Costa Verde Center Revitalization Project
Environmental Impact Report
SCH No. 2016071031; Project No. 477943

Appendix G2

Storm Water Quality Management Plan

March 2020

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

Costa Verde Center

PTS 477943

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

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

Engineer of Work:

Tom Eagling, P.E. C. 75897

Provide Wet Signature and Stamp Above Line

Prepared For:

Regency Centers

420 Stevens Ave, Suite 320

Solana Beach, CA 92075

858-847-4600

Prepared By:

Kimley-Horn

401 B Street, Suite 600

San Diego, CA 92101

619-234-9411

Date:

October 2019

Approved by: City of San Diego Date

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Project Name: Costa Verde Center

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:
Permit Application

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

75897 — PE#

June 30, 2020 — Expiration Date

Tom Eagling

Print Name

Kimley-Horn

Company

Date

Engineer's Stamp

Project Name: Costa Verde Center

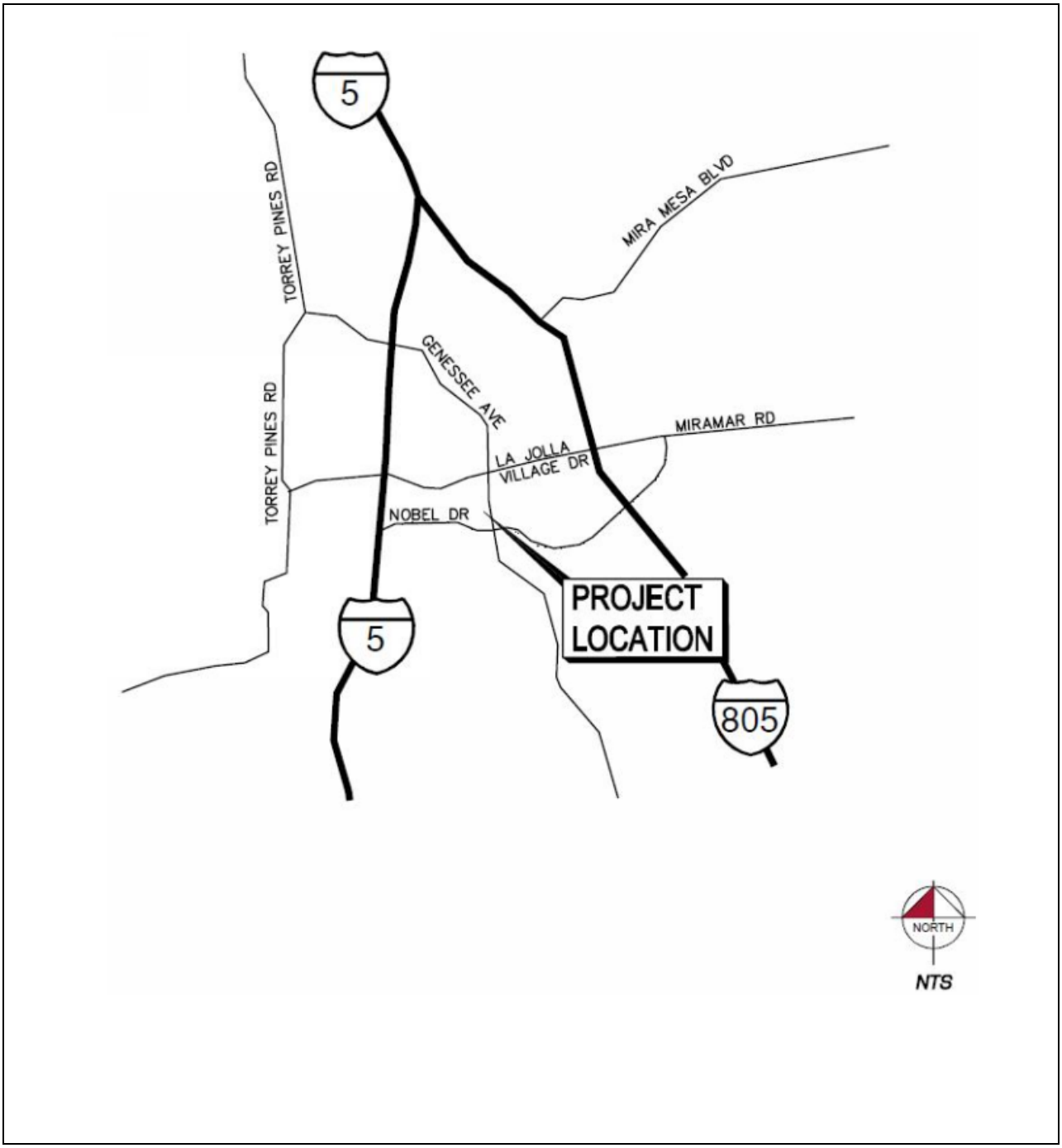
Submittal Record

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	1/15/16	☑ **Preliminary Design/Planning/CEQA** ☐ **Final Design**	**Initial Submittal**
2	7/28/16, 12/2/16	☑ **Preliminary Design/Planning/CEQA** ☐ **Final Design**	Second, Third Submittal
3	12/21/17	☑ **Preliminary Design/Planning/CEQA** ☐ **Final Design**	Fourth Submittal
4	6/11/19	☑ **Preliminary Design/Planning/CEQA** ☐ **Final Design**	Fifth Submittal (Project Redesign)

Project Vicinity Map

Project Name: Costa Verde Center
Permit Application PTS 477943



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

Attach DS-560 form.

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City of San Diego
Development Services
1222 First Ave., MS-302
San Diego, CA 92101
(619) 446-5000

Storm Water Requirements Applicability Checklist

FORM
DS-560
November 2018

Project Address: 8650 Genesee Avenue, San Diego, CA 92122	Project Number: 477943

SECTION 1. Construction Storm Water BMP Requirements:

All construction sites are required to implement construction BMPs in accordance with the performance standards in the Storm Water Standards Manual. Some sites are additionally required to obtain coverage under the State Construction General Permit (CGP)[1] , which is administered by the State Regional Water Quality Control Board.

For all projects complete PART A: If project is required to submit a SWPPP or WPCP, continue to PART B.

PART A: Determine Construction Phase Storm Water Requirements.

1. Is the project subject to California's statewide General NPDES permit for Storm Water 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 required, skip questions 2-4 ☐ No; 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 storm water?

☐ Yes; WPCP required, skip questions 3-4 ☐ No; next question

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

☐ Yes; WPCP required, skip question 4 ☐ No; 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, pot holing, curb and gutter replacement, and retaining wall encroachments.

☐ Yes; no document required

Check one of the boxes below, and continue to PART B:

☒ If you checked "Yes" for question 1, **a 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 checked "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: www.sandiego.gov/stormwater/regulations/index.shtml

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 continued 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 not located in the ASBS watershed.

b. Projects that qualify as LUP Type 2 or LUP Type 3 per the CGP and 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 not located in an ASBS watershed.

c. WPCP projects (>5,000sf of ground disturbance) located within the Los Penasquitos 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. Permanent Storm Water BMP Requirements.

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

PART C: Determine if Not Subject to Permanent Storm Water Requirements.

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

If "yes" is checked for any number in Part C, proceed to Part F and check "Not Subject to Permanent Storm Water BMP Requirements".

If "no" is checked for all of 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 storm water?	☐ 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 Page 2

PART D: PDP Exempt Requirements.

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

If "yes" was checked for any questions in Part D, continue to Part F and check the box labeled "PDP Exempt."

If "no" was 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 storm water 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 Storm Water Standards manual?**

   ☐ Yes; PDP exempt requirements apply ☒ No; 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 Storm Water Standards Manual?

   ☐ Yes; PDP exempt requirements apply ☒ No; project not exempt.

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 Storm Water 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 drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC 5812), and where the land development creates and/or replace 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

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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 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 a 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 shops 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.** The project is not covered in the categories above, results in the disturbance of one or more acres of land and is expected to generate pollutants post construction, such as fertilizers and pesticides. This does not include projects creating less than 5,000 sf of impervious surface and where added landscaping does not require regular use of pesticides and fertilizers, such as slope stabilization using native plants. Calculation of the square footage of impervious surface need not include linear pathways that are for infrequent vehicle use, such as emergency maintenance access or bicycle pedestrian use, if they are built with pervious surfaces of if they sheet flow to surrounding pervious surfaces. ☐ 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 STORM WATER REQUIREMENTS**. ☐
2. The project is a **STANDARD DEVELOPMENT PROJECT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance. ☐
3. The project is **PDP EXEMPT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance. ☐
4. The project is a **PRIORITY DEVELOPMENT PROJECT**. Site design, source control, and structural pollutant control BMP requirements apply. See the Storm Water Standards Manual for guidance on determining if project requires a hydromodification plan management ☒

Tom Eagling, P.E.	Civil Engineer
Name of Owner or Agent *(Please Print)*	Title
Signature	Date

Clear Page 4

Clear Form

Applicability of Permanent, Post-Construction Storm Water BMP Requirements	Form I-1

Project Identification

Project Name: Costa Verde Center	
Permit Application Number:	Date: June 2019

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 - this project is a Priority Development Project

Project Name: Costa Verde Center

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 (not required if prior lawful approval does not apply):		
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 not apply:		
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 not apply: The project site is not located in a CCSYA in accordance with Figure H.9-1.		

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	Costa Verde Center
Project Address	8650 Genesee Avenue, San Diego, CA 92122
Assessor's Parcel Number(s) (APN(s))	345-210-13 & 345-210-14
Permit Application Number	477943
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)	Los Penasquitos Watershed Hydrologic Unit, within the Miramar Hydrologic Area (no subareas identifiesd). 906.40
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	13.86 Acres (603,838 Square Feet)
Area to be disturbed by the project (Project Footprint)	11.92 Acres (519,235 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	10.27 Acres (447,228 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	1.67 Acres (72,747 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	-2.5 %

Form I-3B Page 2 of 11

Description of Existing Site Condition and Drainage Patterns

Current Status of the Site (select all that apply):

- [x] 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):

- [x] Vegetative Cover
- [ ] Non-Vegetated Pervious Areas
- [x] 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
- [x] NRCS Type D

Approximate Depth to Groundwater:

- [ ] Groundwater Depth < 5 feet
- [ ] 5 feet < Groundwater Depth < 10 feet
- [ ] 10 feet < Groundwater Depth < 20 feet
- [x] Groundwater Depth > 20 feet

Existing Natural Hydrologic Features (select all that apply):

- [ ] Watercourses
- [ ] Seeps
- [ ] Springs
- [ ] Wetlands
- [x] None

Description / Additional Information:

There are two existing subdrains located near the southern portion of the site roughly perpendicular to Nobel Drive.

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 urban/commercial development is broken up into two lots - lot 13 to the north of Esplanade Court and lot 14 to the South of Esplanade Court. As it exists today, lot 13 drains to the north storm drain system (through 18" RCP; POC 2) which leads to the storm drain system that runs along La Jolla Village Drive. This system eventually leads to the Rose Canyon natural channel. The public street Esplanade Court and adjacent areas drain to the east towards Genesee Avenue (through an 18" RCP), eventually being conveyed into the same Rose Canyon natural channel. Lot 14 (south of Esplanade Court) generally drains north to south. Onsite storm water runoff surface flows to existing onsite inlets/catch basins throughout the site and is conveyed through the private onsite storm drain system and connects into the existing 24" RCP storm drain line (POC 1) which crosses Nobel Drive. This existing storm drain line then leads to the same Rose Canyon natural channel. Although Esplanade Court is not within the property line, runoff from this area drains to an existing 18" RCP which connects to a storm main in Genesee Avenue (POC 3). See the table below for a summary of lot areas and the corresponding flows. There is no offsite runoff conveyed through the site.

	Area (ac)	50 Year Storm Event (cfs)	100 Year Storm Event (cfs)
$Q_{Existing}$ (POC 1)	10.80	44.36	51.34
$Q_{Existing}$ (POC 2)	0.90	3.72	4.27
$Q_{Existing}$ (POC 3)	1.60	6.64	7.80

Form I-3B Page 4 of 11

Description of Proposed Site Development and Drainage Patterns

Project Description / Proposed Land Use and/or Activities:

This project proposes to redevelop the existing Costa Verde Shopping Center with research, retail, office space, and a hotel. In addition, Esplanade Court is to be vacated and incorporated in the project development as private property.

List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features):

Proposed impervious features include buildings, a large parking structure with a podium slab that spans most of the developed portion of Lot 14, private access roadways, pedestrian and bike plazas.

List/describe proposed pervious features of the project (e.g., landscape areas):

Proposed pervious features of the project include tree wells, landscape areas/planters, and community gardens.

Does the project include grading and changes to site topography?

☑ Yes

☐ No

Description / Additional Information:

Throughout most of the site, the surface topography will remain similar to the existing developed site. However, there are proposed underground parking structures which require excavative pad grading. Lot 13 and Esplanade Court will no longer drain to La Jolla Drive; instead, Lot 13 runoff will drain and connect with Lot 14, and will all be collected in the underground hydromodification basin located in the southern portion of the site.

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 proposed project site drainage conveyance network is consistent with the existing site with a few additions to the system in order to account for necessary water quality treatment and hydromodification facilities. The northern-most lot proposed design consists of one hotel building which takes up a majority of the lot. The surface runoff enters on-structure/on building area drains and connects to the underground conveyance system for the southern lot. Runoff will flow through the recommended Bioclean Modular Wetland units (or approved equal) before entering the proposed detention system.

The south lot drains similar to the existing condition. Surface drainage generally drains from north to south and is collected in area drains throughout the site. The area drains then convey the runoff to through the recommended Bioclean Modular Wetland units onsite (or approved equal) before entering the proposed hydromodification system located under the southern parking lot. A restrictor orifice will be installed at the basin outlet to regulate flows entering the existing storm drain system. Overflow will be conveyed through a weir and will then enter the existing 24" RCP (POC 1) as in the existing condition. See the table below for a summary of lot areas and the corresponding flows. See Attachment 5 for more detailed calculations.

	Area (ac)	50 Year Storm Event (cfs)	100 Year Storm Event (cfs)
$Q_{Proposed}$ **(POC 1)**	13.50	58.38	63.53
$Q_{Proposed}$ **(POC 2)**	N/A	N/A	N/A
$Q_{Proposed}$ **(POC 3)**	N/A	N/A	N/A

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):

- [x] Onsite storm drain inlets
- [ ] Interior floor drains and elevator shaft sump pumps
- [x] Interior parking garages
- [x] Need for future indoor & structural pest control
- [x] Landscape/outdoor pesticide use
- [ ] Pools, spas, ponds, decorative fountains, and other water features
- [x] Food service
- [x] Refuse areas
- [ ] Industrial processes
- [ ] Outdoor storage of equipment or materials
- [ ] Vehicle and equipment cleaning
- [ ] Vehicle/equipment repair and maintenance
- [ ] Fuel dispensing areas
- [x] Loading docks
- [ ] Fire sprinkler test water
- [ ] Miscellaneous drain or wash water
- [x] 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) Project site discharge enters the public storm drain system at Nobel Drive to the south. The public storm drain system then conveys flows south to discharge into Rose Creek which continues traveling south to outlet at Mission Bay.
Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations Mission Bay benefits from the following uses: industrial service supply, contact water recreation, non-contact water recreation, commercial sport and fishing, estuarine habitat, wildlife habitat, marine habitat, migration of aquatic organisms, spawning, reproduction, and/or early development, shellfish harvesting, and rare threatened, or endangered species.
Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations There are no ASBS located downstream of the project discharge location.
Provide distance from project outfall location to impaired or sensitive receiving waters The project site is approximately 0.5 miles from Rose Creek and approximately 6 miles from Mission Bay.
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 site is not located in an MHPA or in environmentally sensitive lands.

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)
Rose Creek	Selenium & Toxicity	TMDL required
Mission Bay - Rose Creek	Eutrophic & Lead	TMDL required
Mission Bay - Campland	Enterococcus, Fecal Coliform	TMDL required
Mission Bay - Campland	Total Coliform	TMDL required
Mission Bay - Leisure Lagoon	Enterococcus, Total Coliform	TMDL required
Mission Bay Visitors Center	Entercococcus, Fecal Coliform	TMDL required
Mission Bay - Visitors Center	Total Coliform	TMDL required

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:

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.

POC 1: at southwestern edge of the project boundary in Nobel Drive (Rose Creek)

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 proposed underground parking structures constrain the use of biofiltration basins and landscaping sections in these areas. It has been determined the project site is in a "No Infiltration" condition per the geotechnical report performed by Geocon, Inc., dated July 28, 2016.

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.

Project Name: Costa Verde Center

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: No outdoor material storage is anticipated			
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: No outdoor material storage is anticipated.			
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: Costa Verde Center

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.			

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:			

Project Name: Costa Verde Center

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: Impervious areas have been minimized as much as feasible.			
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: The BMPs implemented on site are sufficient for capturing, treating, and appropriately releasing the runoff.			
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: Costa Verde Center

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: The 36 hour demand is less than 0.25DCV therefore harvesting and using precipitation is not feasible.			
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

Form I-5B Page 4 of 4
Insert Site Map with all site design BMPs identified:
See Attachment 1a: DMA Exhibit

Project Name: Costa Verde Center

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.

Due to the site constraints of the extensive proposed underground parking structure, the available areas for landscaping and BMPs were limited. The Infiltration Feasibility Letter provided by the geotechnical engineer shows that the soils onsite are not suitable for infiltration BMPs. This condition requires flow-through BMPs and an underground detention basin to meet both water quality and hydromodification control requirements.

Stormwater runoff from the site will be collected and piped through the recommended Bioclean Modular Wetland units (or approved equal) for water quality treatment. These units have been adequately sized based on the water quality flow rate of 1.2 cfs. In order to satisfy the site's treatment requirements, the proposed underground detention basin was sized to account for water quality and hydromodification storage volumes. The basin will include a restrictor orifice to mitigate flow at the low flow threshold of 0.1Q2 and weir outlet structure for overflows.

Please see Worksheet B-1 for DCV calcs.

(Continue on page 2 as necessary.)

Form I-6 Page 2 of 6

(Continued from page 1)

Form I-6 Page 3 of 6 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BMP 1-10	
Construction Plan Sheet No. 6	
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 and Associates
Who will be the final owner of this BMP?	Regency Centers
Who will maintain this BMP into perpetuity?	Regency Centers
What is the funding mechanism for maintenance?	Regency Centers

Form I-6 Page 4 of 6 (Copy as many as needed)
Structural BMP ID No. BMP 1-10
Construction Plan Sheet No. 6
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): Compact Biofiltration - Bioclean Modular Wetland MWS units (or approved equal)The BMPs will be used to treat storm water prior to entering the underground detention basin. See Form 1-5B for MWS locations and model numbers.

Form I-6 Page 5 of 6 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BMP 11	
Construction Plan Sheet No. 6	
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 and Associates
Who will be the final owner of this BMP?	Regency Centers
Who will maintain this BMP into perpetuity?	Regency Centers
What is the funding mechanism for maintenance?	Regency Centers

Form I-6 Page 6 of 6 (Copy as many as needed)
Structural BMP ID No. BMP 11
Construction Plan Sheet No. 6
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): ~49,000 cubic-feet underground hydromodification storage beneath parking slab. System will be fully designed during final design.

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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: Costa Verde Center

Indicate which Items are Included:

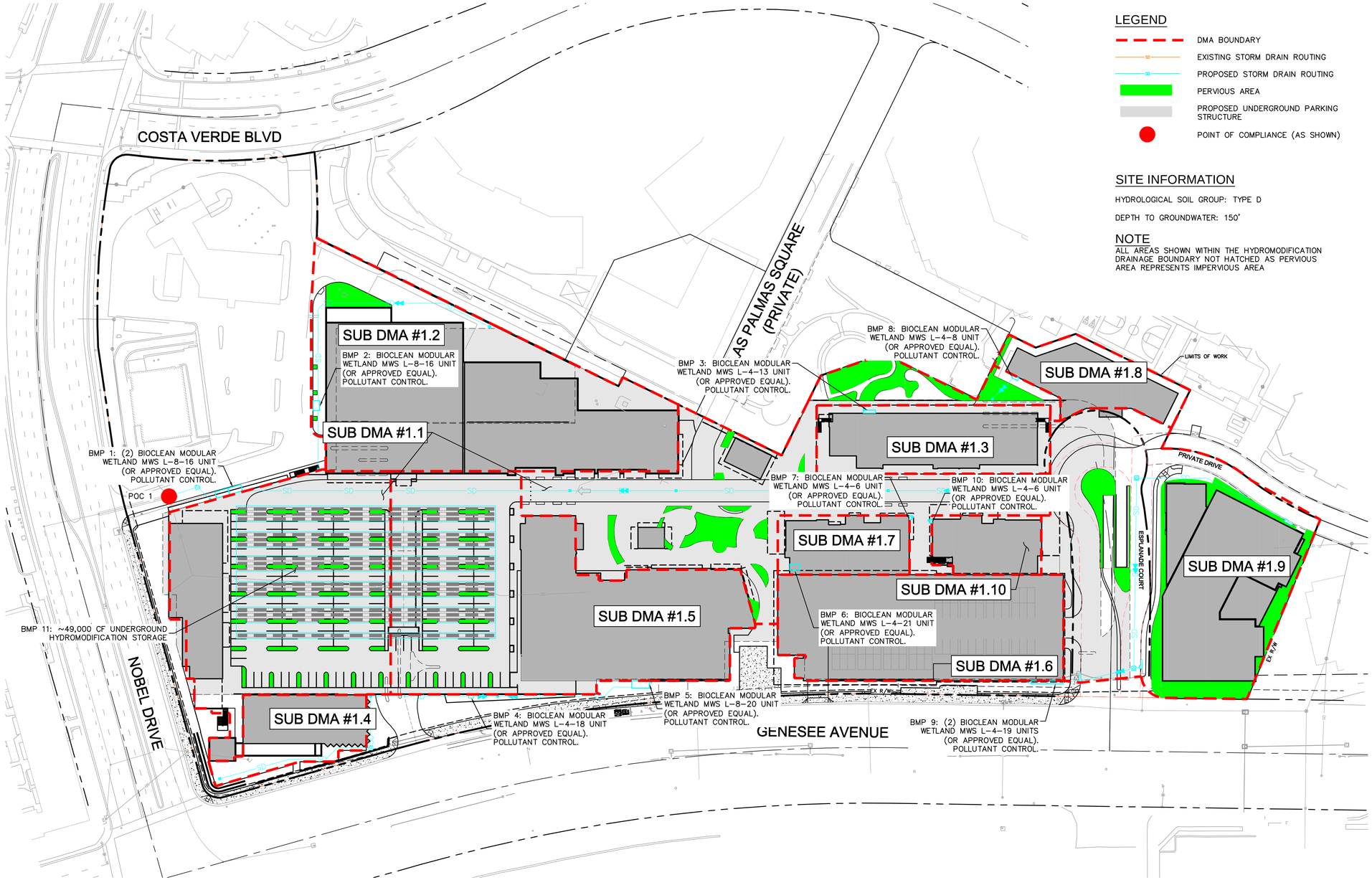
Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	☒ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	☒ Included 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

Project Name: Costa Verde Center

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

The DMA 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
- ✔ Existing topography and impervious areas
- ✔ 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
- ✔ Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)
- ✔ Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Form I-3B)
- ✔ Structural BMPs (identify location, type of BMP, size/detail, and include cross-section)



LEGEND

- DMA BOUNDARY
- EXISTING STORM DRAIN ROUTING
- PROPOSED STORM DRAIN ROUTING
- PERVIOUS AREA
- PROPOSED UNDERGROUND PARKING STRUCTURE
- POINT OF COMPLIANCE (AS SHOWN)

SITE INFORMATION

HYDROLOGICAL SOIL GROUP: TYPE D

DEPTH TO GROUNDWATER: 150'

NOTE

ALL AREAS SHOWN WITHIN THE HYDROMODIFICATION DRAINAGE BOUNDARY NOT HATCHED AS PERVIOUS AREA REPRESENTS IMPERVIOUS AREA

DMA AREA TABLE

DMA	SUB DMA	AREA	BMP
#1	#1.1	3.07 AC	MODULAR WETLAND & UNDERGROUND DETENTION
	#1.2	1.68 AC	MODULAR WETLAND & UNDERGROUND DETENTION
	#1.3	0.50 AC	MODULAR WETLAND & UNDERGROUND DETENTION
	#1.4	0.29 AC	MODULAR WETLAND & UNDERGROUND DETENTION
	#1.5	1.79 AC	MODULAR WETLAND & UNDERGROUND DETENTION
	#1.6	0.94 AC	MODULAR WETLAND & UNDERGROUND DETENTION
	#1.7	0.24 AC	MODULAR WETLAND & UNDERGROUND DETENTION
	#1.8	0.30 AC	MODULAR WETLAND & UNDERGROUND DETENTION
	#1.9	1.82 AC	MODULAR WETLAND & UNDERGROUND DETENTION
	#1.10	0.20 AC	MODULAR WETLAND & UNDERGROUND DETENTION

Kimley»Horn

SEPTEMBER 2019

DMA EXHIBIT

COSTA VERDE CENTER

BMP 1

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME	COSTA VERDE CENTER		
PROJECT LOCATION	SAN DIEGO, CA		
STRUCTURE ID	BMP 1 (2 UNITS)		
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.382	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			23.50
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	TBD	HDPE	18"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	TBD	HDPE	18"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	TBD		
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	2EA ø30"	OPEN PLANTER	ø24"
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION

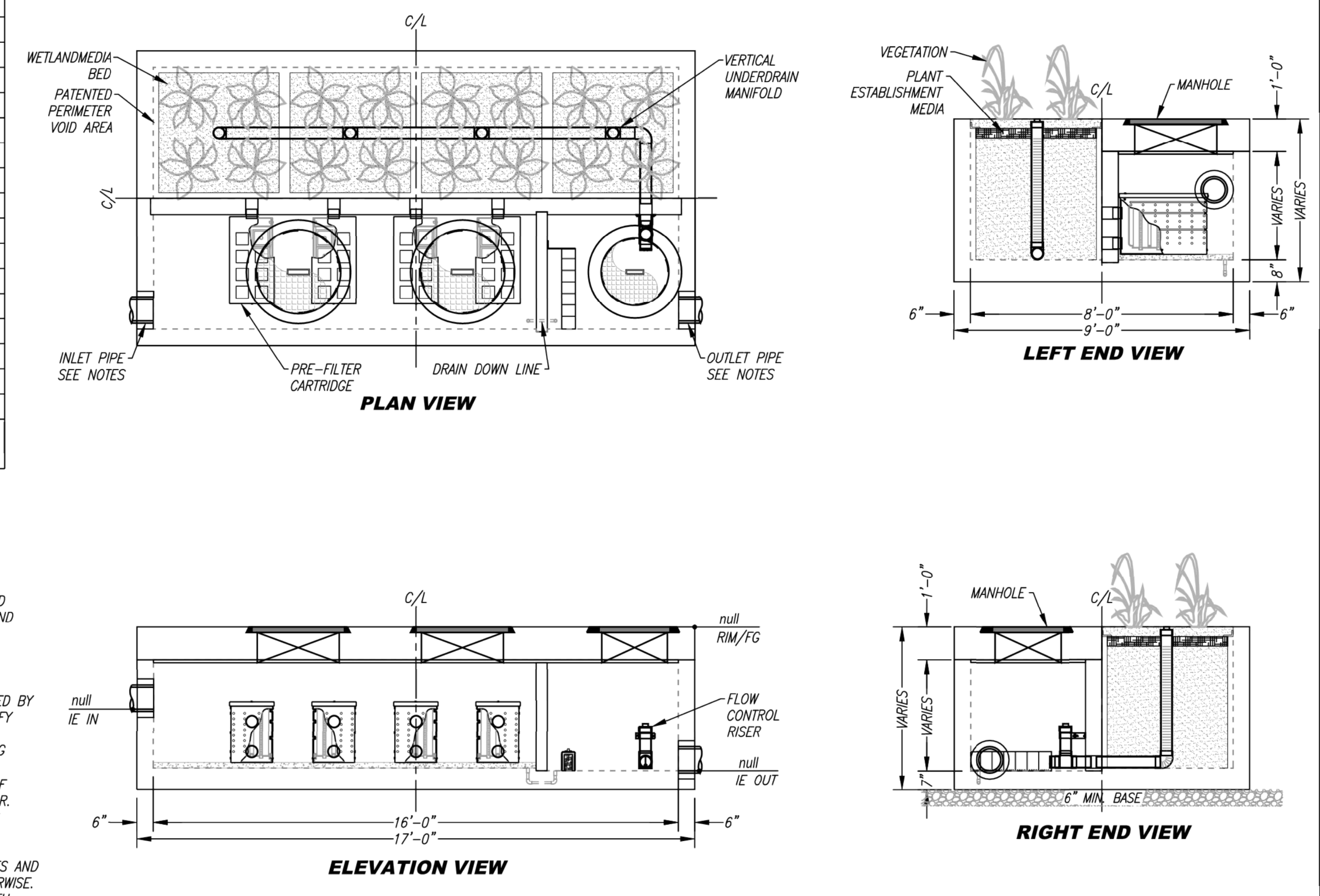
INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATER TIGHT PER MANUFACTURERS STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURERS WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.

5/23/19TOLFE



TREATMENT FLOW (CFS)	0.382
OPERATING HEAD (FT)	2.8
PRETREATMENT LOADING RATE (GPM/SF)	1.7
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS — THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS: 7,425,262; 7,470,362; 7,674,378; 8,303,816; RELATED FOREIGN PATENTS OR OTHER PATENTS PENDING

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Bio Clean — A Forterra Company

(2) MWS-L-8-16-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

BMP 1 - COMPACT BIOFILTRATION

NOT TO SCALE

BMP 2

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME	COSTA VERDE CENTER		
PROJECT LOCATION	SAN DIEGO, CA		
STRUCTURE ID	BMP 2		
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.445	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			8.30 CFS
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	337.32	HDPE	18"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	335.99	HDPE	18"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	347.70		
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	2EA ø30"	OPEN PLANTER	ø24"
NOTES:			

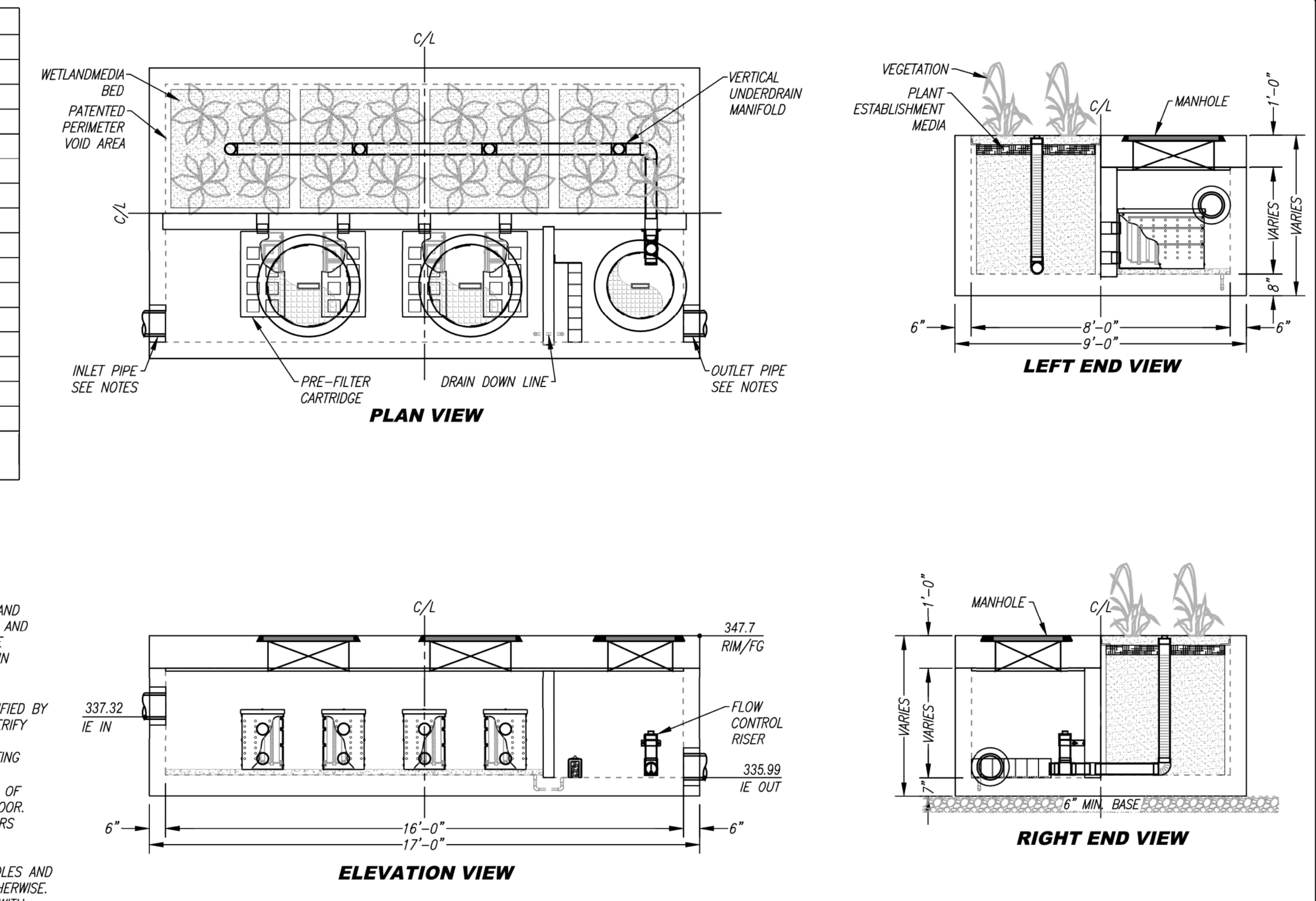
* PRELIMINARY NOT FOR CONSTRUCTION

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATER TIGHT PER MANUFACTURERS STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURERS WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.



TREATMENT FLOW (CFS)	0.445
OPERATING HEAD (FT)	3.3
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

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Bio Clean — A Forterra Company

MWS-L-8-16-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

BMP 2 - COMPACT BIOFILTRATION

NOT TO SCALE

BMP 3

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME	COSTA VERDE CENTER		
PROJECT LOCATION	SAN DIEGO, CA		
STRUCTURE ID	BMP 3		
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.136	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			2.48 CFS
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	360.50	12"	HDPE
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	359.17	12"	HDPE
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	365.50		
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	ø30"	OPEN PLANTER	ø24"
NOTES:			

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INSTALLATION NOTES

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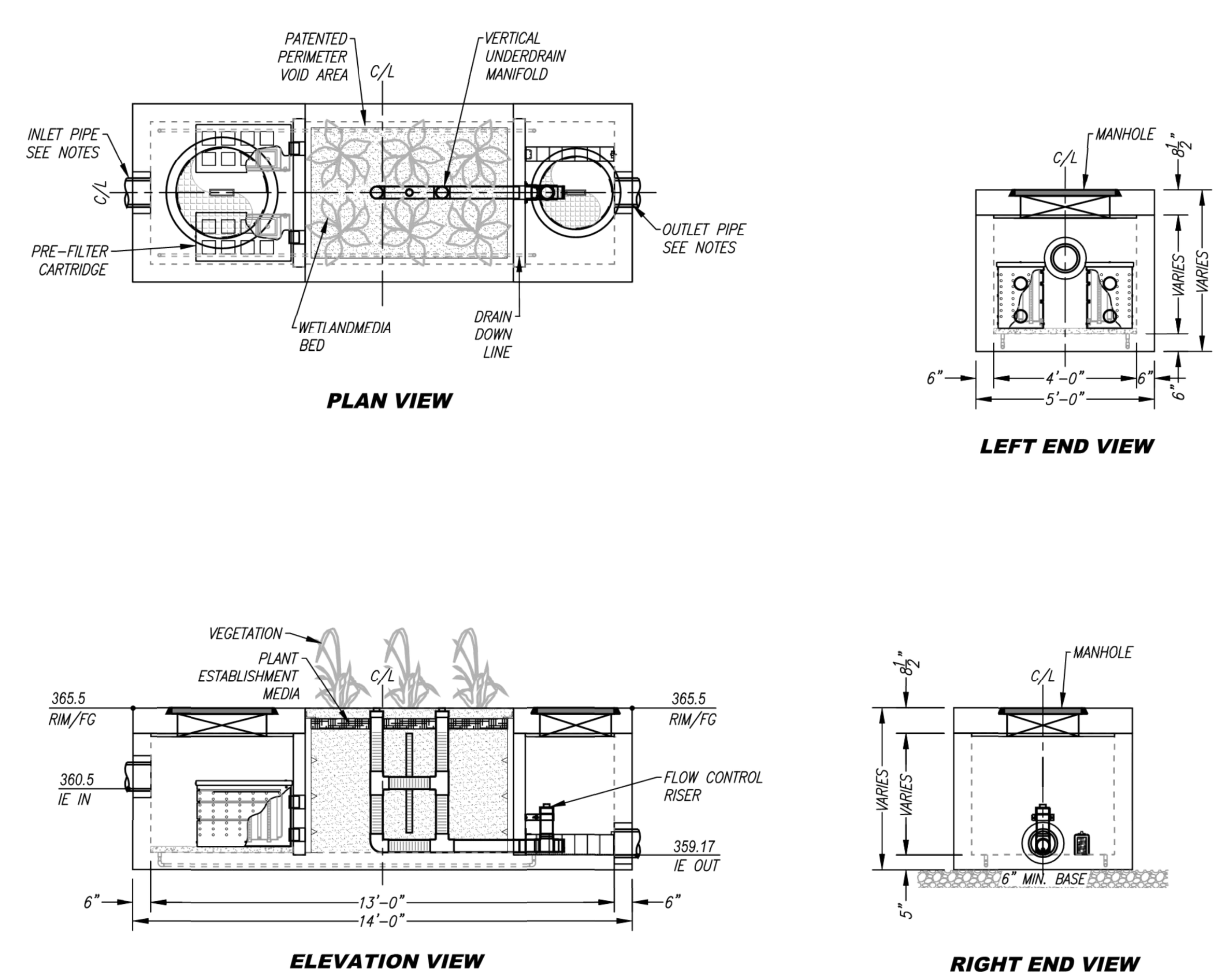

TREATMENT FLOW (CFS)	0.136
OPERATING HEAD (FT)	3.2
PRETREATMENT LOADING RATE (GPM/SF)	1.2
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

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Bio Clean — A Forterra Company

MWS-L-4-13-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

BMP 3 - COMPACT BIOFILTRATION

NOT TO SCALE

BMP 4

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME	COSTA VERDE CENTER		
PROJECT LOCATION	SAN DIEGO, CA		
STRUCTURE ID	BMP 4		
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		.078	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			1.44 CFS
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	338.90	HDPE	12"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	337.57	HDPE	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	359.95		
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	36" X 36"	OPEN PLANTER	N/A
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION

INSTALLATION NOTES

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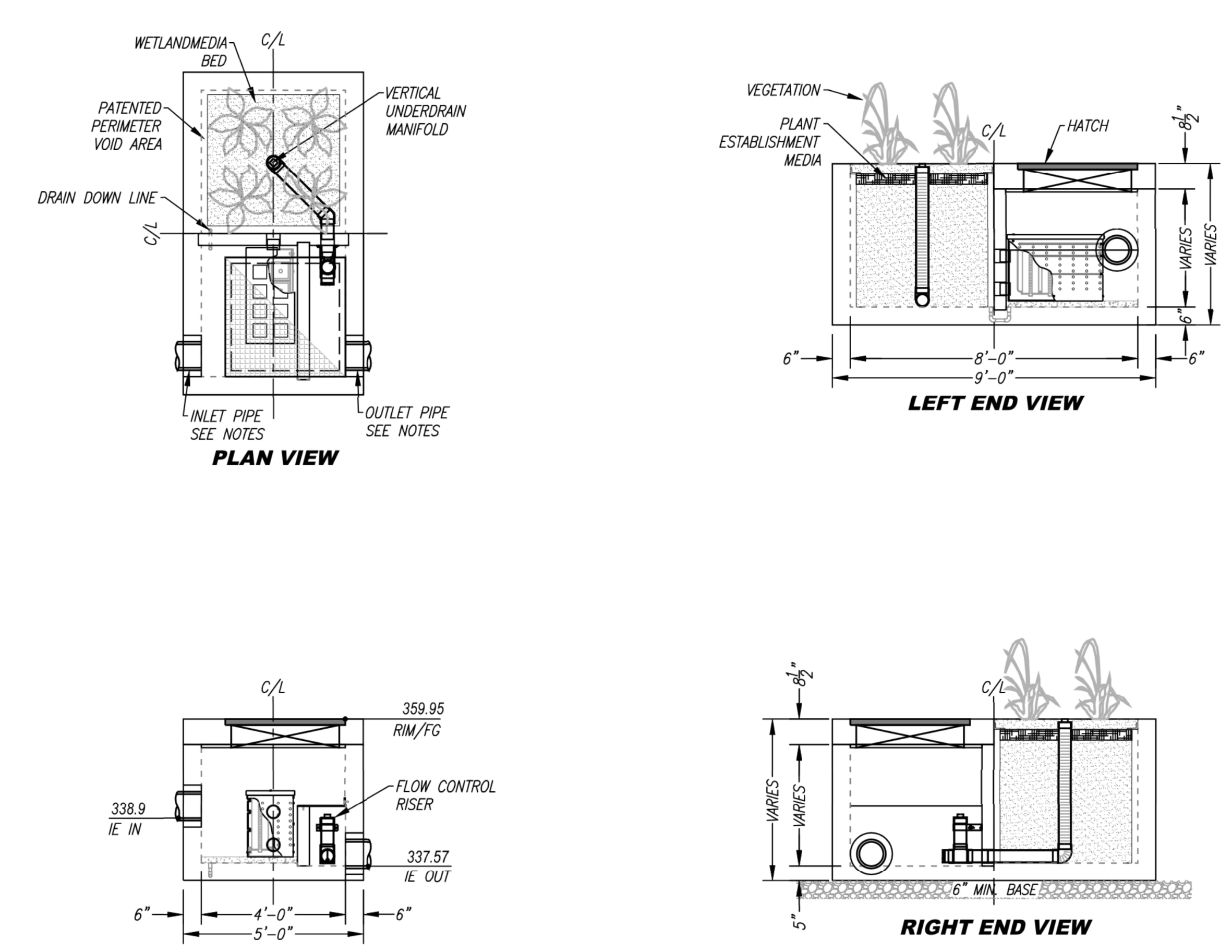

TREATMENT FLOW (CFS)	0.078
OPERATING HEAD (FT)	2.3
PRETREATMENT LOADING RATE (GPM/SF)	1.4
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

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Bio Clean — A Forterra Company

MWS-L-4-8-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

BMP 4 - COMPACT BIOFILTRATION

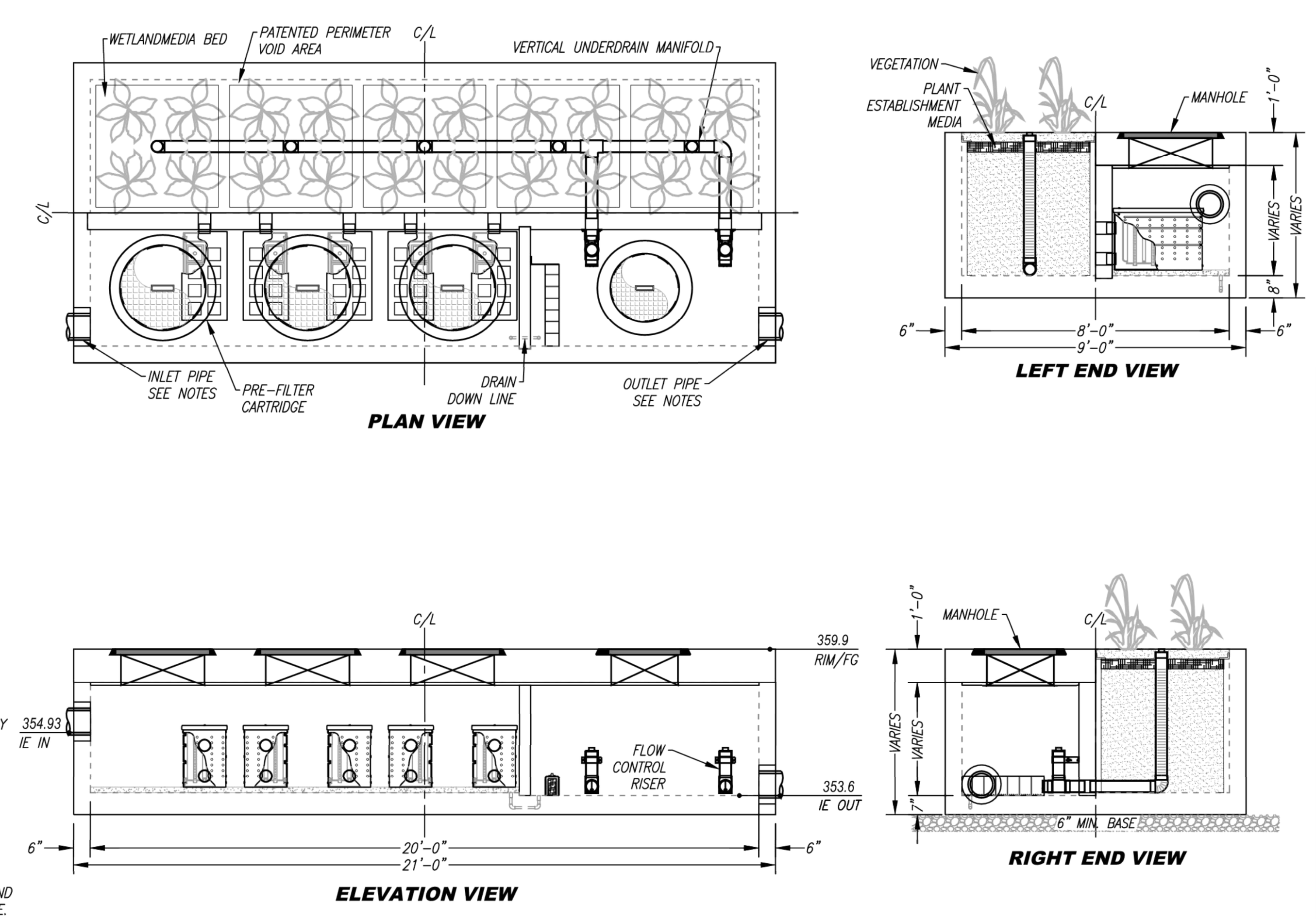
NOT TO SCALE

Kimley»Horn

JUNE 2019

DMA EXHIBIT

COSTA VERDE CENTER



SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME	COSTA VERDE CENTER		
PROJECT LOCATION	SAN DIEGO, CA		
STRUCTURE ID	BMP 5		
TREATMENT REQUIRED			
VOLUME BASED (CF)	FLOW BASED (CFS)		
N/A	0.474		
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			8.85 CFS
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	354.93	HDPE	12"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	353.60	HDPE	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	359.90		
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	3EA ø30"	UNDERGROUND	ø24"
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION

INSTALLATION NOTES

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TREATMENT FLOW (CFS)	0.474
OPERATING HEAD (FT)	2.8
PRETREATMENT LOADING RATE (GPM/SF)	1.7
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

PROPRIETARY AND CONFIDENTIAL:

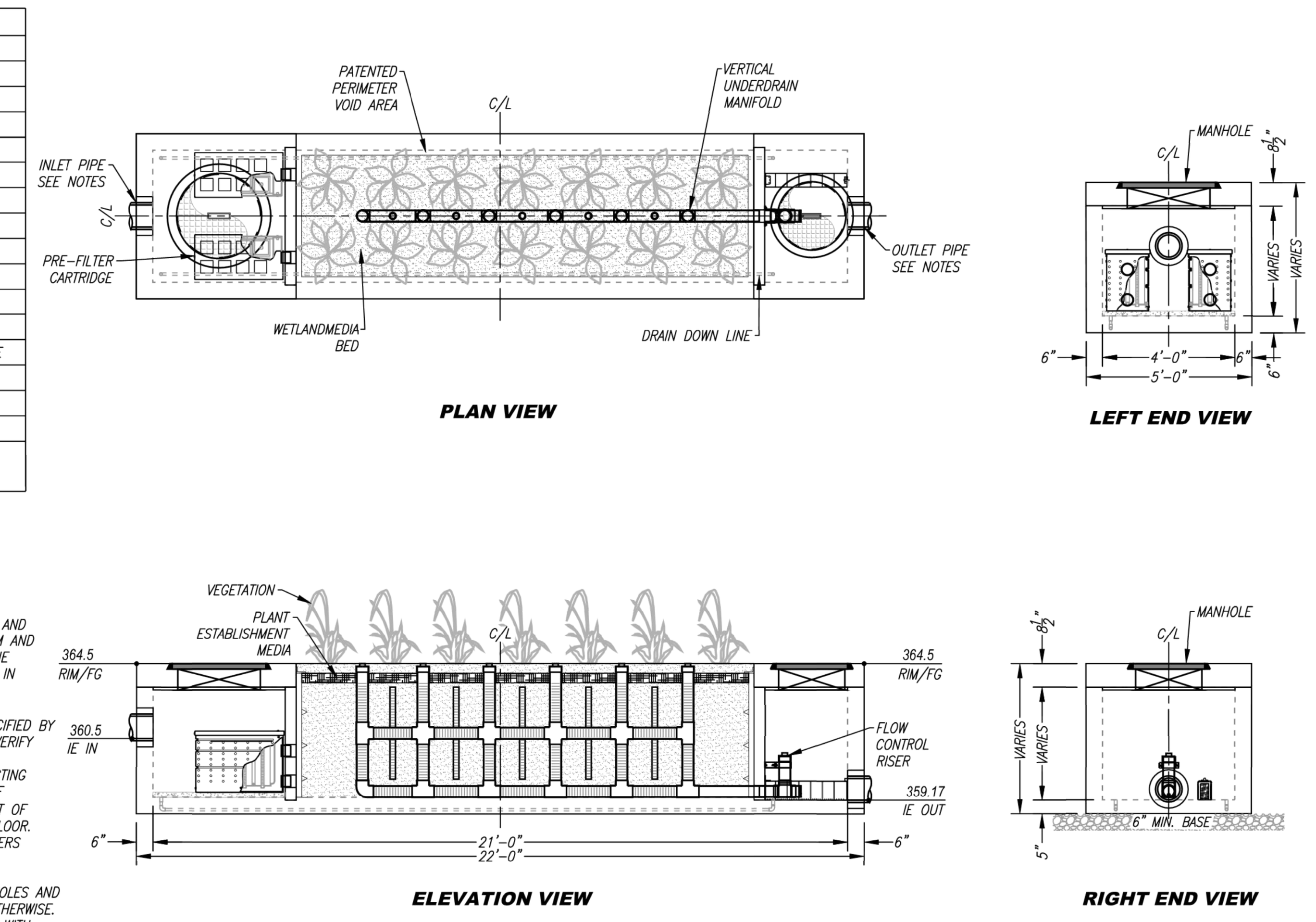
Bio Clean A Forterra Company

MWS-L-8-20-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

5/23/19TOLFF

BMP 5 - COMPACT BIOFILTRATION

NOT TO SCALE



SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME	COSTA VERDE CENTER		
PROJECT LOCATION	SAN DIEGO, CA		
STRUCTURE ID	BMP 6		
TREATMENT REQUIRED			
VOLUME BASED (CF)	FLOW BASED (CFS)		
N/A	0.253		
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			4.02 CFS
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	360.5	HDPE	12"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	359.17	HDPE	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	364.5		
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	ø30"	OPEN PLANTER	ø24"
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION

INSTALLATION NOTES

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TREATMENT FLOW (CFS)	0.253
OPERATING HEAD (FT)	3.2
PRETREATMENT LOADING RATE (GPM/SF)	2.2
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

PROPRIETARY AND CONFIDENTIAL:

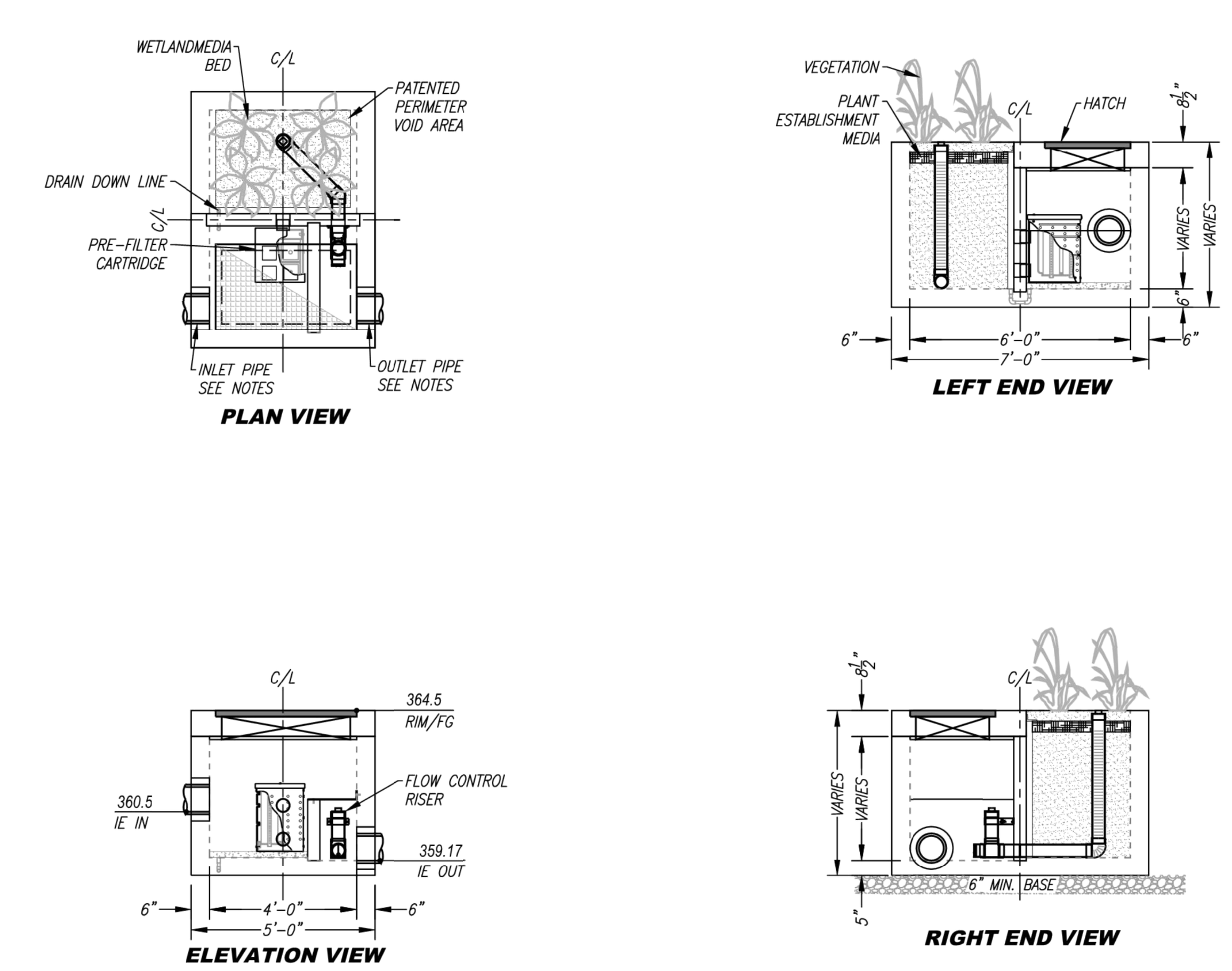
Bio Clean A Forterra Company

MWS-L-4-21-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

5/23/19TOLFF

BMP 6 - COMPACT BIOFILTRATION

NOT TO SCALE



SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME	COSTA VERDE CENTER		
PROJECT LOCATION	SAN DIEGO, CA		
STRUCTURE ID	BMP 7		
TREATMENT REQUIRED			
VOLUME BASED (CF)	FLOW BASED (CFS)		
N/A	0.066		
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			1.04 CFS
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	360.50	HDPE	12"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	359.17	HDPE	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	364.50		
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	24" X 42"	OPEN PLANTER	N/A
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION

INSTALLATION NOTES

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TREATMENT FLOW (CFS)	0.066
OPERATING HEAD (FT)	3.1
PRETREATMENT LOADING RATE (GPM/SF)	1.2
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

PROPRIETARY AND CONFIDENTIAL:

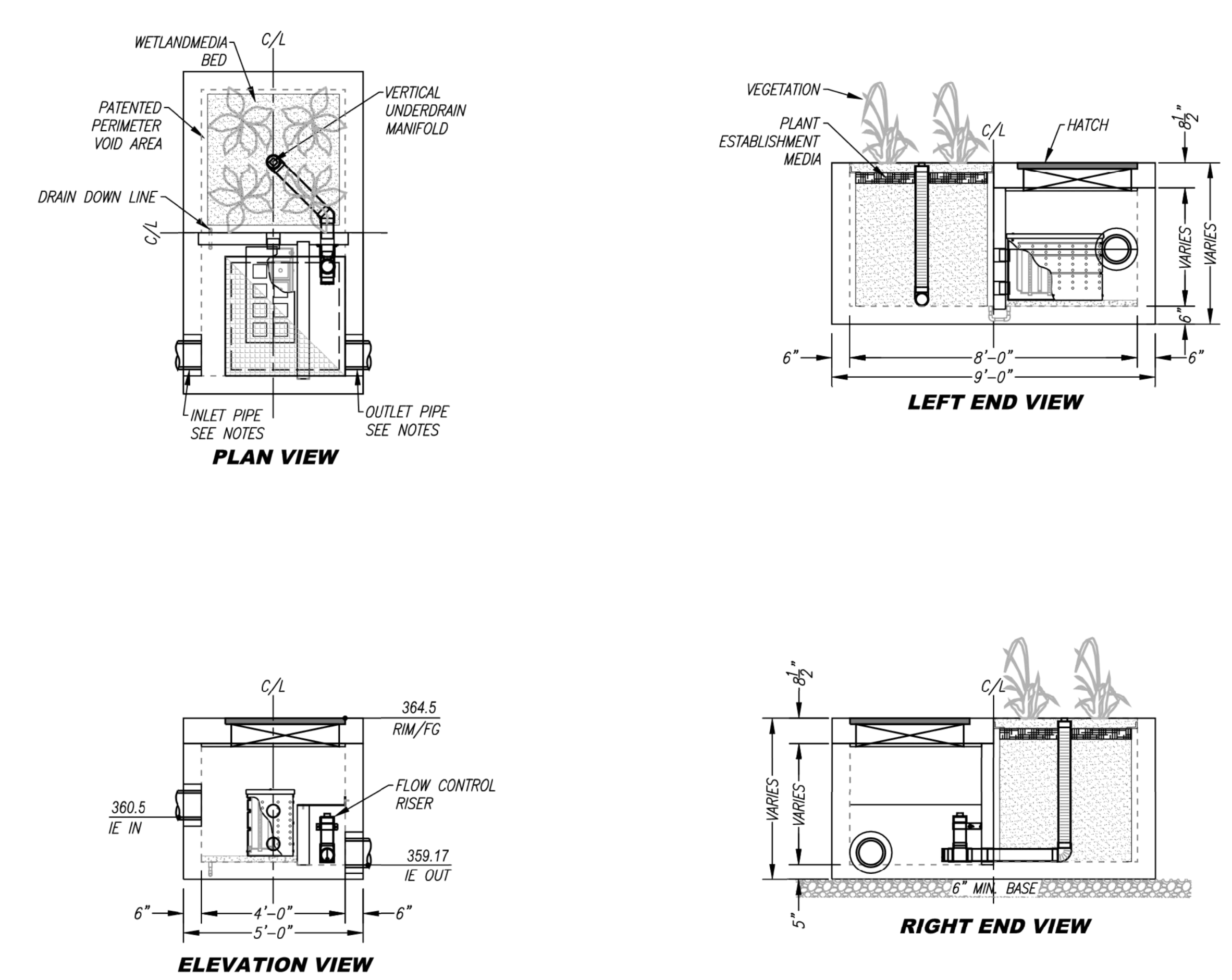
Bio Clean A Forterra Company

MWS-L-4-6-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

5/23/19TOLFF

BMP 7 - COMPACT BIOFILTRATION

NOT TO SCALE



SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME	COSTA VERDE CENTER		
PROJECT LOCATION	SAN DIEGO, CA		
STRUCTURE ID	BMP 8		
TREATMENT REQUIRED			
VOLUME BASED (CF)	FLOW BASED (CFS)		
N/A	.079		
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			1.30 CFS
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	360.5	HDPE	12"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	359.17	HDPE	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	364.5		
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	36" X 36"	OPEN PLANTER	N/A
NOTES:			

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INSTALLATION NOTES

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TREATMENT FLOW (CFS)	0.079
OPERATING HEAD (FT)	2.3
PRETREATMENT LOADING RATE (GPM/SF)	1.4
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

PROPRIETARY AND CONFIDENTIAL:

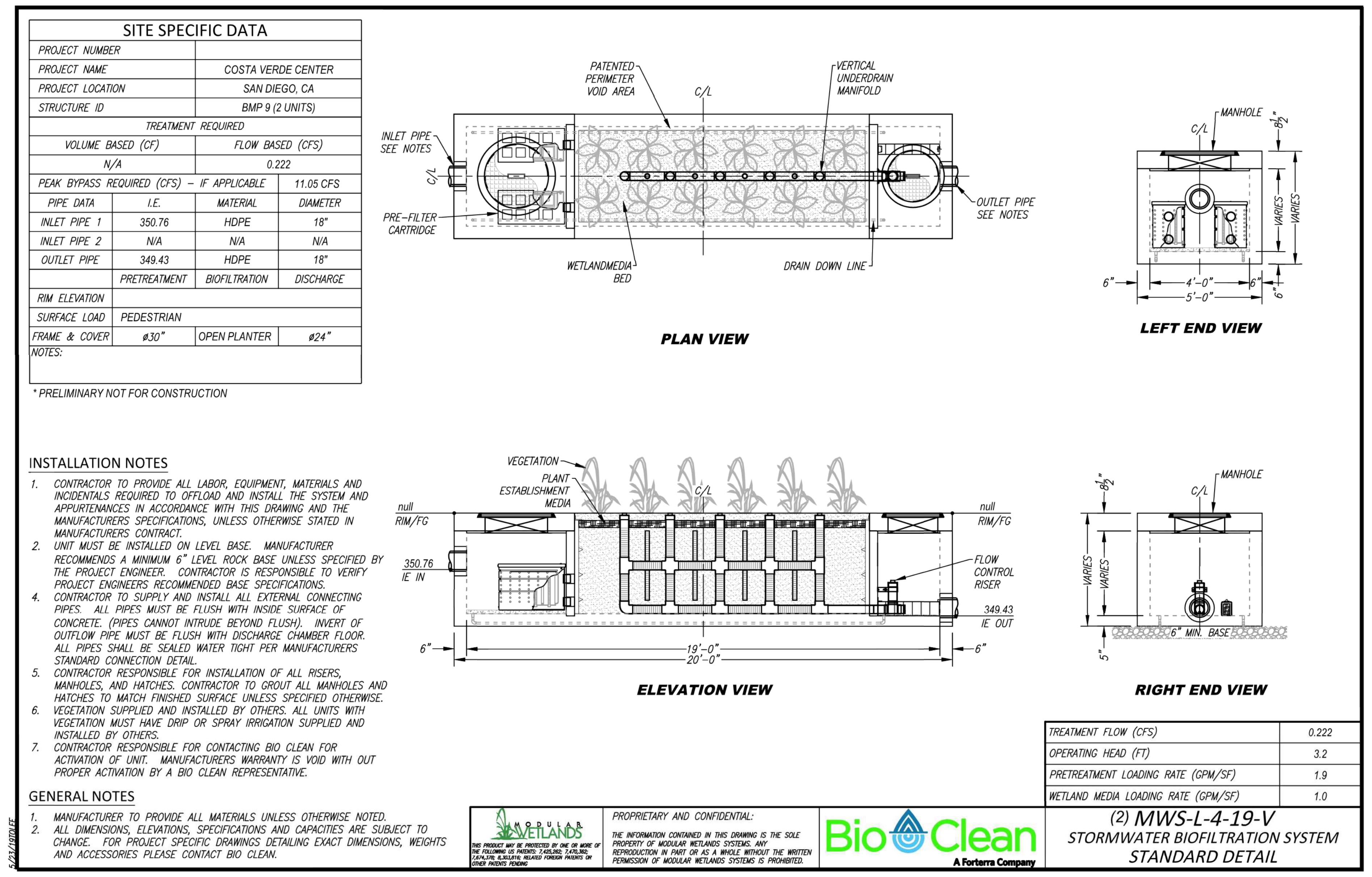
Bio Clean A Forterra Company

MWS-L-4-8-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

5/23/19TOLFF

BMP 8 - COMPACT BIOFILTRATION

NOT TO SCALE



SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME	COSTA VERDE CENTER		
PROJECT LOCATION	SAN DIEGO, CA		
STRUCTURE ID	BMP 9 (2 UNITS)		
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.222	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			11.05 CFS
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	350.76	HDPE	18"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	349.43	HDPE	18"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	ø30"	OPEN PLANTER	ø24"
NOTES:			

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INSTALLATION NOTES

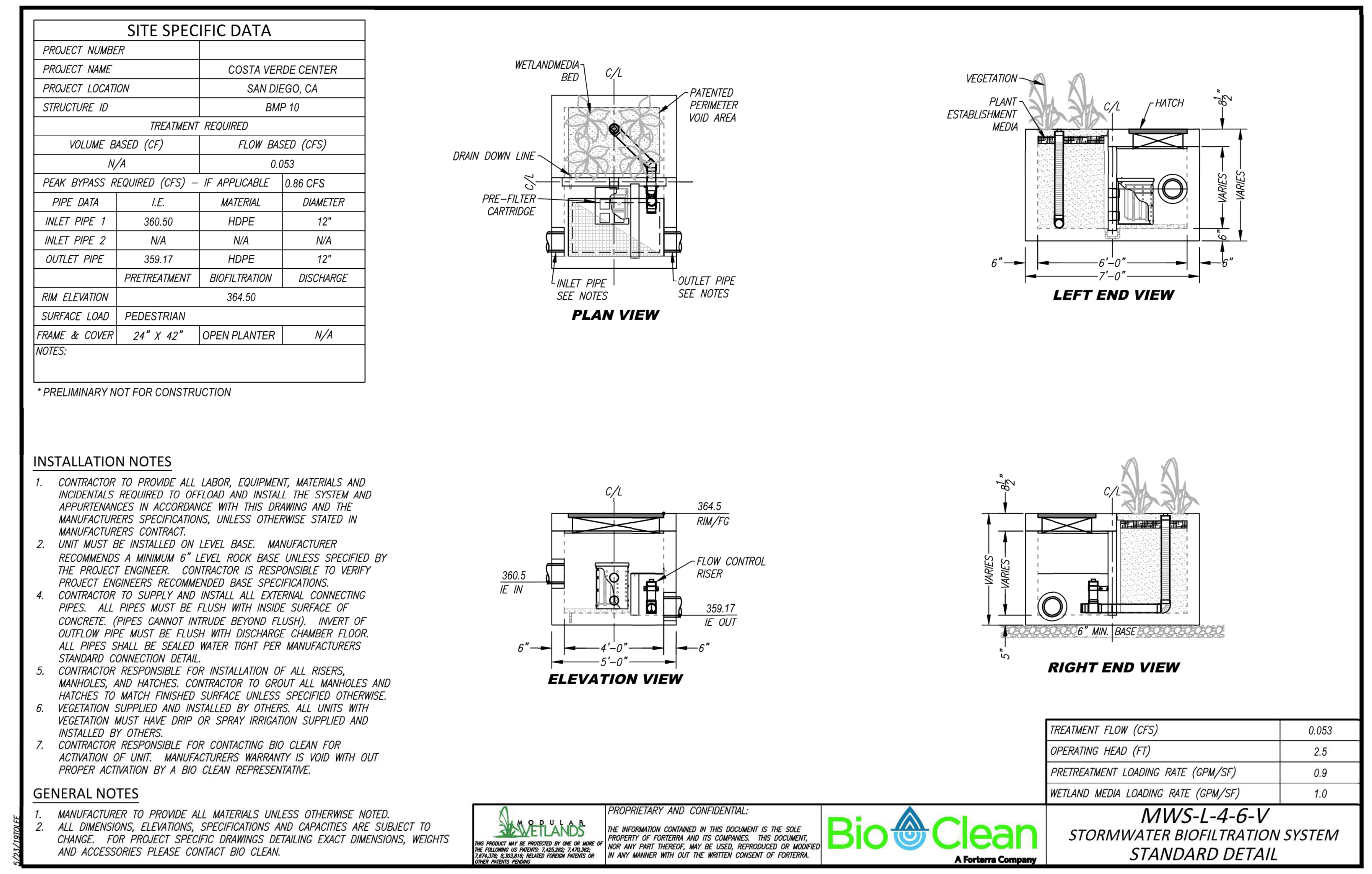
1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATER TIGHT PER MANUFACTURERS STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURERS WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.

TREATMENT FLOW (CFS)	0.222
OPERATING HEAD (FT)	3.2
PRETREATMENT LOADING RATE (GPM/SF)	1.9
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

BMP 9 - COMPACT BIOFILTRATION
NOT TO SCALE



SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME	COSTA VERDE CENTER		
PROJECT LOCATION	SAN DIEGO, CA		
STRUCTURE ID	BMP 10		
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.053	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			0.86 CFS
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	360.50	HDPE	12"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	359.17	HDPE	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	364.50		
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	24" X 42"	OPEN PLANTER	N/A
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION

INSTALLATION NOTES

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GENERAL NOTES

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2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.

TREATMENT FLOW (CFS)	0.053
OPERATING HEAD (FT)	2.5
PRETREATMENT LOADING RATE (GPM/SF)	0.9
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

BMP 10 - COMPACT BIOFILTRATION
NOT TO SCALE

Kimley»Horn

JUNE 2019
DMA EXHIBIT
COSTA VERDE CENTER

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 = ETwet*((SUM(PF*HA)/IE)+SLA)*0.015
=(2.8in/month)*(6months)*(((0.2*23,995SF)/0.9)+0)*0.015
ETWU=1,343gal

3. Calculate the DCV using worksheet B-2.1.
DCV = 17,208 (cubic feet)
[Provide a summary of calculations here]
Calculations provided in this report.

3a. Is the 36-hour demand greater than or equal to the DCV?	3b. Is the 36-hour demand greater than 0.25DCV but less than the full DCV?	3c. Is the 36-hour demand less than 0.25DCV?
☐ Yes / ☑ No ⇨ ⇩	☐ Yes / ☑ No ⇨ ⇩	☑ 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.

Project No. G1927-11-01
December 20, 2017

Regency Centers
420 Stevens Avenue, Suite 320
Solana Beach, California 92075

Attention: Mr. John Murphy

Subject: INFILTRATION FEASIBILITY CONDITION LETTER
COSTA VERDE CENTER REDEVELOPMENT
8650 GENESEE AVENUE
SAN DIEGO, CALIFORNIA

References:
1. *Geologic Reconnaissance Report, Costa Verde Center Redevelopment, 8650 Genesee Avenue, San Diego, California*, prepared by Geocon Incorporated, dated July 28, 2016 (Project No. G1927-11-01).
2. *DMA Exhibit, Costa Verde Center*, prepared by Kimley Horn, dated December 2017.

Dear Mr. Murphy:

We prepared this letter supporting a "No Infiltration" condition for the redevelopment project at Costa Verde Center located at 8650 Genesee Avenue in the City of San Diego.

Site Description

The site was developed at the time of our storm water infiltration analysis in its current configuration. Site development started in the 1980s with building construction completed by the early 1990s. The design team began evaluating the redevelopment of the property in late 2015. The site is predominately covered with buildings and pavement with relatively small exposed surface area consisting of planters and grass areas. The site generally slopes gently to the south with fill slopes present on the western and southern portion of the site with a maximum height of 10 feet. Several retaining walls are present that support a subterranean parking level on a portion of the site and other on grade improvements. Developed areas surround the site consisting of paved roads, commercial and residential buildings.

Previous Geotechnical Studies

Geocon performed an infiltration feasibility evaluation in July 2016 included in our referenced report during the preliminary planning/design phase of redevelopment. As part of the study we reviewed USDA Web Soil Survey mapping for the project site and performed three field infiltration tests within the site geologic units. The soil survey identified the majority of the site as being underlain by Chesterton fine sandy loam, 2 to 5 percent slopes. The soil survey was consistent with previous geotechnical borings performed at the site. The USDA website defines the Chesterton fine sandy loam

as Hydrologic Soil Group D with a saturated hydraulic conductivity (Ksat) rate of 0.00 to 0.06 inches/hour. In addition, we confirmed these rates with an adjusted soil infiltration rate of 0.01 to 0.07 inches/hour and an average infiltration rate of 0.03 inches/hour including a factor of safety of 2. The average infiltration rate is less than 0.05 inches/hour and is defined as a "No Infiltration" condition in accordance with Appendix C with the 2017 *Storm Water Standards* (SWS).

Relatively thin fill associated with the existing development blankets the property. In addition, a canyon fill exists on the southern portion of the property. The fill materials are underlain by the Scripps Formation (Tsc) and consists of very dense sandstone and hard siltstone. We performed our infiltration tests within the Scripps Formation that resulted in a rate less than 0.05 inches/hour. Other geologic units are not present on the property that would possess an infiltration rate of greater than 0.05 inches/hour.

Storm Water Design Narrative

We performed our site reconnaissance and background research for the subject property to evaluate potential areas of infiltration. We also performed some infiltration tests to help evaluate if there are areas where infiltration may be possible. We focused our studies away from the existing buildings/foundation systems and roadways adjacent to the property. We also focused our analyses in areas where the formational materials are present near grade (i.e. not in areas of compacted fill). We considered providing infiltration in areas of the existing landscape and pavement areas as well.

Conclusion

Based on the results of our research, the existing geologic units on the property, and infiltration test results, it does not appear that the site conditions possess an opportunity for full and partial infiltration based on the underlying geologic conditions and the results of the field infiltration tests. Therefore, the property should be considered to possess a "No Infiltration" condition in accordance with Appendix C of the 2017 SWS.

If you have any questions regarding this letter, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

John Hoobs
CEG 1524

Shawn Foy Weedon
GE 2714

JH:SW:ejc

(e-mail) Addressee

Project Name: Costa Verde Center

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)
1.1	3.07	2.80	91	D	0.83	4,708	1	Comp. Biofiltration	1
1.2	1.68	1.64	98	D	0.88	2,745	2	Comp. Biofiltration	1
1.3	0.50	0.50	100	D	0.90	837	3	Comp. Biofiltration	1
1.4	0.29	0.29	100	D	0.90	478	4	Comp. Biofiltration	1
1.5	1.79	1.75	98	D	0.88	2,925	5	Comp. Biofiltration	1
1.6	0.94	0.94	100	D	0.90	1,449	6	Comp. Biofiltration	1
1.7	0.24	0.24	100	D	0.90	408	7	Comp. Biofiltration	1
1.8	0.30	0.29	98	D	0.89	489	8	Comp. Biofiltration	1
1.9	1.82	1.62	89	D	0.81	2,731	9	Comp. Biofiltration	1
1.10	0.20	0.20	100	D	0.90	328	10	Comp. Biofiltration	1
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
10	10.82	10.27	95		0.86	17,208	10.82		1

Where: 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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Infiltration Feasibility Condition	Performance Standard
No Infiltration Condition (Based on Infiltration Feasibility Condition Letter and/or Worksheet C.4-1: Form I-8A and/or Worksheet C.4-2: Form I-8B) [There is no hierarchy in selecting the type of biofiltration BMP as long as the performance standard for the selected biofiltration BMP is met]	**Standard Biofiltration BMPs:** BMPs must meet the criteria in Appendix B.5.1.2
	Non-Standard Biofiltration BMPs: Pollutant Removal: BMP must be sized using Worksheet B.5-1 and Worksheet B.5-4; **AND** Volume Retention: DMA must meet the target volume retention calculated using Worksheet B.5-2 (based on Figure B.5-2). Compliance with volume retention requirements can be documented by: • DMA has a combined BMP footprint and landscaped area (that meet the criteria in SD-B and SD-F factsheet) of 3% of contributing area times adjusted runoff factor or greater. The landscaped area must have an impervious area to pervious area ratio greater than 1.5:1. This can be documented using Worksheet B.5-6. [OR] • Applicant has an option to use other site design BMPs that will meet the target volume retention calculated using Worksheet B.5-2. This can be documented using Worksheet B.5-6 and/or Worksheet B.5-7.
	Compact Biofiltration BMPs: Pollutant Removal: BMP must meet the criteria in Appendix F. Form I-10 must be completed and submitted with the PDP SWQMP; **AND** Volume Retention: DMA must meet the target volume retention calculated using Worksheet B.5-2 (based on Figure B.5-2). Compliance with volume retention requirements can be documented by: • DMA has a combined BMP footprint and landscaped area (that meet the criteria in SD-B and SD-F factsheet) of 3% of contributing area times adjusted runoff factor or greater. The landscaped area must have an impervious area to pervious area ratio greater than 1.5:1. This can be documented using Worksheet B.5-6. [OR] • Applicant has an option to use other site design BMPs that will meet the target volume retention calculated using Worksheet B.5-2. This can be documented using Worksheet B.5-6 and/or Worksheet B.5-7.

The City of SAN DIEGO	Project Name	Costa Verde Shopping Center	
	BMP ID	BMP 1 - (2)MWS L-8-16	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	133688	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.83	
3	85th percentile 24-hour rainfall depth	0.51	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	4716	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 enter 0.05	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]	108	cu. ft.

The City of SAN DIEGO	Project Name	Costa Verde Center
	BMP ID	BMP 1 - (2)MWS - L-8-16

Volume Retention for No Infiltration Condition			Worksheet B.5-6	
1	Area draining to the biofiltration BMP	133688		sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.83		
3	Effective impervious area draining to the BMP [Line 1 x Line 2]	110961		sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]	3329		sq. ft.
5	Biofiltration BMP Footprint	402		sq. ft.

Landscape Area (must be identified on DS-3247)

	Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)	11917				
7	Impervious area draining to the landscape area (sq. ft.)	121771				
8	Impervious to Pervious Area ratio [Line 7/Line 6]	10.22	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]	11917	0	0	0	0

10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]	11917	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]	12319	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	3.7	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	108	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-292.8539248	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1	Landscaped Area for Impervious Dispersion	0	cu. ft.
	2	(2)MWS-L-8-16	20146	cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		20146	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

The City of SAN DIEGO	Project Name	Costa Verde Shopping Center	
	BMP ID	BMP 2 - MWS - L-8-16	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	73172	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.88	
3	85th percentile 24-hour rainfall depth	0.51	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	2737	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 enter 0.05	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]	63	cu. ft.

The City of SAN DIEGO	Project Name	Costa Verde Center
	BMP ID	BMP 2 - MWS - L-8-16

Volume Retention for No Infiltration Condition							Worksheet B.5-6	
1	Area draining to the biofiltration BMP						73172	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)						0.88	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]						64391	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]						1932	sq. ft.
5	Biofiltration BMP Footprint						201	sq. ft.
Landscape Area (must be identified on DS-3247)								
		Identification	**1**	**2**	**3**	**4**	**5**	
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)		1596					
7	Impervious area draining to the landscape area (sq. ft.)		71576					
8	Impervious to Pervious Area ratio [Line 7/Line 6]		44.85	0.00	0.00	0.00	0.00	
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		1596	0	0	0	0	
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]						1596	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]						1797	sq. ft.
Volume Retention Performance Standard								
12	Is Line 11 ≥ Line 4?		No, Proceed to Line 13					
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]						0.93	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]						63	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]						4.405978808	cu. ft.
Site Design BMP								
	Identification	**Site Design Type**					**Credit**	
16	**1**	Landscaped Area for Impervious Dispersion					0	cu. ft.
	2	MWS-L-8-16					10073	cu. ft.
	3							cu. ft.
	4							cu. ft.
	5							cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.						10073	cu. ft.
17	Is Line 16 ≥ Line 15?		Volume Retention Performance Standard is Met					

The City of SAN DIEGO	Project Name	Costa Verde Shopping Center	
	BMP ID	BMP - 3 - MWS - L-4-13	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	21889	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.9	
3	85th percentile 24-hour rainfall depth	0.51	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	837	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 enter 0.05	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]	19	cu. ft.

The City of SAN DIEGO	Project Name	Costa Verde Center
	BMP ID	BMP 3 - MWS - L-4-13

Volume Retention for No Infiltration Condition							Worksheet B.5-6	
1	Area draining to the biofiltration BMP						21889	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)						0.9	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]						19700	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]						591	sq. ft.
5	Biofiltration BMP Footprint						63	sq. ft.
Landscape Area (must be identified on DS-3247)								
		Identification	**1**	**2**	**3**	**4**	**5**	
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)		0					
7	Impervious area draining to the landscape area (sq. ft.)		21889					
8	Impervious to Pervious Area ratio [Line 7/Line 6]		0.00	0.00	0.00	0.00	0.00	
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		0	0	0	0	0	
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]						0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]						63	sq. ft.
Volume Retention Performance Standard								
12	Is Line 11 ≥ Line 4?		No, Proceed to Line 13					
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]						0.11	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]						19	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]						17.1385945	cu. ft.
Site Design BMP								
	Identification	**Site Design Type**					**Credit**	
16	**1**	Landscaped Area for Impervious Dispersion					0	cu. ft.
	2	MWS-L-4-13					3131	cu. ft.
	3							cu. ft.
	4							cu. ft.
	5							cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.						3131	cu. ft.
17	Is Line 16 ≥ Line 15?		Volume Retention Performance Standard is Met					

The City of SAN DIEGO	Project Name	Costa Verde Shopping Center	
	BMP ID	BMP 4 - MWS - L-4-18	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	12504	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.9	
3	85th percentile 24-hour rainfall depth	0.51	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	478	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 enter 0.05	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]	11	cu. ft.

The City of SAN DIEGO	Project Name	Costa Verde Center
	BMP ID	BMP - 4 - MWS - L-4-8

Volume Retention for No Infiltration Condition							Worksheet B.5-6	
1	Area draining to the biofiltration BMP						12504	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)						0.9	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]						11254	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]						338	sq. ft.
5	Biofiltration BMP Footprint						50	sq. ft.
Landscape Area (must be identified on DS-3247)								
		Identification	**1**	**2**	**3**	**4**	**5**	
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)		0					
7	Impervious area draining to the landscape area (sq. ft.)		12504					
8	Impervious to Pervious Area ratio [Line 7/Line 6]		0.00	0.00	0.00	0.00	0.00	
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		0	0	0	0	0	
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]						0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]						50	sq. ft.
Volume Retention Performance Standard								
12	Is Line 11 ≥ Line 4?		No, Proceed to Line 13					
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]						0.15	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]						11	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]						9.3503349	cu. ft.
Site Design BMP								
	Identification	**Site Design Type**					**Credit**	
16	**1**	Landscaped Area for Impervious Dispersion					0	cu. ft.
	2	MWS-L-4-8					2518	cu. ft.
	3							cu. ft.
	4							cu. ft.
	5							cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.						2518	cu. ft.
17	Is Line 16 ≥ Line 15?		Volume Retention Performance Standard is Met					

The City of SAN DIEGO	Project Name	Costa Verde Shopping Center	
	BMP ID	BMP 5 - MWS - L-8-20	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	77786	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.88	
3	85th percentile 24-hour rainfall depth	0.51	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	2909	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 enter 0.05	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]	67	cu. ft.

The City of SAN DIEGO	Project Name	Costa Verde Center
	BMP ID	BMP 5 - MWS L-8-20

Volume Retention for No Infiltration Condition			Worksheet B.5-6	
1	Area draining to the biofiltration BMP		77786	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)		0.88	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]		68452	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]		2054	sq. ft.
5	Biofiltration BMP Footprint		252	sq. ft.

Landscape Area (must be identified on DS-3247)

		Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)		1484				
7	Impervious area draining to the landscape area (sq. ft.)		76302				
8	Impervious to Pervious Area ratio [Line 7/Line 6]		51.42	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		1484	0	0	0	0
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]					1484	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]					1736	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	No, Proceed to Line 13	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	0.85	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	67	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	10.03672758	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1	Landscaped Area for Impervious Dispersion	0	cu. ft.
	2	MWS-L-8-20	12560	cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		12560	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

The City of SAN DIEGO	Project Name	Costa Verde Shopping Center	
	BMP ID	BMP 6 - MWS - L-4-21	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	40748	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.9	
3	85th percentile 24-hour rainfall depth	0.51	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	1559	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 enter 0.05	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]	36	cu. ft.

The City of SAN DIEGO	Project Name	Costa Verde Center
	BMP ID	BMP 6 - MWS - L-4-21

Volume Retention for No Infiltration Condition							Worksheet B.5-6	
1	Area draining to the biofiltration BMP						40748	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)						0.9	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]						36673	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]						1100	sq. ft.
5	Biofiltration BMP Footprint						117	sq. ft.
Landscape Area (must be identified on DS-3247)								
		Identification	**1**	**2**	**3**	**4**	**5**	
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)		0					
7	Impervious area draining to the landscape area (sq. ft.)		40748					
8	Impervious to Pervious Area ratio [Line 7/Line 6]		0.00	0.00	0.00	0.00	0.00	
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		0	0	0	0	0	
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]						0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]						117	sq. ft.
Volume Retention Performance Standard								
12	Is Line 11 ≥ Line 4?				No, Proceed to Line 13			
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]						0.11	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]						36	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]						31.90476717	cu. ft.
Site Design BMP								
	Identification	**Site Design Type**					**Credit**	
16	**1**	Landscaped Area for Impervious Dispersion					0	cu. ft.
	2	MWS-L-4-21					5853	cu. ft.
	3							cu. ft.
	4							cu. ft.
	5							cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.						5853	cu. ft.
17	Is Line 16 ≥ Line 15?				Volume Retention Performance Standard is Met			

The City of SAN DIEGO	Project Name	Costa Verde Shopping Center	
	BMP ID	BMP 7 - MWS - L--4-6	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	10664	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.9	
3	85th percentile 24-hour rainfall depth	0.51	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	408	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 enter 0.05	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]	9	cu. ft.

The City of SAN DIEGO	Project Name	Costa Verde Center
	BMP ID	BMP 7 - MWS - L-4-6

Volume Retention for No Infiltration Condition							Worksheet B.5-6	
1	Area draining to the biofiltration BMP						10664	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)						0.9	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]						9598	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]						288	sq. ft.
5	Biofiltration BMP Footprint						32	sq. ft.
Landscape Area (must be identified on DS-3247)								
		Identification	**1**	**2**	**3**	**4**	**5**	
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)		0					
7	Impervious area draining to the landscape area (sq. ft.)		10664					
8	Impervious to Pervious Area ratio [Line 7/Line 6]		0.00	0.00	0.00	0.00	0.00	
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		0	0	0	0	0	
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]						0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]						32	sq. ft.
Volume Retention Performance Standard								
12	Is Line 11 ≥ Line 4?				No, Proceed to Line 13			
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]						0.11	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]						9	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]						8.34967206	cu. ft.
Site Design BMP								
	Identification	**Site Design Type**					**Credit**	
16	**1**	Landscaped Area for Impervious Dispersion					0	cu. ft.
	2	MWS-L-4-6					1600	cu. ft.
	3							cu. ft.
	4							cu. ft.
	5							cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.						1600	cu. ft.
17	Is Line 16 ≥ Line 15?				Volume Retention Performance Standard is Met			

The City of SAN DIEGO	Project Name	Costa Verde Shopping Center	
	BMP ID	BMP 8 - MWS - L-4-8	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	12966	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.89	
3	85th percentile 24-hour rainfall depth	0.51	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	490	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 enter 0.05	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]	11	cu. ft.

The City of SAN DIEGO	Project Name	Costa Verde Center
	BMP ID	BMP 8 - MWS - L-4-8

Volume Retention for No Infiltration Condition							Worksheet B.5-6	
1	Area draining to the biofiltration BMP						12966	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)						0.89	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]						11540	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]						346	sq. ft.
5	Biofiltration BMP Footprint						50	sq. ft.
Landscape Area (must be identified on DS-3247)								
		Identification	**1**	**2**	**3**	**4**	**5**	
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)		201					
7	Impervious area draining to the landscape area (sq. ft.)		12765					
8	Impervious to Pervious Area ratio [Line 7/Line 6]		63.51	0.00	0.00	0.00	0.00	
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		201	0	0	0	0	
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]						201	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]						251	sq. ft.
Volume Retention Performance Standard								
12	Is Line 11 ≥ Line 4?		No, Proceed to Line 13					
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]						0.73	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]						11	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]						3.04562588	cu. ft.
Site Design BMP								
	Identification	**Site Design Type**					**Credit**	
16	**1**	Landscaped Area for Impervious Dispersion					0	cu. ft.
	2	MWS-L-4-8					2518	cu. ft.
	3							cu. ft.
	4							cu. ft.
	5							cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.						2518	cu. ft.
17	Is Line 16 ≥ Line 15?		Volume Retention Performance Standard is Met					

The City of SAN DIEGO	Project Name	Costa Verde Shopping Center	
	BMP ID	BMP 9 - (2)MWS - L-4-19	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	79221	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.81	
3	85th percentile 24-hour rainfall depth	0.51	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	2727	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 enter 0.05	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]	63	cu. ft.

The City of SAN DIEGO	Project Name	Costa Verde Center
	BMP ID	BMP 9 - (2)MWS - L-4-19

Volume Retention for No Infiltration Condition							Worksheet B.5-6	
1	Area draining to the biofiltration BMP						79221	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)						0.81	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]						64169	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]						1925	sq. ft.
5	Biofiltration BMP Footprint						206	sq. ft.
Landscape Area (must be identified on DS-3247)								
		Identification	**1**	**2**	**3**	**4**	**5**	
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)		8797					
7	Impervious area draining to the landscape area (sq. ft.)		70424					
8	Impervious to Pervious Area ratio [Line 7/Line 6]		8.01	0.00	0.00	0.00	0.00	
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		8797	0	0	0	0	
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]						8797	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]						9003	sq. ft.
Volume Retention Performance Standard								
12	Is Line 11 ≥ Line 4?		Volume Retention Performance Standard is Met					
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]						4.68	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]						63	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]						-230.8287628	cu. ft.
Site Design BMP								
	Identification	**Site Design Type**					**Credit**	
16	**1**	Landscaped Area for Impervious Dispersion					0	cu. ft.
	2	MWS-4-19					5172	cu. ft.
	3							cu. ft.
	4							cu. ft.
	5							cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.						5172	cu. ft.
17	Is Line 16 ≥ Line 15?		Volume Retention Performance Standard is Met					

The City of SAN DIEGO	Project Name	Costa Verde Shopping Center	
	BMP ID	BMP 10 - MWS - L-4-6	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	8585	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.9	
3	85th percentile 24-hour rainfall depth	0.51	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	328	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 enter 0.05	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]	8	cu. ft.

The City of SAN DIEGO	Project Name	Costa Verde Center
	BMP ID	BMP 10 - MWS - L-4-6

Volume Retention for No Infiltration Condition							Worksheet B.5-6	
1	Area draining to the biofiltration BMP						8585	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)						0.9	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]						7727	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]						232	sq. ft.
5	Biofiltration BMP Footprint						32	sq. ft.
Landscape Area (must be identified on DS-3247)								
		Identification	**1**	**2**	**3**	**4**	**5**	
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)		0					
7	Impervious area draining to the landscape area (sq. ft.)		8585					
8	Impervious to Pervious Area ratio [Line 7/Line 6]		0.00	0.00	0.00	0.00	0.00	
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		0	0	0	0	0	
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]						0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]						32	sq. ft.
Volume Retention Performance Standard								
12	Is Line 11 ≥ Line 4?				No, Proceed to Line 13			
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]						0.14	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]						8	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]						6.495282225	cu. ft.
Site Design BMP								
	Identification	**Site Design Type**					**Credit**	
16	**1**	Landscaped Area for Impervious Dispersion					0	cu. ft.
	2	MWS-L-4-6					1600	cu. ft.
	3							cu. ft.
	4							cu. ft.
	5							cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.						1600	cu. ft.
17	Is Line 16 ≥ Line 15?				Volume Retention Performance Standard is Met			

The City of SAN DIEGO	Project Name	Costa Verde Shopping Center	
	BMP ID	11 - Underground Detention Basin	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	471223	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	0.51	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	17223	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 enter 0.05	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]	396	cu. ft.

The City of SAN DIEGO	Project Name	Costa Verde Center
	BMP ID	11 - Underground Detention Basin

Volume Retention for No Infiltration Condition			Worksheet B.5-6	
1	Area draining to the biofiltration BMP		471223	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)		0.86	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]		405252	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]		12158	sq. ft.
5	Biofiltration BMP Footprint		16005	sq. ft.

Landscape Area (must be identified on DS-3247)

		Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)		23995				
7	Impervious area draining to the landscape area (sq. ft.)		447228				
8	Impervious to Pervious Area ratio [Line 7/Line 6]		18.64	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		23995	0	0	0	0

10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]		23995	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]		40000	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met		
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]		3.29	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]		396	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]		-907.1459782	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1	Landscaped Area for Impervious Dispersion	0	cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

B.6.3 Sizing Flow-Thru Treatment Control BMPs:

Flow-thru treatment control BMPs shall be sized to filter or treat the maximum flow rate of runoff produced from a rainfall intensity of 0.2 inch of rainfall per hour, for each hour of every storm event. The required flow-thru treatment rate should be adjusted for the portion of the DCV already retained or biofiltered onsite as described in Worksheet B.6-1. The following hydrologic method (Equation B.6-1) shall be used to calculate the flow rate to be filtered or treated.

Equation B.6-1: Flow Rate

$$Q = C \times i \times A$$

where:

Q	=	Design flow rate in cubic feet per second
C	=	Runoff factor, area-weighted estimate using Table B.1-1
i	=	Rainfall intensity of 0.2 in/hr.
A	=	Tributary area (acres) which includes the total area draining to the BMP, including any offsite or onsite areas that comingle with project runoff and drain to the BMP. Refer to Section 3.3.3 for additional guidance. Street projects consult Section 1.4.3.

$Q_{BMP} = 1.5(C*i*A)$

DMA	AREA (SF)	IMPERVIOUS AREA (SF)	C IMPERVIOUS	PERVIOUS AREA (SF)	C PERVIOUS	COMPOSITE C	85TH PERCENTILE, 24-HR STORM DEPTH (IN)	DCV (CF)	i (in/hr)	Q (CFS)	Q_{BMP} (CFS)	MWS UNIT
1.1	133688	121771	0.9	11917	0.1	0.83	0.51	4708	0.2	0.51	0.763	(2) MWS L-8-16
1.2	73172	71576	0.9	1596	0.1	0.88	0.51	2745	0.2	0.30	0.445	MWS L-8-16
1.3	21889	21889	0.9	0	0.1	0.90	0.51	837	0.2	0.09	0.136	MWS L-4-13
1.4	12504	12504	0.9	0	0.1	0.90	0.51	478	0.2	0.05	0.078	MWS L-4-8
1.5	77786	76302	0.9	1484	0.1	0.88	0.51	2925	0.2	0.32	0.474	MWS L-8-20
1.6	40748	40748	0.9	0	0.1	0.90	0.51	1559	0.2	0.17	0.253	MWS L-4-21
1.7	10664	10664	0.9	0	0.1	0.90	0.51	408	0.2	0.0441	0.066	MWS L-4-6
1.8	12966	12765	0.9	201	0.1	0.89	0.51	489	0.2	0.0528	0.079	MWS L-4-8
1.9	79221	70424	0.9	8797	0.1	0.81	0.51	2731	0.2	0.30	0.443	(2) MWS L-4-19
1.10	8585	8585	0.9	0	0.1	0.90	0.51	328	0.2	0.04	0.053	MWS L-4-6

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.

Worksheet B.5-6 is provided.

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.

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 attached sizing calculations and BioClean MWS cut sheets.

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.

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.

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 2015

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:	*PO. Box 869* *Oceanside, CA 92054*

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.*

Applicant's Use Level Request:

General use level designation as a Basic, Enhanced, and Phosphorus treatment device in accordance with Ecology's Guidance for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE) January 2011 Revision.

Applicant's Performance Claims:

- The MWS – Linear Modular wetland is capable of removing a minimum of 80-percent of TSS from stormwater with influent concentrations between 100 and 200 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 50-percent of Total Phosphorus from stormwater with influent concentrations between 0.1 and 0.5 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 30-percent of dissolved Copper from stormwater with influent concentrations between 0.005 and 0.020 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 60-percent of dissolved Zinc from stormwater with influent concentrations between 0.02 and 0.30 mg/l.

Ecology Recommendations:

- Modular Wetland Systems, Inc. has shown Ecology, through laboratory and field-testing, that the MWS - Linear Modular Wetland Stormwater Treatment System filter system is capable of attaining Ecology's Basic, Total phosphorus, and Enhanced treatment goals.

Findings of Fact:

<u>Laboratory Testing</u>

The MWS-Linear Modular wetland has the:

- Capability to remove 99 percent of total suspended solids (using Sil-Co-Sil 106) in a quarter-scale model with influent concentrations of 270 mg/L.
- Capability to remove 91 percent of total suspended solids (using Sil-Co-Sil 106) in laboratory conditions with influent concentrations of 84.6 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 93 percent of dissolved Copper in a quarter-scale model with influent concentrations of 0.757 mg/L.
- Capability to remove 79 percent of dissolved Copper in laboratory conditions with influent concentrations of 0.567 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 80.5-percent of dissolved Zinc in a quarter-scale model with influent concentrations of 0.95 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 78-percent of dissolved Zinc in laboratory conditions with influent concentrations of 0.75 mg/L at a flow rate of 3.0 gpm per square foot of media.

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: Greg Kent
Modular Wetland Systems, Inc.
P.O. Box 869
Oceanside, CA 92054
gkent@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.

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.

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Project Name: Costa Verde Center

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	BMP details to be provided in later sumbittal. ☑ Included ☐ Submitted as separate stand-alone document

Project Name: Costa Verde Center

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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COSTA VERDE BLVD

LAS PALMAS SQUARE

LAS PALMAS SQUARE

EXISTING SUBDRAINS

POC 1
IMPERVIOUS AREA TREATED: 10.27 ACRES

BMP 11: UNDERGROUND DETENTION BASIN: 49,000 CF, 3.59" ORIFICE HYDROMODIFICATION CONTROL

NOBEL DR

GENESEE AVE

ESPLANADE CT

LEGEND

- HYDROMODIFICATION DRAINAGE BOUNDARY
- POINT OF COMPLIANCE (AS SHOWN)
- SD — EXISTING STORM DRAIN ROUTING
- SD — PROPOSED STORM DRAIN ROUTING
- PERVIOUS AREA
- PROPOSED UNDERGROUND PARKING STRUCTURE

SITE INFORMATION

HYDROLOGICAL SOIL GROUP: TYPE D

DEPTH TO GROUNDWATER: 150'

NOTE

ALL AREAS SHOWN WITHIN THE HYDROMODIFICATION DRAINAGE BOUNDARY NOT HATCHED AS PERVIOUS AREA REPRESENTS IMPERVIOUS AREA

NORTH

GRAPHIC SCALE IN FEET
0 30 60 120

K:\SND_LDE\V\095930002 - Costa Verde Shopping Ctr\Stormwater\SWQMP\Exhibits\Exhibit_HydroModMgmt.dwg 9-24-19-5:04 PM

Kimley»Horn

SEPTEMBER 2019

HYDROMODIFICATION MANAGEMENT

COSTA VERDE CENTER

Attachment 2b – Management of Critical Coarse Sediment Yield Areas

CISTERN SIZING											
DMA	AREA (SF)	IMPERVIOUS AREA (SF)	C IMPERVIOUS	PERVIOUS AREA (SF)	C PERVIOUS	COMPOSITE C	PRE DEVELOPED Q2 (cfs)	LOW FLOW HYDROMOD Q2 (cfs)	"V" (TABLE G.2-6)	MINIMUM DETENTION VOLUME (CF)	VOLUME PROVIDED (CF)
1	471223	447228	0.9	23995	0.1	0.86	6.23	0.62	0.12	48589	49000

85TH % ISOPLUVIAL	RAINFALL BASIN	NRCS SOIL TYPE	EXISTING SLOPE	2 YR UNIT RUNOFF RATIO	PROJECT SLOPE
0.51	OCEANSIDE	D	STEEP	0.576	STEEP

Worksheet for Hydromod Orifice

Project Description

Solve For	Diameter

Input Data

Discharge	0.62	ft³/s
Headwater Elevation	1335.40	ft
Centroid Elevation	1332.05	ft
Tailwater Elevation	1331.90	ft
Discharge Coefficient	0.60	

Results

Diameter	3.59	in
Headwater Height Above Centroid	3.35	ft
Tailwater Height Above Centroid	-0.15	ft
Flow Area	0.07	ft²
Velocity	8.81	ft/s

Attachment 3
Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

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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:
Tom Eagling
401 B St Ste 600
San Diego, CA 92101

(THIS SPACE IS FOR RECORDER'S USE ONLY)

STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT

APPROVAL NUMBER:	ASSESSORS PARCEL NUMBER:	PROJECT NUMBER:
	345-210-14-00, 345-210-13-00	

This agreement is made by and between the City of San Diego, a municipal corporation [City] and Regency Centers _____, the owner or duly authorized representative of the owner [Property Owner] of property located at 8610 Genesee Ave, San Diego, CA 92122

(PROPERTY ADDRESS)

and more particularly described as: 000346 BLK 12*S 40 FT OF LOTS 1&2 IN 000346 BLK 12*(EX ST WID&S 40 FT)LOTS 1&2 IN

(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)

_____
(Company/Organization Name)

_____
(Date)

THE CITY OF SAN DIEGO

APPROVED:

_____
(City Control Engineer Signature)

_____
(Print Name)

_____
(Date)

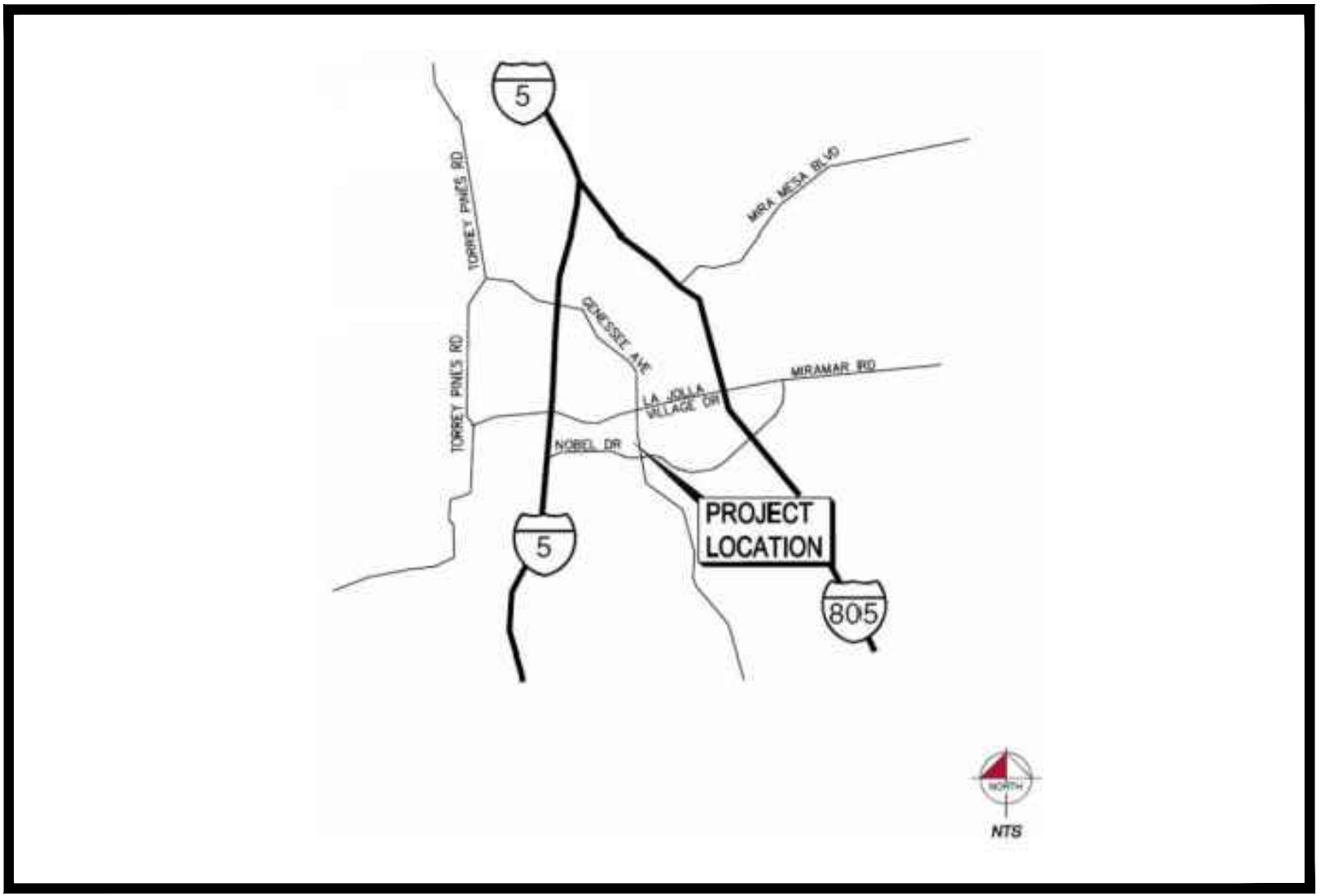
NOTE: ALL SIGNATURES MUST INCLUDE NOTARY ACKNOWLEDGMENTS PER CIVIL CODE SEC. 1180 ET.SEQ.

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).



VICINITY MAP

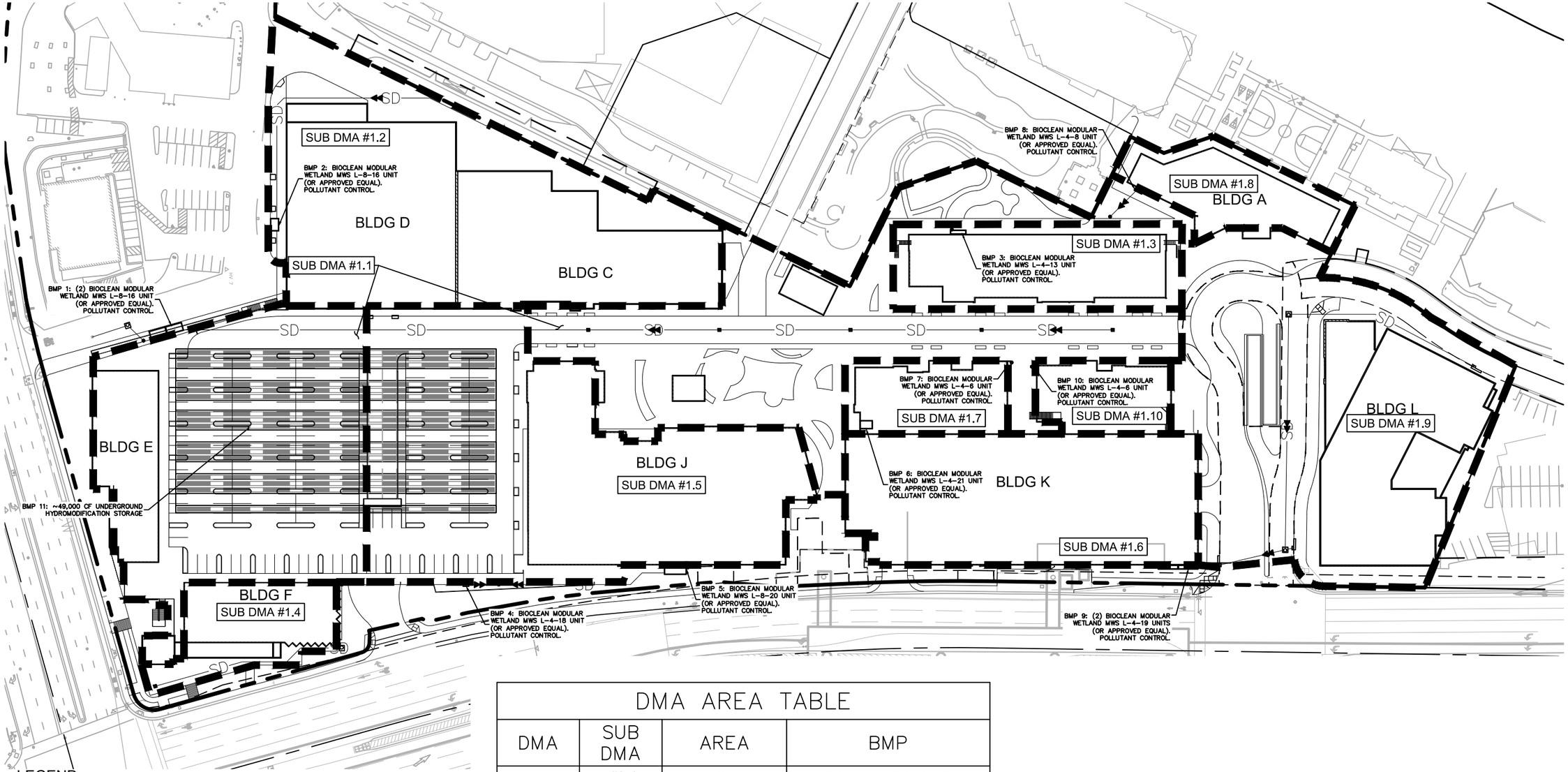
NOT TO SCALE

Kimley»Horn
401 B STREET - SUITE 600
SAN DIEGO, CA. - 92101-4218
TEL: (619) 234-9411

COSTA VERDE CENTER

SWMDCMA EXHIBIT A - VICINITY MAP
NOBEL DRIVE AND GENESSEE AVENUE, SAN DIEGO, CA
6/10/2019

SWMDCMA EXHIBIT B - SITE MAP
COSTA VERDE CENTER
NOBEL DRIVE AND GENESSEE AVENUE, SAN DIEGO, CA



LEGEND

- X — HMP POINT OF COMPLIANCE
- SD — PROPOSED STORM DRAIN
- DMA BOUNDARY

DMA AREA TABLE			
DMA	SUB DMA	AREA	BMP
#1	#1.1	1.47 AC	DRAINS TO BMP
	#1.2	1.68 AC	DRAINS TO BMP
	#1.3	0.74 AC	DRAINS TO BMP
	#1.4	0.22 AC	DRAINS TO BMP
	#1.5	1.79 AC	DRAINS TO BMP
	#1.6	1.38 AC	DRAINS TO BMP
	#1.7	1.37 AC	DRAINS TO BMP
	#1.8	0.30 AV	DRAINS TO BMP
	#1.9	1.82 AC	DRAINS TO BMP

NORTH

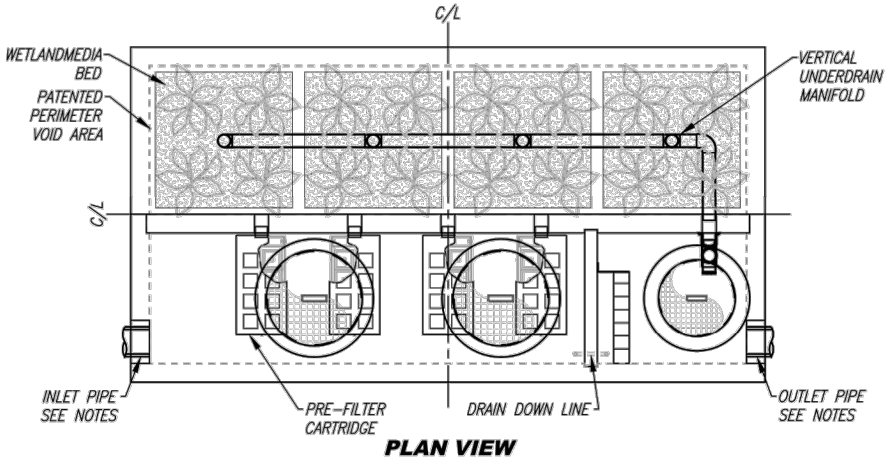
GRAPHIC SCALE IN FEET
0 50 100 200

Kimley»Horn
401 B STREET, SUITE 600, SAN DIEGO, CA 92101
PHONE: 619-234-9411
WWW.KIMLEY-HORN.COM

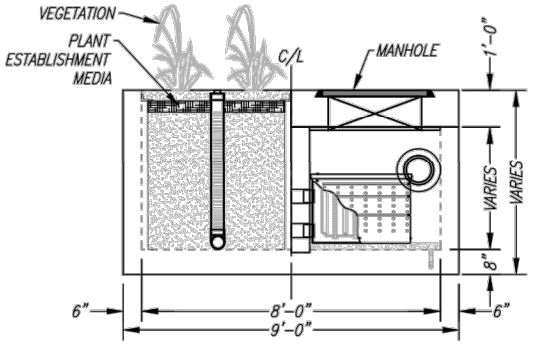
k:\snd_dev\095930002 - costa verde shopping ctr\stormwater\swqmp\exhibits\swmdcma exhibit.dwg 6/10/2019

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME		COSTA VERDE CENTER	
PROJECT LOCATION		SAN DIEGO, CA	
STRUCTURE ID		BMP 1 (2 UNITS)	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.382	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			23.50
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	TBD	HDPE	18"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	TBD	HDPE	18"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	TBD		
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	2EA Ø30"	OPEN PLANTER	Ø24"
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION



PLAN VIEW



LEFT END VIEW

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATER TIGHT PER MANUFACTURERS STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
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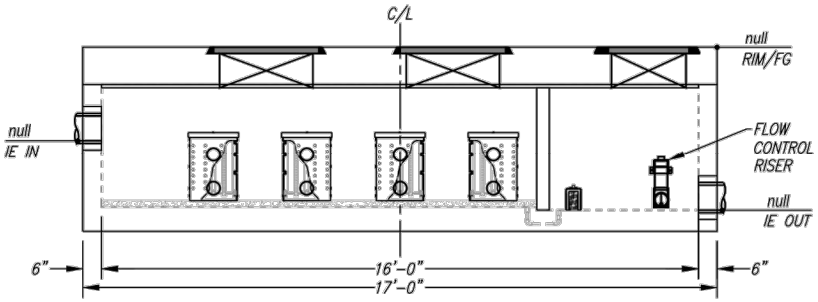
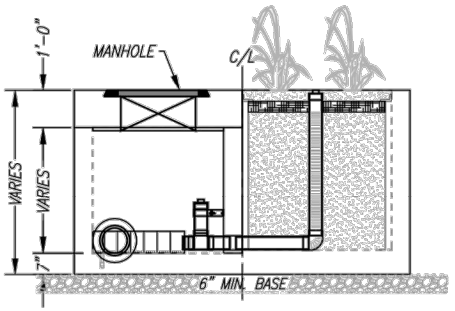
7. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURERS WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.



ELEVATION VIEW



RIGHT END VIEW

TREATMENT FLOW (CFS)	0.382
OPERATING HEAD (FT)	2.8
PRETREATMENT LOADING RATE (GPM/SF)	1.7
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.

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Bio Clean
A Forterra Company

(2) MWS-L-8-16-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

5/23/19TOLEE

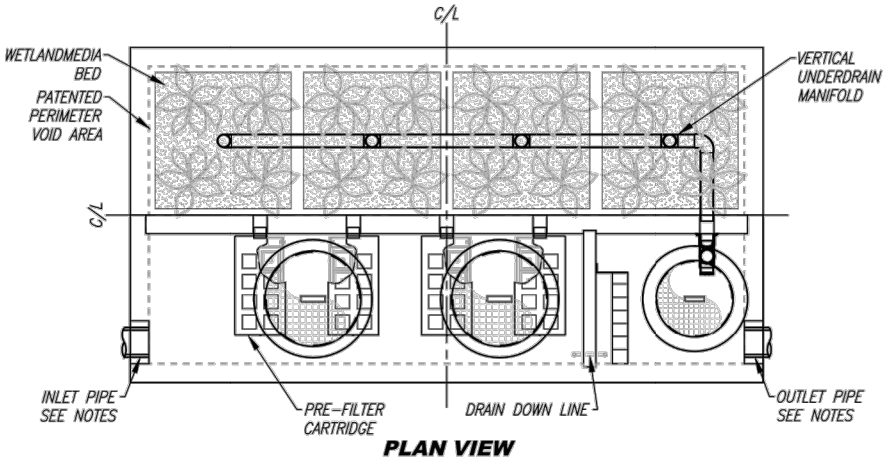
Kimley»Horn
401 B STREET - SUITE 600
SAN DIEGO, CA. - 92101-4218
TEL: (619) 234-9411

COSTA VERDE CENTER

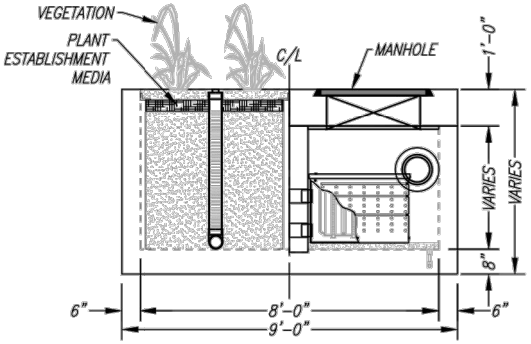
SWMDCMA EXHIBIT C - MWS-L-8-16-V
NOBEL DRIVE AND GENESSEE AVENUE, SAN DIEGO, CA
6/10/2019

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME		COSTA VERDE CENTER	
PROJECT LOCATION		SAN DIEGO, CA	
STRUCTURE ID		BMP 2	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.445	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			8.30 CFS
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	337.32	HDPE	18"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	335.99	HDPE	18"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	347.70		
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	2EA ø30"	OPEN PLANTER	ø24"
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION



PLAN VIEW



LEFT END VIEW

INSTALLATION NOTES

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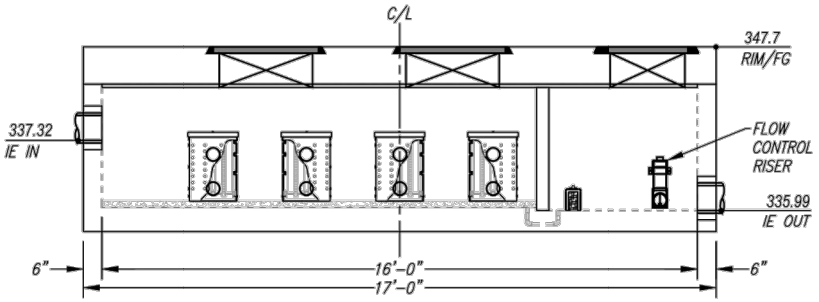
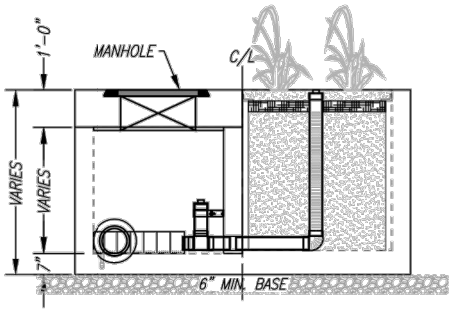


ELEVATION VIEW



RIGHT END VIEW

GENERAL NOTES

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TREATMENT FLOW (CFS)	0.445
OPERATING HEAD (FT)	3.3
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

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Bio Clean
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MWS-L-8-16-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

5/23/2019 10:16:15 AM

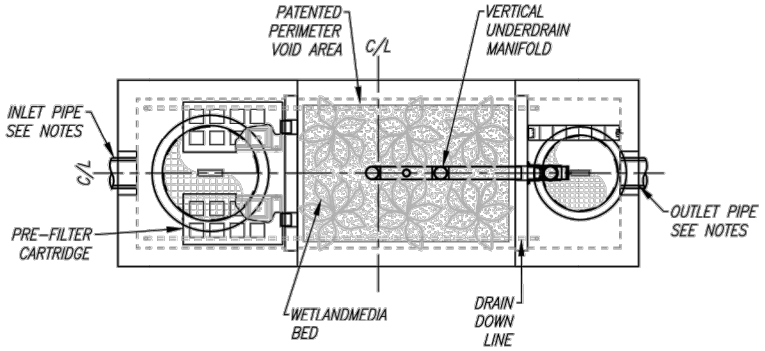
Kimley»Horn
401 B STREET - SUITE 600
SAN DIEGO, CA. - 92101-4218
TEL: (619) 234-9411

COSTA VERDE CENTER

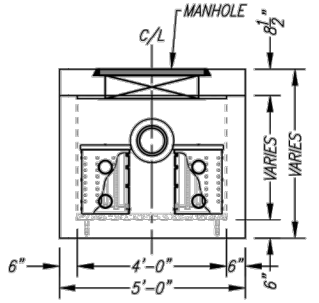
SWMDCMA EXHIBIT D -MWS-L-8-16-V
NOBEL DRIVE AND GENESSEE AVENUE, SAN DIEGO, CA
6/10/2019

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME		COSTA VERDE CENTER	
PROJECT LOCATION		SAN DIEGO, CA	
STRUCTURE ID		BMP 3	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.136	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			2.48 CFS
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	360.50	12"	HDPE
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	359.17	12"	HDPE
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	365.50		
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	ø30"	OPEN PLANTER	ø24"
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION



PLAN VIEW



LEFT END VIEW

INSTALLATION NOTES

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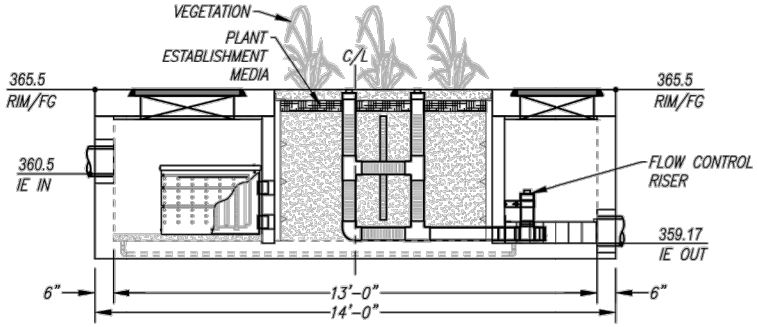
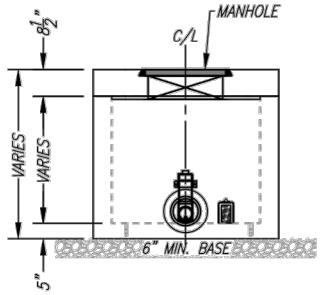


ELEVATION VIEW



RIGHT END VIEW

TREATMENT FLOW (CFS)	0.136
OPERATING HEAD (FT)	3.2
PRETREATMENT LOADING RATE (GPM/SF)	1.2
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.

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PROPRIETARY AND CONFIDENTIAL:

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Bio Clean
A Forterra Company

MWS-L-4-13-V
STORMWATER BIOFILTRATION SYSTEM STANDARD DETAIL

5/23/19TOLFE

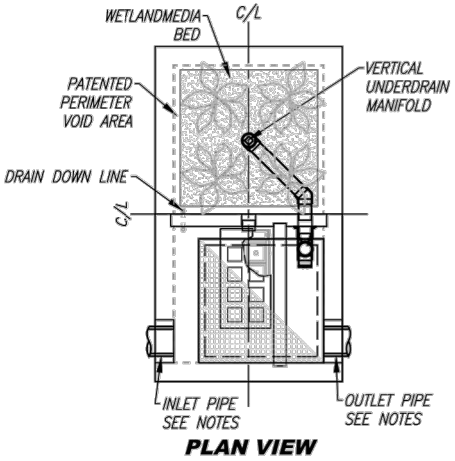
Kimley»Horn
401 B STREET - SUITE 600
SAN DIEGO, CA. - 92101-4218
TEL: (619) 234-9411

COSTA VERDE CENTER

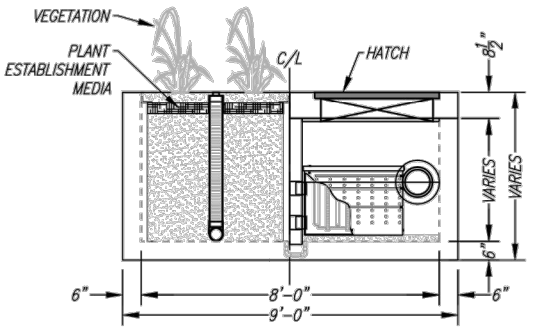
SWMDCMA EXHIBIT E - MWS-L-4-13-V
NOBEL DRIVE AND GENESSEE AVENUE, SAN DIEGO, CA
6/10/2019

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME		COSTA VERDE CENTER	
PROJECT LOCATION		SAN DIEGO, CA	
STRUCTURE ID		BMP 4	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		.078	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			1.44 CFS
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	338.90	HDPE	12"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	337.57	HDPE	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	359.95		
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	36" X 36"	OPEN PLANTER	N/A
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION



PLAN VIEW



LEFT END VIEW

INSTALLATION NOTES

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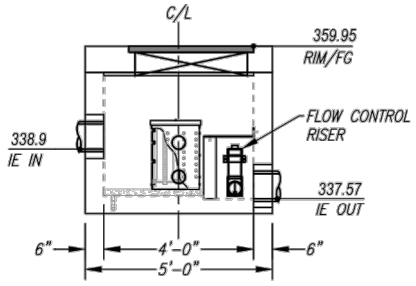
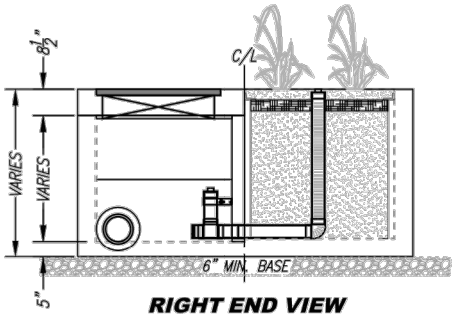


ELEVATION VIEW



RIGHT END VIEW

GENERAL NOTES

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TREATMENT FLOW (CFS)	0.078
OPERATING HEAD (FT)	2.3
PRETREATMENT LOADING RATE (GPM/SF)	1.4
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS

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Bio Clean
A Forterra Company

MWS-L-4-8-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

5/23/19 10:LFE

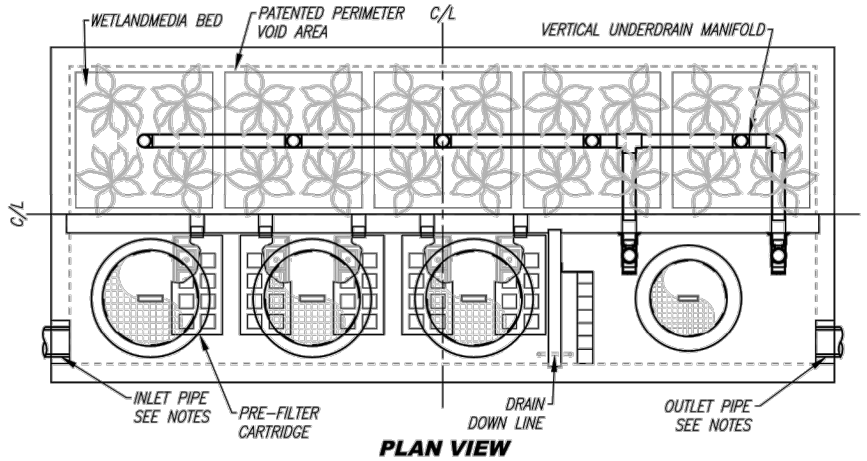
Kimley»Horn
401 B STREET - SUITE 600
SAN DIEGO, CA. - 92101-4218
TEL: (619) 234-9411

COSTA VERDE CENTER

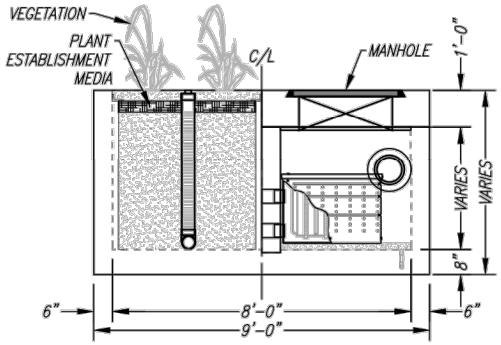
SWMDCMA EXHIBIT F - MWS-L-4-8-V
NOBEL DRIVE AND GENESSEE AVENUE, SAN DIEGO, CA
6/10/2019

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME		COSTA VERDE CENTER	
PROJECT LOCATION		SAN DIEGO, CA	
STRUCTURE ID		BMP 5	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.474	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			8.85 CFS
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	354.93	HDPE	12"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	353.60	HDPE	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	359.90		
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	3EA ø30"	UNDERGROUND	ø24"
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION



PLAN VIEW



LEFT END VIEW

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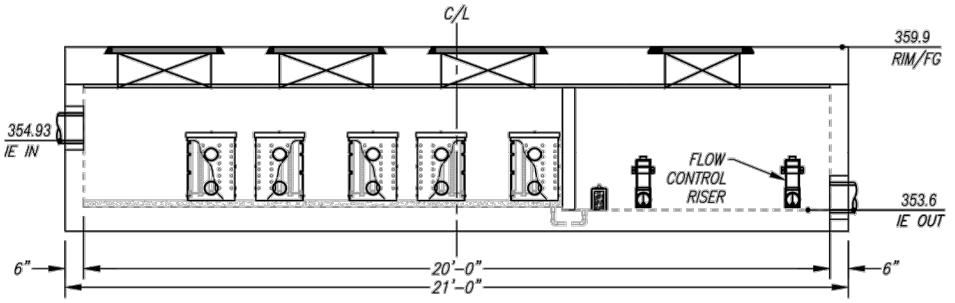
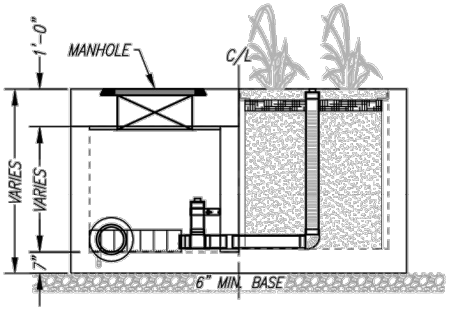


ELEVATION VIEW



RIGHT END VIEW

TREATMENT FLOW (CFS)	0.474
OPERATING HEAD (FT)	2.8
PRETREATMENT LOADING RATE (GPM/SF)	1.7
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

GENERAL NOTES

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Bio Clean
A Forterra Company

MWS-L-8-20-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

5/23/19701CFE

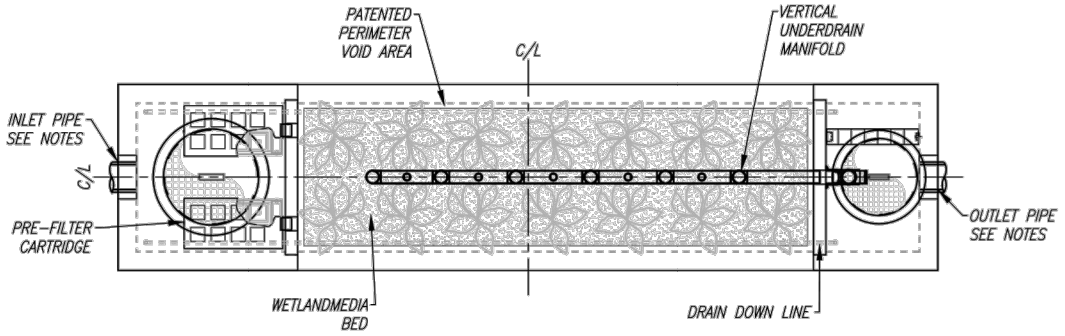
Kimley»Horn
401 B STREET - SUITE 600
SAN DIEGO, CA. - 92101-4218
TEL: (619) 234-9411

COSTA VERDE CENTER

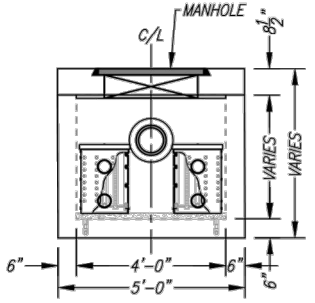
SWMDCMA EXHIBIT G - MWS-L-8-20-V
NOBEL DRIVE AND GENESSEE AVENUE, SAN DIEGO, CA
6/10/2019

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME		COSTA VERDE CENTER	
PROJECT LOCATION		SAN DIEGO, CA	
STRUCTURE ID		BMP 6	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.253	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			4.02 CFS
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	360.5	HDPE	12"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	359.17	HDPE	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	364.5		
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	ø30"	OPEN PLANTER	ø24"
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION



PLAN VIEW



LEFT END VIEW

INSTALLATION NOTES

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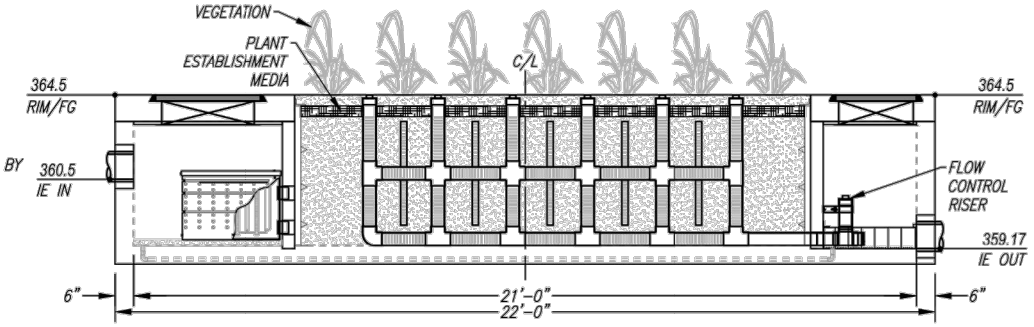
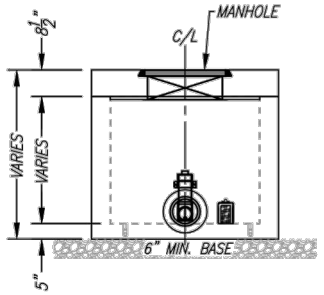


ELEVATION VIEW



RIGHT END VIEW

TREATMENT FLOW (CFS)	0.253
OPERATING HEAD (FT)	3.2
PRETREATMENT LOADING RATE (GPM/SF)	2.2
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

GENERAL NOTES

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Bio Clean
A Forterra Company

MWS-L-4-21-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

5/23/2019 CFF

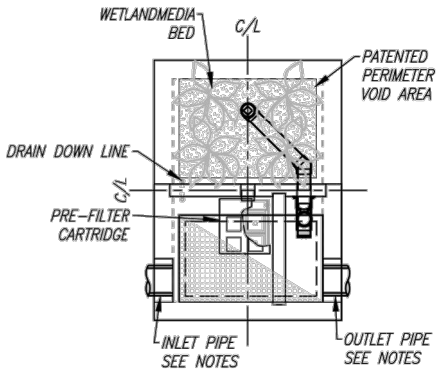
Kimley»Horn
401 B STREET - SUITE 600
SAN DIEGO, CA. - 92101-4218
TEL: (619) 234-9411

COSTA VERDE CENTER

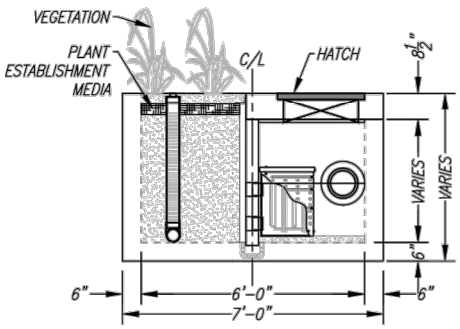
SWMDCMA EXHIBIT H - MWS-L-4-21-V
NOBEL DRIVE AND GENESSEE AVENUE, SAN DIEGO, CA
6/10/2019

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME		COSTA VERDE CENTER	
PROJECT LOCATION		SAN DIEGO, CA	
STRUCTURE ID		BMP 7	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.066	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			1.04 CFS
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	360.50	HDPE	12"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	359.17	HDPE	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	364.50		
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	24" X 42"	OPEN PLANTER	N/A
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION



PLAN VIEW



LEFT END VIEW

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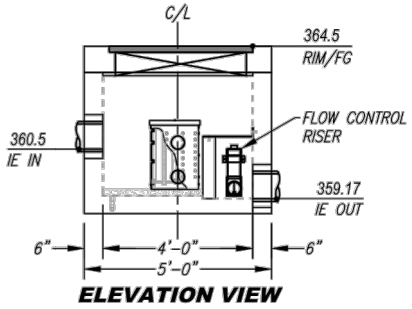
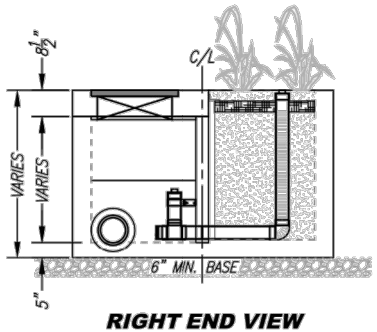


ELEVATION VIEW



RIGHT END VIEW

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TREATMENT FLOW (CFS)	0.066
OPERATING HEAD (FT)	3.1
PRETREATMENT LOADING RATE (GPM/SF)	1.2
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

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Bio Clean
A Forterra Company

MWS-L-4-6-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

5/23/19TOVFE

Kimley»Horn
401 B STREET - SUITE 600
SAN DIEGO, CA. - 92101-4218
TEL: (619) 234-9411

COSTA VERDE CENTER

SWMDCMA EXHIBIT I - MWS-L-4-6-V
NOBEL DRIVE AND GENESSEE AVENUE, SAN DIEGO, CA
6/10/2019

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME		COSTA VERDE CENTER	
PROJECT LOCATION		SAN DIEGO, CA	
STRUCTURE ID		BMP 8	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		.079	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			1.30 CFS
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	360.5	HDPE	12"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	359.17	HDPE	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	364.5		
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	36" X 36"	OPEN PLANTER	N/A
NOTES:			

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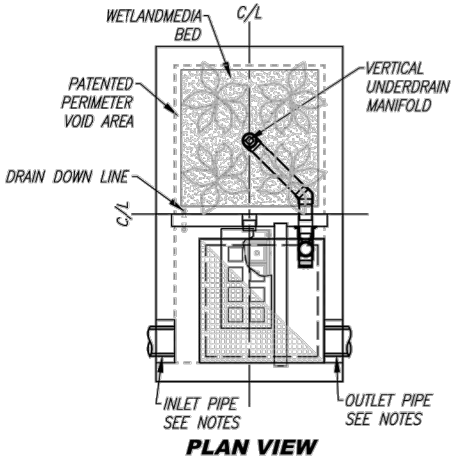
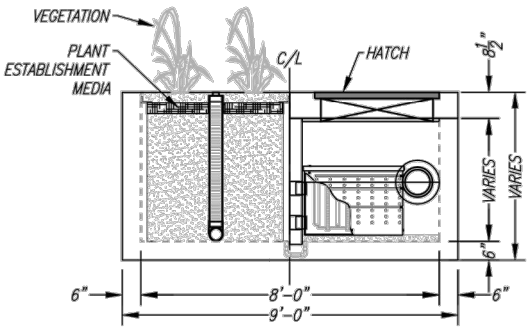


PLAN VIEW



LEFT END VIEW

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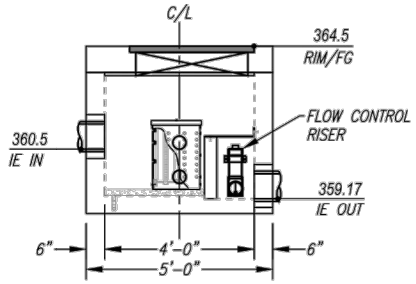
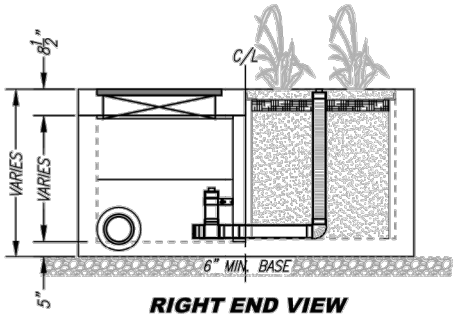


ELEVATION VIEW



RIGHT END VIEW

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.

TREATMENT FLOW (CFS)	0.079
OPERATING HEAD (FT)	2.3
PRETREATMENT LOADING RATE (GPM/SF)	1.4
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS

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Bio Clean
A Forterra Company

MWS-L-4-8-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

5/23/19TOVFE

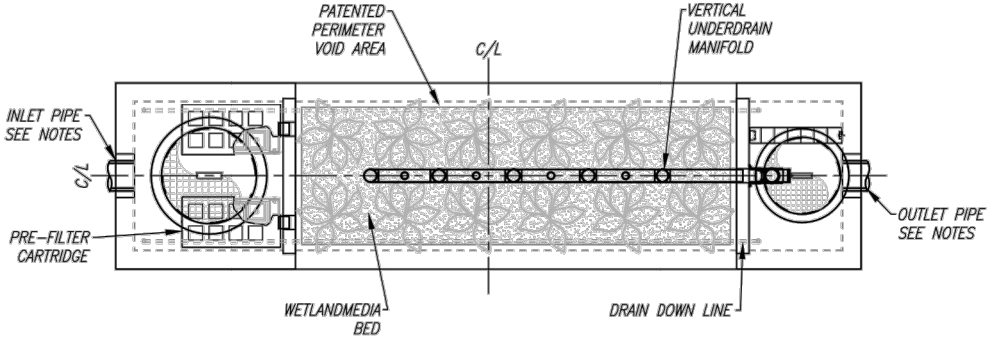
Kimley»Horn
401 B STREET - SUITE 600
SAN DIEGO, CA. - 92101-4218
TEL: (619) 234-9411

COSTA VERDE CENTER

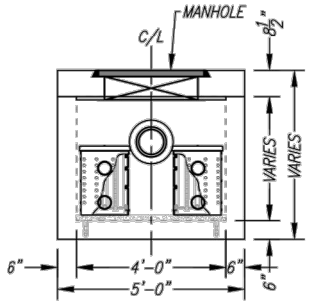
SWMDCMA EXHIBIT J - MWS-L-4-8-V
NOBEL DRIVE AND GENESSEE AVENUE, SAN DIEGO, CA
6/10/2019

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME		COSTA VERDE CENTER	
PROJECT LOCATION		SAN DIEGO, CA	
STRUCTURE ID		BMP 9 (2 UNITS)	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.222	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			11.05 CFS
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	350.76	HDPE	18"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	349.43	HDPE	18"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	ø30"	OPEN PLANTER	ø24"
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION



PLAN VIEW



LEFT END VIEW

INSTALLATION NOTES

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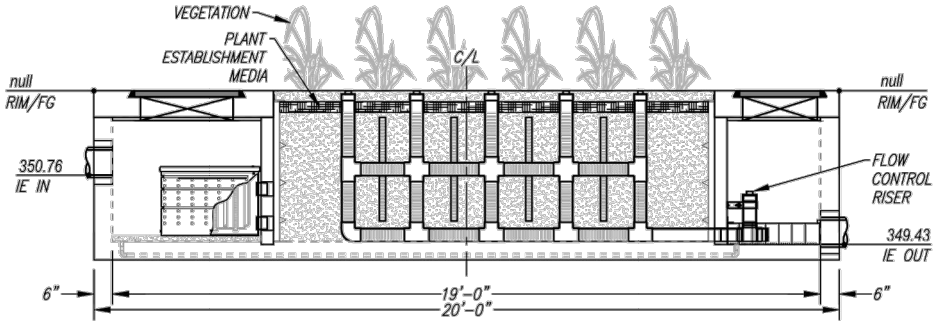
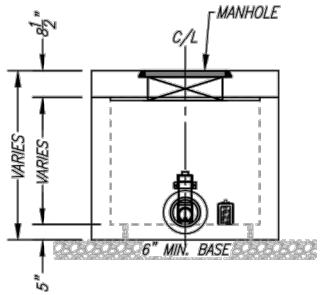


ELEVATION VIEW



RIGHT END VIEW

TREATMENT FLOW (CFS)	0.222
OPERATING HEAD (FT)	3.2
PRETREATMENT LOADING RATE (GPM/SF)	1.9
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

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A Forterra Company

(2) MWS-L-4-19-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

5/23/19TOVCE

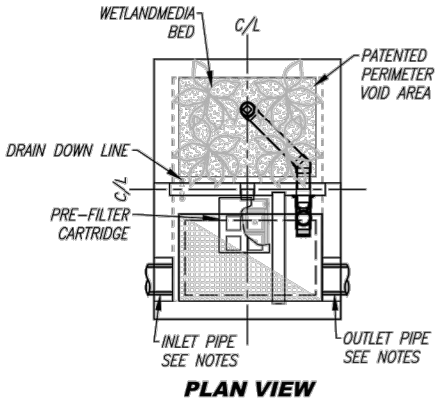
Kimley»Horn
401 B STREET - SUITE 600
SAN DIEGO, CA. - 92101-4218
TEL: (619) 234-9411

COSTA VERDE CENTER

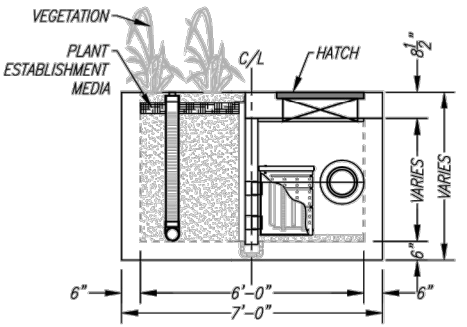
SWMDCMA EXHIBIT K - MWS-L-4-19-V
NOBEL DRIVE AND GENESSEE AVENUE, SAN DIEGO, CA
6/10/2019

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME		COSTA VERDE CENTER	
PROJECT LOCATION		SAN DIEGO, CA	
STRUCTURE ID		BMP 10	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.053	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			0.86 CFS
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	360.50	HDPE	12"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	359.17	HDPE	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	364.50		
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	24" X 42"	OPEN PLANTER	N/A
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION



PLAN VIEW



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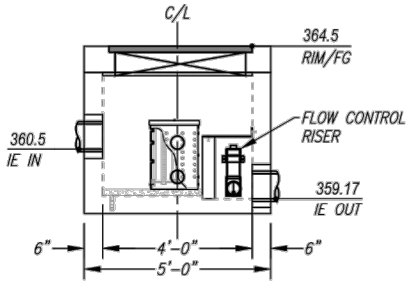
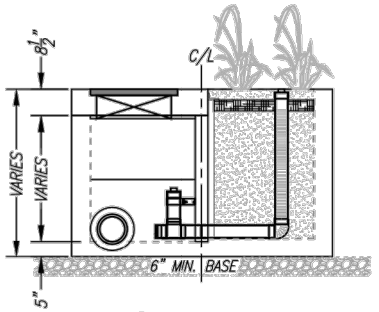


ELEVATION VIEW



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TREATMENT FLOW (CFS)	0.053
OPERATING HEAD (FT)	2.5
PRETREATMENT LOADING RATE (GPM/SF)	0.9
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

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MWS-L-4-6-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

5/23/19TOLFE

Kimley»Horn
401 B STREET - SUITE 600
SAN DIEGO, CA. - 92101-4218
TEL: (619) 234-9411

COSTA VERDE CENTER

SWMDCMA EXHIBIT L - MWS-L-4-6-V
NOBEL DRIVE AND GENESSEE AVENUE, SAN DIEGO, CA
6/10/2019

SITE DESIGN, SOURCE CONTROL AND POLLUTANT CONTROL BMP OPERATION + MAINTENANCE PROCEDURE

STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT APPROVAL NO.:

O&M RESPONSIBLE PARTY DESIGNEE: REGENCY CENTERS

BMP DESCRIPTION	INSPECTION FREQUENCY	MAINTENANCE FREQUENCY	MAINTENANCE METHOD	QUANTITY	INCLUDED IN O&M MANUAL				SHEET NUMBER(S)
SITE DESIGN ELEMENTS									
DESCRIPTION:LANDSCAPE PRESERVATION	ANNUAL	AS NEEDED	REMOVE DEBRIS	AS NEEDED	X	YES		NO	C2.0, 2.1, 2.2
SOURCE CONTROL ELEMENTS									
DESCRIPTION: CURB INLET SIGNAGE	ANNUAL	AS NEEDED	REPAINT/REPAIR/REPLACE	AS NEEDED	X	YES		NO	
POLLUTANT CONTROL BMP(S)									
DESCRIPTION: COMPACT BIOFILTRATION	6-12 MONTHS	12-24 MONTHS	REPLACE MEDIA/ CLEAN OUT	AS NEEDED	X	YES		NO	C2.0, 2.1, 2.2
POLLUTANT CONTROL									
DESCRIPTION: COMPACT BIOFILTRATION	RAINY SEASON	AS NEEDED	REMOVE DEBRIS	AS NEEDED	X	YES		NO	C2.0, 2.1, 2.2

HMP EXEMPT	YES

Kimley»Horn
401 B STREET - SUITE 600
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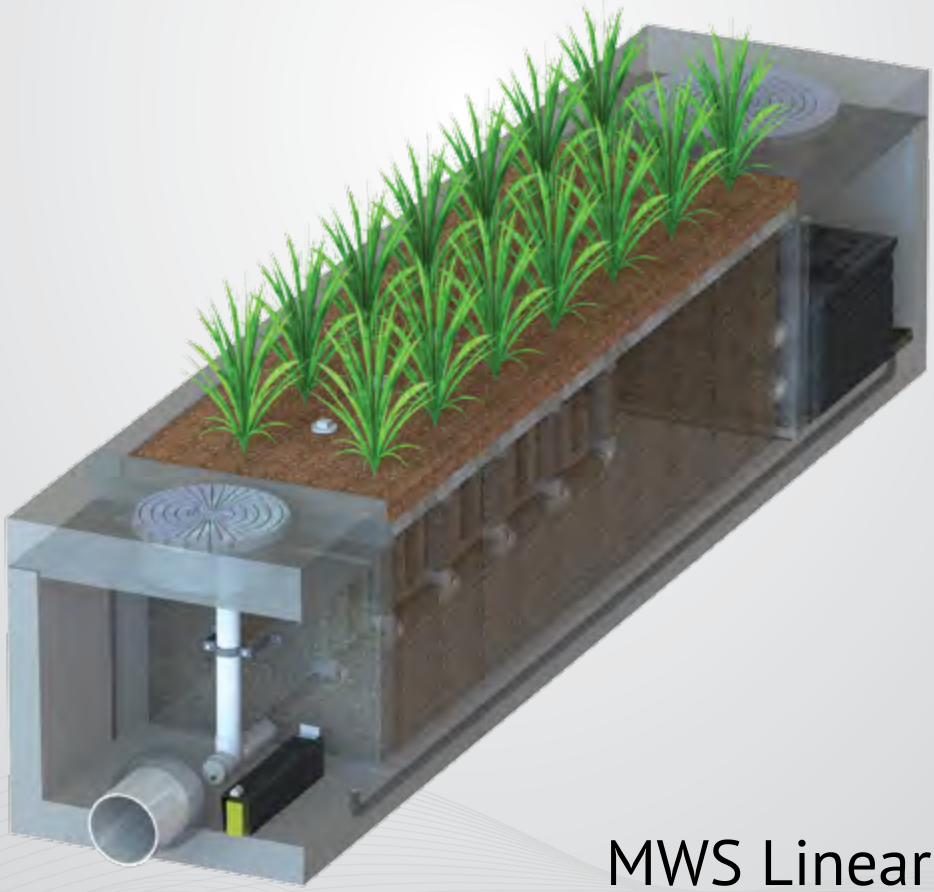
COSTA VERDE CENTER

SWMDCMA EXHIBIT M - OPERATION AND MAINTENANCE
NOBEL DRIVE AND GENESSEE AVENUE, SAN DIEGO, CA
6/10/2019

MODULAR WETLANDS™

*Advanced **Stormwater** Biofiltration*



MWS Linear

Contents

The Urban Impact

For hundreds of years natural wetlands surrounding our shores have played an integral role as nature's stormwater treatment system. But as our cities grow and develop, these natural wetlands have perished under countless roads, rooftops, and parking lots.

Plant A Wetland

Without natural wetlands our cities are deprived of water purification, flood control, and land stability. Modular Wetlands and the MWS Linear re-establish nature's presence and rejuvenate water ways in urban areas.

MWS Linear

The Modular Wetland System Linear represents a pioneering breakthrough in stormwater technology as the only biofiltration system to utilize patented horizontal flow, allowing for a smaller footprint and higher treatment capacity. While most biofilters use little or no pre-treatment, the MWS Linear incorporates an advanced pre-treatment chamber that includes separation and pre-filter cartridges. In this chamber sediment and hydrocarbons are removed from runoff before it enters the biofiltration chamber, in turn reducing maintenance costs and improving performance.

Applications

The MWS Linear has been successfully used on numerous new construction and retrofit projects. The system's superior versatility makes it beneficial for a wide range of stormwater and waste water applications - treating rooftops, streetscapes, parking lots, and industrial sites.

Industrial

Many states enforce strict regulations for discharges from industrial sites. The MWS Linear has helped various sites meet difficult EPA mandated effluent limits for dissolved metals and other pollutants.

Residential

Low to high density developments can benefit from the versatile design of the MWS Linear. The system can be used in both decentralized LID design and cost-effective end-of-the-line configurations.

Streets

Street applications can be challenging due to limited space. The MWS Linear is very adaptable, and offers the smallest footprint to work around the constraints of existing utilities on retrofit projects.

Parking Lots

Parking lots are designed to maximize space and the MWS Linear's 4 ft. standard planter width allows for easy integration into parking lot islands and other landscape medians.

Commercial

Compared to bioretention systems, the MWS Linear can treat far more area in less space - meeting treatment and volume control requirements.

Mixed Use

The MWS Linear can be installed as a raised planter to treat runoff from rooftops or patios, making it perfect for sustainable "live-work" spaces.

More applications are available on our website: www.ModularWetlands.com/Applications

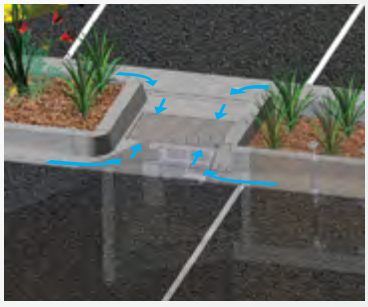
- Agriculture
- Reuse
- Low Impact Development
- Waste Water

Configurations

The MWS Linear is the preferred biofiltration system of Civil Engineers across the country due to its versatile design. This highly versatile system has available "pipe-in" options on most models, along with built-in curb or grated inlets for simple integration into your stormdrain design.

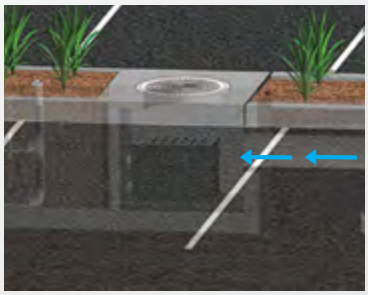
Curb Type

The *Curb Type* configuration accepts sheet flow through a curb opening and is commonly used along road ways and parking lots. It can be used in sump or flow by conditions. Length of curb opening varies based on model and size.



Grate Type

The *Grate Type* configuration offers the same features and benefits as the *Curb Type* but with a grated/drop inlet above the systems pre-treatment chamber. It has the added benefit of allowing for pedestrian access over the inlet. ADA compliant grates are available to assure easy and safe access. The *Grate Type* can also be used in scenarios where runoff needs to be intercepted on both sides of landscape islands.



Vault Type

The system's patented horizontal flow biofilter is able to accept inflow pipes directly into the pre-treatment chamber, meaning the MWS Linear can be used in end-of-the-line installations. This greatly improves feasibility over typical decentralized designs that are required with other biofiltration/bioretention systems. Another benefit of the "pipe in" design is the ability to install the system downstream of underground detention systems to meet water quality volume requirements.

Downspout Type

The *Downspout Type* is a variation of the *Vault Type* and is designed to accept a vertical downspout pipe from roof top and podium areas. Some models have the option of utilizing an internal bypass, simplifying the overall design. The system can be installed as a raised planter and the exterior can be stuccoed or covered with other finishes to match the look of adjacent buildings.

Advantages & Operation

The MWS Linear is the most efficient and versatile biofiltration system on the market, and the only system with horizontal flow which improves performance, reduces footprint, and minimizes maintenance. Figure-1 and Figure-2 illustrate the invaluable benefits of horizontal flow and the multiple treatment stages.

Featured Advantages

- Horizontal Flow Biofiltration
- Greater Filter Surface Area
- Pre-Treatment Chamber
- Patented Perimeter Void Area
- Flow Control
- No Depressed Planter Area

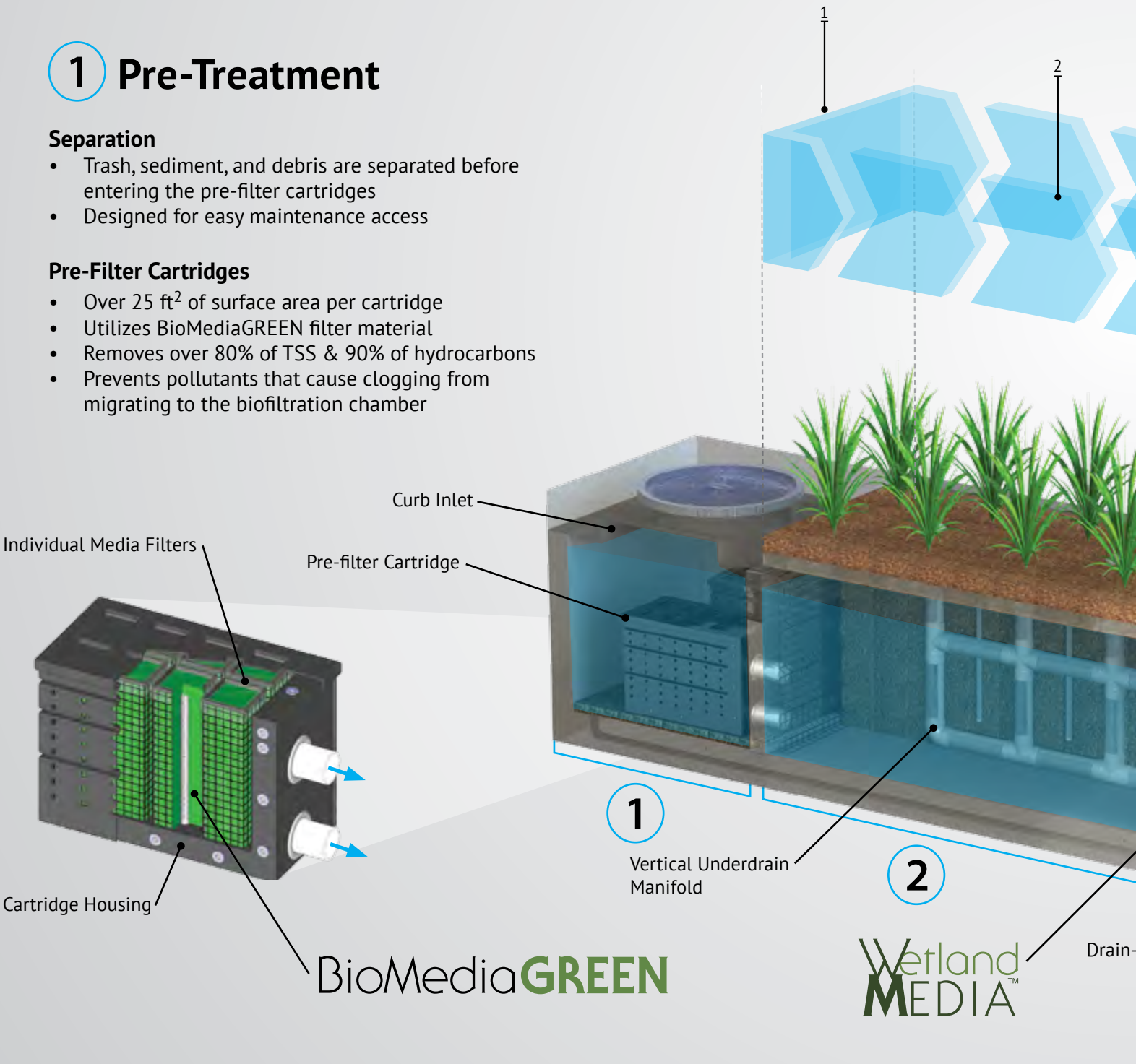
1 Pre-Treatment

Separation

- Trash, sediment, and debris are separated before entering the pre-filter cartridges
- Designed for easy maintenance access

Pre-Filter Cartridges

- Over 25 ft^2 of surface area per cartridge
- Utilizes BioMediaGREEN filter material
- Removes over 80% of TSS & 90% of hydrocarbons
- Prevents pollutants that cause clogging from migrating to the biofiltration chamber



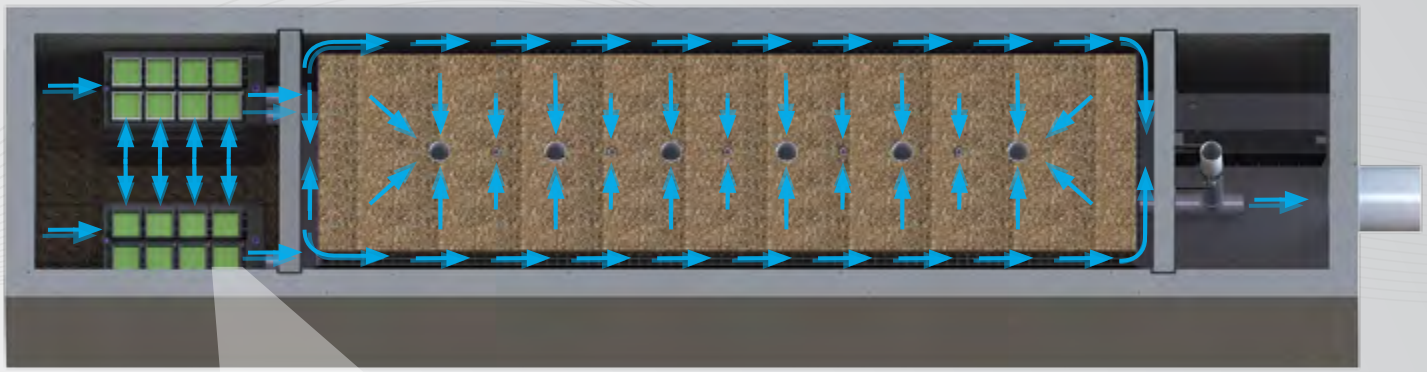


Fig. 2 - Top View

2x to 3x More Surface Area Than Traditional Downward Flow Bioretention Systems.

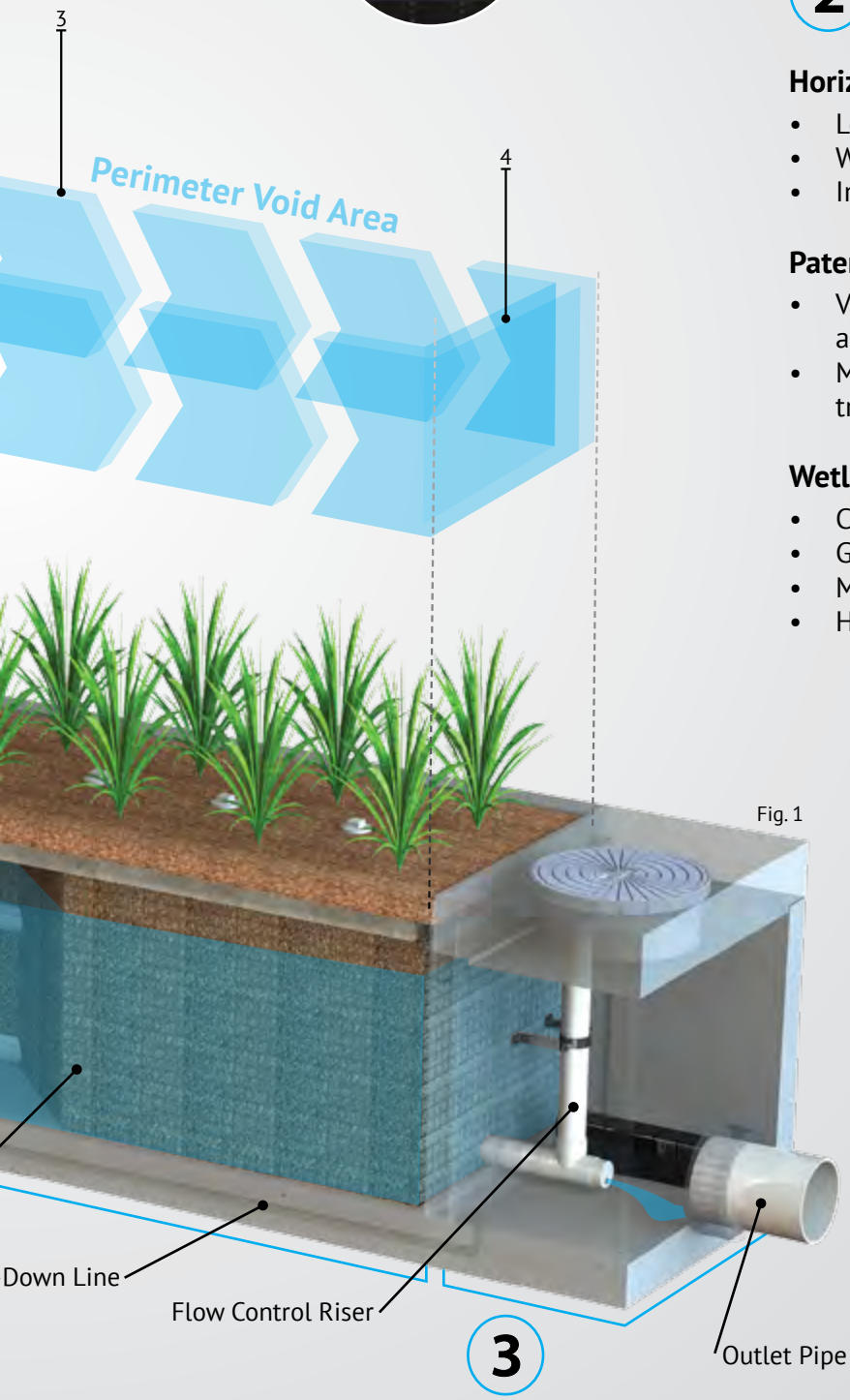


Fig. 1

2 Biofiltration

Horizontal Flow

- Less clogging than downward flow biofilters
- Water flow is subsurface
- Improves biological filtration

Patented Perimeter Void Area

- Vertically extends void area between the walls and the WetlandMEDIA on all four sides.
- Maximizes surface area of the media for higher treatment capacity

WetlandMEDIA

- Contains no organics and removes phosphorus
- Greater surface area and 48% void space
- Maximum evapotranspiration
- High ion exchange capacity and light weight

3 Discharge

Flow Control

- Orifice plate controls flow of water through WetlandMEDIA to a level lower than the media's capacity.
- Extends the life of the media and improves performance

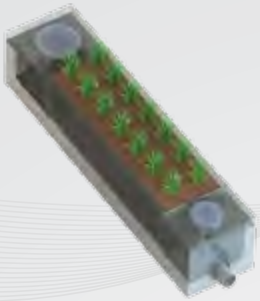
Drain-Down Filter

- The Drain-Down is an optional feature that completely drains the pre-treatment chamber
- Water that drains from the pre-treatment chamber between storm events will be treated

Orientations

Side-By-Side

The *Side-By-Side* orientation places the pre-treatment and discharge chamber adjacent to one another with the biofiltration chamber running parallel on either side. This minimizes the system length, providing a highly compact footprint. It has been proven useful in situations such as streets with directly adjacent sidewalks, as half of the system can be placed under that sidewalk. This orientation also offers internal bypass options as discussed below.



End-To-End

The *End-To-End* orientation places the pre-treatment and discharge chambers on opposite ends of the biofiltration chamber therefore minimizing the width of the system to 5 ft (outside dimension). This orientation is perfect for linear projects and street retrofits where existing utilities and sidewalks limit the amount of space available for installation. One limitation of this orientation is bypass must be external.

Bypass

Internal Bypass Weir (Side-by-Side Only)

The *Side-By-Side* orientation places the pre-treatment and discharge chambers adjacent to one another allowing for integration of internal bypass. The wall between these chambers can act as a bypass weir when flows exceed the system's treatment capacity, thus allowing bypass from the pre-treatment chamber directly to the discharge chamber.

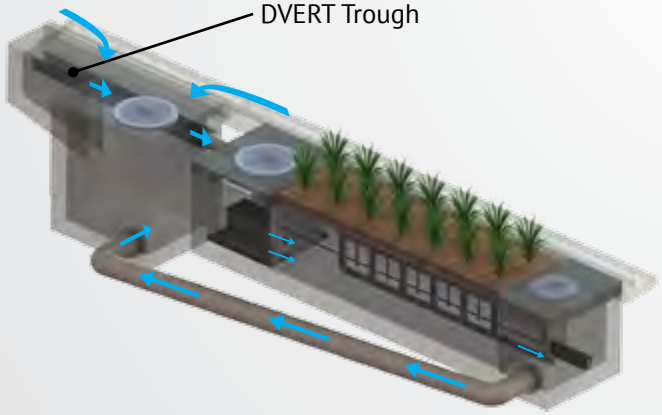
External Diversion Weir Structure

This traditional offline diversion method can be used with the MWS Linear in scenarios where runoff is being piped to the system. These simple and effective structures are generally configured with two outflow pipes. The first is a smaller pipe on the upstream side of the diversion weir - to divert low flows over to the MWS Linear for treatment. The second is the main pipe that receives water once the system has exceeded treatment capacity and water flows over the weir.

Flow By Design

This method is one in which the system is placed just upstream of a standard curb or grate inlet to intercept the first flush. Higher flows simply pass by the MWS Linear and into the standard inlet downstream.

DVERT Low Flow Diversion



This simple yet innovative diversion trough can be installed in existing or new curb and grate inlets to divert the first flush to the MWS Linear via pipe. It works similar to a rain gutter and is installed just below the opening into the inlet. It captures the low flows and channels them over to a connecting pipe exiting out the wall of the inlet and leading to the MWS Linear. The DVERT is perfect for retrofit and green street applications that allows the MWS Linear to be installed anywhere space is available.

Performance

The MWS Linear continues to outperform other treatment methods with superior pollutant removal for TSS, heavy metals, nutrients, hydrocarbons and bacteria. Since 2007 the MWS Linear has been field tested on numerous sites across the country. With it's advanced pre-treatment chamber and innovative horizontal flow biofilter, the system is able to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes. With the same biological processes found in natural wetlands, the MWS Linear harnesses natures ability to process, transform, and remove even the most harmful pollutants.

Approvals

The MWS Linear has successfully met years of challenging technical reviews and testing from some of the most prestigious and demanding agencies in the nation, and perhaps the world.

Washington State DOE Approved

The MWS Linear is approved for General Use Level Designation (GULD) for Basic, Enhanced, and Phosphorus treatment at 1 gpm/ft^2 loading rate. The highest performing BMP on the market for all main pollutant categories.

TSS	Total Phosphorus	Ortho Phosphorus	Nitrogen	Dissolved Zinc	Dissolved Copper	Total Zinc	Total Copper	Motor Oil
85%	64%	67%	45%	66%	38%	69%	50%	95%

DEQ Assignment

The Virginia Department of Environmental Quality assigned the MWS Linear, the highest phosphorus removal rating for manufactured treatment devices to meet the new Virginia Stormwater Management Program (VSMP) Technical Criteria.

MASTEP Evaluation

The University of Massachusetts at Amherst – Water Resources Research Center, issued a technical evaluation report noting removal rates up to 84% TSS, 70% Total Phosphorus, 68.5% Total Zinc, and more.

Rhode Island DEM Approved

Approved as an authorized BMP and noted to achieve the following minimum removal efficiencies: 85% TSS, 60% Pathogens, 30% Total Phosphorus for discharges to freshwater systems, and 30% Total Nitrogen for discharges to saltwater or tidal systems.

Flow Based Sizing

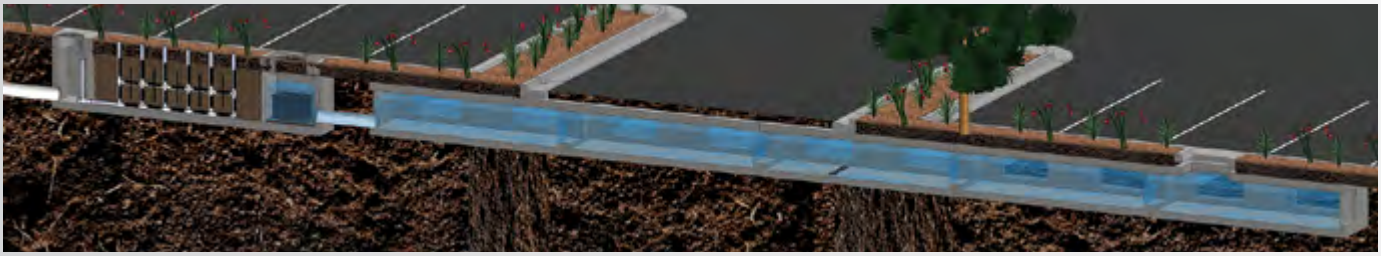
The MWS Linear can be used in stand alone applications to meet treatment flow requirements. Since the MWS Linear is the only biofiltration system that can accept inflow pipes several feet below the surface it can be used not only in decentralized design applications but also as a large central end-of-the-line application for maximum feasibility.

Treatment Flow Sizing Table

Model #	Dimensions	WetlandMedia Surface Area	Treatment Flow Rate (cfs)
MWS-L-4-4	4' x 4'	23 ft^2	0.052
MWS-L-4-6	4' x 6'	32 ft^2	0.073
MWS-L-4-8	4' x 8'	50 ft^2	0.115
MWS-L-4-13	4' x 13'	63 ft^2	0.144
MWS-L-4-15	4' x 15'	76 ft^2	0.175
MWS-L-4-17	4' x 17'	90 ft^2	0.206
MWS-L-4-19	4' x 19'	103 ft^2	0.237
MWS-L-4-21	4' x 21'	117 ft^2	0.268
MWS-L-8-8	8' x 8'	100 ft^2	0.230
MWS-L-8-12	8' x 12'	151 ft^2	0.346
MWS-L-8-16	8' x 16'	201 ft^2	0.462

Volume Based Sizing

Many states require treatment of a water quality volume and do not offer the option of flow based design. The MWS Linear and its unique horizontal flow makes it the only biofilter that can be used in volume based design installed downstream of ponds, detention basins, and underground storage systems.



Treatment Volume Sizing Table

Model #	Treatment Capacity (cu. ft.) @ 24-Hour Drain Down	Treatment Capacity (cu. ft.) @ 48-Hour Drain Down
MWS-L-4-4	1140	2280
MWS-L-4-6	1600	3200
MWS-L-4-8	2518	5036
MWS-L-4-13	3131	6261
MWS-L-4-15	3811	7623
MWS-L-4-17	4492	8984
MWS-L-4-19	5172	10345
MWS-L-4-21	5853	11706
MWS-L-8-8	5036	10072
MWS-L-8-12	7554	15109
MWS-L-8-16	10073	20145

Installation

The MWS Linear is simple, easy to install, and has a space efficient design that offers lower excavation and installation costs compared to traditional tree-box type systems. The structure of the system resembles pre-cast catch basin or utility vaults and is installed in a similar fashion.

The system is delivered fully assembled for quick installation. Generally, the structure can be unloaded and set in place in 15 minutes. Our experienced team of field technicians are available to supervise installations and provide technical support.

Maintenance

Reduce your maintenance costs, man hours, and materials with the MWS Linear. Unlike other biofiltration systems that provide no pre-treatment, the MWS Linear is a self-contained treatment train which incorporates simple and effective pre-treatment.

Maintenance requirements for the biofilter itself are almost completely eliminated, as the pre-treatment chamber removes and isolates trash, sediments, and hydrocarbons. What's left is the simple maintenance of an easily accessible pre-treatment chamber that can be cleaned by hand or with a standard vac truck. Only periodic replacement of low-cost media in the pre-filter cartridges is required for long term operation and there is absolutely no need to replace expensive biofiltration media.

Plant Selection

Abundant plants, trees, and grasses bring value and an aesthetic benefit to any urban setting, but those in the MWS Linear do even more - they increase pollutant removal. What's not seen, but very important, is that below grade the stormwater runoff/flow is being subjected to nature's secret weapon: a dynamic physical, chemical, and biological process working to break down and remove non-point source pollutants. The flow rate is controlled in the MWS Linear, giving the plants more "contact time" so that pollutants are more successfully decomposed, volatilized and incorporated into the biomass of The MWS Linear's micro/macro flora and fauna.

A wide range of plants are suitable for use in the MWS Linear, but selections vary by location and climate. View suitable plants by selecting the list relative to your project location's hardy zone.

Please visit www.ModularWetlands.com/Plants for more information and various plant lists.

Attachment 4
Copy of Plan Sheets Showing Permanent Storm Water BMPs

This is the cover sheet for Attachment 4.

Project Name: Costa Verde Center

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.

LEGEND:

- EX. STORM DRAIN
- PROP. STORM DRAIN (PRIVATE)
- PROP. STORM DRAIN GRATE INLET (PRIVATE)
- PROP. STORM DRAIN CLEANOUT (PRIVATE)
- EX. SIGNALIZED INTERSECTION
- EX. CONTOURS
- PROP. CONTOURS
- SLOPE
- RETAINING WALL
- DAYLIGHT LINE
- BUILDING LIMITS
- CENTERLINE
- BUILDING POINT OF CONNECTION (PRIVATE)
- ULTIMATE RIGHT OF WAY
- LIMITS OF WORK
- LIMITS OF UNDERGROUND PARKING STRUCTURE
- STORM DIRECTION OF FLOW
- VISIBILITY TRIANGLES
- AASHTO SIGHT TRIANGLE
- UNDERGROUND PARKING STRUCTURE
- PROP. LANDSCAPE

ABBREVIATIONS:

AC	ASBESTOS CONCRETE
BW	BOTTOM OF WALL
CL	CENTER LINE
DWY.	DRIVEWAY
EX.	EXISTING
FFE	FINISH FLOOR ELEVATION
FG	FINISH GRADE
FL	FLOW LINE
FS	FINISH SURFACE
H	HEIGHT
IE	INVERT ELEVATION
IMPS	IMPROVEMENTS
L	LENGTH
LP	LOW POINT
LAT.	LATERAL
MAX.	MAXIMUM
PROP.	PROPOSED
R	RADIUS
RET. WALL	RETAINING WALL
R/W	RIGHT OF WAY
SWR.	SEWER
SF	SQUARE FEET
TP	TOP OF PAVEMENT
TW	TOP OF WALL
TYP	TYPICAL
VOL.	VOLUME

NOTES:

1. NO OBSTRUCTION INCLUDING SOLID WALLS IN THE VISIBILITY AREA SHALL EXCEED 3 FEET IN HEIGHT. PLANT MATERIAL, OTHER THAN TREES, WITHIN THE PUBLIC RIGHT-OF-WAY THAT IS LOCATED WITHIN VISIBILITY AREAS SHALL NOT EXCEED 24 INCHES IN HEIGHT, MEASURED FROM THE TOP OF ADJACENT CURB.
2. SEE ARCHITECTURAL FOR FINISH FLOOR ELEVATIONS.
3. PODIUM DRAINAGE IS SHOWN FOR CONCEPTUAL PURPOSES AND WILL BE DESIGNED BY OTHERS.
4. REFER TO ARCHITECTURAL PLANS FOR PODIUM LEVEL ELEVATIONS
5. NO OBJECTS HIGHER THAN 36 INCHES ARE PROPOSED IN VISIBILITY AREAS. NO VEGETATION, OTHER THAN TREES, WILL EXCEED 24 INCHES IN HEIGHT WITHIN ANY PORTION OF THE VISIBILITY AND SIGHT DISTANCE AREAS THAT LIE WITHIN THE PUBLIC RIGHT-OF-WAY.

GRADING INFORMATION:

TOTAL SITE AREA:	13.86 ACRES		
GRADED AREA:	11.92 ACRES	MAX. CUT DEPTH:	~25 FT
CUT QUANTITIES:	143,600 CY	MAX CUT SLOPE RATIO:	2:1 MAX
FILL QUANTITIES:	0 CY	MAX. FILL DEPTH:	~2.5 FT
EXPORT:	143,600 CY	MAX FILL SLOPE RATIO:	2:1 MAX
SITE RETAINING WALLS:	630 LF	MAX WALL HEIGHT:	3.5 FT

NOTE: GRADING QUANTITIES ARE ESTIMATED FOR DESIGN AND PERMIT PURPOSES ONLY AND SHALL BE INDEPENDENTLY VERIFIED BY THE CONTRACTOR PRIOR TO BIDDING. ACTUAL QUANTITIES MAY VARY DUE TO SHRINKAGE LOSSES, CLEARING OPERATIONS, COMPACTION, SETTLEMENT, ETC. CONTRACTOR TO NOTIFY THE ENGINEER OF WORK OF ANY DISCREPANCIES PRIOR TO GRADING OPERATIONS. QUANTITIES DO NOT INCLUDE EXCAVATIONS SPOILS FROM UTILITY TRENCHES, STRUCTURAL FOOTINGS, EXISTING IMPROVEMENT DEMOLITION, OVEREXCAVATION AND REMEDIAL GRADING, OR SLOPE CUTBACKS.

THIS PROJECT PROPOSES TO EXPORT 143,600 CUBIC YARDS OF MATERIAL FROM THIS SITE. ALL EXPORT MATERIAL SHALL BE DISCHARGED TO A LEGAL DISPOSAL SITE.

SOURCE OF TOPOGRAPHY

BY PHOTOGRAMMETRIC METHODS PROVIDED BY GEODETIC, CORP SUPPLEMENTED BY ONSITE FIELD SURVEY METHODS BY KIMLEY-HORN AND ASSOCIATES,INC.
DATUM: MSL (NGVD-29)

DATUM DISCLAIMER:

ALL ELEVATIONS REFERENCED IN THIS PLAN SET ARE CONSISTENT WITH NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD - 29) AS REQUIRED BY THE CITY OF SAN DIEGO.

LEVEL 1 (PODIUM) = 360.5

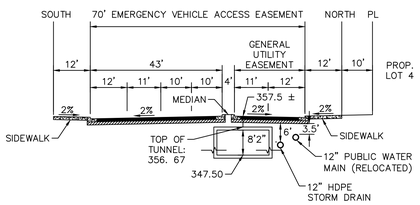
LEVEL B1 = 347.5

LEVEL B2 = 337.5

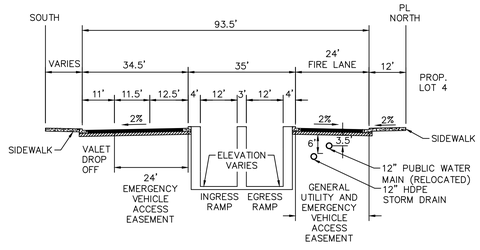
COSTA VERDE BLVD
LAS PALMAS SQUARE (PRIVATE)
BROOKE COURT (PRIVATE)
ESPLANADE COURT (PRIVATE)
NOBEL DRIVE
GENESEE AVENUE
PROP. LOT 1
PROP. LOT 2
PROP. LOT 3
PROP. LOT 4
PROP. PROPERTY LINE
PROPOSED LOT LINE
EX. BLDG TO REMAIN
EXISTING WALL TO REMAIN
PROPOSED WALL MAX HEIGHT: 3.4'
PROP. AREA DRAIN TG 342.90 IE 338.90
PROP. AREA DRAIN TG 359.60 IE 347.16
PROP. AREA DRAIN TG 359.60 IE 349.64
PROP. AREA DRAIN TG 359.60 IE 352.12
PROP. AREA DRAIN TG 359.60 IE 354.62
PROP. AREA DRAIN TG 359.60 IE 357.10
BMP 1: (2) BIOCLEAN MODULAR WETLAND MWS L-8-16 UNIT (OR APPROVED EQUAL) IE OUT 330.86 IE IN 330.75 IE OUT 330.65
BMP 2: BIOCLEAN MODULAR WETLAND MWS L-8-16 UNIT (OR APPROVED EQUAL) IE IN 337.32 IE OUT 335.99
BMP 3: BIOCLEAN MODULAR WETLAND MWS L-4-13 UNIT (OR APPROVED EQUAL). POLLUTANT CONTROL. IE IN 354.33
BMP 4: BIOCLEAN MODULAR WETLAND MWS L-4-8 UNIT (OR APPROVED EQUAL) IE IN 338.90 IE OUT 337.57
BMP 5: BIOCLEAN MODULAR WETLAND MWS L-8-20 UNIT (OR APPROVED EQUAL) IE IN 354.93 IE OUT 353.60
BMP 6: BIOCLEAN MODULAR WETLAND MWS L-4-21 UNIT (OR APPROVED EQUAL)
BMP 7: BIOCLEAN MODULAR WETLAND MWS L-4-6 UNIT (OR APPROVED EQUAL)
BMP 8: BIOCLEAN MODULAR WETLAND MWS L-4-8 UNIT (OR APPROVED EQUAL) IE OUT 354.50
BMP 9: (2) BIOCLEAN MODULAR WETLAND MWS L-4-19 UNITS (OR APPROVED EQUAL) IE IN 350.76 IE OUT 349.43
BMP 10: BIOCLEAN MODULAR WETLAND MWS L-4-6 UNIT (OR APPROVED EQUAL)
PROP. UNDERGROUND HYDROMODIFICATION CONTROL VOLUME = ~49,000 CU-FT (BELOW LEVEL B2)
PODIUM FS = 360.50 (SEE NOTE 4)
BLDG A
BLDG B
BLDG C
BLDG D
BLDG E 347.5'
BLDG F FF: 343.5'
BLDG G
BLDG J
BLDG K
BLDG L FF: 360.0 ±
BLDG Q1 1 LEVEL
BLDG Q2 1 LEVEL
BLDG T1
BLDG T2
PROP. MH RIM 343.00 IE IN 339.90 IE OUT 339.80
PROP. MH RIM 360.30 IE IN 352.47 IE OUT 352.37
PROP. MH RIM 357.95 IE IN 351.27 IE OUT 351.17
PROP. CURB INLET TC 357.90 IE OUT 353.40
PROP. CURB INLET TC 357.50 IE OUT 350.87
PROPOSED TYPE H CURB AND GUTTER PER SDR SD G-02 (PUBLIC)
PROPOSED 4' BIKE LANE & 11' TURN LANE STRIPING
EXISTING 4' BIKE LANE TO CONTINUE
RIGHT TURN IN/RIGHT TURN OUT ONLY DRIVEWAY
39'X275' SIGHT DISTANCE TRIANGLE
14.0' PARKWAY
11.0' DECELERATION LANE
2.0' PROPOSED SIDEWALK PER CITY OF SAN DIEGO SDG-155
12' S/W PER CITY OF SAN DIEGO SDG-155
7.5' S/W
PROP. RETAINING WALL
SLOPE AND DRAINAGE EASEMENT F/P NO. 76232 & 76233
SLOPE AND DRAINAGE EASEMENT F/P NO. 76232 & 76233
EXISTING TRAFFIC SIGNAL AND STREET LIGHT TO BE RELOCATED
SERVICE DRIVE EGRESS ONLY PER CITY OF SAN DIEGO SDG-163
PROP. MIDCOAST TROLLEY STATION (BY SANDAG)
EXISTING STREET LIGHT
PROP. IMPROVEMENTS PER MIDCOAST TROLLEY STATION IMPS (BY SANDAG)
SANDAG EASEMENT DEDICATED PER SEPARATE DOCUMENT
MID-COAST CORRIDOR TRANSIT PROJECT PER SEPARATE PERMIT NOT A PART OF THIS PROJECT
SDGE TRANSFORMERS BY OTHERS
PROPOSED VALET DROP OFF AREA
SERVICE DRIVE INGRESS ONLY (ACCESS TO PODIUM LEVEL)
10'X10' VISIBILITY TRIANGLES
25'X25' VISIBILITY TRIANGLE
25'X385' AASHTO SIGHT TRIANGLE
117'X48' AASHTO SIGHT TRIANGLE
27'X430' AASHTO SIGHT TRIANGLE
55'X82' AASHTO SIGHT TRIANGLE
36' GENERAL UTILITY EASEMENT
LIMITS OF WORK
10' SETBACK
EX TYPE 'B' INLET PER 35118-8-D (IE OUT 327.45)
CONNECT TO EX. 24" SD FL 24" 330.39 N (FL 24" 330.06 S) (FL 18" 330.31 W)
EX. 12" SD PER 22969-21-D
EX. 24" SD PER 22696-21-D
6' S/W
10'X10' VISIBILITY TRIANGLE
(FL 24" 343.58 N) (FL 24" 343.42 E) (FL 18" 343.48 S)

STORM WATER NOTES:

1. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITTEE SHALL ENTER INTO A MAINTENANCE AGREEMENT FOR THE ONGOING PERMANENT BMP MAINTENANCE, SATISFACTORY TO THE CITY ENGINEER.
2. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITTEE SHALL INCORPORATE ANY CONSTRUCTION BEST MANAGEMENT PRACTICES NECESSARY TO COMPLY WITH CHAPTER 14, ARTICLE 2, DIVISION 1 (GRADING REGULATIONS) OF THE SAN DIEGO MUNICIPAL CODE, INTO THE CONSTRUCTION PLANS OR SPECIFICATIONS.
3. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE APPLICANT SHALL SUBMIT A TECHNICAL REPORT THAT WILL BE SUBJECT TO FINAL REVIEW AND APPROVAL BY THE CITY ENGINEER, BASED ON THE STORM WATER STANDARDS IN EFFECT AT THE TIME OF THE CONSTRUCTION PERMIT ISSUANCE.
4. DEVELOPMENT OF THIS PROJECT SHALL COMPLY WITH ALL STORM WATER CONSTRUCTION REQUIREMENTS OF THE STATE CONSTRUCTION GENERAL PERMIT, ORDER NO. 2009-0009DWQ, OR SUBSEQUENT ORDER, AND THE MUNICIPAL STORM WATER PERMIT, ORDER NO. R9-2013-0001, OR SUBSEQUENT ORDER. IN ACCORDANCE WITH ORDER NO. 2009-0009DWQ, OR SUBSEQUENT ORDER, A RISK LEVEL DETERMINATION SHALL BE CALCULATED FOR THE SITE AND A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) SHALL BE IMPLEMENTED CONCURRENTLY WITH THE COMMENCEMENT OF GRADING ACTIVITIES.
5. PRIOR TO ISSUANCE OF A GRADING OR A CONSTRUCTION PERMIT, A COPY OF THE NOTICE OF INTENT (NOI) WITH A VALID WASTE DISCHARGE ID NUMBER (WDID#) SHALL BE SUBMITTED TO THE CITY OF SAN DIEGO AS A PROOF OF ENROLLMENT UNDER THE CONSTRUCTION GENERAL PERMIT. WHEN OWNERSHIP OF THE ENTIRE SITE OR PORTIONS OF THE SITE CHANGES PRIOR TO FILING OF THE NOTICE OF TERMINATION (NOT), A REVISED NOI SHALL BE SUBMITTED ELECTRONICALLY TO THE STATE WATER RESOURCES BOARD IN ACCORDANCE WITH THE PROVISIONS AS SET FORTH IN SECTION II.C OF ORDER NO. 2009-0009-DWQ AND A COPY SHALL BE SUBMITTED TO THE CITY.



SECTION A-A
PROPOSED PRIVATE ESPLANADE COURT
NOT TO SCALE



SECTION B-B
PROPOSED PRIVATE ESPLANADE COURT
NOT TO SCALE

NORTH

GRAPHIC SCALE IN FEET
0 20 40 80

PREPARED BY:
Kimley»Horn
NAME:
ADDRESS: 401 B. STREET SAN DIEGO, CA 92101
PHONE: (619) 272-7111

ORIGINAL DATE:	3/15/2016
REVISION DATE:	7/28/2016
REVISION DATE:	12/12/2016
REVISION DATE:	12/19/2017
REVISION DATE:	6/10/2019

SHEET TITLE:
PRELIM. GRADING AND DRAINAGE PLAN

SHEET NO. 6 OF 67

PTS #: 477943
PROJECT #: 477943

Regency Centers.
REGENCY CENTERS
420 STEVENS AVE. SUITE 320
SOLANA BEACH, CA 92075

9/25/2019 7:50 AM
K:\SND_LDEV\095930002 - Costa Verde Shopping Ctr\Design\Grading & Drainage Plan.dwg

Attachment 5
Drainage Report

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

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Preliminary Drainage Study

COSTA VERDE CENTER

San Diego, Ca

Prepared for:

Regency Centers

COSTA VERDE CENTER

Preliminary Drainage Study

P.T.S. No. 477943
Drawing No. _____
IO No. _____

June 2019

Prepared for:

Regency Centers
420 Stevens Avenue, Suite 320
Solana Beach, CA 92075

Tom Eagling R.C.E. 75897

Contents

Tables

Exhibits

Appendices

1 INTRODUCTION

The proposed Costa Verde Center project (herein referred to as "Project") is located at northwest corner of the intersection of Genesee Avenue and Nobel Drive in the City of San Diego. The Project has been previously developed as a commercial shopping center and will be redeveloped with retail, office space, and a hotel. Genesee Avenue improvements (including the addition of the Trolley as a part of the Midcoast Project) are also proposed and are planned to be interwoven into the proposed design for the Costa Verde Center, although not a part of this project.

The Project consists of a 13.86-acre property to be redeveloped as a commercial center. See **Exhibit A**, Vicinity Map.

2 DESIGN CRITERIA AND METHODOLOGY

Runoff calculations are based on the requirements outlined in the City of San Diego Hydrology Manual. The proposed pipes have been designed to accommodate a 50-year storm event. A runoff coefficient of 0.82 was utilized for this site, based on **Table 3-1**, Runoff Coefficients for Urban Areas, per the City of San Diego County Hydrology Manual. Copies of all reference material are included with this report. See **Appendix A** – Hydrology Reference Material.

Runoff calculations for both the proposed and existing conditions were performed using the Rational Method Computer Program Package, Advanced Engineering Software (AES), 2006 version. The method calculates times of concentration and runoff volumes using the criteria specified in the San Diego County Hydrology Manual. Copies of all runoff calculations made are included with this report. See **Appendix B** – AES Hydrology Calculation Results.

3 EXISTING CONDITIONS

The existing site has been developed as a commercial shopping center with several multi-level buildings and a large underground parking structure per the Costa Verde Improvement and Grading Plans, City of San Diego Drawing Number 22969-D, dated June 27, 1995. The existing storm drain within the right-of-way that serves the Project was constructed per the same set of plans. The total project site consists of two lots (lot 13 & 14), with lot 13 north of Esplanade Court and lot 14 to the south. These two lots form two separate hydrological basins with 2 separate discharge locations. Lot 13 as it exists today, consists of one commercial building with its associated parking lot. Surface runoff drains from east to west where it enters a grated inlet and is conveyed by an 18" RCP storm drain (POC 2) which leads to the storm drain system along La Jolla Village Drive to the mprth. Runoff from Esplanade Court and its tributary area is captured by curb inlets prior to exiting the property (POC 3). The collected runoff is conveyed to the existing storm drain in Genesee Avenue. The existing topography of the south lot (Lot 14) slopes generally from North to South. Drainage contributes to the existing private onsite storm drain system through both grated and curb inlets (as well as on-structure grated inlets because of the large underground parking structure), which is routed south across Nobel Drive (POC 1) and outlets to the

existing natural Rose Canyon Channel, to the south. The channel accepts site flow, as well as runoff from adjacent parcels and adjacent public roadway segments. See **Exhibit B** for **Existing Drainage Exhibit**.

Table 3.1 summarizes the peak runoff for the underground detention basin for both the existing, ultimate and detained conditions.

Table 3–1 Existing Conditions Peak Runoff

	Area (ac)	50 Year Storm Event (cfs)	100 Year Storm Event (cfs)
$Q_{Existing}$ **(POC 1)**	10.80	44.36	51.34
$Q_{Existing}$ **(POC 2)**	0.90	3.72	4.27
$Q_{Existing}$ **(POC 3)**	1.60	6.64	7.80

4 PROPOSED CONDITIONS

The total disturbed area consists of 11.92 acres. A portion of the site adjacent to the improvements (0.66 acres) includes perimeter landscaping that drains to adjacent streets (Genesee Avenue and Nobel Drive). Another portion of the property that is included in the hydrology calculations is the existing McDonalds and Chevron (2.24 acres). Both will remain unchanged by this project.

Stormwater runoff onsite will be collected by inlets and catch basins, which will then be routed through proprietary biofiltration systems and into the storm drain system located within the underground parking structure (storm drain system within the parking structure will be designed by others). Stormwater will then be conveyed to the underground detention basin. The underground basin is sized appropriately to detain the increase in runoff generated by the proposed improvements or the required hydromodification volume. Mitigated runoff will exit the basin and flow into the existing 24” RCP storm drain (POC 1) that connects to the Nobel Drive storm drain system and enters the existing Rose Canyon channel as was done in the existing condition. See **Exhibit C** for **Proposed Drainage Exhibit**.

AES was used to determine the peak flows for the proposed condition. Per the City of San Diego 2017 Drainage Design Manual, the 50-year storm event was used to determine minimum pipe sizes for the site. A minimum size of 6” was used in the AES model for storm drain lines onsite. The 100-year rain event was used to determine the minimum volume required for the detention volume for the underground detention basin. See **Table 4-1** for onsite peak runoff rates that are conveyed to the existing storm drain.

Table 4–1 Proposed Conditions Peak Runoff

	Area (ac)	50 Year Storm Event (cfs)	100 Year Storm Event (cfs)
$Q_{Proposed}$ **(POC 1)**	13.50	58.38	63.53
$Q_{Proposed}$ **(POC 2)**	N/A	N/A	N/A
$Q_{Proposed}$ **(POC 3)**	N/A	N/A	N/A

As discussed above, the underground detention basin is sized to accommodate the increase in runoff generated by the proposed improvements and the required hydromodification volume. Since the hydromodification volume is larger than the differential volume between existing and proposed peak flows, the hydromodification volume governed. The 100-year peak flow and time of concentration were entered into RickRat Hydro to generate a hydrograph for the proposed conditions. The hydrograph was exported into Hydraflow to route flows through the detention basin with hydromodification control. See **Table 4-2** for a summary and **Appendix C** for results. Hydrographs were not generated for POC's 2 and 3 because they will not be used for discharge in the proposed condition.

Table 4–2 Underground Detention Basin Results Summary (POC 1)

	Proposed Basin Inflow (cfs)	Proposed Basin Outflow (cfs)	Allowable Discharge (cfs)
100-Year	65.53	17.53	44.36

As mentioned previously, the proposed project discharges into a storm drain system that is owned and operated by the City of San Diego. The City of San Diego falls within the R9-2013-0001 National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer System (MS4s) draining the watersheds within the San Diego region. A storm water quality management plan was prepared for the project to demonstrate permit compliance.

A 401 Certification and 404 permit is not required for the project. 401 certifications are required for projects that discharge into navigateable waters. The 404 permit regulates the discharge of dredge or fill material into waters of the United States. This project will not discharge to navigateable water or discharge dredge fill material into waters of the US.

5 CONCLUSION

Costa Verde Center preliminary drainage study provides analysis showing that the proposed onsite storm drain system accounts for the proposed Project runoff on both lots. Runoff generated from this proposed project will not negatively affect neighboring properties and/or projects. All drainage design and flow patterns proposed herein are in accordance with requirements outlined in the City of San Diego Drainage Design Manual.

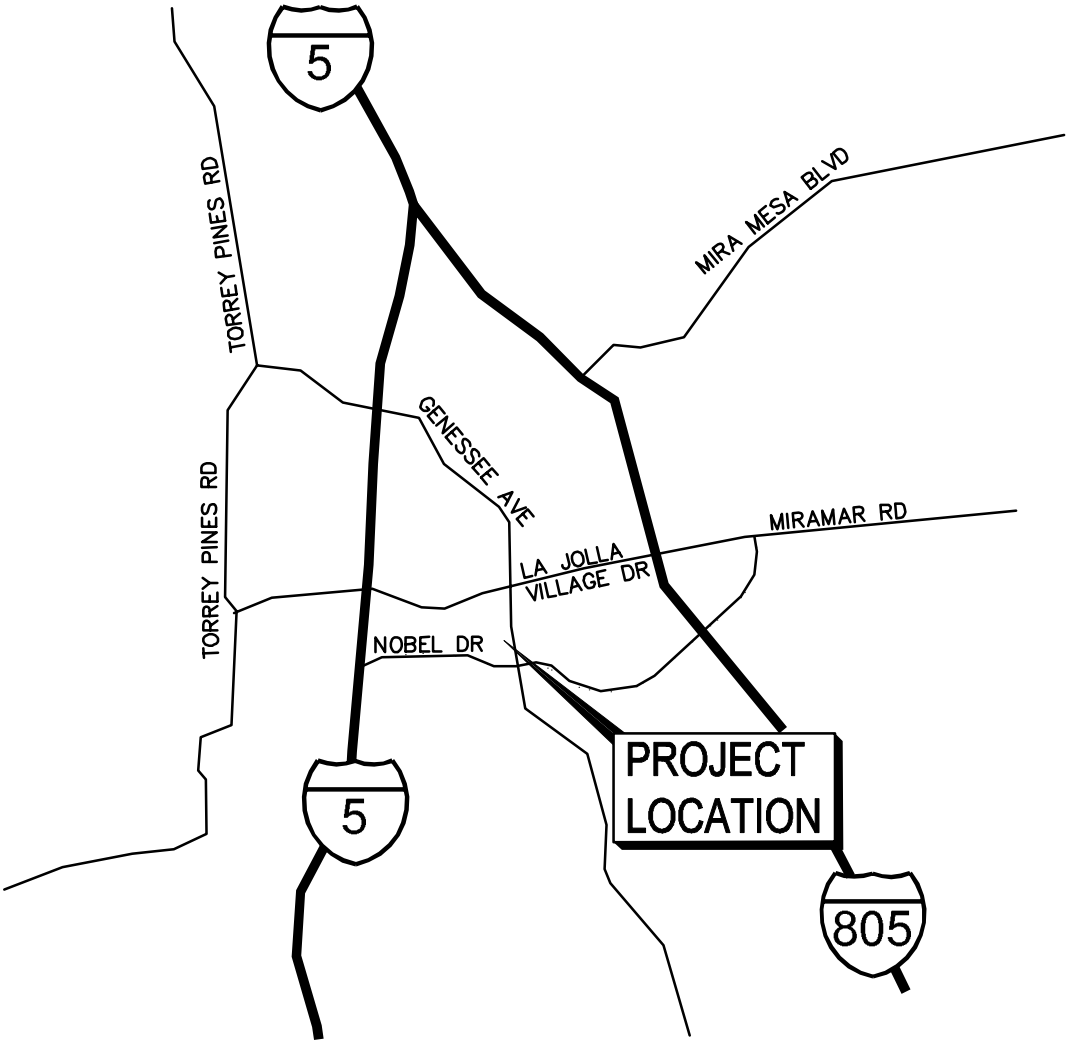
6 REFERENCES

This Drainage Study incorporates, by reference, the appropriate elements of the following documents and plans required by local; State or Federal agencies.

1. City of San Diego Drainage Design Manual
2. City of San Diego Stormwater Standards Manual

EXHIBIT A

VICINITY MAP



NORTH

NTS

Kimley»Horn

Costa Verde Center
VICINITY MAP

K:\SND_LDEV\095930002 - Costa Verde Shopping Ctr\Drainage\Drainage Study\Exhibit\Vicinity Map.dwg 11-17-15-3:27 PM

EXHIBIT B

EXISTING DRAINAGE EXHIBIT

LEGEND:
- PROJECT BOUNDARY
- DRAINAGE AREA BOUNDARY
- FLOW PATH
- ### NODE
- EXISTING STORM DRAIN

COSTA VERDE BLVD

NOBEL DRIVE

GENESEE AVENUE

ESPLANADE CT

A01 0.74 AC
A02 0.91 AC
A03 0.33 AC
A04 0.76 AC
A05 2.74 AC
A06 0.54 AC
A07 0.88 AC
A08 0.19 AC
A09 0.18 AC
A10 0.21 AC
A11 0.27 AC
A12 0.27 AC
A13 0.62 AC
A14 0.16 AC
A15 0.68 AC
A16 0.48 AC
A17 0.11 AC
A18 0.09 AC
A19 0.21 AC
A20 1.08 AC
A21 0.44 AC
A22 0.56 AC
A23 0.86 AC

363 364 359 360 365 332 331 330 354 356.1 356.2 356 362 355 334 336 342 344 345 341 343 348 316 314 315 339 337 338 307 308 306 311 310.1 312 310 313 309 325 326 318 317 320 321 323 319 324 329 349 350 347 346 352 351 353 100 101 102 103 104 105 106 200 201 202 203 300 301 302

SCALE: 1" = 40'

EXHIBIT C

PROPOSED DRAINAGE EXHIBIT

LEGEND:
- PROJECT BOUNDARY
- DRAINAGE AREA BOUNDARY
- FLOW PATH
- ### NODE
- SD STORM DRAIN

COSTA VERDE BLVD

A13
0.76 AC

A14
1.12 AC

A10
1.67 AC

A05
0.50 AC

A04
0.30 AC

A03
0.50 AC

A02
0.48 AC

A01
0.98 AC

A02.1
0.70 AC

A06.1
1.47 AC

A06
1.59 AC

A08
1.78 AC

A07
0.24 AC

A11
0.20 AC

A12
0.93 AC

A09
0.29 AC

POC1
Q_50EX=44.36 CFS
Q_50PR=58.38 CFS
Q_100EX=51.39 CFS
Q_100PR=63.53 CFS
Q_100MIT=17.53X CFS

Q_50EX=3.72 CFS
Q_50PR=0 CFS

UNDERGROUND BASIN FOR HYDROMODIFICATION CONTROL

NOBEL DRIVE

ESPLANADE CT

GENESEE AVENUE

SCALE: 1" = 40'

NORTH

9/25/19

Kimley»Horn

Costa Verde Center - Proposed Drainage

EXHIBIT 'C'

I:\SND_LJST\069630002 - Costa Verde Shopping Ctr\Drainage\Drainage Study\Exhibit\VWD Backup\Exhibit C - Proposed Drainage Exhibit.dwg

APPENDIX A

HYDROLOGY REFERENCE MATERIAL

$USER
$TIME
$DATE
$IP-SHORT-PEN-TABLE
$REQUEST

PARSONS BRINCKERHOFF
401 B STREET, SUITE 1650 SAN DIEGO, CA 92101
TEL (619) 338-9376 FAX (619) 338-8123

RELATIVE BORDER SCALE IS IN INCHES 0 1 2

MID-COAST CORRIDOR TRANSIT PROJECT

	DATE
DESIGNED BY	
DRAWN BY	
CHECKED BY	
SANDAG	

SANDAG
San Diego Association of Governments
401 B STREET, SUITE 800, SAN DIEGO, CA 92101-4231(619) 699-1900

MID-COAST CORRIDOR TRANSIT PROJECT
ALTERNATIVE TYPE
HYDROMODIFICATION MANAGEMENT PLAN
GENESEE Ave (Rose Creek)

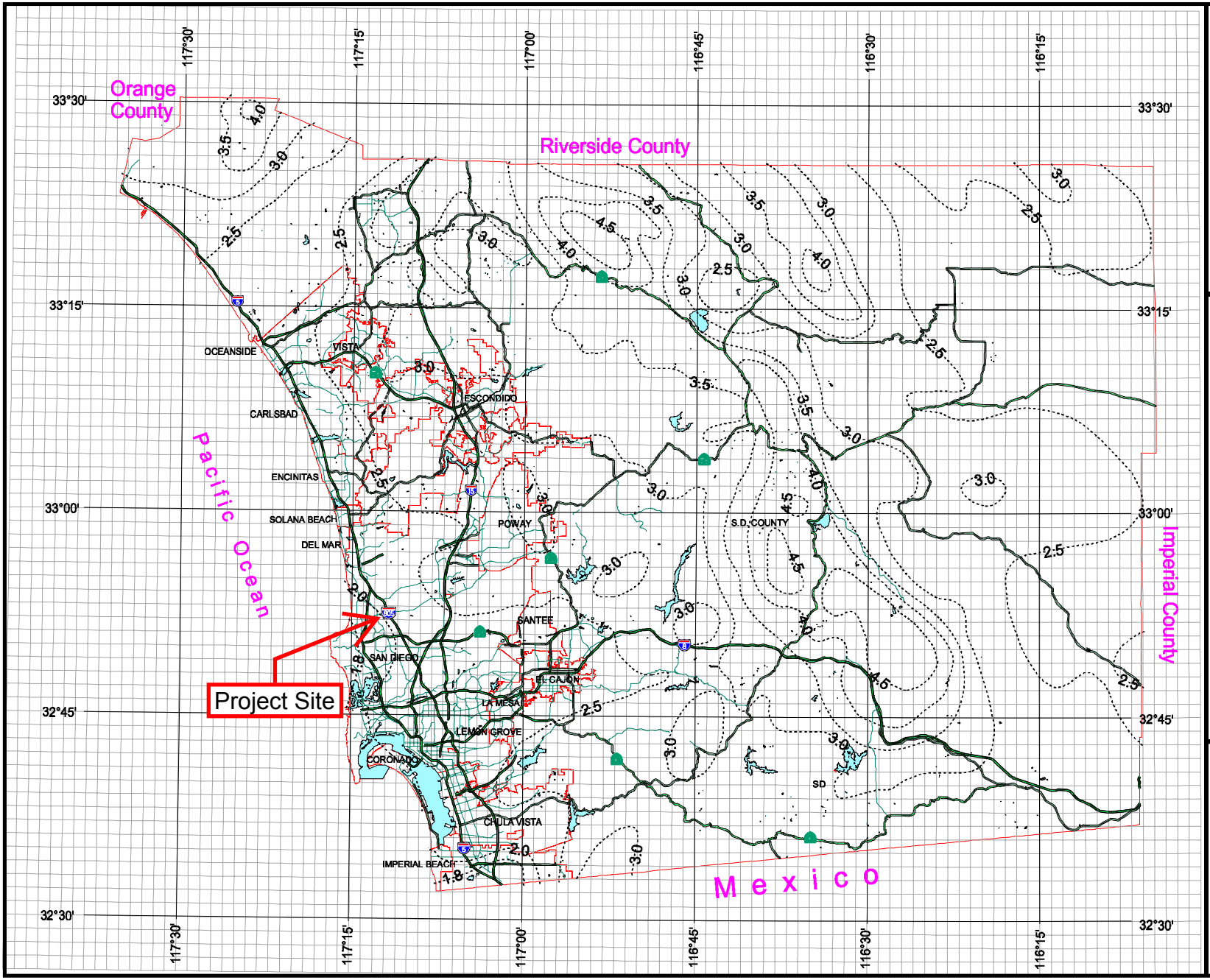
SCALE	HORIZ: 1"=500'
SANDAG CONTRACT NO.	5001904
DRAWING NO.	SHEET NO. 2

County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 6 Hours

Isopluvial (inches)



DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

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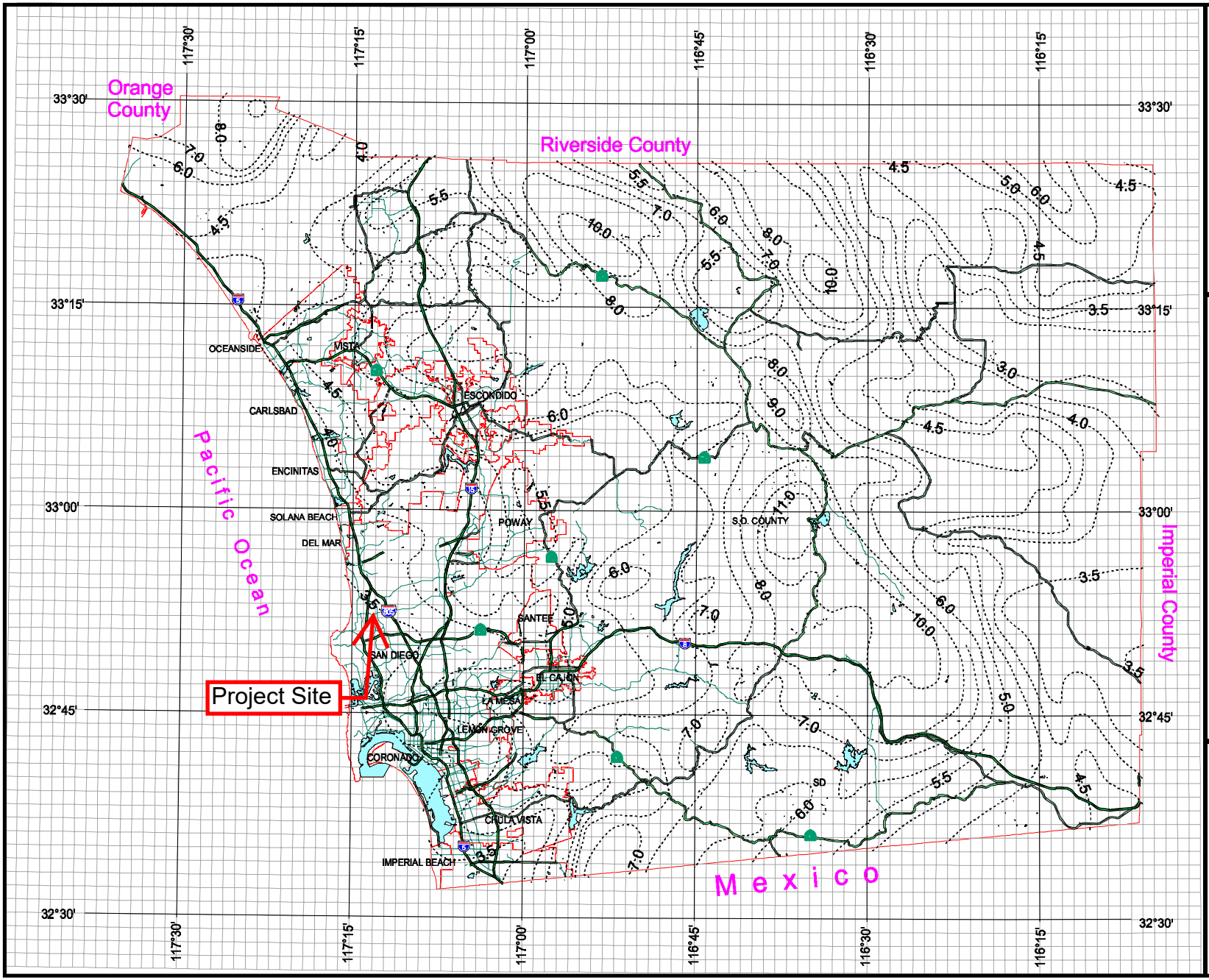
3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 24 Hours

Isopluvial (inches)



DPW GIS
Department of Public Works Geographic Information Services

SanGIS
We Have San Diego Covered!

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3 0 3 Miles

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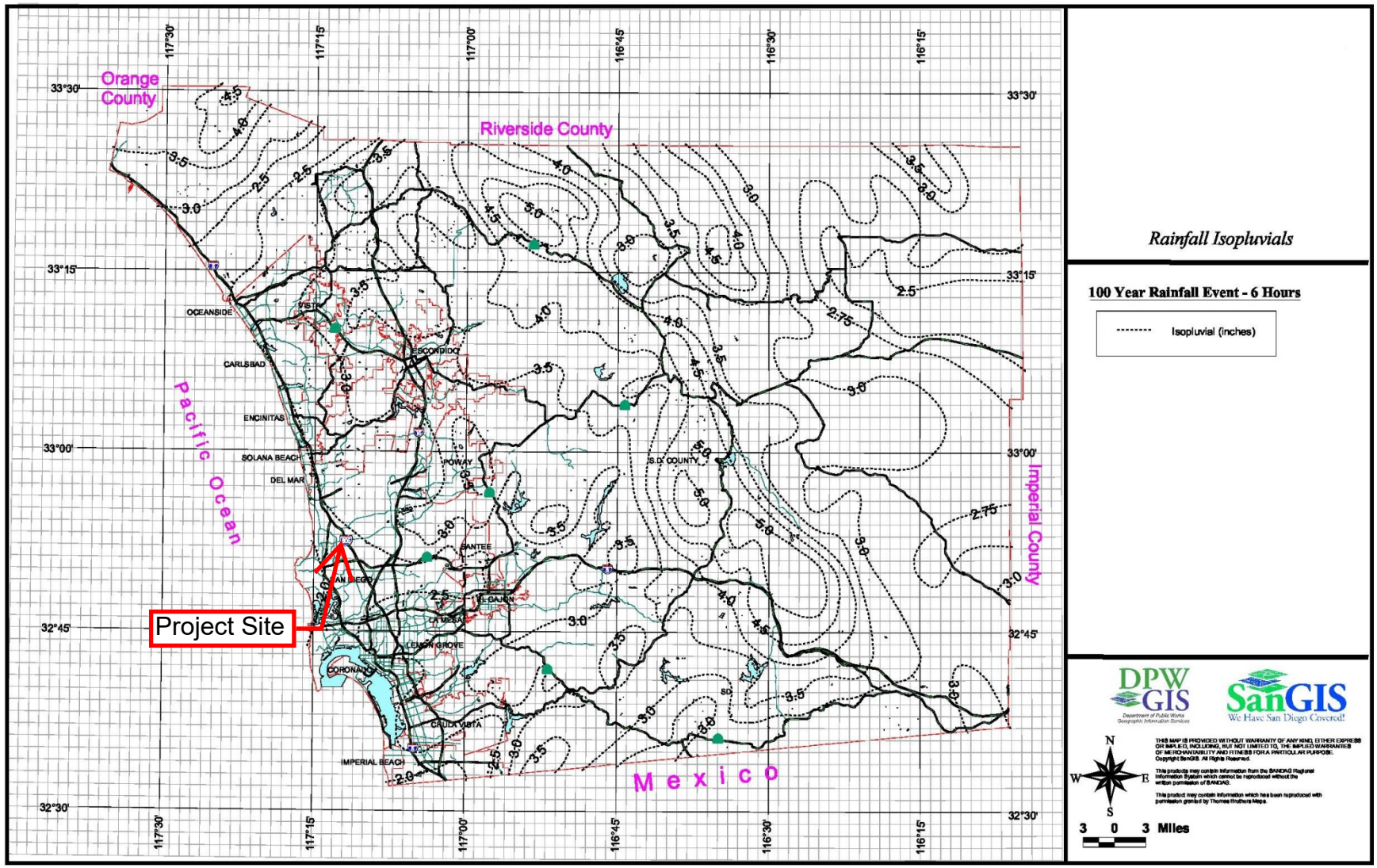
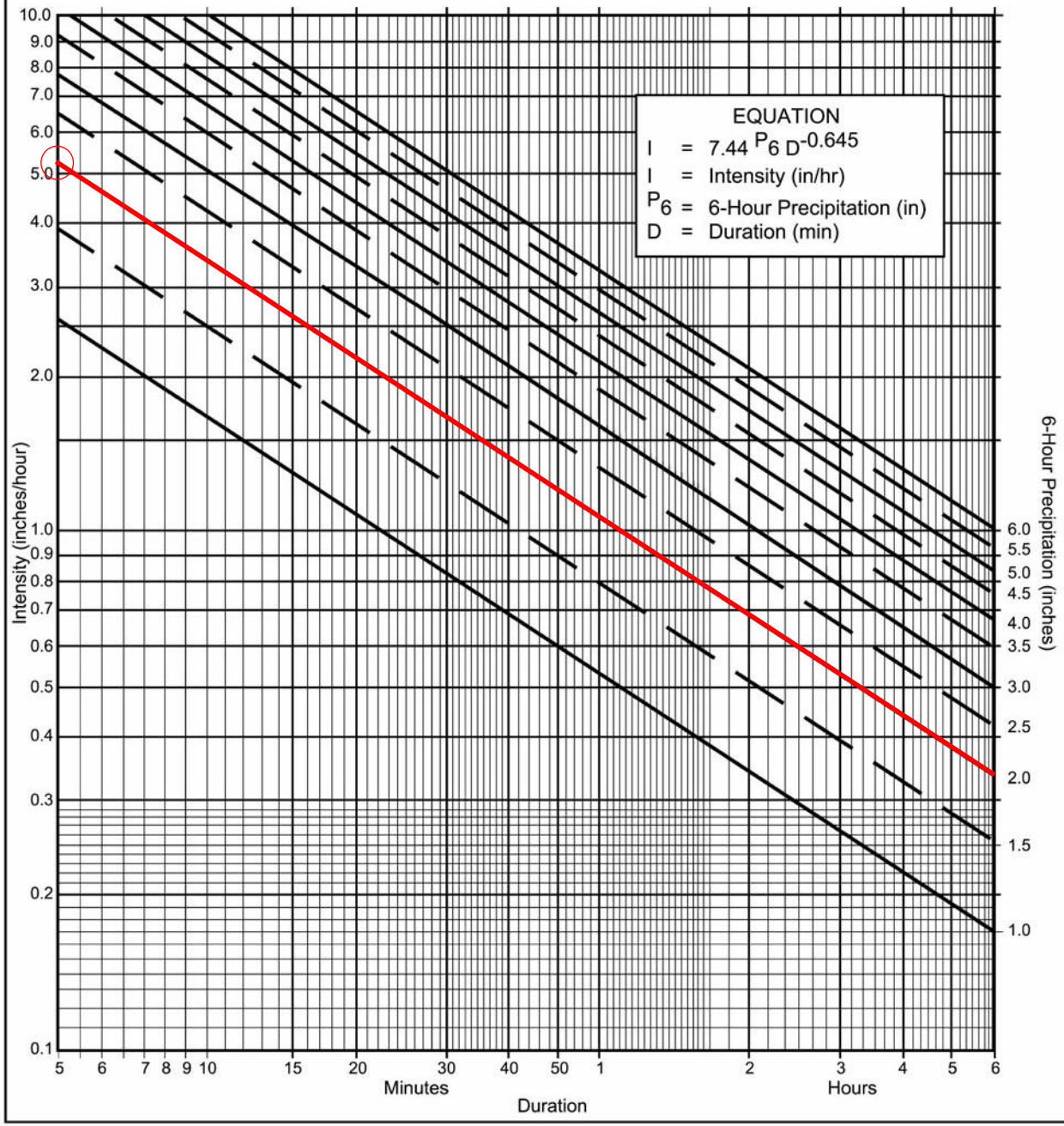


Figure B-2. 100-Year 6-Hour Isopluvials.



Directions for Application:

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

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

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

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

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

Application Form:

(a) Selected frequency 50 year

(b) P_6 = 2 in., P_{24} = 3.5, $\frac{P_6}{P_{24}}$ = 0.57 %(2)

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

(d) t_x = 5 min.

(e) I = 5.3 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

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

APPENDIX B

AES HYDROLOGY CALCULATION RESULTS

```
_____
********************************************************************************

            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:




 ************************** DESCRIPTION OF STUDY **************************
* EXSITING DRAINAGE - 50 YEAR - COSTA VERDE CENTER                         *
* KIMLEY-HORN & ASSOCIATES                                                 *
* JUNE 2019 - MJS                                                          *
 ****************************************************************************

  FILE NAME: CVC50E.DAT
  TIME/DATE OF STUDY: 16:56 06/09/2019
--------------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  50.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.000
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  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   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

********************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    363.49
  DOWNSTREAM ELEVATION(FEET) =    362.68
  ELEVATION DIFFERENCE(FEET) =      0.81
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.053
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    56.20
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    362.68  DOWNSTREAM(FEET) =    358.76
  CHANNEL LENGTH THRU SUBAREA(FEET) =   126.00   CHANNEL SLOPE =  0.0311
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.55
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.78
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   0.76
  Tc(MIN.) =    4.81
  SUBAREA AREA(ACRES) =     0.98       SUBAREA RUNOFF(CFS) =    4.23
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        1.1         PEAK FLOW RATE(CFS) =       4.67

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   3.02
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     226.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   350.33  DOWNSTREAM(FEET) =   349.58
  FLOW LENGTH(FEET) =    80.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.57
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.67
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    5.01
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     306.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 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.) =    5.01
  RAINFALL INTENSITY(INCH/HR) =   5.26
  TOTAL STREAM AREA(ACRES) =     1.08
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.67

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    363.97
  DOWNSTREAM ELEVATION(FEET) =    361.28
  ELEVATION DIFFERENCE(FEET) =      2.69
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.280
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    81.90
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
```

```
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    361.28  DOWNSTREAM(FEET) =    358.84
  CHANNEL LENGTH THRU SUBAREA(FEET) =   220.00   CHANNEL SLOPE =  0.0111
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.857
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.35
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.53
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   2.39
  Tc(MIN.) =    5.67
  SUBAREA AREA(ACRES) =     0.46       SUBAREA RUNOFF(CFS) =    1.83
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       2.23

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.11   FLOW VELOCITY(FEET/SEC.) =   1.81
  LONGEST FLOWPATH FROM NODE    104.00 TO NODE    103.00 =     320.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 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.) =    5.67
  RAINFALL INTENSITY(INCH/HR) =   4.86
  TOTAL STREAM AREA(ACRES) =     0.56
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.23

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        4.67     5.01        5.261          1.08
      2        2.23     5.67        4.857          0.56

  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        6.64     5.01       5.261
      2        6.54     5.67       4.857

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       6.64   Tc(MIN.) =    5.01
  TOTAL AREA(ACRES) =        1.6
  LONGEST FLOWPATH FROM NODE    104.00 TO NODE    103.00 =     320.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    106.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   349.58  DOWNSTREAM(FEET) =   346.83
```

```
  FLOW LENGTH(FEET) =    38.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.19
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.64
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    5.05
  LONGEST FLOWPATH FROM NODE    104.00 TO NODE    106.00 =     358.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    361.38
  DOWNSTREAM ELEVATION(FEET) =    359.33
  ELEVATION DIFFERENCE(FEET) =      2.05
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.447
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    75.50
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    359.33  DOWNSTREAM(FEET) =    358.11
  CHANNEL LENGTH THRU SUBAREA(FEET) =   109.00   CHANNEL SLOPE =  0.0112
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.07
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.74
  AVERAGE FLOW DEPTH(FEET) =   0.11   TRAVEL TIME(MIN.) =   1.04
  Tc(MIN.) =    4.49
  SUBAREA AREA(ACRES) =     0.76       SUBAREA RUNOFF(CFS) =    3.28
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.9         PEAK FLOW RATE(CFS) =       3.72

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.13   FLOW VELOCITY(FEET/SEC.) =   2.08
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     209.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   343.97  DOWNSTREAM(FEET) =   343.19
  FLOW LENGTH(FEET) =    91.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.99
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.72
  PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    4.74
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =     300.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    85.00
  UPSTREAM ELEVATION(FEET) =    373.75
  DOWNSTREAM ELEVATION(FEET) =    364.05
  ELEVATION DIFFERENCE(FEET) =      9.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.157
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    363.73  DOWNSTREAM(FEET) =    363.69
  CHANNEL LENGTH THRU SUBAREA(FEET) =    40.00   CHANNEL SLOPE =  0.0010
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.17
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.60
  AVERAGE FLOW DEPTH(FEET) =   0.14   TRAVEL TIME(MIN.) =   1.11
  Tc(MIN.) =    3.27
  SUBAREA AREA(ACRES) =     0.34       SUBAREA RUNOFF(CFS) =    1.47
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.4         PEAK FLOW RATE(CFS) =       1.90

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   0.71
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =     125.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    306.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   361.00  DOWNSTREAM(FEET) =   359.31
  FLOW LENGTH(FEET) =   169.00   MANNING'S N =  0.010
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.45
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.90
  PIPE TRAVEL TIME(MIN.) =   0.52    Tc(MIN.) =    3.79
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    306.00 =     294.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    306.00 TO NODE    306.00 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.) =    3.79
```

```
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     0.44
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.90

****************************************************************************
  FLOW PROCESS FROM NODE    307.00 TO NODE    308.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    374.08
  DOWNSTREAM ELEVATION(FEET) =    363.95
  ELEVATION DIFFERENCE(FEET) =     10.13
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.340
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    308.00 TO NODE    306.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    363.95  DOWNSTREAM(FEET) =    362.69
  CHANNEL LENGTH THRU SUBAREA(FEET) =    40.00   CHANNEL SLOPE =  0.0315
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.25
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.35
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.28
  Tc(MIN.) =    2.62
  SUBAREA AREA(ACRES) =     0.38       SUBAREA RUNOFF(CFS) =    1.64
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       2.07

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   2.66
  LONGEST FLOWPATH FROM NODE    307.00 TO NODE    306.00 =     140.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    306.00 TO NODE    306.00 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.) =    2.62
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     0.48
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.07

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.90     3.79        5.269          0.44
      2        2.07     2.62        5.269          0.48

  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        3.39     2.62       5.269
      2        3.98     3.79       5.269

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.98   Tc(MIN.) =    3.79
  TOTAL AREA(ACRES) =        0.9
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    306.00 =     294.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    306.00 TO NODE    309.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   359.31  DOWNSTREAM(FEET) =   358.60
  FLOW LENGTH(FEET) =    71.00   MANNING'S N =  0.010
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.39
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.98
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    3.89
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    309.00 =     365.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    309.00 TO NODE    309.00 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.) =    3.89
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     0.92
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.98

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    310.10 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    363.63
  DOWNSTREAM ELEVATION(FEET) =    363.28
  ELEVATION DIFFERENCE(FEET) =      0.35
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.014
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    310.10 TO NODE    311.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    363.28  DOWNSTREAM(FEET) =    362.58
  CHANNEL LENGTH THRU SUBAREA(FEET) =    20.00   CHANNEL SLOPE =  0.0350
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
```

```
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.45
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.79
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   0.19
  Tc(MIN.) =    4.20
  SUBAREA AREA(ACRES) =     0.01       SUBAREA RUNOFF(CFS) =    0.04
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.48

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.05   FLOW VELOCITY(FEET/SEC.) =   1.88
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    311.00 =      70.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    311.00 TO NODE    309.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   361.09  DOWNSTREAM(FEET) =   358.60
  FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   1.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.42
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.48
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    4.33
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    309.00 =     120.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    309.00 TO NODE    309.00 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.) =    4.33
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     0.11
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    312.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    363.63
  DOWNSTREAM ELEVATION(FEET) =    362.55
  ELEVATION DIFFERENCE(FEET) =      1.08
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.431
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    312.00 TO NODE    309.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   361.50  DOWNSTREAM(FEET) =   358.60
  FLOW LENGTH(FEET) =    70.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   1.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.84
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.43
```

```
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    3.63
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    309.00 =     135.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    309.00 TO NODE    309.00 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.) =    3.63
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     0.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.43

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        3.98     3.89        5.269          0.92
      2        0.48     4.33        5.269          0.11
      3        0.43     3.63        5.269          0.10

  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        4.81     3.63       5.269
      2        4.83     3.89       5.269
      3        4.88     4.33       5.269

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.88   Tc(MIN.) =    4.33
  TOTAL AREA(ACRES) =        1.1
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    309.00 =     365.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    309.00 TO NODE    313.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   358.60  DOWNSTREAM(FEET) =   357.57
  FLOW LENGTH(FEET) =   103.00   MANNING'S N =  0.010
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.22
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.88
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    4.61
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    313.00 =     468.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    313.00 TO NODE    313.00 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.) =    4.61
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     1.13
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.88

****************************************************************************
  FLOW PROCESS FROM NODE    314.00 TO NODE    315.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
```

```
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    373.56
  DOWNSTREAM ELEVATION(FEET) =    373.06
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.564
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    315.00 TO NODE    316.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    373.06  DOWNSTREAM(FEET) =    363.48
  CHANNEL LENGTH THRU SUBAREA(FEET) =    50.00   CHANNEL SLOPE =  0.1916
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.80
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.38
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   0.19
  Tc(MIN.) =    3.75
  SUBAREA AREA(ACRES) =     0.17       SUBAREA RUNOFF(CFS) =    0.73
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.17

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.05   FLOW VELOCITY(FEET/SEC.) =   4.61
  LONGEST FLOWPATH FROM NODE    314.00 TO NODE    316.00 =     100.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    316.00 TO NODE    313.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   361.98  DOWNSTREAM(FEET) =   361.02
  FLOW LENGTH(FEET) =    96.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   5.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.72
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.17
  PIPE TRAVEL TIME(MIN.) =   0.34    Tc(MIN.) =    4.09
  LONGEST FLOWPATH FROM NODE    314.00 TO NODE    313.00 =     196.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    313.00 TO NODE    313.00 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.) =    4.09
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     0.27
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.17

****************************************************************************
  FLOW PROCESS FROM NODE    317.00 TO NODE    318.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
==============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    26.00
  UPSTREAM ELEVATION(FEET) =    363.41
  DOWNSTREAM ELEVATION(FEET) =    363.08
  ELEVATION DIFFERENCE(FEET) =      0.33
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.374
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

******************************************************************************
  FLOW PROCESS FROM NODE    318.00 TO NODE    313.00 IS CODE =  51
------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    363.08  DOWNSTREAM(FEET) =    362.36
  CHANNEL LENGTH THRU SUBAREA(FEET) =    20.00   CHANNEL SLOPE =  0.0360
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.56
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.79
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.19
  Tc(MIN.) =    2.56
  SUBAREA AREA(ACRES) =     0.06       SUBAREA RUNOFF(CFS) =    0.26
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.69

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   2.06
  LONGEST FLOWPATH FROM NODE    317.00 TO NODE    313.00 =      46.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE    313.00 TO NODE    313.00 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.) =    2.56
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     0.16
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.69

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        4.88     4.61        5.269          1.13
      2        1.17     4.09        5.269          0.27
      3        0.69     2.56        5.269          0.16

  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        6.30     2.56       5.269
      2        6.74     4.09       5.269
      3        6.74     4.61       5.269
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       6.74   Tc(MIN.) =    4.61
  TOTAL AREA(ACRES) =        1.6
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    313.00 =     468.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    313.00 TO NODE    319.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   361.02  DOWNSTREAM(FEET) =   358.30
  FLOW LENGTH(FEET) =   138.00   MANNING'S N =  0.010
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.58
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.74
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =    4.87
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    319.00 =     606.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    319.00 TO NODE    319.00 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.) =    4.87
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     1.56
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.74

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    320.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    363.63
  DOWNSTREAM ELEVATION(FEET) =    362.92
  ELEVATION DIFFERENCE(FEET) =      0.71
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.159
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    54.20
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    320.00 TO NODE    321.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    362.92  DOWNSTREAM(FEET) =    362.45
  CHANNEL LENGTH THRU SUBAREA(FEET) =    34.00   CHANNEL SLOPE =  0.0138
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.67
```

```
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.32
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.43
  Tc(MIN.) =    4.59
  SUBAREA AREA(ACRES) =     0.11       SUBAREA RUNOFF(CFS) =    0.48
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.91

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   1.46
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    321.00 =     134.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    321.00 TO NODE    319.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   360.36  DOWNSTREAM(FEET) =   358.30
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.81
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.91
  PIPE TRAVEL TIME(MIN.) =   0.55    Tc(MIN.) =    5.14
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    319.00 =     294.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    319.00 TO NODE    319.00 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.) =    5.14
  RAINFALL INTENSITY(INCH/HR) =   5.17
  TOTAL STREAM AREA(ACRES) =     0.21
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.91

****************************************************************************
  FLOW PROCESS FROM NODE    317.00 TO NODE    323.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    363.41
  DOWNSTREAM ELEVATION(FEET) =    362.41
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.904
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    323.00 TO NODE    319.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    362.41  DOWNSTREAM(FEET) =    361.96
  CHANNEL LENGTH THRU SUBAREA(FEET) =    39.00   CHANNEL SLOPE =  0.0115
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
```

```
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.56
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.69
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   0.38
  Tc(MIN.) =    4.29
  SUBAREA AREA(ACRES) =     0.52       SUBAREA RUNOFF(CFS) =    2.25
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       2.68

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   1.90
  LONGEST FLOWPATH FROM NODE    317.00 TO NODE    319.00 =     139.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    319.00 TO NODE    319.00 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.) =    4.29
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     0.62
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.68

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        6.74     4.87        5.269          1.56
      2        0.91     5.14        5.175          0.21
      3        2.68     4.29        5.269          0.62

  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       10.18     4.29       5.269
      2       10.28     4.87       5.269
      3       10.16     5.14       5.175

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.28   Tc(MIN.) =    4.87
  TOTAL AREA(ACRES) =        2.4
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    319.00 =     606.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    319.00 TO NODE    329.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   361.96  DOWNSTREAM(FEET) =   340.75
  FLOW LENGTH(FEET) =   209.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.47
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.28
  PIPE TRAVEL TIME(MIN.) =   0.18    Tc(MIN.) =    5.05
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    329.00 =     815.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    329.00 TO NODE    329.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    325.00 TO NODE    326.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    362.81
  DOWNSTREAM ELEVATION(FEET) =    352.23
  ELEVATION DIFFERENCE(FEET) =     10.58
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.340
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    326.00 TO NODE    324.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    352.23  DOWNSTREAM(FEET) =    349.25
  CHANNEL LENGTH THRU SUBAREA(FEET) =    57.00   CHANNEL SLOPE =  0.0523
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.80
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.39
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.40
  Tc(MIN.) =    2.74
  SUBAREA AREA(ACRES) =     0.17       SUBAREA RUNOFF(CFS) =    0.73
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.17

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   2.72
  LONGEST FLOWPATH FROM NODE    325.00 TO NODE    324.00 =     157.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    324.00 TO NODE    324.00 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.) =    2.74
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     0.27
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.17

****************************************************************************
  FLOW PROCESS FROM NODE    346.00 TO NODE    347.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    53.00
  UPSTREAM ELEVATION(FEET) =    373.73
  DOWNSTREAM ELEVATION(FEET) =    373.20
  ELEVATION DIFFERENCE(FEET) =      0.53
```

```
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.669
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    347.00 TO NODE    324.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    373.20  DOWNSTREAM(FEET) =    363.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =    40.00   CHANNEL SLOPE =  0.2500
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.63
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.76
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   0.18
  Tc(MIN.) =    3.85
  SUBAREA AREA(ACRES) =     0.09       SUBAREA RUNOFF(CFS) =    0.39
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.82

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.04   FLOW VELOCITY(FEET/SEC.) =   4.50
  LONGEST FLOWPATH FROM NODE    346.00 TO NODE    324.00 =      93.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    324.00 TO NODE    324.00 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.) =    3.85
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     0.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.82

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.17     2.74        5.269          0.27
      2        0.82     3.85        5.269          0.19

  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        1.75     2.74       5.269
      2        1.99     3.85       5.269

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.99   Tc(MIN.) =    3.85
  TOTAL AREA(ACRES) =        0.5
  LONGEST FLOWPATH FROM NODE    325.00 TO NODE    324.00 =     157.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    324.00 TO NODE    329.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
```

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   361.12  DOWNSTREAM(FEET) =   345.60
  FLOW LENGTH(FEET) =    58.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.76
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.99
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    3.90
  LONGEST FLOWPATH FROM NODE    325.00 TO NODE    329.00 =     215.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    329.00 TO NODE    329.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        1.99     3.90       5.269        0.46
  LONGEST FLOWPATH FROM NODE    325.00 TO NODE    329.00 =     215.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       10.28     5.05       5.234        2.39
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    329.00 =     815.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       9.92       3.90        5.269
      2      12.25       5.05        5.234

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      12.25   Tc(MIN.) =    5.05
  TOTAL AREA(ACRES) =        2.8

****************************************************************************
  FLOW PROCESS FROM NODE    329.00 TO NODE    329.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    329.00 TO NODE    329.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    337.00 TO NODE    338.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    90.00
  UPSTREAM ELEVATION(FEET) =    373.96
  DOWNSTREAM ELEVATION(FEET) =    372.96
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.821
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    61.67
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    338.00 TO NODE    339.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    372.96  DOWNSTREAM(FEET) =    363.92
  CHANNEL LENGTH THRU SUBAREA(FEET) =    86.00   CHANNEL SLOPE =  0.1051
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.69
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.93
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.36
  Tc(MIN.) =    4.19
  SUBAREA AREA(ACRES) =     0.58       SUBAREA RUNOFF(CFS) =    2.51
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       2.94

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   4.52
  LONGEST FLOWPATH FROM NODE    337.00 TO NODE    339.00 =     176.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    339.00 TO NODE    336.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   362.42  DOWNSTREAM(FEET) =   361.33
  FLOW LENGTH(FEET) =   109.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.93
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.94
  PIPE TRAVEL TIME(MIN.) =   0.31    Tc(MIN.) =    4.49
  LONGEST FLOWPATH FROM NODE    337.00 TO NODE    336.00 =     285.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    336.00 TO NODE    336.00 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.) =    4.49
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     0.68
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.94

****************************************************************************
  FLOW PROCESS FROM NODE    334.00 TO NODE    342.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    370.00
  DOWNSTREAM ELEVATION(FEET) =    369.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.904
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
```

```
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    342.00 TO NODE    336.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    369.00  DOWNSTREAM(FEET) =    363.42
  CHANNEL LENGTH THRU SUBAREA(FEET) =   104.00   CHANNEL SLOPE =  0.0537
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.38
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.73
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.63
  Tc(MIN.) =    4.54
  SUBAREA AREA(ACRES) =     0.44       SUBAREA RUNOFF(CFS) =    1.90
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       2.33

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   3.13
  LONGEST FLOWPATH FROM NODE    334.00 TO NODE    336.00 =     204.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    336.00 TO NODE    336.00 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.) =    4.54
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     0.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.33

****************************************************************************
  FLOW PROCESS FROM NODE    330.00 TO NODE    331.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    360.00
  DOWNSTREAM ELEVATION(FEET) =    345.54
  ELEVATION DIFFERENCE(FEET) =     14.46
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.340
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    331.00 TO NODE    332.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    345.54  DOWNSTREAM(FEET) =    345.37
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =    11.00   CHANNEL SLOPE =  0.0155
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.86
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.02
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   0.09
  Tc(MIN.) =    2.43
  SUBAREA AREA(ACRES) =     0.66       SUBAREA RUNOFF(CFS) =    2.85
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       3.28

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   2.13
  LONGEST FLOWPATH FROM NODE    330.00 TO NODE    332.00 =     111.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    332.00 TO NODE    336.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   343.87  DOWNSTREAM(FEET) =   341.72
  FLOW LENGTH(FEET) =   365.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.89
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.28
  PIPE TRAVEL TIME(MIN.) =   1.24    Tc(MIN.) =    3.67
  LONGEST FLOWPATH FROM NODE    330.00 TO NODE    336.00 =     476.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    336.00 TO NODE    336.00 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.) =    3.67
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     0.76
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.28

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        2.94     4.49        5.269          0.68
      2        2.33     4.54        5.269          0.54
      3        3.28     3.67        5.269          0.76

  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        7.58     3.67       5.269
      2        8.53     4.49       5.269
      3        8.56     4.54       5.269

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       8.56   Tc(MIN.) =    4.54
  TOTAL AREA(ACRES) =        2.0
  LONGEST FLOWPATH FROM NODE    330.00 TO NODE    336.00 =     476.00 FEET.

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

```
 FLOW PROCESS FROM NODE    336.00 TO NODE    341.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   341.72  DOWNSTREAM(FEET) =   341.11
 FLOW LENGTH(FEET) =   122.00   MANNING'S N =  0.010
 DEPTH OF FLOW IN  42.0 INCH PIPE IS   8.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.79
 GIVEN PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       8.56
 PIPE TRAVEL TIME(MIN.) =   0.35    Tc(MIN.) =    4.89
 LONGEST FLOWPATH FROM NODE    330.00 TO NODE    341.00 =     598.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    341.00 TO NODE    341.00 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.) =    4.89
 RAINFALL INTENSITY(INCH/HR) =   5.27
 TOTAL STREAM AREA(ACRES) =     1.98
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.56

****************************************************************************
 FLOW PROCESS FROM NODE    343.00 TO NODE    344.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  95
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
 UPSTREAM ELEVATION(FEET) =    364.11
 DOWNSTREAM ELEVATION(FEET) =    351.22
 ELEVATION DIFFERENCE(FEET) =     12.89
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.340
 WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.43
 TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
 FLOW PROCESS FROM NODE    344.00 TO NODE    345.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    351.22  DOWNSTREAM(FEET) =    350.28
 CHANNEL LENGTH THRU SUBAREA(FEET) =    24.00   CHANNEL SLOPE =  0.0392
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
 MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  95
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.67
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.14
 AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.19
 Tc(MIN.) =    2.53
 SUBAREA AREA(ACRES) =     0.11       SUBAREA RUNOFF(CFS) =    0.48
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
 TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.91

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   2.24
 LONGEST FLOWPATH FROM NODE    343.00 TO NODE    345.00 =     124.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    345.00 TO NODE    341.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   348.78  DOWNSTREAM(FEET) =   341.11
  FLOW LENGTH(FEET) =    39.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   2.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.27
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.91
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    2.58
  LONGEST FLOWPATH FROM NODE    343.00 TO NODE    341.00 =     163.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    341.00 TO NODE    341.00 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.) =    2.58
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     0.21
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.91

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        8.56     4.89        5.269          1.98
      2        0.91     2.58        5.269          0.21

  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        9.46     2.58       5.269
      2        9.46     4.89       5.269

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.46   Tc(MIN.) =    4.89
  TOTAL AREA(ACRES) =        2.2
  LONGEST FLOWPATH FROM NODE    330.00 TO NODE    341.00 =     598.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    341.00 TO NODE    329.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   341.11  DOWNSTREAM(FEET) =   340.75
  FLOW LENGTH(FEET) =    96.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  10.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.38
  GIVEN PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.46
  PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =    5.19
  LONGEST FLOWPATH FROM NODE    330.00 TO NODE    329.00 =     694.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    329.00 TO NODE    329.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
```

```
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        9.46     5.19       5.146        2.19
  LONGEST FLOWPATH FROM NODE    330.00 TO NODE    329.00 =     694.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       12.25     5.05       5.234        2.85
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    329.00 =     815.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      21.47       5.05        5.234
      2      21.51       5.19        5.146

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      21.51   Tc(MIN.) =    5.19
  TOTAL AREA(ACRES) =        5.0

****************************************************************************
  FLOW PROCESS FROM NODE    329.00 TO NODE    329.00 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.) =    5.19
  RAINFALL INTENSITY(INCH/HR) =   5.15
  TOTAL STREAM AREA(ACRES) =     5.04
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     21.51

****************************************************************************
  FLOW PROCESS FROM NODE    348.00 TO NODE    349.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    49.00
  UPSTREAM ELEVATION(FEET) =    350.39
  DOWNSTREAM ELEVATION(FEET) =    349.03
  ELEVATION DIFFERENCE(FEET) =      1.36
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.511
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    349.00 TO NODE    329.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    349.03  DOWNSTREAM(FEET) =    348.42
  CHANNEL LENGTH THRU SUBAREA(FEET) =    30.00   CHANNEL SLOPE =  0.0203
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.60
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.50
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.33
  Tc(MIN.) =    2.84
  SUBAREA AREA(ACRES) =     0.08       SUBAREA RUNOFF(CFS) =    0.35
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.78

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.81
  LONGEST FLOWPATH FROM NODE    348.00 TO NODE    329.00 =      79.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    329.00 TO NODE    329.00 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.) =    2.84
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     0.18
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.78

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       21.51     5.19        5.146          5.04
      2        0.78     2.84        5.269          0.18

  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       12.57     2.84       5.269
      2       22.27     5.19       5.146

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      22.27   Tc(MIN.) =    5.19
  TOTAL AREA(ACRES) =        5.2
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    329.00 =     815.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    329.00 TO NODE    350.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   340.80  DOWNSTREAM(FEET) =   338.90
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  10.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.45
  GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      22.27
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    5.32
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    350.00 =     915.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    350.00 TO NODE    350.00 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.) =    5.32
  RAINFALL INTENSITY(INCH/HR) =   5.06
  TOTAL STREAM AREA(ACRES) =     5.22
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     22.27

****************************************************************************
  FLOW PROCESS FROM NODE    351.00 TO NODE    352.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    354.21
  DOWNSTREAM ELEVATION(FEET) =    349.79
  ELEVATION DIFFERENCE(FEET) =      4.42
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.890
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    88.55
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    352.00 TO NODE    350.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    349.79  DOWNSTREAM(FEET) =    347.54
  CHANNEL LENGTH THRU SUBAREA(FEET) =    87.00   CHANNEL SLOPE =  0.0259
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.12
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.40
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   0.60
  Tc(MIN.) =    3.49
  SUBAREA AREA(ACRES) =     0.78       SUBAREA RUNOFF(CFS) =    3.37
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.9         PEAK FLOW RATE(CFS) =       3.80

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   2.79
  LONGEST FLOWPATH FROM NODE    351.00 TO NODE    350.00 =     187.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    350.00 TO NODE    350.00 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.) =    3.49
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     0.88
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.80

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       22.27     5.32        5.062         5.22
      2        3.80     3.49        5.269         0.88

  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       25.19     3.49       5.269
```

```
      2       25.92     5.32       5.062

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      25.92   Tc(MIN.) =    5.32
  TOTAL AREA(ACRES) =        6.1
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    350.00 =     915.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    350.00 TO NODE    353.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   338.80  DOWNSTREAM(FEET) =   333.90
  FLOW LENGTH(FEET) =   360.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  12.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.38
  GIVEN PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      25.92
  PIPE TRAVEL TIME(MIN.) =   0.53    Tc(MIN.) =    5.85
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    353.00 =    1275.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    353.00 TO NODE    353.00 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.) =    5.85
  RAINFALL INTENSITY(INCH/HR) =   4.76
  TOTAL STREAM AREA(ACRES) =     6.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     25.92

****************************************************************************
  FLOW PROCESS FROM NODE    354.00 TO NODE    355.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    370.00
  DOWNSTREAM ELEVATION(FEET) =    349.59
  ELEVATION DIFFERENCE(FEET) =     20.41
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.340
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    355.00 TO NODE    353.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    349.59  DOWNSTREAM(FEET) =    344.41
  CHANNEL LENGTH THRU SUBAREA(FEET) =   253.00   CHANNEL SLOPE =  0.0205
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.14
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.84
  AVERAGE FLOW DEPTH(FEET) =   0.15   TRAVEL TIME(MIN.) =   1.49
```

```
  Tc(MIN.) =    3.83
  SUBAREA AREA(ACRES) =     2.64       SUBAREA RUNOFF(CFS) =   11.41
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        2.7         PEAK FLOW RATE(CFS) =      11.84

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.19   FLOW VELOCITY(FEET/SEC.) =   3.39
  LONGEST FLOWPATH FROM NODE    354.00 TO NODE    353.00 =     353.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    353.00 TO NODE    353.00 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.) =    3.83
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     2.74
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.84

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       25.92     5.85        4.763          6.10
      2       11.84     3.83        5.269          2.74

  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       35.27     3.83       5.269
      2       36.62     5.85       4.763

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      36.62   Tc(MIN.) =    5.85
  TOTAL AREA(ACRES) =        8.8
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    353.00 =    1275.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    353.00 TO NODE    356.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   333.90  DOWNSTREAM(FEET) =   332.50
  FLOW LENGTH(FEET) =    93.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  14.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.00
  GIVEN PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      36.62
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    5.97
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    356.00 =    1368.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    356.00 TO NODE    356.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.97
  RAINFALL INTENSITY(INCH/HR) =   4.70
  TOTAL STREAM AREA(ACRES) =     8.84
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     36.62

****************************************************************************
  FLOW PROCESS FROM NODE    359.00 TO NODE    360.00 IS CODE =  21
```

```
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    360.00
  DOWNSTREAM ELEVATION(FEET) =    348.63
  ELEVATION DIFFERENCE(FEET) =     11.37
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.340
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

********************************************************************************
  FLOW PROCESS FROM NODE    360.00 TO NODE    356.00 IS CODE =  51
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    348.63  DOWNSTREAM(FEET) =    340.65
  CHANNEL LENGTH THRU SUBAREA(FEET) =   270.00   CHANNEL SLOPE =  0.0296
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.18
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.47
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   1.82
  Tc(MIN.) =    4.16
  SUBAREA AREA(ACRES) =     0.81       SUBAREA RUNOFF(CFS) =    3.50
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.9         PEAK FLOW RATE(CFS) =       3.93

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   2.89
  LONGEST FLOWPATH FROM NODE    359.00 TO NODE    356.00 =     370.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    356.00 TO NODE    356.00 IS CODE =   1
--------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.16
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     0.91
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.93

********************************************************************************
  FLOW PROCESS FROM NODE    363.00 TO NODE    364.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    348.63
  DOWNSTREAM ELEVATION(FEET) =    347.84
  ELEVATION DIFFERENCE(FEET) =      0.79
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.073
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    55.80
```

```
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    364.00 TO NODE    365.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    347.84  DOWNSTREAM(FEET) =    345.78
  CHANNEL LENGTH THRU SUBAREA(FEET) =   130.00   CHANNEL SLOPE =  0.0158
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.146
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.79
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.94
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   1.11
  Tc(MIN.) =    5.19
  SUBAREA AREA(ACRES) =     0.64       SUBAREA RUNOFF(CFS) =    2.70
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       3.12

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   2.22
  LONGEST FLOWPATH FROM NODE    363.00 TO NODE    365.00 =     230.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    365.00 TO NODE    356.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   342.88  DOWNSTREAM(FEET) =   332.10
  FLOW LENGTH(FEET) =   200.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.00
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.12
  PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =    5.49
  LONGEST FLOWPATH FROM NODE    363.00 TO NODE    356.00 =     430.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    356.00 TO NODE    356.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.49
  RAINFALL INTENSITY(INCH/HR) =   4.96
  TOTAL STREAM AREA(ACRES) =     0.74
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.12

****************************************************************************
  FLOW PROCESS FROM NODE    356.10 TO NODE    356.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    348.64
  DOWNSTREAM ELEVATION(FEET) =    343.68
```

```
  ELEVATION DIFFERENCE(FEET) =      4.96
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.802
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    89.90
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    356.20 TO NODE    356.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    343.68  DOWNSTREAM(FEET) =    340.65
  CHANNEL LENGTH THRU SUBAREA(FEET) =    50.00   CHANNEL SLOPE =  0.0606
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.93
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.77
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.30
  Tc(MIN.) =    3.10
  SUBAREA AREA(ACRES) =     0.23       SUBAREA RUNOFF(CFS) =    0.99
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.43

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   2.82
  LONGEST FLOWPATH FROM NODE    356.10 TO NODE    356.00 =     150.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    356.00 TO NODE    356.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  4 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.10
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     0.33
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.43

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       36.62     5.97        4.701          8.84
      2        3.93     4.16        5.269          0.91
      3        3.12     5.49        4.961          0.74
      4        1.43     3.10        5.269          0.33

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  4 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       38.79     3.10       5.269
      2       40.39     4.16       5.269
      3       42.87     5.49       4.961
      4       44.36     5.97       4.701

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
```

```
  PEAK FLOW RATE(CFS) =      44.36   Tc(MIN.) =    5.97
  TOTAL AREA(ACRES) =       10.8
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    356.00 =    1368.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    356.00 TO NODE    365.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   332.10  DOWNSTREAM(FEET) =   331.57
  FLOW LENGTH(FEET) =    53.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  17.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.81
  GIVEN PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      44.36
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    6.04
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    365.00 =    1421.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       10.8  TC(MIN.) =      6.04
  PEAK FLOW RATE(CFS)   =      44.36
============================================================================
============================================================================
  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:




 ************************** DESCRIPTION OF STUDY **************************
* EXISTING DRAINAGE - 100 YEAR - COSTA VERDE CENTER                       *
* KIMLEY-HORN & ASSOCIATES                                                *
* JUNE 2019 - MJS                                                         *
 ***************************************************************************

  FILE NAME: CVC100E.DAT
  TIME/DATE OF STUDY: 17:10 06/09/2019
----------------------------------------------------------------------------
  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) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  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   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    363.49
  DOWNSTREAM ELEVATION(FEET) =    362.68
  ELEVATION DIFFERENCE(FEET) =      0.81
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.053
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    56.20
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    362.68  DOWNSTREAM(FEET) =    358.76
  CHANNEL LENGTH THRU SUBAREA(FEET) =   126.00   CHANNEL SLOPE =  0.0311
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.93
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.74
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   0.77
  Tc(MIN.) =    4.82
  SUBAREA AREA(ACRES) =     0.98       SUBAREA RUNOFF(CFS) =    4.87
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        1.1         PEAK FLOW RATE(CFS) =       5.37

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.13   FLOW VELOCITY(FEET/SEC.) =   3.37
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     226.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   350.33  DOWNSTREAM(FEET) =   349.58
  FLOW LENGTH(FEET) =    80.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.82
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.37
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    5.02
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     306.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 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.) =    5.02
  RAINFALL INTENSITY(INCH/HR) =   6.05
  TOTAL STREAM AREA(ACRES) =     1.08
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.37

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    363.97
  DOWNSTREAM ELEVATION(FEET) =    361.28
  ELEVATION DIFFERENCE(FEET) =      2.69
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.280
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    81.90
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.50
 TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    361.28  DOWNSTREAM(FEET) =    358.84
 CHANNEL LENGTH THRU SUBAREA(FEET) =   220.00   CHANNEL SLOPE =  0.0111
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
 MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.741
 GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  95
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.56
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.70
 AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   2.16
 Tc(MIN.) =    5.44
 SUBAREA AREA(ACRES) =     0.46       SUBAREA RUNOFF(CFS) =    2.17
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
 TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       2.64

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   1.87
 LONGEST FLOWPATH FROM NODE    104.00 TO NODE    103.00 =     320.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 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.) =    5.44
 RAINFALL INTENSITY(INCH/HR) =   5.74
 TOTAL STREAM AREA(ACRES) =     0.56
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.64

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        5.37     5.02        6.048          1.08
     2        2.64     5.44        5.741          0.56

 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        7.80     5.02       6.048
     2        7.73     5.44       5.741

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       7.80   Tc(MIN.) =    5.02
 TOTAL AREA(ACRES) =        1.6
 LONGEST FLOWPATH FROM NODE    104.00 TO NODE    103.00 =     320.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    106.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   349.58  DOWNSTREAM(FEET) =   346.83
```

```
  FLOW LENGTH(FEET) =    38.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.89
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.80
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    5.05
  LONGEST FLOWPATH FROM NODE    104.00 TO NODE    106.00 =     358.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    361.38
  DOWNSTREAM ELEVATION(FEET) =    359.33
  ELEVATION DIFFERENCE(FEET) =      2.05
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.447
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    75.50
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    359.33  DOWNSTREAM(FEET) =    358.11
  CHANNEL LENGTH THRU SUBAREA(FEET) =   109.00   CHANNEL SLOPE =  0.0112
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.39
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.75
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   1.04
  Tc(MIN.) =    4.48
  SUBAREA AREA(ACRES) =     0.76       SUBAREA RUNOFF(CFS) =    3.78
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.9         PEAK FLOW RATE(CFS) =       4.27

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.14   FLOW VELOCITY(FEET/SEC.) =   2.14
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     209.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   343.97  DOWNSTREAM(FEET) =   343.19
  FLOW LENGTH(FEET) =    91.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.22
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.27
  PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =    4.73
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =     300.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    85.00
  UPSTREAM ELEVATION(FEET) =    373.75
  DOWNSTREAM ELEVATION(FEET) =    364.05
  ELEVATION DIFFERENCE(FEET) =      9.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.157
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    363.73  DOWNSTREAM(FEET) =    363.69
  CHANNEL LENGTH THRU SUBAREA(FEET) =    40.00   CHANNEL SLOPE =  0.0010
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.34
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.62
  AVERAGE FLOW DEPTH(FEET) =   0.15   TRAVEL TIME(MIN.) =   1.07
  Tc(MIN.) =    3.23
  SUBAREA AREA(ACRES) =     0.34       SUBAREA RUNOFF(CFS) =    1.69
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.4         PEAK FLOW RATE(CFS) =       2.19

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.18   FLOW VELOCITY(FEET/SEC.) =   0.69
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =     125.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    306.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   361.00  DOWNSTREAM(FEET) =   359.31
  FLOW LENGTH(FEET) =   169.00   MANNING'S N =  0.010
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.26
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.19
  PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =    3.68
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    306.00 =     294.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    306.00 TO NODE    306.00 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.) =    3.68
```

```
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     0.44
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.19

****************************************************************************
  FLOW PROCESS FROM NODE    307.00 TO NODE    308.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    374.08
  DOWNSTREAM ELEVATION(FEET) =    363.95
  ELEVATION DIFFERENCE(FEET) =     10.13
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.340
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    308.00 TO NODE    306.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    363.95  DOWNSTREAM(FEET) =    362.69
  CHANNEL LENGTH THRU SUBAREA(FEET) =    40.00   CHANNEL SLOPE =  0.0315
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.44
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.32
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   0.29
  Tc(MIN.) =    2.63
  SUBAREA AREA(ACRES) =     0.38       SUBAREA RUNOFF(CFS) =    1.89
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       2.39

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   2.70
  LONGEST FLOWPATH FROM NODE    307.00 TO NODE    306.00 =     140.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    306.00 TO NODE    306.00 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.) =    2.63
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     0.48
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.39

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        2.19     3.68        6.060          0.44
      2        2.39     2.63        6.060          0.48

  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        3.95     2.63       6.060
      2        4.57     3.68       6.060

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.57   Tc(MIN.) =    3.68
  TOTAL AREA(ACRES) =        0.9
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    306.00 =     294.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    306.00 TO NODE    309.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   359.31  DOWNSTREAM(FEET) =   358.60
  FLOW LENGTH(FEET) =    71.00   MANNING'S N =  0.010
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.10
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.57
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    3.77
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    309.00 =     365.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    309.00 TO NODE    309.00 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.) =    3.77
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     0.92
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.57

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    310.10 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    363.63
  DOWNSTREAM ELEVATION(FEET) =    363.28
  ELEVATION DIFFERENCE(FEET) =      0.35
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.014
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    310.10 TO NODE    311.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    363.28  DOWNSTREAM(FEET) =    362.58
  CHANNEL LENGTH THRU SUBAREA(FEET) =    20.00   CHANNEL SLOPE =  0.0350
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
```

```
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.52
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.06
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   0.16
  Tc(MIN.) =    4.18
  SUBAREA AREA(ACRES) =     0.01       SUBAREA RUNOFF(CFS) =    0.05
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.55

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   1.74
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    311.00 =      70.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    311.00 TO NODE    309.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   361.09  DOWNSTREAM(FEET) =   358.60
  FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   1.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.75
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.55
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    4.30
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    309.00 =     120.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    309.00 TO NODE    309.00 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.) =    4.30
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     0.11
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.55

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    312.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    363.63
  DOWNSTREAM ELEVATION(FEET) =    362.55
  ELEVATION DIFFERENCE(FEET) =      1.08
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.431
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    312.00 TO NODE    309.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   361.50  DOWNSTREAM(FEET) =   358.60
  FLOW LENGTH(FEET) =    70.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   1.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.13
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.50
```

```
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =    3.62
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    309.00 =     135.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    309.00 TO NODE    309.00 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.) =    3.62
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     0.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.50

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        4.57     3.77        6.060          0.92
      2        0.55     4.30        6.060          0.11
      3        0.50     3.62        6.060          0.10

  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        5.53     3.62       6.060
      2        5.55     3.77       6.060
      3        5.62     4.30       6.060

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.62   Tc(MIN.) =    4.30
  TOTAL AREA(ACRES) =        1.1
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    309.00 =     365.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    309.00 TO NODE    313.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   358.60  DOWNSTREAM(FEET) =   357.57
  FLOW LENGTH(FEET) =   103.00   MANNING'S N =  0.010
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.15
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.62
  PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =    4.54
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    313.00 =     468.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    313.00 TO NODE    313.00 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.) =    4.54
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     1.13
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.62

****************************************************************************
  FLOW PROCESS FROM NODE    314.00 TO NODE    315.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
```

```
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    373.56
  DOWNSTREAM ELEVATION(FEET) =    373.06
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.564
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    315.00 TO NODE    316.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    373.06  DOWNSTREAM(FEET) =    363.48
  CHANNEL LENGTH THRU SUBAREA(FEET) =    50.00   CHANNEL SLOPE =  0.1916
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.92
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.93
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   0.21
  Tc(MIN.) =    3.78
  SUBAREA AREA(ACRES) =     0.17       SUBAREA RUNOFF(CFS) =    0.84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.34

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   4.28
  LONGEST FLOWPATH FROM NODE    314.00 TO NODE    316.00 =     100.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    316.00 TO NODE    313.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   361.98  DOWNSTREAM(FEET) =   361.02
  FLOW LENGTH(FEET) =    96.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   5.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.82
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.34
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =    4.11
  LONGEST FLOWPATH FROM NODE    314.00 TO NODE    313.00 =     196.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    313.00 TO NODE    313.00 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.) =    4.11
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     0.27
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.34

****************************************************************************
  FLOW PROCESS FROM NODE    317.00 TO NODE    318.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
==============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    26.00
  UPSTREAM ELEVATION(FEET) =    363.41
  DOWNSTREAM ELEVATION(FEET) =    363.08
  ELEVATION DIFFERENCE(FEET) =      0.33
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.374
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

******************************************************************************
  FLOW PROCESS FROM NODE    318.00 TO NODE    313.00 IS CODE =  51
------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    363.08  DOWNSTREAM(FEET) =    362.36
  CHANNEL LENGTH THRU SUBAREA(FEET) =    20.00   CHANNEL SLOPE =  0.0360
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.65
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.06
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.16
  Tc(MIN.) =    2.54
  SUBAREA AREA(ACRES) =     0.06       SUBAREA RUNOFF(CFS) =    0.30
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.80

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   1.97
  LONGEST FLOWPATH FROM NODE    317.00 TO NODE    313.00 =      46.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE    313.00 TO NODE    313.00 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.) =    2.54
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     0.16
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.80

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        5.62     4.54        6.060          1.13
      2        1.34     4.11        6.060          0.27
      3        0.80     2.54        6.060          0.16

  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        7.24     2.54       6.060
      2        7.75     4.11       6.060
      3        7.75     4.54       6.060
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       7.75   Tc(MIN.) =    4.54
  TOTAL AREA(ACRES) =        1.6
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    313.00 =     468.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    313.00 TO NODE    319.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   361.02  DOWNSTREAM(FEET) =   358.30
  FLOW LENGTH(FEET) =   138.00   MANNING'S N =  0.010
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.87
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.75
  PIPE TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =    4.77
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    319.00 =     606.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    319.00 TO NODE    319.00 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.) =    4.77
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     1.56
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.75

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    320.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    363.63
  DOWNSTREAM ELEVATION(FEET) =    362.92
  ELEVATION DIFFERENCE(FEET) =      0.71
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.159
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    54.20
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    320.00 TO NODE    321.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    362.92  DOWNSTREAM(FEET) =    362.45
  CHANNEL LENGTH THRU SUBAREA(FEET) =    34.00   CHANNEL SLOPE =  0.0138
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.77
```

```
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.44
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.39
  Tc(MIN.) =    4.55
  SUBAREA AREA(ACRES) =     0.11       SUBAREA RUNOFF(CFS) =    0.55
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       1.04

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   1.60
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    321.00 =     134.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    321.00 TO NODE    319.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   360.36  DOWNSTREAM(FEET) =   358.30
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.03
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.04
  PIPE TRAVEL TIME(MIN.) =   0.53    Tc(MIN.) =    5.08
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    319.00 =     294.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    319.00 TO NODE    319.00 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.) =    5.08
  RAINFALL INTENSITY(INCH/HR) =   6.00
  TOTAL STREAM AREA(ACRES) =     0.21
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.04

****************************************************************************
  FLOW PROCESS FROM NODE    317.00 TO NODE    323.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    363.41
  DOWNSTREAM ELEVATION(FEET) =    362.41
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.904
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    323.00 TO NODE    319.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    362.41  DOWNSTREAM(FEET) =    361.96
  CHANNEL LENGTH THRU SUBAREA(FEET) =    39.00   CHANNEL SLOPE =  0.0115
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
```

```
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.79
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.67
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   0.39
  Tc(MIN.) =    4.29
  SUBAREA AREA(ACRES) =     0.52       SUBAREA RUNOFF(CFS) =    2.58
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       3.08

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.13   FLOW VELOCITY(FEET/SEC.) =   1.93
  LONGEST FLOWPATH FROM NODE    317.00 TO NODE    319.00 =     139.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    319.00 TO NODE    319.00 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.) =    4.29
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     0.62
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.08

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        7.75     4.77        6.060          1.56
      2        1.04     5.08        5.997          0.21
      3        3.08     4.29        6.060          0.62

  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       11.71     4.29       6.060
      2       11.81     4.77       6.060
      3       11.76     5.08       5.997

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      11.81   Tc(MIN.) =    4.77
  TOTAL AREA(ACRES) =        2.4
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    319.00 =     606.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    319.00 TO NODE    329.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   361.96  DOWNSTREAM(FEET) =   340.75
  FLOW LENGTH(FEET) =   209.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.97
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.81
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    4.95
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    329.00 =     815.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    329.00 TO NODE    329.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    325.00 TO NODE    326.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    362.81
  DOWNSTREAM ELEVATION(FEET) =    352.23
  ELEVATION DIFFERENCE(FEET) =     10.58
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.340
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    326.00 TO NODE    324.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    352.23  DOWNSTREAM(FEET) =    349.25
  CHANNEL LENGTH THRU SUBAREA(FEET) =    57.00   CHANNEL SLOPE =  0.0523
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.92
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.74
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.35
  Tc(MIN.) =    2.69
  SUBAREA AREA(ACRES) =     0.17       SUBAREA RUNOFF(CFS) =    0.84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.34

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   2.65
  LONGEST FLOWPATH FROM NODE    325.00 TO NODE    324.00 =     157.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    324.00 TO NODE    324.00 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.) =    2.69
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     0.27
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.34

****************************************************************************
  FLOW PROCESS FROM NODE    346.00 TO NODE    347.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    53.00
  UPSTREAM ELEVATION(FEET) =    373.73
  DOWNSTREAM ELEVATION(FEET) =    373.20
  ELEVATION DIFFERENCE(FEET) =      0.53
```

```
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.669
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    347.00 TO NODE    324.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    373.20  DOWNSTREAM(FEET) =    363.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =    40.00   CHANNEL SLOPE =  0.2500
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.72
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.33
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   0.15
  Tc(MIN.) =    3.82
  SUBAREA AREA(ACRES) =     0.09       SUBAREA RUNOFF(CFS) =    0.45
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.94

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.04   FLOW VELOCITY(FEET/SEC.) =   5.18
  LONGEST FLOWPATH FROM NODE    346.00 TO NODE    324.00 =      93.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    324.00 TO NODE    324.00 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.) =    3.82
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     0.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.94

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.34     2.69        6.060          0.27
      2        0.94     3.82        6.060          0.19

  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        2.00     2.69       6.060
      2        2.29     3.82       6.060

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.29   Tc(MIN.) =    3.82
  TOTAL AREA(ACRES) =        0.5
  LONGEST FLOWPATH FROM NODE    325.00 TO NODE    324.00 =     157.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    324.00 TO NODE    329.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
```

```
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   361.12  DOWNSTREAM(FEET) =   345.60
  FLOW LENGTH(FEET) =    58.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.50
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.29
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    3.88
  LONGEST FLOWPATH FROM NODE    325.00 TO NODE    329.00 =     215.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    329.00 TO NODE    329.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        2.29     3.88       6.060        0.46
  LONGEST FLOWPATH FROM NODE    325.00 TO NODE    329.00 =     215.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       11.81     4.95       6.060        2.39
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    329.00 =     815.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      11.54       3.88        6.060
      2      14.10       4.95        6.060

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      14.10   Tc(MIN.) =    4.95
  TOTAL AREA(ACRES) =        2.8

****************************************************************************
  FLOW PROCESS FROM NODE    329.00 TO NODE    329.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    329.00 TO NODE    329.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    337.00 TO NODE    338.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    90.00
  UPSTREAM ELEVATION(FEET) =    373.96
  DOWNSTREAM ELEVATION(FEET) =    372.96
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.821
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    61.67
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    338.00 TO NODE    339.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    372.96  DOWNSTREAM(FEET) =    363.92
  CHANNEL LENGTH THRU SUBAREA(FEET) =    86.00   CHANNEL SLOPE =  0.1051
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.94
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.83
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.37
  Tc(MIN.) =    4.20
  SUBAREA AREA(ACRES) =     0.58       SUBAREA RUNOFF(CFS) =    2.88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       3.38

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   4.53
  LONGEST FLOWPATH FROM NODE    337.00 TO NODE    339.00 =     176.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    339.00 TO NODE    336.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   362.42  DOWNSTREAM(FEET) =   361.33
  FLOW LENGTH(FEET) =   109.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.17
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.38
  PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =    4.49
  LONGEST FLOWPATH FROM NODE    337.00 TO NODE    336.00 =     285.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    336.00 TO NODE    336.00 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.) =    4.49
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     0.68
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.38

****************************************************************************
  FLOW PROCESS FROM NODE    334.00 TO NODE    342.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    370.00
  DOWNSTREAM ELEVATION(FEET) =    369.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.904
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
```

```
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    342.00 TO NODE    336.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    369.00  DOWNSTREAM(FEET) =    363.42
  CHANNEL LENGTH THRU SUBAREA(FEET) =   104.00   CHANNEL SLOPE =  0.0537
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.59
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.98
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.58
  Tc(MIN.) =    4.49
  SUBAREA AREA(ACRES) =     0.44       SUBAREA RUNOFF(CFS) =    2.19
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       2.68

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   3.45
  LONGEST FLOWPATH FROM NODE    334.00 TO NODE    336.00 =     204.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    336.00 TO NODE    336.00 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.) =    4.49
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     0.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.68

****************************************************************************
  FLOW PROCESS FROM NODE    330.00 TO NODE    331.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    360.00
  DOWNSTREAM ELEVATION(FEET) =    345.54
  ELEVATION DIFFERENCE(FEET) =     14.46
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.340
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    331.00 TO NODE    332.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    345.54  DOWNSTREAM(FEET) =    345.37
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =    11.00   CHANNEL SLOPE =  0.0155
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.14
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.00
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   0.09
  Tc(MIN.) =    2.43
  SUBAREA AREA(ACRES) =     0.66       SUBAREA RUNOFF(CFS) =    3.28
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       3.78

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.13   FLOW VELOCITY(FEET/SEC.) =   2.37
  LONGEST FLOWPATH FROM NODE    330.00 TO NODE    332.00 =     111.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    332.00 TO NODE    336.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   343.87  DOWNSTREAM(FEET) =   341.72
  FLOW LENGTH(FEET) =   365.00   MANNING'S N =  0.010
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.81
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.78
  PIPE TRAVEL TIME(MIN.) =   1.27    Tc(MIN.) =    3.70
  LONGEST FLOWPATH FROM NODE    330.00 TO NODE    336.00 =     476.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    336.00 TO NODE    336.00 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.) =    3.70
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     0.76
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.78

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        3.38     4.49        6.060          0.68
      2        2.68     4.49        6.060          0.54
      3        3.78     3.70        6.060          0.76

  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        8.77     3.70       6.060
      2        9.84     4.49       6.060
      3        9.84     4.49       6.060

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.84   Tc(MIN.) =    4.49
  TOTAL AREA(ACRES) =        2.0
  LONGEST FLOWPATH FROM NODE    330.00 TO NODE    336.00 =     476.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    336.00 TO NODE    341.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   341.72  DOWNSTREAM(FEET) =   341.11
  FLOW LENGTH(FEET) =   122.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  42.0 INCH PIPE IS   9.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.03
  GIVEN PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.84
  PIPE TRAVEL TIME(MIN.) =   0.34    Tc(MIN.) =    4.83
  LONGEST FLOWPATH FROM NODE    330.00 TO NODE    341.00 =     598.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    341.00 TO NODE    341.00 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) =   6.06
  TOTAL STREAM AREA(ACRES) =     1.98
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.84

****************************************************************************
  FLOW PROCESS FROM NODE    343.00 TO NODE    344.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    364.11
  DOWNSTREAM ELEVATION(FEET) =    351.22
  ELEVATION DIFFERENCE(FEET) =     12.89
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.340
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    344.00 TO NODE    345.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    351.22  DOWNSTREAM(FEET) =    350.28
  CHANNEL LENGTH THRU SUBAREA(FEET) =    24.00   CHANNEL SLOPE =  0.0392
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.77
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.30
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.17
  Tc(MIN.) =    2.51
  SUBAREA AREA(ACRES) =     0.11       SUBAREA RUNOFF(CFS) =    0.55
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       1.04

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   2.43
```

```
 LONGEST FLOWPATH FROM NODE    343.00 TO NODE    345.00 =     124.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    345.00 TO NODE    341.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   348.78  DOWNSTREAM(FEET) =   341.11
 FLOW LENGTH(FEET) =    39.00   MANNING'S N =  0.010
 DEPTH OF FLOW IN   8.0 INCH PIPE IS   2.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  13.81
 GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       1.04
 PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    2.56
 LONGEST FLOWPATH FROM NODE    343.00 TO NODE    341.00 =     163.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    341.00 TO NODE    341.00 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.) =    2.56
 RAINFALL INTENSITY(INCH/HR) =   6.06
 TOTAL STREAM AREA(ACRES) =     0.21
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.04

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        9.84     4.83        6.060          1.98
     2        1.04     2.56        6.060          0.21

 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       10.88     2.56       6.060
     2       10.88     4.83       6.060

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      10.88   Tc(MIN.) =    4.83
 TOTAL AREA(ACRES) =        2.2
 LONGEST FLOWPATH FROM NODE    330.00 TO NODE    341.00 =     598.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    341.00 TO NODE    329.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   341.11  DOWNSTREAM(FEET) =   340.75
 FLOW LENGTH(FEET) =    96.00   MANNING'S N =  0.010
 DEPTH OF FLOW IN  42.0 INCH PIPE IS  10.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.60
 GIVEN PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.88
 PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =    5.11
 LONGEST FLOWPATH FROM NODE    330.00 TO NODE    329.00 =     694.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    329.00 TO NODE    329.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================
```

```
  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       10.88     5.11       5.973        2.19
  LONGEST FLOWPATH FROM NODE    330.00 TO NODE    329.00 =     694.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       14.10     4.95       6.060        2.85
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    329.00 =     815.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      24.63       4.95        6.060
      2      24.78       5.11        5.973

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      24.78   Tc(MIN.) =    5.11
  TOTAL AREA(ACRES) =        5.0

****************************************************************************
  FLOW PROCESS FROM NODE    329.00 TO NODE    329.00 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.) =    5.11
  RAINFALL INTENSITY(INCH/HR) =   5.97
  TOTAL STREAM AREA(ACRES) =     5.04
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     24.78

****************************************************************************
  FLOW PROCESS FROM NODE    348.00 TO NODE    349.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    49.00
  UPSTREAM ELEVATION(FEET) =    350.39
  DOWNSTREAM ELEVATION(FEET) =    349.03
  ELEVATION DIFFERENCE(FEET) =      1.36
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.511
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    349.00 TO NODE    329.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    349.03  DOWNSTREAM(FEET) =    348.42
  CHANNEL LENGTH THRU SUBAREA(FEET) =    30.00   CHANNEL SLOPE =  0.0203
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.70
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.62
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.31
  Tc(MIN.) =    2.82
```

```
  SUBAREA AREA(ACRES) =     0.08       SUBAREA RUNOFF(CFS) =    0.40
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.89

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.77
  LONGEST FLOWPATH FROM NODE    348.00 TO NODE    329.00 =      79.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    329.00 TO NODE    329.00 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.) =    2.82
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     0.18
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.89

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       24.78     5.11        5.973         5.04
      2        0.89     2.82        6.060         0.18

  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       14.55     2.82       6.060
      2       25.66     5.11       5.973

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      25.66   Tc(MIN.) =    5.11
  TOTAL AREA(ACRES) =        5.2
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    329.00 =     815.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    329.00 TO NODE    350.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   340.80  DOWNSTREAM(FEET) =   338.90
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  11.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.96
  GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      25.66
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    5.24
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    350.00 =     915.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    350.00 TO NODE    350.00 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.) =    5.24
  RAINFALL INTENSITY(INCH/HR) =   5.88
  TOTAL STREAM AREA(ACRES) =     5.22
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     25.66

****************************************************************************
  FLOW PROCESS FROM NODE    351.00 TO NODE    352.00 IS CODE =  21
----------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    354.21
  DOWNSTREAM ELEVATION(FEET) =    349.79
  ELEVATION DIFFERENCE(FEET) =      4.42
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.890
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    88.55
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    352.00 TO NODE    350.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    349.79  DOWNSTREAM(FEET) =    347.54
  CHANNEL LENGTH THRU SUBAREA(FEET) =    87.00   CHANNEL SLOPE =  0.0259
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.43
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.36
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   0.61
  Tc(MIN.) =    3.50
  SUBAREA AREA(ACRES) =     0.78       SUBAREA RUNOFF(CFS) =    3.88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.9         PEAK FLOW RATE(CFS) =       4.37

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   2.83
  LONGEST FLOWPATH FROM NODE    351.00 TO NODE    350.00 =     187.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    350.00 TO NODE    350.00 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.) =    3.50
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     0.88
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.37

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       25.66     5.24        5.878          5.22
      2        4.37     3.50        6.060          0.88

  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       29.26     3.50       6.060
      2       29.90     5.24       5.878

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      29.90   Tc(MIN.) =    5.24
  TOTAL AREA(ACRES) =        6.1
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    350.00 =     915.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    350.00 TO NODE    353.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   338.80  DOWNSTREAM(FEET) =   333.90
  FLOW LENGTH(FEET) =   360.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  13.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.85
  GIVEN PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      29.90
  PIPE TRAVEL TIME(MIN.) =   0.51    Tc(MIN.) =    5.75
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    353.00 =    1275.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    353.00 TO NODE    353.00 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.) =    5.75
  RAINFALL INTENSITY(INCH/HR) =   5.54
  TOTAL STREAM AREA(ACRES) =     6.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     29.90

****************************************************************************
  FLOW PROCESS FROM NODE    354.00 TO NODE    355.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    370.00
  DOWNSTREAM ELEVATION(FEET) =    349.59
  ELEVATION DIFFERENCE(FEET) =     20.41
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.340
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    355.00 TO NODE    353.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    349.59  DOWNSTREAM(FEET) =    344.41
  CHANNEL LENGTH THRU SUBAREA(FEET) =   253.00   CHANNEL SLOPE =  0.0205
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.06
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.95
```

```
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   1.43
  Tc(MIN.) =    3.77
  SUBAREA AREA(ACRES) =     2.64       SUBAREA RUNOFF(CFS) =   13.12
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        2.7         PEAK FLOW RATE(CFS) =      13.62

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   3.60
  LONGEST FLOWPATH FROM NODE    354.00 TO NODE    353.00 =     353.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    353.00 TO NODE    353.00 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.) =    3.77
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     2.74
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.62

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       29.90     5.75        5.539          6.10
      2       13.62     3.77        6.060          2.74

  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       40.94     3.77       6.060
      2       42.35     5.75       5.539

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      42.35   Tc(MIN.) =    5.75
  TOTAL AREA(ACRES) =        8.8
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    353.00 =    1275.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    353.00 TO NODE    356.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   333.90  DOWNSTREAM(FEET) =   332.50
  FLOW LENGTH(FEET) =    93.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  15.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.54
  GIVEN PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      42.35
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    5.86
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    356.00 =    1368.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    356.00 TO NODE    356.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.86
  RAINFALL INTENSITY(INCH/HR) =   5.47
  TOTAL STREAM AREA(ACRES) =     8.84
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     42.35

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

```
 FLOW PROCESS FROM NODE    359.00 TO NODE    360.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  95
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
 UPSTREAM ELEVATION(FEET) =    360.00
 DOWNSTREAM ELEVATION(FEET) =    348.63
 ELEVATION DIFFERENCE(FEET) =     11.37
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.340
 WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.50
 TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
 FLOW PROCESS FROM NODE    360.00 TO NODE    356.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    348.63  DOWNSTREAM(FEET) =    340.65
 CHANNEL LENGTH THRU SUBAREA(FEET) =   270.00   CHANNEL SLOPE =  0.0296
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
 MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  95
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.51
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.73
 AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   1.65
 Tc(MIN.) =    3.99
 SUBAREA AREA(ACRES) =     0.81       SUBAREA RUNOFF(CFS) =    4.02
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
 TOTAL AREA(ACRES) =        0.9         PEAK FLOW RATE(CFS) =       4.52

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   2.93
 LONGEST FLOWPATH FROM NODE    359.00 TO NODE    356.00 =     370.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    356.00 TO NODE    356.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  4
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    3.99
 RAINFALL INTENSITY(INCH/HR) =   6.06
 TOTAL STREAM AREA(ACRES) =     0.91
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.52

****************************************************************************
 FLOW PROCESS FROM NODE    363.00 TO NODE    364.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  95
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
 UPSTREAM ELEVATION(FEET) =    348.63
 DOWNSTREAM ELEVATION(FEET) =    347.84
 ELEVATION DIFFERENCE(FEET) =      0.79
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.073
 WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
```

```
          THE MAXIMUM OVERLAND FLOW LENGTH =    55.80
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    364.00 TO NODE    365.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    347.84  DOWNSTREAM(FEET) =    345.78
  CHANNEL LENGTH THRU SUBAREA(FEET) =   130.00   CHANNEL SLOPE =  0.0158
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.940
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.06
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.00
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   1.09
  Tc(MIN.) =    5.16
  SUBAREA AREA(ACRES) =     0.64       SUBAREA RUNOFF(CFS) =    3.12
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       3.60

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.13   FLOW VELOCITY(FEET/SEC.) =   2.26
  LONGEST FLOWPATH FROM NODE    363.00 TO NODE    365.00 =     230.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    365.00 TO NODE    356.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   342.88  DOWNSTREAM(FEET) =   332.10
  FLOW LENGTH(FEET) =   200.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.47
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.60
  PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =    5.45
  LONGEST FLOWPATH FROM NODE    363.00 TO NODE    356.00 =     430.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    356.00 TO NODE    356.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.45
  RAINFALL INTENSITY(INCH/HR) =   5.73
  TOTAL STREAM AREA(ACRES) =     0.74
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.60

****************************************************************************
  FLOW PROCESS FROM NODE    356.10 TO NODE    356.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    348.64
```

```
  DOWNSTREAM ELEVATION(FEET) =    343.68
  ELEVATION DIFFERENCE(FEET) =      4.96
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.802
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    89.90
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    356.20 TO NODE    356.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    343.68  DOWNSTREAM(FEET) =    340.65
  CHANNEL LENGTH THRU SUBAREA(FEET) =    50.00   CHANNEL SLOPE =  0.0606
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.07
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.64
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.32
  Tc(MIN.) =    3.12
  SUBAREA AREA(ACRES) =     0.23       SUBAREA RUNOFF(CFS) =    1.14
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.64

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   3.07
  LONGEST FLOWPATH FROM NODE    356.10 TO NODE    356.00 =     150.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    356.00 TO NODE    356.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  4 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.12
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     0.33
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.64

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       42.35     5.86        5.469          8.84
      2        4.52     3.99        6.060          0.91
      3        3.60     5.45        5.733          0.74
      4        1.64     3.12        6.060          0.33

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  4 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       45.45     3.12       6.060
      2       47.01     3.99       6.060
      3       49.82     5.45       5.733
      4       51.34     5.86       5.469
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      51.34   Tc(MIN.) =    5.86
  TOTAL AREA(ACRES) =       10.8
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    356.00 =    1368.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    356.00 TO NODE    365.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   332.10  DOWNSTREAM(FEET) =   331.57
  FLOW LENGTH(FEET) =    53.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  18.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.28
  GIVEN PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      51.34
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    5.93
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    365.00 =    1421.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       10.8  TC(MIN.) =      5.93
  PEAK FLOW RATE(CFS)   =      51.34
============================================================================
============================================================================
  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:




 ************************** DESCRIPTION OF STUDY **************************
* PROPOSED DRAINAGE - 50 YEAR - COSTA VERDE CENTER                        *
* KIMLEY-HORN & ASSOCIATES                                                *
* JUNE 2019 - MJS                                                         *
 ***************************************************************************

  FILE NAME: CVC50P.DAT
  TIME/DATE OF STUDY: 12:28 06/10/2019
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  50.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.000
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  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   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    361.10
  DOWNSTREAM ELEVATION(FEET) =    360.00
  ELEVATION DIFFERENCE(FEET) =      1.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.740
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    360.00  DOWNSTREAM(FEET) =    357.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   112.00   CHANNEL SLOPE =  0.0232
  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) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.33
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.18
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   0.86
  Tc(MIN.) =    3.60
  SUBAREA AREA(ACRES) =     0.88       SUBAREA RUNOFF(CFS) =    3.80
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        1.0         PEAK FLOW RATE(CFS) =       4.23

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.13   FLOW VELOCITY(FEET/SEC.) =   2.43
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     162.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   353.40  DOWNSTREAM(FEET) =   351.20
  FLOW LENGTH(FEET) =   408.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.47
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.23
  PIPE TRAVEL TIME(MIN.) =   1.52    Tc(MIN.) =    5.12
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     570.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.192
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    0.48   SUBAREA RUNOFF(CFS) =    2.04
  TOTAL AREA(ACRES) =        1.5   TOTAL RUNOFF(CFS) =       6.22
  TC(MIN.) =    5.12

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.192
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    0.70   SUBAREA RUNOFF(CFS) =    2.98
  TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =       9.20
  TC(MIN.) =    5.12

****************************************************************************
  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) =   351.20  DOWNSTREAM(FEET) =   350.90
  FLOW LENGTH(FEET) =    63.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.4 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.21
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        9.20
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    5.32
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     633.00 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) =  5.064
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    0.50   SUBAREA RUNOFF(CFS) =    2.08
  TOTAL AREA(ACRES) =        2.7   TOTAL RUNOFF(CFS) =      11.05
  TC(MIN.) =    5.32

****************************************************************************
  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) =   350.90  DOWNSTREAM(FEET) =   349.40
  FLOW LENGTH(FEET) =    64.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.02
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.05
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    5.42
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =     697.00 FEET.

****************************************************************************
  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) =   349.40  DOWNSTREAM(FEET) =   331.90
  FLOW LENGTH(FEET) =   625.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  12.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.32
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.05
  PIPE TRAVEL TIME(MIN.) =   1.01    Tc(MIN.) =    6.43
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =    1322.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.43
  RAINFALL INTENSITY(INCH/HR) =   4.48
  TOTAL STREAM AREA(ACRES) =     2.66
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.05

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    346.20
  DOWNSTREAM ELEVATION(FEET) =    345.20
```

```
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.829
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    345.20  DOWNSTREAM(FEET) =    342.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =   114.00   CHANNEL SLOPE =  0.0202
  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) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.82
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.20
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   0.86
  Tc(MIN.) =    3.69
  SUBAREA AREA(ACRES) =     1.57       SUBAREA RUNOFF(CFS) =    6.78
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        1.7         PEAK FLOW RATE(CFS) =       7.22

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   2.68
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     164.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   338.90  DOWNSTREAM(FEET) =   335.70
  FLOW LENGTH(FEET) =   401.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.99
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.22
  PIPE TRAVEL TIME(MIN.) =   1.12    Tc(MIN.) =    4.81
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =     565.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    203.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    1.47   SUBAREA RUNOFF(CFS) =    6.35
  TOTAL AREA(ACRES) =        3.1   TOTAL RUNOFF(CFS) =      13.57
  TC(MIN.) =    4.81

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    203.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    1.59   SUBAREA RUNOFF(CFS) =    6.87
  TOTAL AREA(ACRES) =        4.7   TOTAL RUNOFF(CFS) =      20.44
  TC(MIN.) =    4.81

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 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) =   335.70  DOWNSTREAM(FEET) =   331.90
  FLOW LENGTH(FEET) =    38.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.50
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      20.44
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    4.84
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    106.00 =     603.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.84
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     4.73
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     20.44

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    362.40
  DOWNSTREAM ELEVATION(FEET) =    361.40
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.829
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    361.40  DOWNSTREAM(FEET) =    359.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =    76.00   CHANNEL SLOPE =  0.0197
  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) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.06
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.27
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   0.56
  Tc(MIN.) =    3.39
  SUBAREA AREA(ACRES) =     1.68       SUBAREA RUNOFF(CFS) =    7.26
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       7.69
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.17   FLOW VELOCITY(FEET/SEC.) =   2.67
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =     126.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   354.90  DOWNSTREAM(FEET) =   337.40
  FLOW LENGTH(FEET) =   187.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.36
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.69
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    3.59
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =     313.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    303.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    0.29   SUBAREA RUNOFF(CFS) =    1.25
  TOTAL AREA(ACRES) =        2.1   TOTAL RUNOFF(CFS) =       8.94
  TC(MIN.) =    3.59

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 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) =   337.40  DOWNSTREAM(FEET) =   331.90
  FLOW LENGTH(FEET) =    68.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.90
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.94
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    3.67
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    106.00 =     381.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.67
  RAINFALL INTENSITY(INCH/HR) =   5.27
  TOTAL STREAM AREA(ACRES) =     2.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.94

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    364.10
  DOWNSTREAM ELEVATION(FEET) =    363.10
  ELEVATION DIFFERENCE(FEET) =      1.00
```

```
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.829
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    363.10  DOWNSTREAM(FEET) =    360.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   130.00   CHANNEL SLOPE =  0.0200
  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) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.86
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.62
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   1.34
  Tc(MIN.) =    4.17
  SUBAREA AREA(ACRES) =     0.20       SUBAREA RUNOFF(CFS) =    0.86
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.30

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   1.74
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     180.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   354.60  DOWNSTREAM(FEET) =   354.30
  FLOW LENGTH(FEET) =    35.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.98
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.30
  PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =    4.31
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    403.00 =     215.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    403.00 TO NODE    403.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    0.50   SUBAREA RUNOFF(CFS) =    2.16
  TOTAL AREA(ACRES) =        0.8   TOTAL RUNOFF(CFS) =       3.46
  TC(MIN.) =    4.31

****************************************************************************
  FLOW PROCESS FROM NODE    403.00 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) =   354.30  DOWNSTREAM(FEET) =   331.90
  FLOW LENGTH(FEET) =   594.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.99
```

```
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.46
  PIPE TRAVEL TIME(MIN.) =   1.10    Tc(MIN.) =    5.42
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    106.00 =     809.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  4 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.42
  RAINFALL INTENSITY(INCH/HR) =   5.01
  TOTAL STREAM AREA(ACRES) =     0.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.46

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       11.05     6.43        4.479          2.66
      2       20.44     4.84        5.269          4.73
      3        8.94     3.67        5.269          2.07
      4        3.46     5.42        5.005          0.80

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  4 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF       Tc      INTENSITY
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)
      1       33.05     3.67       5.269
      2       40.79     4.84       5.269
      3       40.66     5.42       5.005
      4       39.11     6.43       4.479

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      40.79   Tc(MIN.) =    4.84
  TOTAL AREA(ACRES) =       10.3
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =    1322.00 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) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    0.24   SUBAREA RUNOFF(CFS) =    1.04
  TOTAL AREA(ACRES) =       10.5   TOTAL RUNOFF(CFS) =      45.37
  TC(MIN.) =    4.84

****************************************************************************
  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) =  5.269
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    0.20   SUBAREA RUNOFF(CFS) =    0.86
  TOTAL AREA(ACRES) =       10.7   TOTAL RUNOFF(CFS) =      46.23
  TC(MIN.) =    4.84

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

```
 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) =  5.269
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 USER-SPECIFIED RUNOFF COEFFICIENT = .8200
 S.C.S. CURVE NUMBER (AMC II) =  95
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
 SUBAREA AREA(ACRES) =    0.93   SUBAREA RUNOFF(CFS) =    4.02
 TOTAL AREA(ACRES) =       11.6   TOTAL RUNOFF(CFS) =      50.25
 TC(MIN.) =    4.84

****************************************************************************
 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) =   331.90  DOWNSTREAM(FEET) =   330.30
 FLOW LENGTH(FEET) =    56.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  20.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  15.38
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      50.25
 PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    4.90
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =    1378.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 USER-SPECIFIED RUNOFF COEFFICIENT = .8200
 S.C.S. CURVE NUMBER (AMC II) =  95
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
 SUBAREA AREA(ACRES) =    0.76   SUBAREA RUNOFF(CFS) =    3.28
 TOTAL AREA(ACRES) =       12.4   TOTAL RUNOFF(CFS) =      53.54
 TC(MIN.) =    4.90

****************************************************************************
 FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.269
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 USER-SPECIFIED RUNOFF COEFFICIENT = .8200
 S.C.S. CURVE NUMBER (AMC II) =  95
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
 SUBAREA AREA(ACRES) =    1.12   SUBAREA RUNOFF(CFS) =    4.84
 TOTAL AREA(ACRES) =       13.5   TOTAL RUNOFF(CFS) =      58.38
 TC(MIN.) =    4.90
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       13.5  TC(MIN.) =      4.90
 PEAK FLOW RATE(CFS)   =      58.38
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

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_____
*****************************************************************************

            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:




 ************************** DESCRIPTION OF STUDY **************************
* PROPOSED DRAINAGE - 100 YEAR - COSTA VERDE CENTER                       *
* KIMLEY-HORN & ASSOCIATES                                                *
* JUNE 2019 - MJS                                                         *
 ***************************************************************************

  FILE NAME: CVC100P.DAT
  TIME/DATE OF STUDY: 12:27 06/10/2019
----------------------------------------------------------------------------
  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) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  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   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    361.10
  DOWNSTREAM ELEVATION(FEET) =    360.00
  ELEVATION DIFFERENCE(FEET) =      1.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.740
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    360.00  DOWNSTREAM(FEET) =    357.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   112.00   CHANNEL SLOPE =  0.0232
  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.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.68
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.18
  AVERAGE FLOW DEPTH(FEET) =   0.11   TRAVEL TIME(MIN.) =   0.86
  Tc(MIN.) =    3.60
  SUBAREA AREA(ACRES) =     0.88       SUBAREA RUNOFF(CFS) =    4.37
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        1.0         PEAK FLOW RATE(CFS) =       4.87

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.14   FLOW VELOCITY(FEET/SEC.) =   2.50
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     162.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   353.40  DOWNSTREAM(FEET) =   351.20
  FLOW LENGTH(FEET) =   408.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  12.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.53
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.87
  PIPE TRAVEL TIME(MIN.) =   1.50    Tc(MIN.) =    5.10
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     570.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.984
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    0.48   SUBAREA RUNOFF(CFS) =    2.36
  TOTAL AREA(ACRES) =        1.5   TOTAL RUNOFF(CFS) =       7.16
  TC(MIN.) =    5.10

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.984
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    0.70   SUBAREA RUNOFF(CFS) =    3.44
  TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =      10.60
  TC(MIN.) =    5.10

****************************************************************************
  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) =   351.20  DOWNSTREAM(FEET) =   350.90
  FLOW LENGTH(FEET) =    63.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  16.2 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.31
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.60
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    5.30
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     633.00 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) =  5.839
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    0.50   SUBAREA RUNOFF(CFS) =    2.39
  TOTAL AREA(ACRES) =        2.7   TOTAL RUNOFF(CFS) =      12.74
  TC(MIN.) =    5.30

****************************************************************************
  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) =   350.90  DOWNSTREAM(FEET) =   349.40
  FLOW LENGTH(FEET) =    64.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.32
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.74
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    5.40
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =     697.00 FEET.

****************************************************************************
  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) =   349.40  DOWNSTREAM(FEET) =   331.90
  FLOW LENGTH(FEET) =   625.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.08
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.74
  PIPE TRAVEL TIME(MIN.) =   0.94    Tc(MIN.) =    6.34
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =    1322.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.34
  RAINFALL INTENSITY(INCH/HR) =   5.20
  TOTAL STREAM AREA(ACRES) =     2.66
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     12.74

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    346.20
  DOWNSTREAM ELEVATION(FEET) =    345.20
```

```
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.829
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    345.20  DOWNSTREAM(FEET) =    342.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =   114.00   CHANNEL SLOPE =  0.0202
  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.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.40
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.46
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   0.77
  Tc(MIN.) =    3.60
  SUBAREA AREA(ACRES) =     1.57       SUBAREA RUNOFF(CFS) =    7.80
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        1.7         PEAK FLOW RATE(CFS) =       8.30

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.17   FLOW VELOCITY(FEET/SEC.) =   2.81
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     164.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   338.90  DOWNSTREAM(FEET) =   335.70
  FLOW LENGTH(FEET) =   401.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.14
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.30
  PIPE TRAVEL TIME(MIN.) =   1.09    Tc(MIN.) =    4.69
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =     565.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    203.00 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.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    1.47   SUBAREA RUNOFF(CFS) =    7.30
  TOTAL AREA(ACRES) =        3.1   TOTAL RUNOFF(CFS) =      15.60
  TC(MIN.) =    4.69

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    203.00 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.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    1.59   SUBAREA RUNOFF(CFS) =    7.90
  TOTAL AREA(ACRES) =        4.7   TOTAL RUNOFF(CFS) =      23.50
  TC(MIN.) =    4.69

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 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) =   335.70  DOWNSTREAM(FEET) =   331.90
  FLOW LENGTH(FEET) =    38.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  20.83
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      23.50
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    4.72
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    106.00 =     603.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.72
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     4.73
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     23.50

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    362.40
  DOWNSTREAM ELEVATION(FEET) =    361.40
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.829
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    361.40  DOWNSTREAM(FEET) =    359.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =    76.00   CHANNEL SLOPE =  0.0197
  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.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.67
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.40
  AVERAGE FLOW DEPTH(FEET) =   0.14   TRAVEL TIME(MIN.) =   0.53
  Tc(MIN.) =    3.36
  SUBAREA AREA(ACRES) =     1.68       SUBAREA RUNOFF(CFS) =    8.35
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       8.85
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.18   FLOW VELOCITY(FEET/SEC.) =   2.81
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =     126.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   354.90  DOWNSTREAM(FEET) =   337.40
  FLOW LENGTH(FEET) =   187.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.81
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.85
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    3.55
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =     313.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    303.00 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.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    0.29   SUBAREA RUNOFF(CFS) =    1.44
  TOTAL AREA(ACRES) =        2.1   TOTAL RUNOFF(CFS) =      10.29
  TC(MIN.) =    3.55

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 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) =   337.40  DOWNSTREAM(FEET) =   331.90
  FLOW LENGTH(FEET) =    68.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.12
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.29
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    3.63
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    106.00 =     381.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    3.63
  RAINFALL INTENSITY(INCH/HR) =   6.06
  TOTAL STREAM AREA(ACRES) =     2.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.29

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    364.10
  DOWNSTREAM ELEVATION(FEET) =    363.10
  ELEVATION DIFFERENCE(FEET) =      1.00
```

```
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.829
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.060
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    363.10  DOWNSTREAM(FEET) =    360.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   130.00   CHANNEL SLOPE =  0.0200
  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.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.99
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.60
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   1.35
  Tc(MIN.) =    4.18
  SUBAREA AREA(ACRES) =     0.20       SUBAREA RUNOFF(CFS) =    0.99
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.49

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   1.69
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     180.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   354.60  DOWNSTREAM(FEET) =   354.30
  FLOW LENGTH(FEET) =    35.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   7.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.05
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.49
  PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =    4.33
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    403.00 =     215.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    403.00 TO NODE    403.00 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.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    0.50   SUBAREA RUNOFF(CFS) =    2.48
  TOTAL AREA(ACRES) =        0.8   TOTAL RUNOFF(CFS) =       3.98
  TC(MIN.) =    4.33

****************************************************************************
  FLOW PROCESS FROM NODE    403.00 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) =   354.30  DOWNSTREAM(FEET) =   331.90
  FLOW LENGTH(FEET) =   594.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.31
```

```
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.98
  PIPE TRAVEL TIME(MIN.) =   1.06    Tc(MIN.) =    5.39
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    106.00 =     809.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  4 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.39
  RAINFALL INTENSITY(INCH/HR) =   5.77
  TOTAL STREAM AREA(ACRES) =     0.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.98

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       12.74     6.34        5.200          2.66
      2       23.50     4.72        6.060          4.73
      3       10.29     3.63        6.060          2.07
      4        3.98     5.39        5.774          0.80

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  4 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF       Tc      INTENSITY
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)
      1       38.32     3.63       6.060
      2       46.76     4.72       6.060
      3       47.00     5.39       5.774
      4       45.31     6.34       5.200

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      47.00   Tc(MIN.) =    5.39
  TOTAL AREA(ACRES) =       10.3
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =    1322.00 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) =  5.774
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    0.24   SUBAREA RUNOFF(CFS) =    1.14
  TOTAL AREA(ACRES) =       10.5   TOTAL RUNOFF(CFS) =      49.72
  TC(MIN.) =    5.39

****************************************************************************
  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) =  5.774
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    0.20   SUBAREA RUNOFF(CFS) =    0.95
  TOTAL AREA(ACRES) =       10.7   TOTAL RUNOFF(CFS) =      50.66
  TC(MIN.) =    5.39

****************************************************************************
  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) =  5.774
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    0.93   SUBAREA RUNOFF(CFS) =    4.40
  TOTAL AREA(ACRES) =       11.6   TOTAL RUNOFF(CFS) =      55.07
  TC(MIN.) =    5.39

****************************************************************************
  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) =   331.90  DOWNSTREAM(FEET) =   330.30
  FLOW LENGTH(FEET) =    56.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  19.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.02
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      55.07
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    5.45
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =    1378.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.734
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    0.76   SUBAREA RUNOFF(CFS) =    3.57
  TOTAL AREA(ACRES) =       12.4   TOTAL RUNOFF(CFS) =      58.26
  TC(MIN.) =    5.45

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.734
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =  95
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8200
  SUBAREA AREA(ACRES) =    1.12   SUBAREA RUNOFF(CFS) =    5.27
  TOTAL AREA(ACRES) =       13.5   TOTAL RUNOFF(CFS) =      63.53
  TC(MIN.) =    5.45
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       13.5  TC(MIN.) =      5.45
  PEAK FLOW RATE(CFS)   =      63.53
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX C

HYDRAFLOW RESULTS

RATIONAL METHOD HYDROGRAPH PROGRAM
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RUN DATE 6/9/2019
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 11 MIN.
6 HOUR RAINFALL 2.3 INCHES
BASIN AREA 10.8 ACRES
RUNOFF COEFFICIENT 0.82
PEAK DISCHARGE 51.34 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 11	DISCHARGE (CFS) = 1.2
TIME (MIN) = 22	DISCHARGE (CFS) = 1.2
TIME (MIN) = 33	DISCHARGE (CFS) = 1.3
TIME (MIN) = 44	DISCHARGE (CFS) = 1.3
TIME (MIN) = 55	DISCHARGE (CFS) = 1.4
TIME (MIN) = 66	DISCHARGE (CFS) = 1.4
TIME (MIN) = 77	DISCHARGE (CFS) = 1.5
TIME (MIN) = 88	DISCHARGE (CFS) = 1.5
TIME (MIN) = 99	DISCHARGE (CFS) = 1.6
TIME (MIN) = 110	DISCHARGE (CFS) = 1.7
TIME (MIN) = 121	DISCHARGE (CFS) = 1.8
TIME (MIN) = 132	DISCHARGE (CFS) = 1.9
TIME (MIN) = 143	DISCHARGE (CFS) = 2
TIME (MIN) = 154	DISCHARGE (CFS) = 2.1
TIME (MIN) = 165	DISCHARGE (CFS) = 2.4
TIME (MIN) = 176	DISCHARGE (CFS) = 2.5
TIME (MIN) = 187	DISCHARGE (CFS) = 2.9
TIME (MIN) = 198	DISCHARGE (CFS) = 3.1
TIME (MIN) = 209	DISCHARGE (CFS) = 3.8
TIME (MIN) = 220	DISCHARGE (CFS) = 4.4
TIME (MIN) = 231	DISCHARGE (CFS) = 6.4
TIME (MIN) = 242	DISCHARGE (CFS) = -10.1
TIME (MIN) = 253	DISCHARGE (CFS) = 51.34
TIME (MIN) = 264	DISCHARGE (CFS) = 5.1
TIME (MIN) = 275	DISCHARGE (CFS) = 3.4
TIME (MIN) = 286	DISCHARGE (CFS) = 2.7
TIME (MIN) = 297	DISCHARGE (CFS) = 2.2
TIME (MIN) = 308	DISCHARGE (CFS) = 2
TIME (MIN) = 319	DISCHARGE (CFS) = 1.7
TIME (MIN) = 330	DISCHARGE (CFS) = 1.6
TIME (MIN) = 341	DISCHARGE (CFS) = 1.5
TIME (MIN) = 352	DISCHARGE (CFS) = 1.4
TIME (MIN) = 363	DISCHARGE (CFS) = 1.3
TIME (MIN) = 374	DISCHARGE (CFS) = 0

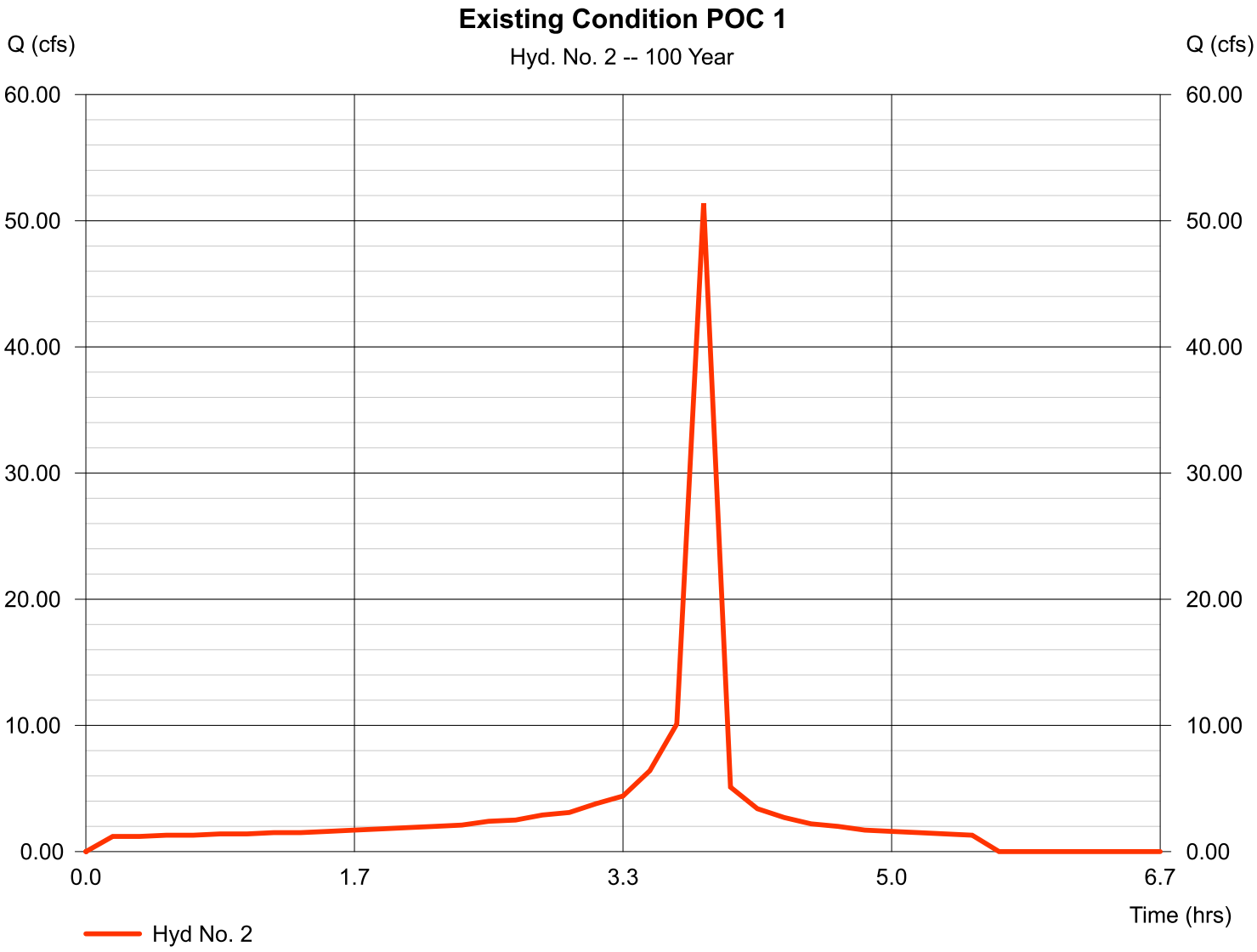
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Sunday, 06 / 9 / 2019

Hyd. No. 2

Existing Condition POC 1

Hydrograph type	= Manual	Peak discharge	= 51.39 cfs
Storm frequency	= 100 yrs	Time to peak	= 3.83 hrs
Time interval	= 10 min	Hyd. volume	= 79,092 cuft



RATIONAL METHOD HYDROGRAPH PROGRAM
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RUN DATE 6/10/2019
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 5 MIN.
6 HOUR RAINFALL 2.3 INCHES
BASIN AREA 13.5 ACRES
RUNOFF COEFFICIENT 0.82
PEAK DISCHARGE 63.53 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) = 2.7
TIME (MIN) = 155	DISCHARGE (CFS) = 2.9
TIME (MIN) = 160	DISCHARGE (CFS) = 2.9
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) = 4.2
TIME (MIN) = 200	DISCHARGE (CFS) = 4.4
TIME (MIN) = 205	DISCHARGE (CFS) = 4.9
TIME (MIN) = 210	DISCHARGE (CFS) = 5.2
TIME (MIN) = 215	DISCHARGE (CFS) = 6
TIME (MIN) = 220	DISCHARGE (CFS) = 6.5
TIME (MIN) = 225	DISCHARGE (CFS) = 7.9
TIME (MIN) = 230	DISCHARGE (CFS) = 9
TIME (MIN) = 235	DISCHARGE (CFS) = 13.3
TIME (MIN) = 240	DISCHARGE (CFS) = 22.3
TIME (MIN) = 245	DISCHARGE (CFS) = 63.53
TIME (MIN) = 250	DISCHARGE (CFS) = 10.7
TIME (MIN) = 255	DISCHARGE (CFS) = 7.1
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) = 2.3
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) = 1.9
TIME (MIN) = 330	DISCHARGE (CFS) = 1.9
TIME (MIN) = 335	DISCHARGE (CFS) = 1.8
TIME (MIN) = 340	DISCHARGE (CFS) = 1.7
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) = 1.5

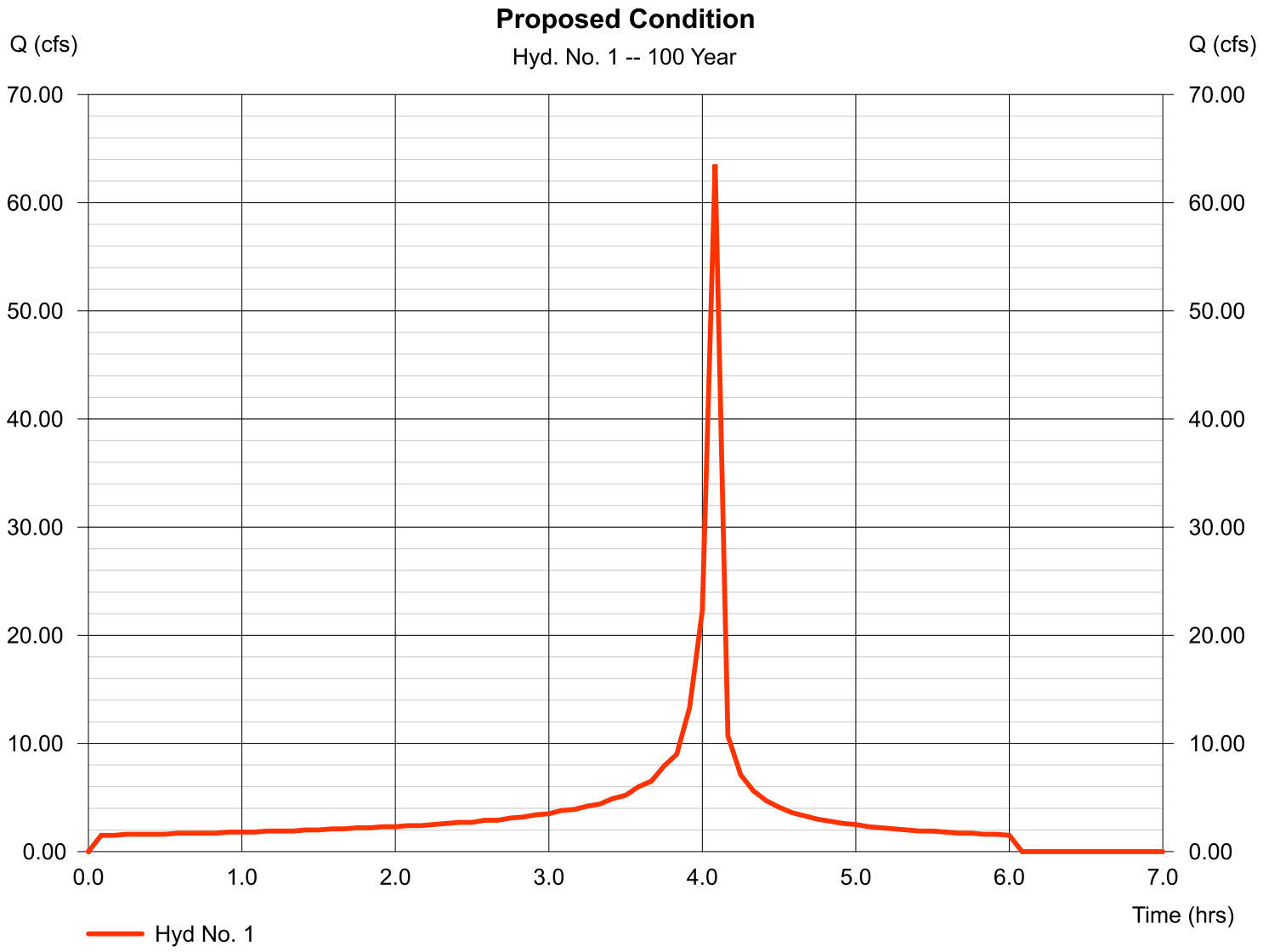
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Monday, 06 / 10 / 2019

Hyd. No. 1

Proposed Condition

Hydrograph type	= Manual	Peak discharge	= 63.53 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 91,809 cuft



Hydrograph Report

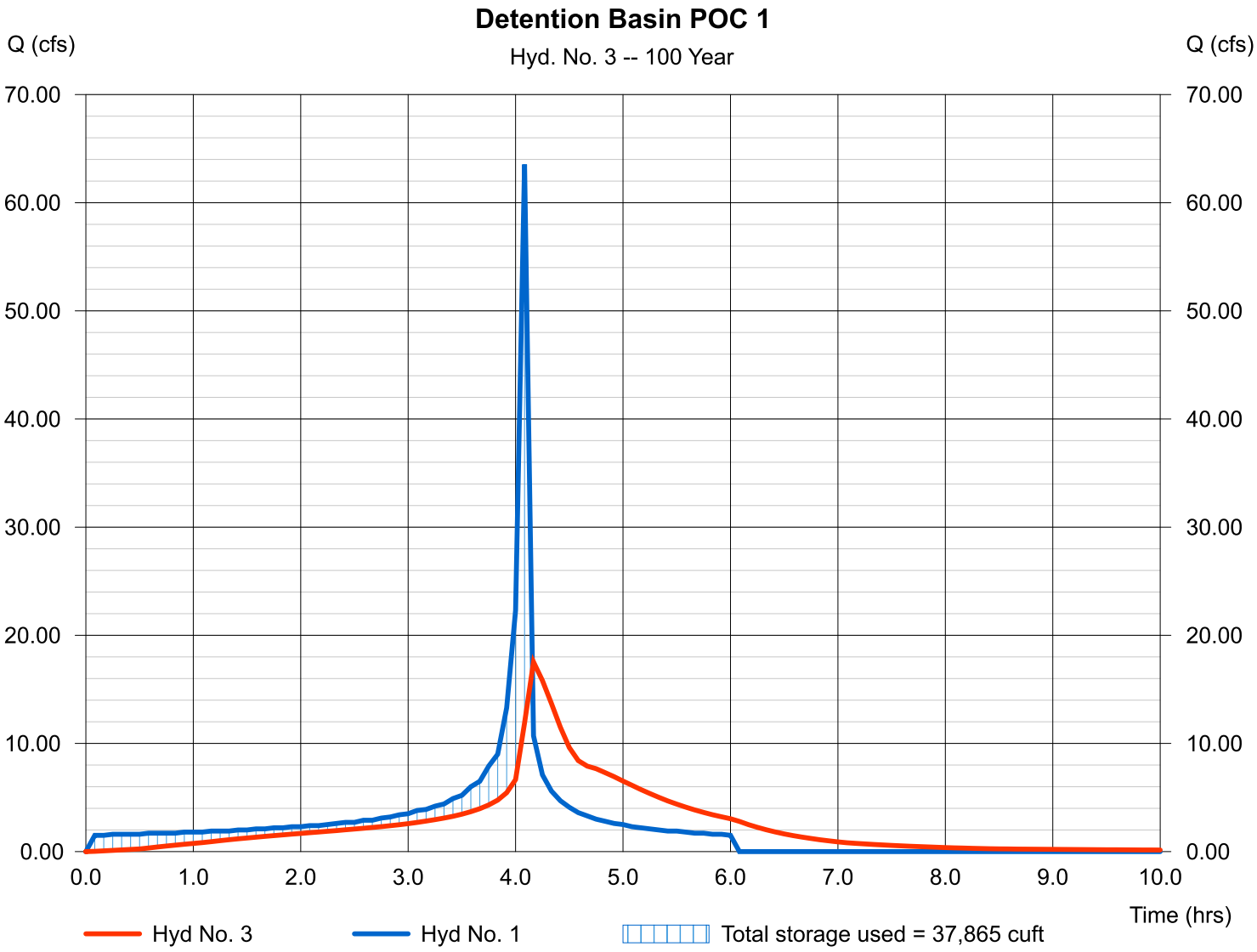
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Monday, 06 / 10 / 2019

Hyd. No. 3

Detention Basin POC 1

Hydrograph type	=	Reservoir	Peak discharge	=	17.53 cfs
Storm frequency	=	100 yrs	Time to peak	=	4.17 hrs
Time interval	=	5 min	Hyd. volume	=	91,799 cuft
Inflow hyd. No.	=	1 - Proposed Condition	Max. Elevation	=	334.68 ft
Reservoir name	=	Underground Detention Basin	Max. Storage	=	37,865 cuft

Storage Indication method used.



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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GEOLOGIC RECONNAISSANCE REPORT

COSTA VERDE
CENTER REDEVELOPMENT
8650 GENESEE AVENUE
SAN DIEGO, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

REGENCY CENTERS
SOLANA BEACH, CALIFORNIA

JULY 28, 2016
PROJECT NO. G1927-11-01

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. G1927-11-01
July 28, 2016

Regency Centers
420 Stevens Avenue, Suite 320
Solana Beach, California 92075

Attention: Mr. Gregg Sadowsky

Subject: GEOLOGIC RECONNAISSANCE REPORT
COSTA VERDE CENTER REDEVELOPMENT
8650 GENESEE AVENUE
SAN DIEGO, CALIFORNIA

Dear Mr. Sadowsky:

In accordance with your authorization of our Proposal No. LG-15417 dated November 9, 2015, we prepared this geologic reconnaissance report for the proposed Costa Verde Center redevelopment project. We understand that this report will be used to supplement the preparation of the EIR document for the project.

The accompanying report describes the general site soil, geologic conditions and limited geotechnical recommendations based on a desktop study. This report also includes field infiltration testing and storm water management recommendations.

Should you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

John Hoobs
CEG 1524

PROFESSIONAL GEOLOGIST
JOHN HOOBS
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CERTIFIED ENGINEERING GEOLOGIST
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JH:SW:dmc

(3/del) Addressee

TABLE OF CONTENTS

GEOLOGIC RECONNAISSANCE REPORT

1. PURPOSE AND SCOPE

This report presents the results of a geologic reconnaissance for use in preparation of an EIR document. The Costa Verde Center is located at 8650 Genesee Avenue within the University Town Center (UTC) area of San Diego, California (see Vicinity Map, Figure 1). The purpose of this study is to review the referenced geotechnical documents (see List of References) and evaluate the existing geologic conditions and the geologic/geotechnical hazards that may affect re-development of the property. In addition, we performed field infiltration testing and prepared storm water management recommendations that also included preparation of Worksheet C.4-1.

The scope of our study consisted of performing site visits to observe the current site conditions, perform three field infiltration tests, and review of the site plans titled *Preliminary Concept Plan, Regency Centers: Costa Verde Center, Marketing Package*, prepared by Callison Architects, dated July 2016. In addition, we also reviewed the proposed grading and improvement plans prepared by Kimley-Horn, progress date July 25, 2016.

To aid in preparation of this report we reviewed:

1. *Geotechnical Engineering Investigation for Costa Verde, San Diego, California*, prepared by Geocon Incorporated dated April 4, 1986 (Project No. D-2631-J02).

2. *Final Report of Testing and Observation Services During Mass Grading Operations for Costa Verde, Lots 1, 2, 6 through 14, W.O. No. 850783, San Diego, California*, prepared by Geocon Incorporated dated July 17, 1987 (Project No. D-2631-W07).

3. *Final Report of Testing and Observation Services During Mass Grading Operations for Costa Verde, Lots 1 through 14, San Diego*, California, prepared by Geocon Incorporated dated November 19, 1987 (Project No. D-2631-W07).

4. *Soil and Geologic Reconnaissance, Planned 18-inch Sewer, Genesee Avenue and Rose Canyon, San Diego, California*, prepared by Geocon Incorporated dated July 12, 2012 (Project No. G1120-52-01).

5. *Update Geotechnical Report, Monte Verde, Genesee Avenue and La Jolla Village Drive, San Diego, California*, prepared by Geocon Incorporated dated June 4, 2014 (Project No. 05812-52-05).

6. *Geotechnical Engineering Investigation and Geologic Reconnaissance for La Jolla Towers, San Diego, California*, prepared by Geocon Incorporated dated May 28, 1992 (Project No. 04846-35-01).

The conclusions presented herein are based on a review of the geotechnical data for the property and on properties adjacent to this study and our experience with similar soil and geologic conditions in the surrounding area.

2. SITE AND PROJECT DESCRIPTION

The project site is located west of Genesee Avenue, north of Nobel Drive, east of Costa Verde Boulevard and Las Palmas Square Drive with Esplanade Court located within the northern portion of the site. Residential Towers are present to the west and the Monte Verde Towers project is currently in construction to the north. The site is currently occupied by a shopping center with multiple buildings, a two level parking structure on the northern portion of the site with one level partially subterranean and several large areas of on-grade parking. Existing buildings are one to two stories occupied by retail stores. The site generally gently slopes to the south with elevations ranging from about 340 feet above Mean Sea Level (MSL) to about 365 feet MSL at the south and north sides, respectively.

Geocon Incorporated provided the original geotechnical services during the investigation and mass grading operations for the Costa Verde Center in the 1980's as well as the adjacent residential towers to the west. We are also providing geotechnical engineering services during the construction of the Monte Verde Towers project to the north that consists of 4 levels of subterranean parking with excavations of roughly 45 to 50 feet. Geocon also performed the investigation and testing services for the 2015 Genesee Sewer Replacement project fronting the Costa Verde Center property. The previous geotechnical documents applicable to the subject site are referenced herein.

Based on our review of the concept plans prepared by Callison Architects, the planned redevelopment will include a new parking structure integrated with several buildings on the east side of the property that will connect to the elevated new Trolley Station within Genesee Avenue, a 200-room hotel on the northern portion of the property, several new retail buildings as well as modifications to existing retail buildings on the central portion of the property, and areas of on-grade parking. Amenities that will be included in the project include pedestrian friendly areas, patio decks, and a community room. The proposed parking structure will have one level subterranean and four levels above grade.

3. GEOLOGIC SETTING

The site is located in the western portion of a geologic coastal plain within the southern portion of the Peninsular Ranges Geomorphic Province of southern California. The Peninsular Ranges is a geologic and geomorphic province that extends from the Imperial Valley to the Pacific Ocean and from the Transverse Ranges to the north and into Baja California to the south. The coastal plain of San Diego County is underlain by a thick sequence of relatively undisturbed and non-conformable sedimentary rocks that thicken to the west and range in age from Upper Cretaceous through the Pleistocene with

intermittent deposition. The sedimentary units are deposited on bedrock Cretaceous to Jurassic age igneous and metavolcanic rocks. Geomorphically, the coastal plain is characterized by a series of twenty-one, stair-stepped marine terraces which get younger to the west that have been dissected by west flowing rivers that drain the Peninsular Ranges which are located to the east. The coastal plain is a relatively stable block that is dissected by relatively few faults consisting of the potentially active La Nacion Fault Zone and the active Rose Canyon Fault Zone. The Peninsular Ranges Province is also dissected by the Elsinore Fault Zone that is associated with and sub-parallel to the San Andreas Fault Zone, which is the plate boundary between the Pacific and North American Plates.

The site is composed of fill soils placed in the 1980's overlying marine deposited Eocene-age Scripps Formation which is roughly 150 feet thick in the general area. Geomorphically the site is located on a former broad marine/non-marine terrace that generally sloped gently to the south toward the existing west flowing Rose Canyon drainage south of Nobel Drive.

4. SOIL AND GEOLOGIC CONDITIONS

Based on review of the referenced reports and our experience in the area with similar projects, the site is underlain by previously placed fill overlying the Scripps Formation. Figure 2 presents our Geologic Map, Figure 3 our geologic cross-sections, and Figure 4 the Regional Geologic Map, respectively. The locations of selected previously excavated deep exploratory borings on and adjacent to the site are presented on Figure 2 and the boring logs are included in Appendix A.

4.1 Previously Placed Fill (Qpf)

We expect localized areas of previously placed fill underlies a majority of the site associated with previous grading operations for the existing shopping center structures and improvements. We performed the testing and observation services performed during overall mass grading operations in the 1980's. We did not provide testing and observation services during subsequent fine grading operations for the building pads and utility trench backfill within the shopping center. Based on review of our previous mass grading reports and the existing finish grades, the majority of the site will have fill with a maximum thickness of approximately 10 to 15 feet (designated as Qpf_2 on Figure 2). A previous canyon drainage located on the south side of the site was filled with a maximum thickness of approximately 35 to 40 feet of compacted fill (designated as Qpf_1 on Figure 2) which included the placement of two canyon subdrains. The previously placed fill is generally composed of clayey or silty, fine to coarse sand and sandy clay. The fill soil will generally possesses a "very low" to "medium" expansion potential (expansion index of 90 or less) and likely possesses "Not Applicable" and "S0" to "Severe" and "S2" sulfate exposure to concrete improvements in contact with the native soils. We expect the upper portions of the previously placed fill impacted by improvements and irrigation practices will not be suitable to support the proposed re-development improvements and some remedial grading would be required.

4.2 Very Old Paralic Deposits (Qvop)

Middle to early Pleistocene-age Very Old Paralic Deposits were encountered at the site previous to mass grading operations in 1987. We encountered approximately 2 to 5 feet of Very Old Paralic Deposits (previously called the Lindavista Formation) underlying topsoil and overlying Scripps Formation during our previous geotechnical investigation performed in 1986. We expect a majority of the Very Old Paralic Deposits was removed during mass grading operations and may have been reused as fill. The Very Old Paralic Deposits generally consist of dense, reddish brown, silty, fine to medium sandstone and sandy siltstone with occasional traces of fine gravel. The Very Old Paralic Deposits likely possesses a "very low" to "low" expansion potential (expansion index of 50 or less) and likely possesses "Not Applicable" and "S0" sulfate exposure to concrete improvements in contact with this formation. The Very Old Paralic Deposits, if present, is considered suitable for additional fill or structural loads for the proposed re-development of the shopping center.

4.3 Scripps Formation (Tsc)

Middle Eocene-age Scripps Formation underlies the previously placed fill and may exist at pad grade within the existing underground parking area. Materials encountered within this formation are variable and consist of hard and very dense, slightly and moderately cemented, light brown, olive brown and gray sandy siltstone, silty to clayey, fine sandstone and localized thick lenses of brown cobble conglomerate. Scripps Formation also typically contains localized areas of highly cemented concretionary beds. The Scripps Formation likely possesses a "very low" to "medium" expansion potential (expansion index of 90 or less) and likely possesses "Not Applicable" and "S0" to "Severe" and "S2" sulfate exposure to concrete improvements in contact with this formation. The Scripps Formation is considered suitable for additional fill or structural loads for the proposed re-development of the shopping center.

5. GROUNDWATER

We do not expect groundwater would significantly affect project development. We expect a permanent groundwater table exists in excess of 150 feet below the ground surface. It is not uncommon for seepage conditions to develop where none previously existed due to the permeability characteristics of the geologic units encountered on site. During the rainy season, seepage conditions may develop that would require special consideration during improvement operations. Groundwater elevations are dependent on seasonal precipitation, irrigation and land use, among other factors, and vary as a result. Proper surface drainage will be critical to future performance of the project.

6. GEOLOGIC HAZARDS

6.1 Geologic Hazard Category

The City of San Diego Seismic Safety Study, Geologic Hazards and Faults, Map Sheet 30 defines the site with a Hazard Category 51: *Level mesas – Underlain by terrace deposits and bedrock – Nominal risk* and a Hazard Category 54: *Other Terrain – Steeply sloping terrain, unfavorable or fault controlled geologic structure, Moderate Risk*. A fault with a length of approximately 500 lineal feet within the Scripps Formation and categorized as potentially active, inactive, presumed inactive, or activity unknown is mapped approximately 100 feet southwest of the site.

6.2 Faulting and Seismicity

Based on a review of geologic literature and experience with the soil and geologic conditions in the general area, it is our opinion that known active, potentially active, or inactive faults are not located at the site. An active fault is defined by the California Geological Survey (CGS) as a fault showing evidence for activity within the last 11,000 years. In addition to our background review, the site is not mapped in the vicinity of geologic hazards such as landslides, liquefaction areas, or faulting and is not located within the State of California Earthquake Fault Zone.

According to the computer program *EZ-FRISK* (Version 7.65), seven known active faults are located within a search radius of 50 miles from the property. We used the 2008 USGS fault database to evaluate the fault parameters. The nearest known active fault is the Newport-Inglewood and Rose Canyon Faults, located approximately 3 miles west of the site and is the dominant source of potential ground motion. Earthquakes that might occur on these fault zones 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 Fault are 7.5 and 0.47g, respectively. Table 6.2.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for the most dominant faults in relationship to the site location. We calculated peak ground acceleration (PGA) using Boore-Atkinson (2008) NGA USGS2008, Campbell-Bozorgnia (2008) NGA USGS, 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	3	7.5	0.39	0.37	0.47
Rose Canyon	3	6.9	0.36	0.36	0.43
Coronado Bank	16	7.4	0.21	0.15	0.19
Palos Verdes Connected	16	7.7	0.23	0.17	0.22
Elsinore	35	7.9	0.16	0.10	0.13
Earthquake Valley	42	6.8	0.09	0.06	0.05
Palos Verdes	42	7.3	0.09	0.06	0.06

We used the computer program *EZ-FRISK* to perform a probabilistic seismic hazard analysis. The computer program *EZ-FRISK* operates under the assumption that the occurrence rate of earthquakes on each mappable Quaternary fault is proportional to the fault's slip rate. The program accounts for fault rupture length as a function of earthquake magnitude, 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 USGS2008, Campbell-Bozorgnia (2008) NGA USGS2008, and Chiou-Youngs (2007) NGA USGS2008 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	0.53	0.47	0.56
5% in a 50 Year Period	0.37	0.33	0.38
10% in a 50 Year Period	0.27	0.24	0.26

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 2013 California Building Code (CBC) guidelines currently adopted by the City of San Diego. We understand new 2016 CBC guidelines may go into effect in January 2017, which may require updated seismic design parameters.

6.3 Liquefaction and Seismically Induced Settlement

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soil is cohesionless or silt/clay with low plasticity, groundwater is encountered within 50 feet of the surface, and soil relative densities are less than about 70 percent. If the four of the previous criteria are met, a seismic event could result in a rapid pore-water pressure increase from the earthquake-generated ground accelerations. Seismically induced settlement may occur whether the potential for liquefaction exists or not. The potential for liquefaction and seismically induced settlement occurring within the site soil is considered to be negligible due to the very dense nature of the Scripps Formation and lack of groundwater within 50 feet of the ground surface.

6.4 Seiches and Tsunamis

A seiche is a run-up of water within a lake or embayment triggered by fault- or landslide-induced ground displacement. The site is not located in the vicinity of or downstream from such bodies of water. Therefore, the risk of seiches affecting the site is negligible.

A tsunami is a series of long-period waves generated in the ocean by a sudden displacement of large volumes of water. Causes of tsunamis include underwater earthquakes, volcanic eruptions, or offshore slope failures. The first-order driving force for locally generated tsunamis offshore from southern California is expected to be tectonic deformation from large earthquakes. The property is located at an elevation of about 350 feet above MSL and is about 3 miles from the Pacific Ocean; therefore, the risk of tsunamis affecting the site is negligible.

6.5 Landslides

Examination of aerial photographs in our files, review of published geologic maps for the site vicinity, and the relatively level topography, it is our opinion landslides are not present at the subject property.

6.6 Settlement Potential

The existing fill soil could experience settlement due to new compacted fill and building loading conditions. The magnitude of settlement is dependent on the amount of fill soil present below the

improvement and the building loading from the proposed structure. The Scripps Formation will have much smaller settlement magnitudes from proposed building loads due to its very dense conditions. The risk of seismically induced settlement is considered very low due to the dense to very dense nature of the existing fill soil, Very Old Paralic Deposits (where present) and Scripps Formation.

6.7 Shrinkage/Subsidence Potential

Subsidence is a gradual settling or sudden sinking of the ground surface (i.e., loss of elevation). The principal causes of subsidence are aquifer-system compaction, drainage of organic soils, underground mining, and natural compaction. Shrinkage (also known as hydro-consolidation) is the reduction in volume in soil as the water content of the soil changes. The risk due to subsidence and hydro-consolidation affecting the project site is considered to be negligible.

6.8 Slope and Soil Instability

Existing fill slopes have been performing as intended and do not show slope instability or excessive soil erosion. Proper implementation of surface drainage and landscaping practices during future improvements will continue to create stable slopes and soil conditions for the site.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 From a geotechnical engineering standpoint, it is our opinion that soil or geologic conditions do not exist at the site that would prohibit the planned re-development project. A geotechnical investigation will be required by the City of San Diego to provide additional evaluation of the soil conditions, potential hazards on the property, and site specific recommendations for re-development once grading and structural plans are prepared.

7.1.2 Based on a review of the referenced documents and our experience in the area, we expect the site is generally underlain by previously placed fill overlying Scripps Formation. We expect the on-site soil can be used for properly compacted new fill from a geotechnical engineering standpoint.

7.1.3 We expect groundwater exists in excess of 150 feet below the existing grades or at an elevation below approximately 200 feet MSL. However, it is not uncommon for seepage conditions to develop where none previously existed due to the permeability characteristics of the geologic units encountered on site.

7.1.4 We understand the current conceptual plans are preliminary. Therefore, we have prepared this report for use in preparation of an EIR document. We should prepare a geotechnical investigation level report for future improvements to the property once grading and structural plans are prepared.

7.1.5 We expect the existing structures at the site are supported on conventional shallow foundations with a concrete slab-on-grade. Based on limited, visual observations at the property, it appears the structures are behaving as designed from a geotechnical engineering standpoint.

7.1.6 We expect that most of the proposed new structures will be supported on conventional shallow foundations with a concrete slab-on-grade. However, some use of drilled piers may be needed based on lateral loading conditions to existing improvements and potential differential settlements due to differential fill thicknesses. In addition, review of lateral support elements for the adjacent Monte Verde development to the north should be performed to check for construction conflicts.

7.1.7 Adequate drainage provisions are imperative to the performance of the development. Site drainage should be maintained to direct surface runoff into controlled drainage devices.

Positive site drainage should be maintained away from structures and pavements and tops of slopes and directed to storm drain facilities.

7.2 Excavation and Soil Characteristics

7.2.1 Based on the results of expansion index laboratory testing performed during mass grading operations at the site and from adjacent sites, we expect the onsite soil can be considered to be "non-expansive" and "expansive" (expansion index less than 20 and greater than 20, respectively) as defined by 2013 California Building Code (CBC) Section 1803.5.3. Table 7.2.1 presents soil classifications based on the expansion index. Based on the results of our previous laboratory testing, we expect the on-site materials possesses a "very low" to "medium" expansion potential (Expansion Index of 90 or less).

TABLE 7.2.1
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	Expansion Classification	2013 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

7.2.2 We previously performed laboratory tests on samples of the site materials during mass grading to evaluate the percentage of water-soluble sulfate content. Based on the results from the laboratory water-soluble sulfate content tests previously performed, the on-site materials at the locations tested possess "not applicable" or "S0" to "Severe" or "S2" sulfate exposure to concrete improvements in contact with the project soils as defined by 2013 CBC Section 1904 and ACI 318-08 Sections 4.2 and 4.3. Additional laboratory testing should be performed subsequent to the remedial grading operations. Table 7.2.2 presents a summary of concrete requirements set forth by 2013 CBC Section 1904 and ACI 318. 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 (SO_4) Percent by Weight	Cement Type (ASTM C 150)	Maximum Water to Cement Ratio by Weight	Minimum Compressive Strength (psi)
Not Applicable	S0	$SO_4<0.10$	--	--	2,500
Moderate	S1	$0.10\leq SO_4<0.20$	II	0.50	4,000
Severe	S2	$0.20\leq SO_4\leq 2.00$	V	0.45	4,500
Very Severe	S3	$SO_4>2.00$	V+Pozzolan or Slag	0.45	4,500

7.2.3 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, further evaluation by a corrosion engineer may be performed if improvements that could be susceptible to corrosion are planned.

7.2.4 Existing fill soil can be excavated with light to moderate effort using conventional heavy-duty grading and trenching equipment. The Scripps Formation will require heavy effort to excavate and may generate oversize rock within localized cemented zones. The oversize materials will likely require export if it cannot be broken down to suitable sizes and properly incorporated in new compacted fill areas. Cemented zones, gravel and cobble layers are not uncommon within the Scripps Formation and may require special excavation equipment such as rock breakers if encountered. This issue may be the focus of future studies. Blasting of the on-site materials will not be required during re-development of the shopping center.

7.3 Seismic Design Criteria

7.3.1 The underlying soil conditions should be evaluated during the future geotechnical investigation. The property will possess Site Class C or D in accordance with 2013 California Building Code (CBC; Based on the 2011 International Building Code [IBC] and ASCE 07-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The Site Class should be evaluated during the future geotechnical investigation based on final locations of buildings and improvements.

7.4 Proposed Foundation Systems

7.4.1 We expect the new buildings can be supported on conventional shallow foundations bearing in property compacted fill or the Scripps Formation. Proposed buildings may

require deepened footings or drilled piers such that they do not surcharge adjacent existing or proposed buildings and retaining walls. Footings should be deepened such that they are extended below a 1:1 upward projection from adjacent building and retaining wall footings.

7.5 Site Drainage and Moisture Protection

7.5.1 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 2013 CBC 1804.3 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 conduits that carry runoff away from the proposed structure.

7.5.2 In the case of basement walls or building walls retaining landscaping areas, a water-proofing system should be used on the wall and joints, and a Miradrain drainage panel (or similar) should be placed over the waterproofing. A perforated drainpipe of schedule 40 or better should be installed at the base of the wall below the floor slab and drained to an appropriate discharge area. Accordion-type pipe is not acceptable. The project architect or civil engineer should provide detailed specifications on the plans for all waterproofing and drainage.

7.5.3 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.

7.5.4 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.

7.6 Storm Water Management Background

7.6.1 We understand storm water management devices are being proposed in accordance with the *2016 City of San Diego Storm Water Standards* (SWS). If not properly constructed, there is a potential for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water to be detained, its residence time, and soil permeability have an important effect on seepage transmission and

the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeologic study at the site. If infiltration of storm water runoff occurs, downstream properties may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of water infiltration.

7.6.2 The United States Department of Agriculture (USDA), Natural Resources Conservation Services, possesses general information regarding the existing soil conditions for areas within the United States. The USDA website also provides the Hydrologic Soil Group. Table 7.6.1 presents the descriptions of the hydrologic soil groups. If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. In addition, the USDA website also provides an estimated saturated hydraulic conductivity for the existing soil.

TABLE 7.6.1
HYDROLOGIC SOIL GROUP DEFINITIONS

Soil Group	Soil Group Definition
A	Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.
B	Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.
C	Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.
D	Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

7.6.3 The United States Department of Agriculture (USDA), Natural Resources Conservation Services possesses general information regarding the existing soil conditions for areas within the United States. Table 7.6.2 presents the soil name based on the USDA website.

TABLE 7.6.2
USDA SOIL GENERAL INFORMATION

Map Unit Name	Map Unit Symbol	Hydrologic Soil Group	Approximate Percentage of Property
Chesterton Fine Sandy Loam, 2 to 5 Percent Slopes	CfB	D	86
Gaviota Fine Sandy Loam, 30 to 50 Percent Slopes	GaF	D	14

7.6.4 The USDA website also provides the Hydrologic Soil Group as presented in Table 7.6.2. Based on the USDA website, the soil at the site is defined as a Hydrologic Soil Group D. Table 7.6.2 presents the description of Hydrologic Soil Group. Based on the provided table, if a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in the natural condition are in group D are assigned to dual classes.

7.7 In-Situ Testing

7.7.1 The infiltration rate, percolation rates, and saturated hydraulic conductivity are different and have different meanings. Percolation rates tend to overestimate infiltration rates and saturated hydraulic conductivities by a factor of 10 or more. Table 7.7.1 describes the differences in the definitions.

TABLE 7.7.1
SOIL PERMEABILITY DEFINITIONS

Term	Definition
Infiltration Rate	The observation of the flow of water through a material into the ground downward into a given soil structure under long term conditions. This is a function of layering of soil, density, pore space, discontinuities and initial moisture content.
Percolation Rate	The observation of the flow of water through a material into the ground downward and laterally into a given soil structure under long term conditions. This is a function of layering of soil, density, pore space, discontinuities and initial moisture content.
Saturated Hydraulic Conductivity (k_{SAT}, Permeability)	The volume of water that will move in a porous medium under a hydraulic gradient through a unit area. This is a function of density, structure, stratification, fines content and discontinuities. It is also a function of the properties of the liquid as well as of the porous medium.

7.7.2 The degree of soil compaction or in-situ density has a significant impact on soil permeability and infiltration. Based on our experience and other studies we performed an increase in compaction results in a decrease in soil permeability.

7.7.3 We performed three Aardvark Permeameter tests at the property. The approximate locations of our infiltration tests are shown on Figure 2, Geologic Map. The test borings were 4 inches in diameter and were 4.0 and 6.0 feet deep. The results of the tests provide parameters regarding the saturated hydraulic conductivity and infiltration characteristics of the near surface geologic units. Table 7.7.2 presents the results of the estimated field saturated hydraulic conductivities obtained from the Aardvark Permeameter tests. The field sheets are included in Appendix B. We applied an appropriate factor of safety of 2 to the field results for use in preparation of Worksheet C.4-1. The results indicate an adjusted soil infiltration rate of 0.01 to 0.07 inches per hour or an average rate of 0.03 inches per hour applying a Factor of Safety of 2. Soil infiltration rates from in-situ tests can vary significantly from one location to another due to the heterogeneous characteristics inherent to most soil.

TABLE 7.7.2
FIELD PERMEAMETER INFILTRATION TEST RESULTS

Test No.	Geologic Unit	Test Depth and Elevation (feet, MSL)	Field-Saturated Hydraulic Conductivity, k_{sat} (inch/hour)	Worksheet[1] Saturated Hydraulic Conductivity, k_{sat} (inch/hour)
P-1	Tsc	(-5.2 feet) 355 feet MSL	0.14	0.07
P-3	Tsc	(-6.0 feet) 343 feet MSL	0.02	0.01
P-2	Tsc	(-4.0 feet) 345 Feet MSL	0.04	0.02

[1] Using a factor of safety of 2 for Worksheet C.4-1.

7.8 Storm Water Management Conclusions

7.8.1 The following presents a discussion of the soil types on site regarding storm water infiltration feasibility.

Compacted Fill – Compacted fill exists across the majority of the property to depths of up to about 10 to 15 feet. A canyon fill exists on the southern portion of the site with maximum fill depths of up to 35 to 40 feet. The compacted fill varies in soil type, density and some areas possess relatively high fines content (silt and clay). Water that is allowed to migrate within the compacted fill soil cannot be controlled due to lateral migration potential, would destabilize support for the existing improvements, and would shrink and swell. Therefore, full and partial infiltration should be considered infeasible within existing and proposed compacted fill.

Scripps Formation – The Scripps Formation exists below the compacted fill and consists of very dense and hard, moderately to well cemented silty to clayey sandstones, along with siltstones and claystones. This geologic unit can have a variable expansion potential of "very low" to "medium" (expansion index of 90 or less). Based on the low infiltration rates and the cemented and hard characteristics of this unit, full infiltration is considered infeasible within the Scripps Formation. Partial infiltration can be performed and side liners should be installed to prevent water from migrating within the existing fill materials.

7.8.2 We did not encounter groundwater during the previous grading or drilling operations on the property. The groundwater table will be in excess of 150 feet below existing grades. Therefore, infiltration associated with this risk is considered feasible.

7.8.3 Utilities are located on and adjacent to the property. Therefore, full infiltration near these utilities should be considered infeasible. Mitigation for utilities includes setting back the water management devices from the utility corridors and installing liners to prevent water migration into the utility backfill.

7.8.4 We are unaware of contaminated soil or groundwater on the property. Therefore, infiltration associated with this risk is considered feasible. We should be provided environmental reports if these have been prepared for the property.

7.8.5 Slopes are present within the southern and southeast portion of the site. Infiltration should not be considered within 50 feet of these slopes to reduce the potential for increased seepage forces and slope instability. Therefore, full and partial infiltration should be considered infeasible adjacent to slope areas.

7.8.6 We understand planters may be used as storm water management devices. The planters should be properly lined to prevent water migration into the adjacent improvements. Water storage devices can be installed to reduce the velocity and amount of water entering the storm drain system. The project civil engineer should provide the final design of the storm water management devices.

7.8.7 Liners and subdrains may need to be incorporated into the design and construction of the planned storm water devices. The liners should be impermeable (e.g. High-density polyethylene, HDPE, with a thickness of about 30 mil or equivalent Polyvinyl Chloride**,** PVC) to prevent water migration. The subdrains should be perforated within the liner area, installed at the base and above the liner, be at least 3 inches in diameter and consist of Schedule 40 PVC pipe. The subdrains outside of the liner should consist of solid pipe. The penetration of the liners at the subdrains should be properly waterproofed. The subdrains

should be connected to a proper outlet. The devices should also be installed in accordance with the manufacturer's recommendations.

7.9 Storm Water Standard Worksheets

7.9.1 The SWS requests the geotechnical engineer complete the *Categorization of Infiltration Feasibility Condition* (Worksheet C.4-1 or I-8) worksheet information to help evaluate the potential for infiltration on the property. The attached Worksheet C.4-1 presents the completed information for the submittal process.

7.9.2 The regional storm water standards also have a worksheet (Worksheet D.5-1 or Form I-9) that helps the project civil engineer estimate the factor of safety based on several factors. Table 7.9.1 describes the suitability assessment input parameters related to the geotechnical engineering aspects for the factor of safety determination.

TABLE 7.9.1
SUITABILITY ASSESSMENT RELATED CONSIDERATIONS
FOR INFILTRATION FACILITY SAFETY FACTORS

Consideration	High Concern – 3 Points	Medium Concern – 2 Points	Low Concern – 1 Point
Assessment Methods	Use of soil survey maps or simple texture analysis to estimate short-term infiltration rates. Use of well permeameter or borehole methods without accompanying continuous boring log. Relatively sparse testing with direct infiltration methods	Use of well permeameter or borehole methods with accompanying continuous boring log. Direct measurement of infiltration area with localized infiltration measurement methods (e.g., Infiltrometer). Moderate spatial resolution	Direct measurement with localized (i.e. small-scale) infiltration testing methods at relatively high resolution or use of extensive test pit infiltration measurement methods.
Predominant Soil Texture	Silty and clayey soils with significant fines	Loamy soils	Granular to slightly loamy soils
Site Soil Variability	Highly variable soils indicated from site assessment or unknown variability	Soil boring/test pits indicate moderately homogenous soils	Soil boring/test pits indicate relatively homogenous soils
Depth to Groundwater/ Impervious Layer	<5 feet below facility bottom	5-15 feet below facility bottom	>15 feet below facility bottom

7.9.3 Based on our geotechnical investigation and the previous table, Table 7.9.2 presents the estimated factor values for the evaluation of the factor of safety. This table only presents the suitability assessment safety factor (Part A) of the worksheet. The project civil engineer should evaluate the safety factor for design (Part B) and use the combined safety factor for the design infiltration rate.

TABLE 7.9.2
FACTOR OF SAFETY WORKSHEET DESIGN VALUES – PART A[1]

Suitability Assessment Factor Category	Assigned Weight (w)	Factor Value (v)	Product (p = w x v)
Assessment Methods	0.25	2	0.50
Predominant Soil Texture	0.25	3	0.75
Site Soil Variability	0.25	2	0.50
Depth to Groundwater/ Impervious Layer	0.25	1	0.25
Suitability Assessment Safety Factor, $S_A = \sum p$			2.00

[1]The project civil engineer should complete Worksheet D.5-1 or Form I-9 using the data on this table. Additional information is required to evaluate the design factor of safety.

7.10 Geotechnical Investigation

7.10.1 A geotechnical investigation will be required by the City of San Diego to provide additional evaluation of the soil conditions, potential hazards on the property, and site specific recommendations for re-development once grading and structural plans are prepared. The field investigation would consist of evaluating proposed building and parking structure locations to perform the proposed field drilling program and sampling of the existing soil conditions.

7.10.2 Laboratory tests should be performed on selected soil samples to evaluate maximum dry density and optimum moisture content, shear strength, expansion characteristics, water-soluble sulfate content, pH, resistivity, chloride-ion content, consolidation, resistance value (R-Value), plasticity index, in-situ dry density and moisture content and gradation of the soil encountered.

7.10.3 The geotechnical investigation report should present the findings, conclusions, and recommendations regarding the geotechnical aspects of structures as proposed in the future. Foundation and concrete slab on-grade design criteria, current California Building Code seismic design parameters, temporary shoring recommendations, excavation characteristics, geologic hazard analyses, and remedial grading measures at the site would be included in the report.

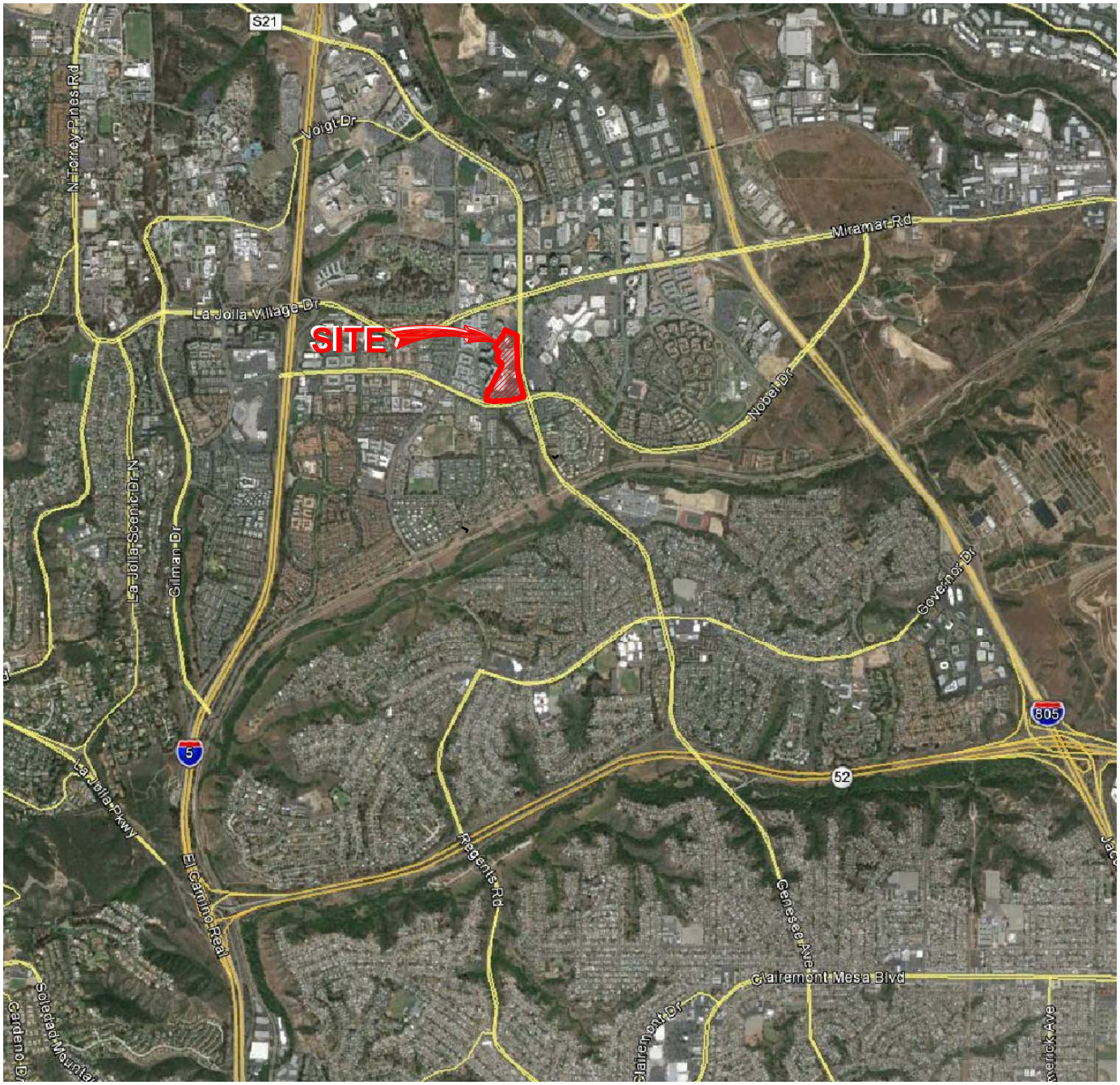
LIMITATIONS AND UNIFORMITY OF CONDITIONS

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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PHONE 858 558-6900 - FAX 858 558-6159

LR / CW		DSK/GTYPD

COSTA VERDE CENTER REDEVELOPMENT
8650 GENESEE AVENUE
SAN DIEGO, CALIFORNIA

DATE 07 - 28 - 2016	PROJECT NO. G1927 - 11 - 01	FIG. 1

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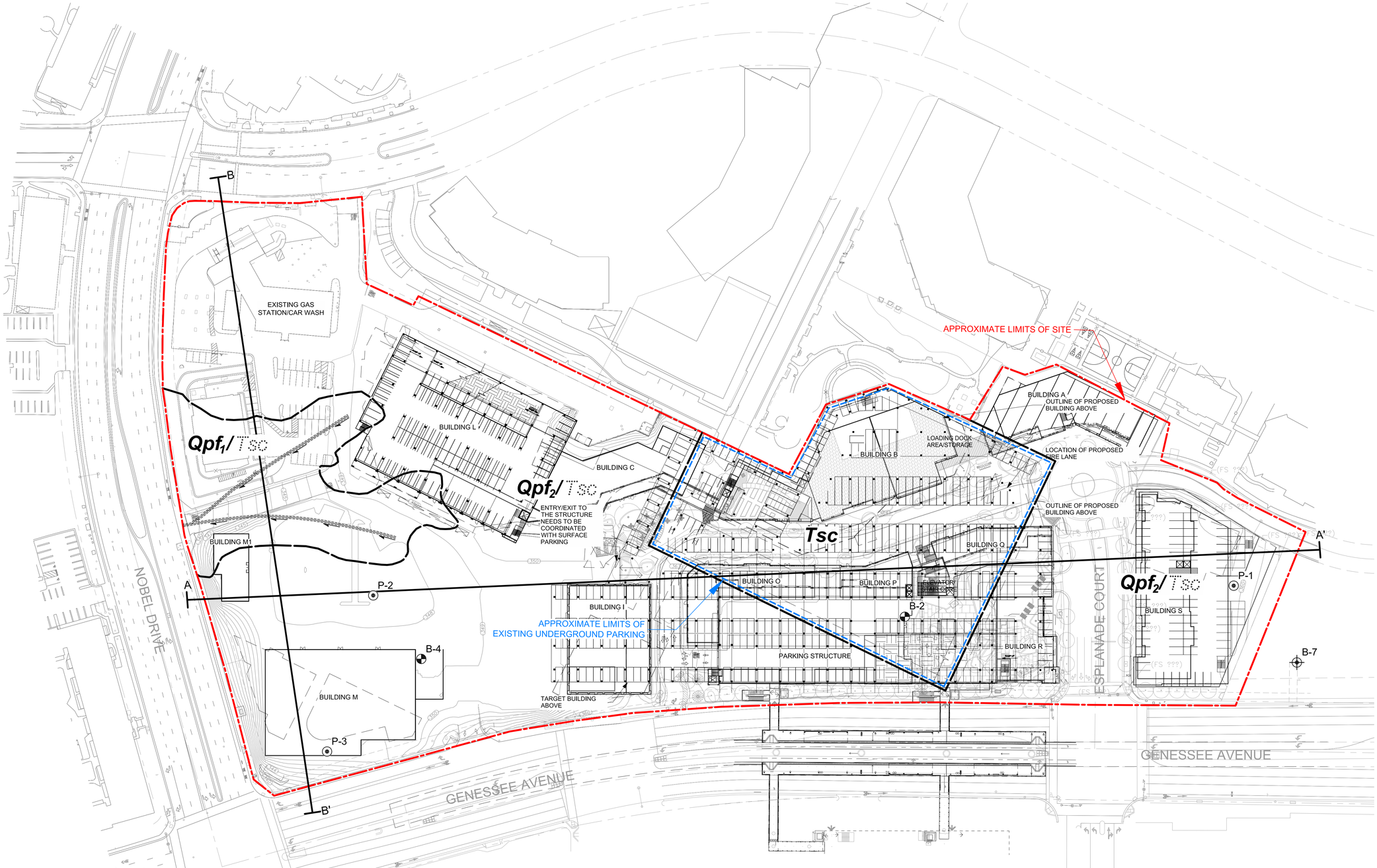

0' 60' 120' 180' 240'

SCALE 1"=60' (On 36x24)

GEOCON LEGEND

- Qpf_1 .....PREVIOUSLY PLACED CANYON FILL (1986)
- Qpf_2 .....PREVIOUSLY PLACED FILL (Circa, 1986-1988)
- Tsc .....SCRIPPS FORMATION (Dotted Where Buried)
- B-4 .....APPROX. LOCATION OF PREVIOUS BORING (Geocon, 1986)
- B-7 .....APPROX. LOCATION OF PREVIOUS BORING (Geocon, 1999)
- P-3 .....APPROX. LOCATION OF INFILTRATION TEST
- B B' .....GEOLOGIC CROSS - SECTION
- .....APPROX. LOCATION OF CANYON SUBDRAINS
- .....APPROX. LOCATION OF GEOLOGIC CONTACT

GEOLOGIC MAP

COSTA VERDE CENTER REDEVELOPMENT
8650 GENESEE AVENUE
SAN DIEGO, CALIFORNIA

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SCALE	1" = 60'	DATE	07 - 28 - 2016
PROJECT NO.	G1927 - 11 - 01	FIGURE	2
SHEET	1 OF 1		

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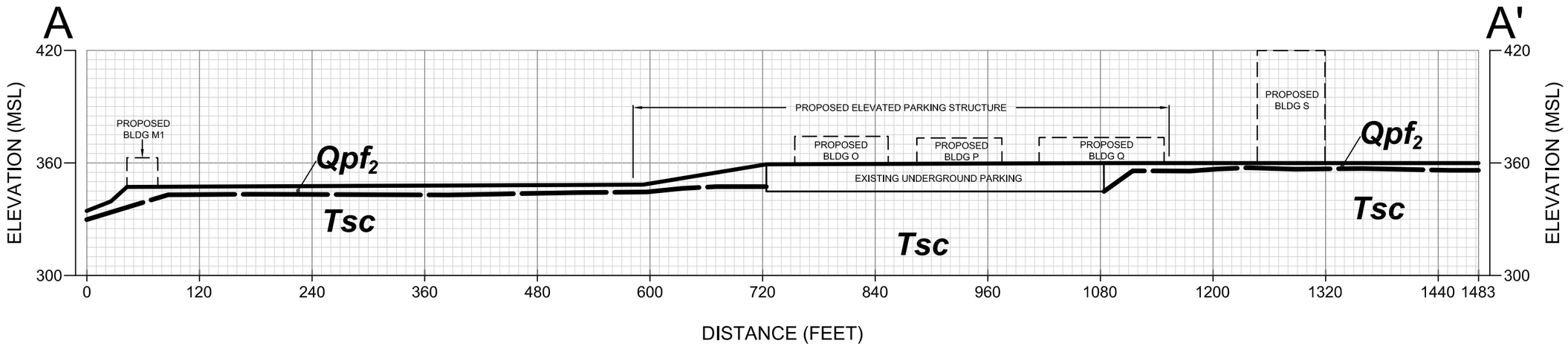
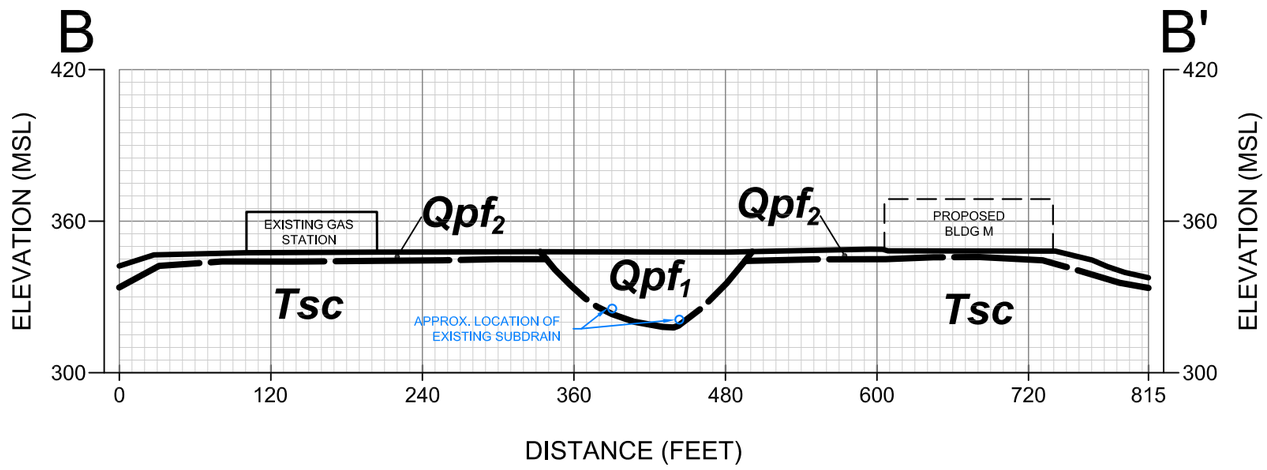
COSTA VERDE CENTER REDEVELOPMENT
8650 GENESSEE AVENUE
SAN DIEGO, CALIFORNIA



GEOLOGIC CROSS-SECTION A-A'

SCALE
VERTICAL: 1" = 60'
HORIZONTAL: 1" = 120'



GEOLOGIC CROSS-SECTION B-B'

SCALE
VERTICAL: 1" = 60'
HORIZONTAL: 1" = 120'

GEOCON LEGEND

Qpf_1.....PREVIOUS PLACED FILL (1986)
Qpf_2.....PREVIOUS PLACED FILL (CIRCA, 1986-1988)
Tsc.....SCRIPPS FORMATION
.....APPROX. LOCATION OF GEOLOGIC CONTACT

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FIGURE 3
DATE 07 - 28 - 2016

GEOLOGIC CROSS - SECTION

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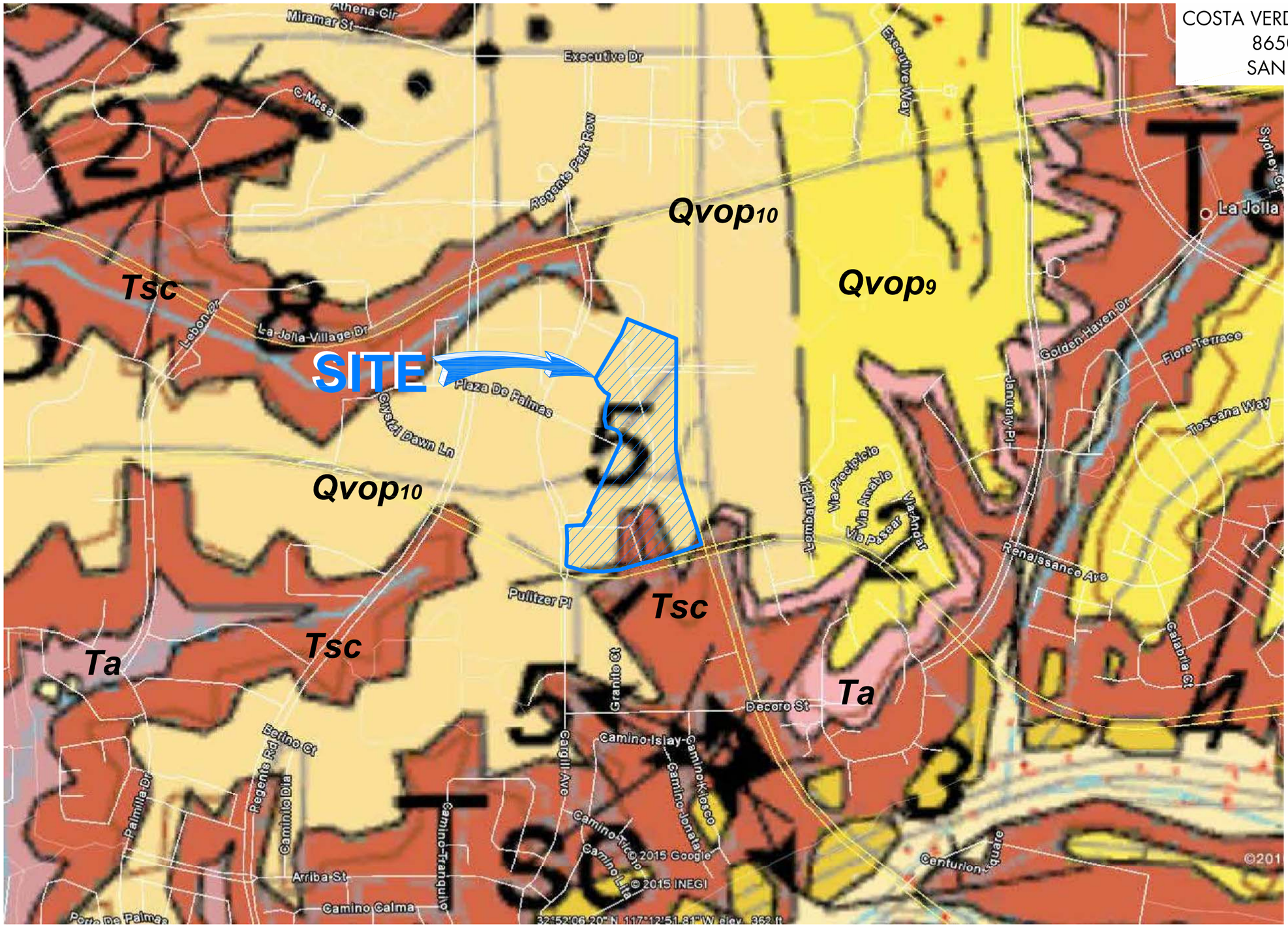
COSTA VERDE CENTER REDEVELOPMENT
8650 GENESEE AVENUE
SAN DIEGO, CALIFORNIA



0’ 600’ 1200’
SCALE 1”=600’

GEOCON LEGEND

- Qvop10 .....VERY OLD PARALIC DEPOSITS
- Qvop9 .....VERY OLD PARALIC DEPOSITS
- Tsc .....SCRIPPS FORMATION
- Ta .....ARDATH SHALE

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PROJECT NO. G1927 - 11 - 01
FIGURE 4
DATE 07 - 28 - 2016

REGIONAL GEOLOGIC MAP

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APPENDIX A

APPENDIX A

PREVIOUS GEOTECHNICAL BORINGS (GEOCON, 1986 AND 1999)

FOR

COSTA VERDE CENTER REDEVELOPMENT
8650 GENESEE AVENUE
SAN DIEGO, CALIFORNIA

PROJECT NO. G1927-11-01

File No. D-2631-J02
April 4, 1986

BORING 2

ELEVATION 359+ DATE DRILLED 3/19/86

EQUIPMENT Watson 2000

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	TOPSOILS Soft/loose, moist to very moist, red-brown to gray-brown, fine Sandy Silty CLAY			
4				SM	SCRIPPS FORMATION Dense, slightly moist to moist, orange-brown, fine to medium, Silty SAND			
6	2-1						BULK	SAMPLE
8								
10	2-2					8	107.9	16.9
12				ML	Very dense, slightly moist, gray, fine, Sandy SILTSTONE, little to some clay — becomes very moist (seep)			
14								
16				SM	Very dense, slightly moist, gray-orange-brown strata, fine to medium, Sandy SILT			
18								
20	2-3					25	117.1	10.9
22				SM/ML	Very dense, slightly moist, fine to medium, gray-brown, Silty SANDSTONE and Clayey SILTSTONE			
					Break in log			
30	2-4					14/6"	112.8	8.1
32								
34								
36								

Figure A-3, Log of Test Boring 2

Continued next page

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-2631-J02
April 4, 1986

BORING 2 CONTINUED

ELEVATION _____ DATE DRILLED _____

EQUIPMENT _____

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, %
36								
					possible CLAY seam			
38								
40								
	2-5					10/ 6"	109.7	7.1
42								
44								
46					possible CLAY seam			
48								
50								
	2-6					12/ 6"	103.1	11.8
52					BORING TERMINATED AT 51.5 FEET			

Figure A-4, Log of Test Boring 2 Continued

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-2631-JO2
April 4, 1986

BORING 4

ELEVATION 353+ DATE DRILLED 3/20/86

EQUIPMENT Watson 2000

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					TOPSOILS			
2				GM/CL	LINDAVISTA FORMATION Soft to medium, wet, red-brown, fine Sandy Silty CLAY, trace of coarse sand, fine to medium gravel and cobble			
6				ML	SCRIPPS FORMATION Dense, dry to slightly moist, orange-brown to gray-brown, fine, Sandy SILT with interbedded SILTSTONES and CLAYSTONES			
10	4-1				grading slightly moist to moist	10/6"	92.1	28.0
14				ML	very stiff, slightly moist, gray, fine Sandy SILTSTONE layer			
20	4-2					12/10"	104.3	18.1
24	4-3						BULK	SAMPLE
30								

Figure A-7, Log of Test Boring 4

Continued next page

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-2631-J02
April 4, 1986

BORING 4 CONTINUED

ELEVATION _____ DATE DRILLED _____

EQUIPMENT _____

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, %
30								
	4-4			SM	grading occasional seams of orange-brown-gray, fine, Silty SANDSTONE	10	109.9	17.3
32								
34								
36								
38								
40	4-5					4	98.9	18.3
					BORING TERMINATED AT 40.0 FEET			

Figure A-8, Log of Test Boring 4 Continued

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.

PROJECT NO. 05812-52-05

BORING B 7

ELEV. (MSL.) 357 DATE COMPLETED 01-27-1999

EQUIPMENT CME 55

DEPTH IN FEET	SAMPLE NO	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					ASPHALT			
					BASE MATERIAL			
2	B 7-1			SM	UNDOCUMENTED FILL **(Qudf)** Dense to loose, moist, red-brown to brown, Silty, fine- to medium SAND, some to trace clay, trace gravel	32	116.7	10.4
4	B 7-2							
6	B 7-3					14		
8	B 7-4			SC	Loose, very moist to wet, brown, very Clayey, fine- to medium SAND, trace gravel			
10	B 7-5			ML-SP	SCRIPPS FORMATION **(Tsc)** Very dense, very moist to wet, brown SILT and very fine- to fine SAND	76/10"	118.3	13.5
12								
14					Very dense,m very moist to wet, light brown to red-brown, Silty, very fine- to medium SAND			
16	B 7-6					92/9"	114.2	14.8
18	B 7-7			SM				
20	B 7-8					50/6"	107.7	12.1
22								
24								
26								
28				ML-CH	Very dense, very moist, light brown to red-brown, very fine Sandy SILTSTONE, some gray, silty claystone -Difficult drilling from 29 feet			
30	B 7-9					75/9"	107.8	20.6
32								
34				ML-CH				

Figure A-7,
Log of Boring B 7, Page 1 of 2

05812-52-05 GPJ

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.

PROJECT NO. 05812-52-05

BORING B 7

ELEV. (MSL.) 357 DATE COMPLETED 01-27-1999

EQUIPMENT CME 55

DEPTH IN FEET	SAMPLE NO	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
36	B 7-10							
38								
40	B 7-11				Very dense, damp, yellow-brown to red-brown, Silty, very fine- to medium SAND -Difficult drilling, water added at 41 feet	81/8"	106.8	19.8
42								
44								
46								
48								
50	B 7-12			SM	-Difficult drilling, water added at 51 feet	50/4"	97.6	5.0
52								
54								
56								
58								
60	B 7-13				BORING TERMINATED AT 60.5 FEET No Groundwater Encountered	50/6"	98.9	10.9

Figure A-7,
Log of Boring B 7, Page 2 of 2

05812-52-05 GPJ

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

APPENDIX B

APPENDIX B

STORM WATER MANAGEMENT WORKSHEETS

FOR

COSTA VERDE CENTER REDEVELOPMENT
8650 GENESEE AVENUE
SAN DIEGO, CALIFORNIA

PROJECT NO. G1927-11-01

Categorization of Infiltration Feasibility Condition	Worksheet C.4-1

Part 1 - Full Infiltration Feasibility Screening Criteria

Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
1	**Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

We obtained the following infiltration rates based on field testing:

P-1: 0.14 inches/hour (0.07 with FOS=2)
P-2: 0.02 inches/hour (0.01 with FOS=2)
P-3: 0.04 inches/hour (0.02 with FOS=2)

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	

Provide basis:

The project geotechnical report presents compacted fill and the Scripps Formation underlie the property. Water that would be allowed to infiltrate would migrate laterally outside of the property limits to the existing right-of-ways and toward the adjacent downtown properties. Based on the comprehensive geotechnical evaluation and the very low infiltration rates obtained, full infiltration is not feasible due to the dense to very dense and cemented nature of the underlying materials and the potential for distress to adjacent properties.

Setbacks from slopes and liners on the sidewalls of the basins will be required to prevent daylight seepage/slope instability and lateral water migration.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Worksheet C.4-1 Page 2 of 4			
Criteria	Screening Question	**Yes**	**No**
3	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: Based on the geotechnical report, groundwater is at least 150 feet below existing grades. Therefore, infiltration (if possible) would be feasible. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
4	**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 or increased discharge of contaminated groundwater to surface waters?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: We do not expect infiltration will cause water balance issues such as seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
Part 1 Result*	If all answers to rows 1 - 4 are "**Yes**" a full infiltration design is potentially feasible. The feasibility screening category is **Full Infiltration** If any answer from row 1-4 is "**No**", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2		Not Full Infiltration

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

Worksheet C.4-1 Page 3 of 4

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria

Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	**Do soil and geologic conditions allow for infiltration in any appreciable rate or volume?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	X	

Provide basis:

We obtained the following infiltration rates based on field testing:

P-1: 0.14 inches/hour (0.07 with FOS=2)
P-2: 0.02 inches/hour (0.01 with FOS=2)
P-3: 0.04 inches/hour (0.02 with FOS=2)

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	

Provide basis:

The project geotechnical report presents compacted fill and the Scripps Formation underlie the property. Water that would be allowed to infiltrate would migrate laterally outside of the property limits to the existing right-of-ways and toward the adjacent downtown properties. Based on the comprehensive geotechnical evaluation and the very low infiltration rates obtained, partial infiltration within the formational materials can be performed.

Setbacks from slopes and liners on the sidewalls of the basins will be required to prevent daylight seepage/slope instability and lateral water migration.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

Worksheet C.4-1 Page 4 of 4			
Criteria	Screening Question	**Yes**	**No**
7	**Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: Based on the geotechnical report, groundwater is at least 150 feet below existing grades. Therefore, partial infiltration would be feasible. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
8	**Can infiltration be allowed without violating downstream water rights**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: We did not provide a study regarding water rights. However, these rights are not typical in the San Diego area. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.** If any answer from row 5-8 is no, then infiltration of any volume is considered to be **infeasible** within the drainage area. The feasibility screening category is **No Infiltration.**		Partial Infiltration

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

GEOCON

Aardvark Permeameter Data Analysis

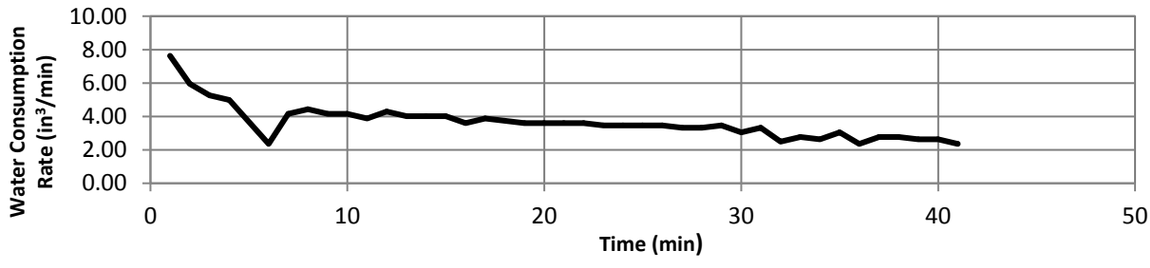
Project Name:	Costa Verde	Date:	7/22/2016
Project Number:	G1927-11-01	By:	JML
Borehole Location:	P-1	Ref. EL (feet, MSL):	
		Bottom EL (feet, MSL):	

Borehole Diameter (inches):	4.00
Borehole Depth, **H** (feet):	5.17
Distance Between Reservoir & Top of Borehole (feet):	2.33
Depth to Water Table, **s** (feet):	200
Height APM Raised from Bottom (inches):	2.00

Wetted Area, **A** (in^2): 238.76

Distance Between Resevoir and APM, **D** (feet):	6.73
Head Height, **h** (inches):	18.00
Distance Between Constant Head and Water Table, **L** (inches):	2356

Reading	Time (min)	Time Elapsed (min)	Reservoir Water Weight (g)	Resevoir Water Weight (lbs)	Interval Water Consumption (lbs)	Total Water Consumption (lbs)	*Water Consumption Rate (in^3/min)
1	0.00			20.600			
2	1.00	1.00		20.325	0.28	0.28	7.62
3	2.00	1.00		20.110	0.22	0.49	5.96
4	3.00	1.00		19.920	0.19	0.68	5.27
5	4.00	1.00		19.740	0.18	0.86	4.99
6	6.00	2.00		19.570	0.17	1.03	2.36
7	7.00	1.00		19.420	0.15	1.18	4.16
8	8.00	1.00		19.260	0.16	1.34	4.44
9	9.00	1.00		19.110	0.15	1.49	4.16
10	10.00	1.00		18.960	0.15	1.64	4.16
11	11.00	1.00		18.820	0.14	1.78	3.88
12	12.00	1.00		18.665	0.16	1.94	4.30
13	13.00	1.00		18.520	0.15	2.08	4.02
14	14.00	1.00		18.375	0.15	2.23	4.02
15	15.00	1.00		18.230	0.15	2.37	4.02
16	16.00	1.00		18.100	0.13	2.50	3.60
17	17.00	1.00		17.960	0.14	2.64	3.88
18	18.00	1.00		17.825	0.14	2.78	3.74
19	19.00	1.00		17.695	0.13	2.91	3.60
20	20.00	1.00		17.565	0.13	3.04	3.60
21	21.00	1.00		17.435	0.13	3.17	3.60
22	22.00	1.00		17.305	0.13	3.30	3.60
23	23.00	1.00		17.180	0.13	3.42	3.46
24	24.00	1.00		17.055	0.13	3.55	3.46
25	25.00	1.00		16.930	0.13	3.67	3.46
26	26.00	1.00		16.805	0.13	3.80	3.46
27	27.00	1.00		16.685	0.12	3.92	3.33
28	28.00	1.00		16.565	0.12	4.04	3.33
29	29.00	1.00		16.440	0.13	4.16	3.46
30	30.00	1.00		16.330	0.11	4.27	3.05
31	31.00	1.00		16.210	0.12	4.39	3.33
32	32.00	1.00		16.120	0.09	4.48	2.49
33	33.00	1.00		16.020	0.10	4.58	2.77
34	34.00	1.00		15.925	0.09	4.68	2.63
35	35.00	1.00		15.815	0.11	4.79	3.05
36	36.00	1.00		15.730	0.08	4.87	2.36
37	37.00	1.00		15.630	0.10	4.97	2.77
38	38.00	1.00		15.530	0.10	5.07	2.77
39	39.00	1.00		15.435	0.09	5.17	2.63
40	40.00	1.00		15.340	0.10	5.26	2.63
41	41.00	1.00		15.255	0.08	5.35	2.36
						Steady Flow Rate, Q (in^3/min):	2.36



Field-Saturated Hydraulic Conductivity

Case 1: L/h > 3 K_{sat} = 0.002 in/min 0.14 in/hr

GEOCON

Aardvark Permeameter Data Analysis

Project Name:	Costa Verde	Date:	1/22/2016
Project Number:	G1927-11-01	By:	JML
Borehole Location:	P-2	Ref. EL (feet, MSL):	
		Bottom EL (feet, MSL):	

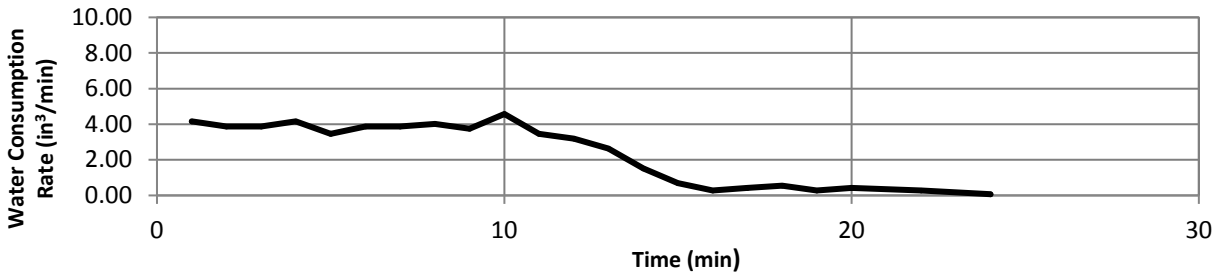
Borehole Diameter (inches):	4.00
Borehole Depth, **H** (feet):	6.00
Distance Between Reservoir & Top of Borehole (feet):	2.50
Depth to Water Table, **s** (feet):	200
Height APM Raised from Bottom (inches):	2.00

Wetted Area, **A** (in^2): 81.68

Distance Between Resevoir and APM, **D** (feet):	7.73
Head Height, **h** (inches):	5.50
Distance Between Constant Head and Water Table, **L** (inches):	2334

Reading	Time (min)	Time Elapsed (min)	Reservoir Water Weight (g)	Resevoir Water Weight (lbs)	Interval Water Consumption (lbs)	Total Water Consumption (lbs)	*Water Consumption Rate (in^3/min)
1	0.00			22.700			
2	1.00	1.00		22.550	0.15	0.15	4.16
3	2.00	1.00		22.410	0.14	0.29	3.88
4	3.00	1.00		22.270	0.14	0.43	3.88
5	4.00	1.00		22.120	0.15	0.58	4.16
6	5.00	1.00		21.995	0.13	0.70	3.46
7	6.00	1.00		21.855	0.14	0.84	3.88
8	7.00	1.00		21.715	0.14	0.98	3.88
9	8.00	1.00		21.570	0.15	1.13	4.02
10	9.00	1.00		21.435	0.14	1.27	3.74
11	10.00	1.00		21.270	0.16	1.43	4.57
12	11.00	1.00		21.145	0.13	1.56	3.46
13	12.00	1.00		21.030	0.11	1.67	3.19
14	13.00	1.00		20.935	0.10	1.77	2.63
15	14.00	1.00		20.880	0.05	1.82	1.52
16	15.00	1.00		20.855	0.02	1.85	0.69
17	16.00	1.00		20.845	0.01	1.86	0.28
18	17.00	1.00		20.830	0.02	1.87	0.42
19	18.00	1.00		20.810	0.02	1.89	0.55
20	19.00	1.00		20.800	0.01	1.90	0.28
21	20.00	1.00		20.785	0.02	1.92	0.42
22	22.00	2.00		20.765	0.02	1.94	0.28
23	24.00	2.00		20.760	0.00	1.94	0.07
24							
25							
26							

Steady Flow Rate, Q (in^3/min): 0.07



Field-Saturated Hydraulic Conductivity

Case 1: L/h > 3 K_{sat} = 0.0004 in/min 0.02 in/hr

GEOCON

Aardvark Permeameter Data Analysis

Project Name:	Costa Verde	Date:	7/22/2016
Project Number:	G1927-11-02	By:	JML
Borehole Location:	P-3	Ref. EL (feet, MSL):	
		Bottom EL (feet, MSL):	

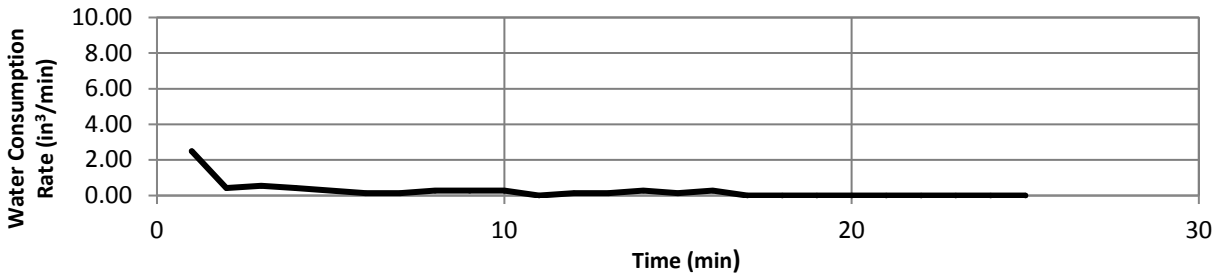
Borehole Diameter (inches):	4.00
Borehole Depth, **H** (feet):	4.00
Distance Between Reservoir & Top of Borehole (feet):	2.50
Depth to Water Table, **s** (feet):	200
Height APM Raised from Bottom (inches):	2.00

Wetted Area, **A** (in^2): 87.96

Distance Between Resevoir and APM, **D** (feet):	5.73
Head Height, **h** (inches):	6.00
Distance Between Constant Head and Water Table, **L** (inches):	2358

Reading	Time (min)	Time Elapsed (min)	Reservoir Water Weight (g)	Resevoir Water Weight (lbs)	Interval Water Consumption (lbs)	Total Water Consumption (lbs)	*Water Consumption Rate (in^3/min)
1	0.00			20.100			
2	1.00	1.00		20.010	0.09	0.09	2.49
3	2.00	1.00		19.995	0.02	0.11	0.42
4	3.00	1.00		19.975	0.02	0.13	0.55
5	4.00	1.00		19.960	0.02	0.14	0.42
6	6.00	2.00		19.950	0.01	0.15	0.14
7	7.00	1.00		19.945	0.00	0.16	0.14
8	8.00	1.00		19.935	0.01	0.17	0.28
9	9.00	1.00		19.925	0.01	0.18	0.28
10	10.00	1.00		19.915	0.01	0.19	0.28
11	11.00	1.00		19.915	0.00	0.19	0.00
12	12.00	1.00		19.910	0.00	0.19	0.14
13	13.00	1.00		19.905	0.00	0.20	0.14
14	14.00	1.00		19.895	0.01	0.21	0.28
15	15.00	1.00		19.890	0.00	0.21	0.14
16	16.00	1.00		19.880	0.01	0.22	0.28
17	17.00	1.00		19.880	0.00	0.22	0.00
18	18.00	1.00					
19	19.00	1.00					
20	20.00	1.00					
21	21.00	1.00					
22	22.00	1.00					
23	23.00	1.00					
24	24.00	1.00					
25	25.00	1.00					

Steady Flow Rate, Q (in^3/min): 0.14



Field-Saturated Hydraulic Conductivity

Case 1: L/h > 3 K_{sat} = 0.001 in/min 0.04 in/hr

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