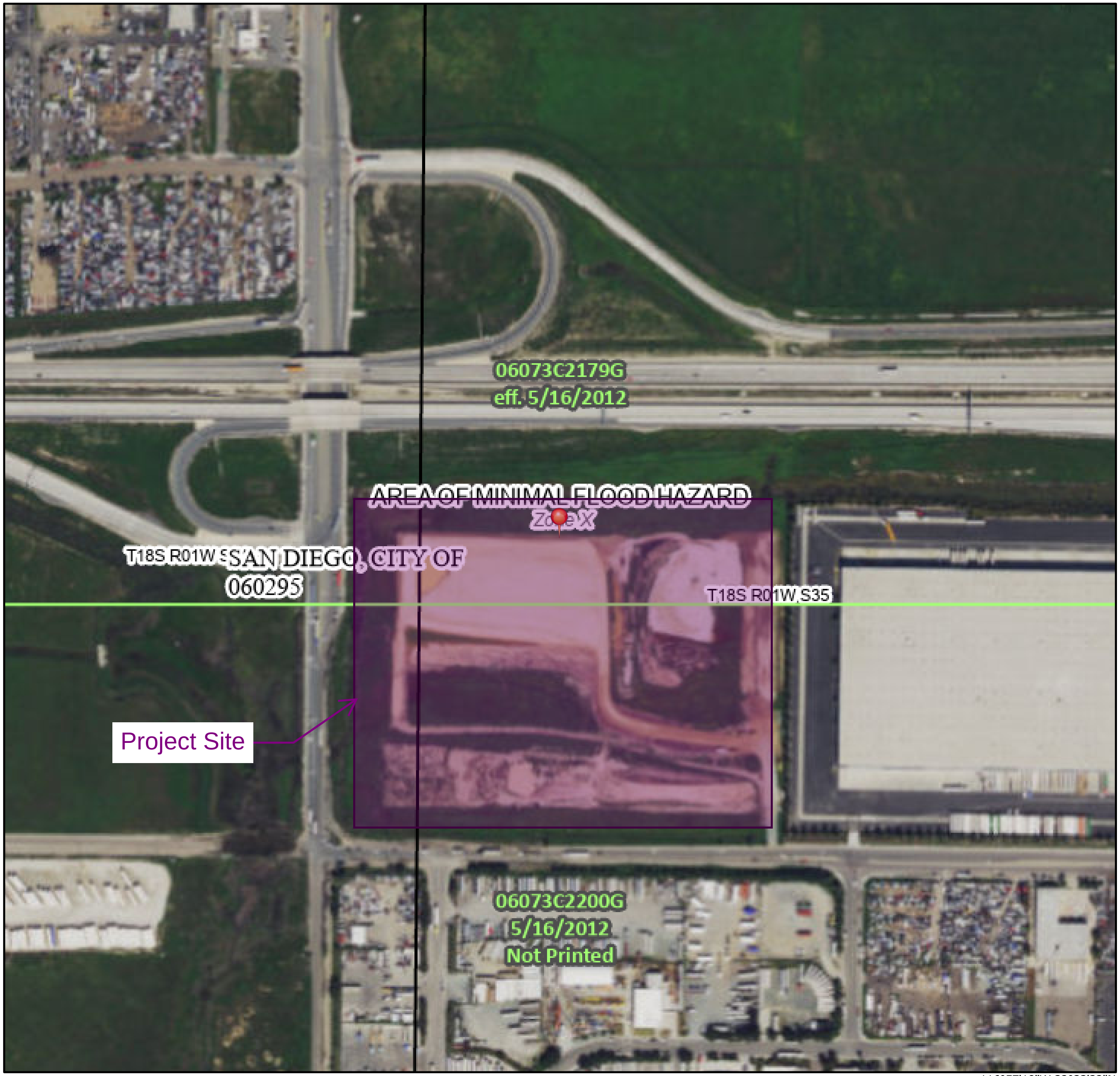
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/5/2021 at 2:59 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

National Flood Hazard Layer FIRMette

FEMA

116°57'55"W 32°34'2"N



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Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
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OTHER AREAS OF FLOOD HAZARD
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- Area with Flood Risk due to Levee *Zone D*

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- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

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APPENDIX H

HEC-RAS MODELS

PROPOSED CONDITION HEC-RAS WORKMAP
FOR
METROPOLITAN AIRPARK - LA MEDIA ROAD

SHEET 1 OF 3

J-18429
DATE: DECEMBER 16, 2019

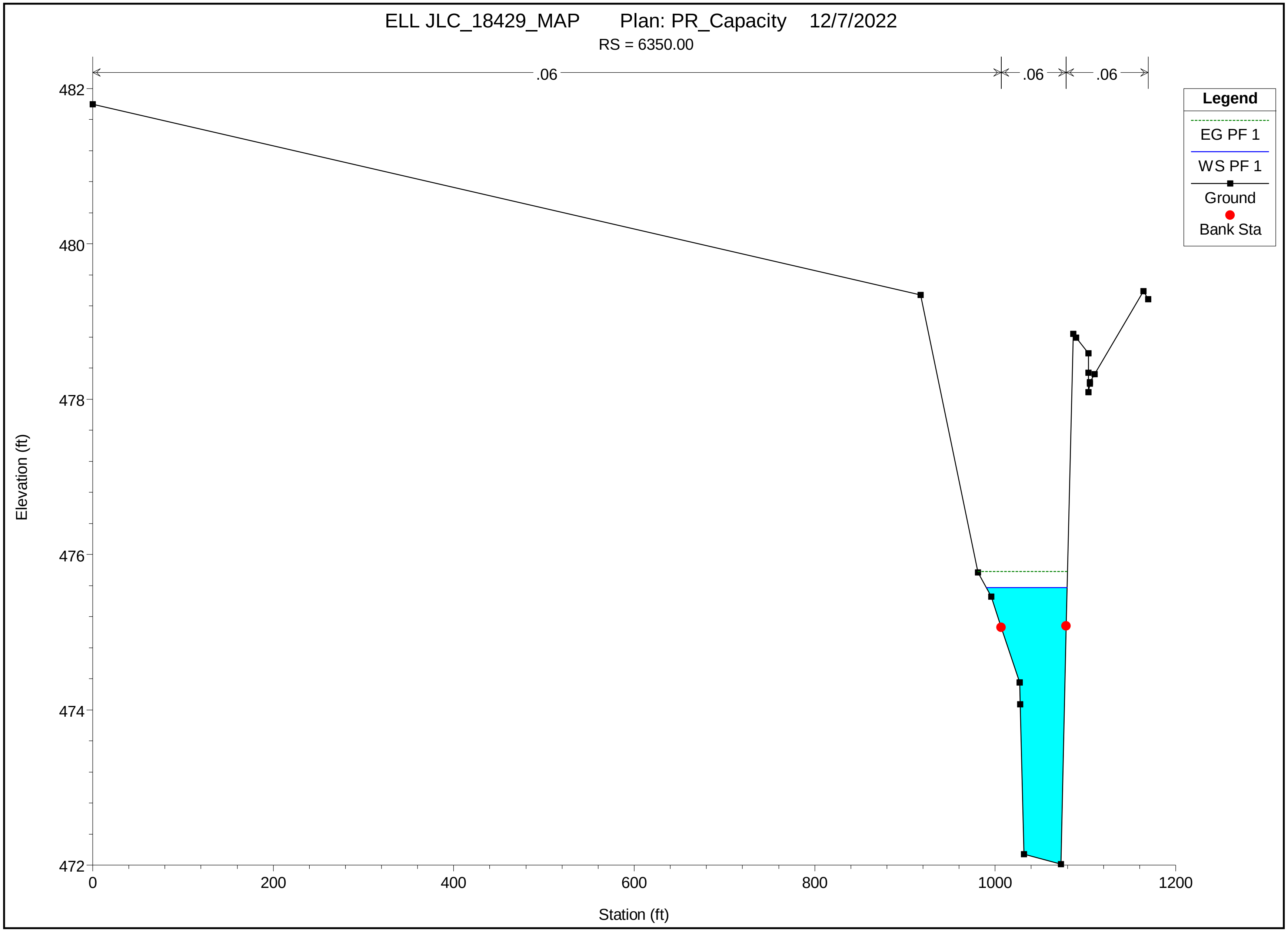
RICK ENGINEERING COMPANY
San Diego
5620 FRIARS ROAD
SAN DIEGO, CA 92110
619.291.0707
(FAX)619.291.4165
rickengineering.com
Orange - Riverside - Sacramento - San Luis Obispo - Phoenix - Tucson - Denver - Las Vegas

Q25

HEC-RAS Plan: PR_Capacity River: Otay Mesa Reach: Main Reach Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main Reach	7063.61	PF 1	682.00	473.36	477.83		477.91	0.001791	2.51	331.52	143.59	0.23
Main Reach	6863.01	PF 1	682.00	473.09	477.55		477.60	0.001276	2.18	407.77	180.19	0.19
Main Reach	6660.16	PF 1	682.00	472.82	477.15		477.26	0.002239	2.94	282.90	133.24	0.26
Main Reach	6459.63	PF 1	682.00	472.58	476.54		476.71	0.003428	3.39	214.77	73.98	0.31
Main Reach	6350.00	PF 1	682.00	472.01	475.57		475.78	0.006466	3.68	188.38	89.64	0.41
Main Reach	6305.78	PF 1	682.00	472.00	475.07	473.44	475.23	0.003716	3.19	213.73	69.55	0.32
Main Reach	6255.99		Culvert									
Main Reach	6190.78	PF 1	682.00	471.40	474.78		474.91	0.002660	2.88	236.88	76.62	0.28

Q25



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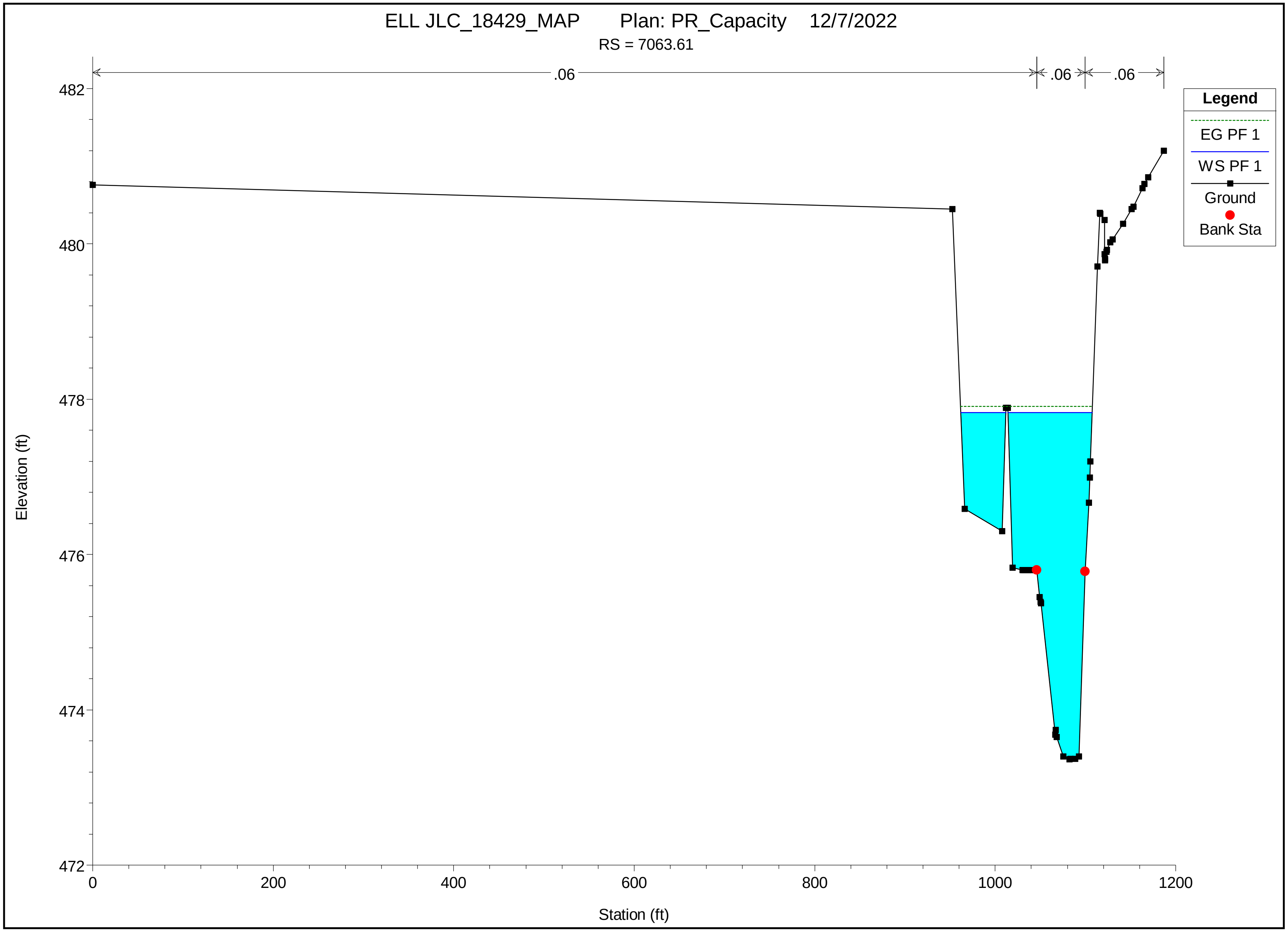

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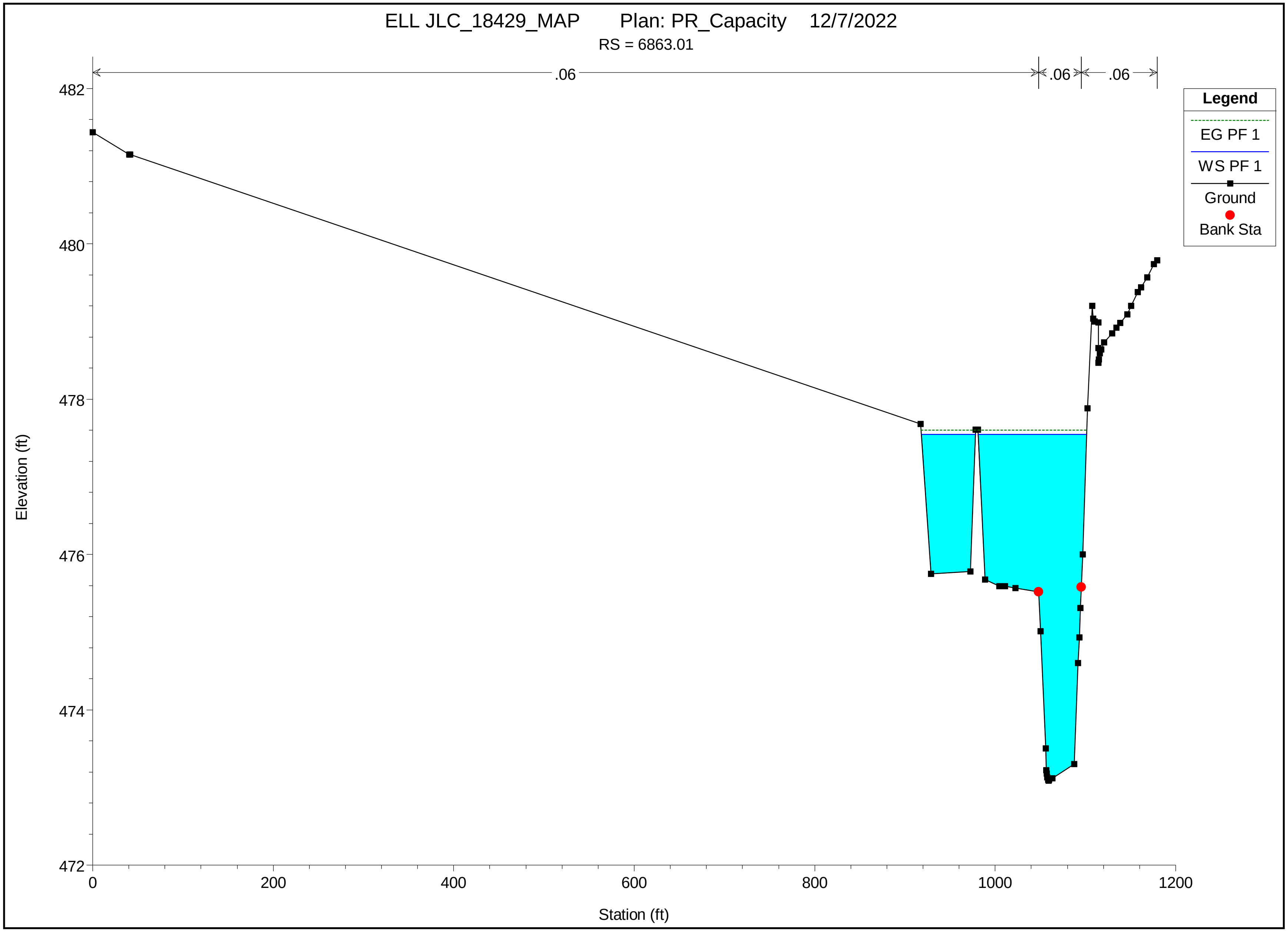

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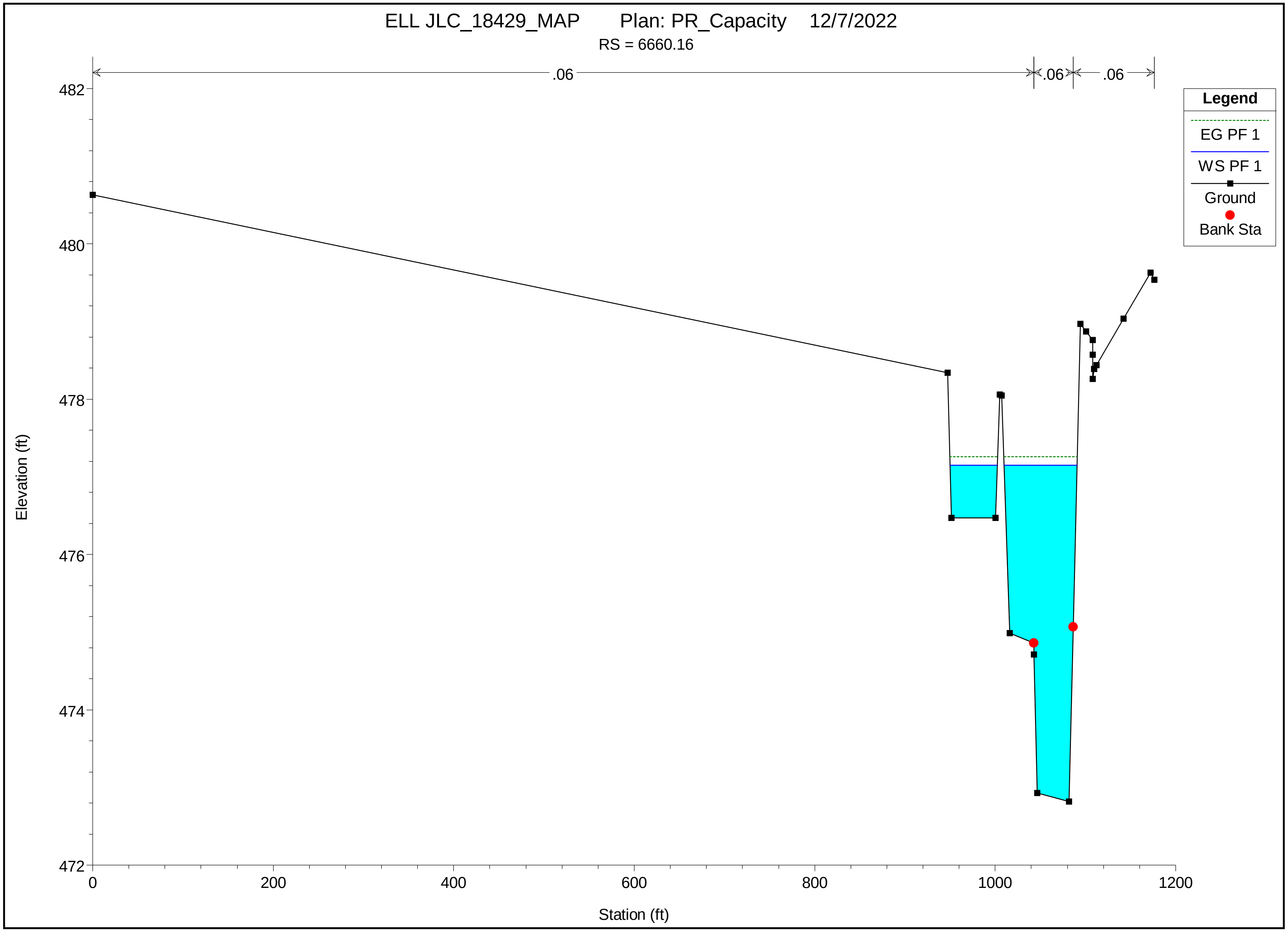
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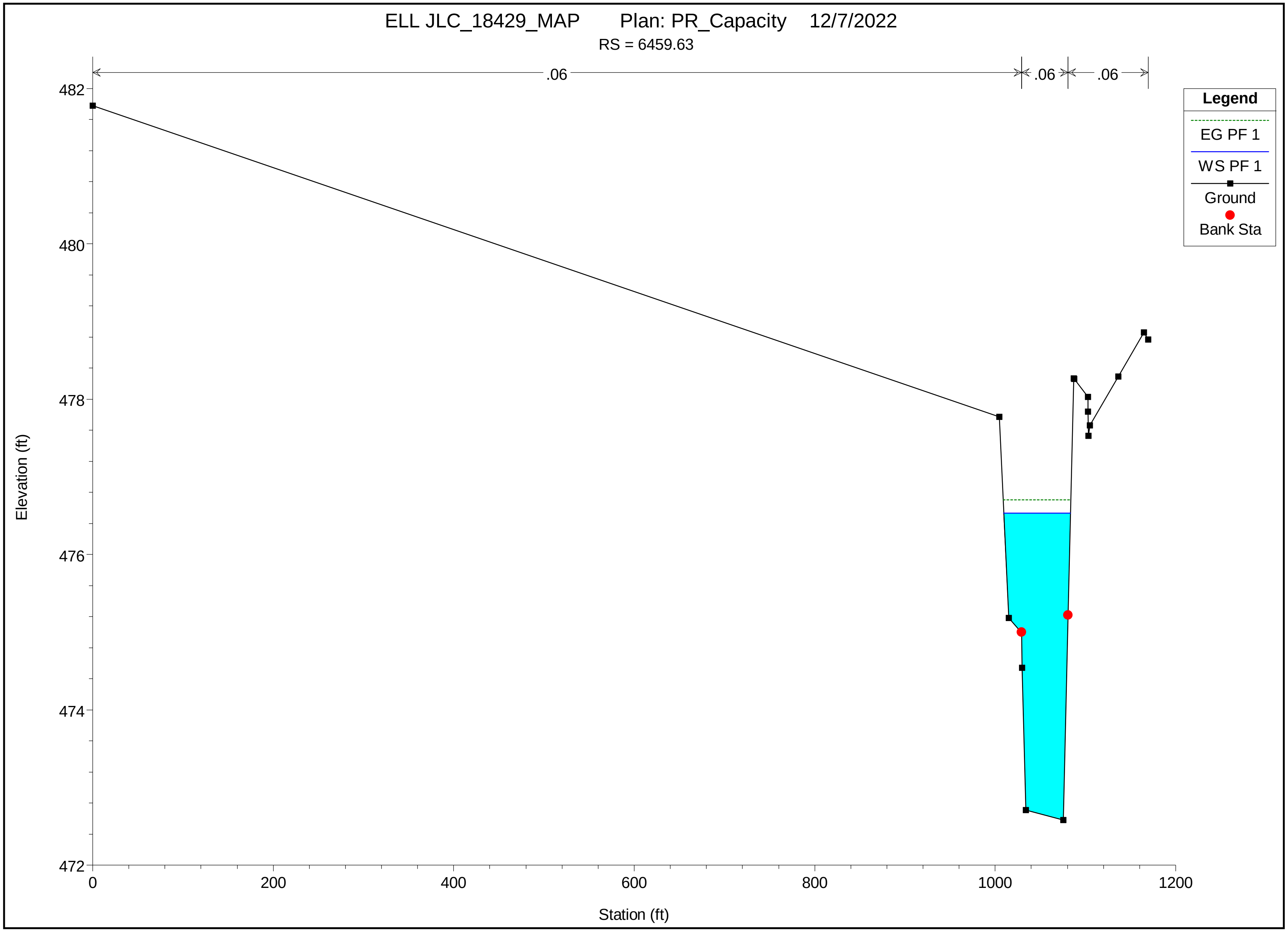

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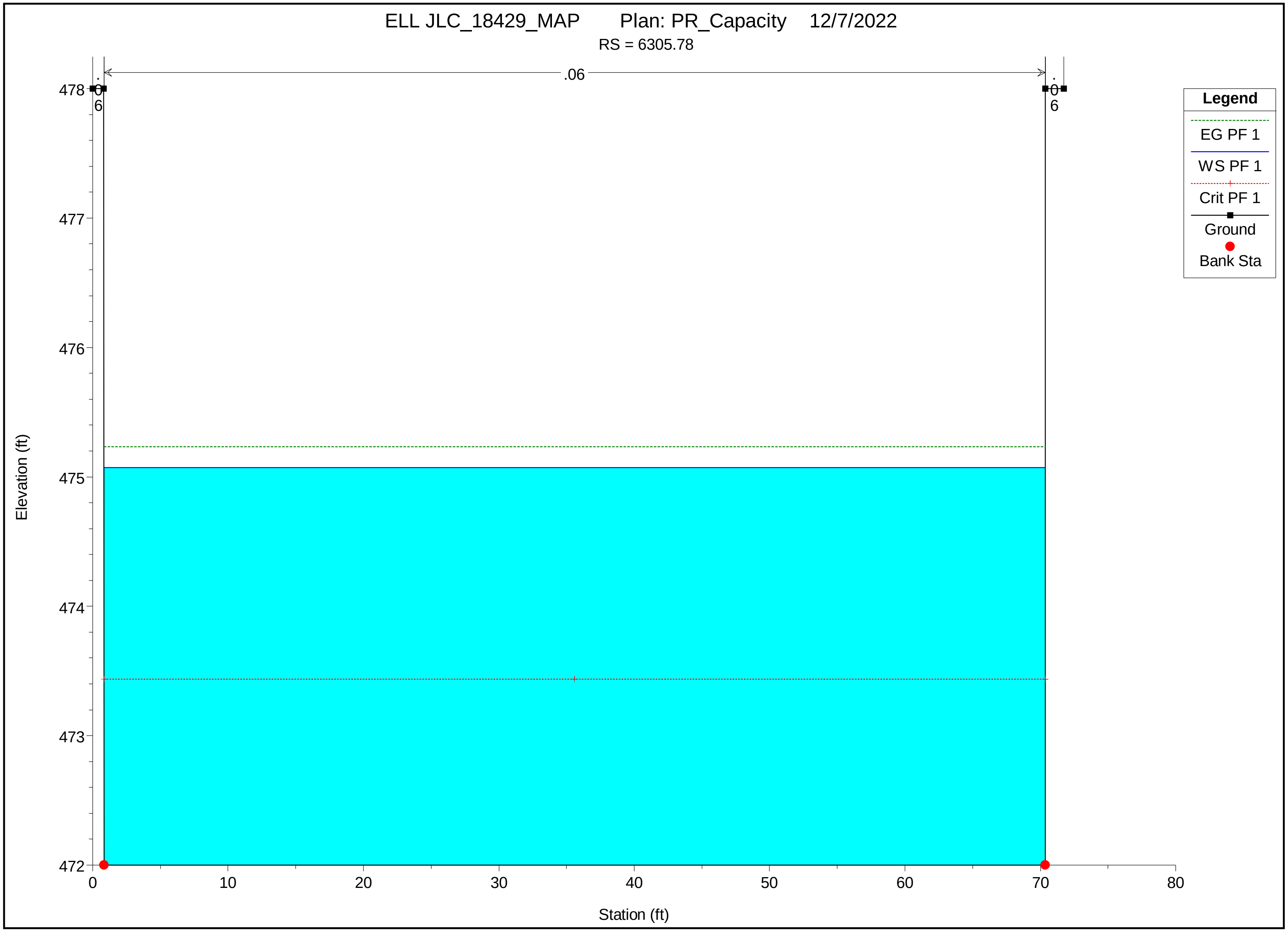

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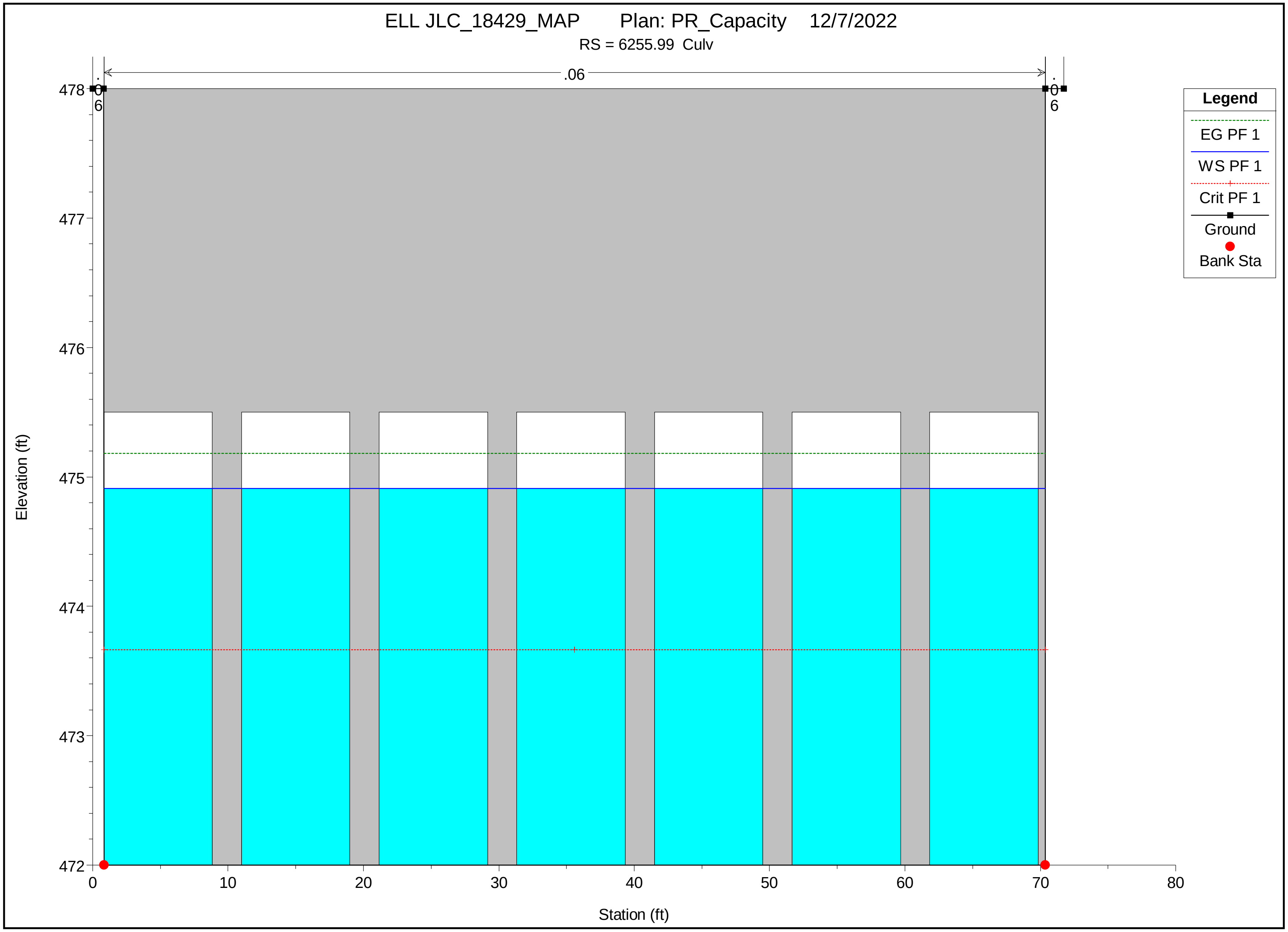
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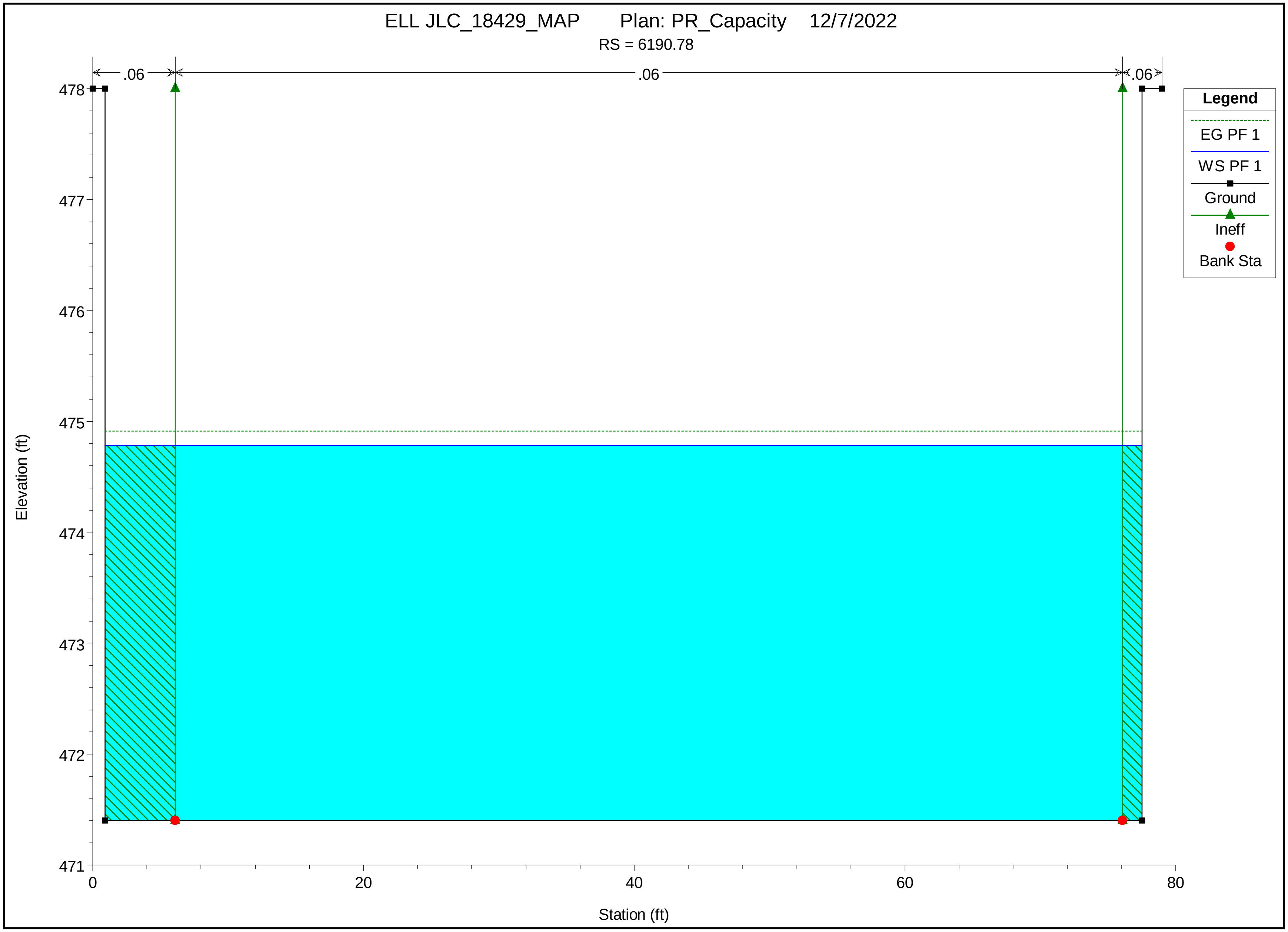

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HEC-RAS Plan: PR_Capacity River: Otay Mesa Reach: Main Reach Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main Reach	7063.61	PF 1	871.00	473.36	478.47	476.23	478.59	0.002015	2.96	328.27	96.29	0.25
Main Reach	6863.01	PF 1	871.00	473.09	478.13	476.07	478.22	0.001607	2.68	386.90	124.18	0.22
Main Reach	6660.16	PF 1	871.00	472.82	477.66	475.52	477.82	0.002508	3.37	290.51	83.11	0.28
Main Reach	6459.63	PF 1	871.00	472.58	477.02		477.22	0.003539	3.74	251.06	76.96	0.32
Main Reach	6350.00	PF 1	871.00	472.01	476.18		476.39	0.004900	3.70	249.73	107.36	0.37
Main Reach	6305.78	PF 1	871.00	472.00	475.79	473.69	475.96	0.003023	3.31	263.34	69.55	0.30
Main Reach	6255.99		Culvert									
Main Reach	6190.78	PF 1	871.00	471.40	475.17		475.34	0.003016	3.30	264.19	76.62	0.30

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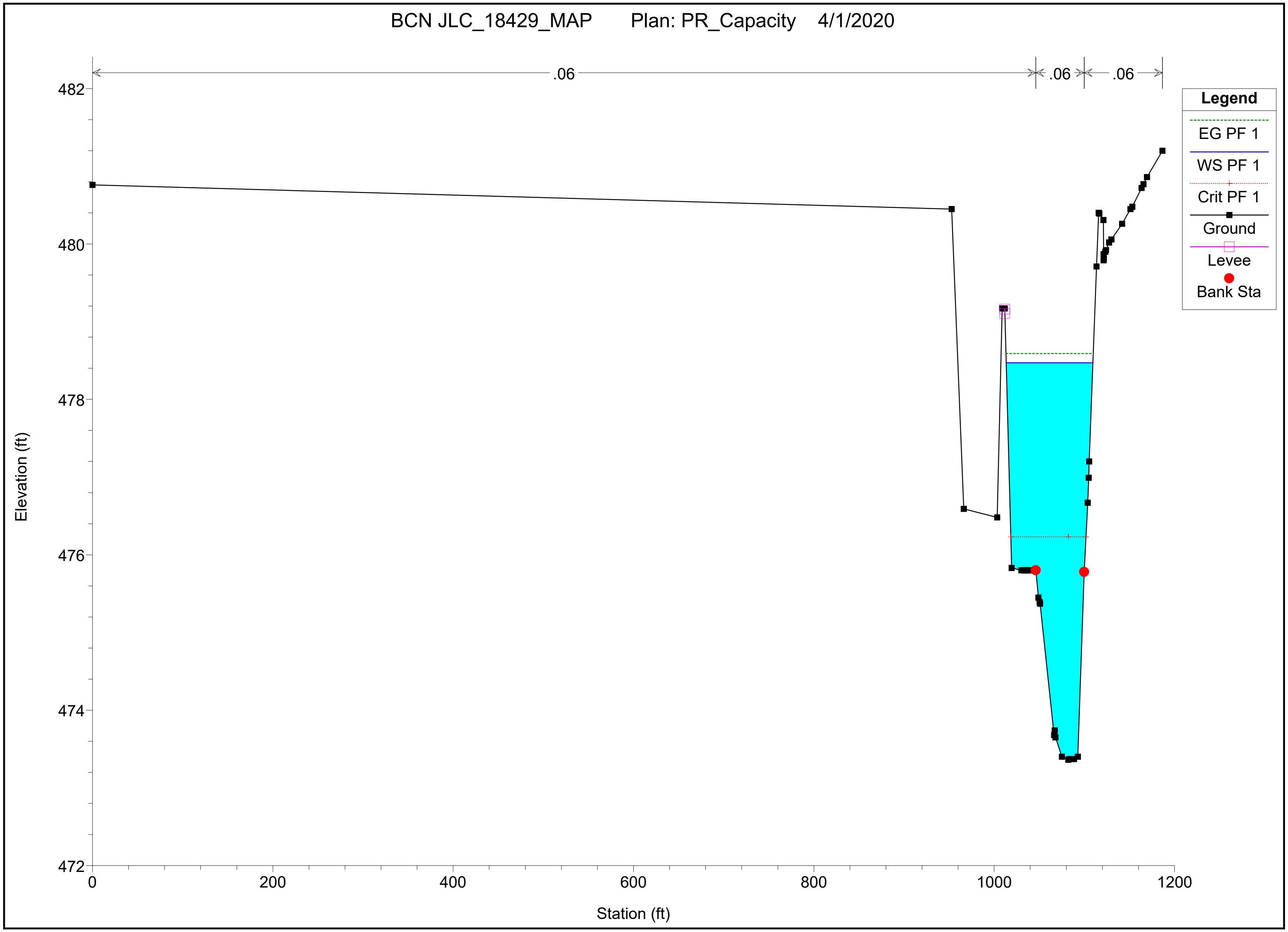

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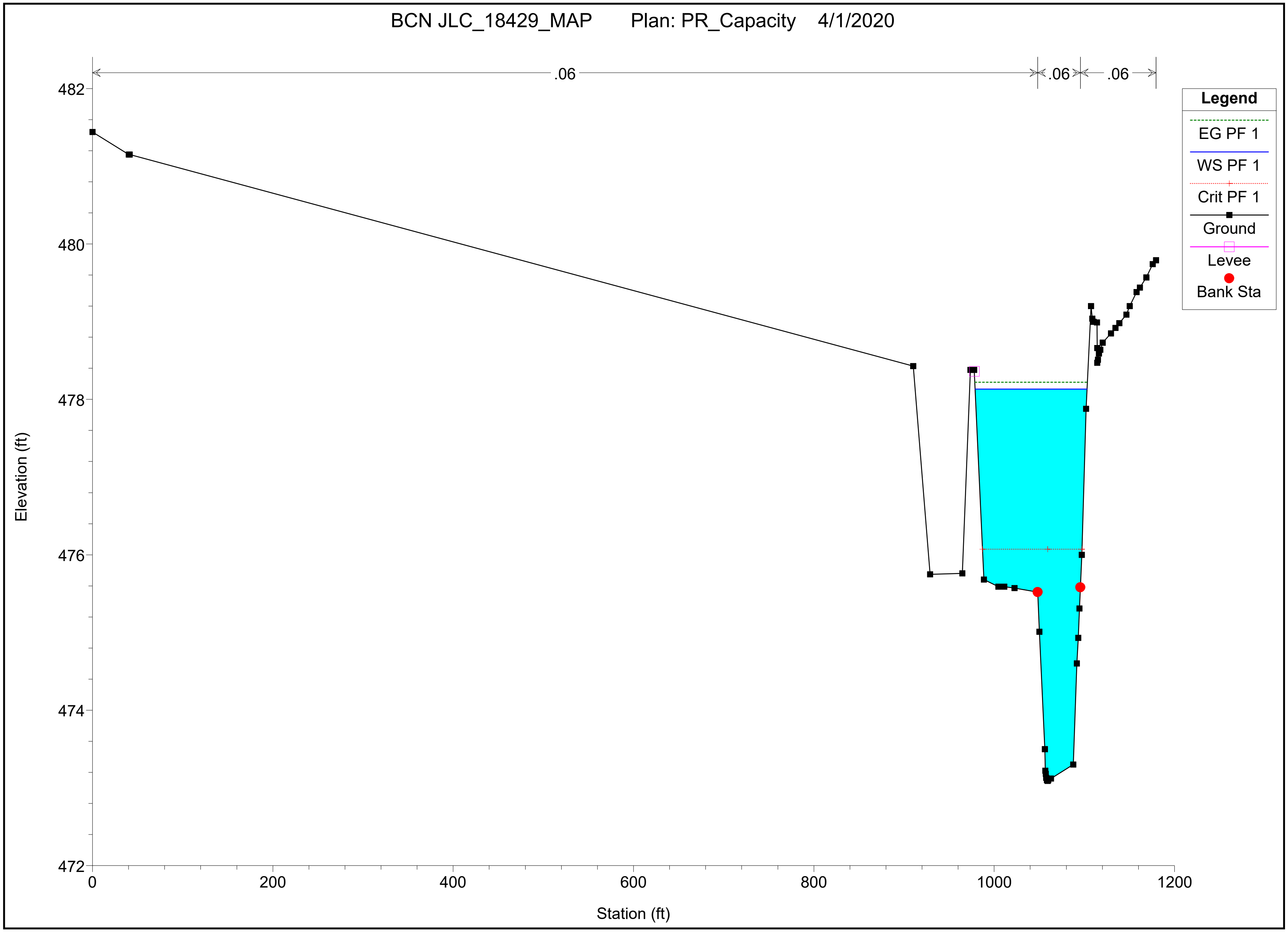

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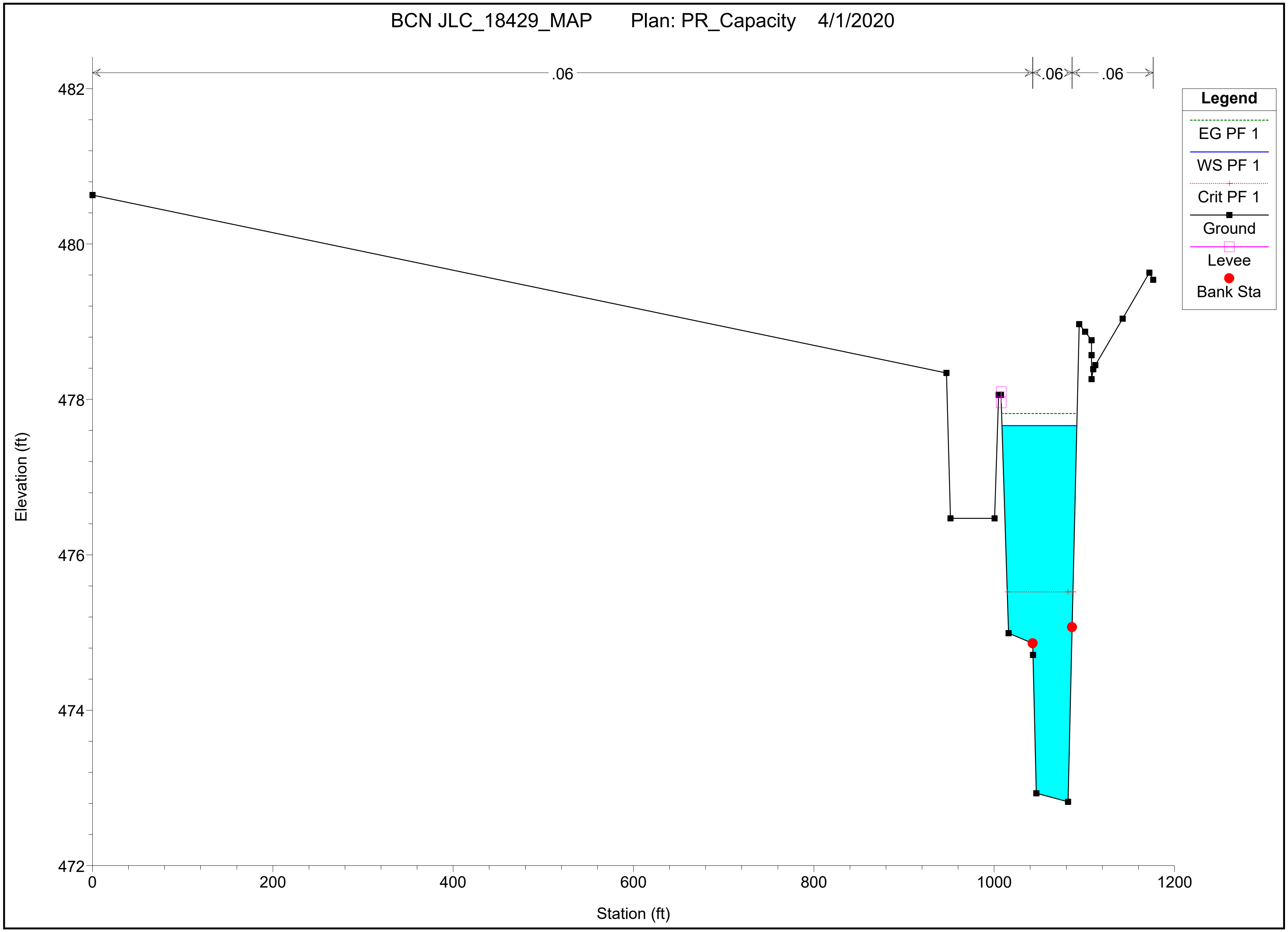
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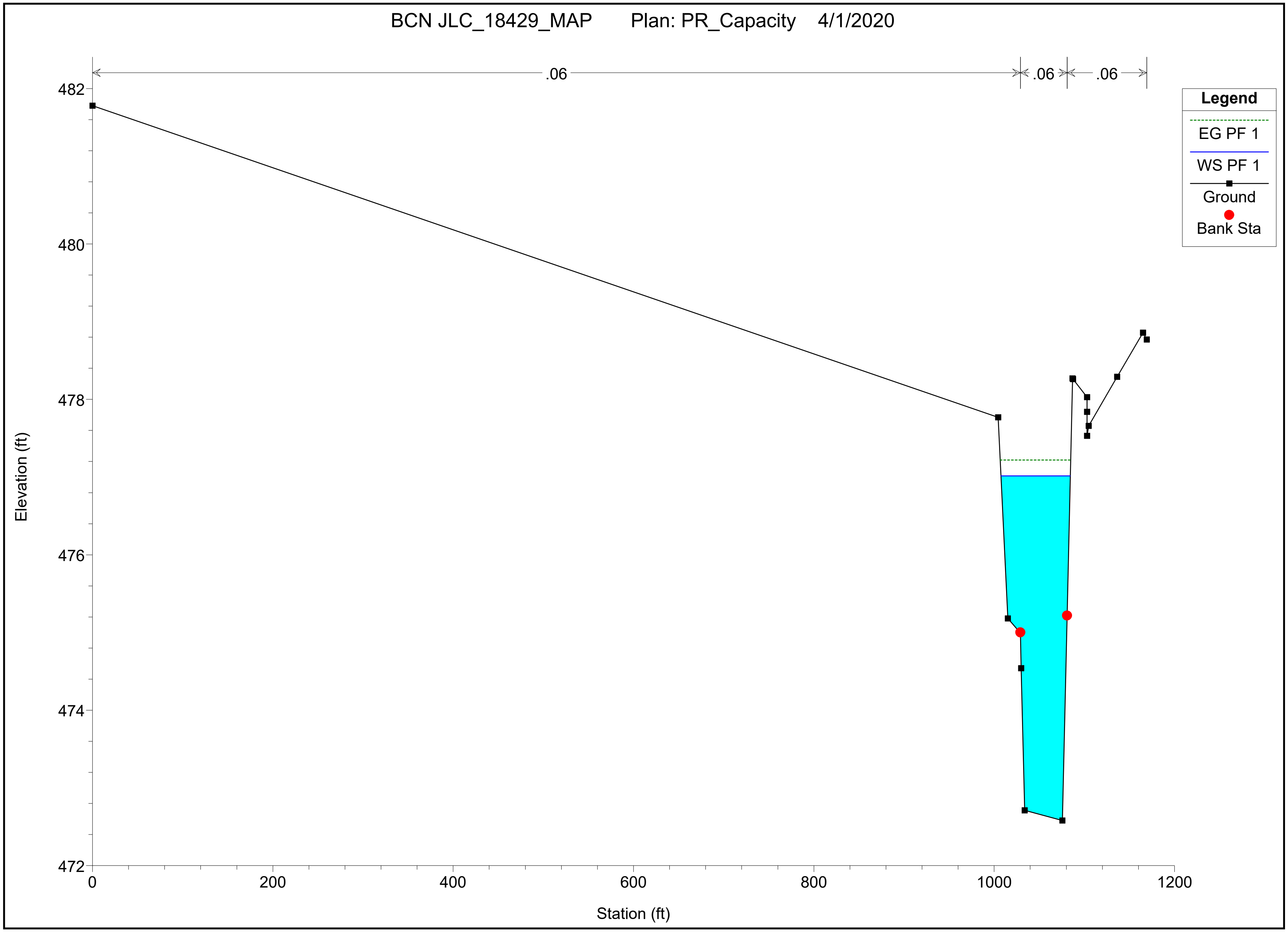

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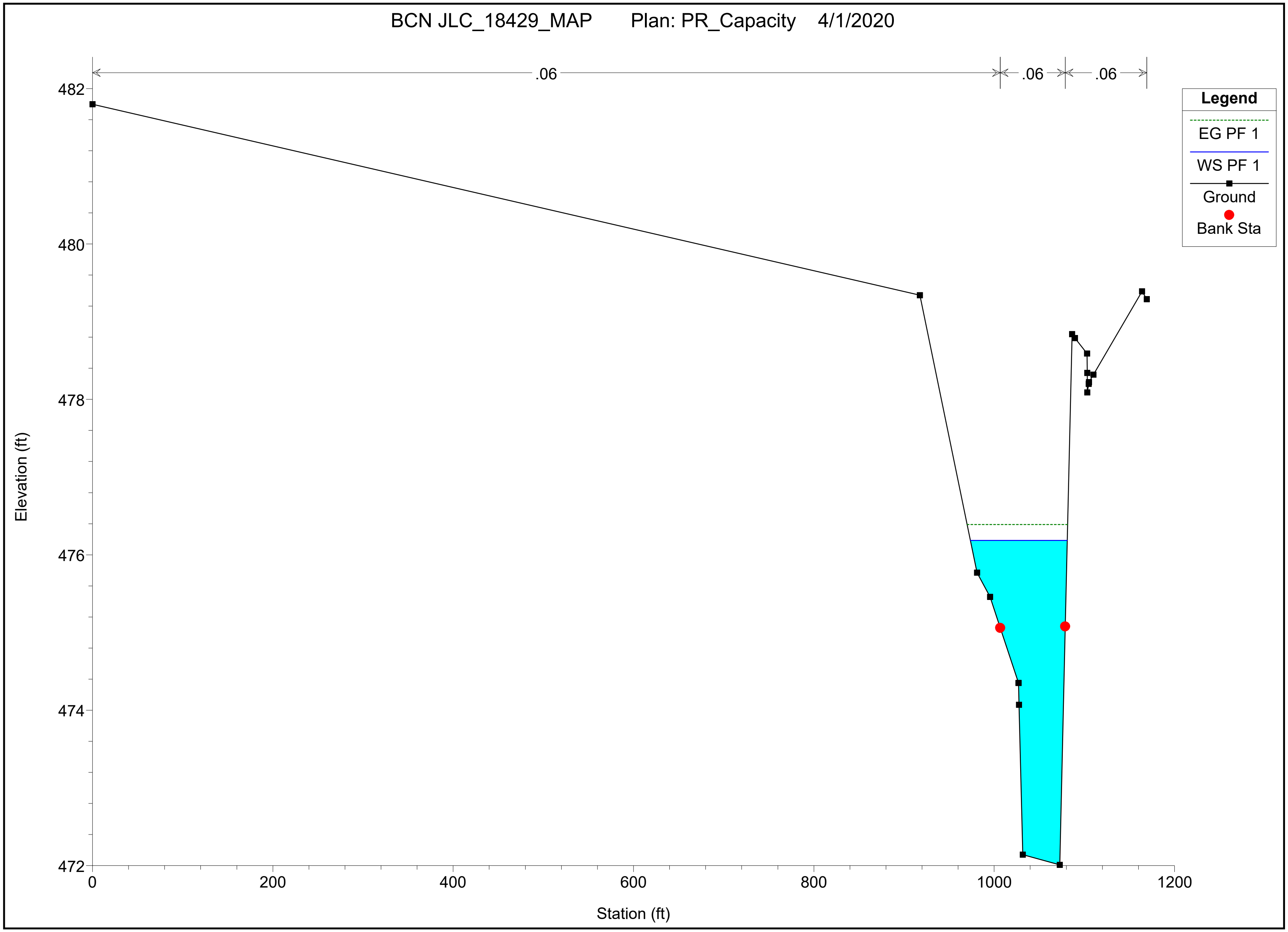

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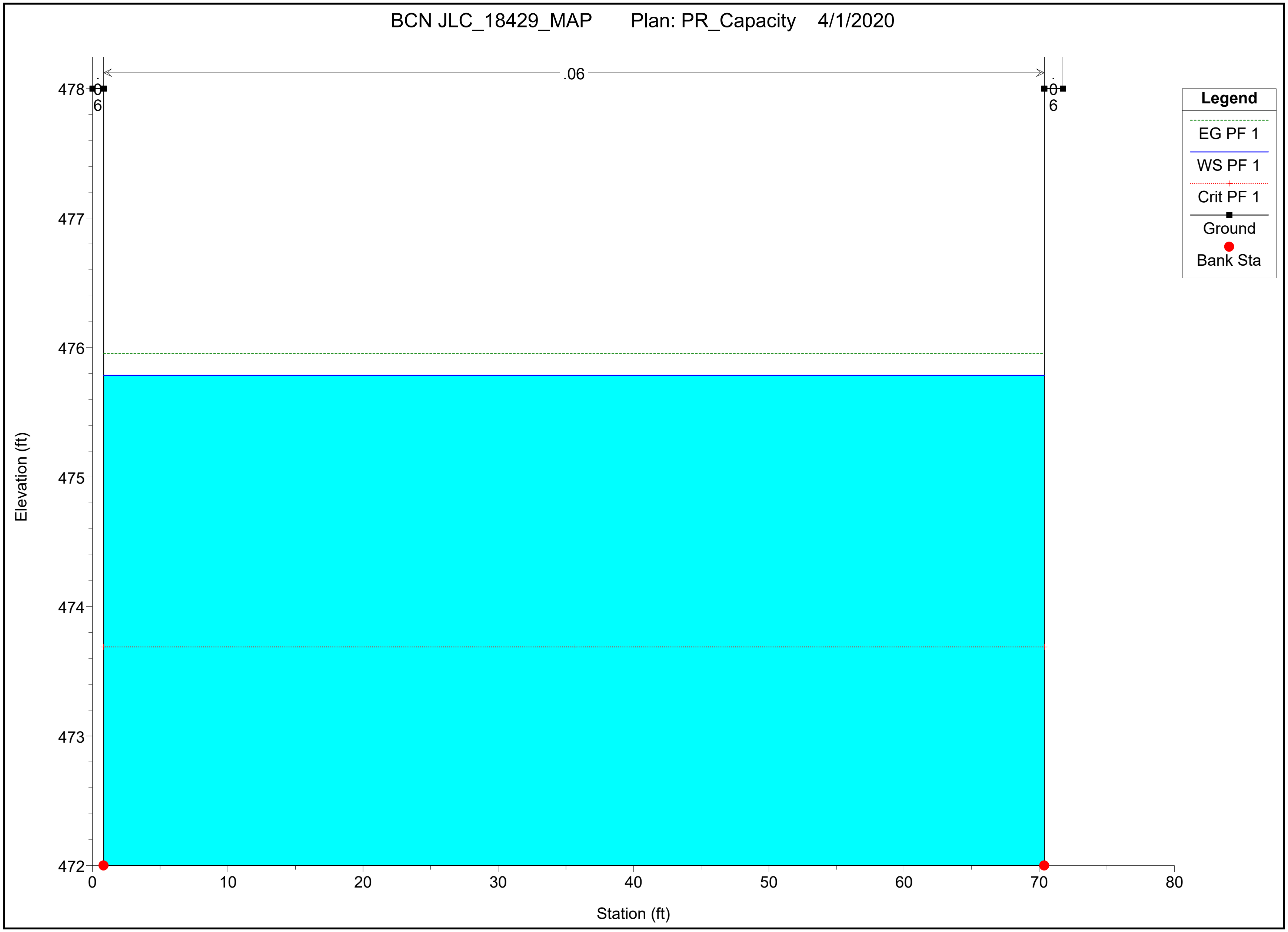
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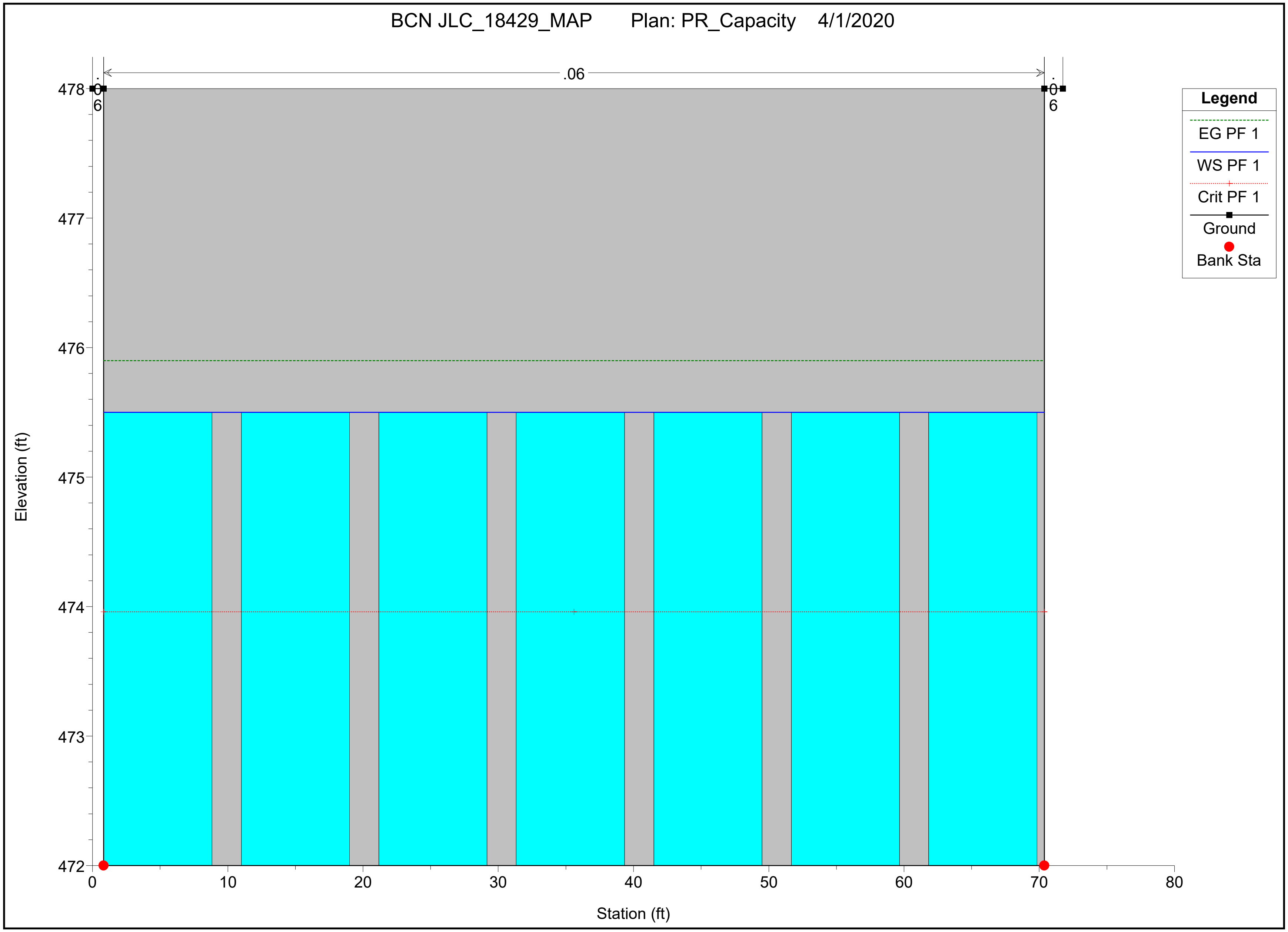

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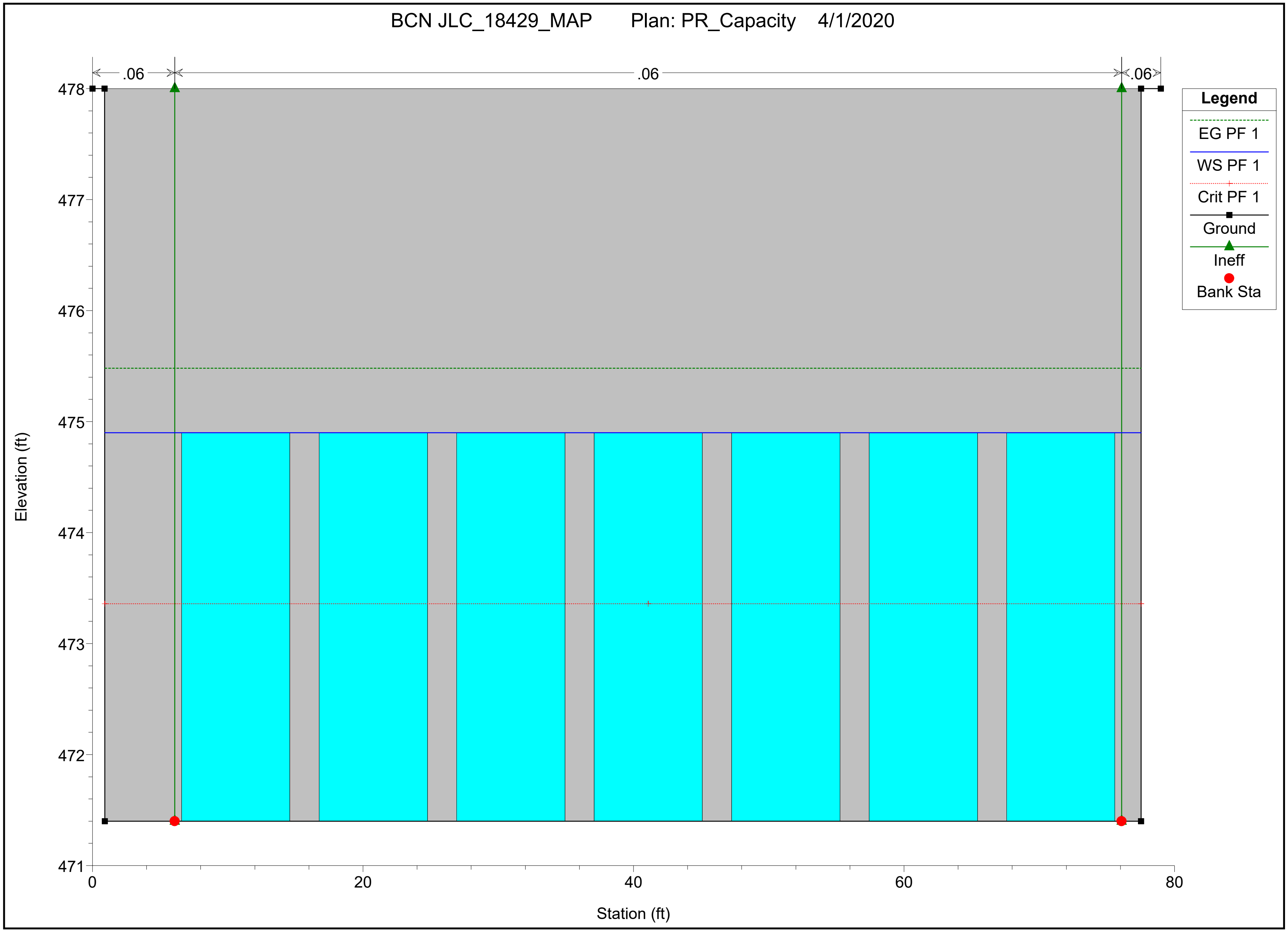
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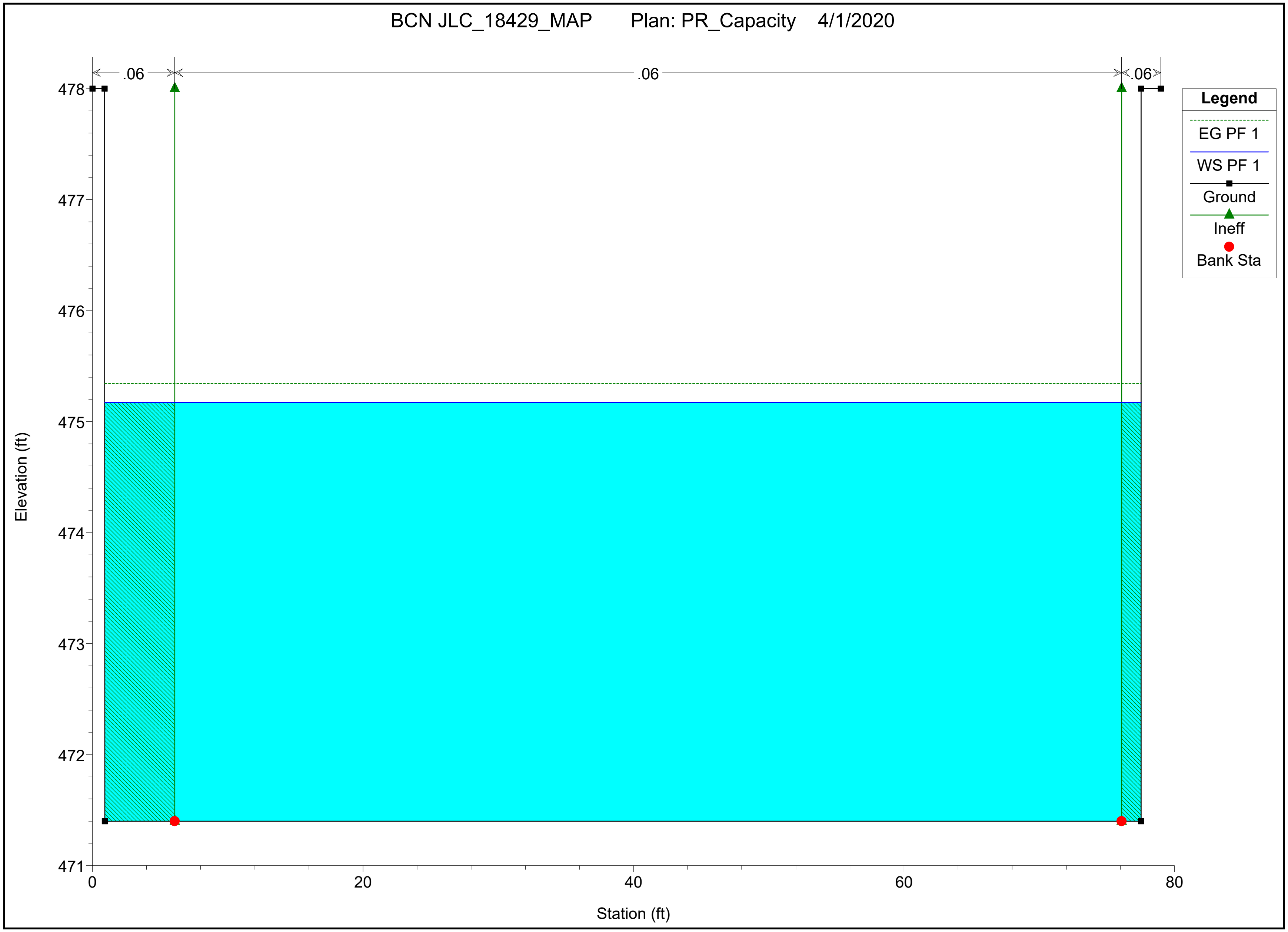

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Station (ft)

EXHIBIT A

EXISTING DRAINAGE EXHIBIT

Kimley»Horn

5 May 2021

EXISTING DRAINAGE AREA EXHIBIT

MAJESTIC AIRWAY - SAN DIEGO, CALIFORNIA

EXHIBIT B

PROPOSED DRAINAGE EXHIBIT

K:\SND_LDEV\195208002 - Majestic Airway\Drainage Exhibit\Prop. Drainage Exhibit.dwg 12-20-22-5:59 PM

Kimley»Horn

20 December 2022

PROPOSED DRAINAGE AREA EXHIBIT
MAJESTIC AIRWAY - SAN DIEGO, CALIFORNIA

Attachment 6
Geotechnical and Groundwater Investigation Report

Attach project's geotechnical and groundwater investigation report. Refer to Appendix C.4 to determine the reporting requirements.

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GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

UPDATE
GEOTECHNICAL INVESTIGATION

PLAZA LA MEDIA–SOUTH
AIRWAY ROAD AND
LA MEDIA ROAD
SAN DIEGO, CALIFORNIA

PREPARED FOR

WESTERN ALLIANCE BANK
REO/COMMERCIAL FACILITIES
℅ BANK OF NEVADA
LAS VEGAS, NEVADA

NOVEMBER 8, 2018
PROJECT NO. 07056-32-04

Project No. 07056-32-04
November 8, 2018

Western Alliance Bank REO/Commercial Facilities
% Bank of Nevada
2700 West Sahara Avenue, 5th Floor
Las Vegas, Nevada 89102

Attention: Ms. Anne Marie Berg

Subject: UPDATE GEOTECHNICAL INVESTIGATION
PLAZA LA MEDIA–SOUTH
AIRWAY ROAD AND LA MEDIA ROAD
SAN DIEGO, CALIFORNIA

Dear Ms. Berg:

In accordance with your authorization of our proposal No. LG-13395, dated February 26, 2016, and Change Order No. 2, dated October 29, 2018, we have prepared this update geotechnical investigation for the subject project. The accompanying report discusses soil and geologic conditions at the site and provides recommendations relative to the geotechnical engineering aspects for developing the project as presently proposed.

Provided that the recommendations of the report are followed, the site is considered suitable for construction of the planned development.

Should you have questions regarding this update report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Raul R. Garcia
GE 2842

REGISTERED PROFESSIONAL ENGINEER
RAUL R. GARCIA
No. 2842
GEOTECHNICAL
STATE OF CALIFORNIA

David B. Evans
CEG 1860

PROFESSIONAL GEOLOGIST
DAVID B. EVANS
NO. 1860
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

RRG:DBE:dmc

(e-mail) Addressee
(2/del) Atlantis Group
Attention: Mr. Theodore R. L. Shaw
(e-mail) Bank of Nevada
Attention: Ms. Geysy Fernandez
(2/del) Kettler-Leweck Engineering
Attention: Mr. Steve Kettler

TABLE OF CONTENTS

TABLE OF CONTENTS (Concluded)

UPDATE GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report is an update geotechnical investigation for the proposed Plaza La Media-South project located northeast of Airway Road and La Media Road in the Otay Mesa area of San Diego, California (See Vicinity Map, Figure 1). The purpose of this study is to update previous geotechnical investigations performed by Geocon Incorporated and to evaluate whether the conclusions and recommendations presented in the referenced reports are relevant to the proposed development, and to provide additional recommendations, if necessary.

The scope of the study included a review of the following geotechnical reports previously prepared for the project and the current project plans:

1. *Soil and Geologic Investigation for Otay Mesa International Plaza Limited, San Diego, California,* dated April 26, 1989, revised October 13, 1989 (Project No. D-4342-J01).
2. *Updated Geotechnical Investigation [for] Judd and Dillard LLC (Otay Mesa International Plaza Limited), San Diego, California,* prepared by Geocon Incorporated, dated March 14, 2003 (Project No. 07056-22-01).
3. *Update Geotechnical Investigation for Plaza La Media–North, Otay Mesa Road and La Media Road, San Diego, California,* prepared by Geocon Incorporated, dated September 11, 2017 (Project No. 07056-32-04).
4. *Grading Plans for Plaza la Media-South,* prepared by Kettler Leweck Engineering, received via email October 22, 2018.

The scope of this update geotechnical investigation also included a review of readily available geologic literature and in-house reports pertinent to the property. Reports and published literature reviewed for this investigation are summarized in the *List of References* at the end of this report.

The purpose of the referenced geotechnical investigations was to evaluate the surface and subsurface soil and geologic conditions at the site and, based on the conditions encountered, provide recommendations pertinent to the geotechnical engineering aspects of proposed site development. Previous subsurface exploration performed in the south section of the site included 2 large-diameter borings and 6 exploratory trenches used to estimate the thickness of the soil types (undocumented fill, topsoil, Very Old Paralic Deposits and Otay Formation), collect samples for laboratory testing, and to delineate the near-surface geologic units. Details of the previous field investigation and the boring and trench logs are presented in Appendix A.

Laboratory testing was performed on selected representative samples collected during the 1989 subsurface investigation. The purpose of the laboratory testing was to evaluate pertinent physical and chemical soil properties for engineering analysis to assist in providing recommendations for site grading and development. Details of the laboratory testing and a summary of the test results are presented in Appendix B.

The Geologic Map, Figure 2 (map pocket) depicts the configuration of the property, proposed grading, existing topography and geology, and the approximate locations of exploratory excavations. The Geologic Map is based on the referenced grading and drainage plans prepared by Kettler Leweck Engineering.

Conclusions and recommendations presented herein are based on an analysis of the data obtained from our recent geologic reconnaissance; our review of our previous studies; previous laboratory testing; and our experience with similar soil and geologic conditions.

2. SITE AND PROJECT DESCRIPTION

The Plaza La Media-South consists of approximately 31 acres of undeveloped land located northeast of Airway Road and La Media Road in the Otay Mesa area of San Diego, California. The site is a semi-rectangular parcel and is delineated along the north property line with approximately 1,260 feet of frontage with the Interstate 905 Freeway easement, to the east with 1,160 feet along an existing industrial project, to the west with 980 feet along La Media Road, and to the south with 1,260 feet of frontage with Airway Road. The project limits are presented on the Geologic Map, Figure 2.

The site is relatively level with a northeast to southwesterly drainage gradient. Elevations vary from approximately 481 feet Mean Sea Level (MSL) in the southeast corner to approximately 475 feet MSL at the northwest corner. Vegetation typically consists of dense weeds and grasses.

Based on our review of the grading plans, we understand that proposed project will consist of developing a commercial retail center to receive four building pads with at grade parking areas, access driveways, associated improvements and nine desilting basins. Widening of Airway Road and La Media Road are contemplated as part of project development. We expect that the buildings will be one- to two-story structures with concrete slab-on-grade supported on conventional continuous and isolated spread footings.

In general, the grading will consist of importing fill to raise the grade approximately 6 to 8 feet above existing elevation. Extensive remedial grading, consisting in the removal and compaction of existing undocumented fill and topsoil should be expected to receive the import fill soil.

The locations and descriptions of the site and proposed development are based on a site reconnaissance. Review of the referenced grading plans, and our general understanding of the project as presently proposed. If project details vary significantly from those described, Geocon Incorporated should be retained to update and/or modify this report accordingly.

3. SOIL AND GEOLOGIC CONDITIONS

Three surficial soil deposits and one geologic formation exist at the site. Surficial soils consist of undocumented fill, topsoil, and Quaternary-age Very Old Paralic Deposits (formerly Lindavista Formation). The geologic unit is the Tertiary-age Otay Formation. Descriptions of the surficial soils and formational unit are provided in order of increasing age. The expected subsurface relationship between the surficial soils and geologic units is presented on the Geologic Map, Figure 2, and Geologic Cross-Sections A-A’, B-B’ and C-C’, Figure 3.

3.1 Undocumented Fill (Qudf)

Undocumented fill is mapped along Airway Road and La Media Road, and was placed after our field investigation (1989). This fill is associated with the widening of Airway Road and La Media Road. An attempt to obtain an as-graded report for this embankment was unsuccessful. The fill is estimated to be approximately 2 to 3 feet thick, and consists of medium soft, dry to damp, sandy gravelly clay and loose clayey sand. The undocumented fill is unsuitable for support of settlement sensitive structures and/or improvements and will require complete removal and compaction. The clayey soils are considered expansive; therefore, they should be placed in deeper parts of the fill areas and at least 5 feet below proposed rough grade.

3.2 Topsoil (unmapped)

Topsoil exists throughout the site with a thickness of approximately 2 to 3 feet. The topsoil, as exposed in exploratory borings and trenches, consists of soft, dry to damp sandy clay. The topsoil is not suitable for support of structural fill or settlement sensitive structures and will require remedial grading in the form of complete removal and compaction. In addition, the topsoil is generally highly expansive and should be placed as compacted fill in deeper parts of the fill areas and at least 5 feet below proposed rough grade.

3.3 Very Old Paralic Deposits (Qvop)

Very Old Paralic Deposits (formerly Lindavista Formation) underlie the topsoil over the majority of the site. Very Old Paralic Deposits consist of two relatively distinct layers; an upper, highly expansive clay layer over a lower granular layer. The upper clay layer consists of approximately 3.5 to 10.5 feet of firm to very stiff clay. The lower granular layer consists of dense silty sand, sandy gravel and clayey sand. Results of our previous laboratory testing indicate that the lower granular soils have a *low* to *medium* expansion potential. Cobble content increases with depth within the sandier portions. The Very Old Paralic Deposits should provide adequate support for the proposed import structural fill soil. Highly expansive Very Old Paralic Deposits, if exposed near rough grade, should be removed and placed as compacted in the deeper parts of the fill areas and at least 5 feet below rough grade.

3.4 Otay Formation (To)

The Otay Formation underlies the Very Old Paralic Deposits at depth throughout the site. This geologic formation consists of dense to very dense, moist to very moist, fine- to medium-grained silty clayey sandstone to sandy clayey siltstone. The Otay Formation exhibits *low* to *medium* expansion characteristics and should provide adequate support for compacted fill and structural loads. However, the soil of this geologic formation is not expected to be encountered due to its depth below proposed grades.

4. GROUNDWATER

Groundwater or seepage was not encountered in the exploratory excavations conducted on the property during the 1989 field investigation. Perched groundwater conditions should be expected to occur seasonally and may affect site grading if grading operations are performed during or shortly after rainy season. Groundwater is not expected to impact the site; however, if grading operations are performed during the rainy season, saturated conditions and extensive moisture conditioning operations should be expected. Proper surface drainage of irrigation water and precipitation will be critical to future performance of project.

5. GEOLOGIC STRUCTURE

Bedding within the Very Old Paralic Deposits and Otay Formation ranges from massive to well-developed with bedding attitudes typically horizontal. Geologic structure is not expected to present a constraint to the proposed project.

6. GEOLOGIC HAZARDS

6.1 Geologic Hazard Category

The City of San Diego *Seismic Safety Study, Geologic Hazards and Faults*, 2008 Edition, Map Sheets 3 and 7 define the site as Hazard Category 53: *Level or Sloping Terrain, unfavorable geologic structure, low to moderate risk*.

6.2 Faulting and Seismicity

Review of the referenced geologic reports and our knowledge of the general area indicate that the site is not underlain by active, potentially active, or inactive faulting. An active fault is defined by the California Geological Survey (CGS) as a fault showing evidence for activity within the last 11,000 years. The site is not located within State of California Earthquake Fault Zone.

A deterministic seismic hazard analysis was performed using the computer program *EZ-FRISK* (Risk Engineering, 2015), six known active faults are located within a search radius of 50 miles from the property. We used the 2008 USGS fault database that provides several models and combinations of fault data to evaluate the fault information. Based on this database, the nearest known active fault is the Newport-Inglewood/Rose Canyon Fault, located approximately 11 miles west of the site and is the dominant source of potential ground motion. Earthquakes that might occur on the Newport-Inglewood/Rose Canyon Fault or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated deterministic maximum earthquake magnitude and peak ground acceleration for the Newport-Inglewood/Rose Canyon Fault are 7.5 and 0.25g, respectively. Table 6.2.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for the 6 most dominant faults in relationship to the site location. We calculated peak ground acceleration (PGA) using Boore-Atkinson (2008) NGA USGS 2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2007) NGA USGS 2008 acceleration-attenuation relationships.

TABLE 6.2.1
DETERMINISTIC SPECTRA SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2007 (g)
Newport-Inglewood/Rose Canyon	11	7.5	0.25	0.20	0.25
Rose Canyon	11	6.9	0.21	0.18	0.20
Coronado Bank	18	7.4	0.20	0.14	0.17
Palos Verdes Connected	18	7.7	0.22	0.15	0.20
Elsinore	42	7.85	0.14	0.09	0.11
Earthquake Valley	46	6.8	0.08	0.06	0.05

A probalistic seismic hazard analysis was performed using the computer program *EZ-FRISK* (Risk Engineering, 2015). *EZ-FRISK* operates under the assumption that the occurrence rate of earthquakes on each mapped Quaternary fault is proportional to the faults slip rate. The program accounts for earthquake magnitude as a function of fault rupture length, and site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS 2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2007) NGA USGS 2008 in the analysis. Table 6.2.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 6.2.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson, 2008 (g)	Campbell-Bozorgnia, 2008 (g)	Chiou-Youngs, 2007 (g)
2% in a 50 Year Period	0.41	0.34	0.40
5% in a 50 Year Period	0.31	0.26	0.28
10% in a 50 Year Period	0.23	0.20	0.21

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site. Seismic design of the structures should be evaluated in accordance with the California Building Code (CBC) and other guidelines currently adopted by the City of San Diego.

6.3 Landslides

No landslides were encountered at the site or mapped in an area that could impact the property. Landslides are mapped outside and to the southwest of the site. The risk associated with landslide hazard is low for this project.

6.4 Soil Liquefaction

Soil liquefaction occurs within relatively loose, cohesionless sands located below the permanent table that are subjected to ground accelerations from earthquakes. Due to the anticipated depth to permanent groundwater (≥50 feet) and the proposed compacted fill and dense nature of the Very Old Paralic Deposits and Otay Formation at the site, the risk associated with liquefaction hazard at the site is low.

6.5 Tsunamis and Seiches

The site is located approximately 10 miles east of the Pacific Ocean at an elevation of approximately 480 feet above Mean Sea Level (MSL). No large bodies of water are located upstream of the site. The risk associated with inundation hazard due to tsunamis or seiches is low.

6.6 Subsidence and Seismic Settlement

Based on the subsurface conditions encountered during our field investigation, we do not expect the site would be subject to hazards from ground subsidence or seismic settlement.

6.7 Expansive Soil

Based on our experience in the area and the laboratory testing performed, existing undocumented fill, topsoil and the upper clay layer of the Very Old Paralic Deposits exhibited a high to very high expansion potential (Expansion Index higher than 91). The underlying gravelly sand of the Very Old Paralic Deposits the Otay Formation exhibit low to medium expansion potential (Expansion Index between 21 and 90).

6.8 Ground Rupture

There is low risk for ground rupture within the site due to apparent lack of faulting within or adjacent to the property.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 Based on our geologic reconnaissance, the site is in a similar condition to that encountered during our previous geotechnical investigations. It is the opinion of Geocon Incorporated that the conclusions and recommendations presented in this update report and in the previous geotechnical investigations are valid for the proposed site development.

7.1.2 No soil or geologic conditions were observed that would preclude development of the property as planned provided the recommendations of this report are followed.

7.1.3 Localized areas of undocumented fill with thickness on the order of 2 to 3 feet are located along Airway Road and La Media Road. Topsoil underlies the majority of the site to approximate thickness of 2 to 3 feet. Highly expansive clays comprise the upper portions of Very Old Paralic Deposits, extending to depths ranging from approximately 3.5 to 10.5 feet. Granular, *low*- to *medium*-expansive Very Old Paralic Deposits underlie this clay layer. Otay Formation underlies the Very Old Paralic Deposits.

7.1.4 The undocumented fill, topsoil, and isolated, soft clays of the Very Old Paralic Deposits (if encountered) are unsuitable in their present condition for support of structural fill or settlement sensitive structures and/or surface improvements. As such, removal and compaction of these materials will be required. The majority of the Very Old Paralic Deposits are suitable for the support of compacted fill and structural loads. The Otay Formation is not expected to be encountered.

7.1.5 Subsurface conditions observed may be extrapolated to reflect general soil and geologic conditions; however, variations in subsurface conditions between boring and trench locations should be expected. The Geologic Map attached as Figure 2, presents the aerial extent of the geologic conditions encountered. Figure 3, Geologic Cross Sections A-A′, B-B′, and C-C′, presents our interpretation of the subsoil conditions.

7.1.6 Highly expansive soils will be encountered within the undocumented fill, topsoil and upper portion of the Very Old Paralic Deposits. Highly expansive soils should be placed in the deeper portions of the fill areas and at least 5 feet below proposed rough grade elevation. Granular low expansive soils should be placed in the upper 5 feet from proposed rough grade on the building pads and in the upper 3 feet from subgrade on paved areas.

7.1.7 A review of the grading plan indicates that import fill will be required to raise the grade elevations from 6 to 8 feet across the site.

7.1.8 Following removal and compaction as described herein, the site can receive the import fill soil until proposed grades are achieved.

7.1.9 The import fill should consist of granular soil with *low* to *medium* expansion potential. (expansion index between 21 and 90).

7.1.10 No significant geologic hazards that would adversely affect the proposed project, other than seismic shaking and expansive soils, were observed or are known to exist on the site.

7.1.11 In general, undisturbed soils are expected to exhibit low erosion potential. However, fill areas or areas stripped of native vegetation will require special consideration to reduce the erosion potential. In this regard, desilting basins, improved surface drainage and early planting of erosion-resistant ground covers are recommended.

7.1.12 Surface settlement monuments or canyon subdrains will not be necessary for the project.

7.2 Soil and Excavation Characteristics

7.2.1 Excavations of the *in situ* soils should be suitable with moderate effort using heavy-duty grading equipment. Layers of cohesionless sand (if encountered within the Very Old Paralic Deposits) will require special attention with respect to the stability of excavations during trenching for utility lines. Planned excavations into the Very Old Paralic Deposits may be difficult due to localized cemented zones, cobbles, and boulders. The presence of cobbles and boulders could require special excavation methods. Cuts in excess of approximately 10 to 15 feet could generate oversize rocks.

7.2.2 Excavation and compaction difficulties may be experienced if grading operations are performed when the clayey soils are wet (rainy season) or dry (summer). Extensive moisture conditioning or drying back the soil may be required if either case is encountered.

7.2.3 The soils encountered in the field investigation are considered to be expansive (expansion index [EI] greater than 20 as defined by 2016 California Building Code (CBC) Section 1803.5.3. Based on extensive studies performed in the area, the clayey sands and sandy gravels of the Very Old Paralic Deposits and the sandy soils of the Otay Formation possess *low* to *medium* expansion potential (Expansion Index <90). Existing undocumented fill, topsoil, clayey soil of the Very Old Paralic Deposits, and the clayey soil of the Otay Formation possess *high* expansion potential. (Expansion Index >91). Table 7.2.1 presents soil classifications based on the expansion index.

TABLE 7.2.1
SOIL CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	ASTM D 4829 Expansion Classification	2016 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

7.2.4 We performed laboratory tests on three samples of the site materials to evaluate water-soluble sulfate content. Results from the laboratory water-soluble sulfate content tests are presented in Appendix B and indicate that the near-surface on-site materials at the locations tested possess *Not Applicable* sulfate exposure to concrete structures as defined by 2016 CBC Section 1904 and ACI 318-14 Chapter 19. Table 7.2.2 presents a summary of concrete requirements set forth by 2016 CBC Section 1904 and ACI 318. ACI guidelines should be followed when determining the type of concrete to be used. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration.

TABLE 7.2.2
REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS

Sulfate Severity	Exposure Class	Water-Soluble Sulfate % by Weight	Cement Type	Maximum Water to Cement Ratio by Weight	Minimum Compressive Strength (psi)
Not Applicable	S0	0.00-0.10	I or II	--	2,500
Moderate	S1	0.10-0.20	II	0.50	4,000
Severe	S2	0.20-2.00	V	0.45	4,500
Very Severe	S3	> 2.00	V + pozzolan or slag	0.45	4,500

7.2.5 We performed laboratory tests on samples to evaluate the corrosion potential to subsurface metal structures as part of our original geotechnical investigation. The laboratory test results are presented in Table B-VI. The laboratory tests were performed in accordance with California Test Method No. 643. Minimum resistivity test results indicated a moderate corrosion potential with respect to buried metal pipes.

7.2.6 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, if improvements that could be susceptible to corrosion are planned, further evaluation by a corrosion engineer should be performed.

7.3 Temporary Excavations

7.3.1 Temporary excavations should be constructed in conformance with OSHA requirements. It is the contractor's responsibility to ensure that all OSHA requirements are being followed. The proposed compacted fill soil should be considered Type B soil in accordance with OSHA requirements. The Very Old Paralic Deposits and the Otay Formation should be considered Type A. In general, special shoring requirements will not be necessary if temporary excavations are less than 4 feet high. Temporary excavation depths greater than 4 feet should be laid back at an appropriate inclination or shored. The soils exposed in these excavations should not become saturated or allowed to dry. Surcharge loads should not be permitted within a distance equal to the depth of the excavation from the top of the excavation. The top of the excavation should be a minimum of 15 feet from the edge of existing improvements. Excavations steeper than those recommended or closer than 15 feet from an existing surface improvement should be shored in accordance with applicable OSHA codes and regulations.

7.4 Grading

7.4.1 All grading should be performed in accordance with grading specifications of the City of San Diego and the *Recommended Grading Specifications* contained in Appendix C. Where the recommendations of this report conflict with those of Appendix C; this section of the report takes precedence.

7.4.2 Prior to commencing grading, a preconstruction conference should be held at the site with the owner and/or developer, grading contractor, civil engineer, and geotechnical engineer in attendance. Special soil handling and/or the grading plans can be discussed at that time.

7.4.3 All grading should be observed by a representative of Geocon Incorporated to verify that the recommendations of this report have been followed.

7.4.4 Site preparation should begin with the removal of all deleterious material and vegetation. The depth of removal should be such that material exposed in areas to receive import fill or soils to be used as fill are relatively free of organic matter. Any existing underground improvements not projected to remain should be removed and the resulting depression (s) properly backfilled in accordance with the procedures described herein. Material generated during stripping and/or site demolition should be exported from the site.

7.4.5 Compressible surficial deposits (undocumented fill/topsoil or soft clays of the Very Old Paralic Deposits) within areas of planned grading should be completely removed and compacted prior to placement of additional fill. The actual extent of unsuitable soil removals should be evaluated in the field by the geotechnical engineer or engineering geologist. Overly wet surficial materials will require drying or mixing with drier soils to facilitate proper compaction. Representatives of Geocon Incorporated should evaluate removals of the compressible surficial deposits.

7.4.6 After unsuitable soils and deleterious materials have been removed, areas planned to receive structural fill soils and/or settlement-sensitive improvements should be scarified to a depth of approximately 12 inches, moisture conditioned to 1 to 3 percent above optimum moisture content, and compacted to a minimum relative compaction of 90 percent (ASTM D 1557).

7.4.7 Following removals, the site should be brought to final subgrade elevations with imported structural fill compacted in layers. In general, soils native to the site are suitable for re-use as fill if free from vegetation, debris and other deleterious material. Highly expansive soils should be placed in deeper portions of the fill and at least 5 feet below proposed rough grade elevation. Layers of fill should be no thicker than will allow for adequate bonding and compaction. Fill lifts of approximately 8 inches thick should be adequate for this project. All fill and backfill should be compacted to at least 90 percent of the maximum dry density at a moisture content ranging from 1 to 3 percent above optimum, as determined in accordance with ASTM D 1557. Fill soils placed at moisture contents outside this range of moisture content may be considered unacceptable at the discretion of the geotechnical engineer. The outer 15 feet of fill slopes should be composed of properly compacted granular soil.

7.4.8 The upper 5 feet of the building pads and 3 feet in pavement areas should be composed of properly compacted *low-* to *medium*-expansive soils. Fill soils with a *high*-expansion potential should be placed in the deeper fill areas and properly compacted. *Low-* to *medium*-expansive soils are defined as those soils that have Expansion Indices from varying 21 to less than 90 as defined in accordance with CBC Section 1805.5.3. Rocks greater than 12 inches in maximum dimension should be placed in accordance with Section 6 of Appendix C.

7.4.9 All import soil, should consist of granular materials with a *low-* to *medium*-expansion potential (EI less than 90). Prior to importing, representative samples of proposed borrow materials should be obtained and subjected to laboratory expansion testing to verify if the soil conforms to the recommended expansion criteria.

7.5 Slope Stability

7.5.1 Fill Slopes

7.5.1.1 Slope stability analyses using laboratory shear strength information and experience with similar soil conditions in nearby areas indicate that 2:1 (horizontal:vertical) fill slopes constructed of on-site granular materials should have calculated factors of safety of at least 1.5 under static conditions for both deep-seated failure and shallow sloughing conditions for heights of 30 feet. Slope stability calculations for deep-seated and surficial stability conditions are presented on Figures 4 and 5. For the slope stability calculations, we used soil parameters obtained as part of the original geotechnical investigation and utilizing our experience with similar soil conditions on nearby projects.

7.5.1.2 Keying and benching operations during grading of the slopes should be performed in accordance with Appendix C.

7.5.1.3 The outer 15 feet of fill slopes should be composed of properly compacted granular fill to reduce the potential for surficial sloughing. In general, soils with an Expansion Index of less than 90 and at least 35 percent sand size particles should be acceptable as granular fill. Slopes should be compacted by backrolling with a loaded sheepsfoot roller at vertical intervals not to exceed 4 feet and should be track-walked at the completion of each slope such that the fill soils are uniformly compacted to at least 90 percent relative compaction to the face of the finished slope.

7.5.1.4 All slopes should be landscaped with drought-tolerant vegetation having variable root depths and requiring minimal landscape irrigation. In addition, all slopes should be drained and properly maintained to reduce erosion. Slope planting should generally consist of drought-tolerant plants having a variable root depth. Slope watering should be kept to a minimum to just support the plant growth. A landscape architect should be contacted to provide recommendations for vegetation planned on slopes constructed with lime treated soils.

7.5.2 Cut Slopes

7.5.2.1 Minor cut slopes are proposed as part of project development.

7.6 Slope Maintenance

7.6.1 Slopes steeper than 3:1 (horizontal:vertical) may, under conditions that are both difficult to prevent and predict, be susceptible to near-surface (surficial) slope instability. The instability is typically limited to the outer three feet of the slope and usually does not directly impact the improvements on pad areas above or below the slope. The occurrence of surficial instability is more prevalent on fill slopes and is generally preceded by a period of heavy rainfall, excessive irrigation or the migration of subsurface seepage. Disturbance and/or loosening of the surficial soils, as might result from root growth, soil expansion or excavation for irrigation lines and slope planting, may also be a significant contributing factor to surficial instability. We recommend that, to the maximum extent practical, (a) disturbed/loosened surficial soils be either removed or properly compacted, (b) irrigation systems be periodically inspected and maintained to eliminate leaks and excessive irrigation, and (c) surface drains on and adjacent to slopes be periodically maintained to preclude ponding or erosion. Although the incorporation of the above recommendations should reduce the potential for surficial slope instability, it will not eliminate the possibility, and it may be necessary to rebuild or repair a portion of the project's slopes in the future.

7.7 Seismic Design Criteria

7.7.1 We used the computer program *U.S. Seismic Design Maps* (USGS, 2014), to evaluate the seismic design criteria. Table 7.7.1 summarizes site-specific design criteria obtained from the 2016 California Building Code (CBC; Based on the 2015 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. For preliminary purposes, the building structures and improvements should be designed using a Site Class D. Once final grading plans with specific building locations are available, Geocon Incorporated should be contacted to provide specific seismic design criteria. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10. The values presented in Table 7.7.1 are for the risk-targeted maximum considered earthquake (MCE_R).

TABLE 7.7.1
2016 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2016 CBC Reference
Site Class	D	Table 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	0.818g	Figure 1613.3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.313g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.173	Table 1613.3.3(1)
Site Coefficient, F_V	1.774	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	0.959g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration (1 sec), S_{M1}	0.555g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.639g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.370g	Section 1613.3.4 (Eqn 16-40)

7.7.2 Table 7.7.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 7.7.2
2016 CBC SITE ACCELERATION DESIGN PARAMETERS

Parameter	Value	ASCE 7-10 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.319g	Figure 22-7
Site Coefficient, F_{PGA}	1.181	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.377g	Section 11.8.3 (Eqn 11.8-1)

7.7.3 Conformance to the criteria in Tables 7.7.1 and 7.7.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a maximum level earthquake occurs. The primary goal of seismic design is to protect life and not to avoid all damage, since such design may be economically prohibitive.

7.8 Foundation Recommendations

7.8.1 Foundation recommendations presented herein are based on *low*- to *medium*-expansive within 5 feet of rough pad grade placed and compacted in accordance with the recommendations presented in this report.

7.8.2 Conventional continuous and/or isolated spread footings are suitable for support of the proposed building. Continuous footings should be at least 12 inches wide and 24 inches deep (below lowest adjacent grade). Isolated spread footings should be at least 2 feet wide and extend 24 inches below lowest adjacent grade. A typical wall/column footing dimension detail is presented in Figure 6.

7.8.3 Continuous footings should be reinforced with four, No. 4 steel, reinforcing bars, two placed near the top of the footing and two near the bottom. The project structural engineer should design reinforcement for spread footings.

7.8.4 Foundations proportioned as recommended may be designed for an allowable soil bearing pressure of 2,500 psf (dead plus live loads). This bearing pressure may be increased by 300 psf and 500 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable soil bearing pressure of 4,000 psf.

7.8.5 The allowable soil bearing recommendations presented above are for dead plus live loads only and may be increased by up to one third when considering transient loads such as those due to wind or seismic forces.

7.9 Concrete Slabs-on-Grade

7.9.1 Interior concrete slabs-on-grade should be at least 5 inches thick. Where heavy concentrated floor loads are anticipated, the slab thickness should be increased to 6 inches and should be underlain by 4 inches of Class 2 aggregate base material compacted to at least 95 percent relative compaction.

7.9.2 Minimum reinforcement of slabs-on-grade should consist of No. 3 reinforcing bars placed at 18 inches on center in both horizontal directions. The concrete slabs-on-grade should also be doweled into the foundation system to prevent vertical movement between the slabs, footings, and walls.

7.9.3 The concrete slab-on-grade recommendations are minimums based on soil support characteristics only. We recommend that the project structural engineer evaluate the structural requirements of the concrete slabs for supporting equipment and storage loads.

7.9.4 A vapor retarder should underlie slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). The membrane should be installed in a manner that prevents puncture in accordance with manufacturer's recommendations and ASTM requirements. The project architect or developer should specify the type of vapor retarder used based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

7.9.5 The project foundation engineer, architect, and/or developer should determine the thickness of bedding sand below the slab. Geocon should be contacted to provide recommendations if the bedding sand is thicker than 6 inches.

7.9.6 All exterior concrete flatwork not subject to vehicular traffic should be a minimum of 4 inches thick and conform to the following recommendations. Slab panels in excess of 8 feet square should be reinforced with 6x6-W2.9/W2.9 (6x6-6/6) welded wire mesh to reduce the potential for cracking. In addition, all concrete flatwork should be provided with crack-control joints to reduce and/or control shrinkage cracking. Crack-control spacing should be determined by the project structural engineer based upon the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack-control spacing. Subgrade soils for exterior slabs should be compacted in accordance with criteria presented in the grading section of this report. The subgrade soils should not be allowed to dry prior to placing concrete.

7.9.7 The recommendations presented herein are intended to reduce the potential for cracking of slabs and foundations as a result of differential soil movement. However, even with the incorporation of these recommendations, foundations and slabs-on-grade will still exhibit some cracking. The occurrence of concrete shrinkage cracks is independent of the soil supporting characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, the use of crack-control joints and proper concrete placement and curing. Crack-control joints should be spaced at intervals no greater than 12 feet. Literature provided by the Portland Cement Association (PCA) and American Concrete Institute (ACI) present recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

7.10 Lateral Loads for Retaining Walls

7.10.1 Retaining walls that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall) at the top of the wall and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 35 pcf. Where the backfill will be inclined at 2:1 (horizontal:vertical), an active soil pressure of 50 pcf is recommended. Expansive soil should not be used as backfill material behind retaining walls. Soil placed for retaining wall backfill should have an Expansion Index less than 50. Near surface, existing soils exhibited a *high* expansion potential. Therefore, we expect import of *low*-expansive granular soil will be required for retaining wall backfill.

7.10.2 Where walls are restrained from movement at the top, an active soil pressure equivalent to the pressure exerted by a fluid density of 60 pcf should be used for horizontal backfill. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill soil should be added (unit weight 125 pcf).

7.10.3 Soil contemplated for use as retaining wall backfill should be identified in the field prior to backfilling. At that time, Geocon Incorporated should obtain samples for laboratory testing to evaluate its suitability. Modified lateral earth pressures may be necessary if the backfill soil does not meet the required expansion index or shear strength. City or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. In this regard, onsite soil to be used as backfill will not meet the values for standard wall designs. Geocon Incorporated should be consulted to assess the suitability of the onsite soil for use as wall backfill if standard wall designs will be used.

7.10.4 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and should be waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the structures adjacent to the base of the wall. The above recommendations assume a properly compacted granular (EI of less than 50) free-draining backfill material with no hydrostatic forces or imposed surcharge load. A typical retaining wall drainage detail is presented on Figure 7, attached. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

7.10.5 The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the CBC. If the project possesses a seismic design category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 1803.5.12 of the 2013 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall. A seismic load of 16H should be used for design. We used the peak ground acceleration adjusted for Site Class effects, PGA_M, of 0.377g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.33.

7.10.6 To resist lateral loads, a passive pressure equivalent to the pressure exerted by a fluid density of 300 pcf should be used for design of footings or shear keys poured neat against properly compacted granular fill soils. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

7.10.7 If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.4 should be used for design. To resist lateral loads, the passive resistance can be combined with friction.

7.10.8 The recommendations presented above are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 8 feet. In the event that walls higher than 8 feet are planned, Geocon Incorporated should be consulted for additional recommendations.

7.11 Preliminary Pavement Recommendations

7.11.1 The following recommendations are for preliminary purposes and are provided for private driveways and parking areas. The final pavement section design will depend upon soil conditions exposed at subgrade elevation and the results of additional Resistance Value (R-Value) laboratory tests. The following preliminary pavement section recommendations are based on an assumed R-Value of 10. Sections are presented for both flexible (asphalt concrete) and rigid (Portland cement concrete) pavement.

7.11.2 The pavement sections for the widening of Airway Road, La Media Road, and Public Street A will be determined by the City of San Diego Engineering Department. The final pavement sections of public streets will be dependent on the traffic index designated by the City of San Diego Engineering Department and the R-Value laboratory test results of the exposed subgrade soils.

TABLE 7.11.1
PRELIMINARY FLEXIBLE PAVEMENT SECTIONS – IMPORTED LOW- TO MEDIUM-EXPANSIVE SUBGRADE SOIL

Location	Assumed Traffic Index (TI)	Assumed R-Value	Asphalt Concrete Thickness (inches)	Class 2 Aggregate Base Thickness (inches)
Parking stalls for automobiles and light-duty vehicles	4.5	10	3	7
Driveways for automobiles and light-duty vehicles	5.5	10	4	9
Driveways and parking areas for heavy-duty trucks and fire lanes	7.0	10	4	14.5

TABLE 7.11.2
PRELIMINARY RIGID PAVEMENT SECTIONS – IMPORTED LOW- TO MEDIUM-EXPANSIVE SUBGRADE SOIL

Location	Average Daily[1] Truck Traffic (ADTT assumed)	Assumed R-Value	Portland Cement Concrete[2] (inches)	Class 2 Aggregate Base Thickness (inches)
Parking stalls[3] for automobiles and light-duty vehicles	25-100	10	5	4
Driveways[3] for automobiles and light-duty vehicles	300-500	10	6*	4
Driveways and parking areas for heavy-duty trucks and fire lanes	100-500	10	7**	6

*Slabs should be reinforced with No. 3 steel reinforcing bars placed at 24 inches on centers.
**Slabs should be reinforced with No. 4 steel reinforcing bars placed at 24 inches on centers.

7.11.3 The subgrade soils should be compacted to a minimum relative compaction of 95 percent at near the optimum moisture content. The depth of subgrade compaction should be approximately 12 inches.

7.11.4 Class 2 aggregate base should conform to Section 26-1.-02B of the *Standard Specifications for The State of California Department of Transportation (Caltrans)* and should be compacted to a minimum of 95 percent of the maximum dry density at near optimum moisture content. The asphalt concrete should conform to Section 203-6 of the *Standard Specifications for Public Works Construction (Green Book)*.

7.11.5 Where trash bin enclosures are planned within asphalt paved areas, we recommend that the pavement sections be equivalent to the heavy-duty truck categories presented in the respective tables. The concrete should extend into the roadway sufficiently so that all wheels of the trash truck are on the concrete when loading.

7.11.6 Rigid Portland cement concrete sections were evaluated using methods suggested by the American Concrete Institute *Guide for Design and Construction of Concrete Parking Lots (ACI330R-08)*.

7.11.7 Construction joints should be provided at a maximum spacing of 12 feet each way to control shrinkage. Installation of these types of joints should be made immediately after concrete finishing.

7.11.8 Construction jointing, doweling, and reinforcing should be provided in accordance with recommendations of the American Concrete Institute.

7.11.9 The performance of asphalt concrete pavements and Portland cement concrete pavements is highly dependent upon providing positive surface drainage away from the edge of the pavement. Ponding of water on or adjacent to the pavement will likely result in pavement distress and subgrade failure. If planter islands are proposed, the perimeter curb should extend at least 12 inches below proposed subgrade elevations. In addition, the surface drainage within the planter should be such that ponding will not occur.

7.11.10 Our experience indicates that even with these provisions, a groundwater condition can develop as a result of increased irrigation, landscaping and surface runoff.

7.12 Bio-Retention Basin and Bio-Swale Recommendations

7.12.1 The site will be underlain by import fill soils and clayey soil and the Very Old Paralic Deposits that are generally composed of clay and very clayey sand with gravel. Based on our experience with the onsite soils and infiltration testing in nearby projects, the onsite soil has very low permeability and generally very low infiltration characteristics. It is our opinion the existing soil is unsuitable for infiltration of storm water runoff. A separate Infiltration Feasibility Condition Letter was prepared by Geocon Incorporated dated November 8, 2018.

7.12.2 Any bio-retention basins, bioswales, and bio-remediation areas should be designed by the project civil engineer and reviewed by Geocon Incorporated. Typically, bioswales consist of a surface layer of vegetation underlain by clean sand. A subdrain should be provided beneath the sand layer. Water should not be allowed to infiltrate adjacent to the planned improvements. We recommend that retention basins, be properly lined to prevent water infiltration into the underlying soil. Prior to discharging into the storm drain pipe or other approved outlet structure, a seepage cutoff wall should be constructed at the interface between the subdrain and storm drainpipe. The concrete cut-off wall should extend at least 6 inches beyond the perimeter of the gravel-packed subdrain system.

7.12.3 The landscape architect should be consulted to provide the appropriate plant recommendations if a vegetated swale is to be implemented. If drought resistant plants are not used, irrigation may be required.

7.13 Drainage and Maintenance

7.13.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2016 CBC 1803.3 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into storm drains and conduits that carry runoff away from the proposed structure.

7.13.2 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

7.13.3 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. We recommend that area drains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes be used. In addition, where landscaping is planned adjacent to the pavement, we recommend construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material.

7.14 Grading and Foundation Plan Review

7.14.1 Geocon Incorporated should review the grading and foundation plans prior to finalization to verify their compliance with the recommendations of this report and determine the need for additional comments, recommendations, and/or analysis.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.

3. This report is issued with the understanding that it is the responsibility of the owner or his representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

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N

NO SCALE

VICINITY MAP

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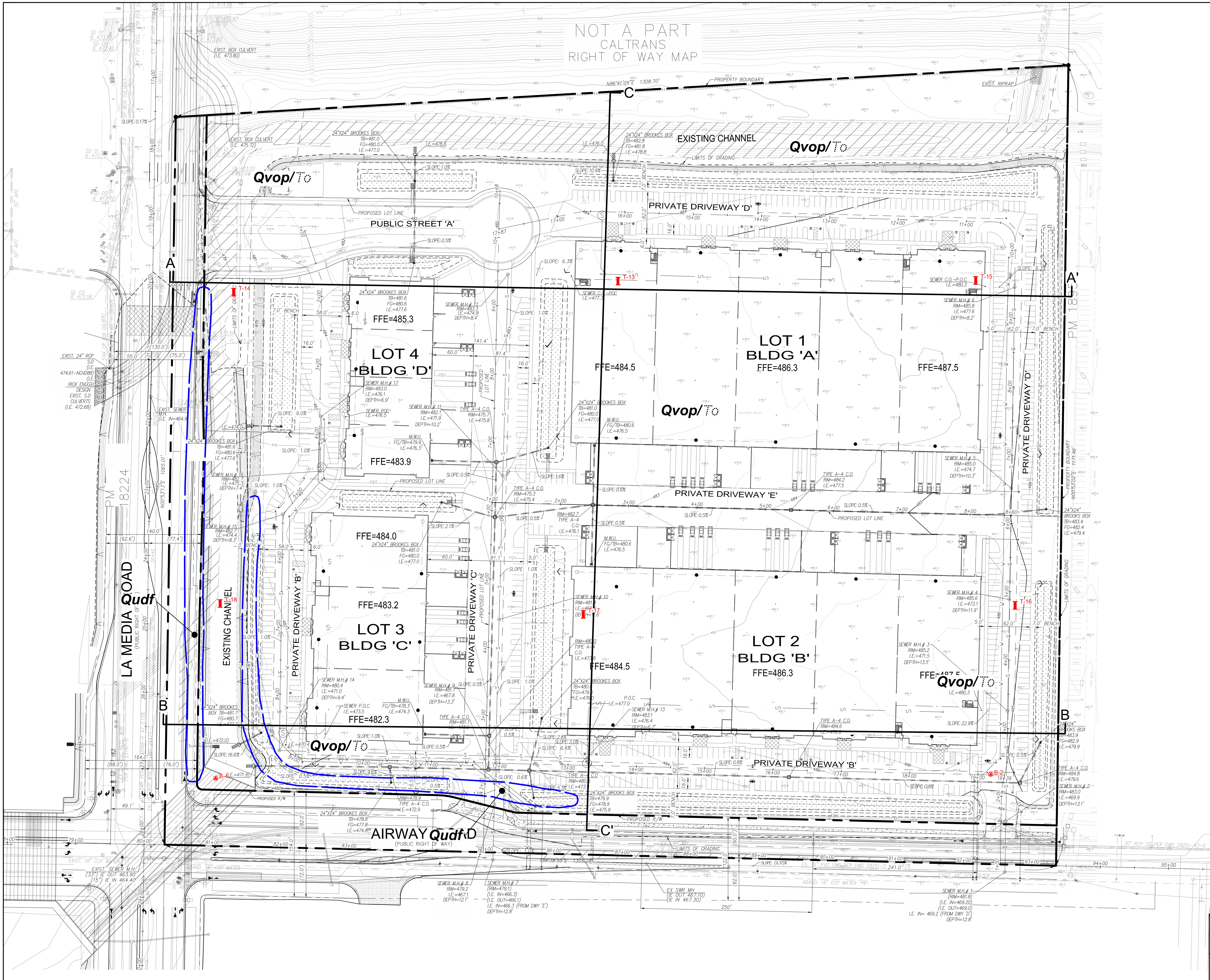
PLAZA LA MEDIA SOUTH
SAN DIEGO, CALIFORNIA

RG / CW		DSK/GTYPD	DATE 11 - 08 - 2018	PROJECT NO. 07056 - 32 - 04	FIG. 1

Plotted:11/07/2018 2:03PM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\07056-32-04 (Plaza La Media)\DETAILS\07056-32-04 Vic Map.dwg



SCALE 1"=50' (On 42x30)

GEOCON LEGEND

- **Qudf** ........UNDOCUMENTED FILL
- **Qvop** ....VERY OLD PARALIC DEPOSITS
- **To** ....OTAY FORMATION (Dotted Where Buried)
- B-4 ....APPROX. LOCATION OF EXPLORATORY BORING (Geocon Inc., 2001)
- T-18 ....APPROX. LOCATION OF EXPLORATORY TRENCH (Geocon Inc., 2001)
- C–C' ....APPROX. LOCATION OF GEOLOGIC CROSS - SECTION
- ....APPROX. LOCATION OF GEOLOGIC CONTACT

GEOLOGIC MAP

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SCALE 1" = 50'	DATE 11 - 08 - 2018	
PROJECT NO. 07056 - 32 - 04		FIGURE 2
SHEET 1 OF 1		

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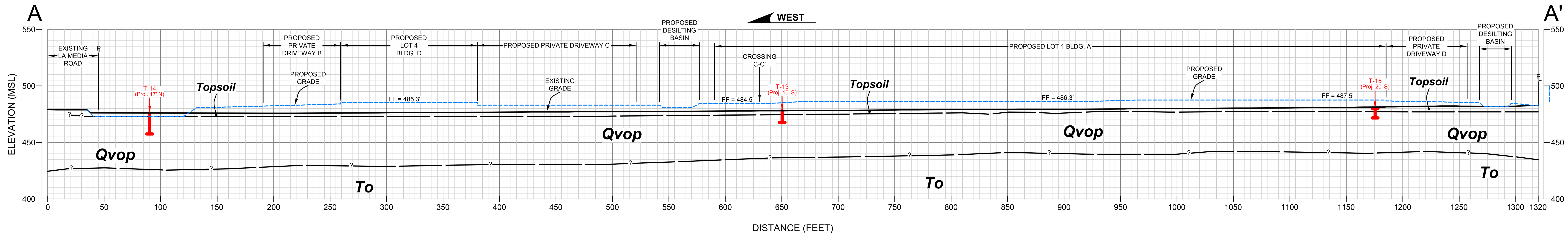
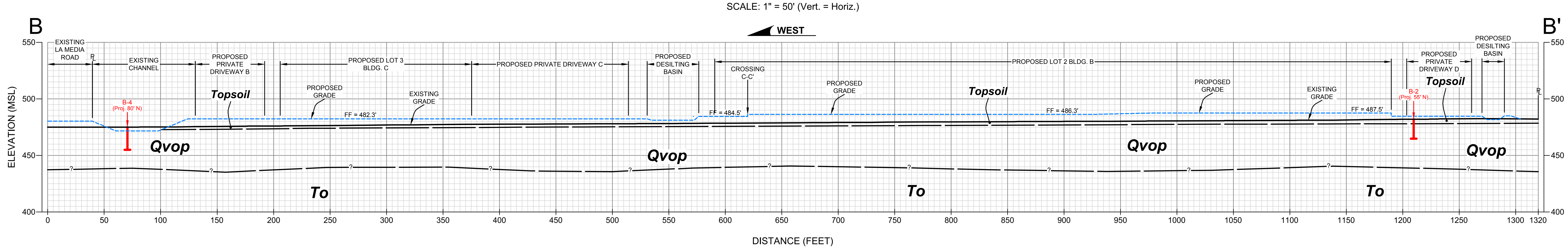


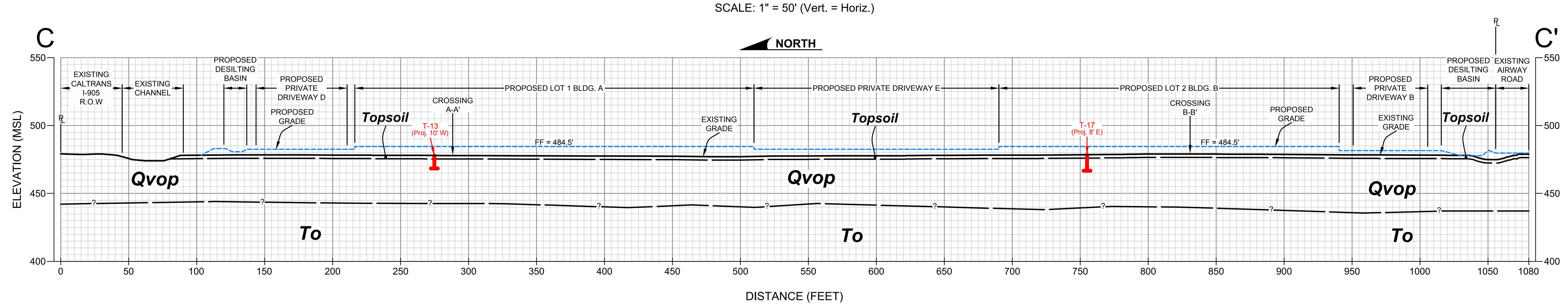
GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 50' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION B-B'

SCALE: 1" = 50' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION C-C'

SCALE: 1" = 50' (Vert. = Horiz.)

GEOCON LEGEND

- Qvop ....VERY OLD PARALIC DEPOSITS
- To ....OTAY FORMATION
- B-4 ....APPROX. LOCATION OF EXPLORATORY BORING (Geocon Inc., 2001)
- T-17 ....APPROX. LOCATION OF EXPLORATORY TRENCH (Geocon Inc., 2001)
- ? ....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

GEOLOGIC CROSS - SECTION

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SCALE	DATE	
1" = 50'	11 - 08 - 2018	
PROJECT NO. 07056 - 32 - 04		FIGURE 3
SHEET 1 OF 1		

Plotted 11/08/2018 9:00AM | By RUBEN AGUILAR | File Location Y:\PROJECTS\07056-32-04 (Plaza La Media)\SHEETS\07056-32-04 Cross-Section.dwg

ASSUMED CONDITIONS :

SLOPE HEIGHT	H	= Infinite
DEPTH OF SATURATION	Z	= 3 feet
SLOPE INCLINATION	2 : 1	(Horizontal : Vertical)
SLOPE ANGLE	i	= 26.6 degrees
UNIT WEIGHT OF WATER	γ_w	= 62.4 pounds per cubic foot
TOTAL UNIT WEIGHT OF SOIL	γ_t	= 122.0 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	= 26 degrees
APPARENT COHESION	C	= 270 pounds per square foot

SLOPE SATURATED TO VERTICAL DEPTH Z BELOW SLOPE FACE

SEEPAGE FORCES PARALLEL TO SLOPE FACE

ANALYSIS :

$$FS = \frac{C + (\gamma_t - \gamma_w)\ Z \cos^2 i \tan \phi}{\gamma_t\ Z \sin i \cos i} = 2.9$$

REFERENCES :

1......Haefeli, R. *The Stability of Slopes Acted Upon by Parallel Seepage*, Proc. Second International Conference, SMFE, Rotterdam, 1948, 1, 57-62

2......Skempton, A. W., and F.A. Delory, *Stability of Natural Slopes in London Clay*, Proc. Fourth International Conference, SMFE, London, 1957, 2, 378-81

SURFICIAL SLOPE STABILITY ANALYSIS - FILL SLOPES

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RG / CW		DSK/GTYPD	DATE 11 - 08 - 2018	PROJECT NO. 07056 - 32 - 04	FIG. 4

ASSUMED CONDITIONS :

SLOPE HEIGHT	H	= 30 feet
SLOPE INCLINATION	2 : 1	(Horizontal : Vertical)
TOTAL UNIT WEIGHT OF SOIL	γ_t	= 122.0 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	= 26 degrees
APPARENT COHESION	C	= 270 pounds per square foot
NO SEEPAGE FORCES		

ANALYSIS :

$\gamma_{c\phi}$	=	$\frac{\gamma_t H \tan\phi}{C}$	EQUATION (3-3), REFERENCE 1
FS	=	$\frac{N_{cf} C}{\gamma_t H}$	EQUATION (3-2), REFERENCE 1
$\gamma_{c\phi}$	=	6.6	CALCULATED USING EQ. (3-3)
Ncf	=	24	DETERMINED USING FIGURE 10, REFERENCE 2
FS	=	1.8	FACTOR OF SAFETY CALCULATED USING EQ. (3-2)

REFERENCES :

1......Janbu, N., Stability Analysis of Slopes with Dimensionless Parameters, Harvard Soil Mechanics, Series No. 46, 1954

2......Janbu, N., Discussion of J.M. Bell, Dimensionless Parameters for Homogeneous Earth Slopes, Journal of Soil Mechanics and Foundation Design, No. SM6, November 1967.

SLOPE STABILITY ANALYSIS - FILL SLOPES

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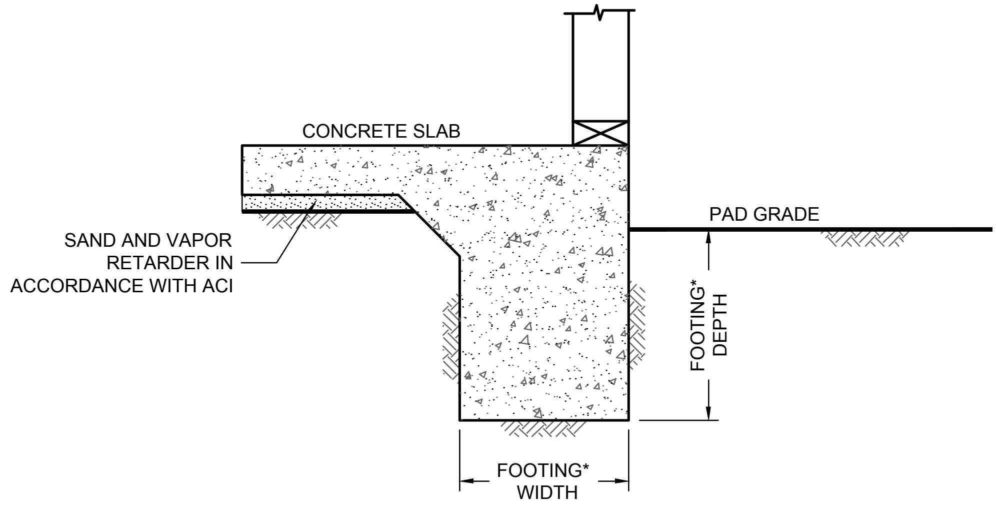
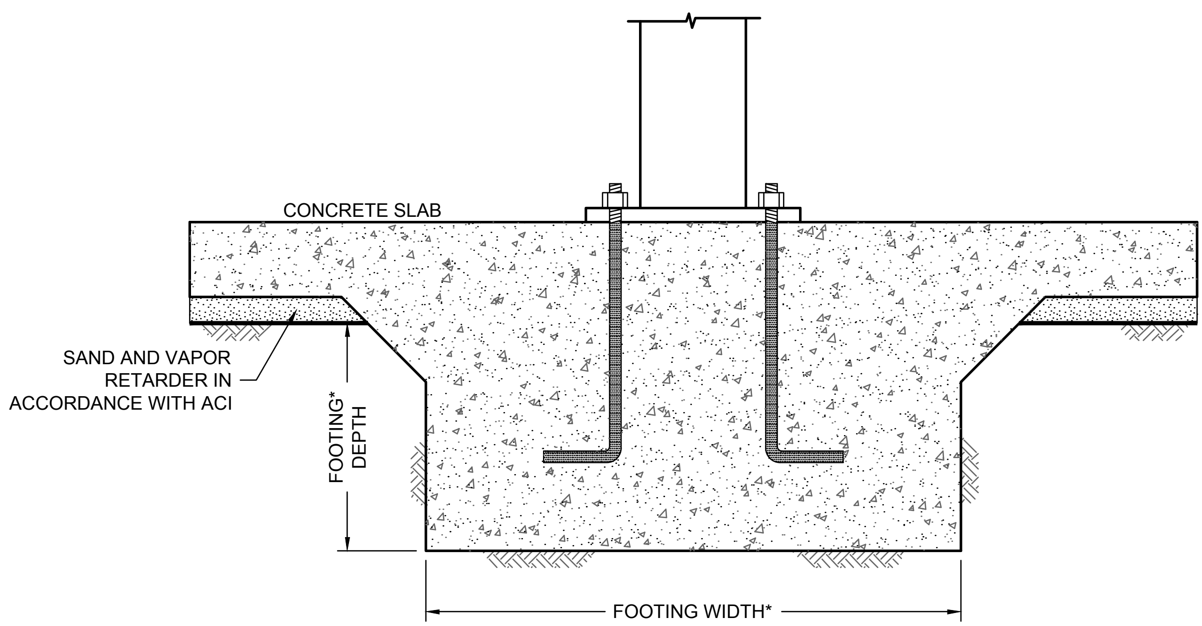
RG / CW		DSK/GTYPD	DATE 11 - 08 - 2018	PROJECT NO. 07056 - 32 - 04	FIG. 5





*....SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

NO SCALE

WALL / COLUMN FOOTING DIMENSION DETAIL

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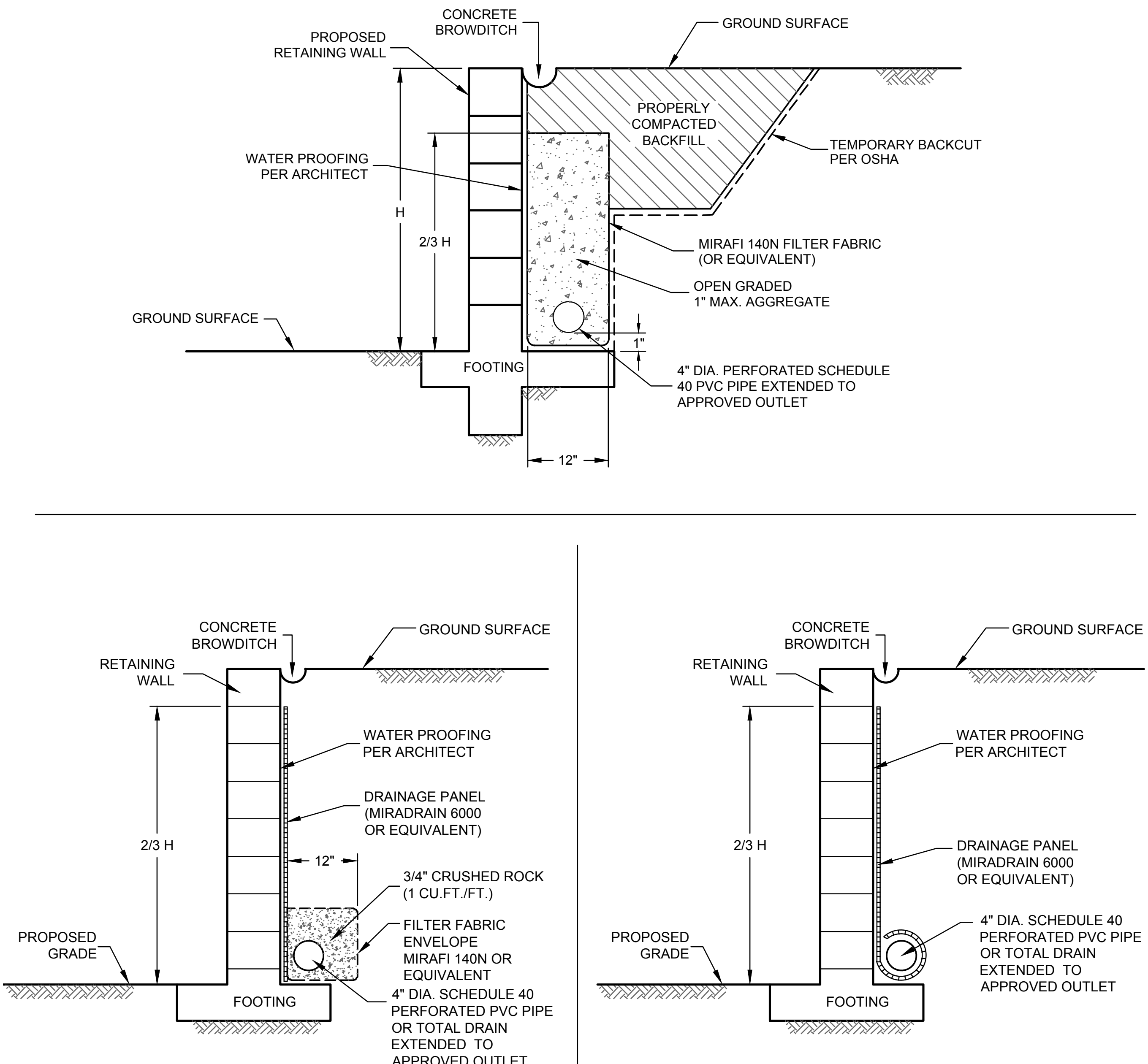
RG / CW		DSK/GTYPD	DATE 11 - 08 - 2018	PROJECT NO. 07056 - 32 - 04	FIG. 6



NOTE :

DRAIN SHOULD BE UNIFORMLY SLOPED TO GRAVITY OUTLET OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPING

NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

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RG / CW		DSK/GTYPD	DATE 11 - 08 - 2018	PROJECT NO. 07056 - 32 - 04	FIG. 7

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The field investigation on the south parcel was performed between March 20 and March 29, 1989, and consisted of a site reconnaissance by an engineering geologist and the excavation of 2 large diameter borings and 6 backhoe trenches. The large-diameter borings were drilled using an E-100 drill rig equipped with a 30-inch-diameter bucket and extended to depths ranging from 18 to 20 feet below the existing ground surface. Trenches were excavated to depths varying from 9.5 feet to 12 feet below the existing ground surface using a John Deere 555 tractor-mounted backhoe equipped with a 24-inch-wide bucket. Relatively undisturbed drive samples and disturbed bulk samples were obtained at selected locations within the exploratory excavations.

The soils encountered in the exploratory borings and trenches were visually examined, classified, and logged in general conformance with the American Society for Testing and Materials (ASTM) Practice for Description and Identification of Soils (Visual-Manual Procedure D 2488). Logs of the large diameter borings and trenches are presented on Figures A-2, A-4, and A-14 through A-18 (former numbering sequence). The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained. The approximate location of the exploratory excavations is depicted on the Geologic Map, Figure 2 (map pocket).

File No. D-4342-J01
April 26, 1989
Revised October 13, 1989

BORING B-2

ELEVATION 484 MSL DATE DRILLED 3/28/89

EQUIPMENT E-100

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S.)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
0 – 2				CL	TOPSOIL Soft, moist, dark brown, fine to medium, Sandy CLAY			
2 – 9				CL	TERRACE DEPOSITS Firm, wet, brown, fine Sandy CLAY			
6	B2-1					push	94.1	27.1
7					– – – becomes reddish-brown			
9 – 12				CL	Firm, moist, dark orange-red, fine Sandy CLAYSTONE			
10	B2-2					1	93.8	27.0
12 – 18				GC	Dense, moist, dark orange-red, Clayey, fine to medium Sandy GRAVEL and Cobbles to 18"			
18					BORING TERMINATED AT 18.0 FEET (REFUSAL)			

Figure A-2, Log of Test Boring B-2

SAMPLE SYMBOLS

- ☐ — SAMPLING UNSUCCESSFUL
- ☒ — DISTURBED OR BAG SAMPLE
- STANDARD PENETRATION TEST
- CHUNK SAMPLE
- DRIVE SAMPLE (UNDISTURBED)
- WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

File No. D-4342-J01
April 26, 1989
Revised October 13, 1989

BORING B-4
ELEVATION 479 MSL DATE DRILLED 3/29/89
EQUIPMENT E-100

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S.)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
0–3				CL	TOPSOIL Soft, moist, dark brown, fine to medium Sandy CLAY			
3–5				CL	TERRACE DEPOSITS Firm, wet, dark reddish-brown, fine Sandy CLAY			
5–9	B4-1			CL	Stiff, moist, dark orange, fine to coarse Sandy CLAY	3	120.0	10.8
9–20	B4-2			GM	Dense, moist, orange, Silty, fine to coarse Sandy GRAVEL, micaceous, slightly wet, GRAVEL and Cobbles to 10"	4	106.1	10.9
20					BORING TERMINATED AT 20.0 FEET			

Figure A-4, Log of Test Boring B-4

SAMPLE SYMBOLS
- ☐ — SAMPLING UNSUCCESSFUL
- ☒ — DISTURBED OR BAG SAMPLE
- STANDARD PENETRATION TEST
- CHUNK SAMPLE
- DRIVE SAMPLE (UNDISTURBED)
- WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

File No. D-4342-J01
April 26, 1989
Revised October 13, 1989

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S.)	TRENCH T-12 ELEVATION 479 MSL DATE DRILLED 3/21/89 EQUIPMENT JD 555	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
					MATERIAL DESCRIPTION			
0 – 2	T12-1			CL	TOPSOIL Soft, dry, dark brown, fine to coarse, Sandy CLAY			
4	T12-2			CL	TERRACE DEPOSITS Stiff, moist, brown, fine to coarse, Sandy CLAY, some gravel		108.5	14.4
6 – 8				GM	Dense, moist, dark orange, Silty, fine to coarse Sandy GRAVEL and Cobbles to 14"			
10					becomes very dense			
					TRENCH TERMINATED AT 10.0 FEET			
					TRENCH T-13 Elevation 481 MSL			
0 – 2	T13-1			CL	TOPSOIL Soft, dry, dark brown, fine to medium, Sandy CLAY			
4	T13-2			CL	TERRACE DEPOSITS Stiff, wet, dark gray, fine Sandy CLAY		91.4	25.3
6					becomes dark reddish-orange			
8				CL	Hard, moist, dark orange, fine to medium, Sandy CLAYSTONE, blocky fractured			
10					TRENCH TERMINATED AT 9.5 FEET			

Figure A-14, Log of Test Trenches T-12 and T-13

SAMPLE SYMBOLS
- SAMPLING UNSUCCESSFUL
- DISTURBED OR BAG SAMPLE
- STANDARD PENETRATION TEST
- CHUNK SAMPLE
- DRIVE SAMPLE (UNDISTURBED)
- WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

File No. D-4342-J01
April 26, 1989
Revised October 13, 1989

TRENCH T-14

ELEVATION 480 MSL DATE DRILLED 3/22/89

EQUIPMENT JD 555

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
0–2	T14-1			CL	TOPSOIL Firm, damp, brown, fine Sandy CLAY			
2–6	T14-2			CL-SC	TERRACE DEPOSITS Stiff, slightly wet, light brown, fine Sandy CLAY to Clayey fine SAND		103.7	15.4
6–17				GM	Dense, moist, dark orange, Silty, fine to very coarse Sandy GRAVEL and Cobbles to 16" (16) becomes very dense			
					TRENCH TERMINATED AT 17.0 FEET			

Figure A-15, Log of Test Trench T-14

SAMPLE SYMBOLS

- □ — SAMPLING UNSUCCESSFUL
- ☒ — DISTURBED OR BAG SAMPLE
- ◧ — STANDARD PENETRATION TEST
- ◩ — CHUNK SAMPLE
- ■ — DRIVE SAMPLE (UNDISTURBED)
- ▼ — WATER TABLE OR SEEPAGE

File No. D-4342-J01
April 26, 1989
Revised October 13, 1989

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S.)	TRENCH T-15 ELEVATION 482 MSL DATE DRILLED 3/22/89 EQUIPMENT JD 555	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
					MATERIAL DESCRIPTION			
0								
2	T15-1			CL	TOPSOIL Soft, dry, dark brown, fine to medium, Sandy CLAY, some gravel becomes moist			
4								
6	T15-2			CL	TERRACE DEPOSITS Stiff, wet, dark gray, fine Sandy CLAY, abundant gypsum crystals		101.9	17.8
8	T15-3			CL	becomes dark orange-brown		BULK SAMPLE	
	T15-4				Hard, moist, dark reddish-orange, fine Sandy CLAYSTONE		100.4	21.9
10								
					TRENCH TERMINATED AT 9.0 FEET (REFUSAL)			
					TRENCH T-16 Elevation 484 MSL			
0								
2	T16-1			CL	TOPSOIL Soft, damp, dark brown, fine to medium Sandy CLAY becomes moist			
4				CL				
6	T16-2			CL	TERRACE DEPOSITS Stiff, slightly wet, orange-brown, fine Sandy CLAY		99.3	18.9
8					Hard, moist, orange, fine to medium, Sandy CLAYSTONE, blocky fractured			
10								
					TRENCH TERMINATED NEAR 9.0 FEET (REFUSAL)			

Figure A-16, Log of Test Trenches T-15 and T-16

SAMPLE SYMBOLS
- ☐ — SAMPLING UNSUCCESSFUL
- ☒ — DISTURBED OR BAG SAMPLE
- ◨ — STANDARD PENETRATION TEST
- ◪ — CHUNK SAMPLE
- ■ — DRIVE SAMPLE (UNDISTURBED)
- ▽ — WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

File No. D-4342-J01
April 26, 1989
Revised October 13, 1989

TRENCH T-17

ELEVATION 481 MSL DATE DRILLED 3/22/89

EQUIPMENT JD 555

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
0 – 2	T17-1			CL	TOPSOIL Soft, damp, dark brown, fine to medium, Sandy CLAY, some gravel			
2 – 6	T17-2			CL	TERRACE DEPOSITS Stiff, wet, dark gray, fine Sandy CLAY		102.8	18.1
6 – 12.5	T17-3			CL	Hard, moist, orange-red, fine Sandy CLAYSTONE		99.9	27.1
					TRENCH TERMINATED NEAR 12.5 FEET (REFUSAL)			

Figure A-17, Log of Test Trench T-17

SAMPLE SYMBOLS
- ☐ — SAMPLING UNSUCCESSFUL
- ◧ — STANDARD PENETRATION TEST
- ■ — DRIVE SAMPLE (UNDISTURBED)
- ☒ — DISTURBED OR BAG SAMPLE
- ◪ — CHUNK SAMPLE
- ▽ — WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

File No. D-4342-J01
April 26, 1989
Revised October 13, 1989

TRENCH T-18
ELEVATION 480 MSL DATE DRILLED 3/22/89
EQUIPMENT JD 555

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S.)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
0 – 3	T18-1			CL	TOPSOIL Soft, dry, dark brown, fine to medium Sandy CLAY			
3 – 6.5	T18-2			CL	TERRACE DEPOSITS Stiff, moist, light brown, fine Sandy CLAY		100.3	9.6
6.5 – 17				GM	Dense, moist, dark orange, Silty, fine to very coarse Sandy GRAVEL and Cobbles to 24"			
17					TRENCH TERMINATED AT 17.0 FEET			

Figure A-18, Log of Test Trench T-18

SAMPLE SYMBOLS
☐ — SAMPLING UNSUCCESSFUL
☒ — DISTURBED OR BAG SAMPLE
STANDARD PENETRATION TEST
CHUNK SAMPLE
DRIVE SAMPLE (UNDISTURBED)
WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

APPENDIX B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected soil samples were tested for their maximum dry density and optimum moisture content, expansion index, and shear strength characteristics. Selected soils samples were also tested to evaluate plasticity, water-soluble sulfate, water-soluble chloride, pH, and minimum resistivity characteristics.

The results of our laboratory tests are presented as follows on Tables B-I through B-VI. The in-place dry density and moisture content results are indicated on the exploratory boring and trench logs.

TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
T2-1	Dark brown, Sandy CLAY	124.4	11.3
T3-2	Dark gray, Sandy CLAY	119.0	13.3
T8-4	Dark red, Silty, fine to medium SAND	121.0	12.3

TABLE B-II
SUMMARY OF DIRECT SHEAR TEST RESULTS
ASTM D 3080

Sample No.	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
T2-1*	112.3	10.9	260	21
T3-2*	107.4	12.9	370	8
B8-4*	109.7	11.5	270	26
B1-2	101.5	22.1	400	25
B2-2	93.8	27.0	1950	22

*Soil samples remolded approximately to 90 percent relative density at near optimum moisture content.

TABLE B-III
SUMMARY OF LABORATORY CALIFORNIA BEARING RATIO TEST RESULTS
ASTM D 1883

Description	Sample No. T2-1	Sample No. T7-3
% + #4 Screen	98.6	98.2
% - #4 Screen	1.4	1.8
Sand Equivalent	---	---
CBR Value @ :		
0.1" penetration	2.7	2.7
0.2" penetration	3.2	3.5
0.3" penetration	3.4	4.1
0.4" penetration	3.5	4.2
0.5" penetration	3.5	4.3
% Moisture before soaking	10.4	12.3
% Moisture after soaking	21.9	25.3
Compacted dry weight, pcf	114.4	108.6
96-hour expansion, %	3.9	9.1

TABLE B-IV
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829

Sample No.	Moisture Content		Dry Density (pcf)	Expansion Index	Potential Expansion	Type of Soil
	Before Test (%)	After Test (%)				
T2-1	10.1	30.0	103.0	105	High	Topsoil
T3-2	11.7	30.3	102.8	82	Medium	Terrace Deposits (clays)
T8-4	9.9	25.7	109.2	60	Medium	Terrace Deposits (sands)
T11-5	11.5	26.3	103.5	85	Medium	Terrace Deposits (sands)

TABLE B-V
SUMMARY OF LABORATORY ATTERBERG LIMITS TEST RESULTS
ASTM D 4318

Sample No.	Liquid Limit	Plastic Limit	Plasticity Index	Category
T2-1	35	13	22	CL
T3-2	44	14	30	CL
T8-4	30	18	12	CL
T11-5	30	18	12	CL

TABLE B-VI
SUMMARY OF LABORATORY MINIMUM RESISTIVITY, POTENTIAL OF HYDROGEN (PH), WATER-SOLUBLE SULFATES, AND WATER-SOLUBLE CHLORIDES TEST RESULTS
CALIFORNIA TEST NOS. 417 AND 643

Sample No.	Minimum Resistivity (ohm-cm)	pH	Water-Soluble Sulfates (%)	Water-Soluble Chlorides (%)
T2-1	1260	7.4	0.004	0.002
T3-2	390	7.6	0.031	0.006
T8-4	620	7.5	0.020	0.004

APPENDIX C

APPENDIX C

RECOMMENDED GRADING SPECIFICATIONS

FOR

PLAZA LA MEDIA–SOUTH
AIRWAY ROAD AND LA MEDIA ROAD
SAN DIEGO, CALIFORNIA

PROJECT NO. 07056-32-04

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, and/or adverse weather result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9 and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition

4. CLEARING AND PREPARING AREAS TO BE FILLED

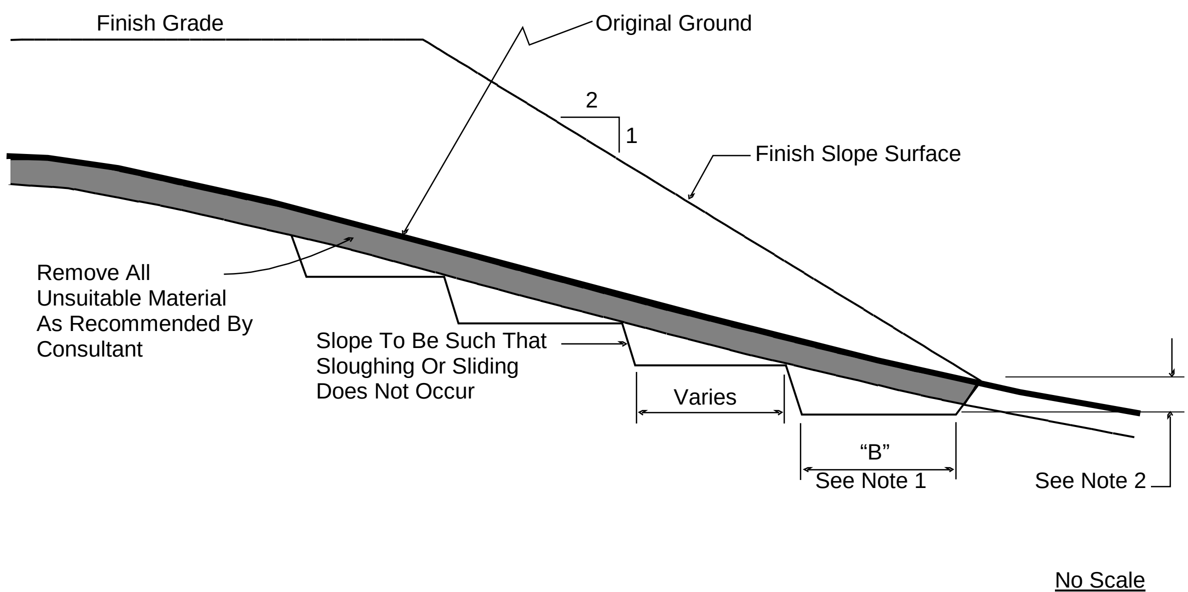
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



DETAIL NOTES: (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

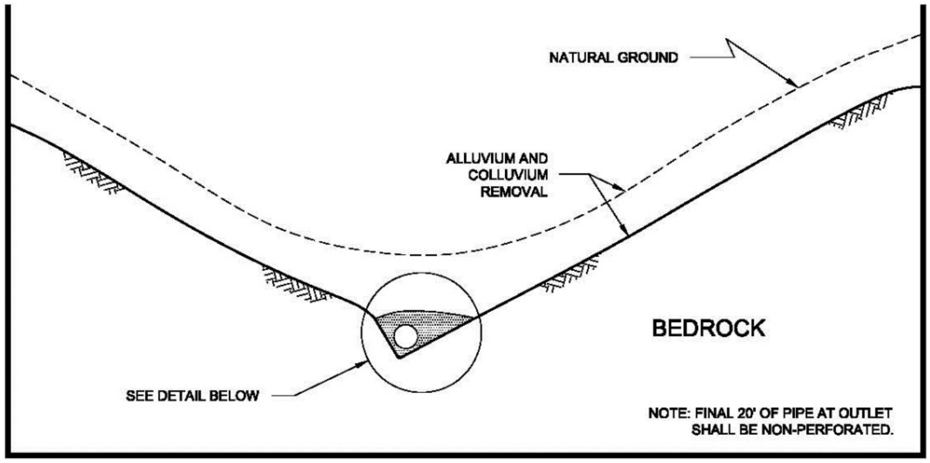
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

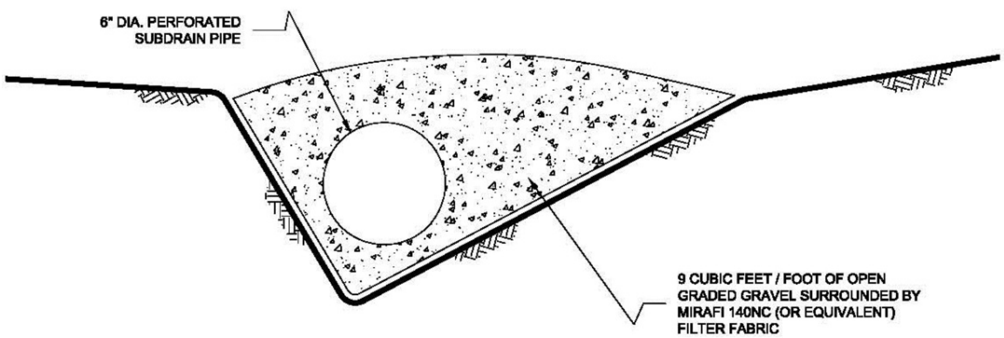
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. SUBDRAINS

7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

TYPICAL CANYON DRAIN DETAIL





NOTES:

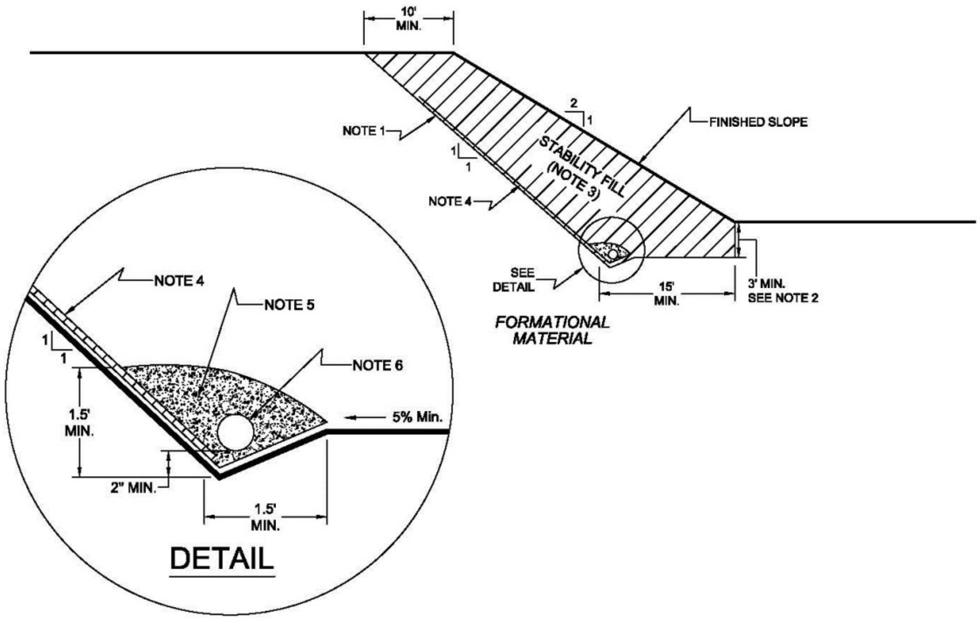
1......6-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2......6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or lager) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2.....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

NO SCALE

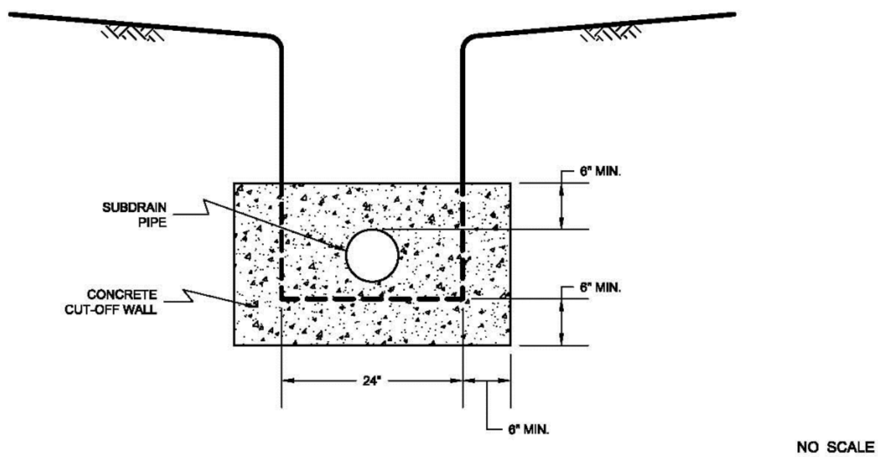
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

7.4 *Rock* fill or *soil-rock* fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock* fill drains should be constructed using the same requirements as canyon subdrains.

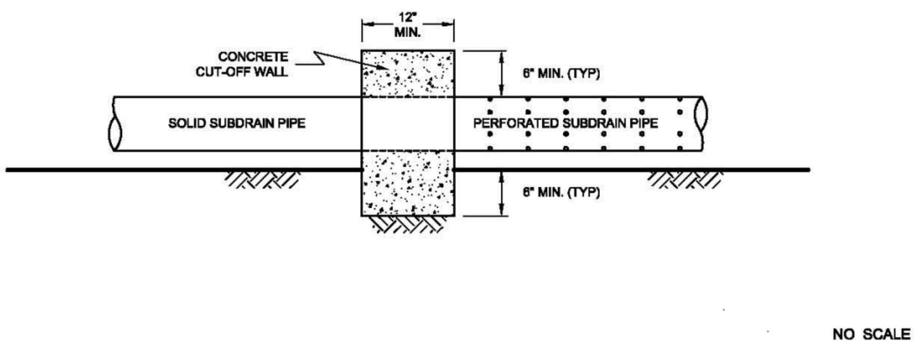
7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

TYPICAL CUT OFF WALL DETAIL

FRONT VIEW



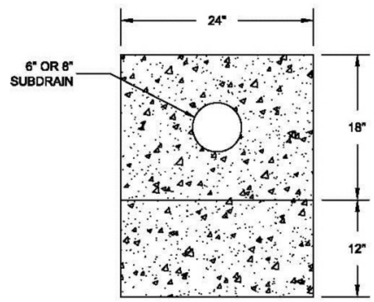
SIDE VIEW



7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

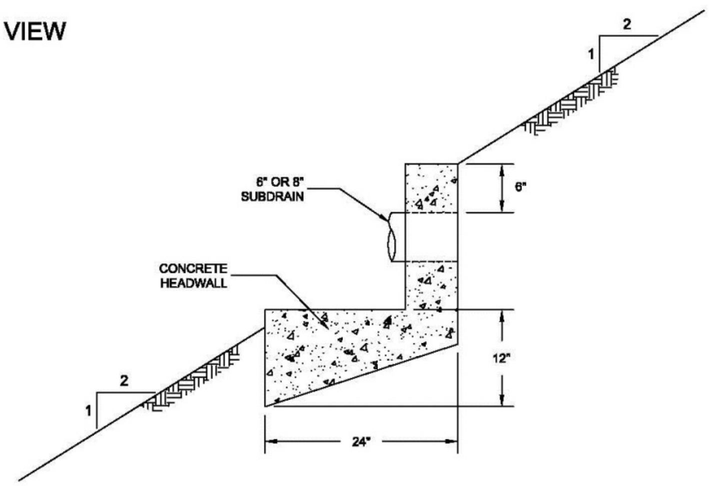
TYPICAL HEADWALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW



NOTE: HEADWALL SHOULD OUTLET AT TOE OF FILL SLOPE OR INTO CONTROLLED SURFACE DRAINAGE

NO SCALE

7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an "as-built" map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

8. OBSERVATION AND TESTING

8.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

8.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.

8.6 Testing procedures shall conform to the following Standards as appropriate:

8.6.1 Soil and Soil-Rock Fills:

8.6.1.1 Field Density Test, ASTM D 1556, *Density of Soil In-Place By the Sand-Cone Method.*

8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.

8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test*.

9. PROTECTION OF WORK

9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

10. CERTIFICATIONS AND FINAL REPORTS

10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

10.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

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