Appendix H

Conceptual Hydrology and Hydraulic Study

Conceptual Hydrology and Hydraulic Study

For:

Vesting Tentative Tract Map and Final Development Plan (TM 32,045/FDP)

Report Submitted to: City of Goleta

Owner/Developer:

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EXECUTIVE SUMMARY

MQ Design Tech, Inc. has prepared a preliminary hydrology study for the proposed 14.38 acres development in the City of Goleta, California. The purpose of this Hydrology Study is to analyze the existing condition hydrology of the subject area as well as determine the hydrologic impact of the proposed development. In order to accomplish this study, the storm runoff rates for the pre- and post-development conditions within the site have been determined.

The proposed VTTM consists of development of 56 residential lots. The intended use of this report is the development of drainage infrastructure solely for the subject project. The subject project site consists of a 2150 sq-ft of single family home along with an 1152 sq-ft barn and a 726 garage, other areas are currently vacant land with medium brush cover.

This report includes a Stormwater MS4 study which has been developed in accordance to the County of Santa Barbara "Stormwater Technical Guide for Low Impact Development" and Post-Construction Stormwater Management Requirements for Development Projects in the Central Coast (Resolution R3-2013-0032). Bio-retention and bio-filtration system has been designed & sized for the full build out of the subject development.

The Santa Barbara County rational method (SBUH) computer model has been used as the basis for hydrologic evaluations and HydroCAD computer program has been used to calculate the time of concentration for the respective design storm events. This report addresses the impacts from a 2-yr, 5-yr, 10-yr, 25-yr, 50-yr and 100 year- 24 hour design storm events. Presented in this report are site hydrologic parameters, analysis methodology, flow rate calculations, pre- and post-development hydrology, and necessary mitigation measures.

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1 – PROJECT OVERVIEW

1.1 Site Description:

The project is located on the north side of the City of Goleta, north of Cathedral Oaks Road, and east of Northgate Drive, (see Figure 1). The project is situated and located entirely within the City of Goleta in Santa Barbara County and contains 14.38 acres net (Gross area of tract map 15.80 acres including 1.42 acres of public right of way). There is an existing 2150 sq-ft of single family home along with a 1152 sq-ft barn and a 726 garage situated on the site presently but will be demolished. Otherwise, the project site is covered with medium brush. The proposed development will consist of master planned residential community along with necessary infrastructures. The proposed VTTM will result in the development of 56 residential lots.

1.2 Site Information:

Address	City of Goleta @ North of Cathedral Oaks Road and East of Northgate Drive

1.3 Design Parameters:

Reference: Santa Barbara County Flood Control and Water Conservation District -"Standard Conditions of Project Plan Approval" and "Stormwater Technical Guide for Low Impact Development"

Hydrologic Map	Per Santa Barbara County
Hydrologic Soil Group	D (Per the SCS TR-55 Manual and the NRCS National Engineering Handbook, Section 4
Runoff Method	SBUH
Pond Routing Method	Storage-Indication
Rainfall Distribution	SCS 24-hour, Type I distribution
Antecedent Moisture Cont.	AMC II
Hydrograph Ordinate Time Increment	0.10 Hr
Rainfall Isohyet	3.20 in (2 yr.-24 hr.)

	4.61 in (5 yr.-24hr.) 5.55 in (10 yr.-24 hr.) 6.71 in (25 yr.-24hr.) 7.56 in (50 yr.-24hr.) 8.38 in (100 yr.-24hr.)
95th Percentile Rainfall	2.4 in (See Appendix H for Isohyte map)
Project Tier	Tier 4 (See section 6.2 for details)

2 – VICINITY MAP



3 – METHODOLOGY

In order to adequately evaluate and mitigate for the impacts of the proposed project, the existing and proposed drainage conditions were analyzed. The purpose of this drainage study is to document the impacts of certain rainfall events on the study area, and for the comparison between pre-development and post-development storm events. The study will also include the required infrastructure improvements needed to mitigate for the proposed project.

This study will analyze the effects of the 2-yr, 10-year, 25-yrs, 50yrs, and 100-year 24-hour storm events within the study area. The results were determined using the County of Santa Barbara Rational Method and HydroCAD software with the Santa Barbara Urban Hydrograph (SBUH) method. All input parameters are in accordance the Santa Barbara County Flood Control District (SBCFD) standards.

The proposed development will have to comply with the MS4 requirements under the City of Goleta Water Management Plan and County of Santa Barbara Stormwater Technical Guide for Low Impact Development standards.

The primary objective relating to storm water conveyance is to satisfy the City policy requiring the detention of the difference between the undeveloped 100-year, 24-hour and the developed 100-year, 24-hour frequency storm events, and the onsite retention of the volume generated by a 95th percentile storm event over the impervious portions of the proposed development.

The Hydrologic Soil Group for the project site was conservatively chosen to be Group D (highest runoff potential) per the Natural Resources Conservation Service (NRCS) Web Soil Survey, as attached in Appendix H.

As a part of this study, a discussion is presented later in the report regarding the City of Goleta Water Management Plan and the recommended measures to satisfy those requirements.

ANTEDECENT MOISTURE CONDITION

The subject project hydrology design calculations are done per the Antecedent Moisture Condition II (Average). In AMC II, the soil has moderate amount of moisture. Following are the reasoning for using AMC II for 100 year storms.

- Santa Barbara experiences wet winters and dry summers. Most rainfall occurs between December and March. This natural cycle leads to high AMC during the wet season, which then decreases throughout the long, dry summer.

- While a 100-year rainfall event is extreme, the pre-existing soil conditions are likely to be average rather than at their driest or wettest. Using AMC II provides the most reasonable and representative estimate for converting the rainfall to runoff for a statistically probable event.

- For standard design projects like stormwater systems, drainage, and dam evaluation, using an average condition (AMC II) prevents over-designing for the worst-case scenario (AMC III) or under-designing for the best-case scenario (AMC I). This approach is consistent with standard engineering design practices that balance safety and cost.

- Santa Barbara County Flood Control and Water Conservation District Standards of Project plan approval (Dated January 2011) suggests using AMC II for the SBUH method.

4 – EXISTING CONDITION HYDROLOGY STUDY

At present, the proposed project site is mostly a vacant land along with a 2150 sq-ft single family home, an 1152 sq-ft barn and a 726 sq-ft garage. Otherwise the site is covered with medium brush. The project is surrounded by a golf course to the north, east and west. El Encanto Creek runs along the westerly property line flowing north to south. Cathedral Oaks Road fronts the southerly property line.

The existing site consists of two (2) hydrologic tributary areas as shown on the “Existing Hydrology Map” in Appendix A. Storm water runoff generated from the Study Area generally drains southerly as overland flow. The overland flow has an existing flow path across the site to Cathedral Oaks Road at the south part of the property that splits into westerly and easterly directions.

In the existing condition of tributary Area 1A (8.14 ac), the run-off on the northern part of the site is draining as sheet flow in the Southerly direction towards street.

In tributary Area 1B (6.24 ac), the run-off on the northern part of the site is draining in the Southerly direction and discharge in El Encanto Creek at the southwest corner of the property. All are surface flow in this tributary area. These areas are shown on the hydrology map and related hydrologic calculations are shown in Appendix C.

A summary of the run-off from a 2-yr, 5-yr, 10-year, 25-yr, 50-yr and 100-year, 24-hour storm events are summarized below for the existing conditions:

SUMMARYTABLE 1: EXISTING CONDITION							
SUB-AREA	AREA (ACRES)	PEAK FLOW (CFS)					
		2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
1A (Existing East)	8.14	2.41	4.06	5.19	6.58	7.6	8.58
1B (Existing West)	6.24	1.34	2.26	2.89	3.68	4.26	4.82
Total	**14.38**	**3.75**	**6.32**	**8.08**	**10.26**	**11.86**	**13.40**

5 – PROPOSED CONDITION HYDROLOGY STUDY

The proposed project involves the development buildable pads for residential units along with drainage and other necessary infrastructures. Drainage improvement plans include streets with curb and gutter, curb-inlet catch basins, grate inlets, swale and underground drain pipes.

In the proposed condition, the project site will have eight (8) tributary areas as shown on the "Proposed Hydrology Map" in Appendix B. Also, there are two (2) detention basins at the proposed development and shown in the "Proposed Hydrology Map". Retention/Detention Area 1 is an onsite underground ADS Stormtech Chamber situated on the South part of the site and detention basin 2 is situated on the South-West part of the site.

Tributary areas A-1 and A-2 are located at the project's easterly part just north of Cathedral Oaks Road and encompass the proposed housing pad development areas. The catch basins on the east side of the project will convey the storm water from the easterly side of the project to an underground detention system consisting of ADS Stormtech MC-7200 system and discharge outflow to the existing stormdrain @ east of Cathedral Oaks road.

Tributary areas B-1, B-2, C-1, C-2 and C-3 are situated on the West part of the site and encompass the proposed housing pad development areas. Majority runoff at these areas run towards South and West direction via street or pipe flow. There are curb-inlet catch basins which capture runoff from street and take to detention basin @ South-West part of the site.

Runoff from all above tributary areas flows to the detention basin 2. All runoff will be transported to the basin through pipe flow. The proposed basin 2 capacity is 37026 cu-ft (0.85 acft) with basin bottom elevation 154. The proposed detention basin design and capacity information calculations are shown in Appendix E. The outflow from the detention basin will be controlled via orifice outlet and designed to maintain the flow requirements per SBFCD. So, the basin will be able to store difference of flow per the SB flow requirements.

The tributary area D-1 which encompasses the Southern part of the project along the street. This area drains to the existing creek.

A summary of the run-off from a 2-yr, 5-yr, 10-year, 25-yr, 50-yr and 100-year, 24-hour storm events are summarized below for the proposed conditions.

SUMMARY TABLE 2: PROPOSED CONDITION							
SUB-AREA	**AREA (ACRES)**	**PEAK FLOW (CFS)**					
		2 YR	**5 YR**	**10 YR**	**25 YR**	**50 YR**	**100 YR**
A-1	2.80	3.72	6.16	7.84	9.95	11.50	13.01
A-2	3.70	4.93	8.17	10.40	13.20	15.26	17.26
Total to Basin 1	**6.50**	**8.65**	**14.33**	**18.24**	**23.15**	**26.76**	**30.27**
B-1	3.00	4.13	6.83	8.70	11.03	12.76	14.42
B-2	1.30	1.81	2.99	3.81	4.83	5.59	6.32
C-1	1.05	1.49	2.47	3.14	3.99	4.61	5.21
C-2	0.16	0.24	0.39	0.50	0.64	0.73	0.83
C-3	0.50	0.73	1.20	1.52	1.93	2.24	2.53
Total to Basin 2	**6.01**	**8.40**	**13.88**	**17.67**	**22.42**	**25.93**	**29.31**
D-1	0.80	1.72	2.50	3.01	3.65	4.12	4.56

The tributary areas of the new development are shown on the proposed hydrology map in Appendix B and related hydrologic calculation is shown in Appendix D.

DETENTION BASIN ANALYSIS

The proposed detention basin system is designed with the capacity to contain the developed project run-off excess and to discharge a run-off volume that is equal to the existing run-off volume from the site (before development). The post-development discharge volume is equal to the pre-development discharge volume. In order to comply with this discharge requirement, an underground retention/detention basin (Basin 1) @ South and a detention basin @ West were designed on-site to control the outflow from the project to the channel. The proposed onsite detention basin 1 and basin 2 meet this outflow criterion and is designed to provide the detention storage needed based on the runoff hydrograph for the ultimate developed 100-yrs frequency storm. In accordance with the County guidelines, the rate of discharge from the site is limited undeveloped 10-, 25-, 50-, 100-yrs runoff rate. Following Table-3 shows the pre-development and post-development flow per the hydrologic calculations.

TABLE 3: BASIN SUMMARY

BASIN #	INFLOW (CFS)	OUTFLOW (CFS)	DETENTION REQUIRED (CU-FT)	DETENTION PROVIDED (CU-FT)	SYSTEM
Basin 1 (100YR)	30.27	9.07	19,589	32,500	ADS StormTech MC-7200
Basin 2 (100YR)	29.31	5.10	26,832	37,026	Detention Basin

The proposed basins drawdown time is 24 hours as shown in the proposed development hydrology calculations and hydrograph (Appendix D). There will be orifice outlet flow control device to maintain the proposed flow rate to match existing condition.

The basins 1 & 2 drain to the El Encanto Creek @ West. The proposed development will follow the similar and the proposed basins 1 and 2 will help to reduce the flow. This will significantly reduce post development flow toward the creek and reduce drainage impacts.

Per the routing calculation, the proposed detention basins can handle the 100-year storm drain event and will maintain 12 inches (minimum) freeboard.

6 – STORM WATER QUALITY

6.1 Storm Water Quality Requirements

This study has been developed in accordance to the County of Santa Barbara "Stormwater Technical Guide for Low Impact Development" and Post-Construction Stormwater Management Requirements for Development Projects in the Central Coast (Resolution R3-2013-0032).

The mass grading operation for the subdivision improvements would need to be designed and installed according to the County Technical Guidance Manual for Stormwater Quality Control Measures. Source control measures are recommended for implementation during specific project design, construction, and operations phases. These measures should include conserving natural areas, minimizing storm water pollutant of concern, protecting slopes and channels, providing storm drain stenciling and signage, properly design and construct outdoor areas.

In addition to source control measures, treatment control Best Management Practices (BMPs) will need to be provided to remove the pollutants of concerns from the runoff before leaving the site. Treatment control BMPs will require ongoing maintenance. BMPs can be provided in a variety of ways that can vary from catch basin filters, to proprietary treatment devices placed in the main storm drain infrastructure, to grass swale filters, to extended impoundment facilities that allow sedimentation of pollutants to occur.

6.2 Project Tiers and Requirements

Per the City of Santa Barbara Storm Water BMP Guidance Manual (2020), the subject project is in Tier 4. Following is the set of project tiers and requirements.

New or Replaced Impervious Surface (Sq Ft)[1,2,3]	Tier	Requirement	More Information
1 – 499	1	Select and implement one or more Tier 1 BMPs.	Section 1.4.1 and Chapter 2
500 – 1,999	2	Select and implement Site Design and/or Storm Water Runoff BMPs to capture and treat runoff generated from a 1" storm[4] from an area equivalent to the new/replaced impervious area.	Section 1.4.2 and Chapter 2
2,000 – 14,999	3	Select and implement Site Design and/or Storm Water Runoff BMPs to capture and treat runoff generated from a 1" storm[4] from at least 95% of the project site's impervious area.	Section 1.4.3 and Chapter 6
15,000 or more	4	Select and implement Site Design and/or Storm Water Runoff BMPs to meet Tier 3 requirements for Peak Runoff Discharge Rate and Water Quality Treatment. In addition, regarding Volume Reduction, Tier 4 projects must retain/prevent offsite discharge from all storm events up to and including the 95th percentile 24-hour rainfall event, which is currently 2.4" for Santa Barbara. Projects are required to retain the 1.2", 24-hour rainfall event for all replaced impervious area and the 2.4", 24-hour rainfall event for all new impervious area.	Section 1.4.4 and Chapter 6

Tier 4 projects are required to identify and demonstrate the use of appropriate site design, basic BMPs, and/or storm water runoff BMPs to meet the City's storm water runoff requirements (i.e., pollutant treatment, runoff volume, and peak discharge rates). More specifically, regarding Volume Reduction, Tier 4 projects must retain/prevent offsite discharge from all storm events up to and including the 95th percentile 24-hour rainfall event, which is currently 2.4" for Santa Barbara. Projects are required to retain the 1.2", 24-hour rainfall event for all replaced impervious area and the 2.4", 24-hour rainfall event for all new impervious area as outlined in Section 6.2.

6.2 – BMP Feasibility study

6.2.1 Infiltration BMP Feasibility Screening

Per the project geotechnical report Section 3.5, the City of Goleta has mapped the Northern portion of the project within an area of high landslide potential and noted that the Rincon geologic formation is susceptible to landslides (See Appendix H for the geotechnical report). So,

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the subject site is not feasible for infiltration BMP because of Hill side and susceptible to land slide.

6.2.2 Capture and Reuse BMP Feasibility Screening

The subject project site stormwater is being captured in detention facilities and then released per the hydrologic requirements to match existing condition. The capture and reuse BMP type is not feasible in this site.

6.3 Post Construction Requirement Compliance:

This study has been developed in accordance to the Central Coast RWQCB Resolution R3-2013-0032, Central Coast Post-Construction Retention Volume Requirement and Low Impact development technology standards. Per the Central Coast Region 95th Percentile 24-hour Rainfall depth data, 2.4- inch storm event has been used to calculate the required storm water design volume.

The proposed improvements will result in changes to existing drainage pattern but in general, the drainage areas and discharge point will be consistent with the existing topography. A set of the supporting calculations is enclosed in Appendix F.

Project Area:

Total Project Site Area = 14.38 Acres

Drainage Management Areas (DMA):

The site is divided into two (2) drainage management areas. See LID plan in Appendix E for the drainage areas and corresponding post construction requirements.

DMA 1: Tributary @ East part of the site (proposed hydrology areas A-1 & A-2)

Total Area = 6.50 Acre

Impervious Area = 2.72 Acre (% Impervious = 42%)

DMA 2: Tributary @ West part of the site (proposed hydrology areas B-1, B-2, C-1 to C-3 & D-1)

Total Area = 6.81 Acre

Impervious Area = 2.86 Acre (% Impervious = 42%)

Stormwater Quality Design Volume:

Retention Volume for 95th Percentile 24-hr Rainfall Depth = (C X Rainfall Depth 95th Percentile X Tributary Area)

Runoff (cu-ft) = C * I in/hr * A acres

C = $0.858i^{\wedge 3} - 0.78i^{\wedge 2} + 0.774i + 0.04$

i = Impervious Fraction

I = 2.4 in/hr (95th Percentile rainfall)

Retention Volume = Runoff X 1.963

DMA 1:

Determine the runoff coefficient (C):

C = $0.858i^{\wedge 3} - 0.78i^{\wedge 2} + 0.774i + 0.04$

= $0.858(0.27)^{\wedge 3} - 0.78(0.27)^{\wedge 2} + 0.774 \times (0.273) + 0.04$

= 0.29

Runoff = C x 2.4 x 6.50

= 0.29 x 2.4/12 x 6.50 x 43560

= 16,482 Cuft

Retention Volume = runoff x 1.963

= 16,482 x 1.963 = 32,354 Cuft

DMA 2:

See Table 4

TABLE 4: LOW IMPACT DEVELOPMENT RETENTION BMP SIZING SUMMARY

DMA	AREA (ACRE)	IMPERVIOUS AREA (ACRE)	C	Q (DESIGN DISCHARGE)	RETENTION VOLUME REQUIRED, CU-FT	VOLUME PROVIDED CU-FT	BMP NAME
DMA-1	6.50	2.73	0.29	16480	32,354	32,500	ADS STORMTECH MC-7200
DMA-2	6.81	2.86	0.29	17484	34,320	37,026	DETENTION BASIN

BMP SUMMARY:

TABLE 5: BMP SUMMARY			
DMA	**BMP TYPE**	**BMP NAME**	**NOTE**
DMA-1	Retention Chamber	StormTech Chamber MC-7200	LID Plans in Appendix E and BMP details in Appendix F
	Media Filter	Stormdrain Inlet Filter Insert	
	Bio-Filtration	Onsite Bio-Swale	
DMA-2	Detention Basin	Onsite Detention Basin	
	Water Quality Inlet	Orifice Detention Basin Outlet	
	Media Filter	Stormdrain Inlet Filter Insert	
	Bio-Filtration	Onsite Bio-Swale	

See Appendix E for LID map.

7 - BEST MANAGEMENT PRACTICES: SITE DESIGN AND SOURCE CONTROL IMPLEMENTATION

7.1 Site Design Concepts

The following site design concepts have been implemented:

- Minimize pollution originating from site.
- Minimize the quantity of stormwater directed to the Municipal Separate Storm Sewer System (MS4).
- Minimize impacts from stormwater and urban runoff on the biological integrity of the natural drainage system and water bodies.
- The proposed area LIDs have been designed and analyzed considering the City of Goleta and Santa Barbara County design techniques.

In order to accomplish the site BMP design, site grade information has been taken from the proposed site plan drawing provided by the contracting company.

7.2 Source Control and Site Specific Mitigation Measures

The following table outlines which BMPs have been selected for the project.

Table 6 - Source Control BMPs

BMP Name	Check One		If not applicable, state brief reason
	Included	Not Applicable	
Non-Structural Source Control BMPs			
Education for Property Owners, Operators, Tenants, Occupants, or Employees	☒	☐	
Activity Restrictions	☒	☐	
Irrigation System and Landscape Maintenance	☒	☐	
Common Area Litter Control	☒	☐	
Street Sweeping Private Streets and Parking Lots	☒	☐	
Drainage Facility Inspection and Maintenance	☒	☐	

Table 6 - Source Control BMPs (Cont.)

BMP Name	Check One		If not applicable, state brief reason
	Included	Not Applicable	
Structural Source Control BMPs			
MS4 Stenciling and Signage	☒	☐	
Landscape and Irrigation System Design	☒	☐	
Protect Slopes and Channels	☒	☐	
Provide Community Car Wash Racks	☐	☒	No car wash in the community
Properly Design:	☐	☐	
Fueling Areas	☐	☒	No Fueling areas
Air/Water Supply Area Drainage	☐	☒	No Air/Water supply
Trash Storage Areas	☒	☐	
Loading Docks	☐	☒	No loading docks
Maintenance Bays	☐	☒	No Maintenance Bays
Vehicle and Equipment Wash Areas	☐	☒	No Vehicle and Equipment wash Areas
Outdoor Material Storage Areas	☐	☒	No Outdoor Material Storage Areas
Outdoor Work Areas or Processing Areas	☐	☒	No Processing Areas
Provide Wash Water Controls for Food Preparation Areas	☐	☒	No Food Preparation Areas

7.3 LID/Post-Development BMPS

The following post-development bmp will be implemented to the site as a part of low impact development. The proposed condition hydrology map in Appendix B shows the location of LID device.

Table 7 - Treatment Control and proprietary BMPs

BMP Detail #	BMP Description	Used	Not Used	Notes
T-1	Infiltration BMP		X	
T-2	Infiltration Basin		X	
T-3	Retention/Reuse	X		StormTech Chamber MC-7200
T-4	Storm Drain Signage	X		
T-5	Constructed Wetlands		X	
T-6	Extended Detention Basin	X		
T-7	Vegetated Swale	X		
T-8	Vegetated Buffer Strip		X	
T-9	Bioretention		X	
T-10	Media Filter	X		
T-11	Water Quality Inlet	X	X	
BIO-5	Proprietary Bio-treatment		X	

7.4 Operation and Maintenance Responsibility

Operations and maintenance will be the responsibility of the Homeowners Association (HOA). Inspections and maintenance will be performed by Homeowners associates will be carried out according to the maintenance requirements of the County of Santa Barbara/California General permit requirements. HOA will develop a maintenance plan and is aware of the maintenance responsibilities of the proposed BMPs. A funding mechanism needs to be placed to maintain the BMPs at the frequency stated in the O&M Plan.

The principal maintenance objective is to prevent sediment buildup and clogging, which reduces pollutant removal efficiency and may lead to BMP failure. Routine maintenance activities and the frequency at which they will be conducted need to be at the O&M plan.

8 – EXISTING AND PROPOSED CONDITION HYDROLOGY COMPARISON

Following are a brief summary comparison of the preliminary pre- and post-development hydrology studies:

1. The tributary areas for the existing and proposed development are shown in the enclosed hydrology plans.
2. Similar to the existing hydrologic condition, the proposed East and West part of the site will drain toward Creek via "Proposed Outlets #1 & #2" per the proposed hydrology map.
3. The proposed detention basins 1 and 2 will help to reduce the flow. This will significantly reduce post development flow toward and reduce drainage impacts.
4. As of the hydrology calculations for the 100 year-24 hour runoff using HydroCAD, the existing site (Tributary Area 1A) generates 9.07 cfs (Q100) and the proposed site will generate 30.27 cfs (Q100). The proposed retention facility @ the exit area will help to retain excess runoff and outlet #1 will match the existing runoff rate @ 9.07 cfs.

   As of the hydrology calculations for the 100 year-24 hour runoff using HydroCAD, the existing site (Tributary Area 1b) generates 5.10 cfs (Q100) and the proposed site will generate 29.31 cfs (Q100). The proposed detention basin @ West will help to detain excess runoff and outlet #2 will match the existing runoff rate @ 5.10 cfs.

   These complies the Santa Barbara County pre & post-development drainage requirement. Also, this will ensure that no downstream impacts will be generated from the developed project.
5. The project site is located within an area of high landslide potential and the Rincon geologic formation is susceptible to landslides. So, the subject site is not feasible for infiltration.
6. Proposed storm drain inlets and pipes are sized to carry more than 25 year-24hr storm event.
7. The detention/retention basin will help to reduce flow as well as bay the bio-swale filtration BMP removes any pollutants from the proposed development.
8. There will be single orifice structure on detention basin #2 to control the outlet flow. Each basin has stand pipe with orifice. The orifice design will be included in the storm drain design plans.

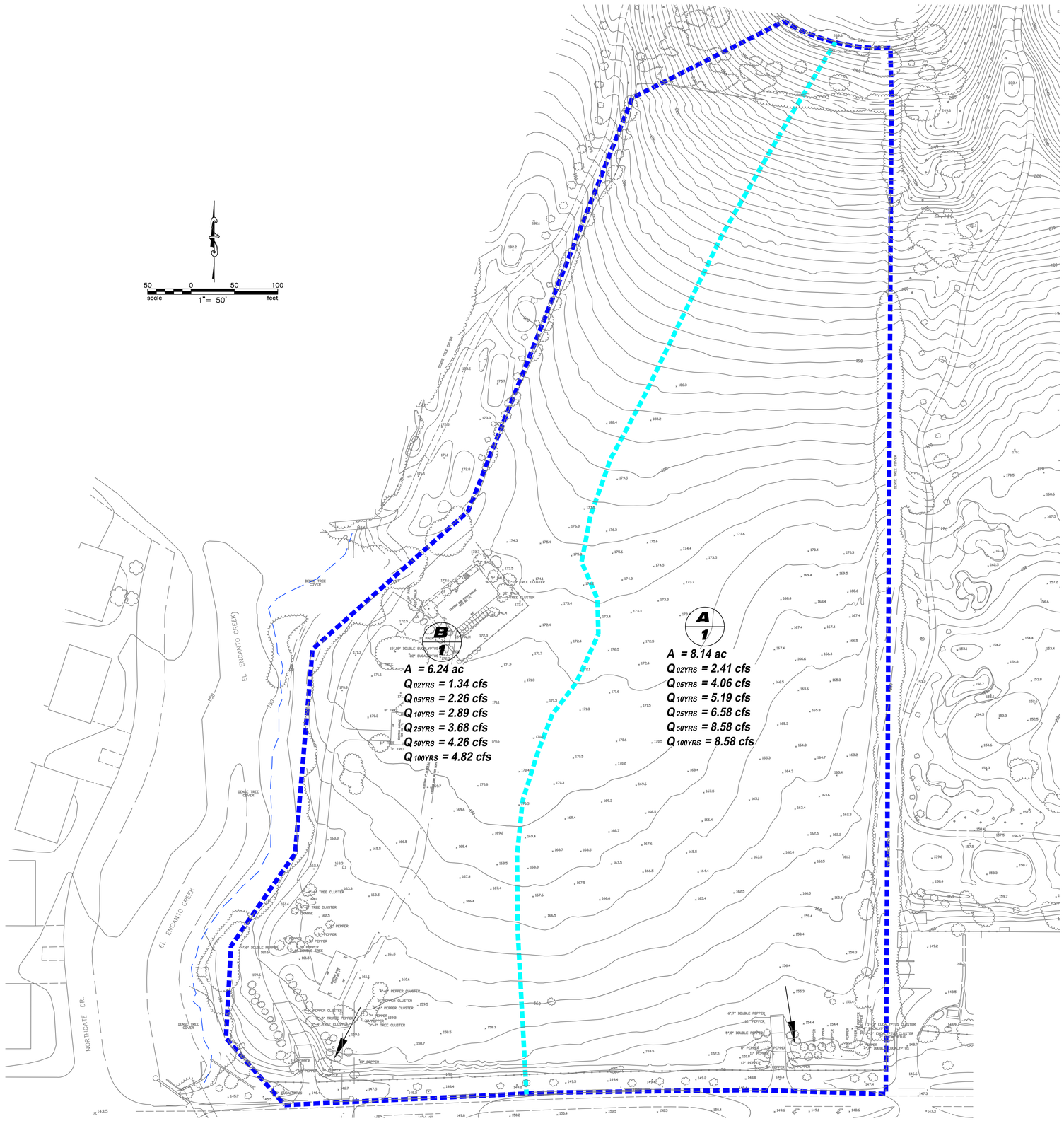
APPENDICES

APPENDICES

Appendix A:
Existing Condition Hydrology Map

EXISTING HYDROLOGY MAP

VESTING TENTATIVE TRACT MAP
AND
FINAL DEVELOPMENT PLAN
(05-154-GPA/RZN/TM 32,045/FDP)
EXISTING HYDROLOGY MAP



LEGEND:

1A	--- LOCATION NAMES
A	--- AREA IN ACRES, ac
Q25-YR	--- 25-YR, DESIGN FLOW IN CUBIC FEET PER SECOND, cfs
Q50-YR	--- 50-YR, DESIGN FLOW IN CUBIC FEET PER SECOND, cfs
	DRAINAGE BOUNDARY
	SUB-AREA BOUNDARY

SUMMARY TABLE 1: EXISTING CONDITION

SUB-AREA	AREA (ACRES)	PEAK FLOW (CFS)					
		2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
1A (Existing East)	8.14	2.41	4.06	5.19	6.58	7.6	8.58
1B (Existing West)	6.24	1.34	2.26	2.89	3.68	4.26	4.82
Total	14.38	3.75	6.32	8.08	10.26	11.86	13.4

NO.	REVISION	PREP.	APPVD.	DATE

ACCEPTED:

DIRECTOR OF PUBLIC WORKS DATE

REVIEWED: SENIOR ENGINEER DATE

RECOMMENDED: DEPUTY DIRECTOR DATE

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MOHAMMAD QUAYUM P.E. C7411 EXP. 06/30/2027

REGISTERED PROFESSIONAL ENGINEER
MOHAMMAD QUAYUM
No.74111
CIVIL
EXP. 06/30/27
STATE OF CALIFORNIA

VESTING TENTATIVE TRACT MAP 32,045
7400 CATHEDAL OAK ROD
P.N. 01-023.01

EXISTING HYDROLOGY MAP

SHEET NUMBER: 1 OF 1

DRAWING NUMBER (CITY OF GOLETA)

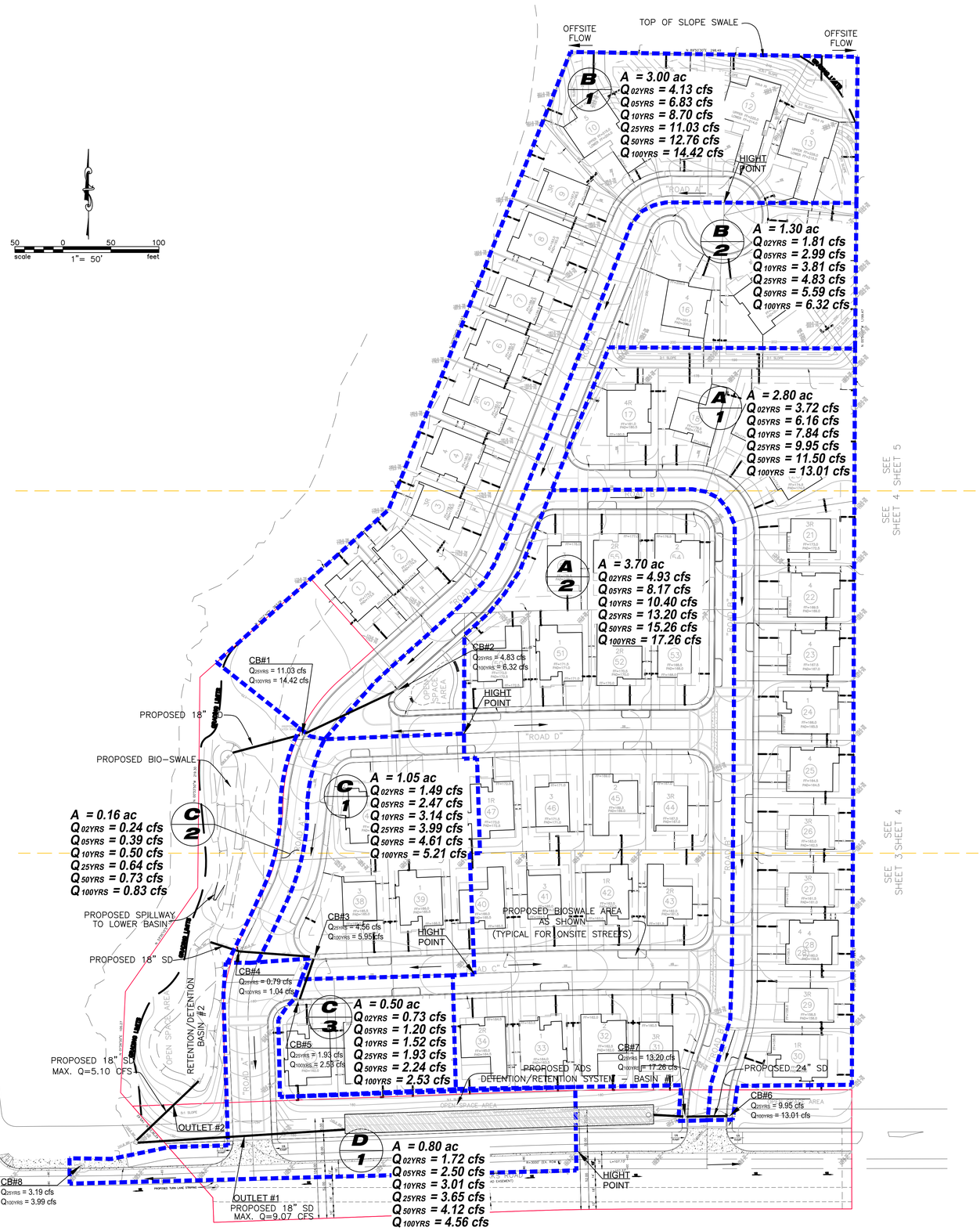
PLOT DATE:
08-10-2025

Appendix B:
Proposed Condition Hydrology Map

DEVELOPED HYDROLOGY MAP

VESTING TENTATIVE TRACT MAP
AND
FINAL DEVELOPMENT PLAN
(05-154-GPA/RZN/TM 32,045/FDP)

DEVELOPED HYDROLOGY MAP



LEGEND:

1A	LOCATION NAMES
A	AREA IN ACRES, ac
Q_{25} CFS	25-YR, DESIGN FLOW IN CUBIC FEET PER SECOND, cfs
Q_{INT} CFS	INTERCEPTED FLOW
$Q_{BYP.}$CFS	BY-PASS FLOW
CB#1	CATCH BASIN ID
AF	ACRE-FEET
CFS	CUBIC FEET PER SECOND
CB	CATCH BASIN
AC	ACRES
———	PROPOSED STORM DRAIN PIPE
- - - -	SUB-AREA BOUNDARY

DETENTION BASIN SUMMARY

BASIN #	INFLOW (CFS)	OUTFLOW (CFS)	DETENTION REQUIRED (CU-FT)	DETENTION PROVIDED (CU-FT)	FREEBOARD	SYSTEM
Basin 1 (100YR)	30.27	9.07	19589	32500	-----	ADS StormTech MC-7200
Basin 2 (100YR)	29.31	5.10	26832	37026	12"	Detention Basin

SUMMARY TABLE 2: PROPOSED CONDITION

SUB-AREA	AREA (ACRES)	PEAK FLOW (CFS)					
		2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
A-1	2.80	3.72	6.16	7.84	9.95	11.50	13.01
A-2	3.70	4.93	8.17	10.40	13.20	15.26	17.26
Total to Basin 1	**6.50**	**8.65**	**14.33**	**18.24**	**23.15**	**26.76**	**30.27**
B-1	3.00	4.13	6.83	8.70	11.03	12.76	14.42
B-2	1.30	1.81	2.99	3.81	4.83	5.59	6.32
C-1	1.05	1.49	2.47	3.14	3.99	4.61	5.21
C-2	0.16	0.24	0.39	0.50	0.64	0.73	0.83
C-3	0.50	0.73	1.20	1.52	1.93	2.24	2.53
Total to Basin 2	**6.01**	**8.40**	**13.88**	**17.67**	**22.42**	**25.93**	**29.31**
D-1	0.80	1.72	2.50	3.01	3.65	4.12	4.56

CATCH BASIN SUB-AREA SUMMARY

CATCH BASIN	WIDTH	SLOPE	Q_{25} (CFS)	Q_{INT} (CFS)	Q_{BYP} (CFS)	Q_{100} (CFS)	Q_{INT} (CFS)	Q_{BYP} (CFS)
CB#1	28'	4.0%	11.03	10.66	0.37	14.42	13.06	1.36
CB#2	14'	2.0%	4.83	4.53	0.30	6.32	5.50	0.82
CB#3	21'	2.0%	4.56	4.56	-----	5.95	5.95	-----
CB#4	14'	4.0%	0.79	0.79	-----	1.04	1.04	-----
CB#5	14'	2.0%	1.93	1.93	-----	2.53	2.53	-----
CB#6	28', 10'	8.0%	9.95	9.95	-----	13.01	13.01	-----
CB#7	28', 14'	8.0%	13.20	13.20	-----	17.26	17.26	-----
CB#8	14'	1.0%	3.19	3.19	-----	3.99	3.99	-----

NO.	REVISION	PREP.	APPVD.	DATE

ACCEPTED:

DIRECTOR OF PUBLIC WORKS DATE

REVIEWED: SENIOR ENGINEER DATE

RECOMMENDED: DEPUTY DIRECTOR DATE

CITY OF GOLETA
DEPARTMENT OF PUBLIC WORKS

PREPARED BY:
MQ DESIGN TECH
Engineering • Planning • Land Development
MQ DESIGN TECH, INC.
741 Lakefield Rd
Suite J
Westlake Village, California 91361
Phone: 818-219-7258
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DATE:
MOHAMMAD QUAYUM P.E. C7411 EXP. 06/30/2027

REGISTERED PROFESSIONAL ENGINEER
MOHAMMAD QUAYUM
No.74111
CIVIL
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VESTING TENTATIVE TRACT MAP 32,045
7400 CATHEDAL OAK ROD
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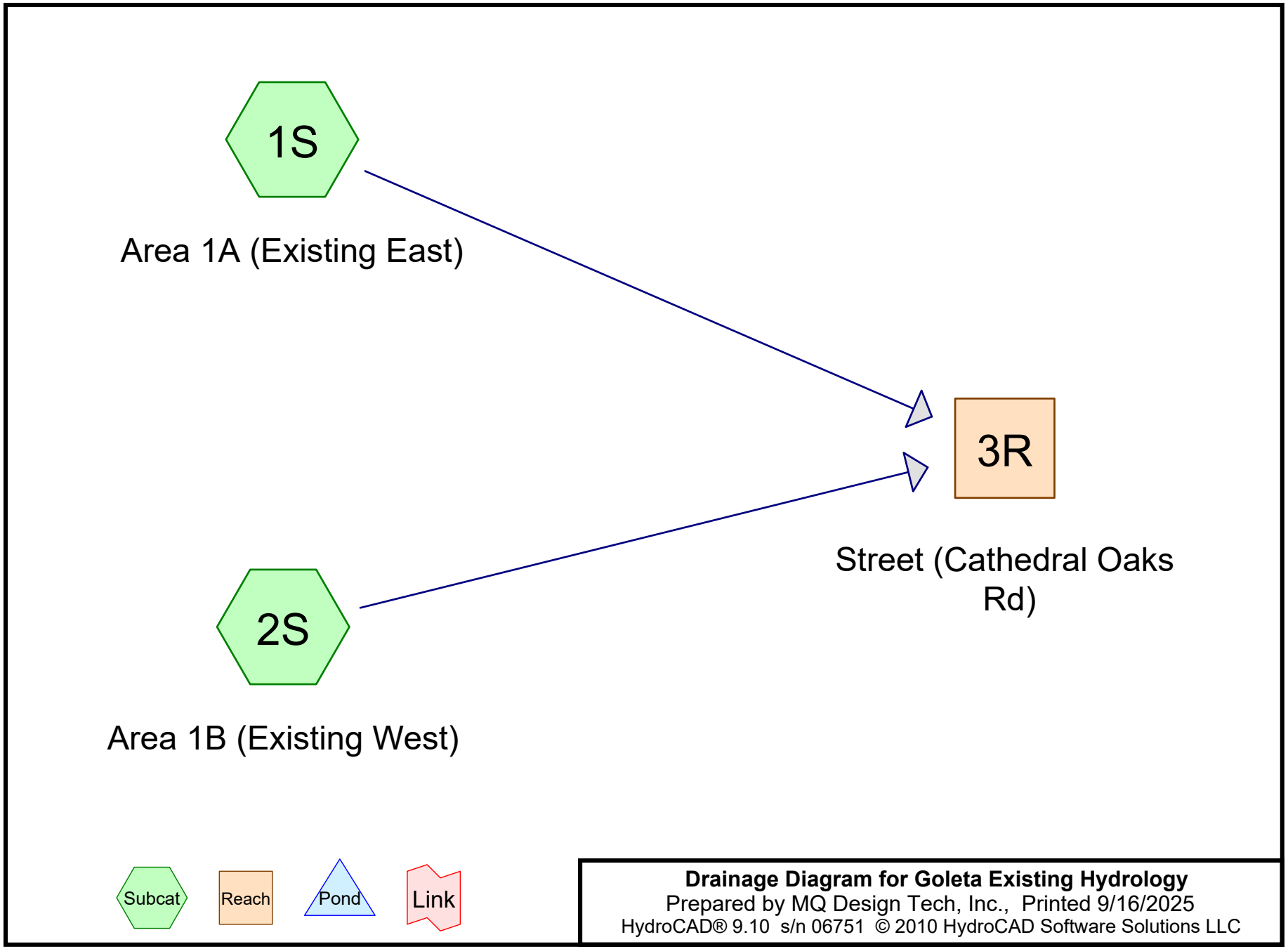
DEVELOPED HYDROLOGY MAP

SHEET NUMBER: 1 OF 1

DRAWING NUMBER (CITY OF GOLETA)

PLOT DATE:
08-10-2025

Appendix C:
Existing Hydrology Calculations



Drainage Diagram for Goleta Existing Hydrology
Prepared by MQ Design Tech, Inc., Printed 9/16/2025
HydroCAD® 9.10 s/n 06751 © 2010 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
14.380	89	<50% Grass cover, Poor, HSG D (1S, 2S)
14.380		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
14.380	HSG D	1S, 2S
0.000	Other	
14.380		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Area 1A (Existing East) Runoff Area=8.140 ac 0.00% Impervious Runoff Depth>1.98"
Flow Length=1,200' Tc=121.6 min CN=89/0 Runoff=2.41 cfs 1.343 af

Subcatchment 2S: Area 1B (Existing West) Runoff Area=6.240 ac 0.00% Impervious Runoff Depth>1.89"
Flow Length=1,380' Tc=194.6 min CN=89/0 Runoff=1.34 cfs 0.984 af

Reach 3R: Street (Cathedral Oaks Rd) Inflow=3.73 cfs 2.327 af
Outflow=3.73 cfs 2.327 af

Total Runoff Area = 14.380 ac Runoff Volume = 2.327 af Average Runoff Depth = 1.94"
100.00% Pervious = 14.380 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Area 1A (Existing East)

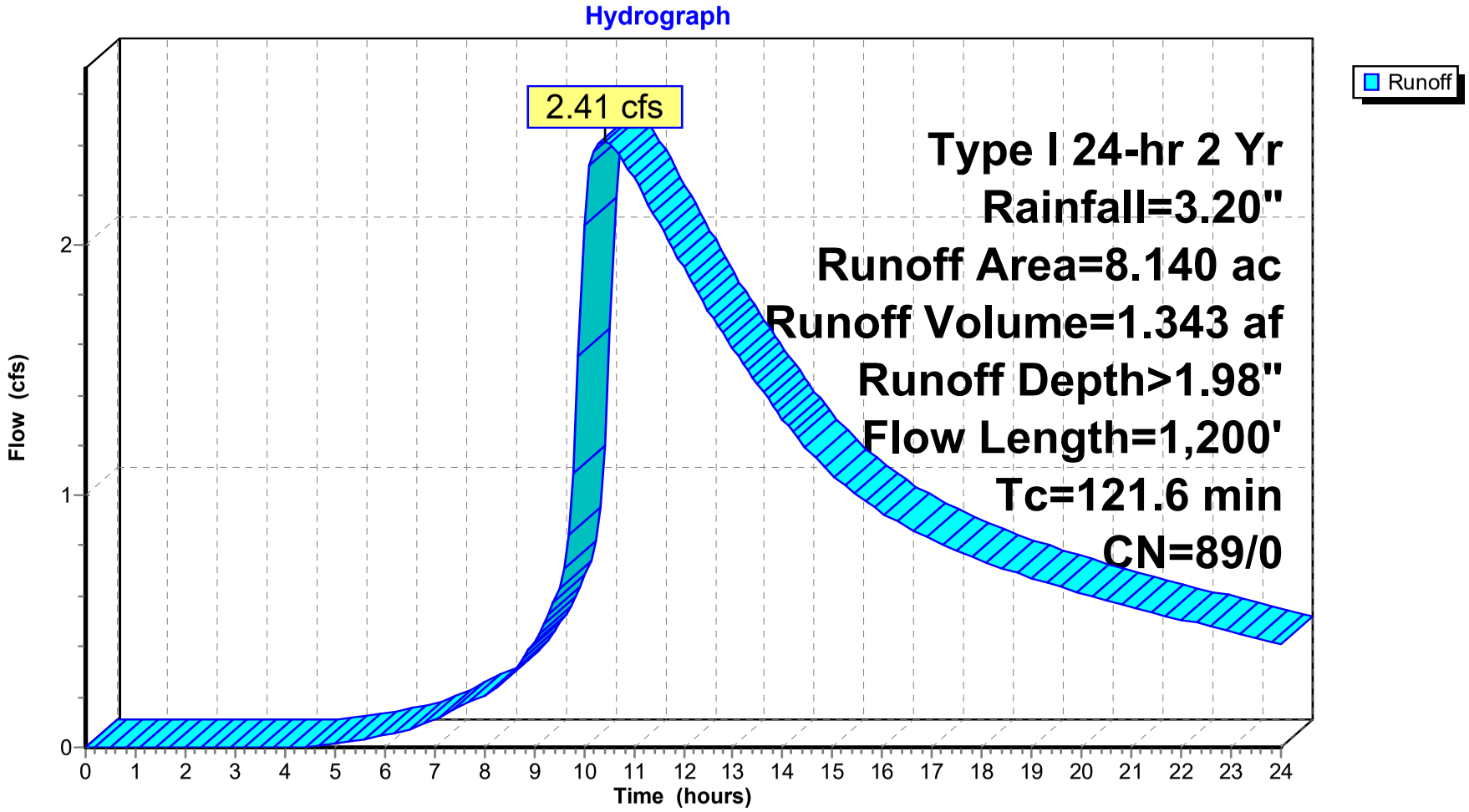
Runoff = 2.41 cfs @ 10.42 hrs, Volume= 1.343 af, Depth> 1.98"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 2 Yr Rainfall=3.20"

Area (ac)	CN	Description
8.140	89	<50% Grass cover, Poor, HSG D
8.140	89	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.1	300	0.2400	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
28.3	300	0.0900	0.18		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
39.2	300	0.0400	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
35.0	300	0.0530	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
121.6	1,200	Total			

Subcatchment 1S: Area 1A (Existing East)



Hydrograph for Subcatchment 1S: Area 1A (Existing East)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	**0.00**	0.00
0.50	0.03	0.00	0.00	0.00
1.00	0.06	0.00	0.00	0.00
1.50	0.08	0.00	0.00	0.00
2.00	0.11	0.00	0.00	0.00
2.50	0.14	0.00	0.00	0.00
3.00	0.17	0.00	0.00	0.00
3.50	0.21	0.00	0.00	0.00
4.00	0.24	0.00	0.00	0.00
4.50	0.28	0.00	0.00	0.00
5.00	0.32	0.00	0.00	0.01
5.50	0.36	0.01	0.00	0.03
6.00	0.40	0.02	0.00	0.05
6.50	0.45	0.03	0.00	0.07
7.00	0.50	0.04	0.00	0.11
7.50	0.56	0.06	0.00	0.16
8.00	0.62	0.09	0.00	0.21
8.50	0.70	0.12	0.00	0.28
9.00	0.81	0.18	0.00	0.42
9.50	0.97	0.27	0.00	0.63
10.00	1.65	0.74	0.00	**2.08**
10.50	1.87	0.92	0.00	**2.41**
11.00	1.99	1.02	0.00	2.27
11.50	2.10	1.11	0.00	2.09
12.00	2.19	1.19	0.00	1.91
12.50	2.27	1.26	0.00	1.74
13.00	2.34	1.32	0.00	1.59
13.50	2.41	1.37	0.00	1.44
14.00	2.46	1.42	0.00	1.31
14.50	2.52	1.47	0.00	1.18
15.00	2.57	1.51	0.00	1.08
15.50	2.62	1.56	0.00	1.00
16.00	2.66	1.60	0.00	0.93
16.50	2.71	1.64	0.00	0.87
17.00	2.75	1.68	0.00	0.82
17.50	2.79	1.72	0.00	0.78
18.00	2.84	1.75	0.00	0.74
18.50	2.87	1.79	0.00	0.71
19.00	2.91	1.82	0.00	0.67
19.50	2.95	1.85	0.00	0.64
20.00	2.98	1.88	0.00	0.61
20.50	3.02	1.91	0.00	0.59
21.00	3.05	1.94	0.00	0.56
21.50	3.08	1.97	0.00	0.53
22.00	3.10	1.99	0.00	0.51
22.50	3.13	2.02	0.00	0.48
23.00	3.16	2.04	0.00	0.46
23.50	3.18	2.06	0.00	0.44
24.00	**3.20**	**2.08**	0.00	0.41

Summary for Subcatchment 2S: Area 1B (Existing West)

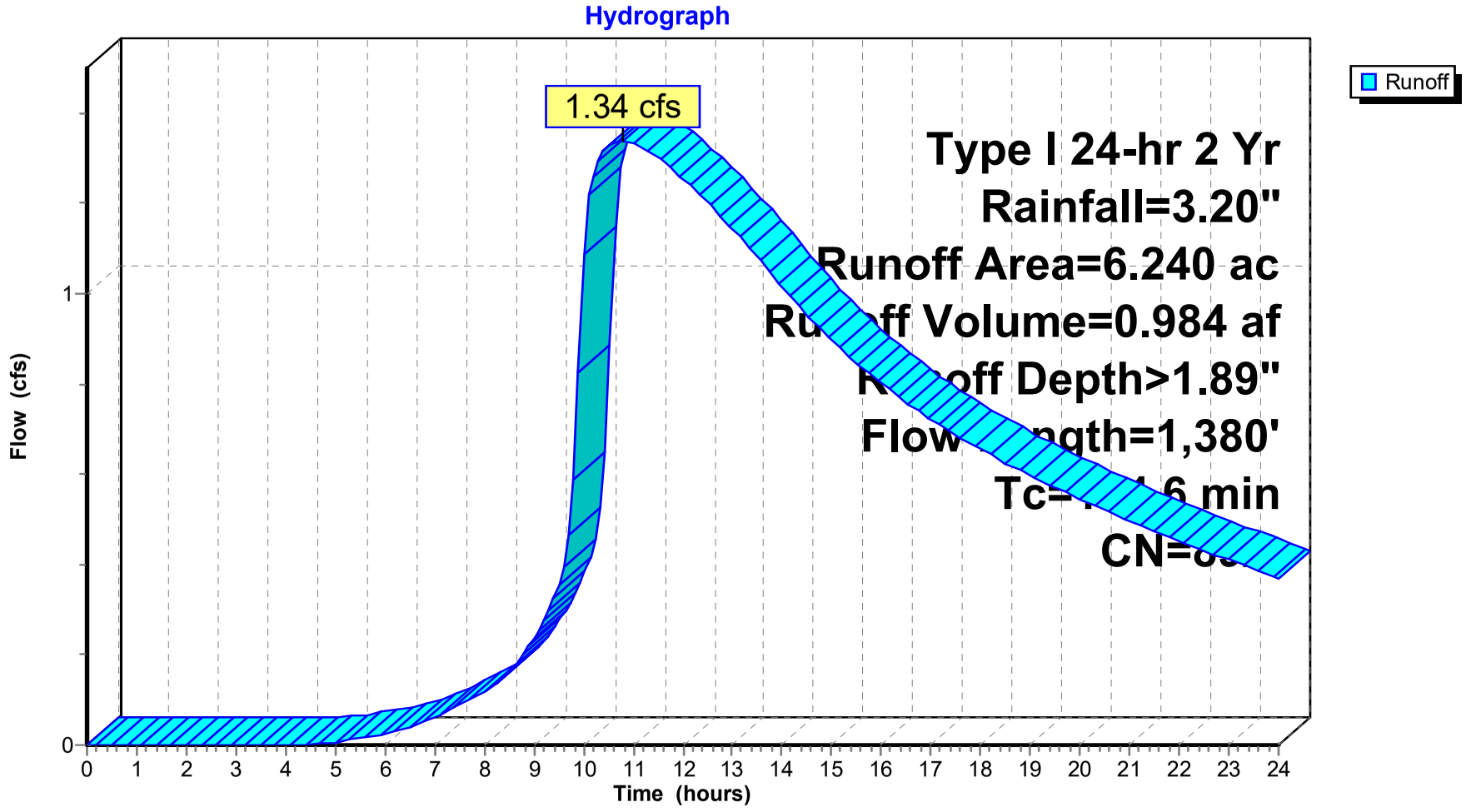
Runoff = 1.34 cfs @ 10.78 hrs, Volume= 0.984 af, Depth> 1.89"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 2 Yr Rainfall=3.20"

Area (ac)	CN	Description
6.240	89	<50% Grass cover, Poor, HSG D
6.240	89	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.1	300	0.2400	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
31.3	300	0.0700	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
55.2	300	0.0170	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
68.2	300	0.0100	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
20.8	180	0.0700	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
194.6	1,380	Total			

Subcatchment 2S: Area 1B (Existing West)



Hydrograph for Subcatchment 2S: Area 1B (Existing West)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	**0.00**	0.00
0.50	0.03	0.00	0.00	0.00
1.00	0.06	0.00	0.00	0.00
1.50	0.08	0.00	0.00	0.00
2.00	0.11	0.00	0.00	0.00
2.50	0.14	0.00	0.00	0.00
3.00	0.17	0.00	0.00	0.00
3.50	0.21	0.00	0.00	0.00
4.00	0.24	0.00	0.00	0.00
4.50	0.28	0.00	0.00	0.00
5.00	0.32	0.00	0.00	0.01
5.50	0.36	0.01	0.00	0.01
6.00	0.40	0.02	0.00	0.03
6.50	0.45	0.03	0.00	0.04
7.00	0.50	0.04	0.00	0.06
7.50	0.56	0.06	0.00	0.09
8.00	0.62	0.09	0.00	0.12
8.50	0.70	0.12	0.00	0.16
9.00	0.81	0.18	0.00	0.24
9.50	0.97	0.27	0.00	0.35
10.00	1.65	0.74	0.00	1.09
10.50	1.87	0.92	0.00	**1.33**
11.00	1.99	1.02	0.00	**1.33**
11.50	2.10	1.11	0.00	1.30
12.00	2.19	1.19	0.00	1.25
12.50	2.27	1.26	0.00	1.20
13.00	2.34	1.32	0.00	1.14
13.50	2.41	1.37	0.00	1.08
14.00	2.46	1.42	0.00	1.02
14.50	2.52	1.47	0.00	0.95
15.00	2.57	1.51	0.00	0.90
15.50	2.62	1.56	0.00	0.85
16.00	2.66	1.60	0.00	0.80
16.50	2.71	1.64	0.00	0.76
17.00	2.75	1.68	0.00	0.72
17.50	2.79	1.72	0.00	0.69
18.00	2.84	1.75	0.00	0.65
18.50	2.87	1.79	0.00	0.62
19.00	2.91	1.82	0.00	0.60
19.50	2.95	1.85	0.00	0.57
20.00	2.98	1.88	0.00	0.54
20.50	3.02	1.91	0.00	0.52
21.00	3.05	1.94	0.00	0.50
21.50	3.08	1.97	0.00	0.47
22.00	3.10	1.99	0.00	0.45
22.50	3.13	2.02	0.00	0.43
23.00	3.16	2.04	0.00	0.41
23.50	3.18	2.06	0.00	0.39
24.00	**3.20**	**2.08**	0.00	0.37

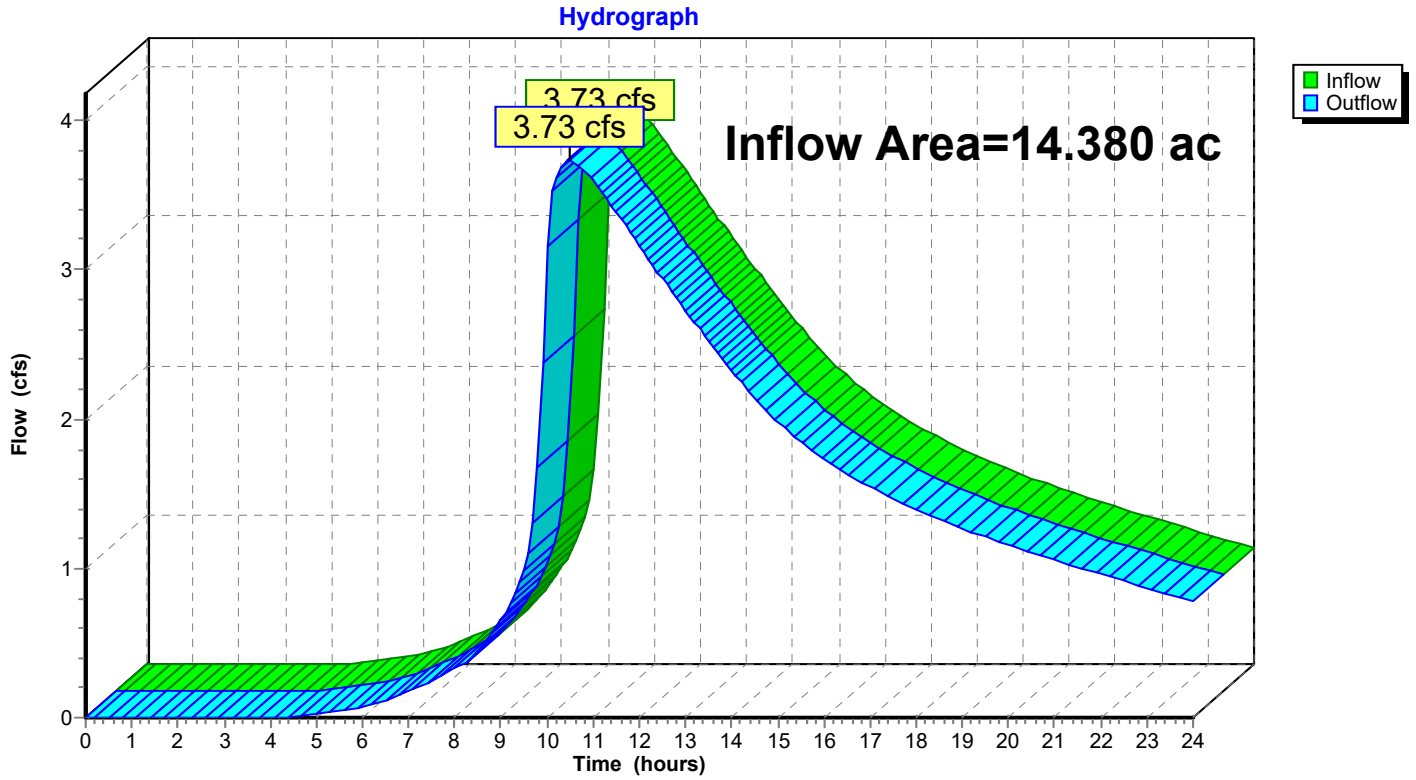
Summary for Reach 3R: Street (Cathedral Oaks Rd)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 14.380 ac, 0.00% Impervious, Inflow Depth > 1.94" for 2 Yr event
Inflow = 3.73 cfs @ 10.49 hrs, Volume= 2.327 af
Outflow = 3.73 cfs @ 10.49 hrs, Volume= 2.327 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Reach 3R: Street (Cathedral Oaks Rd)



Hydrograph for Reach 3R: Street (Cathedral Oaks Rd)

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00
0.50	0.00		0.00
1.00	0.00		0.00
1.50	0.00		0.00
2.00	0.00		0.00
2.50	0.00		0.00
3.00	0.00		0.00
3.50	0.00		0.00
4.00	0.00		0.00
4.50	0.00		0.00
5.00	0.02		0.02
5.50	0.04		0.04
6.00	0.07		0.07
6.50	0.11		0.11
7.00	0.17		0.17
7.50	0.25		0.25
8.00	0.33		0.33
8.50	0.45		0.45
9.00	0.65		0.65
9.50	0.99		0.99
10.00	3.17		3.17
10.50	**3.73**		**3.73**
11.00	3.60		3.60
11.50	3.39		3.39
12.00	3.16		3.16
12.50	2.94		2.94
13.00	2.73		2.73
13.50	2.52		2.52
14.00	2.32		2.32
14.50	2.14		2.14
15.00	1.98		1.98
15.50	1.85		1.85
16.00	1.73		1.73
16.50	1.63		1.63
17.00	1.55		1.55
17.50	1.47		1.47
18.00	1.39		1.39
18.50	1.33		1.33
19.00	1.27		1.27
19.50	1.21		1.21
20.00	1.16		1.16
20.50	1.11		1.11
21.00	1.06		1.06
21.50	1.01		1.01
22.00	0.96		0.96
22.50	0.92		0.92
23.00	0.87		0.87
23.50	0.83		0.83
24.00	0.78		0.78

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Area 1A (Existing East) Runoff Area=8.140 ac 0.00% Impervious Runoff Depth>3.25"
Flow Length=1,200' Tc=121.6 min CN=89/0 Runoff=4.06 cfs 2.203 af

Subcatchment 2S: Area 1B (Existing West) Runoff Area=6.240 ac 0.00% Impervious Runoff Depth>3.11"
Flow Length=1,380' Tc=194.6 min CN=89/0 Runoff=2.26 cfs 1.618 af

Reach 3R: Street (Cathedral Oaks Rd) Inflow=6.31 cfs 3.821 af
Outflow=6.31 cfs 3.821 af

Total Runoff Area = 14.380 ac Runoff Volume = 3.821 af Average Runoff Depth = 3.19"
100.00% Pervious = 14.380 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Area 1A (Existing East)

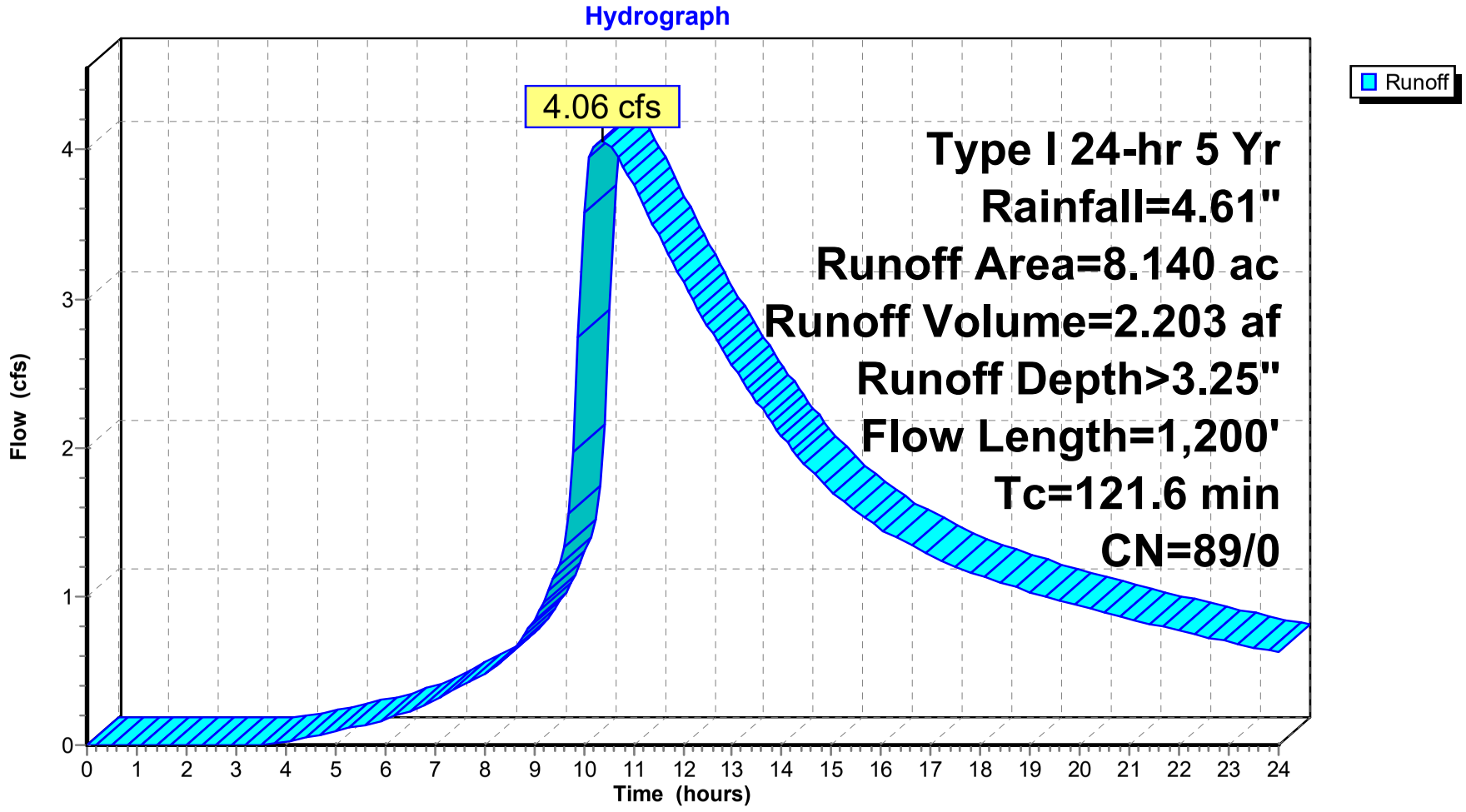
Runoff = 4.06 cfs @ 10.38 hrs, Volume= 2.203 af, Depth> 3.25"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 5 Yr Rainfall=4.61"

Area (ac)	CN	Description
8.140	89	<50% Grass cover, Poor, HSG D
8.140	89	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.1	300	0.2400	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
28.3	300	0.0900	0.18		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
39.2	300	0.0400	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
35.0	300	0.0530	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
121.6	1,200	Total			

Subcatchment 1S: Area 1A (Existing East)



Hydrograph for Subcatchment 1S: Area 1A (Existing East)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	**0.00**	0.00
0.50	0.04	0.00	0.00	0.00
1.00	0.08	0.00	0.00	0.00
1.50	0.12	0.00	0.00	0.00
2.00	0.16	0.00	0.00	0.00
2.50	0.20	0.00	0.00	0.00
3.00	0.25	0.00	0.00	0.00
3.50	0.30	0.00	0.00	0.01
4.00	0.35	0.01	0.00	0.02
4.50	0.40	0.02	0.00	0.05
5.00	0.46	0.03	0.00	0.09
5.50	0.52	0.05	0.00	0.13
6.00	0.58	0.07	0.00	0.18
6.50	0.64	0.10	0.00	0.23
7.00	0.72	0.13	0.00	0.30
7.50	0.80	0.17	0.00	0.39
8.00	0.89	0.22	0.00	0.48
8.50	1.01	0.29	0.00	0.61
9.00	1.17	0.40	0.00	0.84
9.50	1.40	0.55	0.00	1.21
10.00	2.37	1.35	0.00	**3.58**
10.50	2.69	1.62	0.00	**4.04**
11.00	2.87	1.78	0.00	3.77
11.50	3.02	1.92	0.00	3.43
12.00	3.15	2.04	0.00	3.12
12.50	3.27	2.15	0.00	2.82
13.00	3.37	2.24	0.00	2.55
13.50	3.47	2.33	0.00	2.30
14.00	3.55	2.40	0.00	2.08
14.50	3.62	2.47	0.00	1.87
15.00	3.70	2.54	0.00	1.71
15.50	3.77	2.61	0.00	1.57
16.00	3.84	2.67	0.00	1.45
16.50	3.90	2.73	0.00	1.36
17.00	3.96	2.79	0.00	1.27
17.50	4.03	2.85	0.00	1.20
18.00	4.08	2.90	0.00	1.14
18.50	4.14	2.96	0.00	1.08
19.00	4.20	3.01	0.00	1.03
19.50	4.25	3.06	0.00	0.98
20.00	4.30	3.10	0.00	0.93
20.50	4.34	3.15	0.00	0.89
21.00	4.39	3.19	0.00	0.85
21.50	4.43	3.23	0.00	0.81
22.00	4.47	3.27	0.00	0.77
22.50	4.51	3.30	0.00	0.73
23.00	4.55	3.34	0.00	0.69
23.50	4.58	3.37	0.00	0.66
24.00	**4.61**	**3.40**	0.00	0.62

Summary for Subcatchment 2S: Area 1B (Existing West)

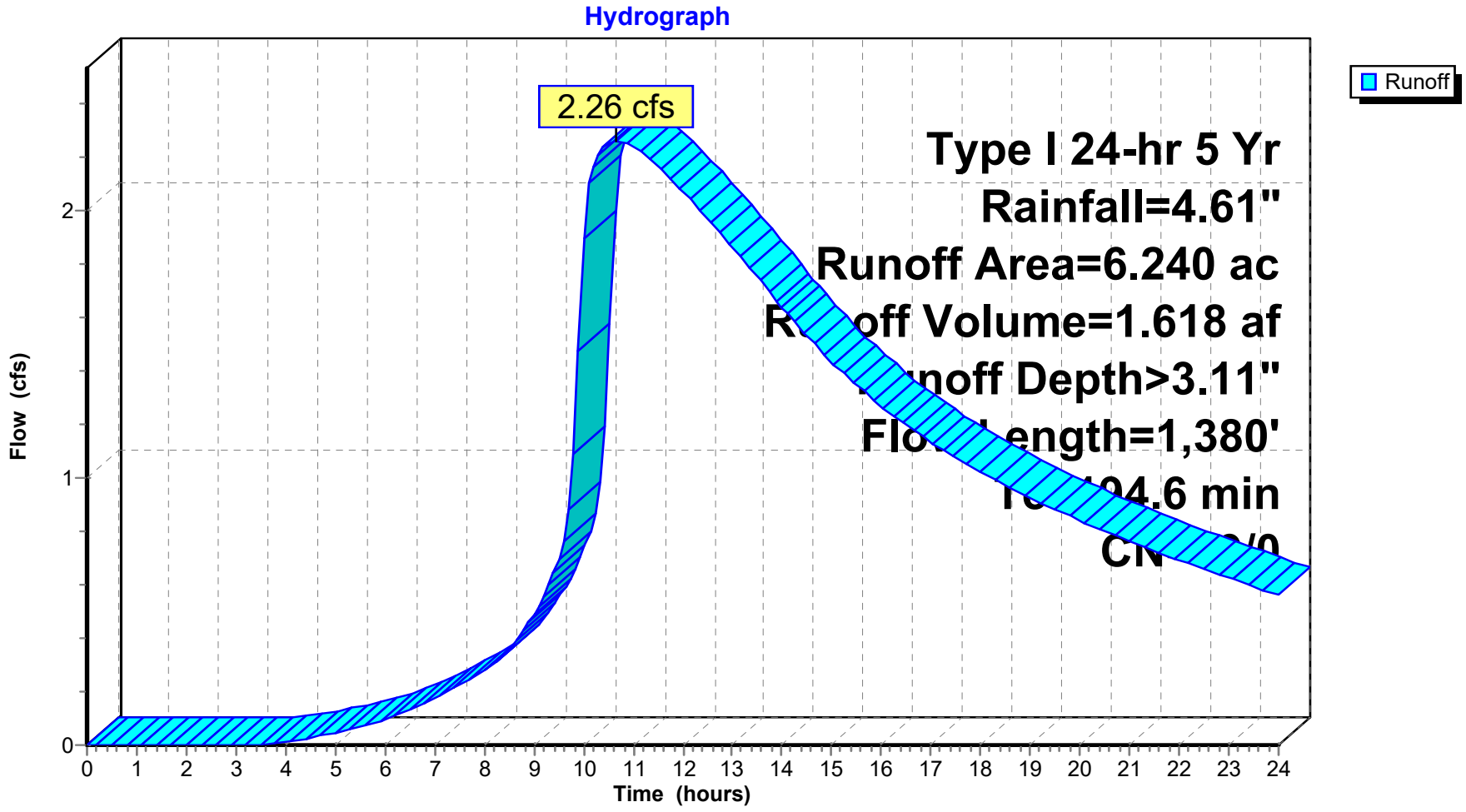
Runoff = 2.26 cfs @ 10.64 hrs, Volume= 1.618 af, Depth> 3.11"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 5 Yr Rainfall=4.61"

Area (ac)	CN	Description
6.240	89	<50% Grass cover, Poor, HSG D
6.240	89	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.1	300	0.2400	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
31.3	300	0.0700	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
55.2	300	0.0170	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
68.2	300	0.0100	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
20.8	180	0.0700	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
194.6	1,380	Total			

Subcatchment 2S: Area 1B (Existing West)



Hydrograph for Subcatchment 2S: Area 1B (Existing West)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	**0.00**	0.00
0.50	0.04	0.00	0.00	0.00
1.00	0.08	0.00	0.00	0.00
1.50	0.12	0.00	0.00	0.00
2.00	0.16	0.00	0.00	0.00
2.50	0.20	0.00	0.00	0.00
3.00	0.25	0.00	0.00	0.00
3.50	0.30	0.00	0.00	0.00
4.00	0.35	0.01	0.00	0.01
4.50	0.40	0.02	0.00	0.03
5.00	0.46	0.03	0.00	0.05
5.50	0.52	0.05	0.00	0.07
6.00	0.58	0.07	0.00	0.10
6.50	0.64	0.10	0.00	0.13
7.00	0.72	0.13	0.00	0.17
7.50	0.80	0.17	0.00	0.22
8.00	0.89	0.22	0.00	0.28
8.50	1.01	0.29	0.00	0.36
9.00	1.17	0.40	0.00	0.49
9.50	1.40	0.55	0.00	0.69
10.00	2.37	1.35	0.00	1.90
10.50	2.69	1.62	0.00	**2.26**
11.00	2.87	1.78	0.00	**2.24**
11.50	3.02	1.92	0.00	2.16
12.00	3.15	2.04	0.00	2.07
12.50	3.27	2.15	0.00	1.97
13.00	3.37	2.24	0.00	1.86
13.50	3.47	2.33	0.00	1.75
14.00	3.55	2.40	0.00	1.64
14.50	3.62	2.47	0.00	1.53
15.00	3.70	2.54	0.00	1.43
15.50	3.77	2.61	0.00	1.35
16.00	3.84	2.67	0.00	1.27
16.50	3.90	2.73	0.00	1.20
17.00	3.96	2.79	0.00	1.13
17.50	4.03	2.85	0.00	1.08
18.00	4.08	2.90	0.00	1.02
18.50	4.14	2.96	0.00	0.97
19.00	4.20	3.01	0.00	0.92
19.50	4.25	3.06	0.00	0.88
20.00	4.30	3.10	0.00	0.84
20.50	4.34	3.15	0.00	0.80
21.00	4.39	3.19	0.00	0.76
21.50	4.43	3.23	0.00	0.73
22.00	4.47	3.27	0.00	0.69
22.50	4.51	3.30	0.00	0.66
23.00	4.55	3.34	0.00	0.63
23.50	4.58	3.37	0.00	0.59
24.00	**4.61**	**3.40**	0.00	0.56

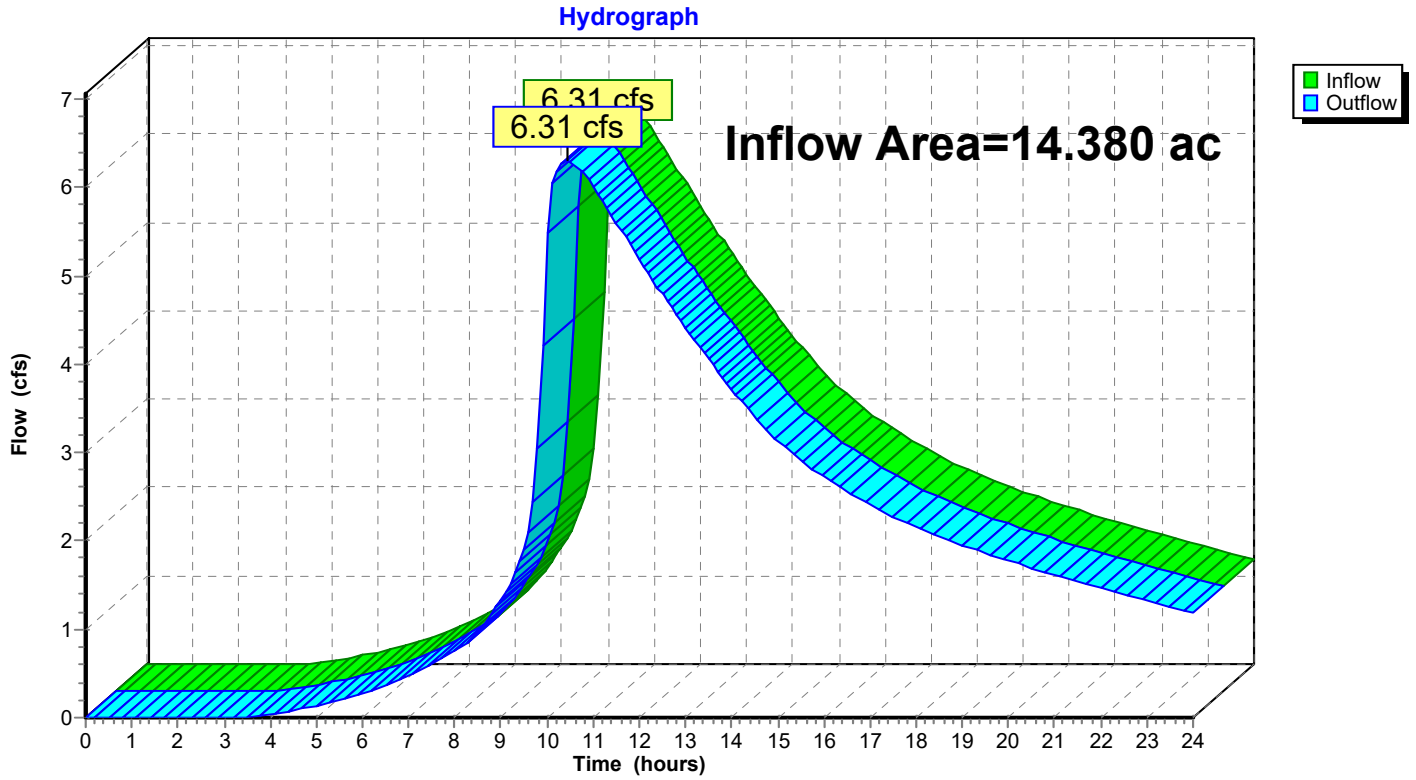
Summary for Reach 3R: Street (Cathedral Oaks Rd)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 14.380 ac, 0.00% Impervious, Inflow Depth > 3.19" for 5 Yr event
Inflow = 6.31 cfs @ 10.44 hrs, Volume= 3.821 af
Outflow = 6.31 cfs @ 10.44 hrs, Volume= 3.821 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Reach 3R: Street (Cathedral Oaks Rd)



Hydrograph for Reach 3R: Street (Cathedral Oaks Rd)

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	17.50	2.28		2.28
0.50	0.00		0.00	18.00	2.16		2.16
1.00	0.00		0.00	18.50	2.05		2.05
1.50	0.00		0.00	19.00	1.95		1.95
2.00	0.00		0.00	19.50	1.86		1.86
2.50	0.00		0.00	20.00	1.77		1.77
3.00	0.00		0.00	20.50	1.69		1.69
3.50	0.01		0.01	21.00	1.61		1.61
4.00	0.04		0.04	21.50	1.54		1.54
4.50	0.08		0.08	22.00	1.46		1.46
5.00	0.14		0.14	22.50	1.39		1.39
5.50	0.20		0.20	23.00	1.32		1.32
6.00	0.27		0.27	23.50	1.25		1.25
6.50	0.36		0.36	24.00	1.18		1.18
7.00	0.47		0.47				
7.50	0.61		0.61				
8.00	0.76		0.76				
8.50	0.97		0.97				
9.00	1.33		1.33				
9.50	1.90		1.90				
10.00	**5.48**		**5.48**				
10.50	**6.30**		**6.30**				
11.00	6.01		6.01				
11.50	5.60		5.60				
12.00	5.19		5.19				
12.50	4.79		4.79				
13.00	4.41		4.41				
13.50	4.06		4.06				
14.00	3.72		3.72				
14.50	3.40		3.40				
15.00	3.14		3.14				
15.50	2.91		2.91				
16.00	2.72		2.72				
16.50	2.56		2.56				
17.00	2.41		2.41				

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Area 1A (Existing East) Runoff Area=8.140 ac 0.00% Impervious Runoff Depth>4.11"
Flow Length=1,200' Tc=121.6 min CN=89/0 Runoff=5.19 cfs 2.791 af

Subcatchment 2S: Area 1B (Existing West) Runoff Area=6.240 ac 0.00% Impervious Runoff Depth>3.95"
Flow Length=1,380' Tc=194.6 min CN=89/0 Runoff=2.89 cfs 2.052 af

Reach 3R: Street (Cathedral Oaks Rd) Inflow=8.06 cfs 4.843 af
Outflow=8.06 cfs 4.843 af

Total Runoff Area = 14.380 ac Runoff Volume = 4.843 af Average Runoff Depth = 4.04"
100.00% Pervious = 14.380 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Area 1A (Existing East)

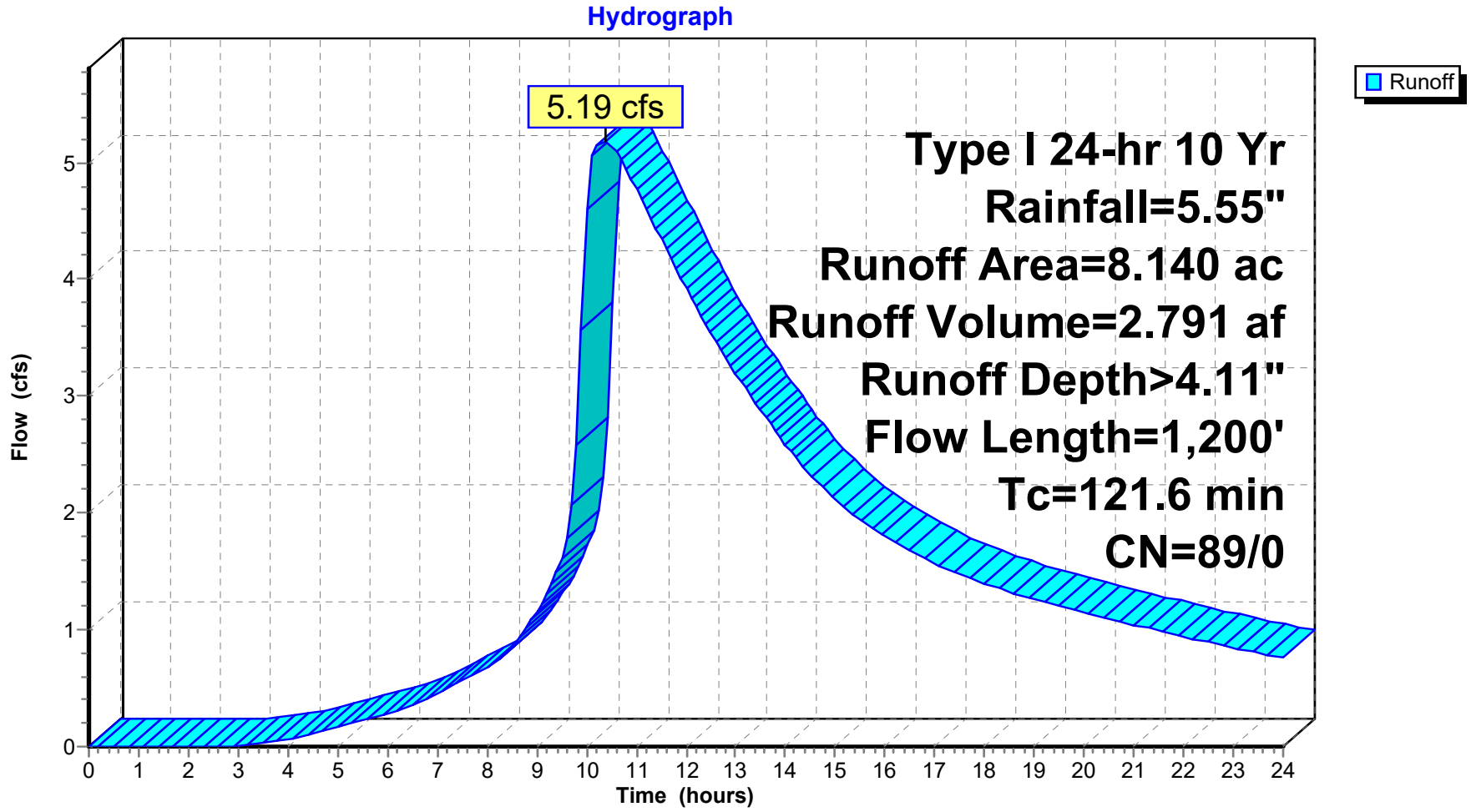
Runoff = 5.19 cfs @ 10.36 hrs, Volume= 2.791 af, Depth> 4.11"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 10 Yr Rainfall=5.55"

Area (ac)	CN	Description
8.140	89	<50% Grass cover, Poor, HSG D
8.140	89	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.1	300	0.2400	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
28.3	300	0.0900	0.18		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
39.2	300	0.0400	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
35.0	300	0.0530	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
121.6	1,200	Total			

Subcatchment 1S: Area 1A (Existing East)



Hydrograph for Subcatchment 1S: Area 1A (Existing East)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	**0.00**	0.00
0.50	0.05	0.00	0.00	0.00
1.00	0.10	0.00	0.00	0.00
1.50	0.15	0.00	0.00	0.00
2.00	0.19	0.00	0.00	0.00
2.50	0.25	0.00	0.00	0.00
3.00	0.30	0.00	0.00	0.01
3.50	0.36	0.01	0.00	0.03
4.00	0.42	0.02	0.00	0.07
4.50	0.49	0.04	0.00	0.11
5.00	0.55	0.06	0.00	0.17
5.50	0.62	0.09	0.00	0.22
6.00	0.69	0.12	0.00	0.28
6.50	0.77	0.16	0.00	0.36
7.00	0.87	0.21	0.00	0.45
7.50	0.97	0.27	0.00	0.57
8.00	1.08	0.33	0.00	0.68
8.50	1.22	0.43	0.00	0.85
9.00	1.41	0.56	0.00	1.15
9.50	1.68	0.77	0.00	1.62
10.00	2.86	1.77	0.00	**4.61**
10.50	3.24	2.11	0.00	**5.15**
11.00	3.46	2.32	0.00	4.78
11.50	3.64	2.49	0.00	4.34
12.00	3.80	2.63	0.00	3.92
12.50	3.94	2.76	0.00	3.54
13.00	4.06	2.88	0.00	3.20
13.50	4.17	2.99	0.00	2.88
14.00	4.27	3.08	0.00	2.59
14.50	4.36	3.17	0.00	2.33
15.00	4.45	3.25	0.00	2.12
15.50	4.54	3.33	0.00	1.94
16.00	4.62	3.41	0.00	1.80
16.50	4.70	3.48	0.00	1.68
17.00	4.77	3.55	0.00	1.57
17.50	4.85	3.63	0.00	1.48
18.00	4.92	3.69	0.00	1.40
18.50	4.99	3.76	0.00	1.33
19.00	5.05	3.82	0.00	1.26
19.50	5.11	3.88	0.00	1.20
20.00	5.17	3.94	0.00	1.15
20.50	5.23	3.99	0.00	1.09
21.00	5.28	4.04	0.00	1.04
21.50	5.33	4.09	0.00	0.99
22.00	5.38	4.14	0.00	0.94
22.50	5.43	4.18	0.00	0.90
23.00	5.47	4.23	0.00	0.85
23.50	5.51	4.26	0.00	0.80
24.00	**5.55**	**4.30**	0.00	0.76

Summary for Subcatchment 2S: Area 1B (Existing West)

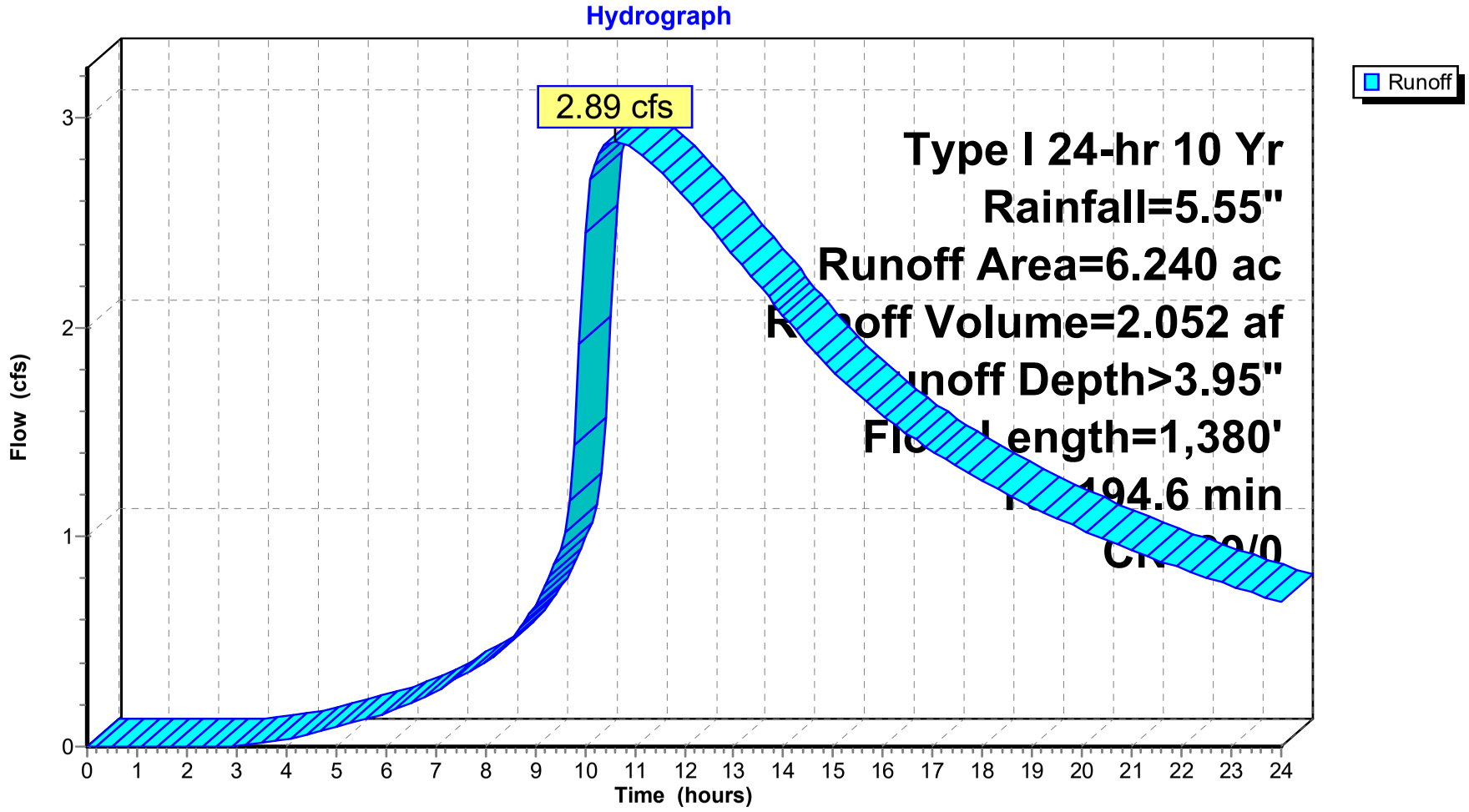
Runoff = 2.89 cfs @ 10.60 hrs, Volume= 2.052 af, Depth> 3.95"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 10 Yr Rainfall=5.55"

Area (ac)	CN	Description
6.240	89	<50% Grass cover, Poor, HSG D
6.240	89	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.1	300	0.2400	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
31.3	300	0.0700	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
55.2	300	0.0170	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
68.2	300	0.0100	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
20.8	180	0.0700	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
194.6	1,380	Total			

Subcatchment 2S: Area 1B (Existing West)



Hydrograph for Subcatchment 2S: Area 1B (Existing West)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	**0.00**	0.00
0.50	0.05	0.00	0.00	0.00
1.00	0.10	0.00	0.00	0.00
1.50	0.15	0.00	0.00	0.00
2.00	0.19	0.00	0.00	0.00
2.50	0.25	0.00	0.00	0.00
3.00	0.30	0.00	0.00	0.00
3.50	0.36	0.01	0.00	0.01
4.00	0.42	0.02	0.00	0.03
4.50	0.49	0.04	0.00	0.06
5.00	0.55	0.06	0.00	0.09
5.50	0.62	0.09	0.00	0.12
6.00	0.69	0.12	0.00	0.16
6.50	0.77	0.16	0.00	0.21
7.00	0.87	0.21	0.00	0.26
7.50	0.97	0.27	0.00	0.33
8.00	1.08	0.33	0.00	0.40
8.50	1.22	0.43	0.00	0.51
9.00	1.41	0.56	0.00	0.67
9.50	1.68	0.77	0.00	0.94
10.00	2.86	1.77	0.00	2.46
10.50	3.24	2.11	0.00	**2.89**
11.00	3.46	2.32	0.00	**2.86**
11.50	3.64	2.49	0.00	2.75
12.00	3.80	2.63	0.00	2.63
12.50	3.94	2.76	0.00	2.49
13.00	4.06	2.88	0.00	2.35
13.50	4.17	2.99	0.00	2.20
14.00	4.27	3.08	0.00	2.06
14.50	4.36	3.17	0.00	1.92
15.00	4.45	3.25	0.00	1.79
15.50	4.54	3.33	0.00	1.68
16.00	4.62	3.41	0.00	1.58
16.50	4.70	3.48	0.00	1.49
17.00	4.77	3.55	0.00	1.41
17.50	4.85	3.63	0.00	1.34
18.00	4.92	3.69	0.00	1.27
18.50	4.99	3.76	0.00	1.20
19.00	5.05	3.82	0.00	1.14
19.50	5.11	3.88	0.00	1.09
20.00	5.17	3.94	0.00	1.04
20.50	5.23	3.99	0.00	0.99
21.00	5.28	4.04	0.00	0.94
21.50	5.33	4.09	0.00	0.89
22.00	5.38	4.14	0.00	0.85
22.50	5.43	4.18	0.00	0.81
23.00	5.47	4.23	0.00	0.77
23.50	5.51	4.26	0.00	0.73
24.00	**5.55**	**4.30**	0.00	0.69

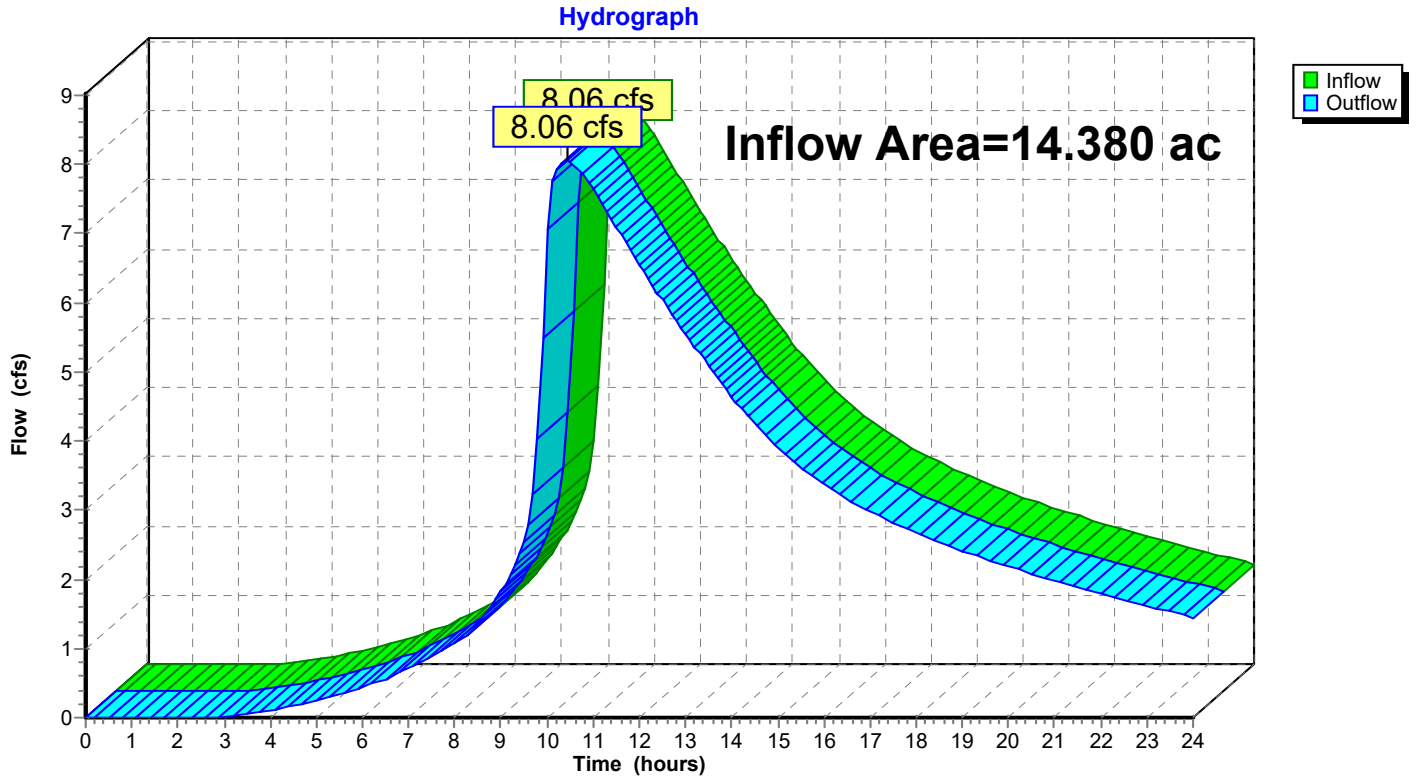
Summary for Reach 3R: Street (Cathedral Oaks Rd)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 14.380 ac, 0.00% Impervious, Inflow Depth > 4.04" for 10 Yr event
Inflow = 8.06 cfs @ 10.43 hrs, Volume= 4.843 af
Outflow = 8.06 cfs @ 10.43 hrs, Volume= 4.843 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Reach 3R: Street (Cathedral Oaks Rd)



Hydrograph for Reach 3R: Street (Cathedral Oaks Rd)

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	17.50	2.82		2.82
0.50	0.00		0.00	18.00	2.67		2.67
1.00	0.00		0.00	18.50	2.53		2.53
1.50	0.00		0.00	19.00	2.41		2.41
2.00	0.00		0.00	19.50	2.29		2.29
2.50	0.00		0.00	20.00	2.18		2.18
3.00	0.01		0.01	20.50	2.08		2.08
3.50	0.04		0.04	21.00	1.98		1.98
4.00	0.10		0.10	21.50	1.89		1.89
4.50	0.17		0.17	22.00	1.79		1.79
5.00	0.26		0.26	22.50	1.70		1.70
5.50	0.35		0.35	23.00	1.62		1.62
6.00	0.45		0.45	23.50	1.53		1.53
6.50	0.56		0.56	24.00	1.45		1.45
7.00	0.72		0.72				
7.50	0.90		0.90				
8.00	1.08		1.08				
8.50	1.36		1.36				
9.00	1.82		1.82				
9.50	2.55		2.55				
10.00	**7.06**		**7.06**				
10.50	**8.04**		**8.04**				
11.00	7.63		7.63				
11.50	7.09		7.09				
12.00	6.55		6.55				
12.50	6.03		6.03				
13.00	5.54		5.54				
13.50	5.09		5.09				
14.00	4.65		4.65				
14.50	4.25		4.25				
15.00	3.91		3.91				
15.50	3.63		3.63				
16.00	3.38		3.38				
16.50	3.17		3.17				
17.00	2.98		2.98				

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Area 1A (Existing East) Runoff Area=8.140 ac 0.00% Impervious Runoff Depth>5.20"
Flow Length=1,200' Tc=121.6 min CN=89/0 Runoff=6.58 cfs 3.526 af

Subcatchment 2S: Area 1B (Existing West) Runoff Area=6.240 ac 0.00% Impervious Runoff Depth>4.99"
Flow Length=1,380' Tc=194.6 min CN=89/0 Runoff=3.68 cfs 2.595 af

Reach 3R: Street (Cathedral Oaks Rd) Inflow=10.23 cfs 6.121 af
Outflow=10.23 cfs 6.121 af

Total Runoff Area = 14.380 ac Runoff Volume = 6.121 af Average Runoff Depth = 5.11"
100.00% Pervious = 14.380 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Area 1A (Existing East)

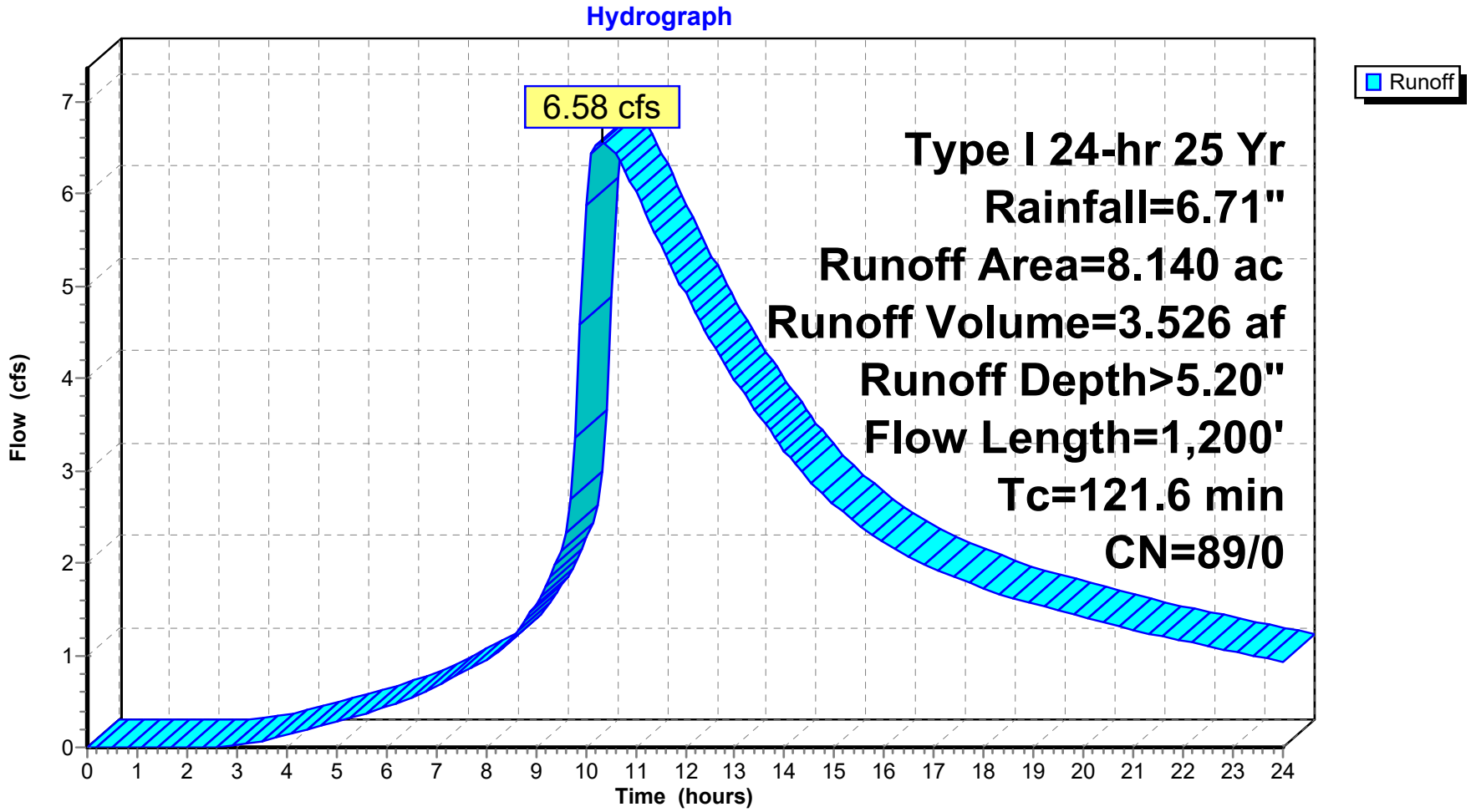
Runoff = 6.58 cfs @ 10.34 hrs, Volume= 3.526 af, Depth> 5.20"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 25 Yr Rainfall=6.71"

Area (ac)	CN	Description
8.140	89	<50% Grass cover, Poor, HSG D
8.140	89	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.1	300	0.2400	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
28.3	300	0.0900	0.18		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
39.2	300	0.0400	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
35.0	300	0.0530	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
121.6	1,200	Total			

Subcatchment 1S: Area 1A (Existing East)



Hydrograph for Subcatchment 1S: Area 1A (Existing East)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	**0.00**	0.00
0.50	0.06	0.00	0.00	0.00
1.00	0.12	0.00	0.00	0.00
1.50	0.18	0.00	0.00	0.00
2.00	0.23	0.00	0.00	0.00
2.50	0.30	0.00	0.00	0.01
3.00	0.36	0.01	0.00	0.03
3.50	0.43	0.02	0.00	0.07
4.00	0.51	0.05	0.00	0.13
4.50	0.59	0.07	0.00	0.20
5.00	0.67	0.11	0.00	0.28
5.50	0.75	0.15	0.00	0.36
6.00	0.84	0.19	0.00	0.44
6.50	0.93	0.25	0.00	0.53
7.00	1.05	0.31	0.00	0.66
7.50	1.17	0.40	0.00	0.80
8.00	1.30	0.49	0.00	0.95
8.50	1.47	0.61	0.00	1.16
9.00	1.70	0.79	0.00	1.54
9.50	2.03	1.06	0.00	2.13
10.00	3.46	2.32	0.00	**5.88**
10.50	3.91	2.74	0.00	**6.52**
11.00	4.18	2.99	0.00	6.03
11.50	4.40	3.20	0.00	5.46
12.00	4.59	3.38	0.00	4.92
12.50	4.76	3.54	0.00	4.43
13.00	4.91	3.69	0.00	3.99
13.50	5.05	3.82	0.00	3.59
14.00	5.17	3.93	0.00	3.22
14.50	5.28	4.04	0.00	2.89
15.00	5.38	4.14	0.00	2.63
15.50	5.48	4.24	0.00	2.41
16.00	5.58	4.33	0.00	2.22
16.50	5.68	4.42	0.00	2.07
17.00	5.77	4.51	0.00	1.94
17.50	5.86	4.60	0.00	1.82
18.00	5.95	4.68	0.00	1.72
18.50	6.03	4.76	0.00	1.63
19.00	6.11	4.84	0.00	1.55
19.50	6.18	4.91	0.00	1.48
20.00	6.25	4.98	0.00	1.41
20.50	6.32	5.05	0.00	1.34
21.00	6.39	5.11	0.00	1.28
21.50	6.45	5.17	0.00	1.21
22.00	6.51	5.23	0.00	1.15
22.50	6.56	5.28	0.00	1.10
23.00	6.62	5.33	0.00	1.04
23.50	6.66	5.38	0.00	0.98
24.00	**6.71**	**5.43**	0.00	0.93

Summary for Subcatchment 2S: Area 1B (Existing West)

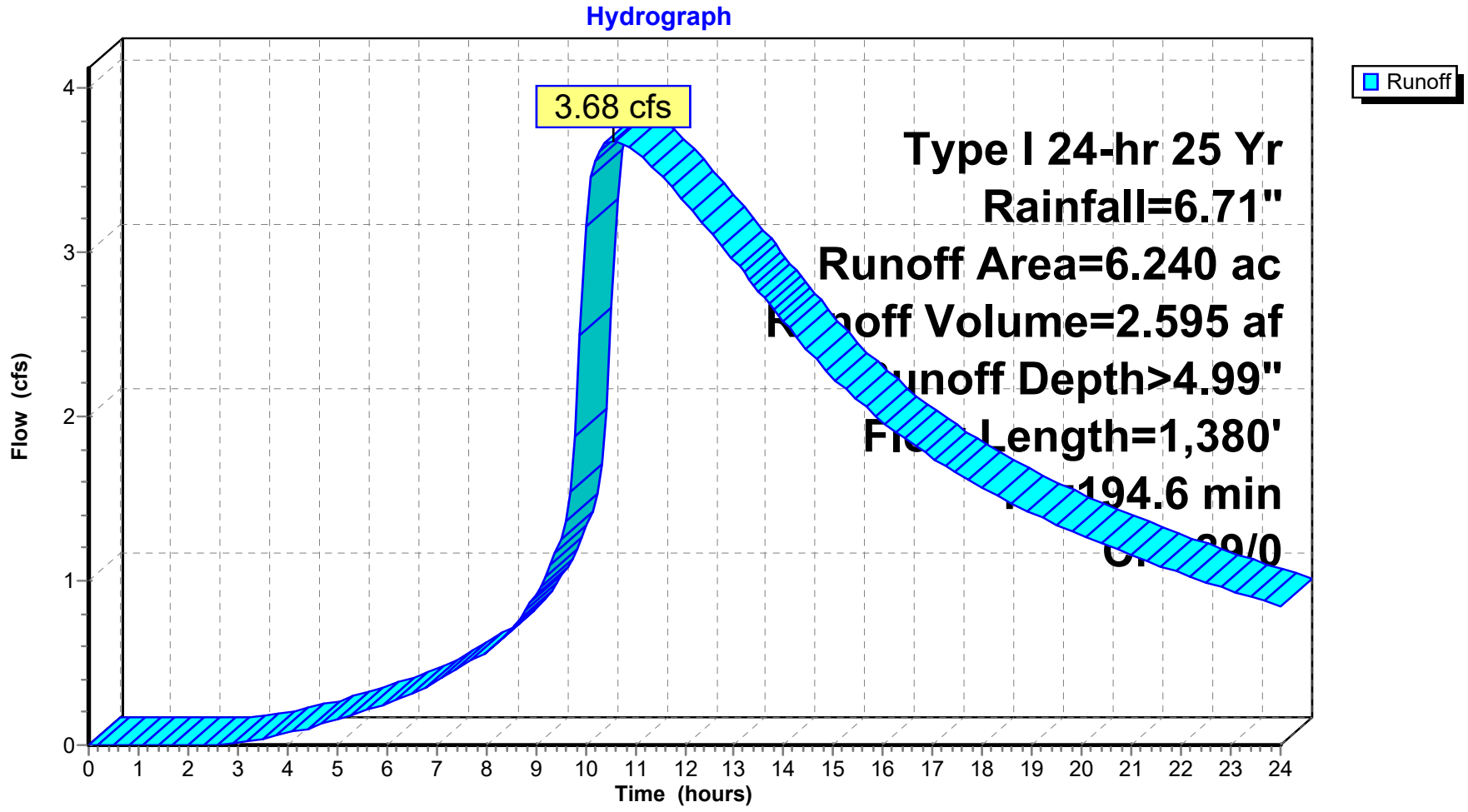
Runoff = 3.68 cfs @ 10.57 hrs, Volume= 2.595 af, Depth> 4.99"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 25 Yr Rainfall=6.71"

Area (ac)	CN	Description
6.240	89	<50% Grass cover, Poor, HSG D
6.240	89	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.1	300	0.2400	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
31.3	300	0.0700	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
55.2	300	0.0170	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
68.2	300	0.0100	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
20.8	180	0.0700	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
194.6	1,380	Total			

Subcatchment 2S: Area 1B (Existing West)



Hydrograph for Subcatchment 2S: Area 1B (Existing West)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	**0.00**	0.00
0.50	0.06	0.00	0.00	0.00
1.00	0.12	0.00	0.00	0.00
1.50	0.18	0.00	0.00	0.00
2.00	0.23	0.00	0.00	0.00
2.50	0.30	0.00	0.00	0.00
3.00	0.36	0.01	0.00	0.02
3.50	0.43	0.02	0.00	0.04
4.00	0.51	0.05	0.00	0.07
4.50	0.59	0.07	0.00	0.11
5.00	0.67	0.11	0.00	0.15
5.50	0.75	0.15	0.00	0.20
6.00	0.84	0.19	0.00	0.25
6.50	0.93	0.25	0.00	0.31
7.00	1.05	0.31	0.00	0.39
7.50	1.17	0.40	0.00	0.48
8.00	1.30	0.49	0.00	0.57
8.50	1.47	0.61	0.00	0.70
9.00	1.70	0.79	0.00	0.92
9.50	2.03	1.06	0.00	1.25
10.00	3.46	2.32	0.00	3.15
10.50	3.91	2.74	0.00	**3.68**
11.00	4.18	2.99	0.00	**3.62**
11.50	4.40	3.20	0.00	3.48
12.00	4.59	3.38	0.00	3.31
12.50	4.76	3.54	0.00	3.13
13.00	4.91	3.69	0.00	2.95
13.50	5.05	3.82	0.00	2.76
14.00	5.17	3.93	0.00	2.58
14.50	5.28	4.04	0.00	2.40
15.00	5.38	4.14	0.00	2.24
15.50	5.48	4.24	0.00	2.10
16.00	5.58	4.33	0.00	1.97
16.50	5.68	4.42	0.00	1.85
17.00	5.77	4.51	0.00	1.75
17.50	5.86	4.60	0.00	1.65
18.00	5.95	4.68	0.00	1.57
18.50	6.03	4.76	0.00	1.49
19.00	6.11	4.84	0.00	1.41
19.50	6.18	4.91	0.00	1.34
20.00	6.25	4.98	0.00	1.28
20.50	6.32	5.05	0.00	1.22
21.00	6.39	5.11	0.00	1.16
21.50	6.45	5.17	0.00	1.10
22.00	6.51	5.23	0.00	1.05
22.50	6.56	5.28	0.00	0.99
23.00	6.62	5.33	0.00	0.94
23.50	6.66	5.38	0.00	0.89
24.00	**6.71**	**5.43**	0.00	0.85

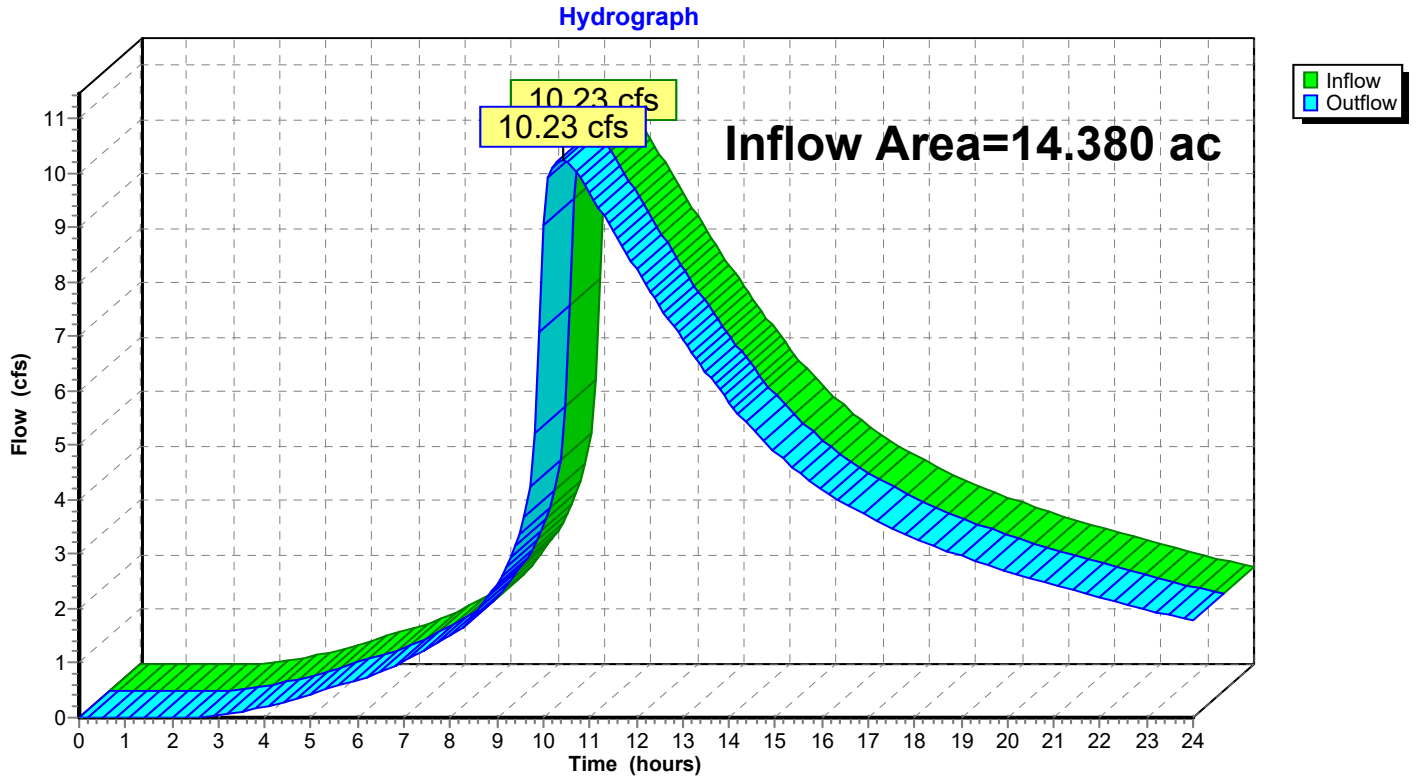
Summary for Reach 3R: Street (Cathedral Oaks Rd)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 14.380 ac, 0.00% Impervious, Inflow Depth > 5.11" for 25 Yr event
Inflow = 10.23 cfs @ 10.41 hrs, Volume= 6.121 af
Outflow = 10.23 cfs @ 10.41 hrs, Volume= 6.121 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Reach 3R: Street (Cathedral Oaks Rd)



Hydrograph for Reach 3R: Street (Cathedral Oaks Rd)

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00
0.50	0.00		0.00
1.00	0.00		0.00
1.50	0.00		0.00
2.00	0.00		0.00
2.50	0.01		0.01
3.00	0.05		0.05
3.50	0.11		0.11
4.00	0.20		0.20
4.50	0.31		0.31
5.00	0.43		0.43
5.50	0.56		0.56
6.00	0.69		0.69
6.50	0.84		0.84
7.00	1.04		1.04
7.50	1.28		1.28
8.00	1.52		1.52
8.50	1.86		1.86
9.00	2.46		2.46
9.50	3.38		3.38
10.00	**9.03**		**9.03**
10.50	**10.20**		**10.20**
11.00	9.65		9.65
11.50	8.94		8.94
12.00	8.24		8.24
12.50	7.56		7.56
13.00	6.94		6.94
13.50	6.35		6.35
14.00	5.80		5.80
14.50	5.29		5.29
15.00	4.86		4.86
15.50	4.50		4.50
16.00	4.19		4.19
16.50	3.92		3.92
17.00	3.69		3.69
17.50	3.48		3.48
18.00	3.29		3.29
18.50	3.12		3.12
19.00	2.96		2.96
19.50	2.82		2.82
20.00	2.68		2.68
20.50	2.55		2.55
21.00	2.43		2.43
21.50	2.31		2.31
22.00	2.20		2.20
22.50	2.09		2.09
23.00	1.98		1.98
23.50	1.88		1.88
24.00	1.77		1.77

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Area 1A (Existing East) Runoff Area=8.140 ac 0.00% Impervious Runoff Depth>6.00"
Flow Length=1,200' Tc=121.6 min CN=89/0 Runoff=7.60 cfs 4.068 af

Subcatchment 2S: Area 1B (Existing West) Runoff Area=6.240 ac 0.00% Impervious Runoff Depth>5.76"
Flow Length=1,380' Tc=194.6 min CN=89/0 Runoff=4.26 cfs 2.997 af

Reach 3R: Street (Cathedral Oaks Rd) Inflow=11.82 cfs 7.065 af
Outflow=11.82 cfs 7.065 af

Total Runoff Area = 14.380 ac Runoff Volume = 7.065 af Average Runoff Depth = 5.90"
100.00% Pervious = 14.380 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Area 1A (Existing East)

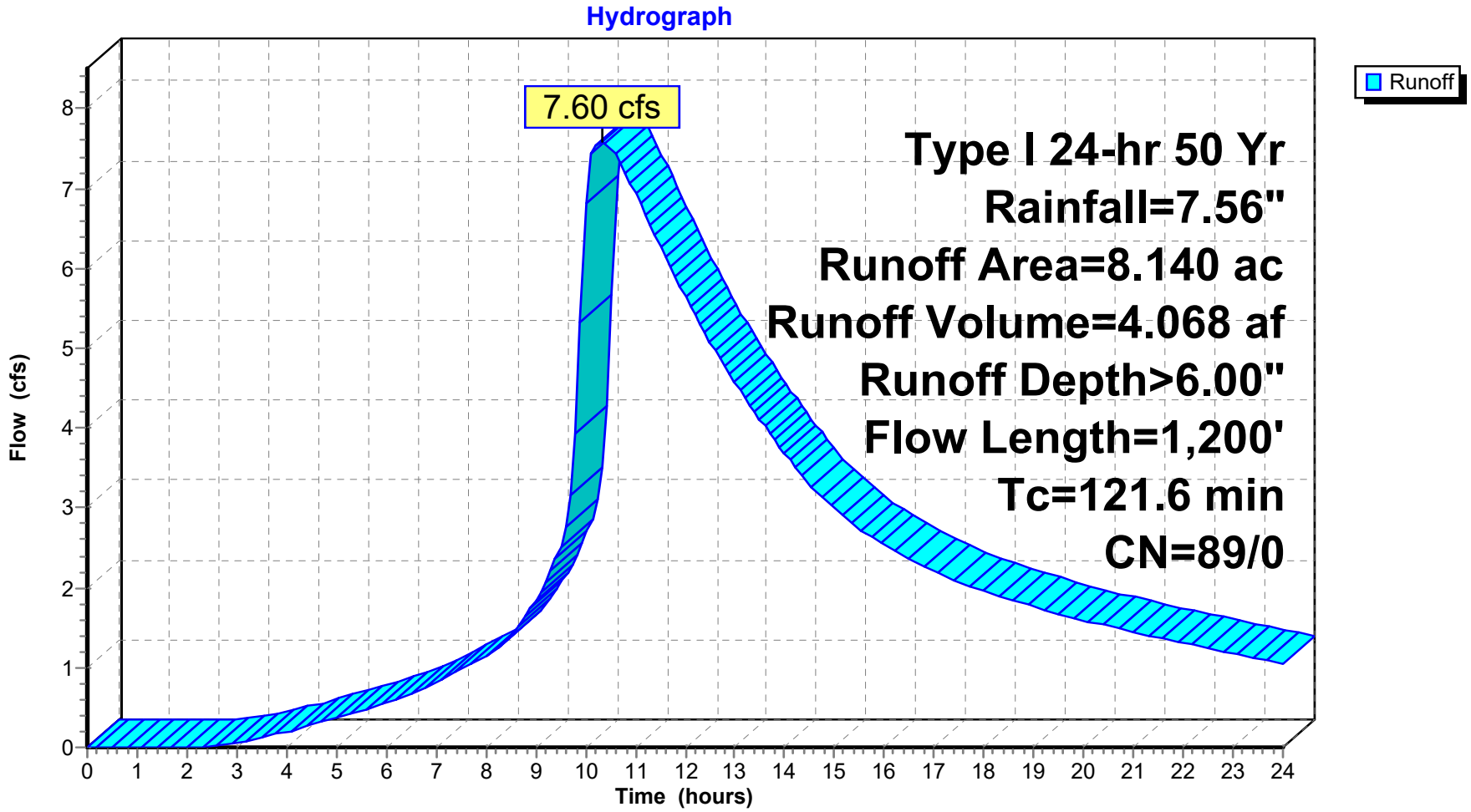
Runoff = 7.60 cfs @ 10.34 hrs, Volume= 4.068 af, Depth> 6.00"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 50 Yr Rainfall=7.56"

Area (ac)	CN	Description
8.140	89	<50% Grass cover, Poor, HSG D
8.140	89	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.1	300	0.2400	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
28.3	300	0.0900	0.18		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
39.2	300	0.0400	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
35.0	300	0.0530	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
121.6	1,200	Total			

Subcatchment 1S: Area 1A (Existing East)



Hydrograph for Subcatchment 1S: Area 1A (Existing East)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	**0.00**	0.00
0.50	0.07	0.00	0.00	0.00
1.00	0.13	0.00	0.00	0.00
1.50	0.20	0.00	0.00	0.00
2.00	0.26	0.00	0.00	0.00
2.50	0.33	0.01	0.00	0.02
3.00	0.41	0.02	0.00	0.06
3.50	0.49	0.04	0.00	0.12
4.00	0.57	0.07	0.00	0.19
4.50	0.66	0.11	0.00	0.28
5.00	0.76	0.15	0.00	0.37
5.50	0.85	0.20	0.00	0.47
6.00	0.95	0.25	0.00	0.56
6.50	1.05	0.32	0.00	0.67
7.00	1.18	0.40	0.00	0.82
7.50	1.32	0.50	0.00	0.98
8.00	1.47	0.61	0.00	1.15
8.50	1.66	0.75	0.00	1.40
9.00	1.92	0.96	0.00	1.84
9.50	2.29	1.27	0.00	2.52
10.00	3.89	2.72	0.00	**6.82**
10.50	4.41	3.21	0.00	**7.53**
11.00	4.71	3.49	0.00	6.94
11.50	4.96	3.73	0.00	6.28
12.00	5.17	3.94	0.00	5.65
12.50	5.36	4.12	0.00	5.08
13.00	5.53	4.28	0.00	4.57
13.50	5.69	4.43	0.00	4.11
14.00	5.82	4.56	0.00	3.68
14.50	5.94	4.68	0.00	3.30
15.00	6.06	4.80	0.00	3.00
15.50	6.18	4.91	0.00	2.74
16.00	6.29	5.02	0.00	2.53
16.50	6.40	5.12	0.00	2.36
17.00	6.50	5.22	0.00	2.20
17.50	6.60	5.32	0.00	2.07
18.00	6.70	5.41	0.00	1.96
18.50	6.79	5.50	0.00	1.85
19.00	6.88	5.59	0.00	1.76
19.50	6.96	5.67	0.00	1.67
20.00	7.05	5.75	0.00	1.59
20.50	7.12	5.83	0.00	1.52
21.00	7.20	5.90	0.00	1.45
21.50	7.27	5.97	0.00	1.38
22.00	7.33	6.03	0.00	1.31
22.50	7.40	6.09	0.00	1.24
23.00	7.45	6.15	0.00	1.18
23.50	7.51	6.21	0.00	1.11
24.00	**7.56**	**6.26**	0.00	1.05

Summary for Subcatchment 2S: Area 1B (Existing West)

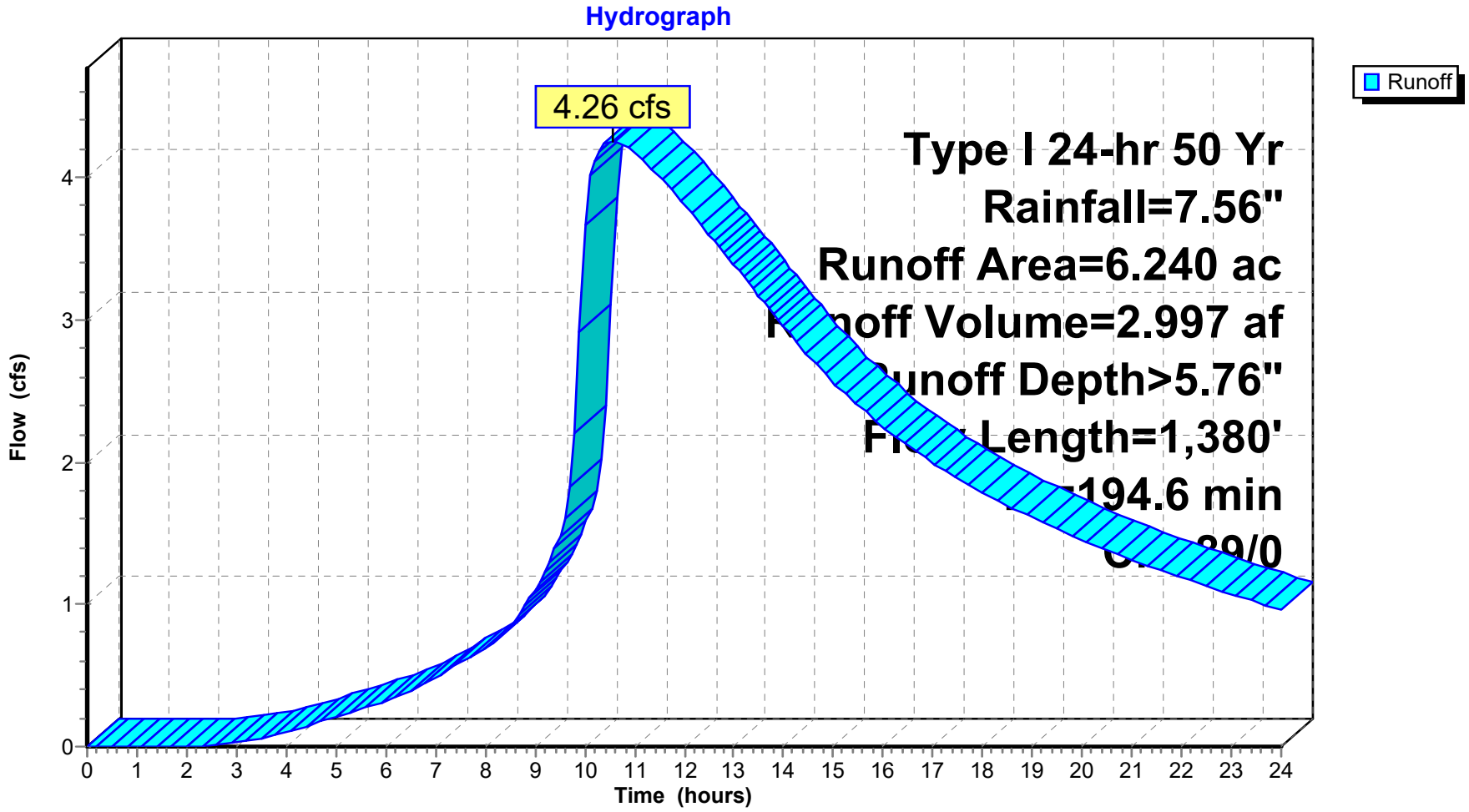
Runoff = 4.26 cfs @ 10.55 hrs, Volume= 2.997 af, Depth> 5.76"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 50 Yr Rainfall=7.56"

Area (ac)	CN	Description
6.240	89	<50% Grass cover, Poor, HSG D
6.240	89	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.1	300	0.2400	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
31.3	300	0.0700	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
55.2	300	0.0170	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
68.2	300	0.0100	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
20.8	180	0.0700	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
194.6	1,380	Total			

Subcatchment 2S: Area 1B (Existing West)



Hydrograph for Subcatchment 2S: Area 1B (Existing West)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	**0.00**	0.00
0.50	0.07	0.00	0.00	0.00
1.00	0.13	0.00	0.00	0.00
1.50	0.20	0.00	0.00	0.00
2.00	0.26	0.00	0.00	0.00
2.50	0.33	0.01	0.00	0.01
3.00	0.41	0.02	0.00	0.03
3.50	0.49	0.04	0.00	0.06
4.00	0.57	0.07	0.00	0.10
4.50	0.66	0.11	0.00	0.15
5.00	0.76	0.15	0.00	0.21
5.50	0.85	0.20	0.00	0.27
6.00	0.95	0.25	0.00	0.32
6.50	1.05	0.32	0.00	0.39
7.00	1.18	0.40	0.00	0.48
7.50	1.32	0.50	0.00	0.59
8.00	1.47	0.61	0.00	0.70
8.50	1.66	0.75	0.00	0.85
9.00	1.92	0.96	0.00	1.10
9.50	2.29	1.27	0.00	1.48
10.00	3.89	2.72	0.00	3.67
10.50	4.41	3.21	0.00	**4.26**
11.00	4.71	3.49	0.00	4.18
11.50	4.96	3.73	0.00	4.01
12.00	5.17	3.94	0.00	3.81
12.50	5.36	4.12	0.00	3.60
13.00	5.53	4.28	0.00	3.39
13.50	5.69	4.43	0.00	3.17
14.00	5.82	4.56	0.00	2.96
14.50	5.94	4.68	0.00	2.75
15.00	6.06	4.80	0.00	2.56
15.50	6.18	4.91	0.00	2.40
16.00	6.29	5.02	0.00	2.25
16.50	6.40	5.12	0.00	2.12
17.00	6.50	5.22	0.00	2.00
17.50	6.60	5.32	0.00	1.89
18.00	6.70	5.41	0.00	1.79
18.50	6.79	5.50	0.00	1.70
19.00	6.88	5.59	0.00	1.61
19.50	6.96	5.67	0.00	1.53
20.00	7.05	5.75	0.00	1.45
20.50	7.12	5.83	0.00	1.38
21.00	7.20	5.90	0.00	1.32
21.50	7.27	5.97	0.00	1.25
22.00	7.33	6.03	0.00	1.19
22.50	7.40	6.09	0.00	1.13
23.00	7.45	6.15	0.00	1.07
23.50	7.51	6.21	0.00	1.02
24.00	**7.56**	**6.26**	0.00	0.96

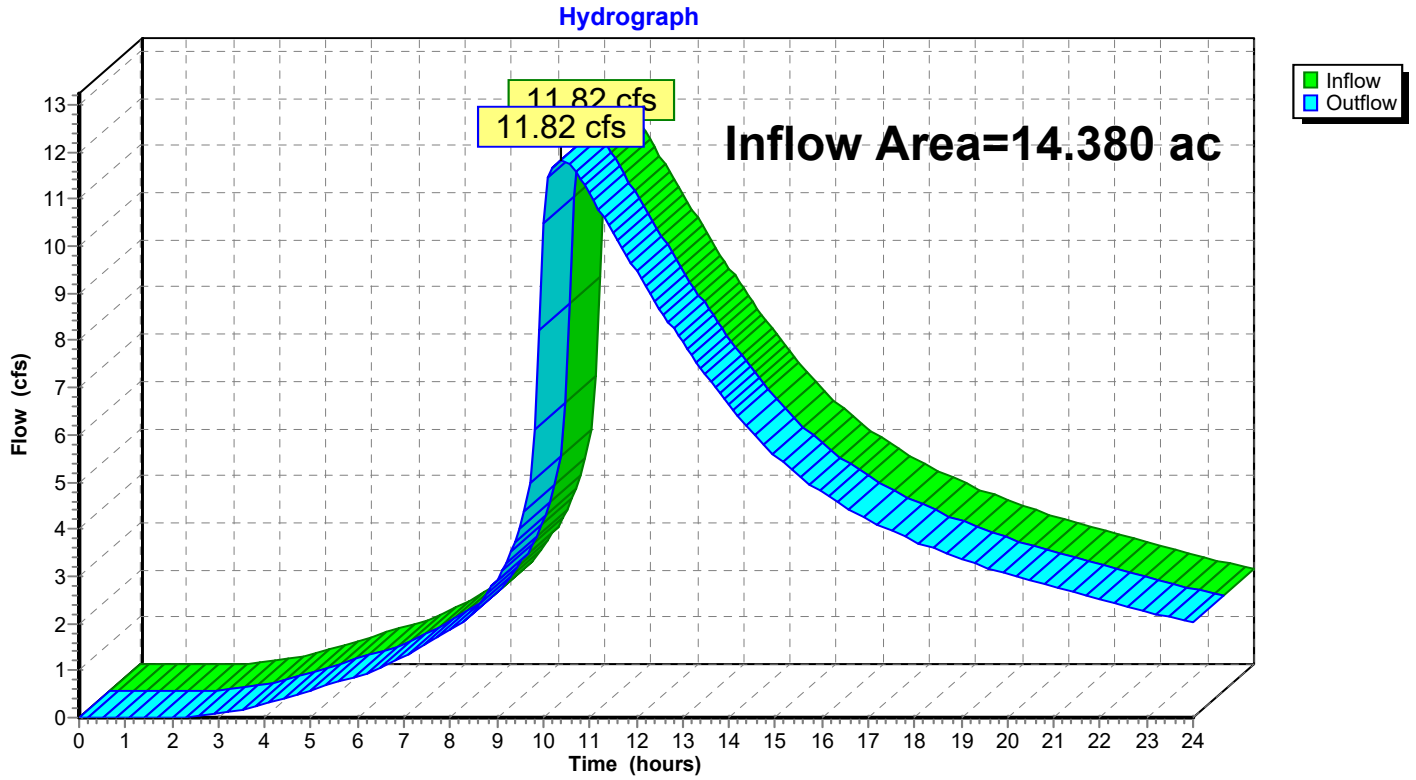
Summary for Reach 3R: Street (Cathedral Oaks Rd)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 14.380 ac, 0.00% Impervious, Inflow Depth > 5.90" for 50 Yr event
Inflow = 11.82 cfs @ 10.40 hrs, Volume= 7.065 af
Outflow = 11.82 cfs @ 10.40 hrs, Volume= 7.065 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Reach 3R: Street (Cathedral Oaks Rd)



Hydrograph for Reach 3R: Street (Cathedral Oaks Rd)

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00
0.50	0.00		0.00
1.00	0.00		0.00
1.50	0.00		0.00
2.00	0.00		0.00
2.50	0.03		0.03
3.00	0.09		0.09
3.50	0.18		0.18
4.00	0.30		0.30
4.50	0.43		0.43
5.00	0.58		0.58
5.50	0.73		0.73
6.00	0.88		0.88
6.50	1.06		1.06
7.00	1.30		1.30
7.50	1.57		1.57
8.00	1.85		1.85
8.50	2.25		2.25
9.00	2.93		2.93
9.50	4.00		4.00
10.00	**10.48**		**10.48**
10.50	**11.79**		**11.79**
11.00	11.13		11.13
11.50	10.29		10.29
12.00	9.47		9.47
12.50	8.68		8.68
13.00	7.96		7.96
13.50	7.28		7.28
14.00	6.63		6.63
14.50	6.05		6.05
15.00	5.56		5.56
15.50	5.14		5.14
16.00	4.78		4.78
16.50	4.47		4.47
17.00	4.20		4.20
17.50	3.96		3.96
18.00	3.75		3.75
18.50	3.55		3.55
19.00	3.37		3.37
19.50	3.20		3.20
20.00	3.05		3.05
20.50	2.90		2.90
21.00	2.76		2.76
21.50	2.63		2.63
22.00	2.50		2.50
22.50	2.37		2.37
23.00	2.25		2.25
23.50	2.13		2.13
24.00	2.01		2.01

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Area 1A (Existing East) Runoff Area=8.140 ac 0.00% Impervious Runoff Depth>6.77"
Flow Length=1,200' Tc=121.6 min CN=89/0 Runoff=8.58 cfs 4.594 af

Subcatchment 2S: Area 1B (Existing West) Runoff Area=6.240 ac 0.00% Impervious Runoff Depth>6.51"
Flow Length=1,380' Tc=194.6 min CN=89/0 Runoff=4.82 cfs 3.386 af

Reach 3R: Street (Cathedral Oaks Rd) Inflow=13.36 cfs 7.980 af
Outflow=13.36 cfs 7.980 af

Total Runoff Area = 14.380 ac Runoff Volume = 7.980 af Average Runoff Depth = 6.66"
100.00% Pervious = 14.380 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Area 1A (Existing East)

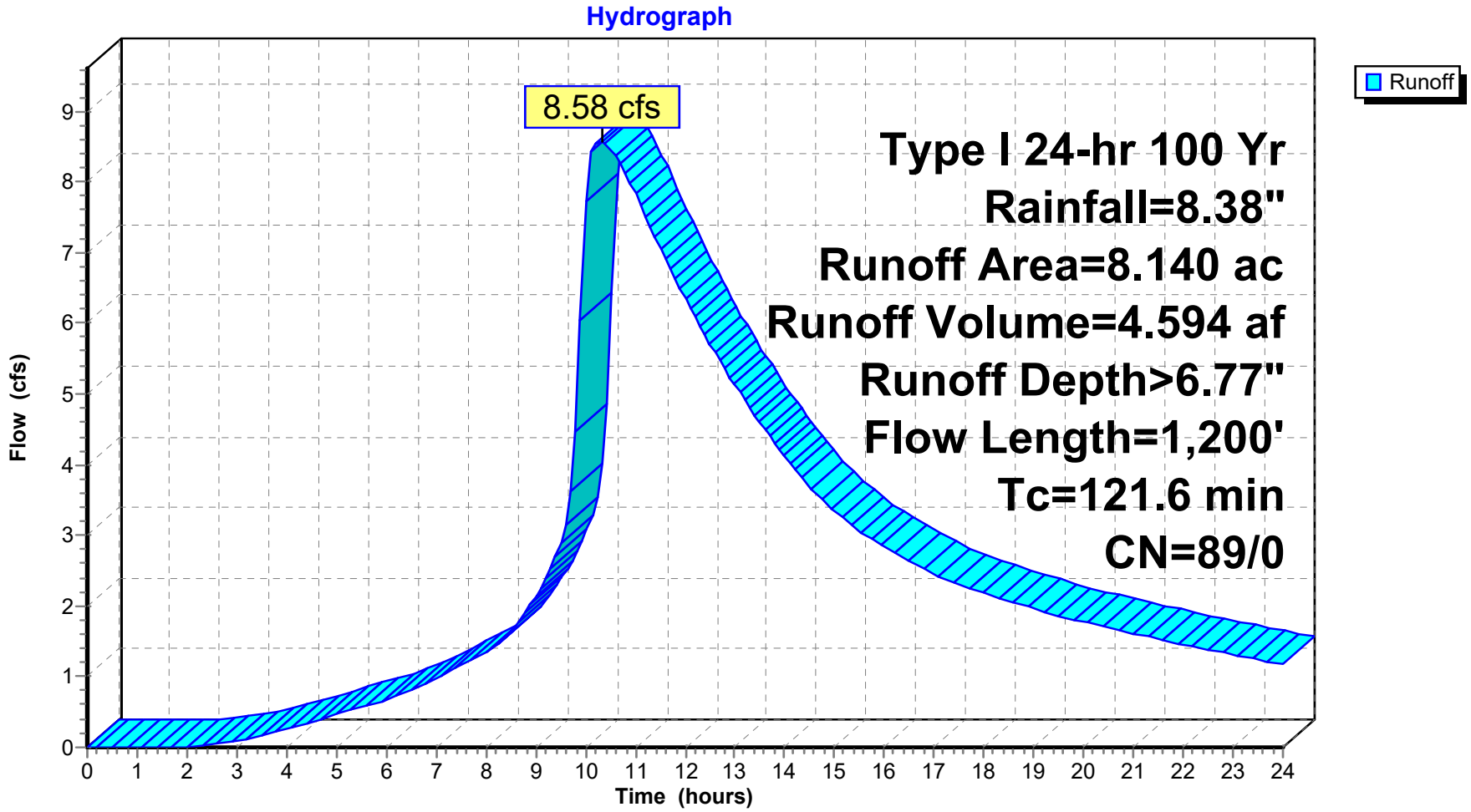
Runoff = 8.58 cfs @ 10.33 hrs, Volume= 4.594 af, Depth> 6.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 100 Yr Rainfall=8.38"

Area (ac)	CN	Description
8.140	89	<50% Grass cover, Poor, HSG D
8.140	89	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.1	300	0.2400	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
28.3	300	0.0900	0.18		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
39.2	300	0.0400	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
35.0	300	0.0530	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
121.6	1,200	Total			

Subcatchment 1S: Area 1A (Existing East)



Hydrograph for Subcatchment 1S: Area 1A (Existing East)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	**0.00**	0.00
0.50	0.07	0.00	0.00	0.00
1.00	0.15	0.00	0.00	0.00
1.50	0.22	0.00	0.00	0.00
2.00	0.29	0.00	0.00	0.00
2.50	0.37	0.01	0.00	0.04
3.00	0.45	0.03	0.00	0.09
3.50	0.54	0.06	0.00	0.17
4.00	0.64	0.09	0.00	0.26
4.50	0.74	0.14	0.00	0.36
5.00	0.84	0.19	0.00	0.47
5.50	0.94	0.25	0.00	0.58
6.00	1.05	0.31	0.00	0.68
6.50	1.17	0.39	0.00	0.80
7.00	1.31	0.49	0.00	0.97
7.50	1.46	0.60	0.00	1.16
8.00	1.63	0.73	0.00	1.35
8.50	1.84	0.89	0.00	1.63
9.00	2.13	1.14	0.00	2.12
9.50	2.54	1.49	0.00	2.89
10.00	4.32	3.12	0.00	**7.72**
10.50	4.89	3.66	0.00	**8.50**
11.00	5.22	3.98	0.00	7.83
11.50	5.49	4.25	0.00	7.07
12.00	5.73	4.48	0.00	6.36
12.50	5.94	4.68	0.00	5.71
13.00	6.13	4.87	0.00	5.13
13.50	6.30	5.03	0.00	4.60
14.00	6.45	5.17	0.00	4.12
14.50	6.59	5.31	0.00	3.70
15.00	6.72	5.44	0.00	3.35
15.50	6.85	5.56	0.00	3.07
16.00	6.97	5.68	0.00	2.83
16.50	7.09	5.80	0.00	2.63
17.00	7.21	5.91	0.00	2.46
17.50	7.32	6.02	0.00	2.31
18.00	7.42	6.12	0.00	2.18
18.50	7.53	6.22	0.00	2.07
19.00	7.63	6.32	0.00	1.96
19.50	7.72	6.41	0.00	1.87
20.00	7.81	6.50	0.00	1.78
20.50	7.90	6.58	0.00	1.69
21.00	7.98	6.66	0.00	1.61
21.50	8.06	6.74	0.00	1.53
22.00	8.13	6.81	0.00	1.46
22.50	8.20	6.88	0.00	1.38
23.00	8.26	6.94	0.00	1.31
23.50	8.32	7.00	0.00	1.24
24.00	**8.38**	**7.06**	0.00	1.17

Summary for Subcatchment 2S: Area 1B (Existing West)

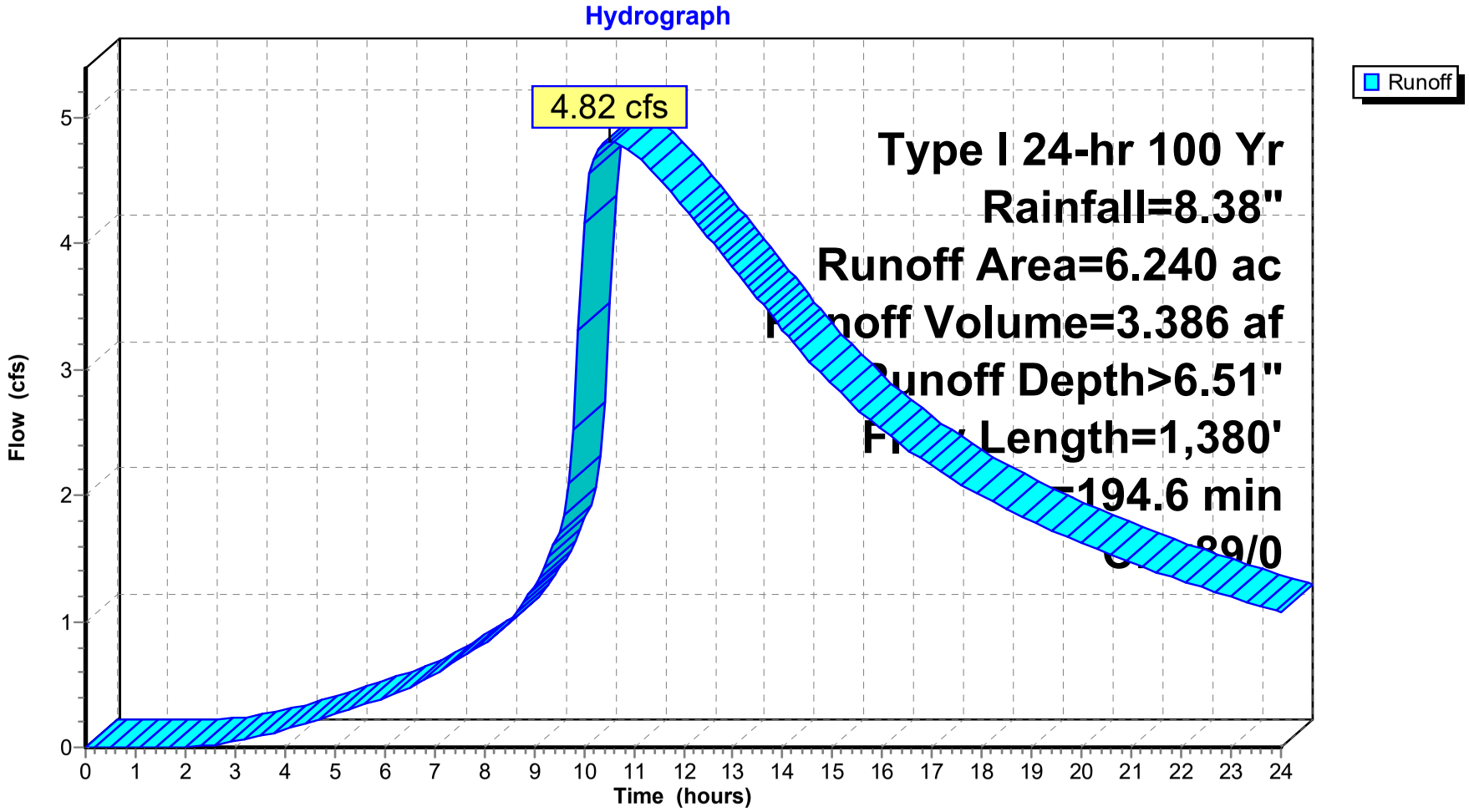
Runoff = 4.82 cfs @ 10.54 hrs, Volume= 3.386 af, Depth> 6.51"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 100 Yr Rainfall=8.38"

Area (ac)	CN	Description
6.240	89	<50% Grass cover, Poor, HSG D
6.240	89	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.1	300	0.2400	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
31.3	300	0.0700	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
55.2	300	0.0170	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
68.2	300	0.0100	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
20.8	180	0.0700	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
194.6	1,380	Total			

Subcatchment 2S: Area 1B (Existing West)



Hydrograph for Subcatchment 2S: Area 1B (Existing West)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	**0.00**	0.00
0.50	0.07	0.00	0.00	0.00
1.00	0.15	0.00	0.00	0.00
1.50	0.22	0.00	0.00	0.00
2.00	0.29	0.00	0.00	0.00
2.50	0.37	0.01	0.00	0.02
3.00	0.45	0.03	0.00	0.05
3.50	0.54	0.06	0.00	0.09
4.00	0.64	0.09	0.00	0.14
4.50	0.74	0.14	0.00	0.20
5.00	0.84	0.19	0.00	0.26
5.50	0.94	0.25	0.00	0.33
6.00	1.05	0.31	0.00	0.40
6.50	1.17	0.39	0.00	0.48
7.00	1.31	0.49	0.00	0.58
7.50	1.46	0.60	0.00	0.70
8.00	1.63	0.73	0.00	0.82
8.50	1.84	0.89	0.00	0.99
9.00	2.13	1.14	0.00	1.27
9.50	2.54	1.49	0.00	1.71
10.00	4.32	3.12	0.00	4.16
10.50	4.89	3.66	0.00	**4.82**
11.00	5.22	3.98	0.00	4.72
11.50	5.49	4.25	0.00	4.53
12.00	5.73	4.48	0.00	4.30
12.50	5.94	4.68	0.00	4.06
13.00	6.13	4.87	0.00	3.81
13.50	6.30	5.03	0.00	3.57
14.00	6.45	5.17	0.00	3.32
14.50	6.59	5.31	0.00	3.08
15.00	6.72	5.44	0.00	2.88
15.50	6.85	5.56	0.00	2.69
16.00	6.97	5.68	0.00	2.52
16.50	7.09	5.80	0.00	2.37
17.00	7.21	5.91	0.00	2.24
17.50	7.32	6.02	0.00	2.11
18.00	7.42	6.12	0.00	2.00
18.50	7.53	6.22	0.00	1.89
19.00	7.63	6.32	0.00	1.80
19.50	7.72	6.41	0.00	1.71
20.00	7.81	6.50	0.00	1.62
20.50	7.90	6.58	0.00	1.54
21.00	7.98	6.66	0.00	1.47
21.50	8.06	6.74	0.00	1.40
22.00	8.13	6.81	0.00	1.33
22.50	8.20	6.88	0.00	1.26
23.00	8.26	6.94	0.00	1.19
23.50	8.32	7.00	0.00	1.13
24.00	**8.38**	**7.06**	0.00	1.07

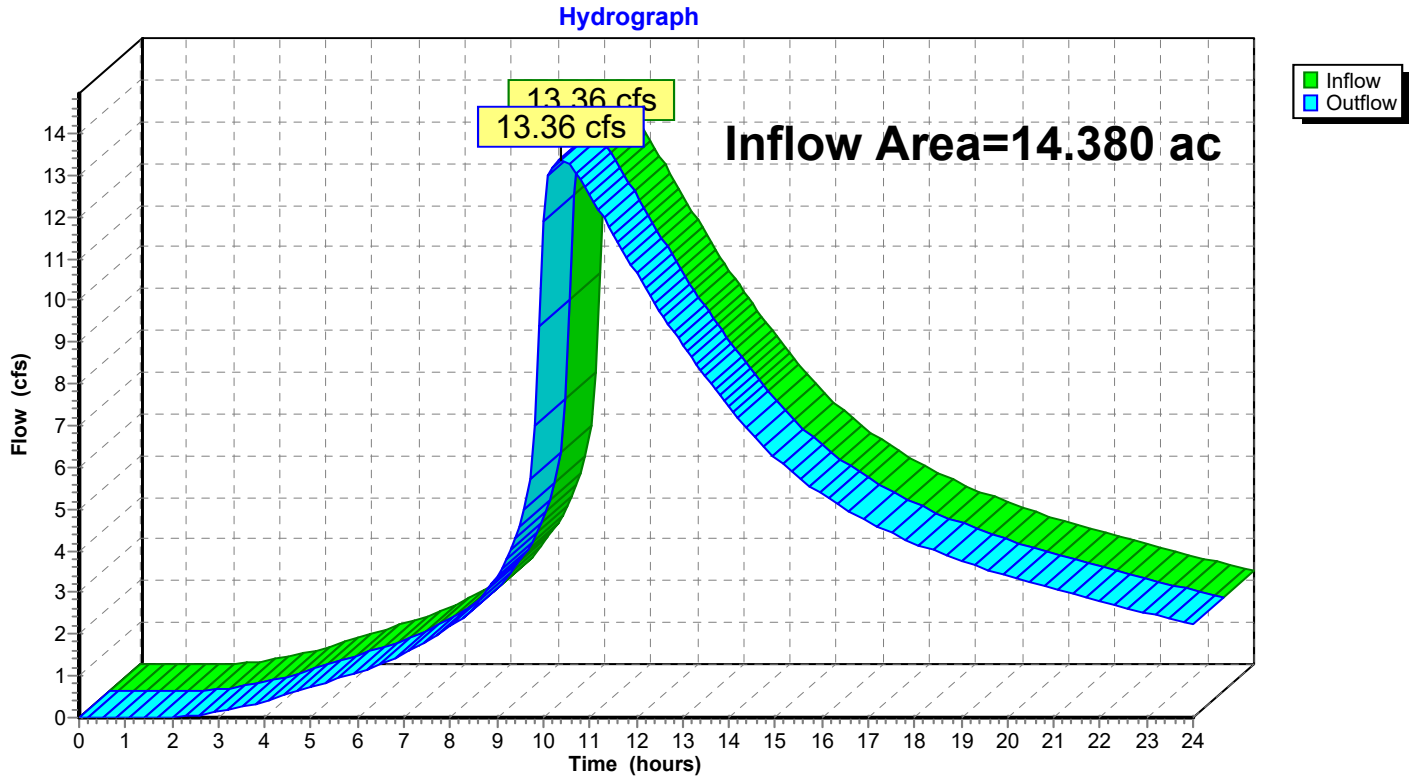
Summary for Reach 3R: Street (Cathedral Oaks Rd)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 14.380 ac, 0.00% Impervious, Inflow Depth > 6.66" for 100 Yr event
Inflow = 13.36 cfs @ 10.39 hrs, Volume= 7.980 af
Outflow = 13.36 cfs @ 10.39 hrs, Volume= 7.980 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

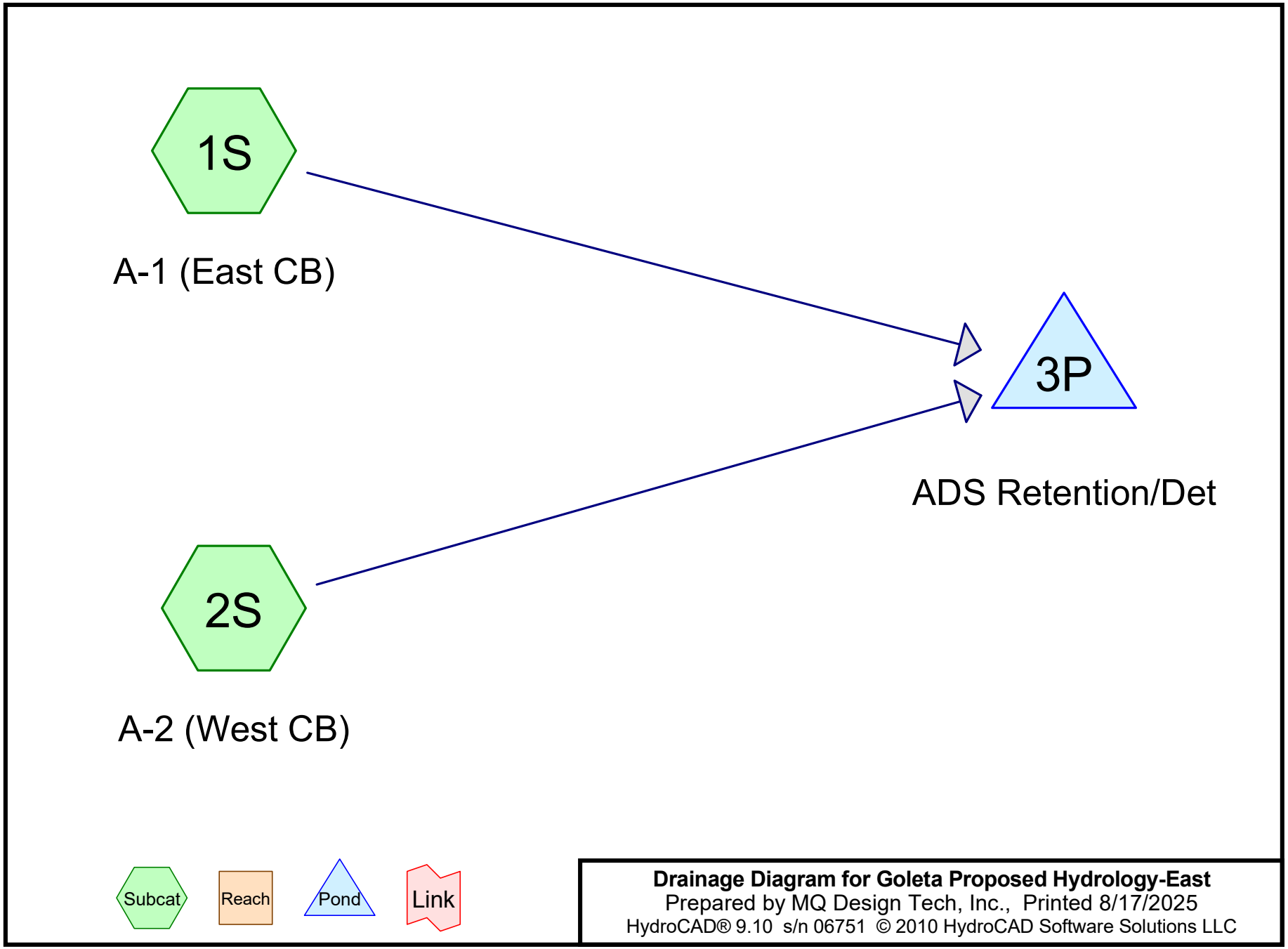
Reach 3R: Street (Cathedral Oaks Rd)



Hydrograph for Reach 3R: Street (Cathedral Oaks Rd)

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	17.50	4.43		4.43
0.50	0.00		0.00	18.00	4.18		4.18
1.00	0.00		0.00	18.50	3.96		3.96
1.50	0.00		0.00	19.00	3.76		3.76
2.00	0.01		0.01	19.50	3.57		3.57
2.50	0.05		0.05	20.00	3.40		3.40
3.00	0.14		0.14	20.50	3.24		3.24
3.50	0.25		0.25	21.00	3.08		3.08
4.00	0.40		0.40	21.50	2.93		2.93
4.50	0.56		0.56	22.00	2.78		2.78
5.00	0.73		0.73	22.50	2.64		2.64
5.50	0.91		0.91	23.00	2.51		2.51
6.00	1.08		1.08	23.50	2.37		2.37
6.50	1.28		1.28	24.00	2.24		2.24
7.00	1.56		1.56				
7.50	1.87		1.87				
8.00	2.17		2.17				
8.50	2.63		2.63				
9.00	3.40		3.40				
9.50	4.59		4.59				
10.00	**11.88**		**11.88**				
10.50	**13.31**		**13.31**				
11.00	12.55		12.55				
11.50	11.59		11.59				
12.00	10.66		10.66				
12.50	9.76		9.76				
13.00	8.94		8.94				
13.50	8.17		8.17				
14.00	7.44		7.44				
14.50	6.78		6.78				
15.00	6.23		6.23				
15.50	5.76		5.76				
16.00	5.35		5.35				
16.50	5.00		5.00				
17.00	4.70		4.70				

Appendix D:
Proposed Hydrology Calculations



Drainage Diagram for Goleta Proposed Hydrology-East
Prepared by MQ Design Tech, Inc., Printed 8/17/2025
HydroCAD® 9.10 s/n 06751 © 2010 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
6.500	87	1/4 acre lots, 38% imp, HSG D (1S, 2S)
6.500		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
6.500	HSG D	1S, 2S
0.000	Other	
6.500		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: A-1 (East CB) Runoff Area=2.800 ac 38.00% Impervious Runoff Depth>1.99"
Flow Length=955' Tc=4.3 min CN=80/98 Runoff=3.72 cfs 0.465 af

Subcatchment 2S: A-2 (West CB) Runoff Area=3.700 ac 38.00% Impervious Runoff Depth>1.99"
Flow Length=935' Tc=4.2 min CN=80/98 Runoff=4.93 cfs 0.615 af

Pond 3P: ADS Retention/Det Peak Elev=150.10' Storage=43 cf Inflow=8.65 cfs 1.080 af
Outflow=8.66 cfs 1.080 af

Total Runoff Area = 6.500 ac Runoff Volume = 1.080 af Average Runoff Depth = 1.99"
62.00% Pervious = 4.030 ac 38.00% Impervious = 2.470 ac

Summary for Subcatchment 1S: A-1 (East CB)

[49] Hint: Tc<2dt may require smaller dt

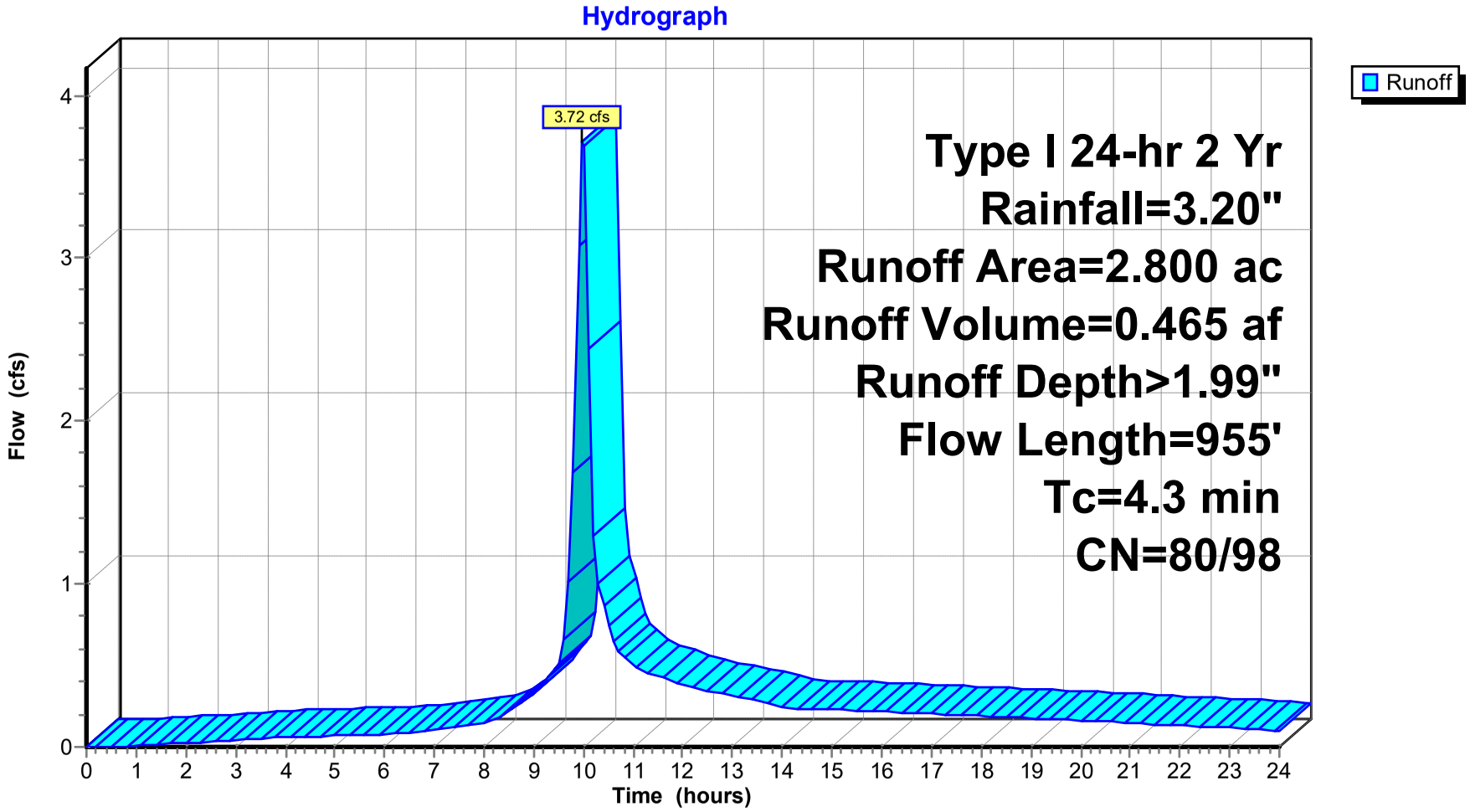
Runoff = 3.72 cfs @ 9.98 hrs, Volume= 0.465 af, Depth> 1.99"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 2 Yr Rainfall=3.20"

Area (ac)	CN	Description
2.800	87	1/4 acre lots, 38% imp, HSG D
1.736	80	62.00% Pervious Area
1.064	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	265	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	160	0.0500	4.54		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.8	315	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	215	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
4.3	955	Total			

Subcatchment 1S: A-1 (East CB)



Hydrograph for Subcatchment 1S: A-1 (East CB)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.03	0.00	0.00	0.00
1.00	0.06	0.00	0.00	0.00
1.50	0.08	0.00	0.01	0.02
2.00	0.11	0.00	0.02	0.03
2.50	0.14	0.00	0.03	0.03
3.00	0.17	0.00	0.05	0.04
3.50	0.21	0.00	0.07	0.05
4.00	0.24	0.00	0.10	0.06
4.50	0.28	0.00	0.13	0.06
5.00	0.32	0.00	0.16	0.07
5.50	0.36	0.00	0.19	0.07
6.00	0.40	0.00	0.23	0.08
6.50	0.45	0.00	0.27	0.09
7.00	0.50	0.00	0.32	0.11
7.50	0.56	0.00	0.37	0.13
8.00	0.62	0.01	0.43	0.14
8.50	0.70	0.01	0.50	0.22
9.00	0.81	0.03	0.61	0.33
9.50	0.97	0.07	0.76	0.52
10.00	1.65	0.36	1.43	**3.69**
10.50	1.87	0.48	1.64	0.75
11.00	1.99	0.56	1.77	0.50
11.50	2.10	0.62	1.87	0.43
12.00	2.19	0.68	1.96	0.38
12.50	2.27	0.73	2.04	0.35
13.00	2.34	0.78	2.11	0.32
13.50	2.41	0.83	2.18	0.28
14.00	2.46	0.86	2.23	0.25
14.50	2.52	0.90	2.29	0.24
15.00	2.57	0.94	2.34	0.23
15.50	2.62	0.97	2.39	0.22
16.00	2.66	1.00	2.43	0.22
16.50	2.71	1.04	2.48	0.21
17.00	2.75	1.07	2.52	0.20
17.50	2.79	1.10	2.56	0.20
18.00	2.84	1.13	2.60	0.19
18.50	2.87	1.16	2.64	0.18
19.00	2.91	1.18	2.68	0.18
19.50	2.95	1.21	2.72	0.17
20.00	2.98	1.24	2.75	0.16
20.50	3.02	1.26	2.78	0.15
21.00	3.05	1.28	2.81	0.15
21.50	3.08	1.31	2.84	0.14
22.00	3.10	1.33	2.87	0.13
22.50	3.13	1.35	2.90	0.12
23.00	3.16	1.37	2.92	0.12
23.50	3.18	1.39	2.95	0.11
24.00	**3.20**	**1.40**	**2.97**	0.10

Summary for Subcatchment 2S: A-2 (West CB)

[49] Hint: Tc<2dt may require smaller dt

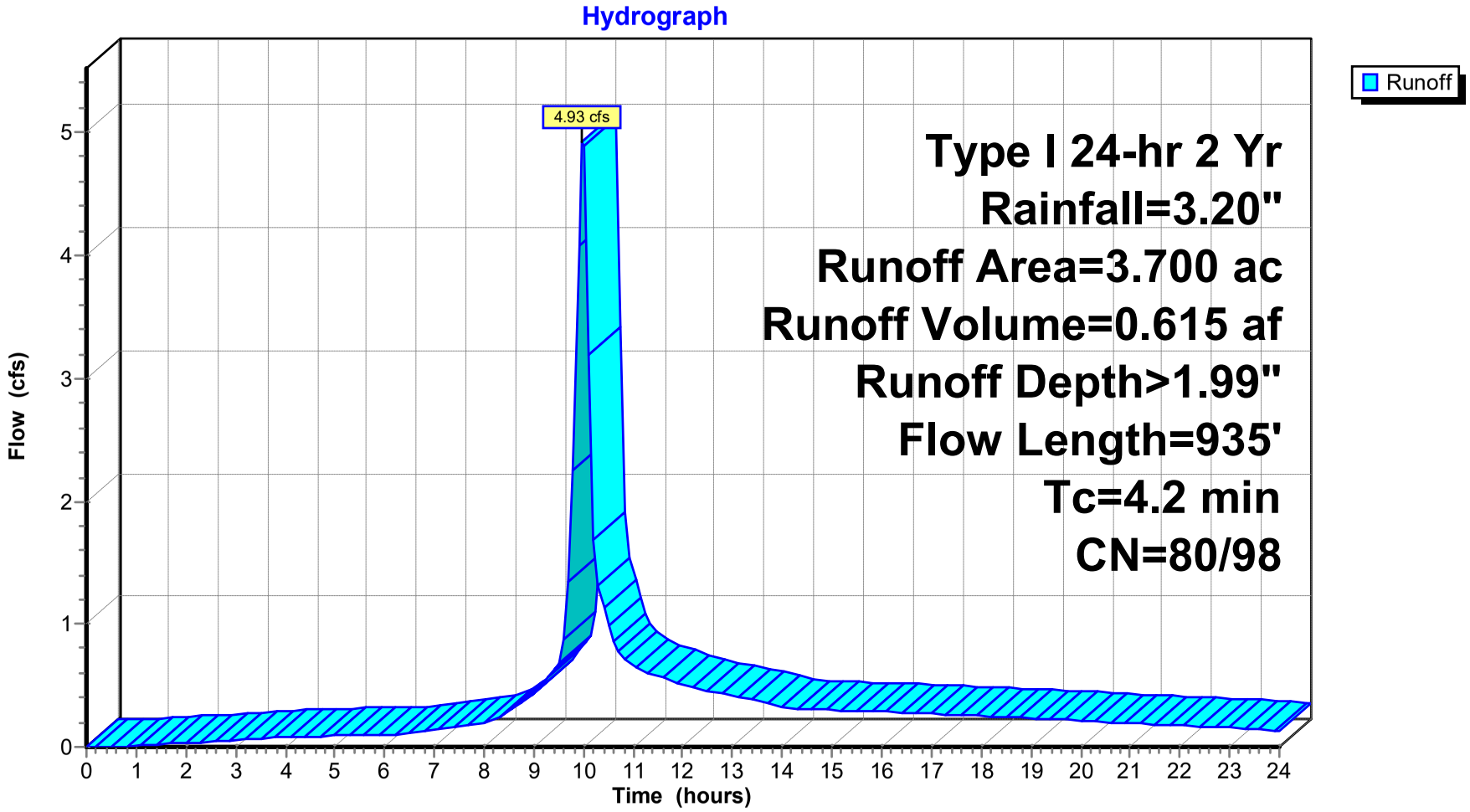
Runoff = 4.93 cfs @ 9.98 hrs, Volume= 0.615 af, Depth> 1.99"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 2 Yr Rainfall=3.20"

Area (ac)	CN	Description
3.700	87	1/4 acre lots, 38% imp, HSG D
2.294	80	62.00% Pervious Area
1.406	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	260	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	155	0.0500	4.54		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.8	310	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	210	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
4.2	935	Total			

Subcatchment 2S: A-2 (West CB)



Hydrograph for Subcatchment 2S: A-2 (West CB)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.03	0.00	0.00	0.00
1.00	0.06	0.00	0.00	0.01
1.50	0.08	0.00	0.01	0.02
2.00	0.11	0.00	0.02	0.03
2.50	0.14	0.00	0.03	0.04
3.00	0.17	0.00	0.05	0.06
3.50	0.21	0.00	0.07	0.07
4.00	0.24	0.00	0.10	0.08
4.50	0.28	0.00	0.13	0.08
5.00	0.32	0.00	0.16	0.09
5.50	0.36	0.00	0.19	0.10
6.00	0.40	0.00	0.23	0.10
6.50	0.45	0.00	0.27	0.12
7.00	0.50	0.00	0.32	0.14
7.50	0.56	0.00	0.37	0.17
8.00	0.62	0.01	0.43	0.19
8.50	0.70	0.01	0.50	0.29
9.00	0.81	0.03	0.61	0.43
9.50	0.97	0.07	0.76	0.69
10.00	1.65	0.36	1.43	**4.89**
10.50	1.87	0.48	1.64	0.98
11.00	1.99	0.56	1.77	0.67
11.50	2.10	0.62	1.87	0.57
12.00	2.19	0.68	1.96	0.51
12.50	2.27	0.73	2.04	0.46
13.00	2.34	0.78	2.11	0.42
13.50	2.41	0.83	2.18	0.37
14.00	2.46	0.86	2.23	0.33
14.50	2.52	0.90	2.29	0.31
15.00	2.57	0.94	2.34	0.30
15.50	2.62	0.97	2.39	0.29
16.00	2.66	1.00	2.43	0.29
16.50	2.71	1.04	2.48	0.28
17.00	2.75	1.07	2.52	0.27
17.50	2.79	1.10	2.56	0.26
18.00	2.84	1.13	2.60	0.25
18.50	2.87	1.16	2.64	0.24
19.00	2.91	1.18	2.68	0.23
19.50	2.95	1.21	2.72	0.22
20.00	2.98	1.24	2.75	0.21
20.50	3.02	1.26	2.78	0.20
21.00	3.05	1.28	2.81	0.19
21.50	3.08	1.31	2.84	0.18
22.00	3.10	1.33	2.87	0.17
22.50	3.13	1.35	2.90	0.16
23.00	3.16	1.37	2.92	0.16
23.50	3.18	1.39	2.95	0.15
24.00	**3.20**	**1.40**	**2.97**	0.14

Summary for Pond 3P: ADS Retention/Det

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow Area = 6.500 ac, 38.00% Impervious, Inflow Depth > 1.99" for 2 Yr event
Inflow = 8.65 cfs @ 9.98 hrs, Volume= 1.080 af
Outflow = 8.66 cfs @ 9.98 hrs, Volume= 1.080 af, Atten= 0%, Lag= 0.1 min
Primary = 8.66 cfs @ 9.98 hrs, Volume= 1.080 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 150.10' @ 9.98 hrs Surf.Area= 907 sf Storage= 43 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (758.1 - 758.0)

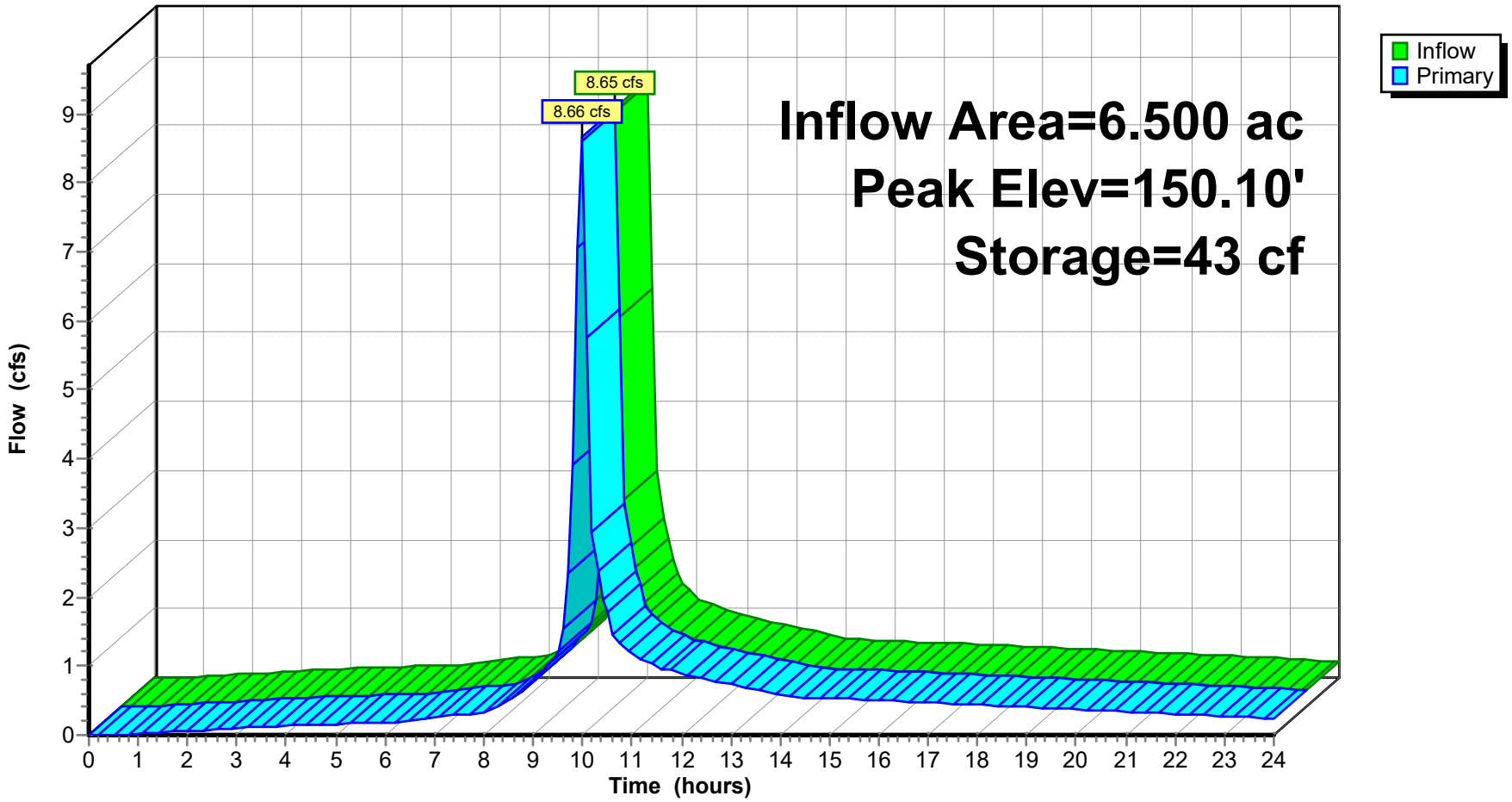
Volume	Invert	Avail.Storage	Storage Description
#1	150.00'	28,025 cf	**228.0"W x 60.0"H x 295.0'L Pipe Storage S= 0.0020 '/'**

Device	Routing	Invert	Outlet Devices
#1	Primary	150.00'	**Special & User-Defined** Head (feet) 0.00 0.10 5.00 Disch. (cfs) 0.000 9.070 9.070

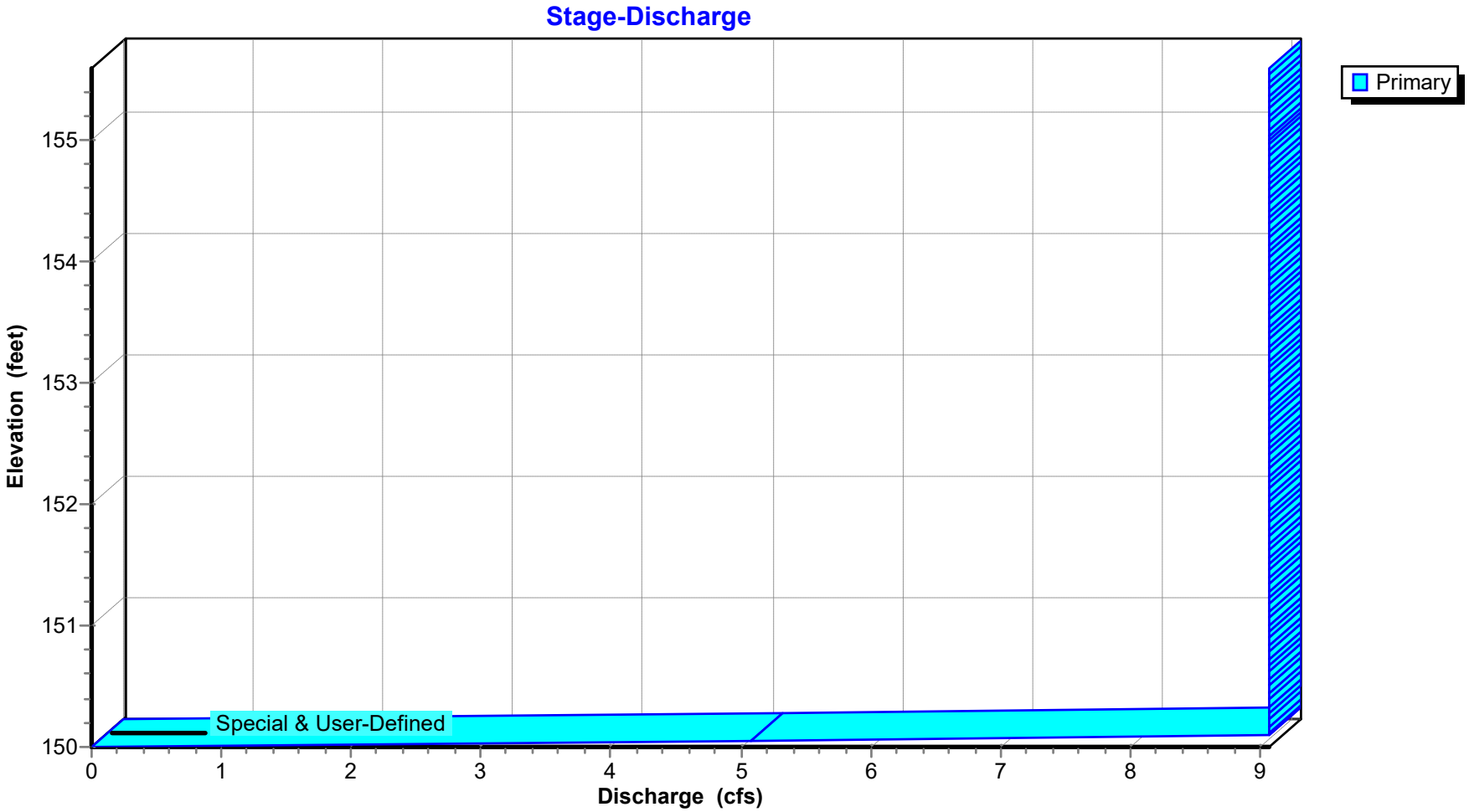
Primary OutFlow Max=8.38 cfs @ 9.98 hrs HW=150.09' (Free Discharge)
1=Special & User-Defined (Custom Controls 8.38 cfs)

Pond 3P: ADS Retention/Det

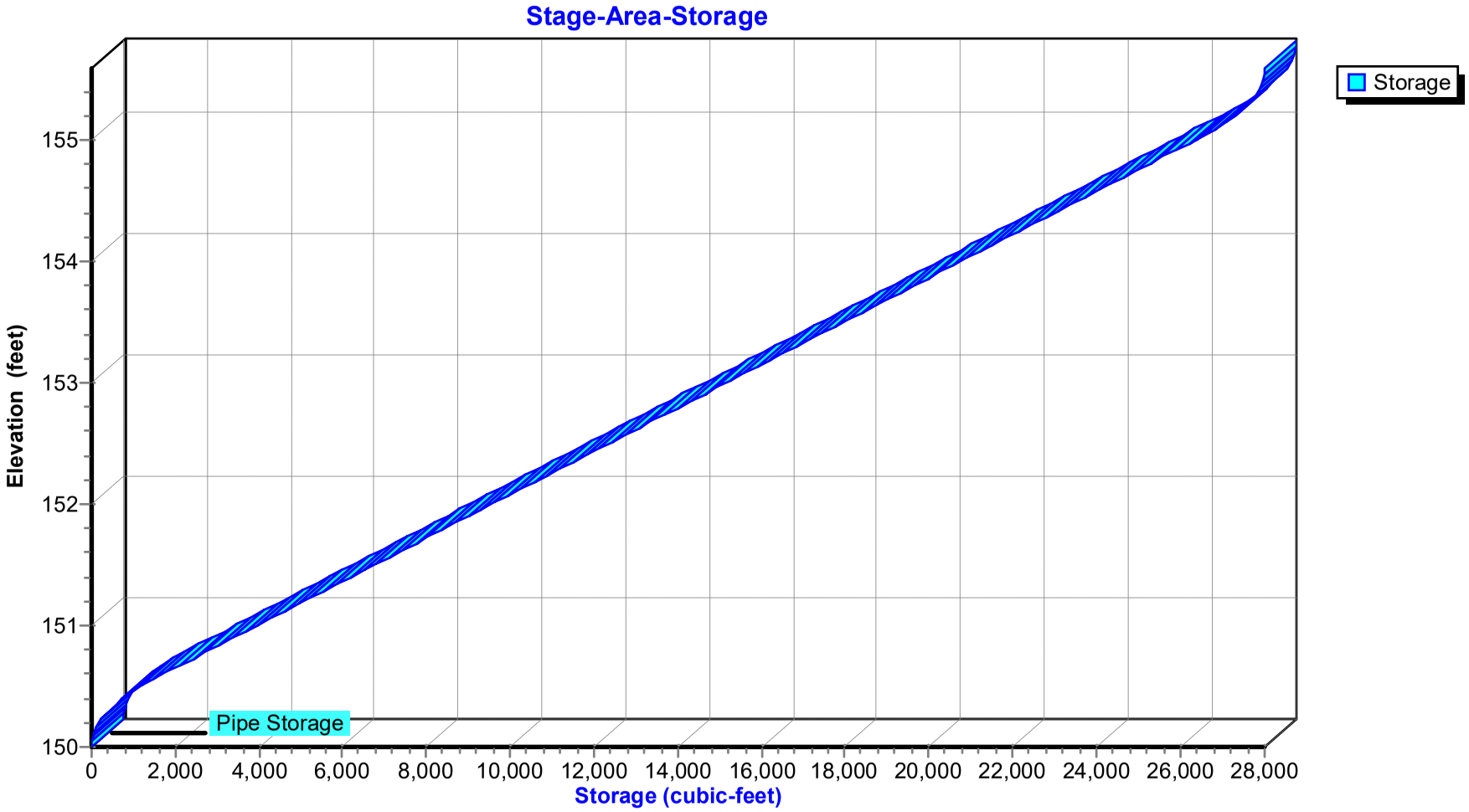
Hydrograph



Pond 3P: ADS Retention/Det



Pond 3P: ADS Retention/Det



Hydrograph for Pond 3P: ADS Retention/Det

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	150.00	0.00
0.50	0.00	0	150.00	0.00
1.00	0.01	0	150.00	0.01
1.50	0.04	0	150.00	0.04
2.00	0.06	0	150.00	0.06
2.50	0.08	0	150.00	0.08
3.00	0.10	0	150.00	0.10
3.50	0.12	0	150.00	0.12
4.00	0.14	0	150.00	0.14
4.50	0.15	0	150.00	0.15
5.00	0.16	0	150.00	0.16
5.50	0.17	0	150.00	0.17
6.00	0.18	1	150.00	0.18
6.50	0.21	1	150.00	0.21
7.00	0.25	1	150.00	0.25
7.50	0.29	1	150.00	0.29
8.00	0.33	1	150.00	0.33
8.50	0.51	1	150.01	0.51
9.00	0.76	2	150.01	0.76
9.50	1.21	4	150.01	1.20
10.00	**8.59**	**44**	**150.09**	**8.61**
10.50	1.73	5	150.02	1.78
11.00	1.17	3	150.01	1.13
11.50	1.01	3	150.01	1.04
12.00	0.89	3	150.01	0.86
12.50	0.81	2	150.01	0.83
13.00	0.73	2	150.01	0.71
13.50	0.66	2	150.01	0.67
14.00	0.58	2	150.01	0.56
14.50	0.55	2	150.01	0.56
15.00	0.53	2	150.01	0.52
15.50	0.52	2	150.01	0.53
16.00	0.50	1	150.01	0.49
16.50	0.49	1	150.01	0.49
17.00	0.47	1	150.01	0.47
17.50	0.46	1	150.01	0.46
18.00	0.44	1	150.00	0.44
18.50	0.42	1	150.00	0.43
19.00	0.41	1	150.00	0.41
19.50	0.39	1	150.00	0.39
20.00	0.38	1	150.00	0.37
20.50	0.36	1	150.00	0.36
21.00	0.34	1	150.00	0.34
21.50	0.32	1	150.00	0.33
22.00	0.31	1	150.00	0.31
22.50	0.29	1	150.00	0.29
23.00	0.27	1	150.00	0.27
23.50	0.26	1	150.00	0.26
24.00	0.24	1	150.00	0.24

Stage-Discharge for Pond 3P: ADS Retention/Det

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
150.00	0.00	151.40	9.07	152.80	9.07	154.20	9.07
150.04	3.63	151.44	9.07	152.84	9.07	154.24	9.07
150.08	7.26	151.48	9.07	152.88	9.07	154.28	9.07
150.12	**9.07**	151.52	9.07	152.92	9.07	154.32	9.07
150.16	9.07	151.56	9.07	152.96	9.07	154.36	9.07
150.20	9.07	151.60	9.07	153.00	9.07	154.40	9.07
150.24	9.07	151.64	9.07	153.04	9.07	154.44	9.07
150.28	9.07	151.68	9.07	153.08	9.07	154.48	9.07
150.32	9.07	151.72	9.07	153.12	9.07	154.52	9.07
150.36	9.07	151.76	9.07	153.16	9.07	154.56	9.07
150.40	9.07	151.80	9.07	153.20	9.07	154.60	9.07
150.44	9.07	151.84	9.07	153.24	9.07	154.64	9.07
150.48	9.07	151.88	9.07	153.28	9.07	154.68	9.07
150.52	9.07	151.92	9.07	153.32	9.07	154.72	9.07
150.56	9.07	151.96	9.07	153.36	9.07	154.76	9.07
150.60	9.07	152.00	9.07	153.40	9.07	154.80	9.07
150.64	9.07	152.04	9.07	153.44	9.07	154.84	9.07
150.68	9.07	152.08	9.07	153.48	9.07	154.88	9.07
150.72	9.07	152.12	9.07	153.52	9.07	154.92	9.07
150.76	9.07	152.16	9.07	153.56	9.07	154.96	9.07
150.80	9.07	152.20	9.07	153.60	9.07	155.00	9.07
150.84	9.07	152.24	9.07	153.64	9.07	155.04	9.07
150.88	9.07	152.28	9.07	153.68	9.07	155.08	9.07
150.92	9.07	152.32	9.07	153.72	9.07	155.12	9.07
150.96	9.07	152.36	9.07	153.76	9.07	155.16	9.07
151.00	9.07	152.40	9.07	153.80	9.07	155.20	9.07
151.04	9.07	152.44	9.07	153.84	9.07	155.24	9.07
151.08	9.07	152.48	9.07	153.88	9.07	155.28	9.07
151.12	9.07	152.52	9.07	153.92	9.07	155.32	9.07
151.16	9.07	152.56	9.07	153.96	9.07	155.36	9.07
151.20	9.07	152.60	9.07	154.00	9.07	155.40	9.07
151.24	9.07	152.64	9.07	154.04	9.07	155.44	9.07
151.28	9.07	152.68	9.07	154.08	9.07	155.48	9.07
151.32	9.07	152.72	9.07	154.12	9.07	155.52	9.07
151.36	9.07	152.76	9.07	154.16	9.07	155.56	9.07

Stage-Area-Storage for Pond 3P: ADS Retention/Det

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
150.00	0	151.40	6,194	152.80	14,041	154.20	21,888
150.04	8	151.44	6,418	152.84	14,265	154.24	22,112
150.08	30	151.48	6,642	152.88	14,489	154.28	22,336
150.12	68	151.52	6,866	152.92	14,713	154.32	22,560
150.16	122	151.56	7,090	152.96	14,937	154.36	22,784
150.20	190	151.60	7,315	153.00	15,162	154.40	23,009
150.24	274	151.64	7,539	153.04	15,386	154.44	23,233
150.28	372	151.68	7,763	153.08	15,610	154.48	23,457
150.32	486	151.72	7,987	153.12	15,834	154.52	23,681
150.36	616	151.76	8,211	153.16	16,058	154.56	23,905
150.40	760	151.80	8,436	153.20	16,283	154.60	24,130
150.44	920	151.84	8,660	153.24	16,507	154.64	24,354
150.48	1,094	151.88	8,884	153.28	16,731	154.68	24,578
150.52	1,284	151.92	9,108	153.32	16,955	154.72	24,802
150.56	1,490	151.96	9,332	153.36	17,179	154.76	25,026
150.60	1,710	152.00	9,557	153.40	17,404	154.80	25,251
150.64	1,934	152.04	9,781	153.44	17,628	154.84	25,475
150.68	2,158	152.08	10,005	153.48	17,852	154.88	25,699
150.72	2,382	152.12	10,229	153.52	18,076	154.92	25,923
150.76	2,606	152.16	10,453	153.56	18,300	154.96	26,147
150.80	2,831	152.20	10,678	153.60	18,525	155.00	26,372
150.84	3,055	152.24	10,902	153.64	18,749	155.04	26,588
150.88	3,279	152.28	11,126	153.68	18,973	155.08	26,790
150.92	3,503	152.32	11,350	153.72	19,197	155.12	26,976
150.96	3,727	152.36	11,574	153.76	19,421	155.16	27,147
151.00	3,952	152.40	11,799	153.80	19,646	155.20	27,303
151.04	4,176	152.44	12,023	153.84	19,870	155.24	27,443
151.08	4,400	152.48	12,247	153.88	20,094	155.28	27,569
151.12	4,624	152.52	12,471	153.92	20,318	155.32	27,679
151.16	4,848	152.56	12,695	153.96	20,542	155.36	27,774
151.20	5,073	152.60	12,920	154.00	20,767	155.40	27,854
151.24	5,297	152.64	13,144	154.04	20,991	155.44	27,918
151.28	5,521	152.68	13,368	154.08	21,215	155.48	27,968
151.32	5,745	152.72	13,592	154.12	21,439	155.52	28,002
151.36	5,969	152.76	13,816	154.16	21,663	155.56	**28,021**

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: A-1 (East CB) Runoff Area=2.800 ac 38.00% Impervious Runoff Depth>3.24"
Flow Length=955' Tc=4.3 min CN=80/98 Runoff=6.16 cfs 0.757 af

Subcatchment 2S: A-2 (West CB) Runoff Area=3.700 ac 38.00% Impervious Runoff Depth>3.24"
Flow Length=935' Tc=4.2 min CN=80/98 Runoff=8.17 cfs 1.000 af

Pond 3P: ADS Retention/Det Peak Elev=150.82' Storage=2,968 cf Inflow=14.33 cfs 1.756 af
Outflow=9.07 cfs 1.757 af

Total Runoff Area = 6.500 ac Runoff Volume = 1.756 af Average Runoff Depth = 3.24"
62.00% Pervious = 4.030 ac 38.00% Impervious = 2.470 ac

Summary for Subcatchment 1S: A-1 (East CB)

[49] Hint: Tc<2dt may require smaller dt

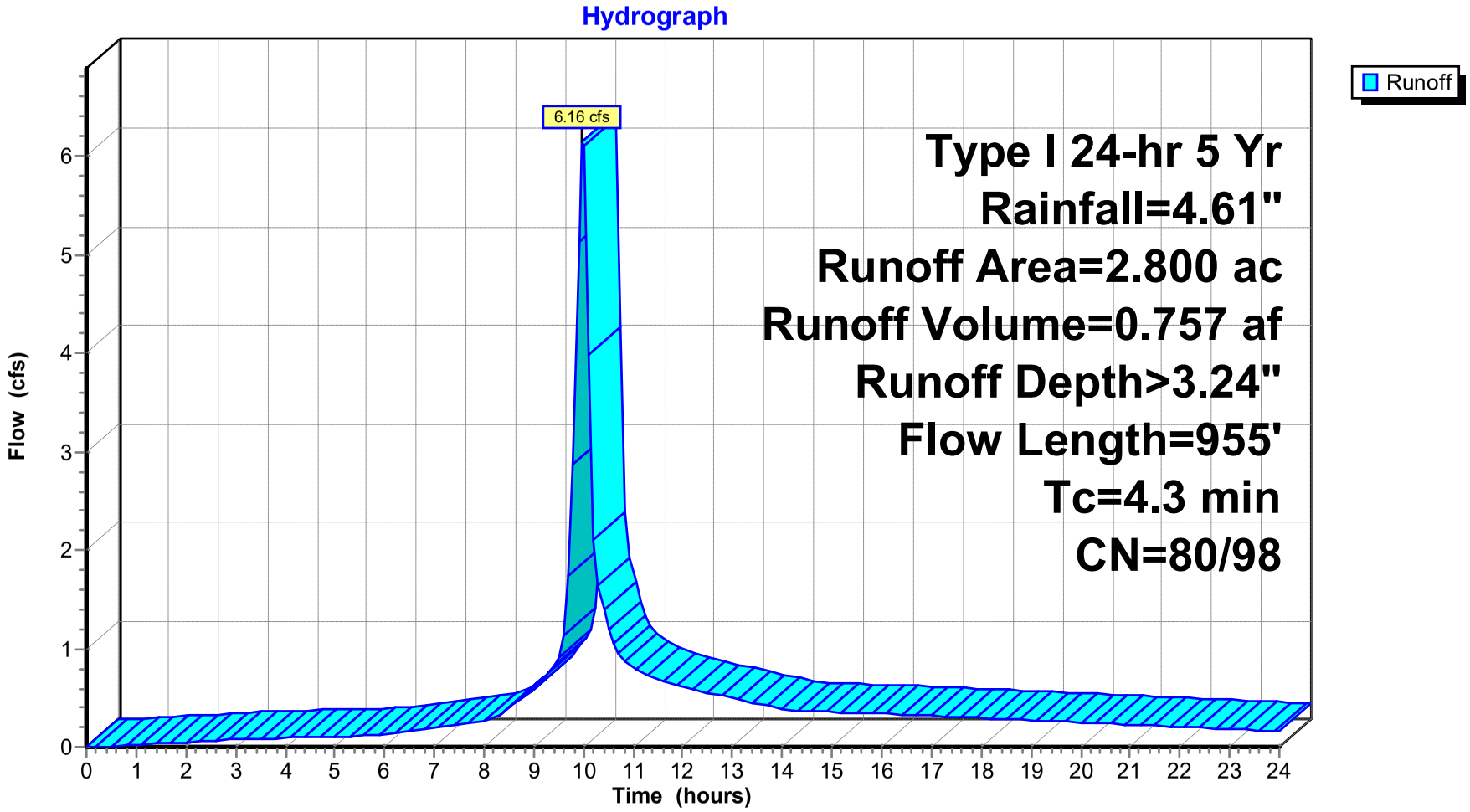
Runoff = 6.16 cfs @ 9.98 hrs, Volume= 0.757 af, Depth> 3.24"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 5 Yr Rainfall=4.61"

Area (ac)	CN	Description
2.800	87	1/4 acre lots, 38% imp, HSG D
1.736	80	62.00% Pervious Area
1.064	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	265	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	160	0.0500	4.54		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.8	315	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	215	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
4.3	955	Total			

Subcatchment 1S: A-1 (East CB)



Hydrograph for Subcatchment 1S: A-1 (East CB)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.04	0.00	0.00	0.00
1.00	0.08	0.00	0.01	0.02
1.50	0.12	0.00	0.02	0.04
2.00	0.16	0.00	0.04	0.05
2.50	0.20	0.00	0.07	0.06
3.00	0.25	0.00	0.11	0.07
3.50	0.30	0.00	0.14	0.08
4.00	0.35	0.00	0.19	0.10
4.50	0.40	0.00	0.23	0.10
5.00	0.46	0.00	0.28	0.11
5.50	0.52	0.00	0.33	0.11
6.00	0.58	0.00	0.39	0.13
6.50	0.64	0.01	0.45	0.16
7.00	0.72	0.02	0.52	0.20
7.50	0.80	0.03	0.60	0.24
8.00	0.89	0.05	0.69	0.26
8.50	1.01	0.09	0.80	0.40
9.00	1.17	0.14	0.96	0.58
9.50	1.40	0.24	1.18	0.90
10.00	2.37	0.80	2.15	**6.10**
10.50	2.69	1.02	2.46	1.20
11.00	2.87	1.15	2.64	0.81
11.50	3.02	1.27	2.79	0.69
12.00	3.15	1.37	2.92	0.61
12.50	3.27	1.46	3.04	0.55
13.00	3.37	1.54	3.14	0.50
13.50	3.47	1.61	3.23	0.44
14.00	3.55	1.68	3.32	0.39
14.50	3.62	1.74	3.39	0.37
15.00	3.70	1.79	3.46	0.36
15.50	3.77	1.85	3.53	0.35
16.00	3.84	1.91	3.60	0.34
16.50	3.90	1.96	3.67	0.33
17.00	3.96	2.01	3.73	0.32
17.50	4.03	2.06	3.79	0.30
18.00	4.08	2.11	3.85	0.29
18.50	4.14	2.16	3.91	0.28
19.00	4.20	2.20	3.96	0.27
19.50	4.25	2.25	4.01	0.26
20.00	4.30	2.29	4.06	0.25
20.50	4.34	2.33	4.11	0.24
21.00	4.39	2.37	4.15	0.23
21.50	4.43	2.40	4.20	0.21
22.00	4.47	2.44	4.24	0.20
22.50	4.51	2.47	4.27	0.19
23.00	4.55	2.50	4.31	0.18
23.50	4.58	2.53	4.34	0.17
24.00	**4.61**	**2.56**	**4.37**	0.16

Summary for Subcatchment 2S: A-2 (West CB)

[49] Hint: Tc<2dt may require smaller dt

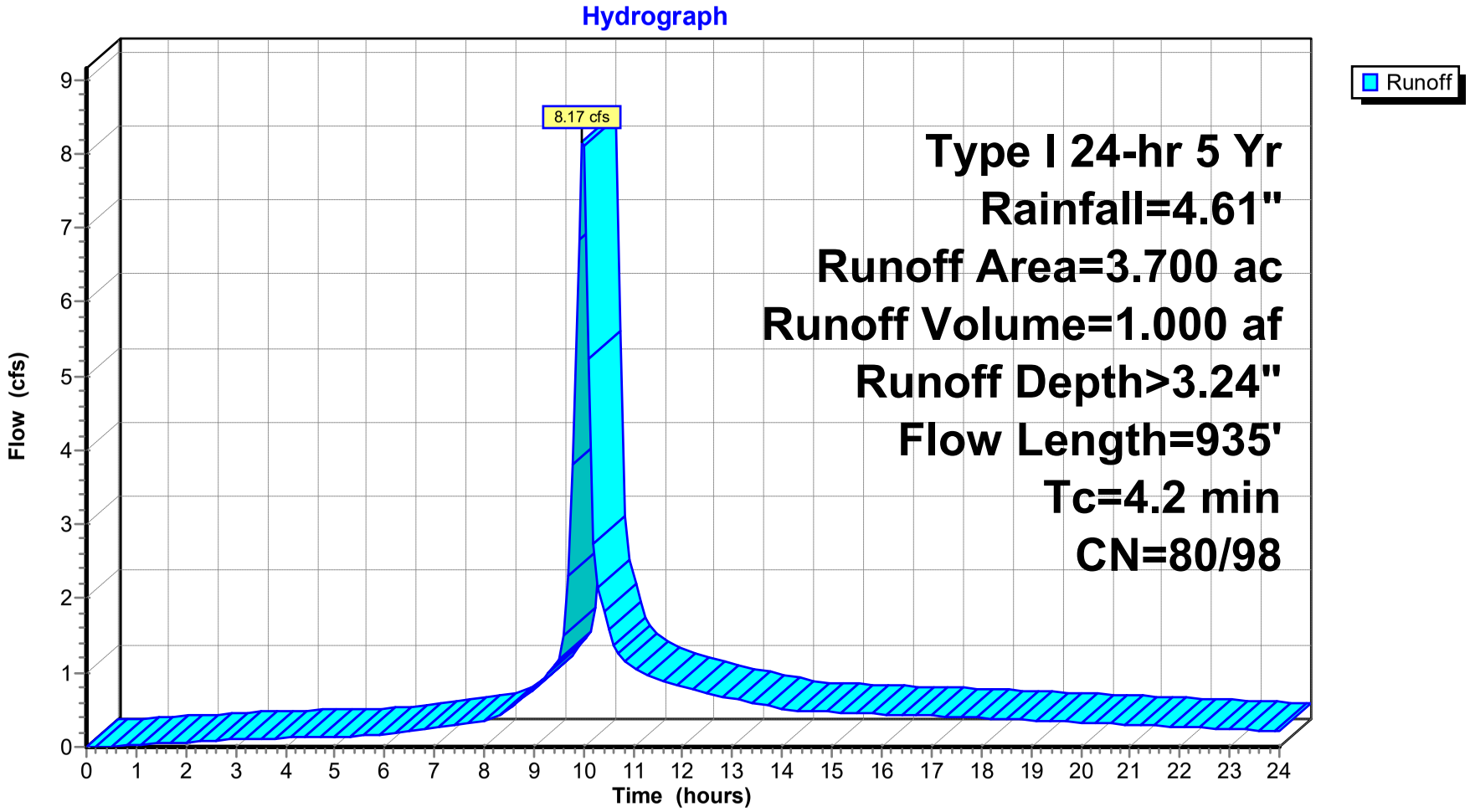
Runoff = 8.17 cfs @ 9.98 hrs, Volume= 1.000 af, Depth> 3.24"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 5 Yr Rainfall=4.61"

Area (ac)	CN	Description
3.700	87	1/4 acre lots, 38% imp, HSG D
2.294	80	62.00% Pervious Area
1.406	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	260	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	155	0.0500	4.54		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.8	310	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	210	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
4.2	935	Total			

Subcatchment 2S: A-2 (West CB)



Hydrograph for Subcatchment 2S: A-2 (West CB)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.04	0.00	0.00	0.00
1.00	0.08	0.00	0.01	0.03
1.50	0.12	0.00	0.02	0.05
2.00	0.16	0.00	0.04	0.07
2.50	0.20	0.00	0.07	0.08
3.00	0.25	0.00	0.11	0.10
3.50	0.30	0.00	0.14	0.11
4.00	0.35	0.00	0.19	0.13
4.50	0.40	0.00	0.23	0.13
5.00	0.46	0.00	0.28	0.14
5.50	0.52	0.00	0.33	0.15
6.00	0.58	0.00	0.39	0.17
6.50	0.64	0.01	0.45	0.21
7.00	0.72	0.02	0.52	0.27
7.50	0.80	0.03	0.60	0.31
8.00	0.89	0.05	0.69	0.35
8.50	1.01	0.09	0.80	0.53
9.00	1.17	0.14	0.96	0.77
9.50	1.40	0.24	1.18	1.19
10.00	2.37	0.80	2.15	**8.09**
10.50	2.69	1.02	2.46	1.58
11.00	2.87	1.15	2.64	1.06
11.50	3.02	1.27	2.79	0.91
12.00	3.15	1.37	2.92	0.80
12.50	3.27	1.46	3.04	0.73
13.00	3.37	1.54	3.14	0.66
13.50	3.47	1.61	3.23	0.59
14.00	3.55	1.68	3.32	0.51
14.50	3.62	1.74	3.39	0.49
15.00	3.70	1.79	3.46	0.47
15.50	3.77	1.85	3.53	0.46
16.00	3.84	1.91	3.60	0.44
16.50	3.90	1.96	3.67	0.43
17.00	3.96	2.01	3.73	0.42
17.50	4.03	2.06	3.79	0.40
18.00	4.08	2.11	3.85	0.39
18.50	4.14	2.16	3.91	0.37
19.00	4.20	2.20	3.96	0.36
19.50	4.25	2.25	4.01	0.34
20.00	4.30	2.29	4.06	0.33
20.50	4.34	2.33	4.11	0.31
21.00	4.39	2.37	4.15	0.30
21.50	4.43	2.40	4.20	0.28
22.00	4.47	2.44	4.24	0.27
22.50	4.51	2.47	4.27	0.25
23.00	4.55	2.50	4.31	0.24
23.50	4.58	2.53	4.34	0.22
24.00	**4.61**	**2.56**	**4.37**	0.21

Summary for Pond 3P: ADS Retention/Det

[85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 6.500 ac, 38.00% Impervious, Inflow Depth > 3.24" for 5 Yr event
Inflow = 14.33 cfs @ 9.98 hrs, Volume= 1.756 af
Outflow = 9.07 cfs @ 9.90 hrs, Volume= 1.757 af, Atten= 37%, Lag= 0.0 min
Primary = 9.07 cfs @ 9.90 hrs, Volume= 1.757 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 150.82' @ 10.11 hrs Surf.Area= 5,605 sf Storage= 2,968 cf

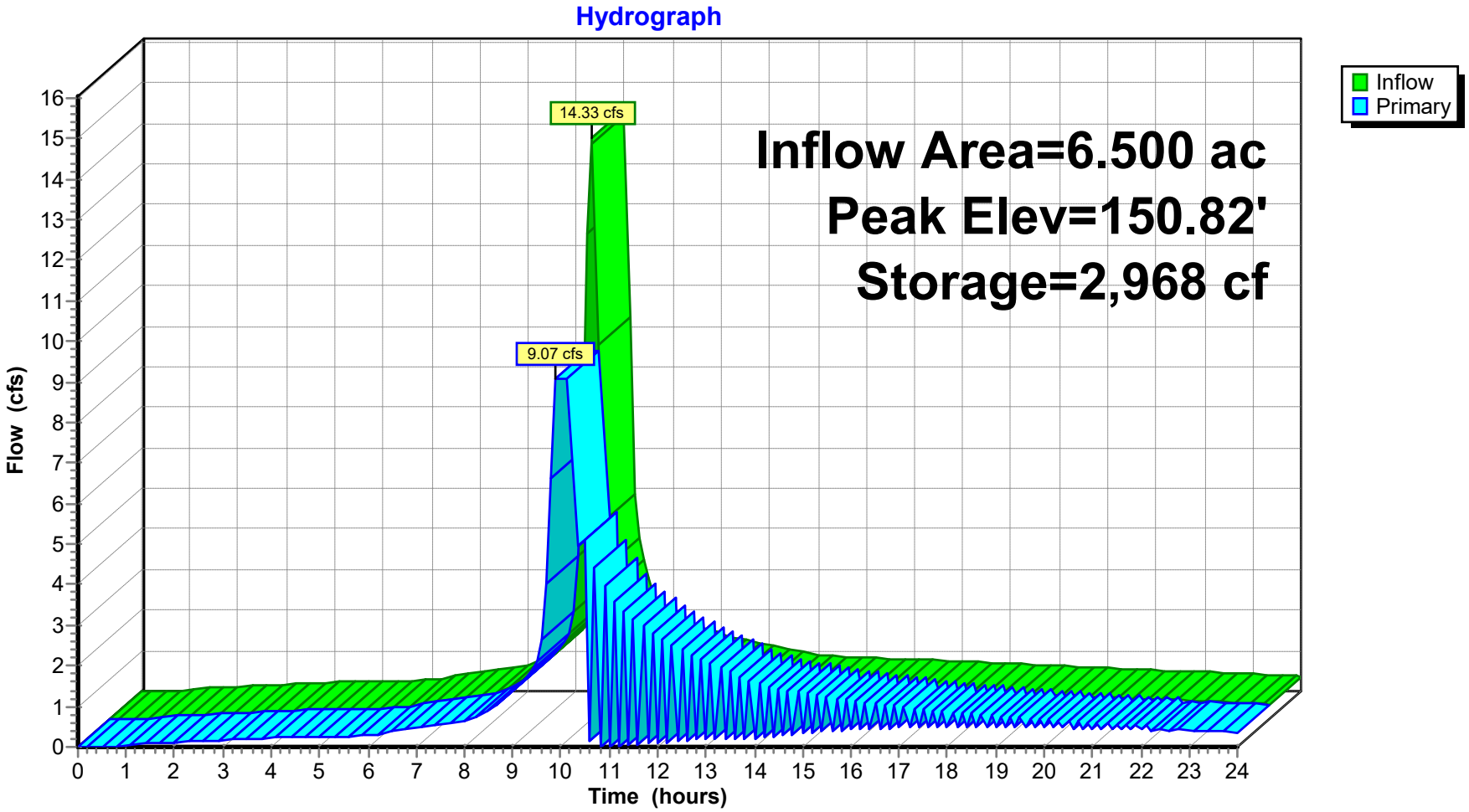
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.6 min (747.6 - 747.0)

Volume	Invert	Avail.Storage	Storage Description
#1	150.00'	28,025 cf	**228.0"W x 60.0"H x 295.0'L Pipe Storage S= 0.0020 '/'**

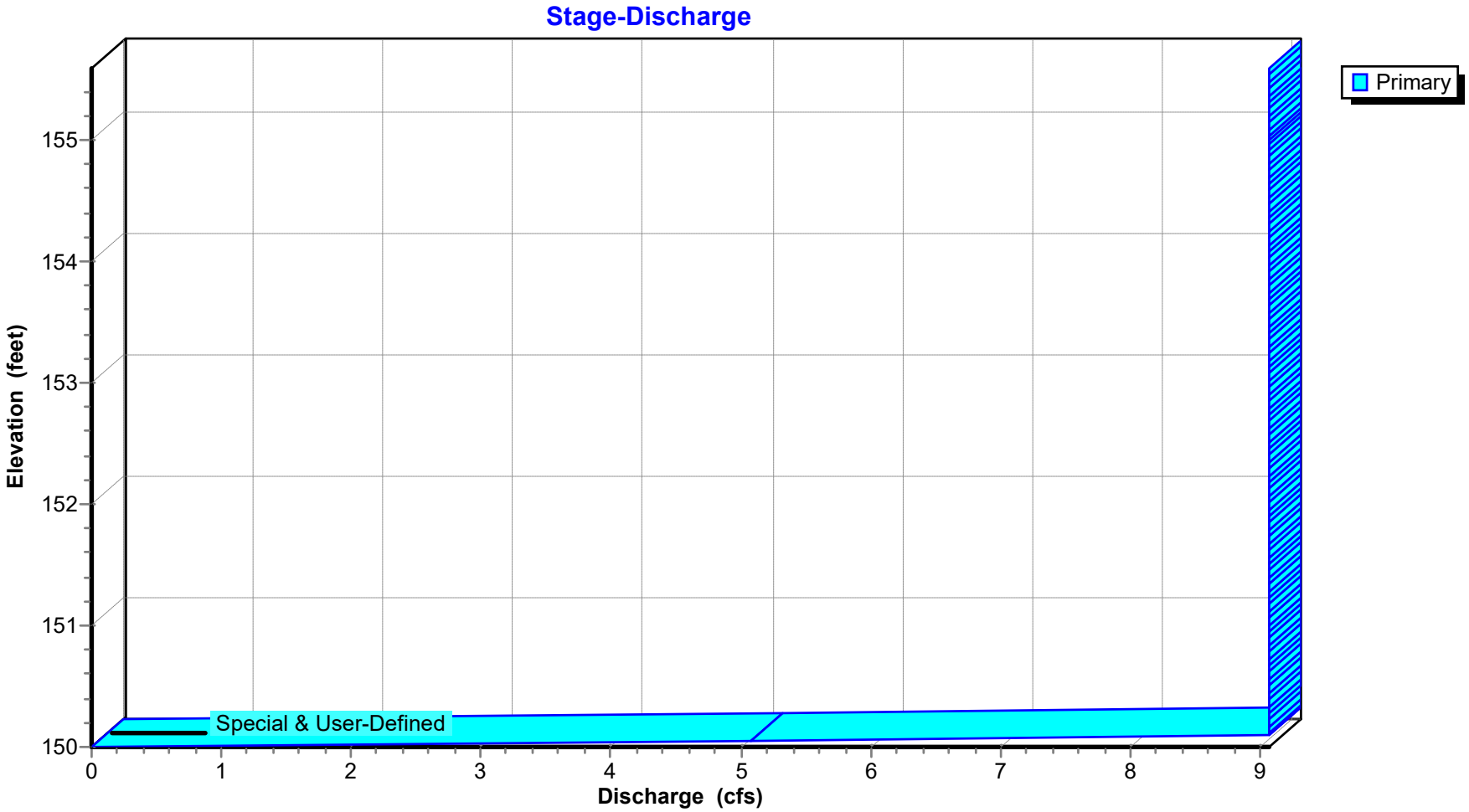
Device	Routing	Invert	Outlet Devices
#1	Primary	150.00'	**Special & User-Defined** Head (feet) 0.00 0.10 5.00 Disch. (cfs) 0.000 9.070 9.070

Primary OutFlow Max=9.07 cfs @ 9.90 hrs HW=150.34' (Free Discharge)
1=Special & User-Defined (Custom Controls 9.07 cfs)

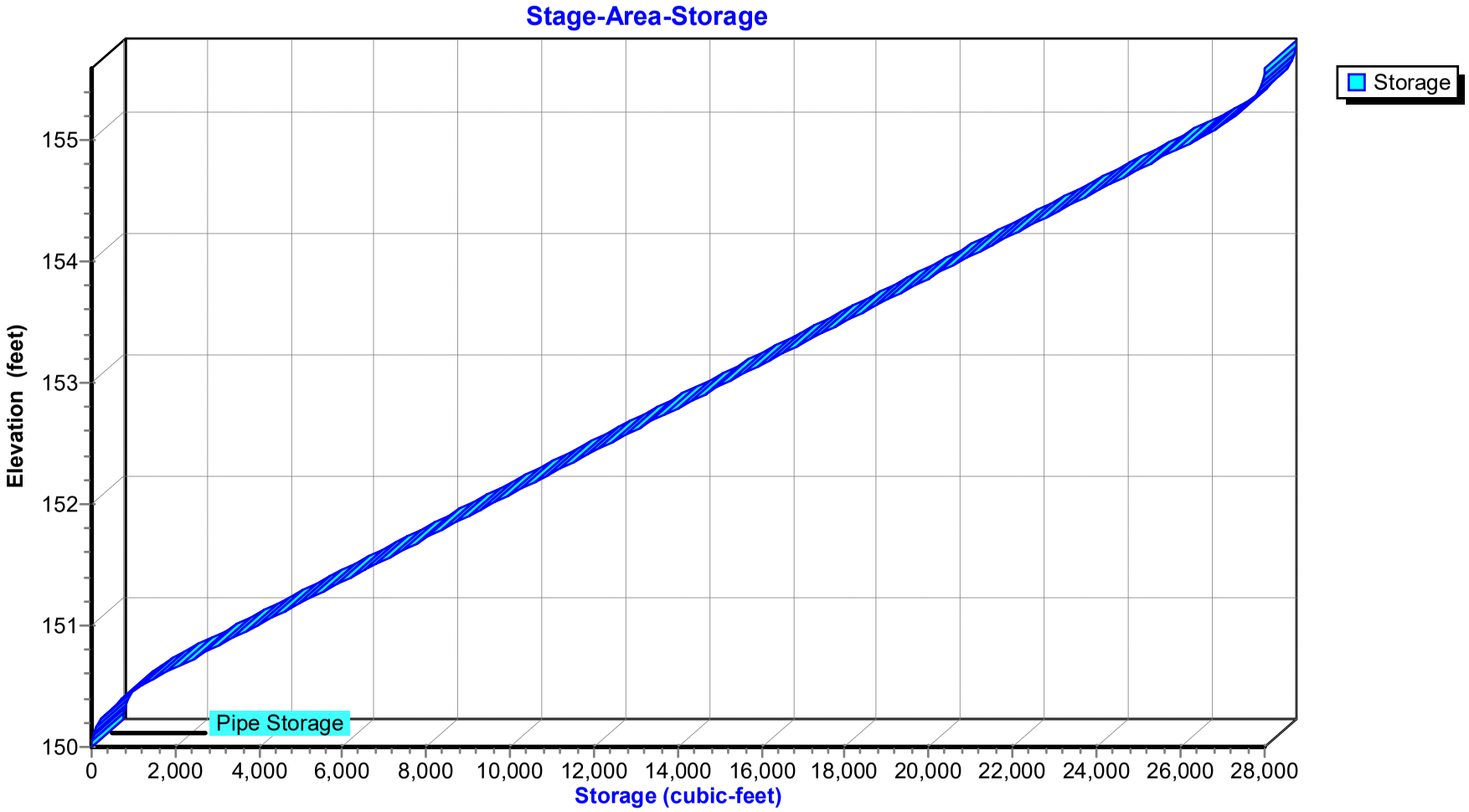
Pond 3P: ADS Retention/Det



Pond 3P: ADS Retention/Det



Pond 3P: ADS Retention/Det



Hydrograph for Pond 3P: ADS Retention/Det

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	150.00	0.00
0.50	0.00	0	150.00	0.00
1.00	0.05	0	150.00	0.05
1.50	0.09	0	150.00	0.09
2.00	0.12	0	150.00	0.12
2.50	0.14	0	150.00	0.14
3.00	0.17	1	150.00	0.17
3.50	0.20	1	150.00	0.20
4.00	0.22	1	150.00	0.22
4.50	0.24	1	150.00	0.24
5.00	0.25	1	150.00	0.25
5.50	0.26	1	150.00	0.26
6.00	0.29	1	150.00	0.29
6.50	0.37	1	150.00	0.37
7.00	0.47	1	150.01	0.47
7.50	0.55	2	150.01	0.55
8.00	0.61	2	150.01	0.61
8.50	0.92	3	150.01	0.92
9.00	1.35	4	150.01	1.35
9.50	2.10	6	150.02	**2.09**
10.00	**14.20**	**2,012**	**150.65**	**9.07**
10.50	2.79	**15**	**150.06**	5.13
11.00	1.87	0	150.00	0.00
11.50	1.60	9	150.03	3.16
12.00	1.41	0	150.00	0.09
12.50	1.28	7	150.03	2.40
13.00	1.15	1	150.00	0.20
13.50	1.03	5	150.02	1.84
14.00	0.90	1	150.00	0.21
14.50	0.85	4	150.02	1.44
15.00	0.83	1	150.00	0.33
15.50	0.81	4	150.01	1.23
16.00	0.78	1	150.00	0.42
16.50	0.76	3	150.01	1.06
17.00	0.73	1	150.01	0.47
17.50	0.71	3	150.01	0.93
18.00	0.68	1	150.01	0.49
18.50	0.66	2	150.01	0.82
19.00	0.63	1	150.01	0.49
19.50	0.60	2	150.01	0.72
20.00	0.58	1	150.01	0.48
20.50	0.55	2	150.01	0.64
21.00	0.53	1	150.01	0.45
21.50	0.50	2	150.01	0.56
22.00	0.47	1	150.00	0.42
22.50	0.45	1	150.01	0.49
23.00	0.42	1	150.00	0.38
23.50	0.39	1	150.00	0.42
24.00	0.36	1	150.00	0.34

Stage-Discharge for Pond 3P: ADS Retention/Det

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
150.00	0.00	151.40	9.07	152.80	9.07	154.20	9.07
150.04	3.63	151.44	9.07	152.84	9.07	154.24	9.07
150.08	7.26	151.48	9.07	152.88	9.07	154.28	9.07
150.12	**9.07**	151.52	9.07	152.92	9.07	154.32	9.07
150.16	9.07	151.56	9.07	152.96	9.07	154.36	9.07
150.20	9.07	151.60	9.07	153.00	9.07	154.40	9.07
150.24	9.07	151.64	9.07	153.04	9.07	154.44	9.07
150.28	9.07	151.68	9.07	153.08	9.07	154.48	9.07
150.32	9.07	151.72	9.07	153.12	9.07	154.52	9.07
150.36	9.07	151.76	9.07	153.16	9.07	154.56	9.07
150.40	9.07	151.80	9.07	153.20	9.07	154.60	9.07
150.44	9.07	151.84	9.07	153.24	9.07	154.64	9.07
150.48	9.07	151.88	9.07	153.28	9.07	154.68	9.07
150.52	9.07	151.92	9.07	153.32	9.07	154.72	9.07
150.56	9.07	151.96	9.07	153.36	9.07	154.76	9.07
150.60	9.07	152.00	9.07	153.40	9.07	154.80	9.07
150.64	9.07	152.04	9.07	153.44	9.07	154.84	9.07
150.68	9.07	152.08	9.07	153.48	9.07	154.88	9.07
150.72	9.07	152.12	9.07	153.52	9.07	154.92	9.07
150.76	9.07	152.16	9.07	153.56	9.07	154.96	9.07
150.80	9.07	152.20	9.07	153.60	9.07	155.00	9.07
150.84	9.07	152.24	9.07	153.64	9.07	155.04	9.07
150.88	9.07	152.28	9.07	153.68	9.07	155.08	9.07
150.92	9.07	152.32	9.07	153.72	9.07	155.12	9.07
150.96	9.07	152.36	9.07	153.76	9.07	155.16	9.07
151.00	9.07	152.40	9.07	153.80	9.07	155.20	9.07
151.04	9.07	152.44	9.07	153.84	9.07	155.24	9.07
151.08	9.07	152.48	9.07	153.88	9.07	155.28	9.07
151.12	9.07	152.52	9.07	153.92	9.07	155.32	9.07
151.16	9.07	152.56	9.07	153.96	9.07	155.36	9.07
151.20	9.07	152.60	9.07	154.00	9.07	155.40	9.07
151.24	9.07	152.64	9.07	154.04	9.07	155.44	9.07
151.28	9.07	152.68	9.07	154.08	9.07	155.48	9.07
151.32	9.07	152.72	9.07	154.12	9.07	155.52	9.07
151.36	9.07	152.76	9.07	154.16	9.07	155.56	9.07

Stage-Area-Storage for Pond 3P: ADS Retention/Det

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
150.00	0	151.40	6,194	152.80	14,041	154.20	21,888
150.04	8	151.44	6,418	152.84	14,265	154.24	22,112
150.08	30	151.48	6,642	152.88	14,489	154.28	22,336
150.12	68	151.52	6,866	152.92	14,713	154.32	22,560
150.16	122	151.56	7,090	152.96	14,937	154.36	22,784
150.20	190	151.60	7,315	153.00	15,162	154.40	23,009
150.24	274	151.64	7,539	153.04	15,386	154.44	23,233
150.28	372	151.68	7,763	153.08	15,610	154.48	23,457
150.32	486	151.72	7,987	153.12	15,834	154.52	23,681
150.36	616	151.76	8,211	153.16	16,058	154.56	23,905
150.40	760	151.80	8,436	153.20	16,283	154.60	24,130
150.44	920	151.84	8,660	153.24	16,507	154.64	24,354
150.48	1,094	151.88	8,884	153.28	16,731	154.68	24,578
150.52	1,284	151.92	9,108	153.32	16,955	154.72	24,802
150.56	1,490	151.96	9,332	153.36	17,179	154.76	25,026
150.60	1,710	152.00	9,557	153.40	17,404	154.80	25,251
150.64	1,934	152.04	9,781	153.44	17,628	154.84	25,475
150.68	2,158	152.08	10,005	153.48	17,852	154.88	25,699
150.72	2,382	152.12	10,229	153.52	18,076	154.92	25,923
150.76	2,606	152.16	10,453	153.56	18,300	154.96	26,147
150.80	2,831	152.20	10,678	153.60	18,525	155.00	26,372
150.84	3,055	152.24	10,902	153.64	18,749	155.04	26,588
150.88	3,279	152.28	11,126	153.68	18,973	155.08	26,790
150.92	3,503	152.32	11,350	153.72	19,197	155.12	26,976
150.96	3,727	152.36	11,574	153.76	19,421	155.16	27,147
151.00	3,952	152.40	11,799	153.80	19,646	155.20	27,303
151.04	4,176	152.44	12,023	153.84	19,870	155.24	27,443
151.08	4,400	152.48	12,247	153.88	20,094	155.28	27,569
151.12	4,624	152.52	12,471	153.92	20,318	155.32	27,679
151.16	4,848	152.56	12,695	153.96	20,542	155.36	27,774
151.20	5,073	152.60	12,920	154.00	20,767	155.40	27,854
151.24	5,297	152.64	13,144	154.04	20,991	155.44	27,918
151.28	5,521	152.68	13,368	154.08	21,215	155.48	27,968
151.32	5,745	152.72	13,592	154.12	21,439	155.52	28,002
151.36	5,969	152.76	13,816	154.16	21,663	155.56	**28,021**

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: A-1 (East CB) Runoff Area=2.800 ac 38.00% Impervious Runoff Depth>4.11"
Flow Length=955' Tc=4.3 min CN=80/98 Runoff=7.84 cfs 0.959 af

Subcatchment 2S: A-2 (West CB) Runoff Area=3.700 ac 38.00% Impervious Runoff Depth>4.11"
Flow Length=935' Tc=4.2 min CN=80/98 Runoff=10.40 cfs 1.267 af

Pond 3P: ADS Retention/Det Peak Elev=151.41' Storage=6,273 cf Inflow=18.25 cfs 2.225 af
Outflow=9.07 cfs 2.225 af

Total Runoff Area = 6.500 ac Runoff Volume = 2.225 af Average Runoff Depth = 4.11"
62.00% Pervious = 4.030 ac 38.00% Impervious = 2.470 ac

Summary for Subcatchment 1S: A-1 (East CB)

[49] Hint: Tc<2dt may require smaller dt

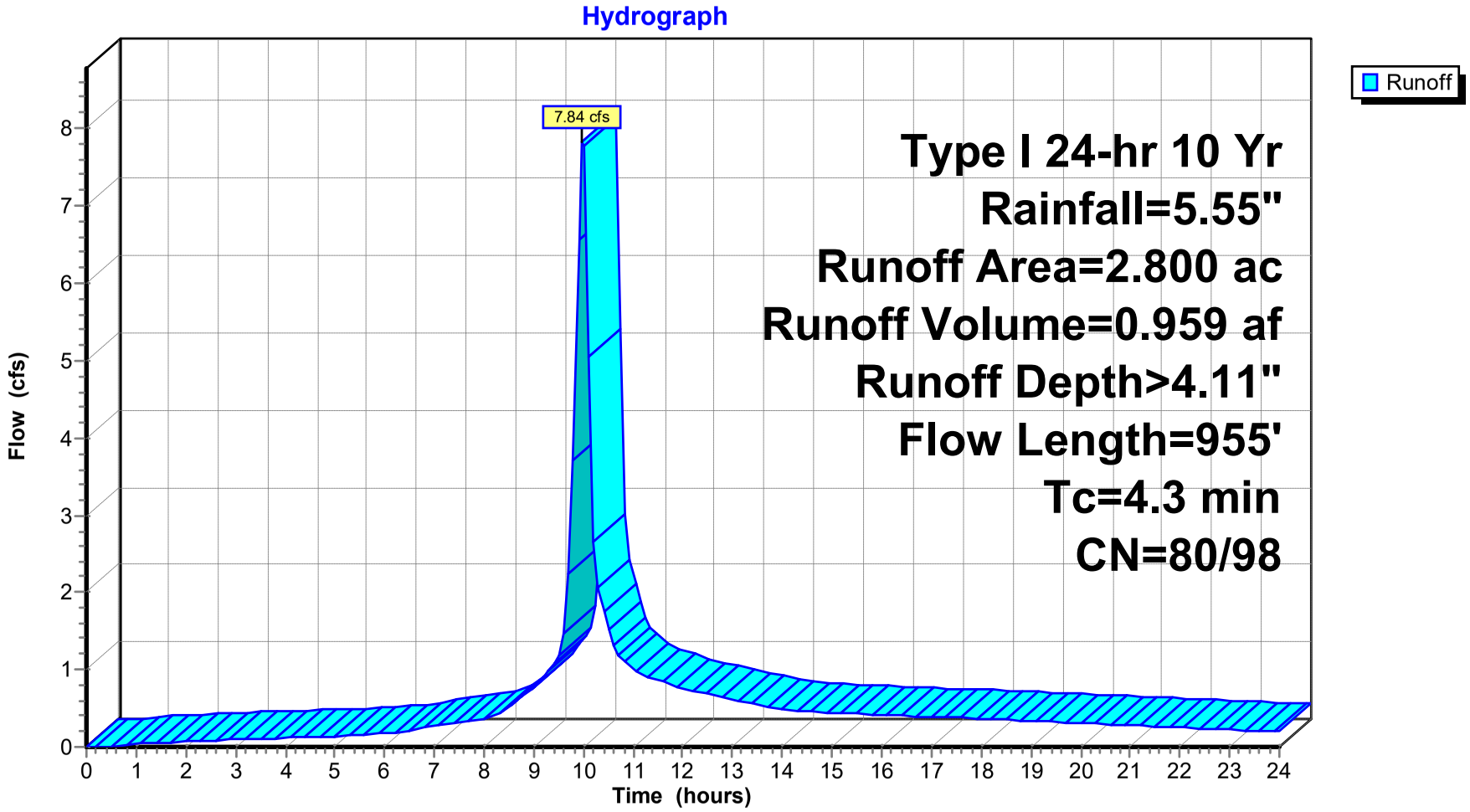
Runoff = 7.84 cfs @ 9.98 hrs, Volume= 0.959 af, Depth> 4.11"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 10 Yr Rainfall=5.55"

Area (ac)	CN	Description
2.800	87	1/4 acre lots, 38% imp, HSG D
1.736	80	62.00% Pervious Area
1.064	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	265	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	160	0.0500	4.54		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.8	315	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	215	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
4.3	955	Total			

Subcatchment 1S: A-1 (East CB)



Hydrograph for Subcatchment 1S: A-1 (East CB)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.05	0.00	0.00	0.00
1.00	0.10	0.00	0.01	0.03
1.50	0.15	0.00	0.04	0.05
2.00	0.19	0.00	0.07	0.07
2.50	0.25	0.00	0.10	0.08
3.00	0.30	0.00	0.14	0.10
3.50	0.36	0.00	0.19	0.11
4.00	0.42	0.00	0.25	0.12
4.50	0.49	0.00	0.31	0.13
5.00	0.55	0.00	0.37	0.14
5.50	0.62	0.01	0.43	0.16
6.00	0.69	0.01	0.50	0.17
6.50	0.77	0.03	0.57	0.22
7.00	0.87	0.05	0.66	0.28
7.50	0.97	0.07	0.76	0.32
8.00	1.08	0.11	0.87	0.35
8.50	1.22	0.16	1.00	0.53
9.00	1.41	0.24	1.19	0.76
9.50	1.68	0.38	1.46	1.17
10.00	2.86	1.14	2.63	**7.77**
10.50	3.24	1.43	3.00	1.51
11.00	3.46	1.60	3.22	1.01
11.50	3.64	1.75	3.40	0.86
12.00	3.80	1.87	3.56	0.76
12.50	3.94	1.99	3.70	0.68
13.00	4.06	2.09	3.83	0.62
13.50	4.17	2.19	3.94	0.55
14.00	4.27	2.27	4.04	0.48
14.50	4.36	2.35	4.13	0.46
15.00	4.45	2.42	4.22	0.44
15.50	4.54	2.49	4.30	0.43
16.00	4.62	2.56	4.38	0.42
16.50	4.70	2.63	4.46	0.40
17.00	4.77	2.70	4.54	0.39
17.50	4.85	2.76	4.61	0.38
18.00	4.92	2.82	4.68	0.36
18.50	4.99	2.88	4.75	0.35
19.00	5.05	2.94	4.81	0.34
19.50	5.11	2.99	4.88	0.32
20.00	5.17	3.04	4.94	0.31
20.50	5.23	3.09	4.99	0.29
21.00	5.28	3.14	5.05	0.28
21.50	5.33	3.19	5.10	0.27
22.00	5.38	3.23	5.15	0.25
22.50	5.43	3.27	5.19	0.24
23.00	5.47	3.31	5.23	0.22
23.50	5.51	3.34	5.27	0.21
24.00	**5.55**	**3.38**	**5.31**	0.19

Summary for Subcatchment 2S: A-2 (West CB)

[49] Hint: Tc<2dt may require smaller dt

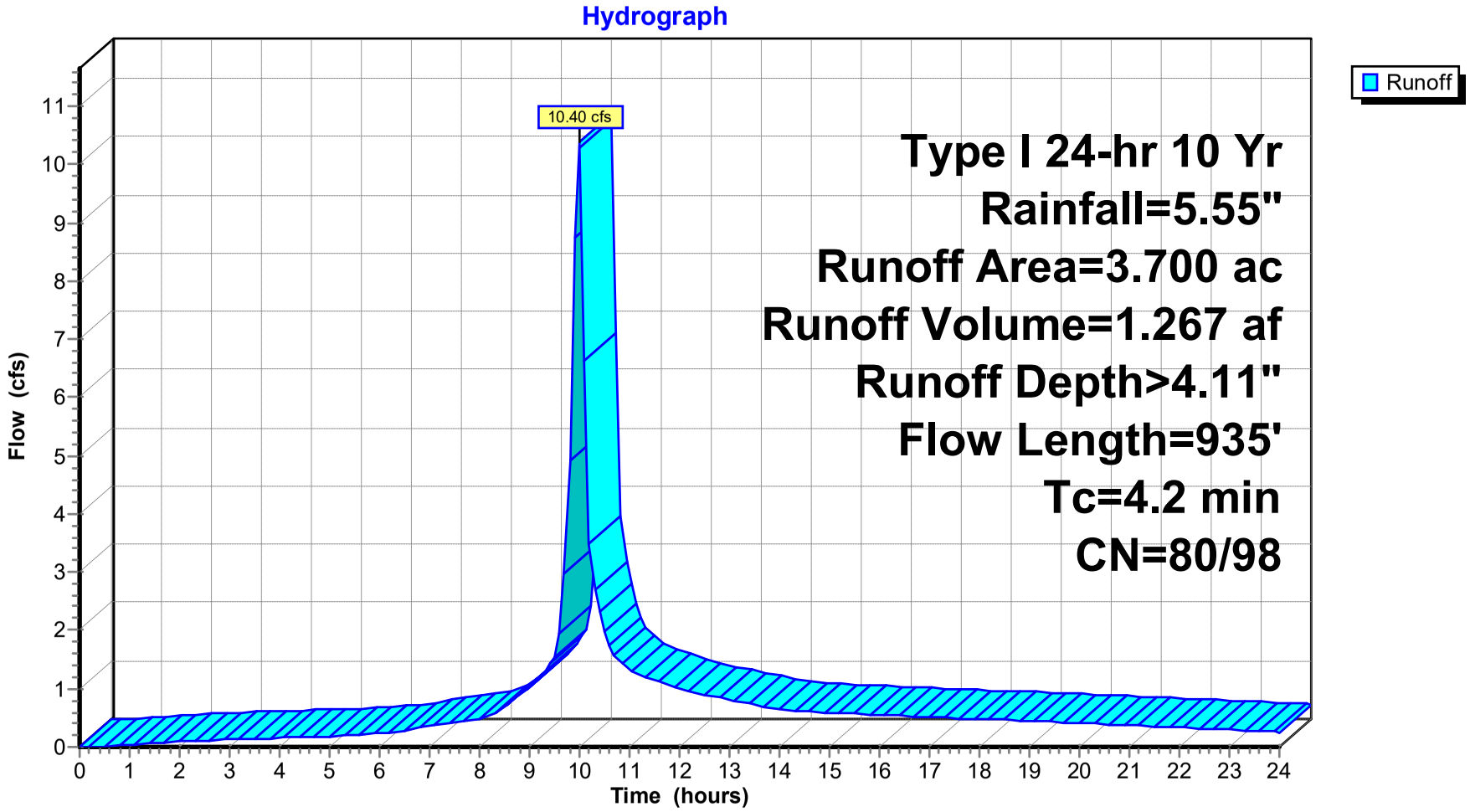
Runoff = 10.40 cfs @ 9.98 hrs, Volume= 1.267 af, Depth> 4.11"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 10 Yr Rainfall=5.55"

Area (ac)	CN	Description
3.700	87	1/4 acre lots, 38% imp, HSG D
2.294	80	62.00% Pervious Area
1.406	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	260	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	155	0.0500	4.54		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.8	310	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	210	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
4.2	935	Total			

Subcatchment 2S: A-2 (West CB)



Hydrograph for Subcatchment 2S: A-2 (West CB)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.05	0.00	0.00	0.00
1.00	0.10	0.00	0.01	0.04
1.50	0.15	0.00	0.04	0.07
2.00	0.19	0.00	0.07	0.09
2.50	0.25	0.00	0.10	0.11
3.00	0.30	0.00	0.14	0.13
3.50	0.36	0.00	0.19	0.14
4.00	0.42	0.00	0.25	0.16
4.50	0.49	0.00	0.31	0.17
5.00	0.55	0.00	0.37	0.18
5.50	0.62	0.01	0.43	0.21
6.00	0.69	0.01	0.50	0.23
6.50	0.77	0.03	0.57	0.29
7.00	0.87	0.05	0.66	0.37
7.50	0.97	0.07	0.76	0.42
8.00	1.08	0.11	0.87	0.47
8.50	1.22	0.16	1.00	0.70
9.00	1.41	0.24	1.19	1.01
9.50	1.68	0.38	1.46	1.55
10.00	2.86	1.14	2.63	**10.30**
10.50	3.24	1.43	3.00	1.99
11.00	3.46	1.60	3.22	1.33
11.50	3.64	1.75	3.40	1.14
12.00	3.80	1.87	3.56	1.00
12.50	3.94	1.99	3.70	0.90
13.00	4.06	2.09	3.83	0.82
13.50	4.17	2.19	3.94	0.73
14.00	4.27	2.27	4.04	0.64
14.50	4.36	2.35	4.13	0.60
15.00	4.45	2.42	4.22	0.59
15.50	4.54	2.49	4.30	0.57
16.00	4.62	2.56	4.38	0.55
16.50	4.70	2.63	4.46	0.53
17.00	4.77	2.70	4.54	0.52
17.50	4.85	2.76	4.61	0.50
18.00	4.92	2.82	4.68	0.48
18.50	4.99	2.88	4.75	0.46
19.00	5.05	2.94	4.81	0.44
19.50	5.11	2.99	4.88	0.42
20.00	5.17	3.04	4.94	0.41
20.50	5.23	3.09	4.99	0.39
21.00	5.28	3.14	5.05	0.37
21.50	5.33	3.19	5.10	0.35
22.00	5.38	3.23	5.15	0.33
22.50	5.43	3.27	5.19	0.31
23.00	5.47	3.31	5.23	0.29
23.50	5.51	3.34	5.27	0.27
24.00	**5.55**	**3.38**	**5.31**	0.26

Summary for Pond 3P: ADS Retention/Det

[85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 6.500 ac, 38.00% Impervious, Inflow Depth > 4.11" for 10 Yr event
Inflow = 18.25 cfs @ 9.98 hrs, Volume= 2.225 af
Outflow = 9.07 cfs @ 9.90 hrs, Volume= 2.225 af, Atten= 50%, Lag= 0.0 min
Primary = 9.07 cfs @ 9.90 hrs, Volume= 2.225 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 151.41' @ 10.15 hrs Surf.Area= 5,605 sf Storage= 6,273 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.6 min (742.8 - 741.2)

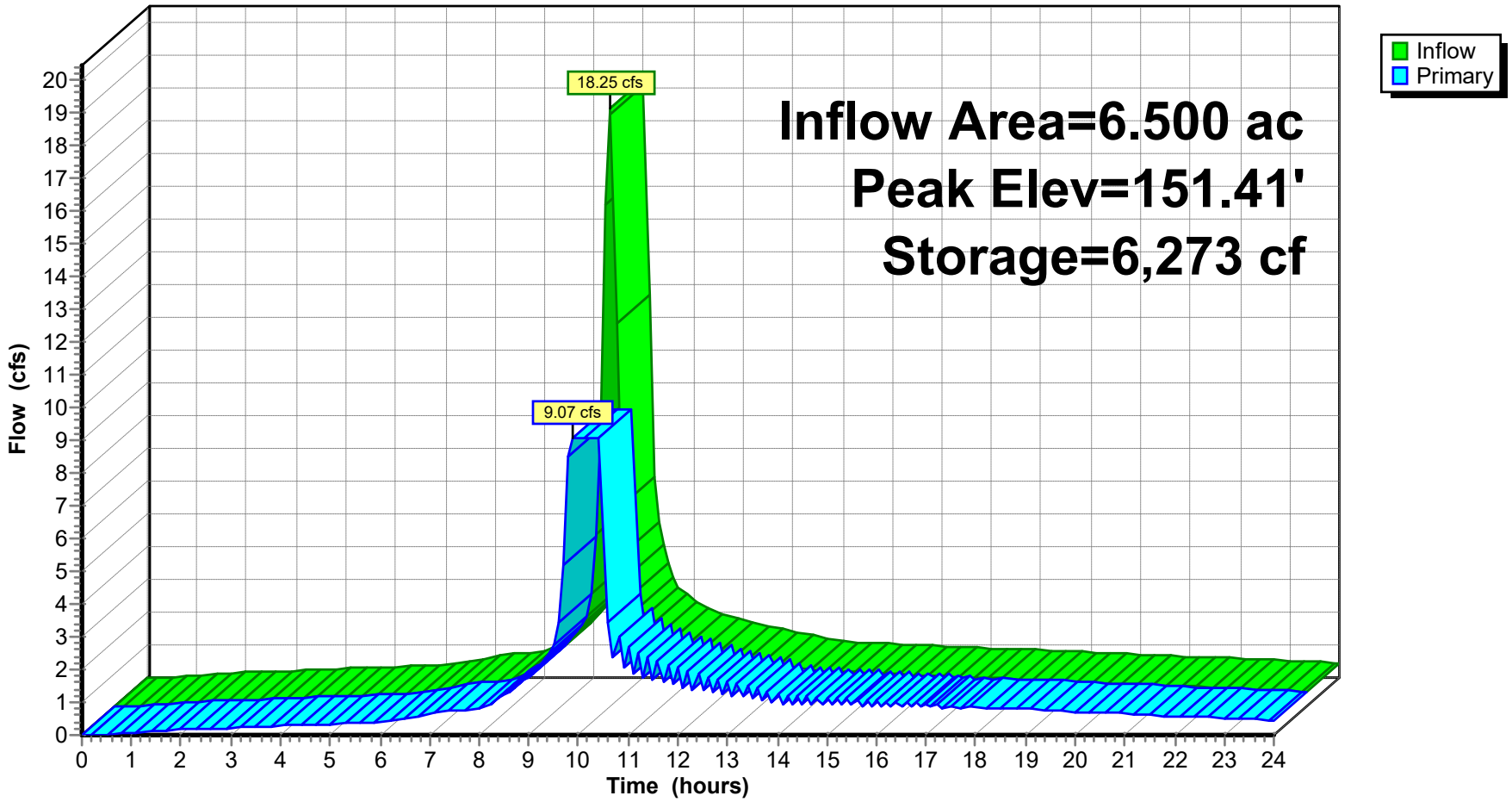
Volume	Invert	Avail.Storage	Storage Description
#1	150.00'	28,025 cf	**228.0"W x 60.0"H x 295.0'L Pipe Storage S= 0.0020 '/'**

Device	Routing	Invert	Outlet Devices
#1	Primary	150.00'	**Special & User-Defined** Head (feet) 0.00 0.10 5.00 Disch. (cfs) 0.000 9.070 9.070

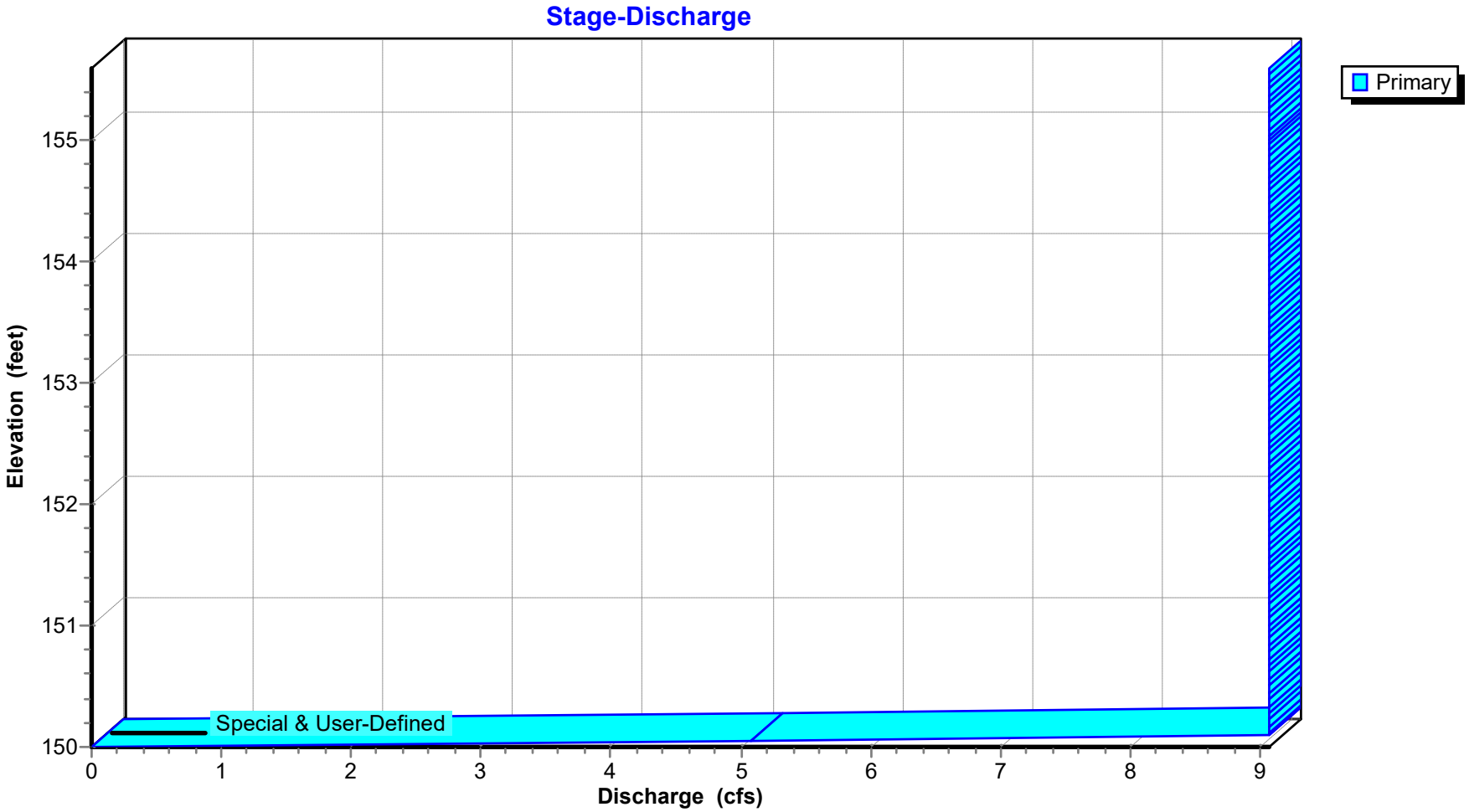
Primary OutFlow Max=9.07 cfs @ 9.90 hrs HW=150.50' (Free Discharge)
1=Special & User-Defined (Custom Controls 9.07 cfs)

Pond 3P: ADS Retention/Det

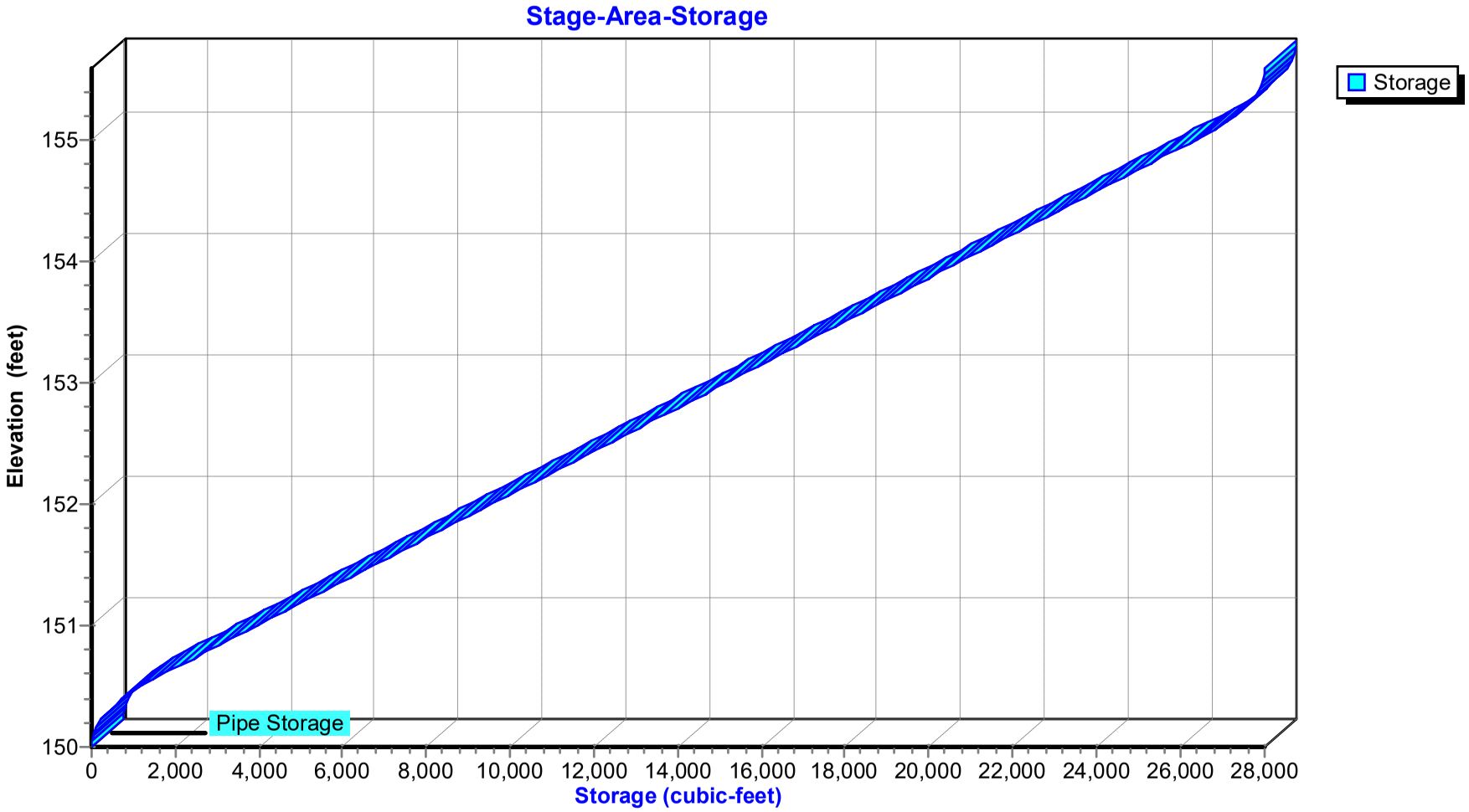
Hydrograph



Pond 3P: ADS Retention/Det



Pond 3P: ADS Retention/Det



Hydrograph for Pond 3P: ADS Retention/Det

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	150.00	0.00
0.50	0.00	0	150.00	0.00
1.00	0.08	0	150.00	0.08
1.50	0.13	0	150.00	0.13
2.00	0.16	0	150.00	0.16
2.50	0.19	1	150.00	0.19
3.00	0.22	1	150.00	0.22
3.50	0.25	1	150.00	0.25
4.00	0.28	1	150.00	0.28
4.50	0.30	1	150.00	0.30
5.00	0.32	1	150.00	0.32
5.50	0.37	1	150.00	0.37
6.00	0.40	1	150.00	0.40
6.50	0.51	1	150.01	0.51
7.00	0.64	2	150.01	0.64
7.50	0.74	2	150.01	0.74
8.00	0.82	2	150.01	0.82
8.50	1.22	4	150.01	1.22
9.00	1.77	5	150.02	1.77
9.50	2.73	8	150.03	**2.73**
10.00	**18.07**	**3,938**	**151.00**	**9.07**
10.50	3.50	**1,089**	**150.48**	9.07
11.00	2.34	8	150.03	2.72
11.50	2.00	5	150.02	1.69
12.00	1.76	6	150.02	2.03
12.50	1.59	4	150.01	1.36
13.00	1.44	5	150.02	1.63
13.50	1.28	3	150.01	1.11
14.00	1.12	4	150.01	1.26
14.50	1.06	3	150.01	0.94
15.00	1.03	3	150.01	1.13
15.50	1.00	3	150.01	0.91
16.00	0.97	3	150.01	1.04
16.50	0.94	3	150.01	0.88
17.00	0.91	3	150.01	0.96
17.50	0.87	2	150.01	0.83
18.00	0.84	3	150.01	0.88
18.50	0.81	2	150.01	0.78
19.00	0.78	2	150.01	0.81
19.50	0.75	2	150.01	0.72
20.00	0.71	2	150.01	0.73
20.50	0.68	2	150.01	0.66
21.00	0.65	2	150.01	0.66
21.50	0.62	2	150.01	0.60
22.00	0.58	2	150.01	0.59
22.50	0.55	2	150.01	0.54
23.00	0.52	2	150.01	0.52
23.50	0.48	1	150.01	0.48
24.00	0.45	1	150.01	0.45

Stage-Discharge for Pond 3P: ADS Retention/Det

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
150.00	0.00	151.40	9.07	152.80	9.07	154.20	9.07
150.04	3.63	151.44	9.07	152.84	9.07	154.24	9.07
150.08	7.26	151.48	9.07	152.88	9.07	154.28	9.07
150.12	**9.07**	151.52	9.07	152.92	9.07	154.32	9.07
150.16	9.07	151.56	9.07	152.96	9.07	154.36	9.07
150.20	9.07	151.60	9.07	153.00	9.07	154.40	9.07
150.24	9.07	151.64	9.07	153.04	9.07	154.44	9.07
150.28	9.07	151.68	9.07	153.08	9.07	154.48	9.07
150.32	9.07	151.72	9.07	153.12	9.07	154.52	9.07
150.36	9.07	151.76	9.07	153.16	9.07	154.56	9.07
150.40	9.07	151.80	9.07	153.20	9.07	154.60	9.07
150.44	9.07	151.84	9.07	153.24	9.07	154.64	9.07
150.48	9.07	151.88	9.07	153.28	9.07	154.68	9.07
150.52	9.07	151.92	9.07	153.32	9.07	154.72	9.07
150.56	9.07	151.96	9.07	153.36	9.07	154.76	9.07
150.60	9.07	152.00	9.07	153.40	9.07	154.80	9.07
150.64	9.07	152.04	9.07	153.44	9.07	154.84	9.07
150.68	9.07	152.08	9.07	153.48	9.07	154.88	9.07
150.72	9.07	152.12	9.07	153.52	9.07	154.92	9.07
150.76	9.07	152.16	9.07	153.56	9.07	154.96	9.07
150.80	9.07	152.20	9.07	153.60	9.07	155.00	9.07
150.84	9.07	152.24	9.07	153.64	9.07	155.04	9.07
150.88	9.07	152.28	9.07	153.68	9.07	155.08	9.07
150.92	9.07	152.32	9.07	153.72	9.07	155.12	9.07
150.96	9.07	152.36	9.07	153.76	9.07	155.16	9.07
151.00	9.07	152.40	9.07	153.80	9.07	155.20	9.07
151.04	9.07	152.44	9.07	153.84	9.07	155.24	9.07
151.08	9.07	152.48	9.07	153.88	9.07	155.28	9.07
151.12	9.07	152.52	9.07	153.92	9.07	155.32	9.07
151.16	9.07	152.56	9.07	153.96	9.07	155.36	9.07
151.20	9.07	152.60	9.07	154.00	9.07	155.40	9.07
151.24	9.07	152.64	9.07	154.04	9.07	155.44	9.07
151.28	9.07	152.68	9.07	154.08	9.07	155.48	9.07
151.32	9.07	152.72	9.07	154.12	9.07	155.52	9.07
151.36	9.07	152.76	9.07	154.16	9.07	155.56	9.07

Stage-Area-Storage for Pond 3P: ADS Retention/Det

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
150.00	0	151.40	6,194	152.80	14,041	154.20	21,888
150.04	8	151.44	6,418	152.84	14,265	154.24	22,112
150.08	30	151.48	6,642	152.88	14,489	154.28	22,336
150.12	68	151.52	6,866	152.92	14,713	154.32	22,560
150.16	122	151.56	7,090	152.96	14,937	154.36	22,784
150.20	190	151.60	7,315	153.00	15,162	154.40	23,009
150.24	274	151.64	7,539	153.04	15,386	154.44	23,233
150.28	372	151.68	7,763	153.08	15,610	154.48	23,457
150.32	486	151.72	7,987	153.12	15,834	154.52	23,681
150.36	616	151.76	8,211	153.16	16,058	154.56	23,905
150.40	760	151.80	8,436	153.20	16,283	154.60	24,130
150.44	920	151.84	8,660	153.24	16,507	154.64	24,354
150.48	1,094	151.88	8,884	153.28	16,731	154.68	24,578
150.52	1,284	151.92	9,108	153.32	16,955	154.72	24,802
150.56	1,490	151.96	9,332	153.36	17,179	154.76	25,026
150.60	1,710	152.00	9,557	153.40	17,404	154.80	25,251
150.64	1,934	152.04	9,781	153.44	17,628	154.84	25,475
150.68	2,158	152.08	10,005	153.48	17,852	154.88	25,699
150.72	2,382	152.12	10,229	153.52	18,076	154.92	25,923
150.76	2,606	152.16	10,453	153.56	18,300	154.96	26,147
150.80	2,831	152.20	10,678	153.60	18,525	155.00	26,372
150.84	3,055	152.24	10,902	153.64	18,749	155.04	26,588
150.88	3,279	152.28	11,126	153.68	18,973	155.08	26,790
150.92	3,503	152.32	11,350	153.72	19,197	155.12	26,976
150.96	3,727	152.36	11,574	153.76	19,421	155.16	27,147
151.00	3,952	152.40	11,799	153.80	19,646	155.20	27,303
151.04	4,176	152.44	12,023	153.84	19,870	155.24	27,443
151.08	4,400	152.48	12,247	153.88	20,094	155.28	27,569
151.12	4,624	152.52	12,471	153.92	20,318	155.32	27,679
151.16	4,848	152.56	12,695	153.96	20,542	155.36	27,774
151.20	5,073	152.60	12,920	154.00	20,767	155.40	27,854
151.24	5,297	152.64	13,144	154.04	20,991	155.44	27,918
151.28	5,521	152.68	13,368	154.08	21,215	155.48	27,968
151.32	5,745	152.72	13,592	154.12	21,439	155.52	28,002
151.36	5,969	152.76	13,816	154.16	21,663	155.56	**28,021**

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: A-1 (East CB) Runoff Area=2.800 ac 38.00% Impervious Runoff Depth>5.20"
Flow Length=955' Tc=4.3 min CN=80/98 Runoff=9.95 cfs 1.213 af

Subcatchment 2S: A-2 (West CB) Runoff Area=3.700 ac 38.00% Impervious Runoff Depth>5.20"
Flow Length=935' Tc=4.2 min CN=80/98 Runoff=13.20 cfs 1.603 af

Pond 3P: ADS Retention/Det Peak Elev=152.31' Storage=11,316 cf Inflow=23.15 cfs 2.816 af
Outflow=9.07 cfs 2.821 af

Total Runoff Area = 6.500 ac Runoff Volume = 2.816 af Average Runoff Depth = 5.20"
62.00% Pervious = 4.030 ac 38.00% Impervious = 2.470 ac

Summary for Subcatchment 1S: A-1 (East CB)

[49] Hint: Tc<2dt may require smaller dt

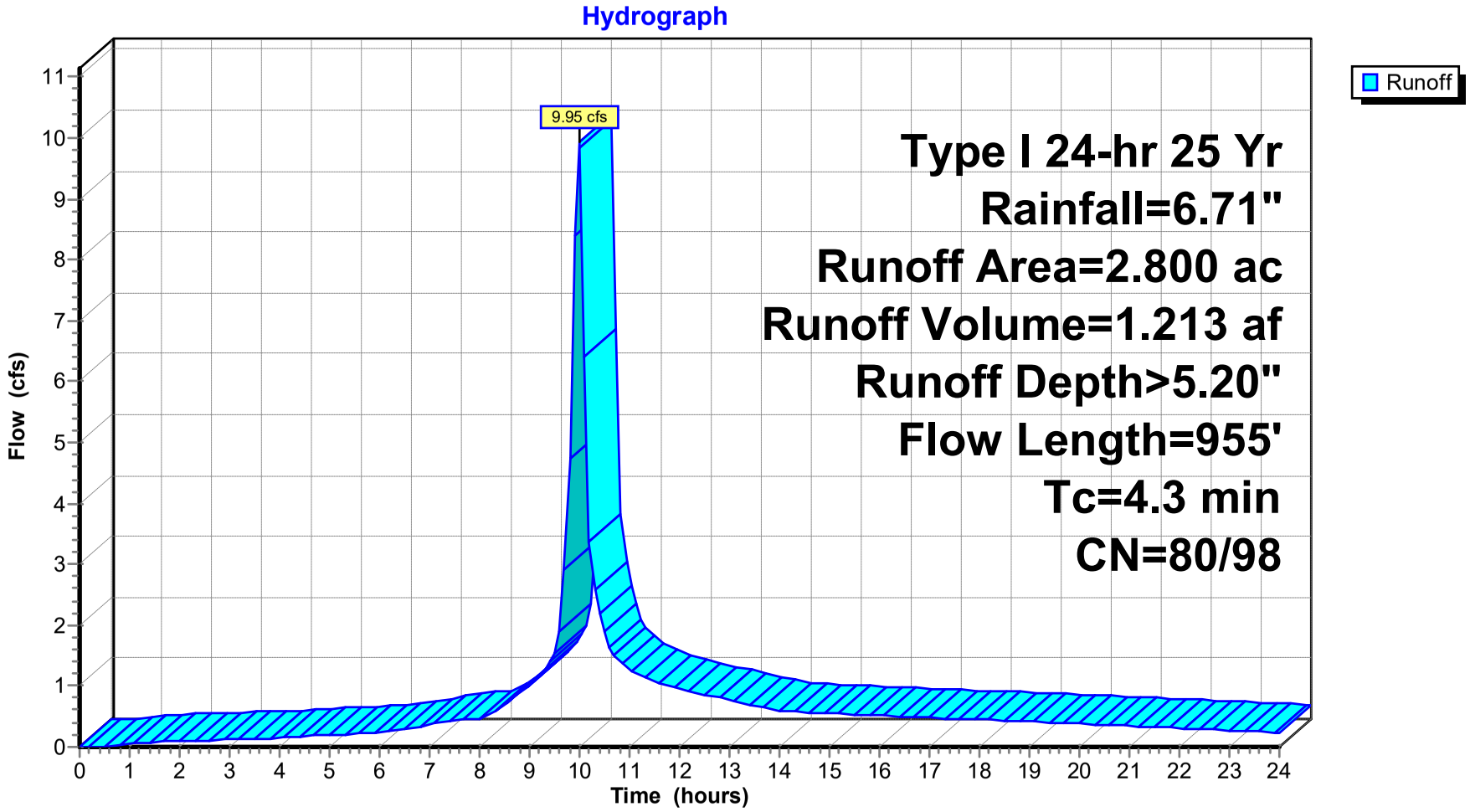
Runoff = 9.95 cfs @ 9.98 hrs, Volume= 1.213 af, Depth> 5.20"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 25 Yr Rainfall=6.71"

Area (ac)	CN	Description
2.800	87	1/4 acre lots, 38% imp, HSG D
1.736	80	62.00% Pervious Area
1.064	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	265	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	160	0.0500	4.54		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.8	315	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	215	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
4.3	955	Total			

Subcatchment 1S: A-1 (East CB)



Hydrograph for Subcatchment 1S: A-1 (East CB)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.06	0.00	0.00	0.01
1.00	0.12	0.00	0.02	0.05
1.50	0.18	0.00	0.05	0.08
2.00	0.23	0.00	0.09	0.09
2.50	0.30	0.00	0.14	0.11
3.00	0.36	0.00	0.20	0.12
3.50	0.43	0.00	0.26	0.14
4.00	0.51	0.00	0.33	0.15
4.50	0.59	0.00	0.40	0.17
5.00	0.67	0.01	0.48	0.20
5.50	0.75	0.02	0.55	0.22
6.00	0.84	0.04	0.64	0.24
6.50	0.93	0.06	0.73	0.30
7.00	1.05	0.10	0.84	0.37
7.50	1.17	0.14	0.96	0.43
8.00	1.30	0.19	1.09	0.47
8.50	1.47	0.27	1.25	0.70
9.00	1.70	0.39	1.48	1.00
9.50	2.03	0.58	1.81	1.52
10.00	3.46	1.60	3.22	**9.85**
10.50	3.91	1.97	3.68	1.90
11.00	4.18	2.19	3.95	1.26
11.50	4.40	2.38	4.16	1.08
12.00	4.59	2.54	4.35	0.95
12.50	4.76	2.68	4.52	0.85
13.00	4.91	2.82	4.68	0.77
13.50	5.05	2.93	4.81	0.68
14.00	5.17	3.04	4.93	0.60
14.50	5.28	3.13	5.04	0.57
15.00	5.38	3.23	5.14	0.55
15.50	5.48	3.32	5.25	0.53
16.00	5.58	3.41	5.35	0.52
16.50	5.68	3.49	5.44	0.50
17.00	5.77	3.57	5.53	0.48
17.50	5.86	3.65	5.62	0.47
18.00	5.95	3.73	5.71	0.45
18.50	6.03	3.81	5.79	0.43
19.00	6.11	3.88	5.87	0.41
19.50	6.18	3.95	5.94	0.40
20.00	6.25	4.01	6.02	0.38
20.50	6.32	4.07	6.08	0.36
21.00	6.39	4.13	6.15	0.34
21.50	6.45	4.19	6.21	0.33
22.00	6.51	4.24	6.27	0.31
22.50	6.56	4.29	6.33	0.29
23.00	6.62	4.34	6.38	0.27
23.50	6.66	4.39	6.43	0.26
24.00	**6.71**	**4.43**	**6.47**	0.24

Summary for Subcatchment 2S: A-2 (West CB)

[49] Hint: Tc<2dt may require smaller dt

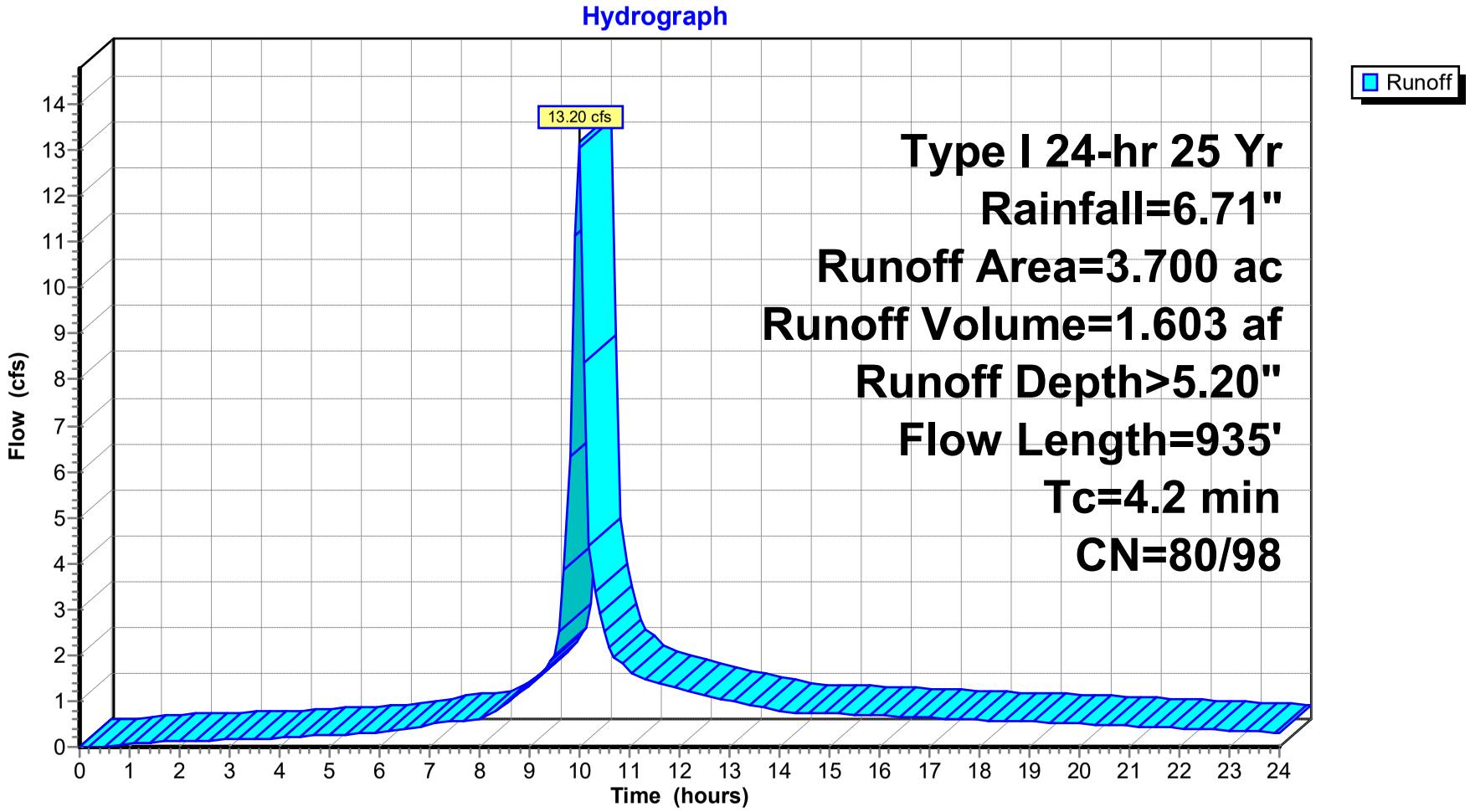
Runoff = 13.20 cfs @ 9.98 hrs, Volume= 1.603 af, Depth> 5.20"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 25 Yr Rainfall=6.71"

Area (ac)	CN	Description
3.700	87	1/4 acre lots, 38% imp, HSG D
2.294	80	62.00% Pervious Area
1.406	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	260	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	155	0.0500	4.54		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.8	310	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	210	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
4.2	935	Total			

Subcatchment 2S: A-2 (West CB)



Hydrograph for Subcatchment 2S: A-2 (West CB)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.06	0.00	0.00	0.01
1.00	0.12	0.00	0.02	0.07
1.50	0.18	0.00	0.05	0.10
2.00	0.23	0.00	0.09	0.12
2.50	0.30	0.00	0.14	0.14
3.00	0.36	0.00	0.20	0.16
3.50	0.43	0.00	0.26	0.18
4.00	0.51	0.00	0.33	0.20
4.50	0.59	0.00	0.40	0.23
5.00	0.67	0.01	0.48	0.26
5.50	0.75	0.02	0.55	0.29
6.00	0.84	0.04	0.64	0.32
6.50	0.93	0.06	0.73	0.39
7.00	1.05	0.10	0.84	0.50
7.50	1.17	0.14	0.96	0.56
8.00	1.30	0.19	1.09	0.62
8.50	1.47	0.27	1.25	0.92
9.00	1.70	0.39	1.48	1.32
9.50	2.03	0.58	1.81	2.01
10.00	3.46	1.60	3.22	**13.05**
10.50	3.91	1.97	3.68	2.50
11.00	4.18	2.19	3.95	1.67
11.50	4.40	2.38	4.16	1.42
12.00	4.59	2.54	4.35	1.25
12.50	4.76	2.68	4.52	1.13
13.00	4.91	2.82	4.68	1.02
13.50	5.05	2.93	4.81	0.90
14.00	5.17	3.04	4.93	0.79
14.50	5.28	3.13	5.04	0.75
15.00	5.38	3.23	5.14	0.73
15.50	5.48	3.32	5.25	0.70
16.00	5.58	3.41	5.35	0.68
16.50	5.68	3.49	5.44	0.66
17.00	5.77	3.57	5.53	0.64
17.50	5.86	3.65	5.62	0.62
18.00	5.95	3.73	5.71	0.59
18.50	6.03	3.81	5.79	0.57
19.00	6.11	3.88	5.87	0.55
19.50	6.18	3.95	5.94	0.52
20.00	6.25	4.01	6.02	0.50
20.50	6.32	4.07	6.08	0.48
21.00	6.39	4.13	6.15	0.45
21.50	6.45	4.19	6.21	0.43
22.00	6.51	4.24	6.27	0.41
22.50	6.56	4.29	6.33	0.38
23.00	6.62	4.34	6.38	0.36
23.50	6.66	4.39	6.43	0.34
24.00	**6.71**	**4.43**	**6.47**	0.31

Summary for Pond 3P: ADS Retention/Det

[85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 6.500 ac, 38.00% Impervious, Inflow Depth > 5.20" for 25 Yr event
Inflow = 23.15 cfs @ 9.98 hrs, Volume= 2.816 af
Outflow = 9.07 cfs @ 9.80 hrs, Volume= 2.821 af, Atten= 61%, Lag= 0.0 min
Primary = 9.07 cfs @ 9.80 hrs, Volume= 2.821 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 152.31' @ 10.20 hrs Surf.Area= 5,605 sf Storage= 11,316 cf

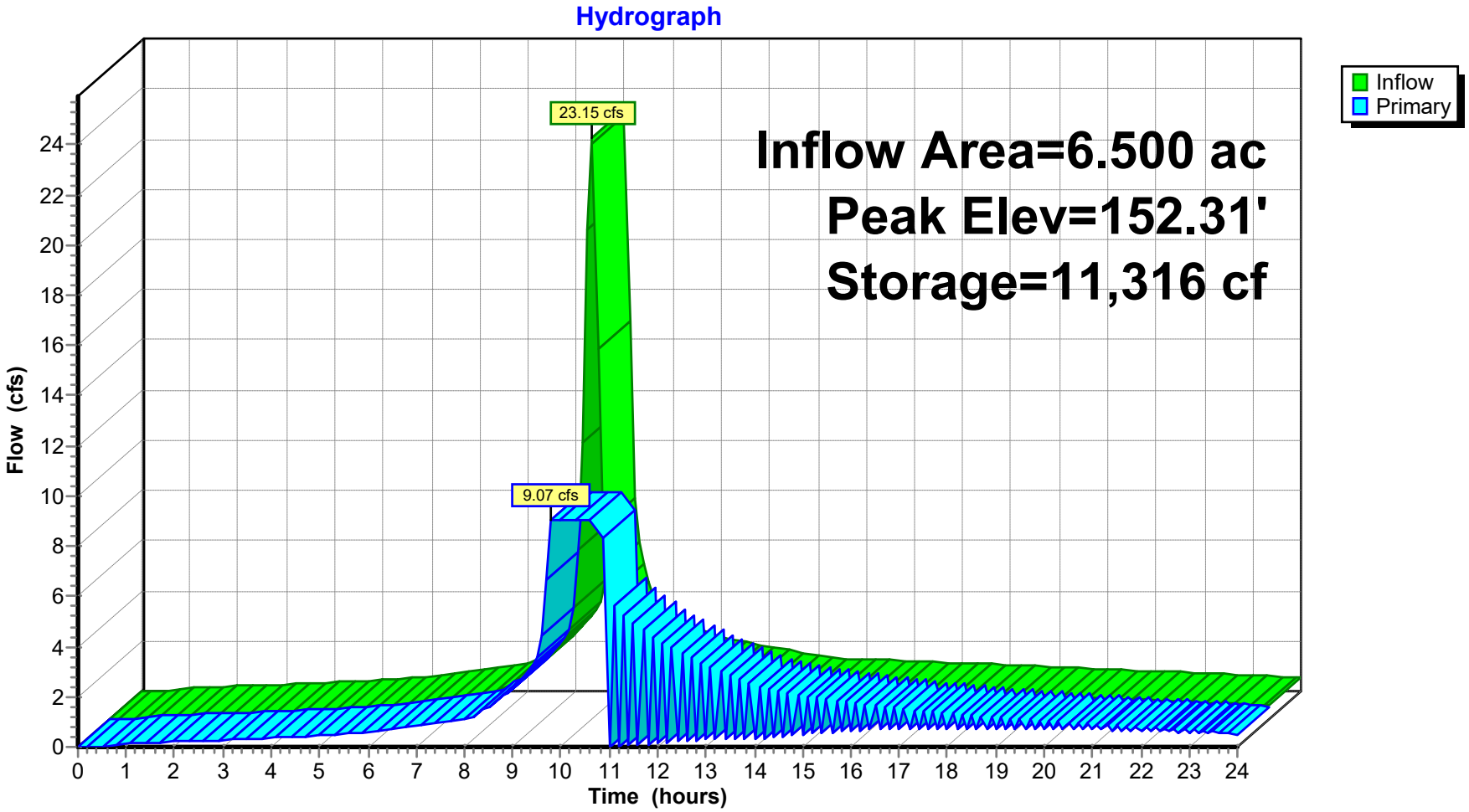
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 3.3 min (738.7 - 735.4)

Volume	Invert	Avail.Storage	Storage Description
#1	150.00'	28,025 cf	**228.0"W x 60.0"H x 295.0'L Pipe Storage S= 0.0020 '/'**

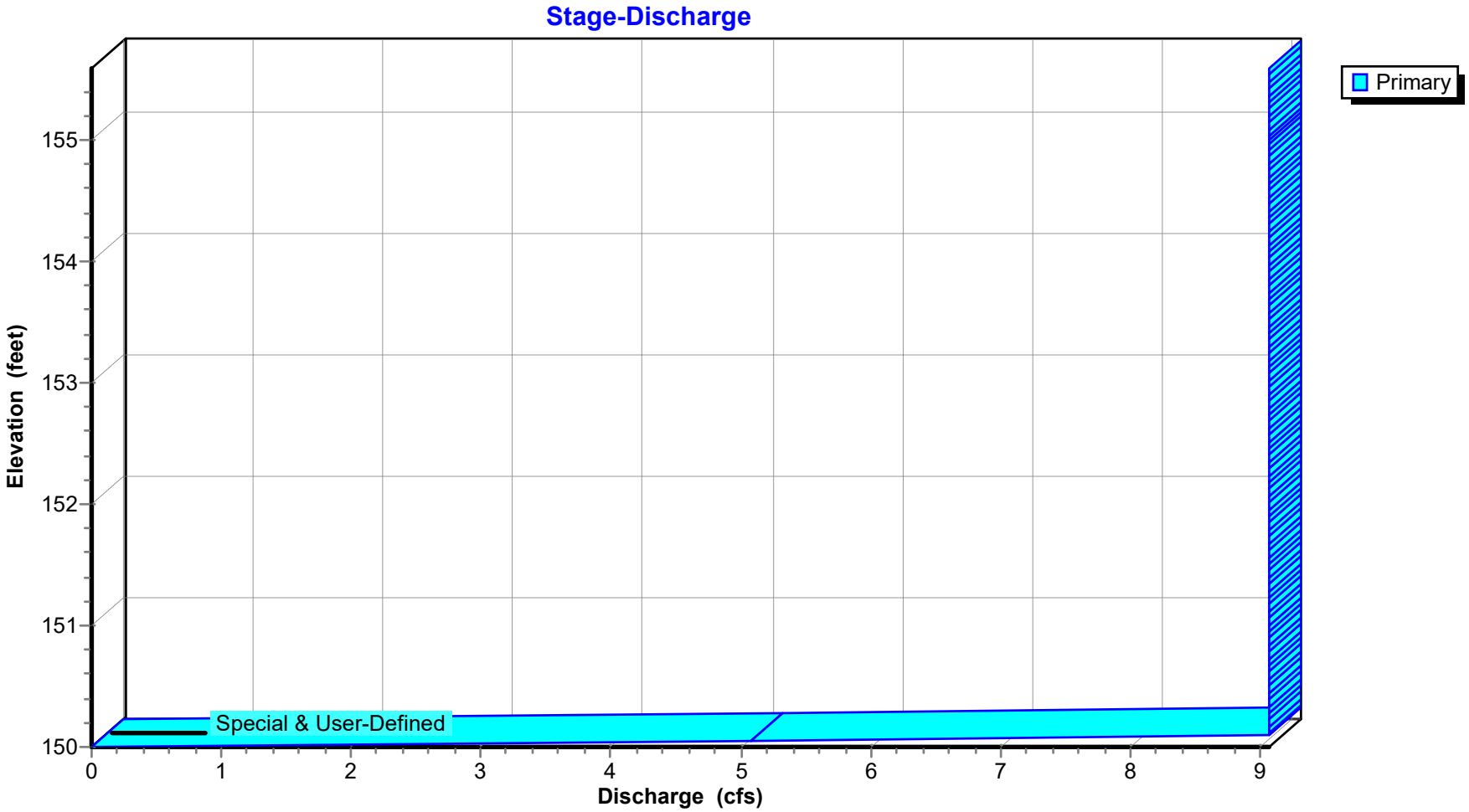
Device	Routing	Invert	Outlet Devices
#1	Primary	150.00'	**Special & User-Defined** Head (feet) 0.00 0.10 5.00 Disch. (cfs) 0.000 9.070 9.070

Primary OutFlow Max=9.07 cfs @ 9.80 hrs HW=150.29' (Free Discharge)
1=Special & User-Defined (Custom Controls 9.07 cfs)

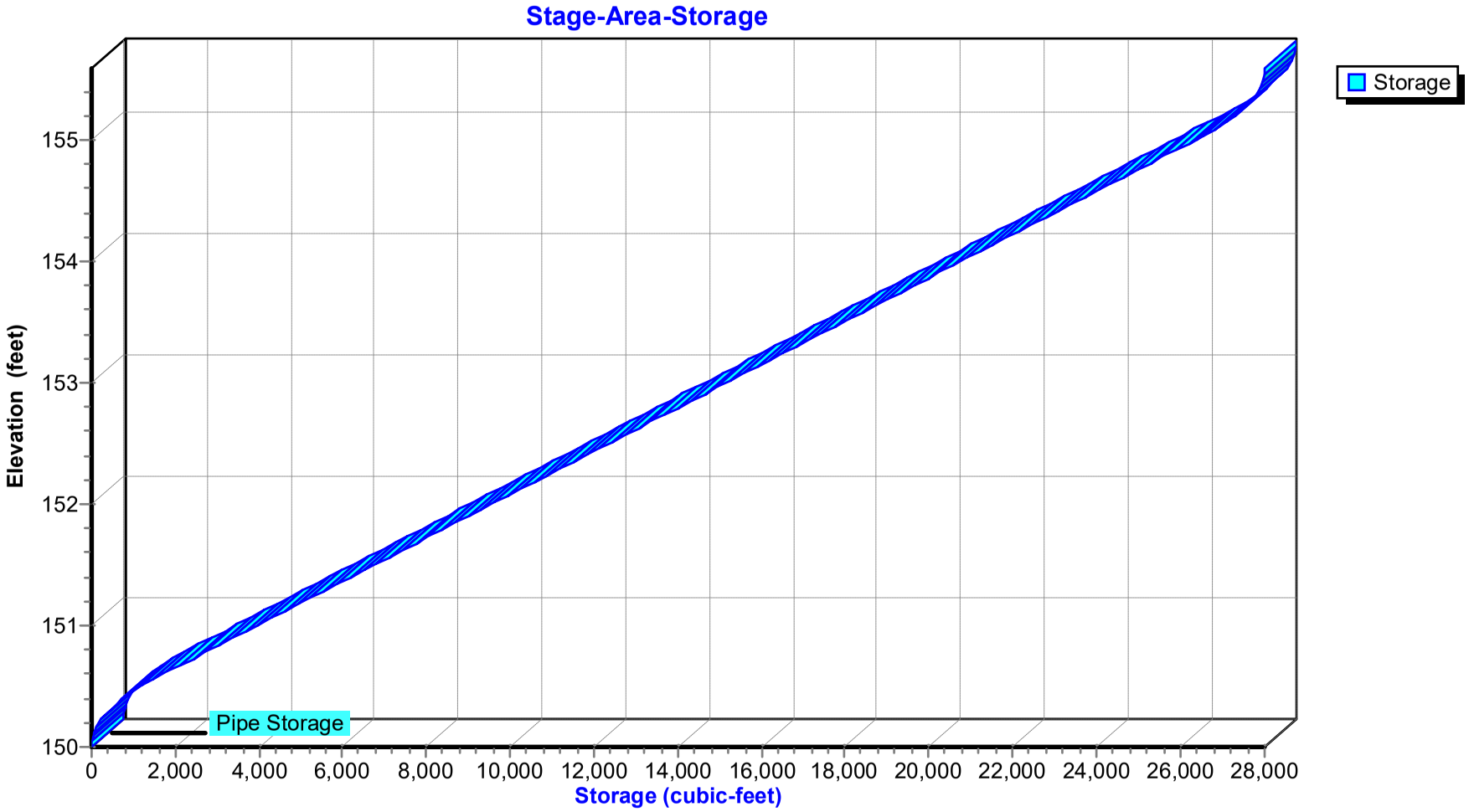
Pond 3P: ADS Retention/Det



Pond 3P: ADS Retention/Det



Pond 3P: ADS Retention/Det



Hydrograph for Pond 3P: ADS Retention/Det

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	150.00	0.00
0.50	0.01	0	150.00	0.01
1.00	0.12	0	150.00	0.12
1.50	0.18	1	150.00	0.18
2.00	0.21	1	150.00	0.21
2.50	0.25	1	150.00	0.25
3.00	0.28	1	150.00	0.28
3.50	0.32	1	150.00	0.32
4.00	0.35	1	150.00	0.35
4.50	0.40	1	150.00	0.40
5.00	0.46	1	150.01	0.45
5.50	0.51	1	150.01	0.51
6.00	0.56	2	150.01	0.56
6.50	0.69	2	150.01	0.69
7.00	0.87	3	150.01	0.87
7.50	0.99	3	150.01	0.99
8.00	1.09	3	150.01	1.09
8.50	1.62	5	150.02	1.61
9.00	2.32	7	150.03	2.32
9.50	3.53	10	150.04	**3.53**
10.00	**22.90**	**7,014**	**151.55**	**9.07**
10.50	4.39	**7,687**	**151.67**	9.07
11.00	2.93	0	150.00	0.00
11.50	2.50	14	150.05	4.93
12.00	2.20	0	150.00	0.13
12.50	1.98	11	150.04	3.73
13.00	1.78	1	150.00	0.29
13.50	1.59	8	150.03	2.85
14.00	1.39	1	150.00	0.31
14.50	1.31	7	150.02	2.23
15.00	1.27	1	150.01	0.50
15.50	1.24	6	150.02	1.90
16.00	1.20	2	150.01	0.64
16.50	1.16	5	150.02	1.64
17.00	1.12	2	150.01	0.71
17.50	1.08	4	150.02	1.43
18.00	1.04	2	150.01	0.75
18.50	1.00	4	150.01	1.25
19.00	0.96	2	150.01	0.75
19.50	0.92	3	150.01	1.10
20.00	0.88	2	150.01	0.73
20.50	0.84	3	150.01	0.97
21.00	0.80	2	150.01	0.69
21.50	0.76	2	150.01	0.85
22.00	0.72	2	150.01	0.64
22.50	0.68	2	150.01	0.74
23.00	0.63	2	150.01	0.58
23.50	0.59	2	150.01	0.64
24.00	0.55	1	150.01	0.51

Stage-Discharge for Pond 3P: ADS Retention/Det

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
150.00	0.00	151.40	9.07	152.80	9.07	154.20	9.07
150.04	3.63	151.44	9.07	152.84	9.07	154.24	9.07
150.08	7.26	151.48	9.07	152.88	9.07	154.28	9.07
150.12	**9.07**	151.52	9.07	152.92	9.07	154.32	9.07
150.16	9.07	151.56	9.07	152.96	9.07	154.36	9.07
150.20	9.07	151.60	9.07	153.00	9.07	154.40	9.07
150.24	9.07	151.64	9.07	153.04	9.07	154.44	9.07
150.28	9.07	151.68	9.07	153.08	9.07	154.48	9.07
150.32	9.07	151.72	9.07	153.12	9.07	154.52	9.07
150.36	9.07	151.76	9.07	153.16	9.07	154.56	9.07
150.40	9.07	151.80	9.07	153.20	9.07	154.60	9.07
150.44	9.07	151.84	9.07	153.24	9.07	154.64	9.07
150.48	9.07	151.88	9.07	153.28	9.07	154.68	9.07
150.52	9.07	151.92	9.07	153.32	9.07	154.72	9.07
150.56	9.07	151.96	9.07	153.36	9.07	154.76	9.07
150.60	9.07	152.00	9.07	153.40	9.07	154.80	9.07
150.64	9.07	152.04	9.07	153.44	9.07	154.84	9.07
150.68	9.07	152.08	9.07	153.48	9.07	154.88	9.07
150.72	9.07	152.12	9.07	153.52	9.07	154.92	9.07
150.76	9.07	152.16	9.07	153.56	9.07	154.96	9.07
150.80	9.07	152.20	9.07	153.60	9.07	155.00	9.07
150.84	9.07	152.24	9.07	153.64	9.07	155.04	9.07
150.88	9.07	152.28	9.07	153.68	9.07	155.08	9.07
150.92	9.07	152.32	9.07	153.72	9.07	155.12	9.07
150.96	9.07	152.36	9.07	153.76	9.07	155.16	9.07
151.00	9.07	152.40	9.07	153.80	9.07	155.20	9.07
151.04	9.07	152.44	9.07	153.84	9.07	155.24	9.07
151.08	9.07	152.48	9.07	153.88	9.07	155.28	9.07
151.12	9.07	152.52	9.07	153.92	9.07	155.32	9.07
151.16	9.07	152.56	9.07	153.96	9.07	155.36	9.07
151.20	9.07	152.60	9.07	154.00	9.07	155.40	9.07
151.24	9.07	152.64	9.07	154.04	9.07	155.44	9.07
151.28	9.07	152.68	9.07	154.08	9.07	155.48	9.07
151.32	9.07	152.72	9.07	154.12	9.07	155.52	9.07
151.36	9.07	152.76	9.07	154.16	9.07	155.56	9.07

Stage-Area-Storage for Pond 3P: ADS Retention/Det

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
150.00	0	151.40	6,194	152.80	14,041	154.20	21,888
150.04	8	151.44	6,418	152.84	14,265	154.24	22,112
150.08	30	151.48	6,642	152.88	14,489	154.28	22,336
150.12	68	151.52	6,866	152.92	14,713	154.32	22,560
150.16	122	151.56	7,090	152.96	14,937	154.36	22,784
150.20	190	151.60	7,315	153.00	15,162	154.40	23,009
150.24	274	151.64	7,539	153.04	15,386	154.44	23,233
150.28	372	151.68	7,763	153.08	15,610	154.48	23,457
150.32	486	151.72	7,987	153.12	15,834	154.52	23,681
150.36	616	151.76	8,211	153.16	16,058	154.56	23,905
150.40	760	151.80	8,436	153.20	16,283	154.60	24,130
150.44	920	151.84	8,660	153.24	16,507	154.64	24,354
150.48	1,094	151.88	8,884	153.28	16,731	154.68	24,578
150.52	1,284	151.92	9,108	153.32	16,955	154.72	24,802
150.56	1,490	151.96	9,332	153.36	17,179	154.76	25,026
150.60	1,710	152.00	9,557	153.40	17,404	154.80	25,251
150.64	1,934	152.04	9,781	153.44	17,628	154.84	25,475
150.68	2,158	152.08	10,005	153.48	17,852	154.88	25,699
150.72	2,382	152.12	10,229	153.52	18,076	154.92	25,923
150.76	2,606	152.16	10,453	153.56	18,300	154.96	26,147
150.80	2,831	152.20	10,678	153.60	18,525	155.00	26,372
150.84	3,055	152.24	10,902	153.64	18,749	155.04	26,588
150.88	3,279	152.28	11,126	153.68	18,973	155.08	26,790
150.92	3,503	152.32	11,350	153.72	19,197	155.12	26,976
150.96	3,727	152.36	11,574	153.76	19,421	155.16	27,147
151.00	3,952	152.40	11,799	153.80	19,646	155.20	27,303
151.04	4,176	152.44	12,023	153.84	19,870	155.24	27,443
151.08	4,400	152.48	12,247	153.88	20,094	155.28	27,569
151.12	4,624	152.52	12,471	153.92	20,318	155.32	27,679
151.16	4,848	152.56	12,695	153.96	20,542	155.36	27,774
151.20	5,073	152.60	12,920	154.00	20,767	155.40	27,854
151.24	5,297	152.64	13,144	154.04	20,991	155.44	27,918
151.28	5,521	152.68	13,368	154.08	21,215	155.48	27,968
151.32	5,745	152.72	13,592	154.12	21,439	155.52	28,002
151.36	5,969	152.76	13,816	154.16	21,663	155.56	**28,021**

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: A-1 (East CB) Runoff Area=2.800 ac 38.00% Impervious Runoff Depth>6.01"
Flow Length=955' Tc=4.3 min CN=80/98 Runoff=11.50 cfs 1.402 af

Subcatchment 2S: A-2 (West CB) Runoff Area=3.700 ac 38.00% Impervious Runoff Depth>6.01"
Flow Length=935' Tc=4.2 min CN=80/98 Runoff=15.26 cfs 1.852 af

Pond 3P: ADS Retention/Det Peak Elev=153.06' Storage=15,474 cf Inflow=26.77 cfs 3.254 af
Outflow=9.07 cfs 3.254 af

Total Runoff Area = 6.500 ac Runoff Volume = 3.254 af Average Runoff Depth = 6.01"
62.00% Pervious = 4.030 ac 38.00% Impervious = 2.470 ac

Summary for Subcatchment 1S: A-1 (East CB)

[49] Hint: Tc<2dt may require smaller dt

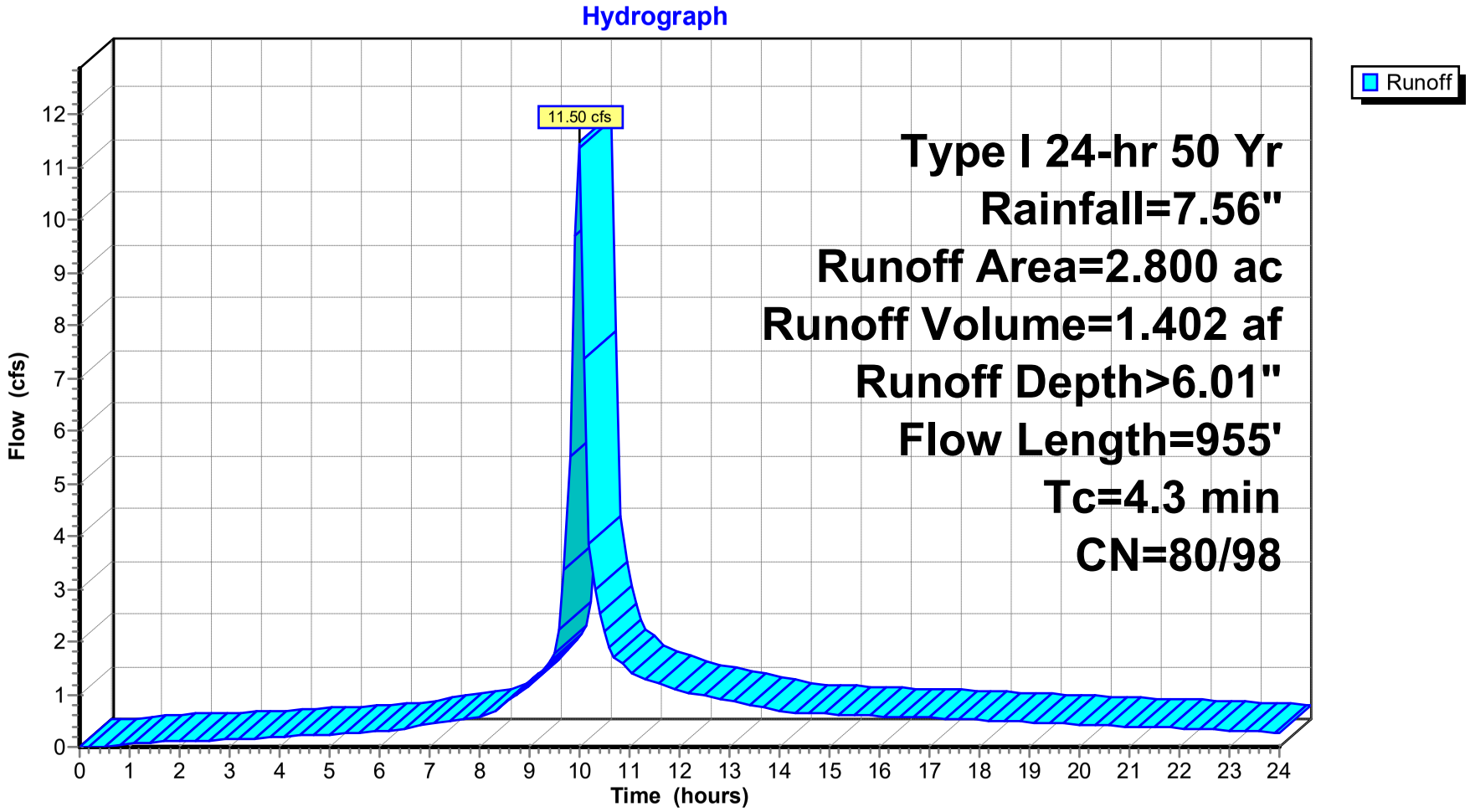
Runoff = 11.50 cfs @ 9.98 hrs, Volume= 1.402 af, Depth> 6.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 50 Yr Rainfall=7.56"

Area (ac)	CN	Description
2.800	87	1/4 acre lots, 38% imp, HSG D
1.736	80	62.00% Pervious Area
1.064	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	265	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	160	0.0500	4.54		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.8	315	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	215	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
4.3	955	Total			

Subcatchment 1S: A-1 (East CB)



Hydrograph for Subcatchment 1S: A-1 (East CB)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.07	0.00	0.00	0.01
1.00	0.13	0.00	0.03	0.07
1.50	0.20	0.00	0.07	0.09
2.00	0.26	0.00	0.12	0.11
2.50	0.33	0.00	0.17	0.12
3.00	0.41	0.00	0.24	0.14
3.50	0.49	0.00	0.31	0.16
4.00	0.57	0.00	0.39	0.18
4.50	0.66	0.01	0.47	0.21
5.00	0.76	0.02	0.56	0.24
5.50	0.85	0.04	0.65	0.27
6.00	0.95	0.07	0.74	0.29
6.50	1.05	0.10	0.84	0.36
7.00	1.18	0.15	0.97	0.45
7.50	1.32	0.20	1.10	0.51
8.00	1.47	0.27	1.25	0.56
8.50	1.66	0.37	1.43	0.82
9.00	1.92	0.51	1.70	1.18
9.50	2.29	0.75	2.06	1.78
10.00	3.89	1.95	3.66	**11.38**
10.50	4.41	2.38	4.17	2.18
11.00	4.71	2.64	4.47	1.45
11.50	4.96	2.85	4.72	1.23
12.00	5.17	3.04	4.93	1.08
12.50	5.36	3.21	5.12	0.97
13.00	5.53	3.36	5.30	0.88
13.50	5.69	3.50	5.45	0.78
14.00	5.82	3.62	5.58	0.68
14.50	5.94	3.73	5.71	0.65
15.00	6.06	3.84	5.82	0.63
15.50	6.18	3.94	5.94	0.61
16.00	6.29	4.04	6.05	0.59
16.50	6.40	4.14	6.16	0.57
17.00	6.50	4.24	6.26	0.55
17.50	6.60	4.33	6.36	0.53
18.00	6.70	4.42	6.46	0.51
18.50	6.79	4.50	6.55	0.49
19.00	6.88	4.58	6.64	0.47
19.50	6.96	4.66	6.73	0.45
20.00	7.05	4.74	6.81	0.43
20.50	7.12	4.81	6.88	0.41
21.00	7.20	4.88	6.96	0.39
21.50	7.27	4.94	7.03	0.37
22.00	7.33	5.00	7.09	0.35
22.50	7.40	5.06	7.16	0.33
23.00	7.45	5.12	7.21	0.31
23.50	7.51	5.17	7.27	0.29
24.00	**7.56**	**5.21**	**7.32**	0.27

Summary for Subcatchment 2S: A-2 (West CB)

[49] Hint: Tc<2dt may require smaller dt

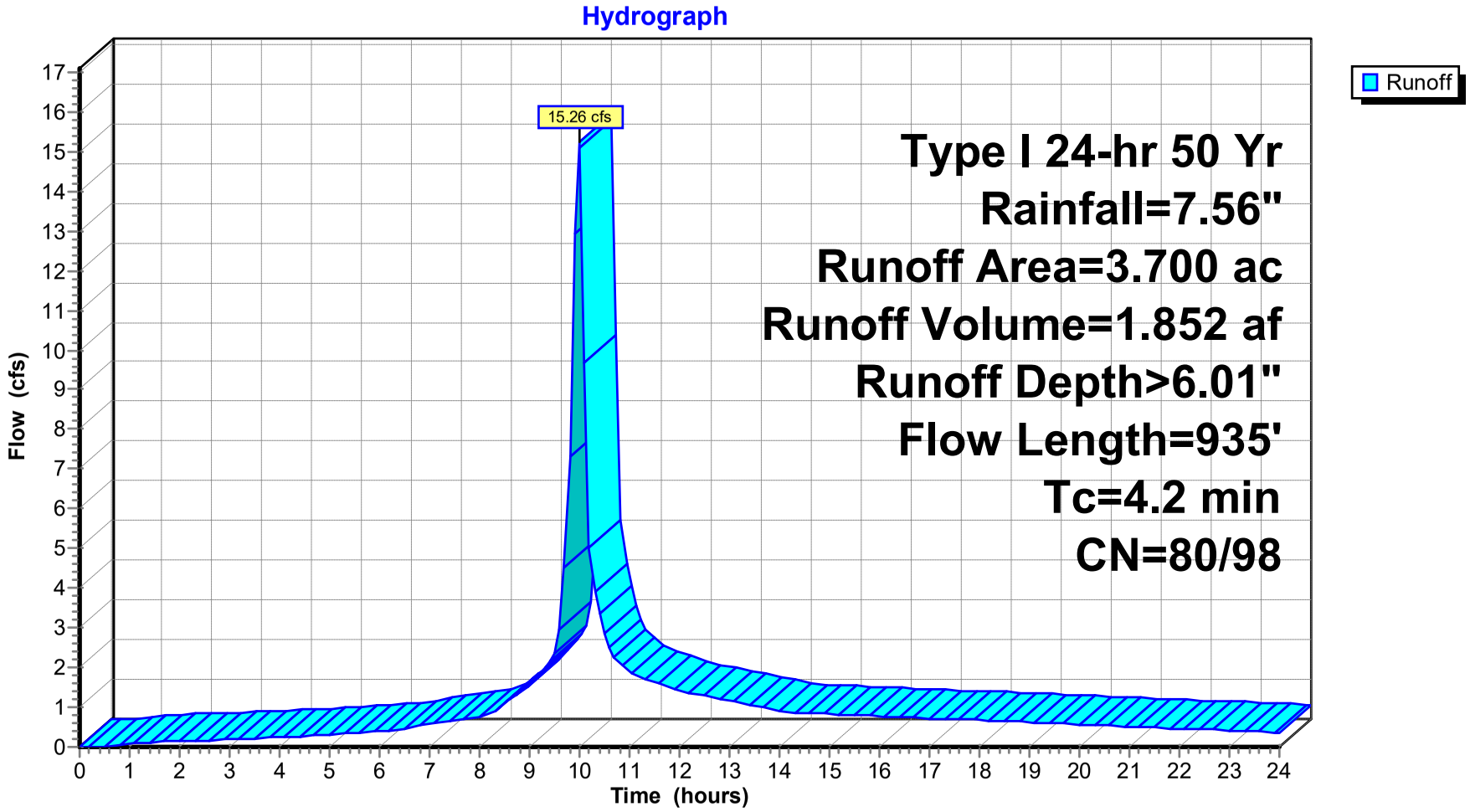
Runoff = 15.26 cfs @ 9.98 hrs, Volume= 1.852 af, Depth> 6.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 50 Yr Rainfall=7.56"

Area (ac)	CN	Description
3.700	87	1/4 acre lots, 38% imp, HSG D
2.294	80	62.00% Pervious Area
1.406	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	260	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	155	0.0500	4.54		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.8	310	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	210	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
4.2	935	Total			

Subcatchment 2S: A-2 (West CB)



Hydrograph for Subcatchment 2S: A-2 (West CB)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.07	0.00	0.00	0.02
1.00	0.13	0.00	0.03	0.09
1.50	0.20	0.00	0.07	0.12
2.00	0.26	0.00	0.12	0.14
2.50	0.33	0.00	0.17	0.16
3.00	0.41	0.00	0.24	0.19
3.50	0.49	0.00	0.31	0.21
4.00	0.57	0.00	0.39	0.24
4.50	0.66	0.01	0.47	0.28
5.00	0.76	0.02	0.56	0.32
5.50	0.85	0.04	0.65	0.35
6.00	0.95	0.07	0.74	0.38
6.50	1.05	0.10	0.84	0.47
7.00	1.18	0.15	0.97	0.59
7.50	1.32	0.20	1.10	0.67
8.00	1.47	0.27	1.25	0.74
8.50	1.66	0.37	1.43	1.09
9.00	1.92	0.51	1.70	1.55
9.50	2.29	0.75	2.06	2.36
10.00	3.89	1.95	3.66	**15.09**
10.50	4.41	2.38	4.17	2.87
11.00	4.71	2.64	4.47	1.91
11.50	4.96	2.85	4.72	1.63
12.00	5.17	3.04	4.93	1.43
12.50	5.36	3.21	5.12	1.29
13.00	5.53	3.36	5.30	1.16
13.50	5.69	3.50	5.45	1.03
14.00	5.82	3.62	5.58	0.90
14.50	5.94	3.73	5.71	0.85
15.00	6.06	3.84	5.82	0.83
15.50	6.18	3.94	5.94	0.80
16.00	6.29	4.04	6.05	0.78
16.50	6.40	4.14	6.16	0.75
17.00	6.50	4.24	6.26	0.73
17.50	6.60	4.33	6.36	0.70
18.00	6.70	4.42	6.46	0.68
18.50	6.79	4.50	6.55	0.65
19.00	6.88	4.58	6.64	0.62
19.50	6.96	4.66	6.73	0.60
20.00	7.05	4.74	6.81	0.57
20.50	7.12	4.81	6.88	0.54
21.00	7.20	4.88	6.96	0.52
21.50	7.27	4.94	7.03	0.49
22.00	7.33	5.00	7.09	0.46
22.50	7.40	5.06	7.16	0.44
23.00	7.45	5.12	7.21	0.41
23.50	7.51	5.17	7.27	0.38
24.00	**7.56**	**5.21**	**7.32**	0.36

Summary for Pond 3P: ADS Retention/Det

[85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 6.500 ac, 38.00% Impervious, Inflow Depth > 6.01" for 50 Yr event
Inflow = 26.77 cfs @ 9.98 hrs, Volume= 3.254 af
Outflow = 9.07 cfs @ 9.80 hrs, Volume= 3.254 af, Atten= 66%, Lag= 0.0 min
Primary = 9.07 cfs @ 9.80 hrs, Volume= 3.254 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 153.06' @ 10.23 hrs Surf.Area= 5,605 sf Storage= 15,474 cf

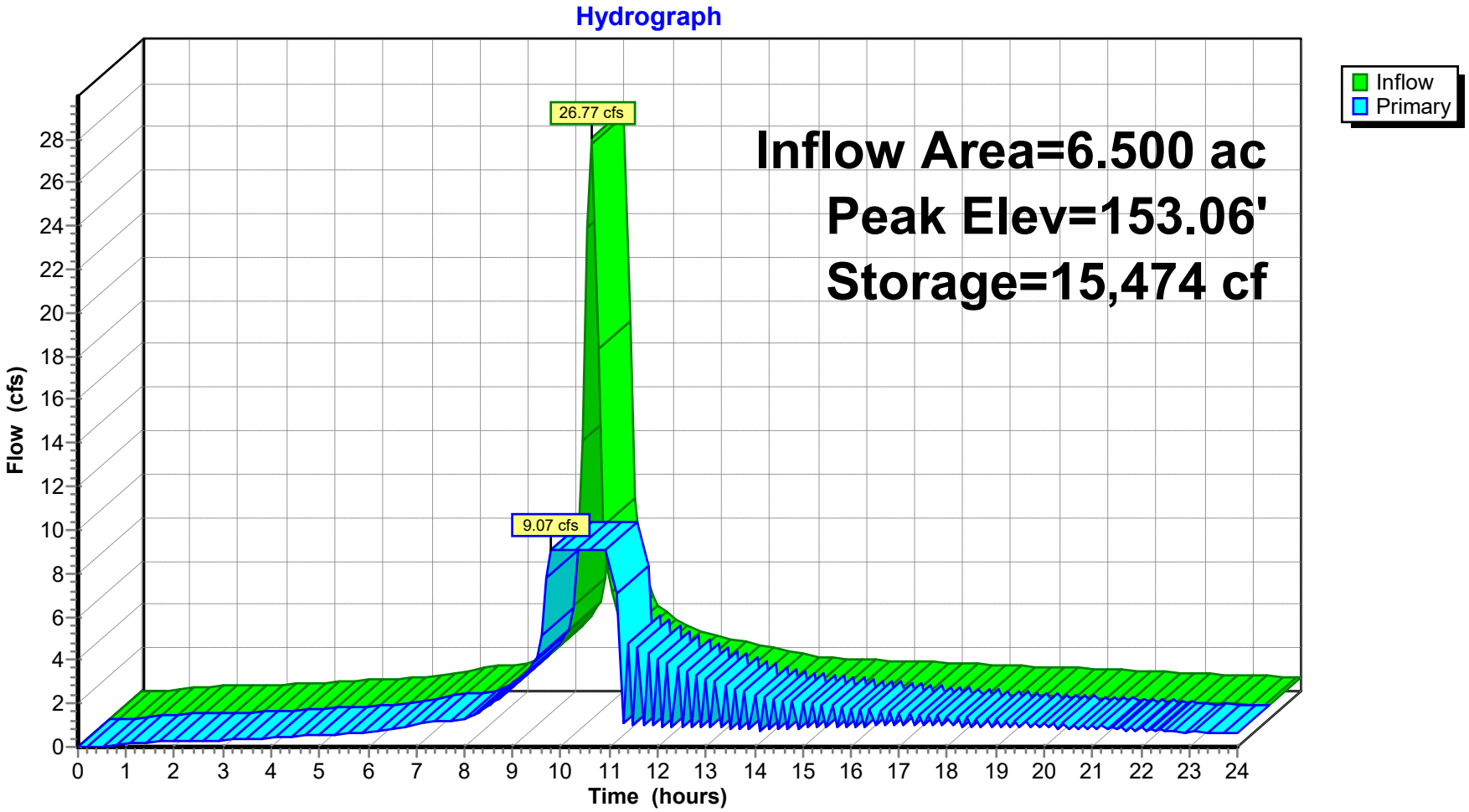
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 5.3 min (737.0 - 731.7)

Volume	Invert	Avail.Storage	Storage Description
#1	150.00'	28,025 cf	**228.0"W x 60.0"H x 295.0'L Pipe Storage S= 0.0020 '/'**

Device	Routing	Invert	Outlet Devices
#1	Primary	150.00'	**Special & User-Defined** Head (feet) 0.00 0.10 5.00 Disch. (cfs) 0.000 9.070 9.070

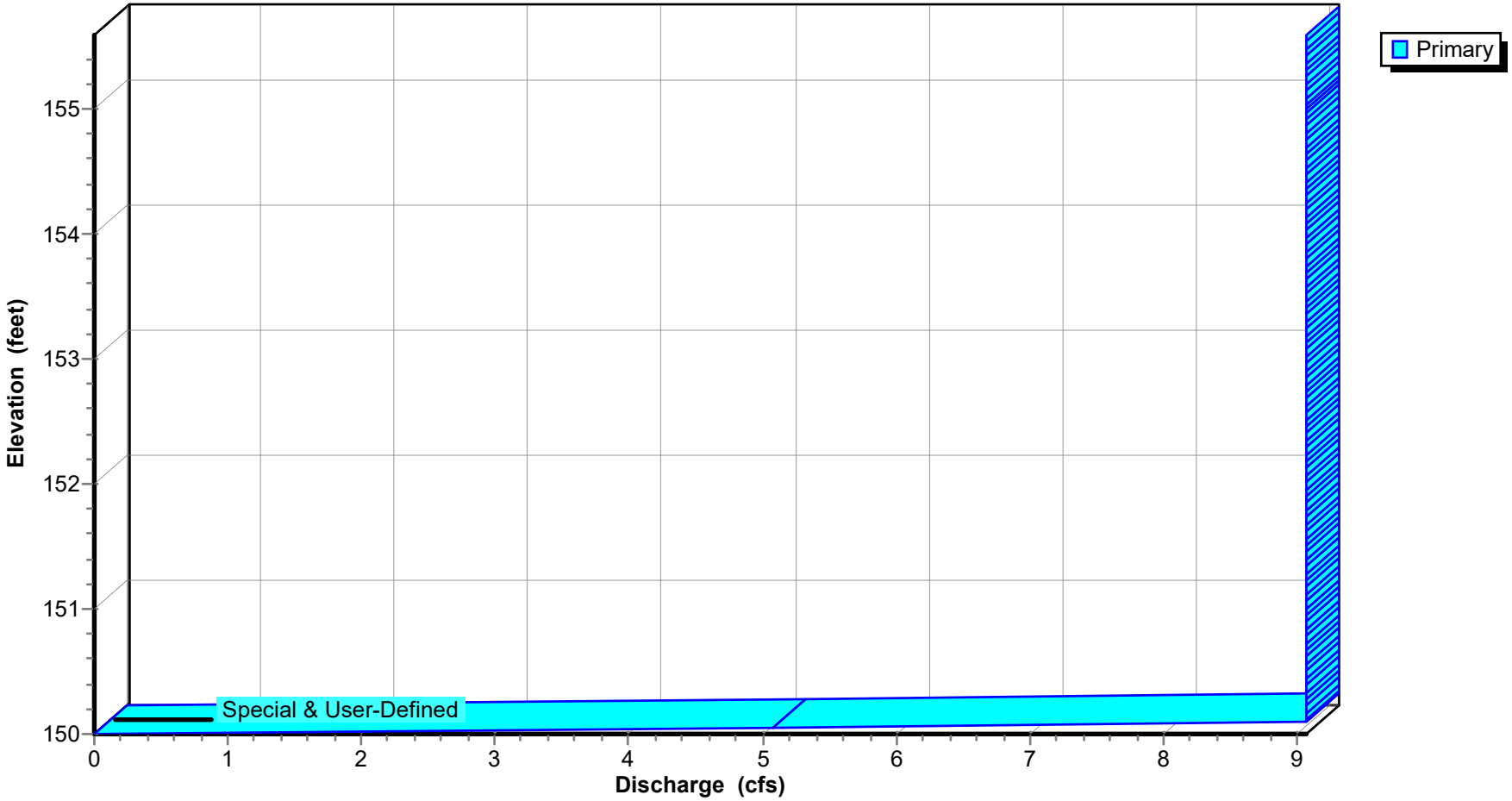
Primary OutFlow Max=9.07 cfs @ 9.80 hrs HW=150.39' (Free Discharge)
1=Special & User-Defined (Custom Controls 9.07 cfs)

Pond 3P: ADS Retention/Det

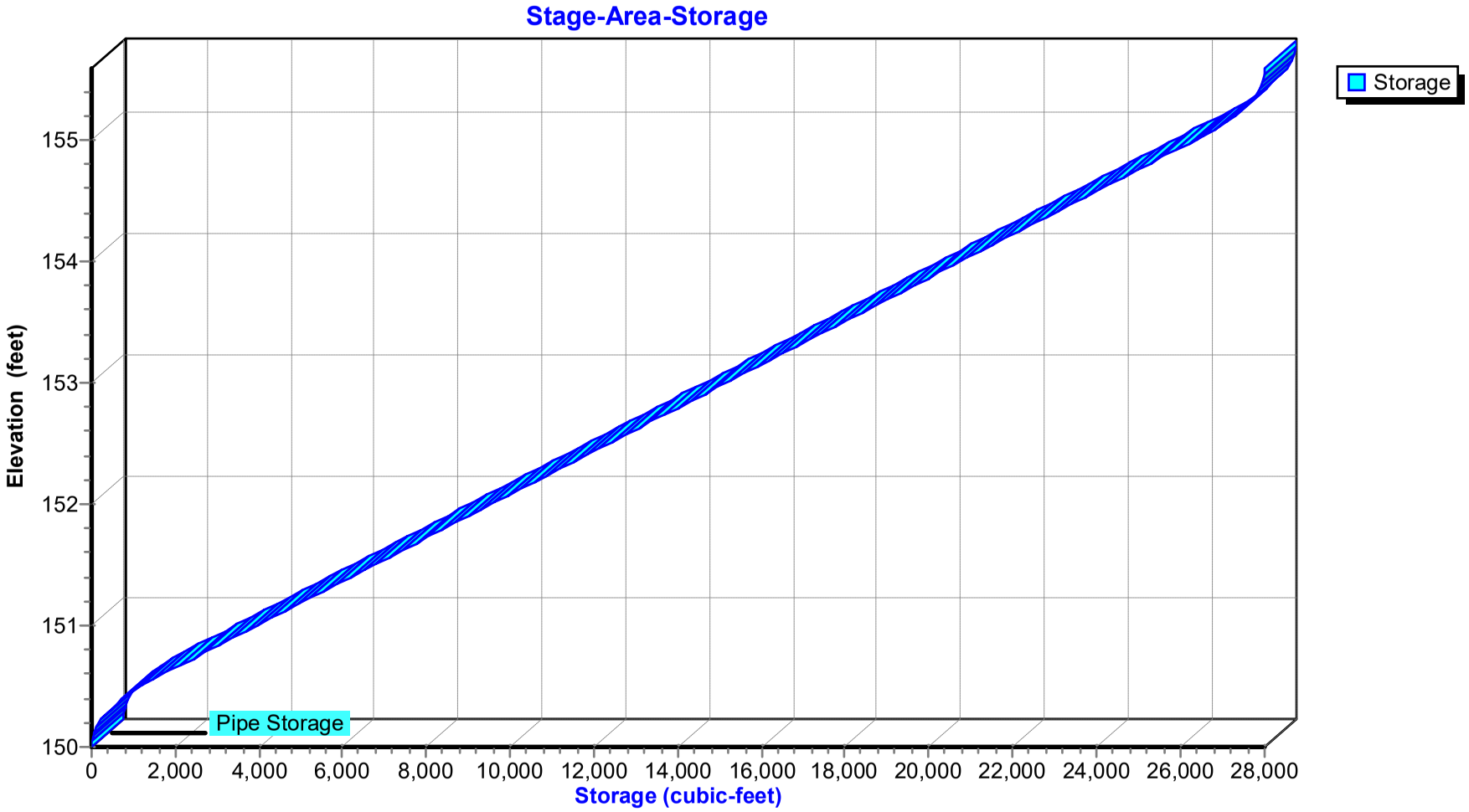


Pond 3P: ADS Retention/Det

Stage-Discharge



Pond 3P: ADS Retention/Det



Hydrograph for Pond 3P: ADS Retention/Det

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	150.00	0.00
0.50	0.03	0	150.00	0.03
1.00	0.15	0	150.00	0.15
1.50	0.21	1	150.00	0.21
2.00	0.25	1	150.00	0.25
2.50	0.29	1	150.00	0.29
3.00	0.33	1	150.00	0.33
3.50	0.36	1	150.00	0.36
4.00	0.43	1	150.00	0.43
4.50	0.50	1	150.01	0.50
5.00	0.56	2	150.01	0.56
5.50	0.62	2	150.01	0.62
6.00	0.67	2	150.01	0.67
6.50	0.83	2	150.01	0.83
7.00	1.04	3	150.01	1.04
7.50	1.18	3	150.01	1.18
8.00	1.29	4	150.01	1.29
8.50	1.91	6	150.02	1.91
9.00	2.73	8	150.03	2.73
9.50	4.14	12	150.05	**4.13**
10.00	**26.47**	**9,440**	**151.98**	**9.07**
10.50	5.04	**12,704**	**152.56**	9.07
11.00	3.36	3,521	150.92	9.07
11.50	2.86	3	150.01	1.05
12.00	2.51	12	150.04	4.05
12.50	2.26	3	150.01	0.95
13.00	2.04	9	150.03	3.15
13.50	1.81	3	150.01	0.87
14.00	1.59	7	150.03	2.39
14.50	1.50	2	150.01	0.81
15.00	1.45	6	150.02	2.04
15.50	1.41	3	150.01	0.92
16.00	1.37	5	150.02	1.79
16.50	1.32	3	150.01	0.96
17.00	1.28	5	150.02	1.58
17.50	1.23	3	150.01	0.97
18.00	1.19	4	150.02	1.40
18.50	1.14	3	150.01	0.95
19.00	1.09	4	150.01	1.25
19.50	1.05	3	150.01	0.91
20.00	1.00	3	150.01	1.12
20.50	0.96	3	150.01	0.86
21.00	0.91	3	150.01	0.99
21.50	0.86	2	150.01	0.79
22.00	0.82	3	150.01	0.88
22.50	0.77	2	150.01	0.72
23.00	0.72	2	150.01	0.77
23.50	0.68	2	150.01	0.64
24.00	0.63	2	150.01	0.66

Stage-Discharge for Pond 3P: ADS Retention/Det

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
150.00	0.00	151.40	9.07	152.80	9.07	154.20	9.07
150.04	3.63	151.44	9.07	152.84	9.07	154.24	9.07
150.08	7.26	151.48	9.07	152.88	9.07	154.28	9.07
150.12	**9.07**	151.52	9.07	152.92	9.07	154.32	9.07
150.16	9.07	151.56	9.07	152.96	9.07	154.36	9.07
150.20	9.07	151.60	9.07	153.00	9.07	154.40	9.07
150.24	9.07	151.64	9.07	153.04	9.07	154.44	9.07
150.28	9.07	151.68	9.07	153.08	9.07	154.48	9.07
150.32	9.07	151.72	9.07	153.12	9.07	154.52	9.07
150.36	9.07	151.76	9.07	153.16	9.07	154.56	9.07
150.40	9.07	151.80	9.07	153.20	9.07	154.60	9.07
150.44	9.07	151.84	9.07	153.24	9.07	154.64	9.07
150.48	9.07	151.88	9.07	153.28	9.07	154.68	9.07
150.52	9.07	151.92	9.07	153.32	9.07	154.72	9.07
150.56	9.07	151.96	9.07	153.36	9.07	154.76	9.07
150.60	9.07	152.00	9.07	153.40	9.07	154.80	9.07
150.64	9.07	152.04	9.07	153.44	9.07	154.84	9.07
150.68	9.07	152.08	9.07	153.48	9.07	154.88	9.07
150.72	9.07	152.12	9.07	153.52	9.07	154.92	9.07
150.76	9.07	152.16	9.07	153.56	9.07	154.96	9.07
150.80	9.07	152.20	9.07	153.60	9.07	155.00	9.07
150.84	9.07	152.24	9.07	153.64	9.07	155.04	9.07
150.88	9.07	152.28	9.07	153.68	9.07	155.08	9.07
150.92	9.07	152.32	9.07	153.72	9.07	155.12	9.07
150.96	9.07	152.36	9.07	153.76	9.07	155.16	9.07
151.00	9.07	152.40	9.07	153.80	9.07	155.20	9.07
151.04	9.07	152.44	9.07	153.84	9.07	155.24	9.07
151.08	9.07	152.48	9.07	153.88	9.07	155.28	9.07
151.12	9.07	152.52	9.07	153.92	9.07	155.32	9.07
151.16	9.07	152.56	9.07	153.96	9.07	155.36	9.07
151.20	9.07	152.60	9.07	154.00	9.07	155.40	9.07
151.24	9.07	152.64	9.07	154.04	9.07	155.44	9.07
151.28	9.07	152.68	9.07	154.08	9.07	155.48	9.07
151.32	9.07	152.72	9.07	154.12	9.07	155.52	9.07
151.36	9.07	152.76	9.07	154.16	9.07	155.56	9.07

Stage-Area-Storage for Pond 3P: ADS Retention/Det

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
150.00	0	151.40	6,194	152.80	14,041	154.20	21,888
150.04	8	151.44	6,418	152.84	14,265	154.24	22,112
150.08	30	151.48	6,642	152.88	14,489	154.28	22,336
150.12	68	151.52	6,866	152.92	14,713	154.32	22,560
150.16	122	151.56	7,090	152.96	14,937	154.36	22,784
150.20	190	151.60	7,315	153.00	15,162	154.40	23,009
150.24	274	151.64	7,539	153.04	15,386	154.44	23,233
150.28	372	151.68	7,763	153.08	15,610	154.48	23,457
150.32	486	151.72	7,987	153.12	15,834	154.52	23,681
150.36	616	151.76	8,211	153.16	16,058	154.56	23,905
150.40	760	151.80	8,436	153.20	16,283	154.60	24,130
150.44	920	151.84	8,660	153.24	16,507	154.64	24,354
150.48	1,094	151.88	8,884	153.28	16,731	154.68	24,578
150.52	1,284	151.92	9,108	153.32	16,955	154.72	24,802
150.56	1,490	151.96	9,332	153.36	17,179	154.76	25,026
150.60	1,710	152.00	9,557	153.40	17,404	154.80	25,251
150.64	1,934	152.04	9,781	153.44	17,628	154.84	25,475
150.68	2,158	152.08	10,005	153.48	17,852	154.88	25,699
150.72	2,382	152.12	10,229	153.52	18,076	154.92	25,923
150.76	2,606	152.16	10,453	153.56	18,300	154.96	26,147
150.80	2,831	152.20	10,678	153.60	18,525	155.00	26,372
150.84	3,055	152.24	10,902	153.64	18,749	155.04	26,588
150.88	3,279	152.28	11,126	153.68	18,973	155.08	26,790
150.92	3,503	152.32	11,350	153.72	19,197	155.12	26,976
150.96	3,727	152.36	11,574	153.76	19,421	155.16	27,147
151.00	3,952	152.40	11,799	153.80	19,646	155.20	27,303
151.04	4,176	152.44	12,023	153.84	19,870	155.24	27,443
151.08	4,400	152.48	12,247	153.88	20,094	155.28	27,569
151.12	4,624	152.52	12,471	153.92	20,318	155.32	27,679
151.16	4,848	152.56	12,695	153.96	20,542	155.36	27,774
151.20	5,073	152.60	12,920	154.00	20,767	155.40	27,854
151.24	5,297	152.64	13,144	154.04	20,991	155.44	27,918
151.28	5,521	152.68	13,368	154.08	21,215	155.48	27,968
151.32	5,745	152.72	13,592	154.12	21,439	155.52	28,002
151.36	5,969	152.76	13,816	154.16	21,663	155.56	**28,021**

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: A-1 (East CB) Runoff Area=2.800 ac 38.00% Impervious Runoff Depth>6.79"
Flow Length=955' Tc=4.3 min CN=80/98 Runoff=13.01 cfs 1.585 af

Subcatchment 2S: A-2 (West CB) Runoff Area=3.700 ac 38.00% Impervious Runoff Depth>6.79"
Flow Length=935' Tc=4.2 min CN=80/98 Runoff=17.26 cfs 2.095 af

Pond 3P: ADS Retention/Det Peak Elev=153.79' Storage=19,589 cf Inflow=30.26 cfs 3.680 af
Outflow=9.07 cfs 3.680 af

Total Runoff Area = 6.500 ac Runoff Volume = 3.680 af Average Runoff Depth = 6.79"
62.00% Pervious = 4.030 ac 38.00% Impervious = 2.470 ac

Summary for Subcatchment 1S: A-1 (East CB)

[49] Hint: Tc<2dt may require smaller dt

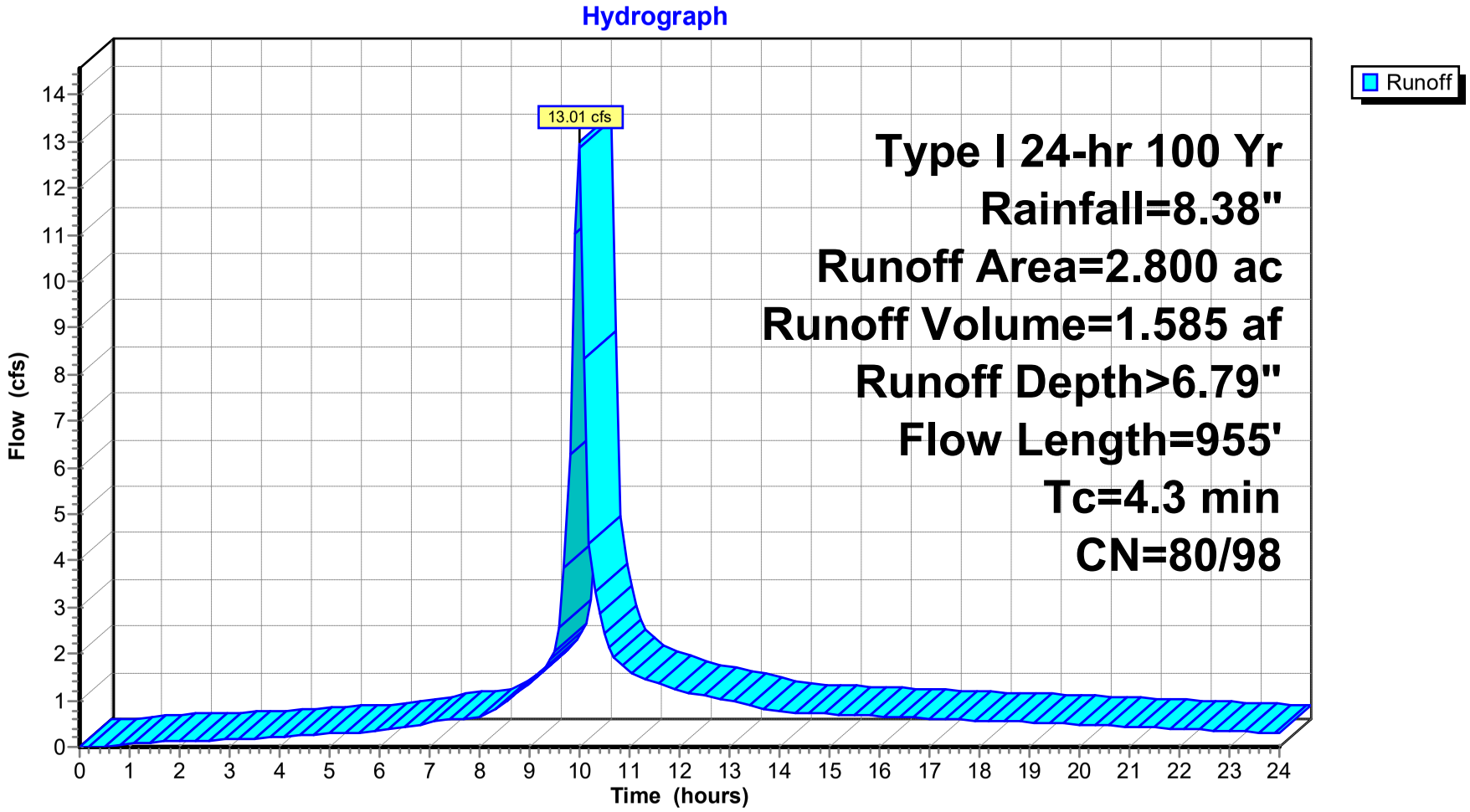
Runoff = 13.01 cfs @ 9.98 hrs, Volume= 1.585 af, Depth> 6.79"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 100 Yr Rainfall=8.38"

Area (ac)	CN	Description
2.800	87	1/4 acre lots, 38% imp, HSG D
1.736	80	62.00% Pervious Area
1.064	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	265	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	160	0.0500	4.54		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.8	315	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	215	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
4.3	955	Total			

Subcatchment 1S: A-1 (East CB)



Hydrograph for Subcatchment 1S: A-1 (East CB)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.07	0.00	0.00	0.02
1.00	0.15	0.00	0.04	0.08
1.50	0.22	0.00	0.08	0.11
2.00	0.29	0.00	0.14	0.12
2.50	0.37	0.00	0.20	0.14
3.00	0.45	0.00	0.28	0.16
3.50	0.54	0.00	0.36	0.18
4.00	0.64	0.01	0.44	0.22
4.50	0.74	0.02	0.54	0.25
5.00	0.84	0.04	0.63	0.28
5.50	0.94	0.07	0.73	0.31
6.00	1.05	0.10	0.84	0.34
6.50	1.17	0.14	0.95	0.42
7.00	1.31	0.20	1.09	0.52
7.50	1.46	0.27	1.24	0.59
8.00	1.63	0.35	1.40	0.64
8.50	1.84	0.46	1.61	0.95
9.00	2.13	0.64	1.90	1.35
9.50	2.54	0.92	2.31	2.03
10.00	4.32	2.31	4.08	**12.87**
10.50	4.89	2.79	4.65	2.45
11.00	5.22	3.09	4.98	1.62
11.50	5.49	3.33	5.26	1.38
12.00	5.73	3.54	5.49	1.21
12.50	5.94	3.73	5.71	1.09
13.00	6.13	3.90	5.90	0.98
13.50	6.30	4.06	6.07	0.87
14.00	6.45	4.19	6.21	0.76
14.50	6.59	4.32	6.35	0.72
15.00	6.72	4.44	6.48	0.70
15.50	6.85	4.55	6.61	0.68
16.00	6.97	4.67	6.73	0.66
16.50	7.09	4.78	6.85	0.64
17.00	7.21	4.89	6.97	0.61
17.50	7.32	4.99	7.08	0.59
18.00	7.42	5.09	7.19	0.57
18.50	7.53	5.18	7.29	0.55
19.00	7.63	5.28	7.39	0.53
19.50	7.72	5.36	7.48	0.50
20.00	7.81	5.45	7.57	0.48
20.50	7.90	5.53	7.66	0.46
21.00	7.98	5.60	7.74	0.44
21.50	8.06	5.68	7.82	0.41
22.00	8.13	5.75	7.89	0.39
22.50	8.20	5.81	7.96	0.37
23.00	8.26	5.87	8.02	0.35
23.50	8.32	5.93	8.08	0.32
24.00	**8.38**	**5.98**	**8.14**	0.30

Summary for Subcatchment 2S: A-2 (West CB)

[49] Hint: Tc<2dt may require smaller dt

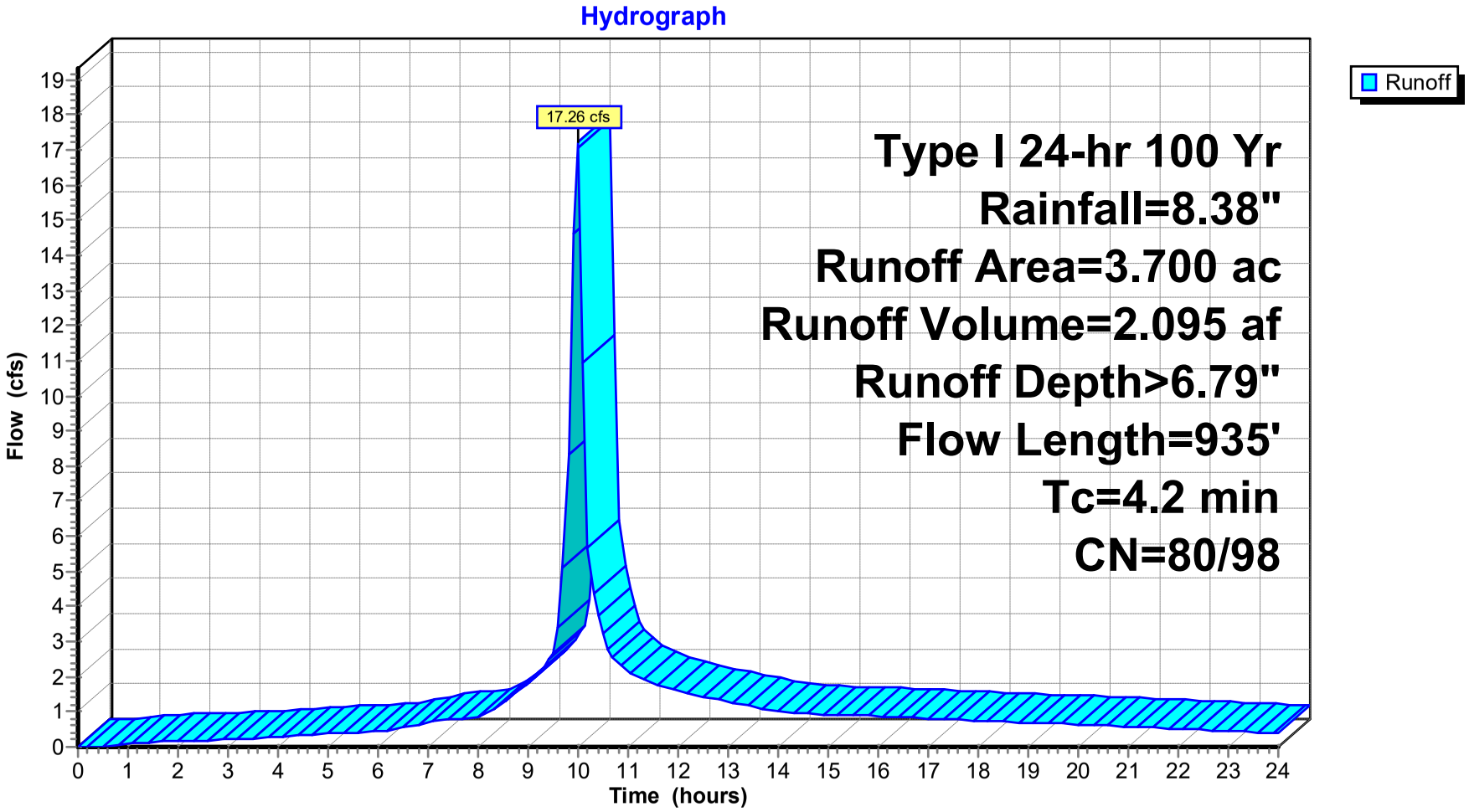
Runoff = 17.26 cfs @ 9.98 hrs, Volume= 2.095 af, Depth> 6.79"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 100 Yr Rainfall=8.38"

Area (ac)	CN	Description
3.700	87	1/4 acre lots, 38% imp, HSG D
2.294	80	62.00% Pervious Area
1.406	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	260	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	155	0.0500	4.54		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.8	310	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	210	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
4.2	935	Total			

Subcatchment 2S: A-2 (West CB)



Hydrograph for Subcatchment 2S: A-2 (West CB)

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.07	0.00	0.00	0.03
1.00	0.15	0.00	0.04	0.11
1.50	0.22	0.00	0.08	0.14
2.00	0.29	0.00	0.14	0.16
2.50	0.37	0.00	0.20	0.19
3.00	0.45	0.00	0.28	0.21
3.50	0.54	0.00	0.36	0.24
4.00	0.64	0.01	0.44	0.29
4.50	0.74	0.02	0.54	0.34
5.00	0.84	0.04	0.63	0.38
5.50	0.94	0.07	0.73	0.41
6.00	1.05	0.10	0.84	0.45
6.50	1.17	0.14	0.95	0.55
7.00	1.31	0.20	1.09	0.69
7.50	1.46	0.27	1.24	0.78
8.00	1.63	0.35	1.40	0.85
8.50	1.84	0.46	1.61	1.26
9.00	2.13	0.64	1.90	1.78
9.50	2.54	0.92	2.31	2.69
10.00	4.32	2.31	4.08	**17.05**
10.50	4.89	2.79	4.65	3.22
11.00	5.22	3.09	4.98	2.14
11.50	5.49	3.33	5.26	1.83
12.00	5.73	3.54	5.49	1.60
12.50	5.94	3.73	5.71	1.44
13.00	6.13	3.90	5.90	1.30
13.50	6.30	4.06	6.07	1.16
14.00	6.45	4.19	6.21	1.01
14.50	6.59	4.32	6.35	0.95
15.00	6.72	4.44	6.48	0.93
15.50	6.85	4.55	6.61	0.90
16.00	6.97	4.67	6.73	0.87
16.50	7.09	4.78	6.85	0.84
17.00	7.21	4.89	6.97	0.81
17.50	7.32	4.99	7.08	0.78
18.00	7.42	5.09	7.19	0.75
18.50	7.53	5.18	7.29	0.73
19.00	7.63	5.28	7.39	0.70
19.50	7.72	5.36	7.48	0.67
20.00	7.81	5.45	7.57	0.64
20.50	7.90	5.53	7.66	0.61
21.00	7.98	5.60	7.74	0.58
21.50	8.06	5.68	7.82	0.55
22.00	8.13	5.75	7.89	0.52
22.50	8.20	5.81	7.96	0.49
23.00	8.26	5.87	8.02	0.46
23.50	8.32	5.93	8.08	0.43
24.00	**8.38**	**5.98**	**8.14**	0.40

Summary for Pond 3P: ADS Retention/Det

[85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 6.500 ac, 38.00% Impervious, Inflow Depth > 6.79" for 100 Yr event
Inflow = 30.26 cfs @ 9.98 hrs, Volume= 3.680 af
Outflow = 9.07 cfs @ 9.80 hrs, Volume= 3.680 af, Atten= 70%, Lag= 0.0 min
Primary = 9.07 cfs @ 9.80 hrs, Volume= 3.680 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 153.79' @ 10.25 hrs Surf.Area= 5,605 sf Storage= 19,589 cf

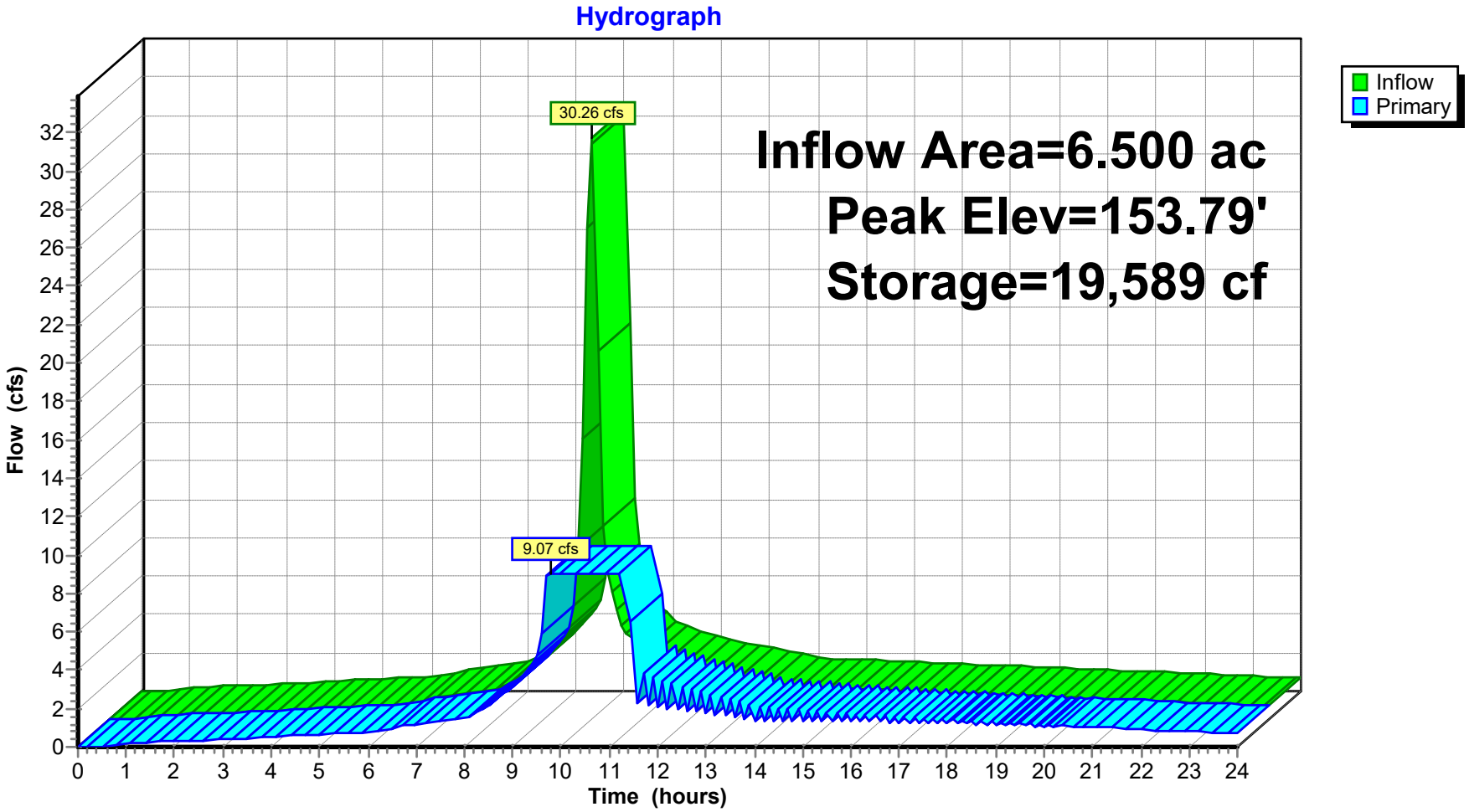
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 7.2 min (735.8 - 728.7)

Volume	Invert	Avail.Storage	Storage Description
#1	150.00'	28,025 cf	**228.0"W x 60.0"H x 295.0'L Pipe Storage S= 0.0020 '/'**

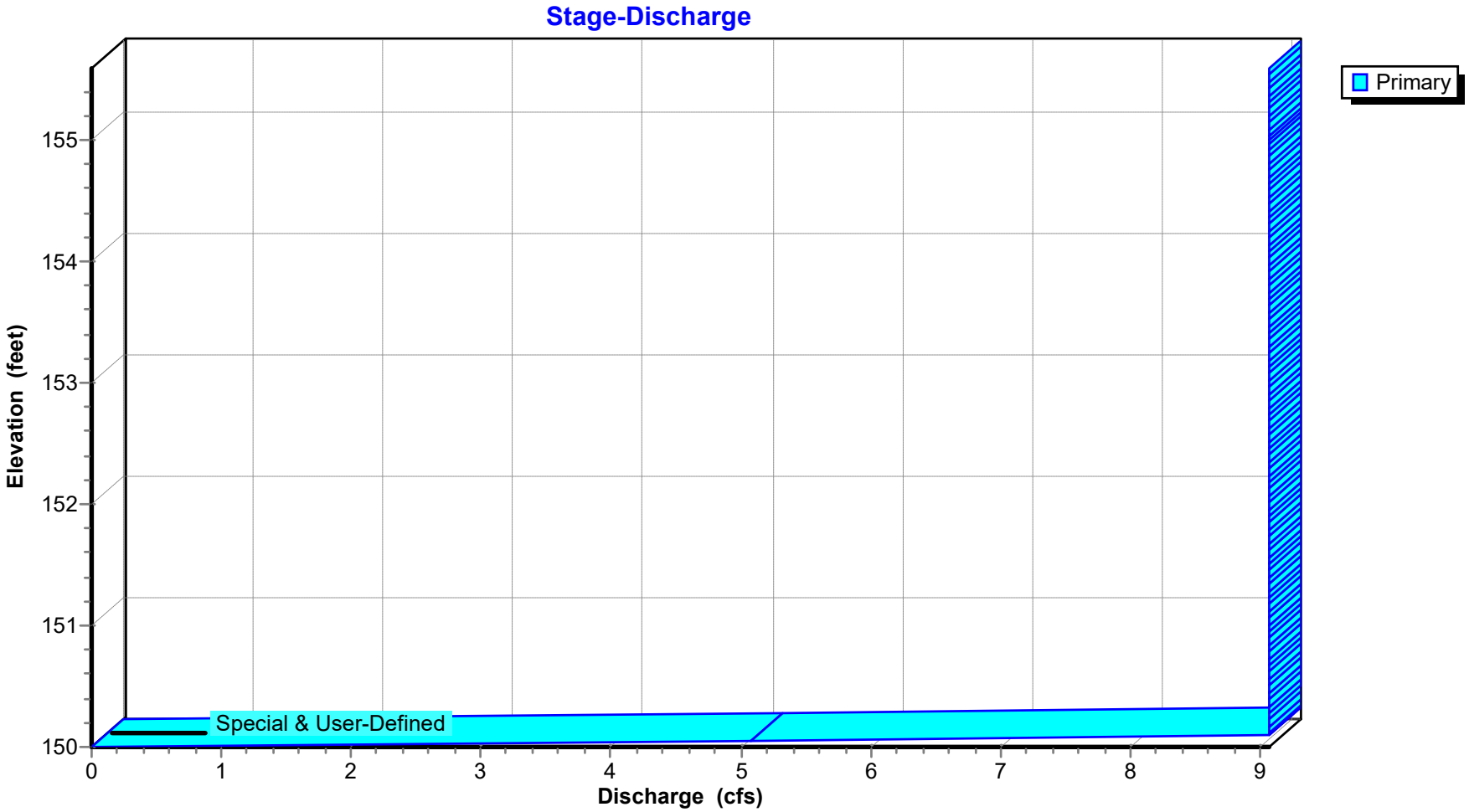
Device	Routing	Invert	Outlet Devices
#1	Primary	150.00'	**Special & User-Defined** Head (feet) 0.00 0.10 5.00 Disch. (cfs) 0.000 9.070 9.070

Primary OutFlow Max=9.07 cfs @ 9.80 hrs HW=150.47' (Free Discharge)
1=Special & User-Defined (Custom Controls 9.07 cfs)

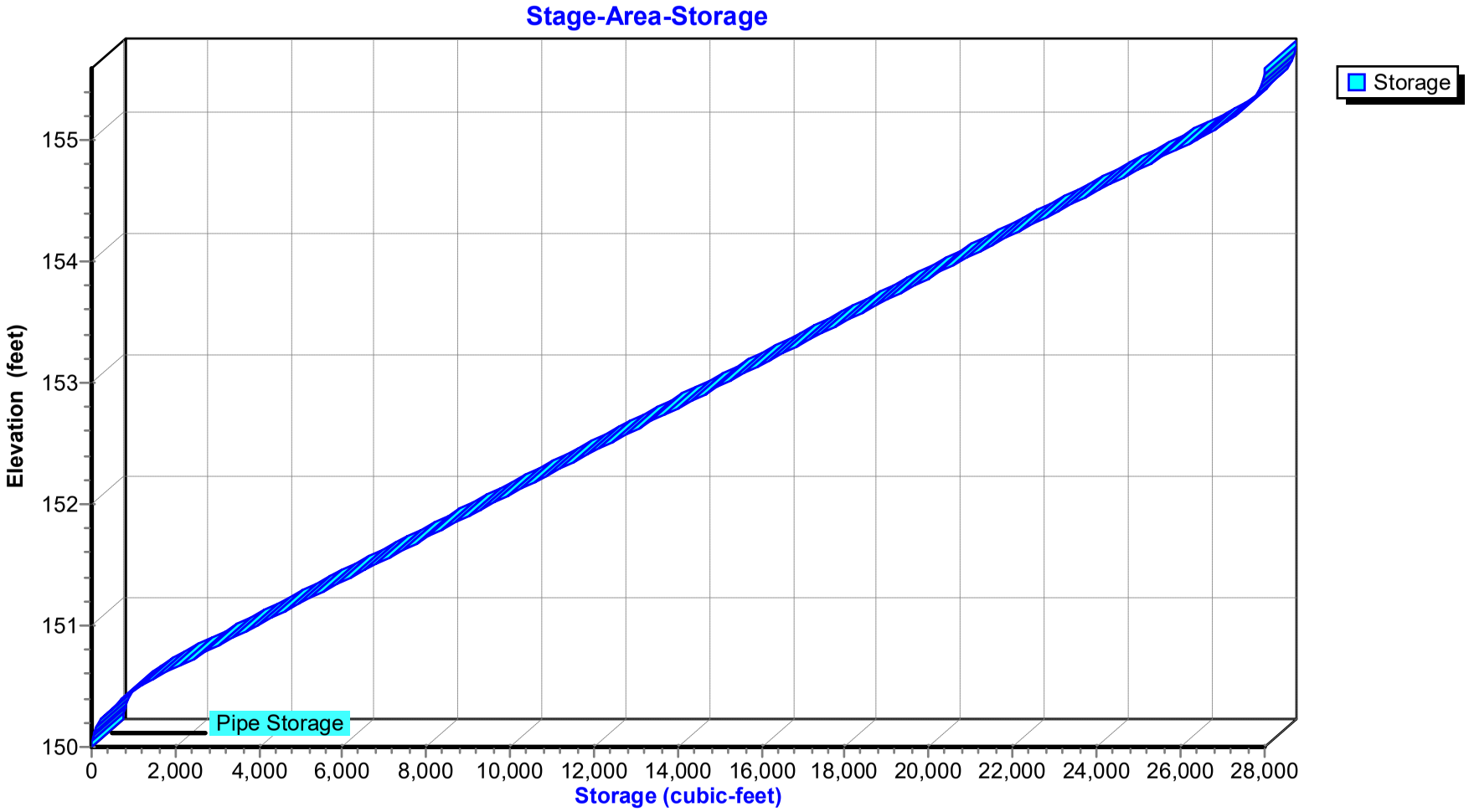
Pond 3P: ADS Retention/Det



Pond 3P: ADS Retention/Det



Pond 3P: ADS Retention/Det



Hydrograph for Pond 3P: ADS Retention/Det

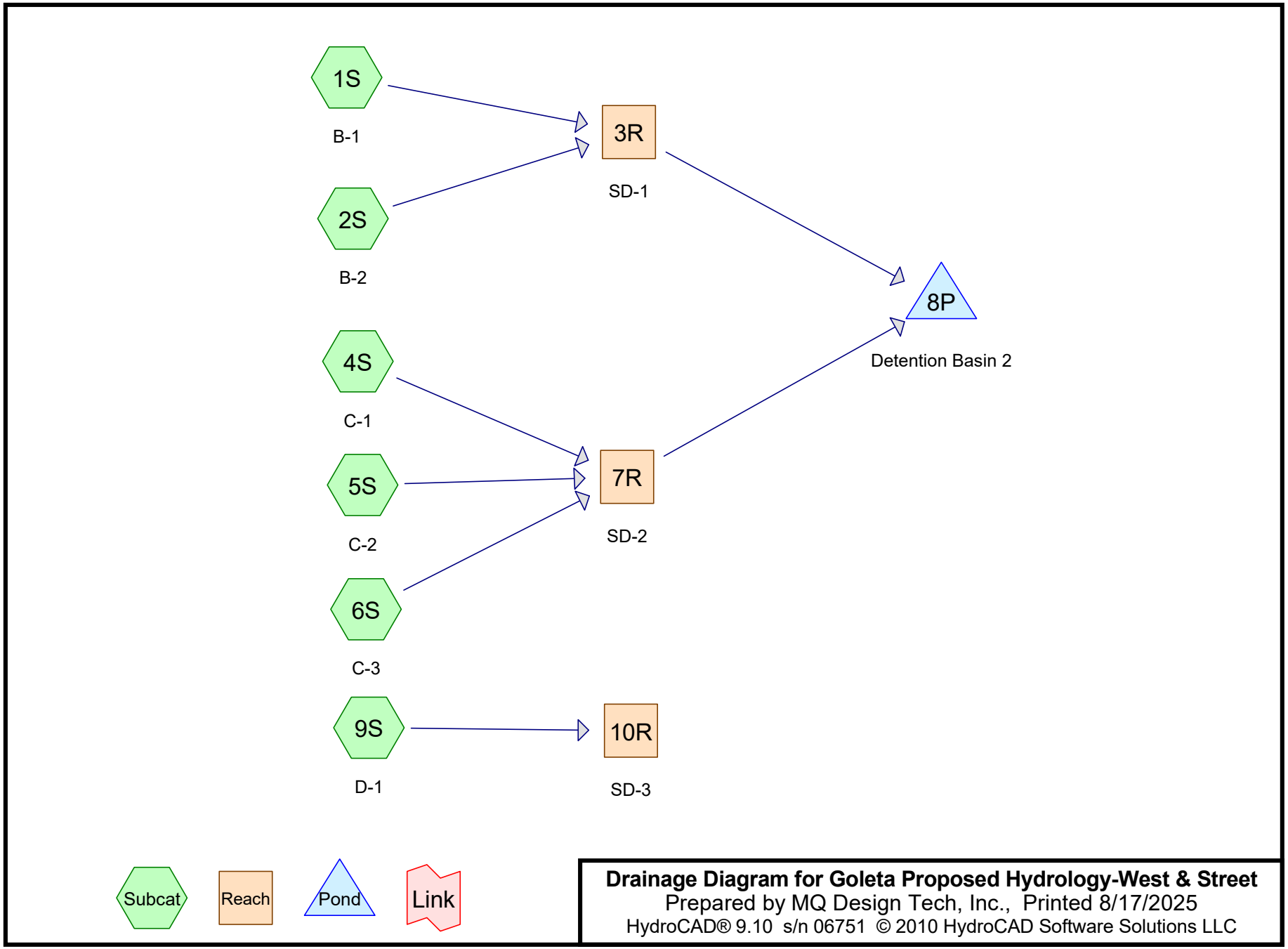
Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	150.00	0.00
0.50	0.05	0	150.00	0.05
1.00	0.19	1	150.00	0.19
1.50	0.25	1	150.00	0.25
2.00	0.29	1	150.00	0.29
2.50	0.33	1	150.00	0.33
3.00	0.37	1	150.00	0.37
3.50	0.42	1	150.00	0.42
4.00	0.51	2	150.01	0.51
4.50	0.59	2	150.01	0.59
5.00	0.66	2	150.01	0.66
5.50	0.73	2	150.01	0.73
6.00	0.79	2	150.01	0.79
6.50	0.97	3	150.01	0.97
7.00	1.21	4	150.01	1.21
7.50	1.37	4	150.02	1.37
8.00	1.49	4	150.02	1.49
8.50	2.20	6	150.02	2.20
9.00	3.13	9	150.03	3.13
9.50	4.73	14	150.05	**4.72**
10.00	**29.92**	**11,785**	**152.40**	**9.07**
10.50	5.67	**17,549**	**153.43**	9.07
11.00	3.77	9,251	151.95	9.07
11.50	3.21	12	150.04	4.07
12.00	2.82	6	150.02	2.09
12.50	2.53	9	150.03	3.15
13.00	2.28	5	150.02	1.76
13.50	2.03	7	150.03	2.48
14.00	1.78	4	150.02	1.39
14.50	1.68	6	150.02	2.00
15.00	1.63	4	150.01	1.35
15.50	1.58	5	150.02	1.81
16.00	1.53	4	150.01	1.33
16.50	1.48	5	150.02	1.65
17.00	1.43	4	150.01	1.28
17.50	1.38	4	150.02	1.50
18.00	1.33	4	150.01	1.22
18.50	1.27	4	150.02	1.36
19.00	1.22	3	150.01	1.15
19.50	1.17	4	150.01	1.23
20.00	1.12	3	150.01	1.07
20.50	1.07	3	150.01	1.11
21.00	1.02	3	150.01	0.98
21.50	0.96	3	150.01	1.00
22.00	0.91	3	150.01	0.88
22.50	0.86	3	150.01	0.88
23.00	0.81	2	150.01	0.79
23.50	0.75	2	150.01	0.77
24.00	0.70	2	150.01	0.69

Stage-Discharge for Pond 3P: ADS Retention/Det

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
150.00	0.00	151.40	9.07	152.80	9.07	154.20	9.07
150.04	3.63	151.44	9.07	152.84	9.07	154.24	9.07
150.08	7.26	151.48	9.07	152.88	9.07	154.28	9.07
150.12	**9.07**	151.52	9.07	152.92	9.07	154.32	9.07
150.16	9.07	151.56	9.07	152.96	9.07	154.36	9.07
150.20	9.07	151.60	9.07	153.00	9.07	154.40	9.07
150.24	9.07	151.64	9.07	153.04	9.07	154.44	9.07
150.28	9.07	151.68	9.07	153.08	9.07	154.48	9.07
150.32	9.07	151.72	9.07	153.12	9.07	154.52	9.07
150.36	9.07	151.76	9.07	153.16	9.07	154.56	9.07
150.40	9.07	151.80	9.07	153.20	9.07	154.60	9.07
150.44	9.07	151.84	9.07	153.24	9.07	154.64	9.07
150.48	9.07	151.88	9.07	153.28	9.07	154.68	9.07
150.52	9.07	151.92	9.07	153.32	9.07	154.72	9.07
150.56	9.07	151.96	9.07	153.36	9.07	154.76	9.07
150.60	9.07	152.00	9.07	153.40	9.07	154.80	9.07
150.64	9.07	152.04	9.07	153.44	9.07	154.84	9.07
150.68	9.07	152.08	9.07	153.48	9.07	154.88	9.07
150.72	9.07	152.12	9.07	153.52	9.07	154.92	9.07
150.76	9.07	152.16	9.07	153.56	9.07	154.96	9.07
150.80	9.07	152.20	9.07	153.60	9.07	155.00	9.07
150.84	9.07	152.24	9.07	153.64	9.07	155.04	9.07
150.88	9.07	152.28	9.07	153.68	9.07	155.08	9.07
150.92	9.07	152.32	9.07	153.72	9.07	155.12	9.07
150.96	9.07	152.36	9.07	153.76	9.07	155.16	9.07
151.00	9.07	152.40	9.07	153.80	9.07	155.20	9.07
151.04	9.07	152.44	9.07	153.84	9.07	155.24	9.07
151.08	9.07	152.48	9.07	153.88	9.07	155.28	9.07
151.12	9.07	152.52	9.07	153.92	9.07	155.32	9.07
151.16	9.07	152.56	9.07	153.96	9.07	155.36	9.07
151.20	9.07	152.60	9.07	154.00	9.07	155.40	9.07
151.24	9.07	152.64	9.07	154.04	9.07	155.44	9.07
151.28	9.07	152.68	9.07	154.08	9.07	155.48	9.07
151.32	9.07	152.72	9.07	154.12	9.07	155.52	9.07
151.36	9.07	152.76	9.07	154.16	9.07	155.56	9.07

Stage-Area-Storage for Pond 3P: ADS Retention/Det

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
150.00	0	151.40	6,194	152.80	14,041	154.20	21,888
150.04	8	151.44	6,418	152.84	14,265	154.24	22,112
150.08	30	151.48	6,642	152.88	14,489	154.28	22,336
150.12	68	151.52	6,866	152.92	14,713	154.32	22,560
150.16	122	151.56	7,090	152.96	14,937	154.36	22,784
150.20	190	151.60	7,315	153.00	15,162	154.40	23,009
150.24	274	151.64	7,539	153.04	15,386	154.44	23,233
150.28	372	151.68	7,763	153.08	15,610	154.48	23,457
150.32	486	151.72	7,987	153.12	15,834	154.52	23,681
150.36	616	151.76	8,211	153.16	16,058	154.56	23,905
150.40	760	151.80	8,436	153.20	16,283	154.60	24,130
150.44	920	151.84	8,660	153.24	16,507	154.64	24,354
150.48	1,094	151.88	8,884	153.28	16,731	154.68	24,578
150.52	1,284	151.92	9,108	153.32	16,955	154.72	24,802
150.56	1,490	151.96	9,332	153.36	17,179	154.76	25,026
150.60	1,710	152.00	9,557	153.40	17,404	154.80	25,251
150.64	1,934	152.04	9,781	153.44	17,628	154.84	25,475
150.68	2,158	152.08	10,005	153.48	17,852	154.88	25,699
150.72	2,382	152.12	10,229	153.52	18,076	154.92	25,923
150.76	2,606	152.16	10,453	153.56	18,300	154.96	26,147
150.80	2,831	152.20	10,678	153.60	18,525	155.00	26,372
150.84	3,055	152.24	10,902	153.64	18,749	155.04	26,588
150.88	3,279	152.28	11,126	153.68	18,973	155.08	26,790
150.92	3,503	152.32	11,350	153.72	19,197	155.12	26,976
150.96	3,727	152.36	11,574	153.76	19,421	155.16	27,147
151.00	3,952	152.40	11,799	153.80	19,646	155.20	27,303
151.04	4,176	152.44	12,023	153.84	19,870	155.24	27,443
151.08	4,400	152.48	12,247	153.88	20,094	155.28	27,569
151.12	4,624	152.52	12,471	153.92	20,318	155.32	27,679
151.16	4,848	152.56	12,695	153.96	20,542	155.36	27,774
151.20	5,073	152.60	12,920	154.00	20,767	155.40	27,854
151.24	5,297	152.64	13,144	154.04	20,991	155.44	27,918
151.28	5,521	152.68	13,368	154.08	21,215	155.48	27,968
151.32	5,745	152.72	13,592	154.12	21,439	155.52	28,002
151.36	5,969	152.76	13,816	154.16	21,663	155.56	**28,021**



Drainage Diagram for Goleta Proposed Hydrology-West & Street

Prepared by MQ Design Tech, Inc., Printed 8/17/2025

HydroCAD® 9.10 s/n 06751 © 2010 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
6.010	87	1/4 acre lots, 38% imp, HSG D (1S, 2S, 4S, 5S, 6S)
0.800	98	Paved roads w/curbs & sewers, HSG D (9S)
6.810		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
6.810	HSG D	1S, 2S, 4S, 5S, 6S, 9S
0.000	Other	
6.810		**TOTAL AREA**

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Fill (inches)
1	3R	158.50	154.00	290.0	0.0155	0.013	24.0	0.0	0.0
2	7R	158.00	154.00	100.0	0.0400	0.013	18.0	0.0	0.0
3	10R	144.80	140.00	50.0	0.0960	0.013	18.0	0.0	0.0

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: B-1 Runoff Area=3.000 ac 38.00% Impervious Runoff Depth>1.99"
Flow Length=895' Tc=3.4 min CN=80/98 Runoff=4.13 cfs 0.499 af

Subcatchment 2S: B-2 Runoff Area=1.300 ac 38.00% Impervious Runoff Depth>1.99"
Flow Length=835' Tc=3.1 min CN=80/98 Runoff=1.81 cfs 0.216 af

Subcatchment 4S: C-1 Runoff Area=1.050 ac 38.00% Impervious Runoff Depth>2.00"
Flow Length=510' Tc=2.5 min CN=80/98 Runoff=1.49 cfs 0.175 af

Subcatchment 5S: C-2 Runoff Area=0.160 ac 38.00% Impervious Runoff Depth>2.00"
Flow Length=240' Slope=0.0400 '/' Tc=1.0 min CN=80/98 Runoff=0.24 cfs 0.027 af

Subcatchment 6S: C-3 Runoff Area=0.500 ac 38.00% Impervious Runoff Depth>2.00"
Flow Length=250' Slope=0.0200 '/' Tc=1.5 min CN=80/98 Runoff=0.73 cfs 0.083 af

Subcatchment 9S: D-1 Runoff Area=0.800 ac 100.00% Impervious Runoff Depth>2.97"
Flow Length=390' Slope=0.0350 '/' Tc=1.7 min CN=0/98 Runoff=1.72 cfs 0.198 af

Reach 3R: SD-1 Avg. Flow Depth=0.62' Max Vel=7.10 fps Inflow=5.94 cfs 0.715 af
24.0" Round Pipe n=0.013 L=290.0' S=0.0155 '/' Capacity=28.18 cfs Outflow=5.80 cfs 0.714 af

Reach 7R: SD-2 Avg. Flow Depth=0.35' Max Vel=7.88 fps Inflow=2.46 cfs 0.284 af
18.0" Round Pipe n=0.013 L=100.0' S=0.0400 '/' Capacity=21.01 cfs Outflow=2.45 cfs 0.284 af

Reach 10R: SD-3 Avg. Flow Depth=0.23' Max Vel=9.61 fps Inflow=1.72 cfs 0.198 af
18.0" Round Pipe n=0.013 L=50.0' S=0.0960 '/' Capacity=32.55 cfs Outflow=1.71 cfs 0.198 af

Pond 8P: Detention Basin 2 Peak Elev=154.38' Storage=0.049 af Inflow=8.21 cfs 0.999 af
Outflow=5.10 cfs 0.998 af

Total Runoff Area = 6.810 ac Runoff Volume = 1.197 af Average Runoff Depth = 2.11"
54.72% Pervious = 3.726 ac 45.28% Impervious = 3.084 ac

Summary for Subcatchment 1S: B-1

[49] Hint: Tc<2dt may require smaller dt

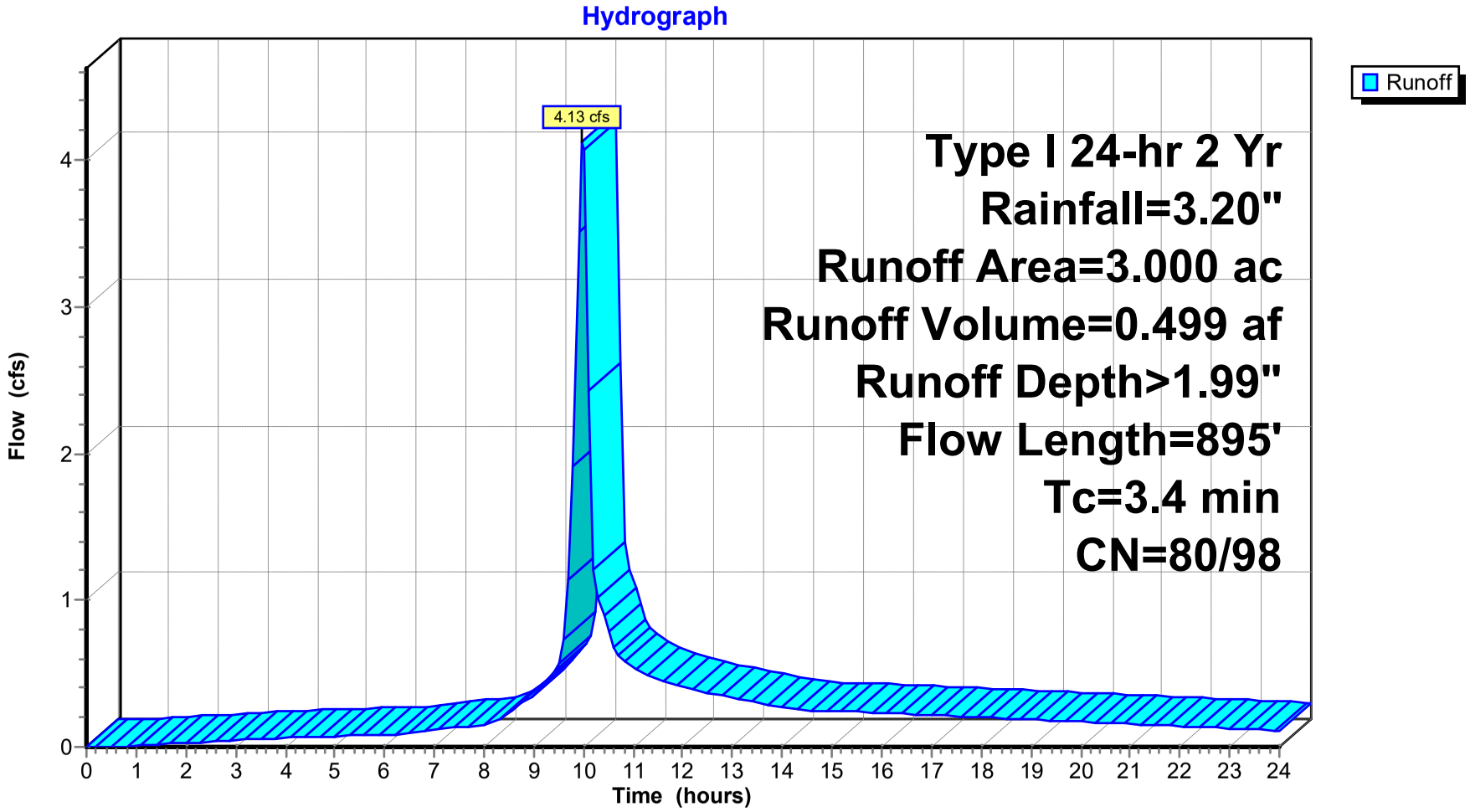
Runoff = 4.13 cfs @ 9.98 hrs, Volume= 0.499 af, Depth> 1.99"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 2 Yr Rainfall=3.20"

Area (ac)	CN	Description
3.000	87	1/4 acre lots, 38% imp, HSG D
1.860	80	62.00% Pervious Area
1.140	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	255	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.3	105	0.0900	6.09		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.5	155	0.0600	4.97		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.0	220	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.9	160	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
3.4	895	Total			

Subcatchment 1S: B-1



Hydrograph for Subcatchment 1S: B-1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.03	0.00	0.00	0.00
1.00	0.06	0.00	0.00	0.01
1.50	0.08	0.00	0.01	0.02
2.00	0.11	0.00	0.02	0.03
2.50	0.14	0.00	0.03	0.04
3.00	0.17	0.00	0.05	0.05
3.50	0.21	0.00	0.07	0.05
4.00	0.24	0.00	0.10	0.06
4.50	0.28	0.00	0.13	0.07
5.00	0.32	0.00	0.16	0.07
5.50	0.36	0.00	0.19	0.08
6.00	0.40	0.00	0.23	0.08
6.50	0.45	0.00	0.27	0.10
7.00	0.50	0.00	0.32	0.12
7.50	0.56	0.00	0.37	0.14
8.00	0.62	0.01	0.43	0.15
8.50	0.70	0.01	0.50	0.24
9.00	0.81	0.03	0.61	0.35
9.50	0.97	0.07	0.76	0.56
10.00	1.65	0.36	1.43	**4.06**
10.50	1.87	0.48	1.64	0.78
11.00	1.99	0.56	1.77	0.54
11.50	2.10	0.62	1.87	0.46
12.00	2.19	0.68	1.96	0.41
12.50	2.27	0.73	2.04	0.37
13.00	2.34	0.78	2.11	0.34
13.50	2.41	0.83	2.18	0.30
14.00	2.46	0.86	2.23	0.26
14.50	2.52	0.90	2.29	0.25
15.00	2.57	0.94	2.34	0.25
15.50	2.62	0.97	2.39	0.24
16.00	2.66	1.00	2.43	0.23
16.50	2.71	1.04	2.48	0.22
17.00	2.75	1.07	2.52	0.22
17.50	2.79	1.10	2.56	0.21
18.00	2.84	1.13	2.60	0.20
18.50	2.87	1.16	2.64	0.20
19.00	2.91	1.18	2.68	0.19
19.50	2.95	1.21	2.72	0.18
20.00	2.98	1.24	2.75	0.17
20.50	3.02	1.26	2.78	0.17
21.00	3.05	1.28	2.81	0.16
21.50	3.08	1.31	2.84	0.15
22.00	3.10	1.33	2.87	0.14
22.50	3.13	1.35	2.90	0.13
23.00	3.16	1.37	2.92	0.13
23.50	3.18	1.39	2.95	0.12
24.00	**3.20**	**1.40**	**2.97**	0.11

Summary for Subcatchment 2S: B-2

[49] Hint: Tc<2dt may require smaller dt

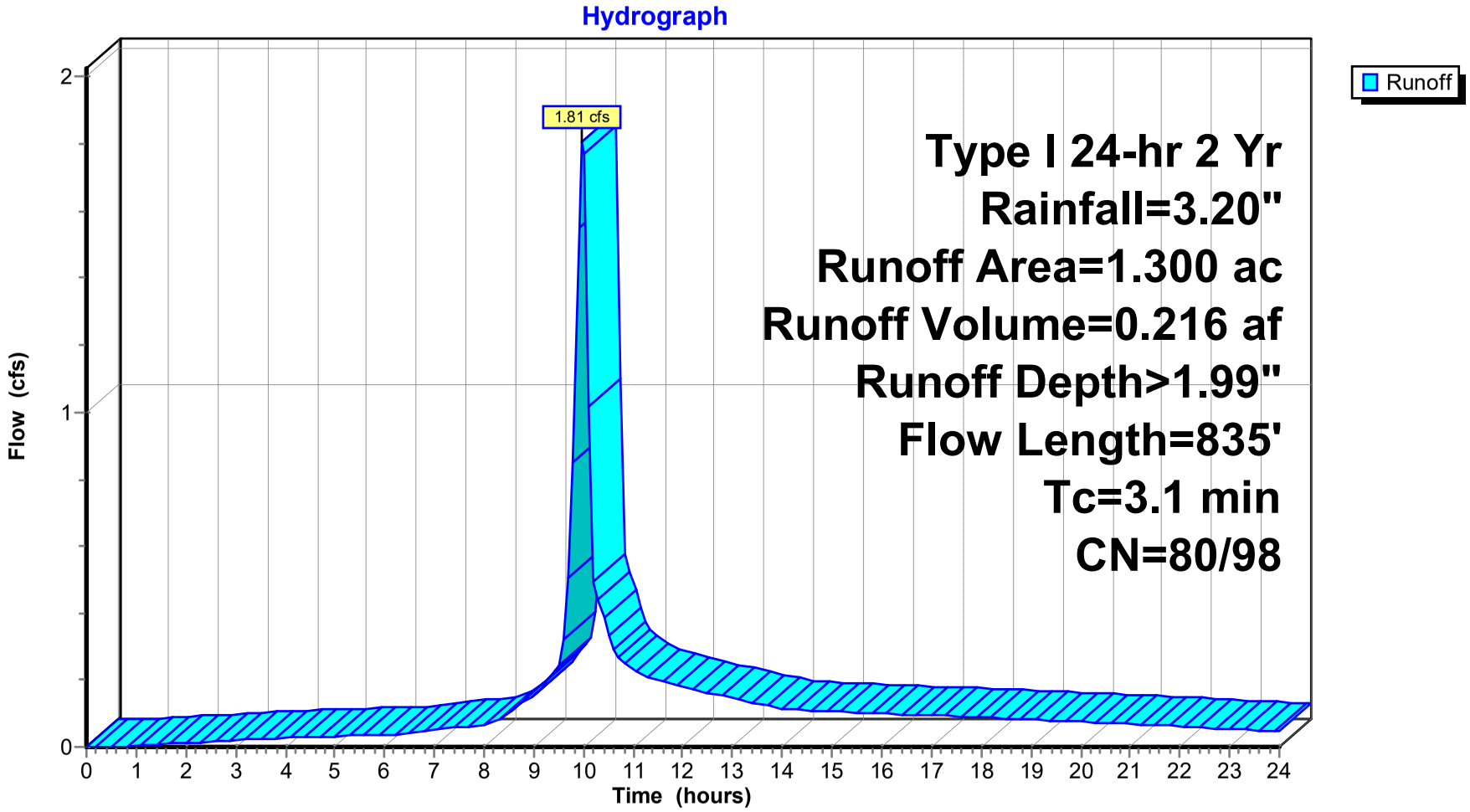
Runoff = 1.81 cfs @ 9.97 hrs, Volume= 0.216 af, Depth> 1.99"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 2 Yr Rainfall=3.20"

Area (ac)	CN	Description
1.300	87	1/4 acre lots, 38% imp, HSG D
0.806	80	62.00% Pervious Area
0.494	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	280	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.3	100	0.0900	6.09		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.5	150	0.0600	4.97		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.0	215	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.5	90	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
3.1	835	Total			

Subcatchment 2S: B-2



Hydrograph for Subcatchment 2S: B-2

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.03	0.00	0.00	0.00
1.00	0.06	0.00	0.00	0.00
1.50	0.08	0.00	0.01	0.01
2.00	0.11	0.00	0.02	0.01
2.50	0.14	0.00	0.03	0.02
3.00	0.17	0.00	0.05	0.02
3.50	0.21	0.00	0.07	0.02
4.00	0.24	0.00	0.10	0.03
4.50	0.28	0.00	0.13	0.03
5.00	0.32	0.00	0.16	0.03
5.50	0.36	0.00	0.19	0.03
6.00	0.40	0.00	0.23	0.04
6.50	0.45	0.00	0.27	0.04
7.00	0.50	0.00	0.32	0.05
7.50	0.56	0.00	0.37	0.06
8.00	0.62	0.01	0.43	0.07
8.50	0.70	0.01	0.50	0.10
9.00	0.81	0.03	0.61	0.15
9.50	0.97	0.07	0.76	0.25
10.00	1.65	0.36	1.43	**1.77**
10.50	1.87	0.48	1.64	0.34
11.00	1.99	0.56	1.77	0.23
11.50	2.10	0.62	1.87	0.20
12.00	2.19	0.68	1.96	0.18
12.50	2.27	0.73	2.04	0.16
13.00	2.34	0.78	2.11	0.15
13.50	2.41	0.83	2.18	0.13
14.00	2.46	0.86	2.23	0.11
14.50	2.52	0.90	2.29	0.11
15.00	2.57	0.94	2.34	0.11
15.50	2.62	0.97	2.39	0.10
16.00	2.66	1.00	2.43	0.10
16.50	2.71	1.04	2.48	0.10
17.00	2.75	1.07	2.52	0.09
17.50	2.79	1.10	2.56	0.09
18.00	2.84	1.13	2.60	0.09
18.50	2.87	1.16	2.64	0.08
19.00	2.91	1.18	2.68	0.08
19.50	2.95	1.21	2.72	0.08
20.00	2.98	1.24	2.75	0.07
20.50	3.02	1.26	2.78	0.07
21.00	3.05	1.28	2.81	0.07
21.50	3.08	1.31	2.84	0.06
22.00	3.10	1.33	2.87	0.06
22.50	3.13	1.35	2.90	0.06
23.00	3.16	1.37	2.92	0.05
23.50	3.18	1.39	2.95	0.05
24.00	**3.20**	**1.40**	**2.97**	0.05

Summary for Subcatchment 4S: C-1

[49] Hint: Tc<2dt may require smaller dt

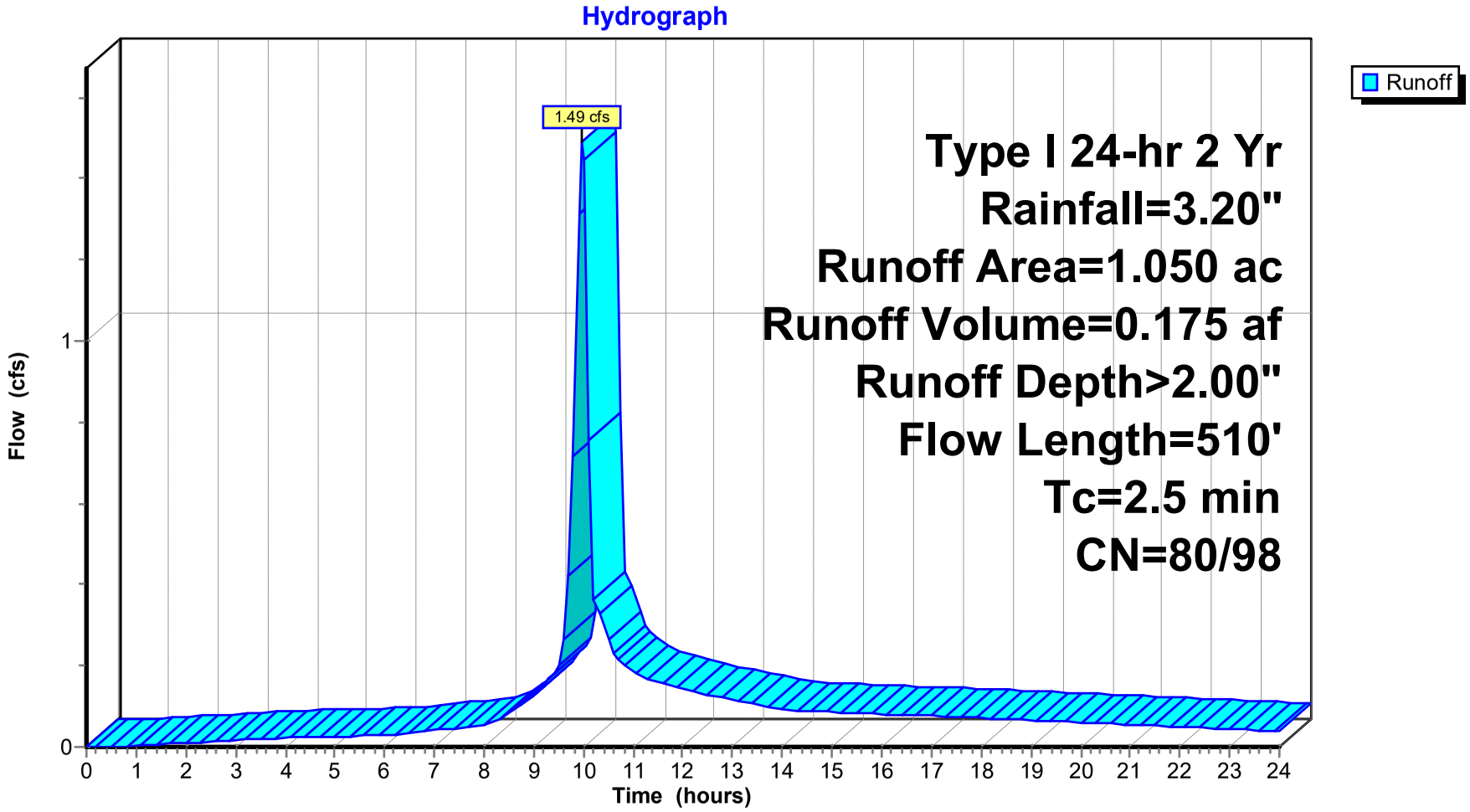
Runoff = 1.49 cfs @ 9.97 hrs, Volume= 0.175 af, Depth> 2.00"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 2 Yr Rainfall=3.20"

Area (ac)	CN	Description
1.050	87	1/4 acre lots, 38% imp, HSG D
0.651	80	62.00% Pervious Area
0.399	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	260	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.0	250	0.0400	4.06		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
2.5	510	Total			

Subcatchment 4S: C-1



Hydrograph for Subcatchment 4S: C-1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.03	0.00	0.00	0.00
1.00	0.06	0.00	0.00	0.00
1.50	0.08	0.00	0.01	0.01
2.00	0.11	0.00	0.02	0.01
2.50	0.14	0.00	0.03	0.01
3.00	0.17	0.00	0.05	0.02
3.50	0.21	0.00	0.07	0.02
4.00	0.24	0.00	0.10	0.02
4.50	0.28	0.00	0.13	0.02
5.00	0.32	0.00	0.16	0.03
5.50	0.36	0.00	0.19	0.03
6.00	0.40	0.00	0.23	0.03
6.50	0.45	0.00	0.27	0.03
7.00	0.50	0.00	0.32	0.04
7.50	0.56	0.00	0.37	0.05
8.00	0.62	0.01	0.43	0.05
8.50	0.70	0.01	0.50	0.08
9.00	0.81	0.03	0.61	0.12
9.50	0.97	0.07	0.76	0.20
10.00	1.65	0.36	1.43	**1.45**
10.50	1.87	0.48	1.64	0.27
11.00	1.99	0.56	1.77	0.19
11.50	2.10	0.62	1.87	0.16
12.00	2.19	0.68	1.96	0.14
12.50	2.27	0.73	2.04	0.13
13.00	2.34	0.78	2.11	0.12
13.50	2.41	0.83	2.18	0.11
14.00	2.46	0.86	2.23	0.09
14.50	2.52	0.90	2.29	0.09
15.00	2.57	0.94	2.34	0.09
15.50	2.62	0.97	2.39	0.08
16.00	2.66	1.00	2.43	0.08
16.50	2.71	1.04	2.48	0.08
17.00	2.75	1.07	2.52	0.08
17.50	2.79	1.10	2.56	0.07
18.00	2.84	1.13	2.60	0.07
18.50	2.87	1.16	2.64	0.07
19.00	2.91	1.18	2.68	0.07
19.50	2.95	1.21	2.72	0.06
20.00	2.98	1.24	2.75	0.06
20.50	3.02	1.26	2.78	0.06
21.00	3.05	1.28	2.81	0.05
21.50	3.08	1.31	2.84	0.05
22.00	3.10	1.33	2.87	0.05
22.50	3.13	1.35	2.90	0.05
23.00	3.16	1.37	2.92	0.04
23.50	3.18	1.39	2.95	0.04
24.00	**3.20**	**1.40**	**2.97**	0.04

Summary for Subcatchment 5S: C-2

[49] Hint: Tc<2dt may require smaller dt

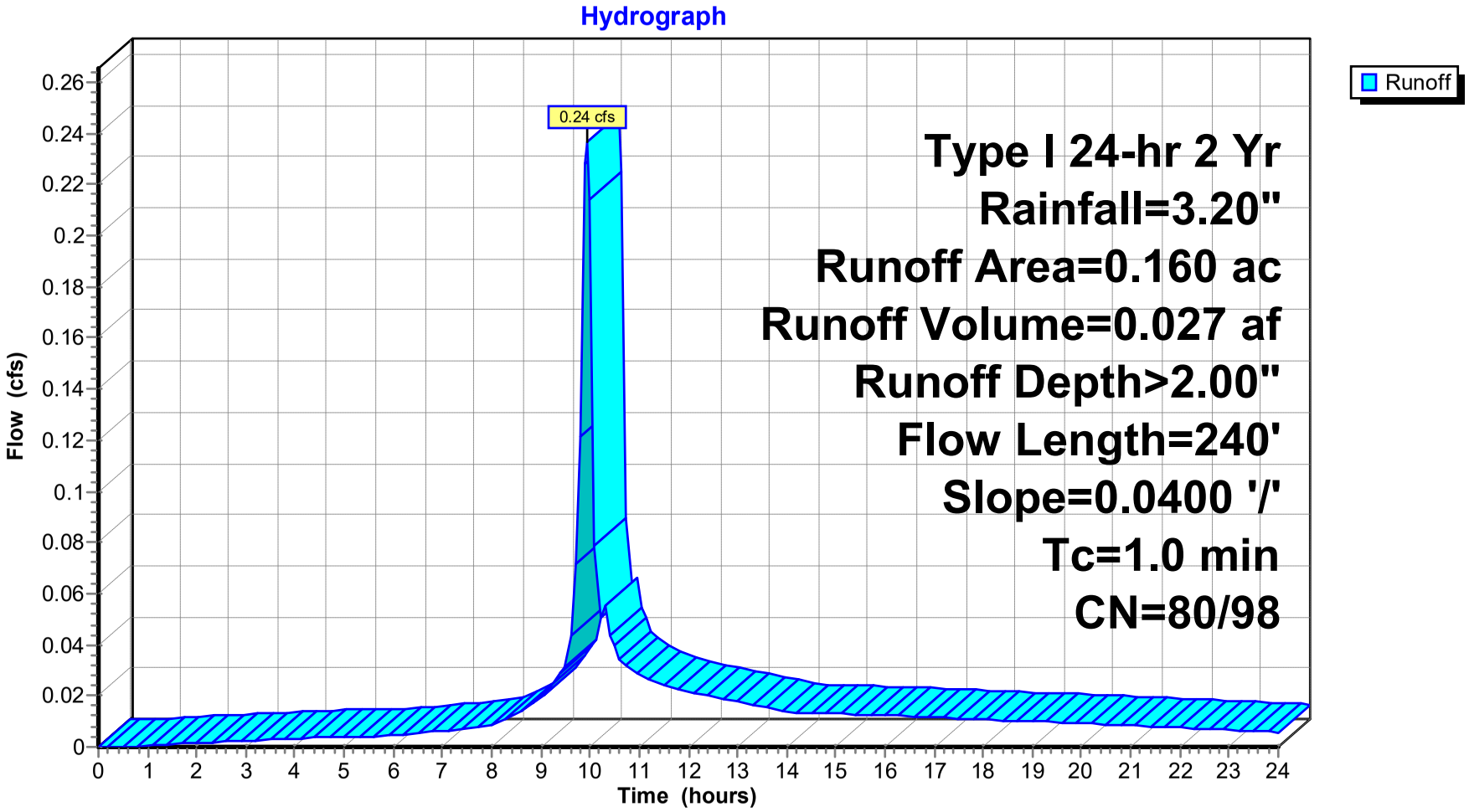
Runoff = 0.24 cfs @ 9.94 hrs, Volume= 0.027 af, Depth> 2.00"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 2 Yr Rainfall=3.20"

Area (ac)	CN	Description
0.160	87	1/4 acre lots, 38% imp, HSG D
0.099	80	62.00% Pervious Area
0.061	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	240	0.0400	4.06		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps

Subcatchment 5S: C-2



Hydrograph for Subcatchment 5S: C-2

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.03	0.00	0.00	0.00
1.00	0.06	0.00	0.00	0.00
1.50	0.08	0.00	0.01	0.00
2.00	0.11	0.00	0.02	0.00
2.50	0.14	0.00	0.03	0.00
3.00	0.17	0.00	0.05	0.00
3.50	0.21	0.00	0.07	0.00
4.00	0.24	0.00	0.10	0.00
4.50	0.28	0.00	0.13	0.00
5.00	0.32	0.00	0.16	0.00
5.50	0.36	0.00	0.19	0.00
6.00	0.40	0.00	0.23	0.00
6.50	0.45	0.00	0.27	0.01
7.00	0.50	0.00	0.32	0.01
7.50	0.56	0.00	0.37	0.01
8.00	0.62	0.01	0.43	0.01
8.50	0.70	0.01	0.50	0.01
9.00	0.81	0.03	0.61	0.02
9.50	0.97	0.07	0.76	**0.03**
10.00	1.65	0.36	1.43	**0.21**
10.50	1.87	0.48	1.64	0.04
11.00	1.99	0.56	1.77	0.03
11.50	2.10	0.62	1.87	0.02
12.00	2.19	0.68	1.96	0.02
12.50	2.27	0.73	2.04	0.02
13.00	2.34	0.78	2.11	0.02
13.50	2.41	0.83	2.18	0.02
14.00	2.46	0.86	2.23	0.01
14.50	2.52	0.90	2.29	0.01
15.00	2.57	0.94	2.34	0.01
15.50	2.62	0.97	2.39	0.01
16.00	2.66	1.00	2.43	0.01
16.50	2.71	1.04	2.48	0.01
17.00	2.75	1.07	2.52	0.01
17.50	2.79	1.10	2.56	0.01
18.00	2.84	1.13	2.60	0.01
18.50	2.87	1.16	2.64	0.01
19.00	2.91	1.18	2.68	0.01
19.50	2.95	1.21	2.72	0.01
20.00	2.98	1.24	2.75	0.01
20.50	3.02	1.26	2.78	0.01
21.00	3.05	1.28	2.81	0.01
21.50	3.08	1.31	2.84	0.01
22.00	3.10	1.33	2.87	0.01
22.50	3.13	1.35	2.90	0.01
23.00	3.16	1.37	2.92	0.01
23.50	3.18	1.39	2.95	0.01
24.00	**3.20**	**1.40**	**2.97**	0.01

Summary for Subcatchment 6S: C-3

[49] Hint: Tc<2dt may require smaller dt

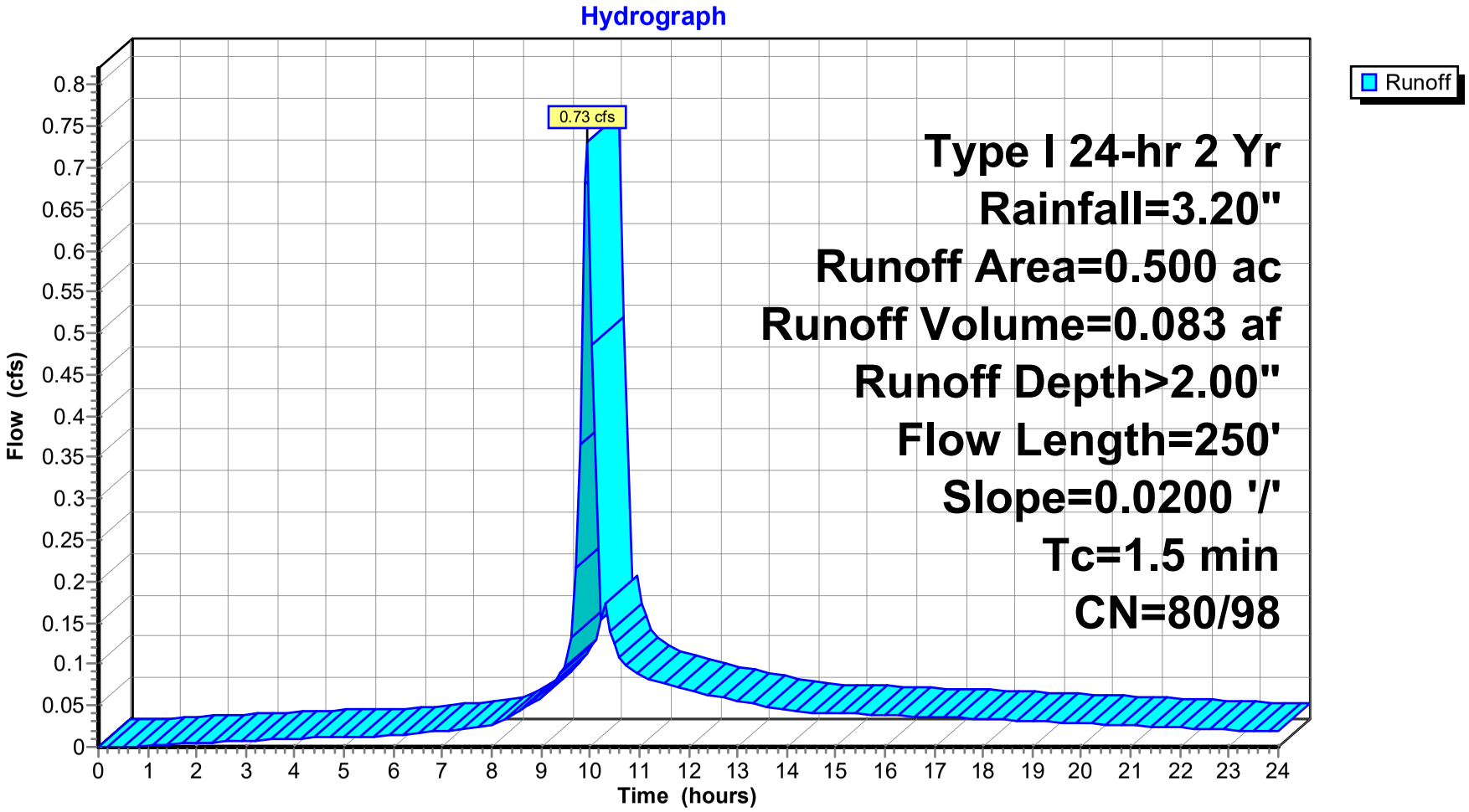
Runoff = 0.73 cfs @ 9.95 hrs, Volume= 0.083 af, Depth> 2.00"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 2 Yr Rainfall=3.20"

Area (ac)	CN	Description
0.500	87	1/4 acre lots, 38% imp, HSG D
0.310	80	62.00% Pervious Area
0.190	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	250	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps

Subcatchment 6S: C-3



Hydrograph for Subcatchment 6S: C-3

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.03	0.00	0.00	0.00
1.00	0.06	0.00	0.00	0.00
1.50	0.08	0.00	0.01	0.00
2.00	0.11	0.00	0.02	0.00
2.50	0.14	0.00	0.03	0.01
3.00	0.17	0.00	0.05	0.01
3.50	0.21	0.00	0.07	0.01
4.00	0.24	0.00	0.10	0.01
4.50	0.28	0.00	0.13	0.01
5.00	0.32	0.00	0.16	0.01
5.50	0.36	0.00	0.19	0.01
6.00	0.40	0.00	0.23	0.01
6.50	0.45	0.00	0.27	0.02
7.00	0.50	0.00	0.32	0.02
7.50	0.56	0.00	0.37	0.02
8.00	0.62	0.01	0.43	0.03
8.50	0.70	0.01	0.50	0.04
9.00	0.81	0.03	0.61	0.06
9.50	0.97	0.07	0.76	0.10
10.00	1.65	0.36	1.43	**0.68**
10.50	1.87	0.48	1.64	0.12
11.00	1.99	0.56	1.77	0.09
11.50	2.10	0.62	1.87	0.08
12.00	2.19	0.68	1.96	0.07
12.50	2.27	0.73	2.04	0.06
13.00	2.34	0.78	2.11	0.06
13.50	2.41	0.83	2.18	0.05
14.00	2.46	0.86	2.23	0.04
14.50	2.52	0.90	2.29	0.04
15.00	2.57	0.94	2.34	0.04
15.50	2.62	0.97	2.39	0.04
16.00	2.66	1.00	2.43	0.04
16.50	2.71	1.04	2.48	0.04
17.00	2.75	1.07	2.52	0.04
17.50	2.79	1.10	2.56	0.03
18.00	2.84	1.13	2.60	0.03
18.50	2.87	1.16	2.64	0.03
19.00	2.91	1.18	2.68	0.03
19.50	2.95	1.21	2.72	0.03
20.00	2.98	1.24	2.75	0.03
20.50	3.02	1.26	2.78	0.03
21.00	3.05	1.28	2.81	0.03
21.50	3.08	1.31	2.84	0.02
22.00	3.10	1.33	2.87	0.02
22.50	3.13	1.35	2.90	0.02
23.00	3.16	1.37	2.92	0.02
23.50	3.18	1.39	2.95	0.02
24.00	**3.20**	**1.40**	**2.97**	0.02

Summary for Subcatchment 9S: D-1

[49] Hint: Tc<2dt may require smaller dt

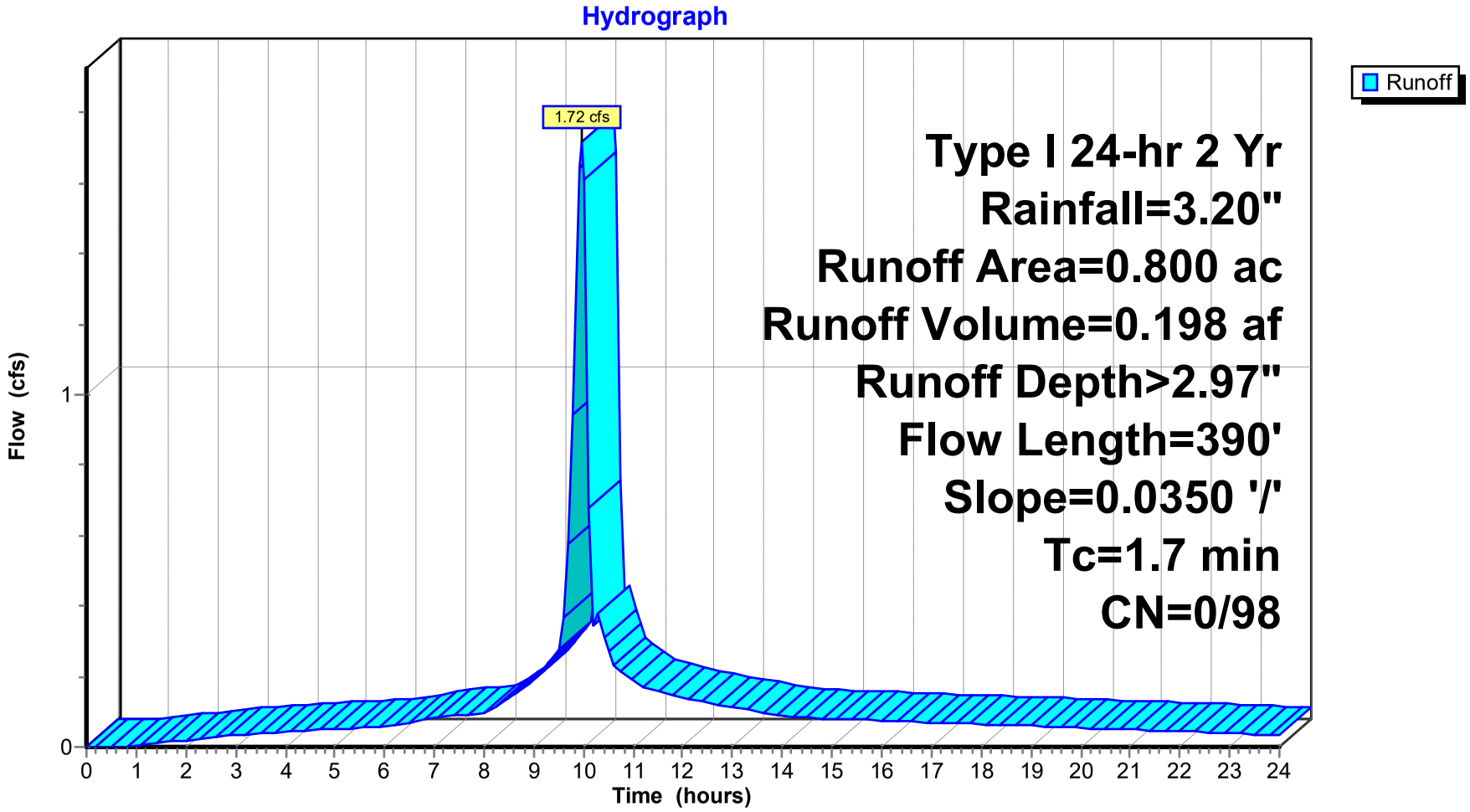
Runoff = 1.72 cfs @ 9.95 hrs, Volume= 0.198 af, Depth> 2.97"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 2 Yr Rainfall=3.20"

Area (ac)	CN	Description
0.800	98	Paved roads w/curbs & sewers, HSG D
0.800	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	390	0.0350	3.80		**Shallow Concentrated Flow, Lower Street Flow** Paved Kv= 20.3 fps

Subcatchment 9S: D-1



Hydrograph for Subcatchment 9S: D-1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	**0.00**	0.00	0.00
0.50	0.03	0.00	0.00	0.00
1.00	0.06	0.00	0.00	0.00
1.50	0.08	0.00	0.01	0.01
2.00	0.11	0.00	0.02	0.02
2.50	0.14	0.00	0.03	0.03
3.00	0.17	0.00	0.05	0.03
3.50	0.21	0.00	0.07	0.04
4.00	0.24	0.00	0.10	0.04
4.50	0.28	0.00	0.13	0.05
5.00	0.32	0.00	0.16	0.05
5.50	0.36	0.00	0.19	0.05
6.00	0.40	0.00	0.23	0.06
6.50	0.45	0.00	0.27	0.07
7.00	0.50	0.00	0.32	0.08
7.50	0.56	0.00	0.37	0.09
8.00	0.62	0.00	0.43	0.09
8.50	0.70	0.00	0.50	0.14
9.00	0.81	0.00	0.61	0.19
9.50	0.97	0.00	0.76	**0.28**
10.00	1.65	0.00	1.43	**1.61**
10.50	1.87	0.00	1.64	0.27
11.00	1.99	0.00	1.77	0.19
11.50	2.10	0.00	1.87	0.16
12.00	2.19	0.00	1.96	0.14
12.50	2.27	0.00	2.04	0.13
13.00	2.34	0.00	2.11	0.11
13.50	2.41	0.00	2.18	0.10
14.00	2.46	0.00	2.23	0.09
14.50	2.52	0.00	2.29	0.08
15.00	2.57	0.00	2.34	0.08
15.50	2.62	0.00	2.39	0.08
16.00	2.66	0.00	2.43	0.07
16.50	2.71	0.00	2.48	0.07
17.00	2.75	0.00	2.52	0.07
17.50	2.79	0.00	2.56	0.07
18.00	2.84	0.00	2.60	0.06
18.50	2.87	0.00	2.64	0.06
19.00	2.91	0.00	2.68	0.06
19.50	2.95	0.00	2.72	0.06
20.00	2.98	0.00	2.75	0.05
20.50	3.02	0.00	2.78	0.05
21.00	3.05	0.00	2.81	0.05
21.50	3.08	0.00	2.84	0.05
22.00	3.10	0.00	2.87	0.04
22.50	3.13	0.00	2.90	0.04
23.00	3.16	0.00	2.92	0.04
23.50	3.18	0.00	2.95	0.04
24.00	**3.20**	0.00	**2.97**	0.03

Summary for Reach 3R: SD-1

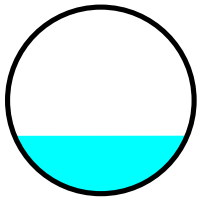
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 4.300 ac, 38.00% Impervious, Inflow Depth > 1.99" for 2 Yr event
Inflow = 5.94 cfs @ 9.97 hrs, Volume= 0.715 af
Outflow = 5.80 cfs @ 9.99 hrs, Volume= 0.714 af, Atten= 2%, Lag= 1.0 min

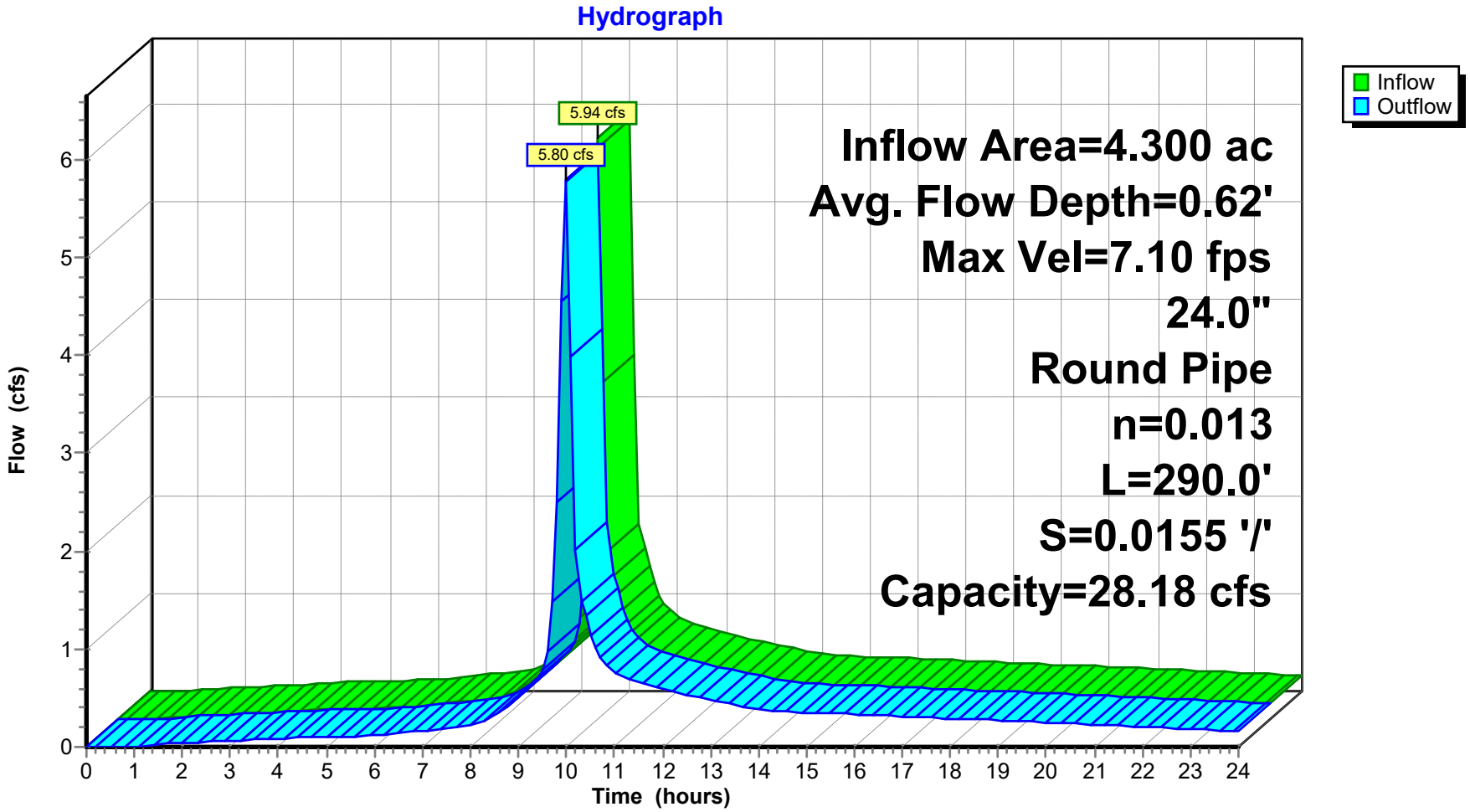
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Max. Velocity= 7.10 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 2.81 fps, Avg. Travel Time= 1.7 min

Peak Storage= 243 cf @ 9.98 hrs
Average Depth at Peak Storage= 0.62'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 28.18 cfs

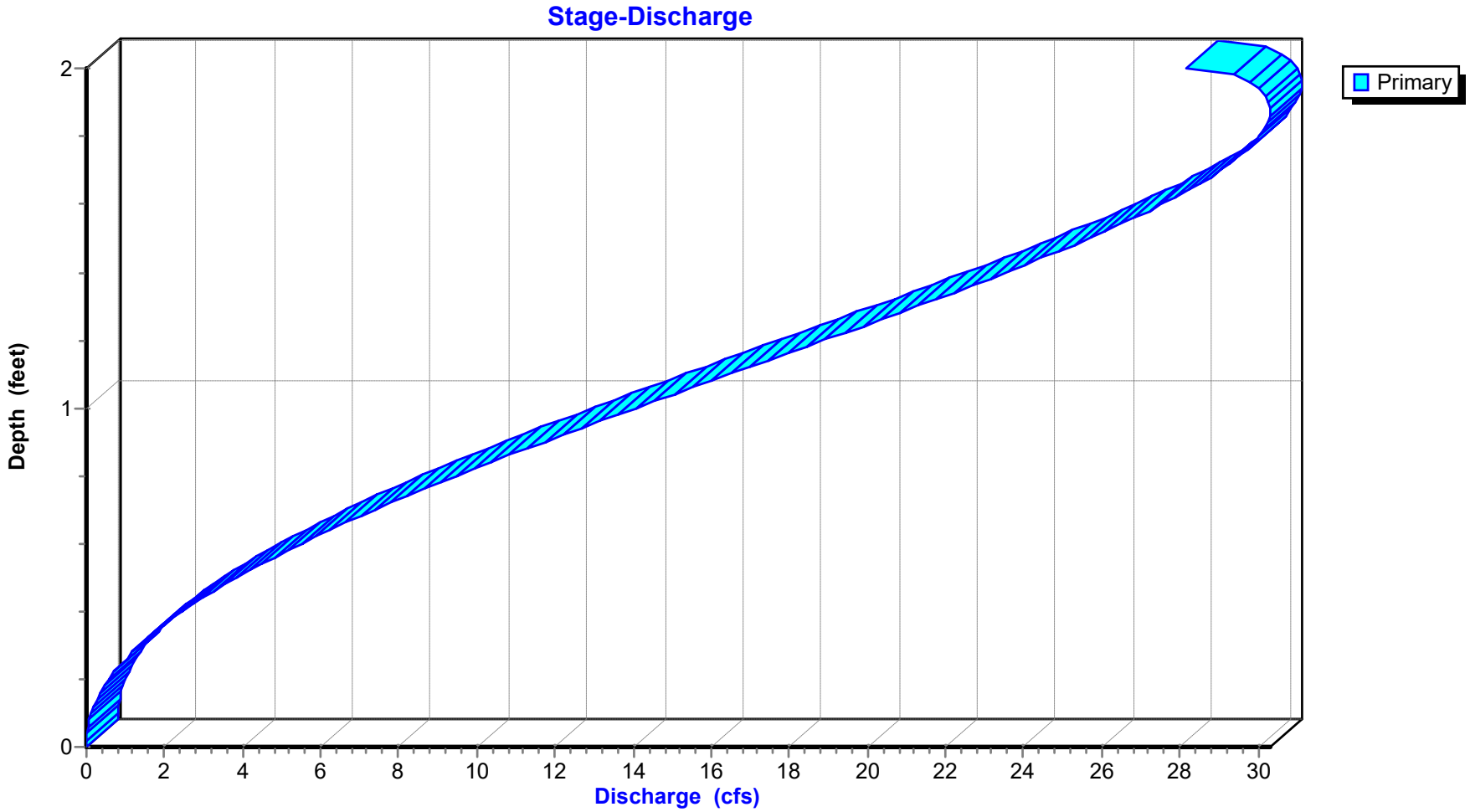
24.0" Round Pipe
n= 0.013
Length= 290.0' Slope= 0.0155 '/'
Inlet Invert= 158.50', Outlet Invert= 154.00'



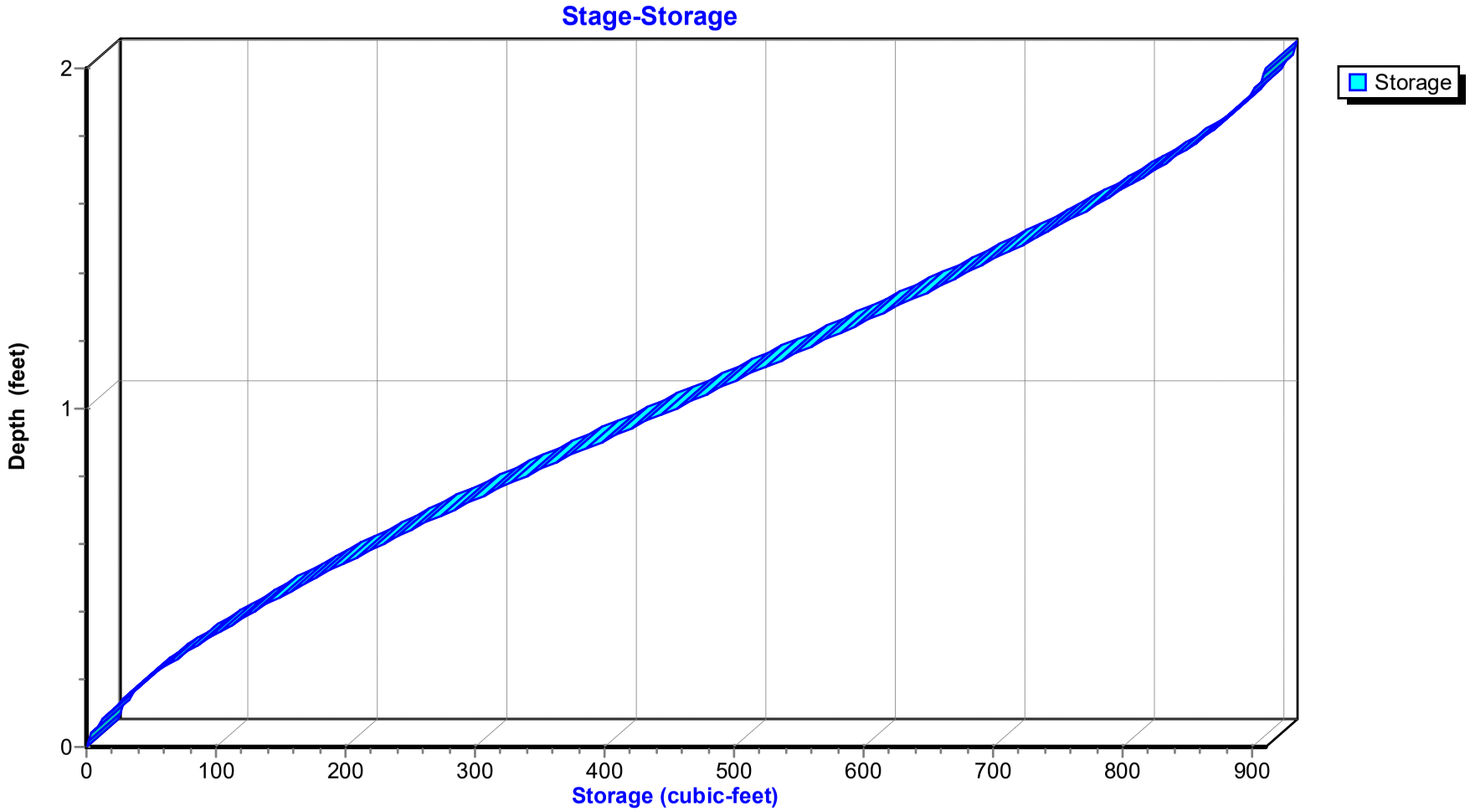
Reach 3R: SD-1


Hydrograph
Inflow
Outflow
5.94 cfs
5.80 cfs
Inflow Area=4.300 ac
Avg. Flow Depth=0.62'
Max Vel=7.10 fps
24.0"
Round Pipe
n=0.013
L=290.0'
S=0.0155 '/'
Capacity=28.18 cfs
Flow (cfs)
0
1
2
3
4
5
6
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Reach 3R: SD-1


Stage-Discharge
Primary
Depth (feet)
0
1
2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Discharge (cfs)

Reach 3R: SD-1


Stage-Storage
Storage
Depth (feet)
0
1
2
0
100
200
300
400
500
600
700
800
900
Storage (cubic-feet)

Hydrograph for Reach 3R: SD-1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	158.50	0.00
0.50	0.00	0	158.50	0.00
1.00	0.01	1	158.52	0.00
1.50	0.03	5	158.54	0.02
2.00	0.04	7	158.55	0.04
2.50	0.05	9	158.56	0.05
3.00	0.07	10	158.57	0.06
3.50	0.08	11	158.58	0.08
4.00	0.09	13	158.58	0.09
4.50	0.10	14	158.59	0.10
5.00	0.10	14	158.59	0.10
5.50	0.11	15	158.59	0.11
6.00	0.12	15	158.59	0.12
6.50	0.14	17	158.60	0.14
7.00	0.17	20	158.61	0.17
7.50	0.19	22	158.62	0.19
8.00	0.22	24	158.62	0.22
8.50	0.34	32	158.65	0.33
9.00	0.51	42	158.69	0.50
9.50	0.81	59	158.73	0.79
10.00	**5.83**	**241**	**159.12**	**5.78**
10.50	1.12	75	158.77	1.15
11.00	0.77	57	158.73	0.78
11.50	0.66	52	158.71	0.67
12.00	0.59	47	158.70	0.59
12.50	0.53	44	158.69	0.54
13.00	0.48	41	158.68	0.49
13.50	0.43	38	158.67	0.43
14.00	0.38	35	158.66	0.38
14.50	0.36	34	158.66	0.36
15.00	0.35	33	158.66	0.35
15.50	0.34	32	158.65	0.34
16.00	0.33	32	158.65	0.33
16.50	0.32	31	158.65	0.32
17.00	0.31	30	158.65	0.31
17.50	0.30	30	158.65	0.30
18.00	0.29	29	158.64	0.29
18.50	0.28	28	158.64	0.28
19.00	0.27	28	158.64	0.27
19.50	0.26	27	158.64	0.26
20.00	0.25	26	158.63	0.25
20.50	0.24	25	158.63	0.24
21.00	0.23	24	158.63	0.23
21.50	0.21	23	158.62	0.21
22.00	0.20	23	158.62	0.20
22.50	0.19	22	158.62	0.19
23.00	0.18	21	158.61	0.18
23.50	0.17	20	158.61	0.17
24.00	0.16	19	158.61	0.16

Stage-Discharge for Reach 3R: SD-1

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)	Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)	Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
158.50	0.00	0.00	159.20	7.56	7.41	159.90	10.04	23.59
158.52	0.80	0.00	159.22	7.67	7.81	159.92	10.07	24.03
158.54	1.26	0.02	159.24	7.78	8.22	159.94	10.10	24.46
158.56	1.65	0.05	159.26	7.89	8.64	159.96	10.13	24.88
158.58	1.99	0.08	159.28	7.99	9.07	159.98	10.15	25.29
158.60	2.30	0.14	159.30	8.09	9.50	160.00	10.17	25.70
158.62	2.59	0.20	159.32	8.19	9.93	160.02	10.18	26.09
158.64	2.87	0.28	159.34	8.29	10.38	160.04	10.20	26.47
158.66	3.12	0.37	159.36	8.38	10.83	160.06	10.21	26.84
158.68	3.37	0.47	159.38	8.47	11.28	160.08	10.22	27.20
158.70	3.60	0.59	159.40	8.56	11.74	160.10	10.22	27.55
158.72	3.82	0.72	159.42	8.65	12.20	160.12	**10.23**	27.88
158.74	4.04	0.86	159.44	8.73	12.67	160.14	10.23	28.19
158.76	4.24	1.02	159.46	8.81	13.14	160.16	10.22	28.49
158.78	4.44	1.19	159.48	8.89	13.61	160.18	10.21	28.77
158.80	4.64	1.37	159.50	8.97	14.09	160.20	10.20	29.04
158.82	4.82	1.56	159.52	9.05	14.57	160.22	10.19	29.28
158.84	5.00	1.77	159.54	9.12	15.05	160.24	10.17	29.51
158.86	5.18	1.99	159.56	9.19	15.53	160.26	10.15	29.71
158.88	5.35	2.22	159.58	9.26	16.02	160.28	10.12	29.88
158.90	5.52	2.47	159.60	9.32	16.51	160.30	10.09	30.03
158.92	5.68	2.72	159.62	9.39	16.99	160.32	10.05	30.16
158.94	5.84	2.99	159.64	9.45	17.48	160.34	10.00	30.25
158.96	5.99	3.27	159.66	9.51	17.96	160.36	9.95	30.30
158.98	6.14	3.56	159.68	9.56	18.45	160.38	9.89	**30.31**
159.00	6.29	3.86	159.70	9.62	18.93	160.40	9.82	30.28
159.02	6.43	4.17	159.72	9.67	19.41	160.42	9.74	30.19
159.04	6.57	4.49	159.74	9.72	19.89	160.44	9.64	30.03
159.06	6.70	4.83	159.76	9.77	20.37	160.46	9.52	29.78
159.08	6.83	5.17	159.78	9.82	20.85	160.48	9.36	29.36
159.10	6.96	5.52	159.80	9.86	21.32	160.50	8.97	28.18
159.12	7.09	5.88	159.82	9.90	21.78			
159.14	7.21	6.25	159.84	9.94	22.24			
159.16	7.33	6.63	159.86	9.98	22.70			
159.18	7.45	7.01	159.88	10.01	23.15			

Stage-Area-Storage for Reach 3R: SD-1

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
158.50	0.0	0	159.20	1.0	284	159.90	2.3	681
158.52	0.0	2	159.22	1.0	295	159.92	2.4	692
158.54	0.0	4	159.24	1.1	306	159.94	2.4	702
158.56	0.0	8	159.26	1.1	318	159.96	2.5	713
158.58	0.0	12	159.28	1.1	329	159.98	2.5	723
158.60	0.1	17	159.30	1.2	340	160.00	2.5	733
158.62	0.1	22	159.32	1.2	352	160.02	2.6	743
158.64	0.1	28	159.34	1.3	363	160.04	2.6	753
158.66	0.1	34	159.36	1.3	375	160.06	2.6	762
158.68	0.1	41	159.38	1.3	386	160.08	2.7	772
158.70	0.2	47	159.40	1.4	398	160.10	2.7	781
158.72	0.2	55	159.42	1.4	409	160.12	2.7	791
158.74	0.2	62	159.44	1.5	421	160.14	2.8	800
158.76	0.2	70	159.46	1.5	432	160.16	2.8	808
158.78	0.3	78	159.48	1.5	444	160.18	2.8	817
158.80	0.3	86	159.50	1.6	456	160.20	2.8	825
158.82	0.3	94	159.52	1.6	467	160.22	2.9	834
158.84	0.4	103	159.54	1.7	479	160.24	2.9	841
158.86	0.4	112	159.56	1.7	490	160.26	2.9	849
158.88	0.4	121	159.58	1.7	502	160.28	3.0	857
158.90	0.4	130	159.60	1.8	513	160.30	3.0	864
158.92	0.5	139	159.62	1.8	525	160.32	3.0	870
158.94	0.5	149	159.64	1.8	536	160.34	3.0	877
158.96	0.5	158	159.66	1.9	548	160.36	3.0	883
158.98	0.6	168	159.68	1.9	559	160.38	3.1	889
159.00	0.6	178	159.70	2.0	571	160.40	3.1	894
159.02	0.6	188	159.72	2.0	582	160.42	3.1	899
159.04	0.7	198	159.74	2.0	593	160.44	3.1	903
159.06	0.7	209	159.76	2.1	605	160.46	3.1	907
159.08	0.8	219	159.78	2.1	616	160.48	3.1	910
159.10	0.8	230	159.80	2.2	627	160.50	**3.1**	**911**
159.12	0.8	241	159.82	2.2	638			
159.14	0.9	251	159.84	2.2	649			
159.16	0.9	262	159.86	2.3	660			
159.18	0.9	273	159.88	2.3	671			

Summary for Reach 7R: SD-2

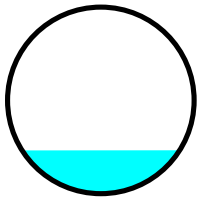
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 1.710 ac, 38.00% Impervious, Inflow Depth > 2.00" for 2 Yr event
Inflow = 2.46 cfs @ 9.96 hrs, Volume= 0.284 af
Outflow = 2.45 cfs @ 9.97 hrs, Volume= 0.284 af, Atten= 0%, Lag= 0.4 min

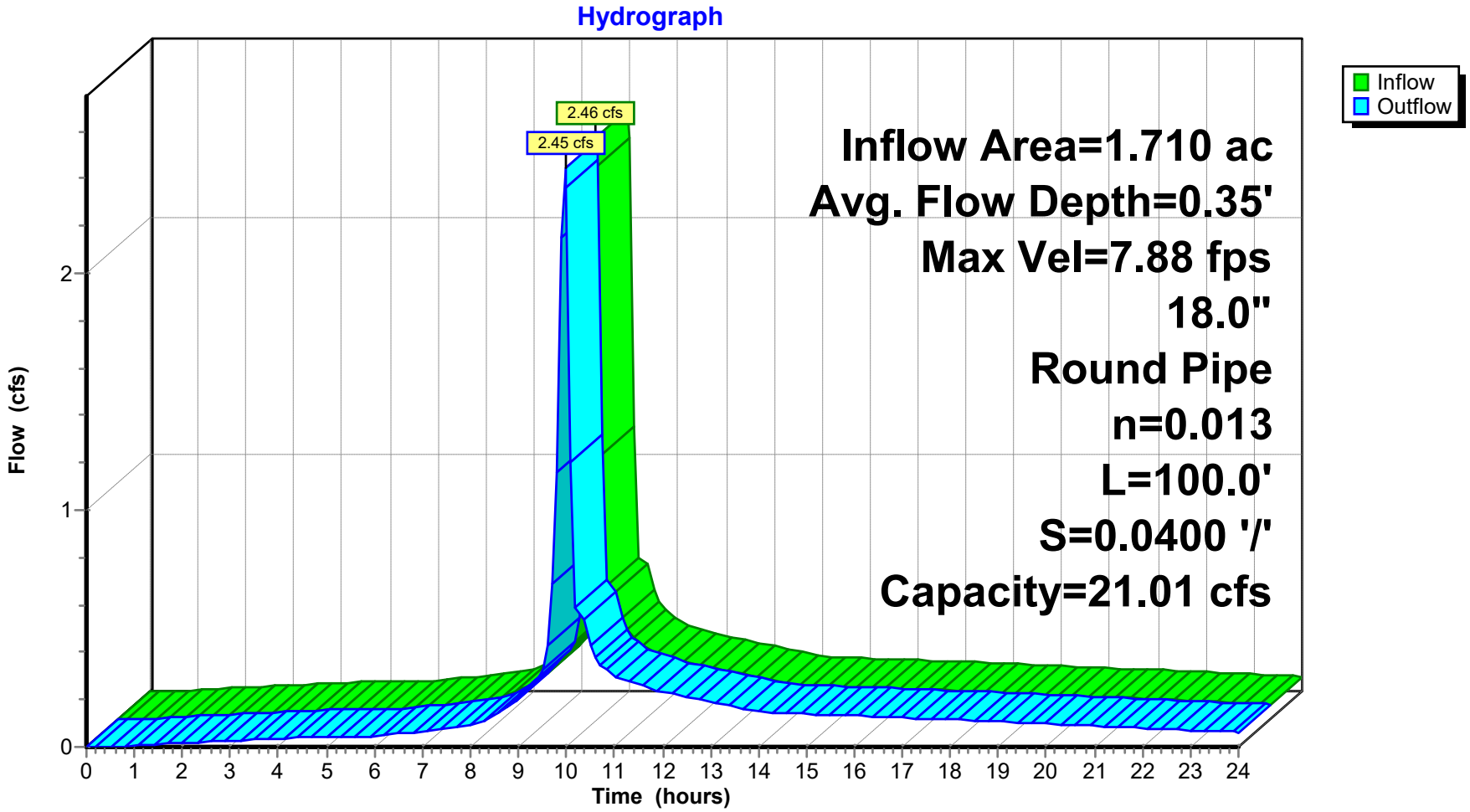
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Max. Velocity= 7.88 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 3.09 fps, Avg. Travel Time= 0.5 min

Peak Storage= 31 cf @ 9.96 hrs
Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 21.01 cfs

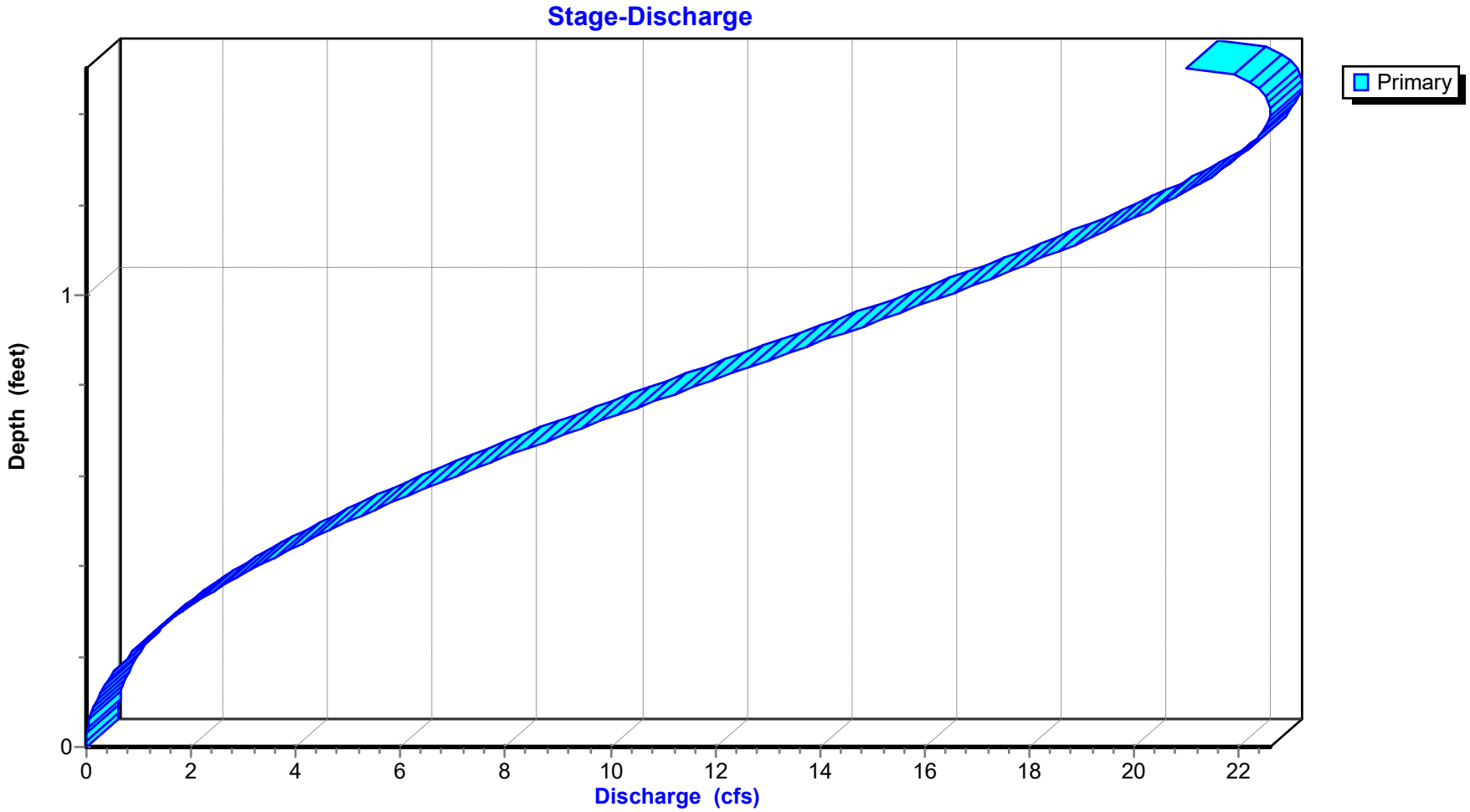
18.0" Round Pipe
n= 0.013
Length= 100.0' Slope= 0.0400 '/'
Inlet Invert= 158.00', Outlet Invert= 154.00'



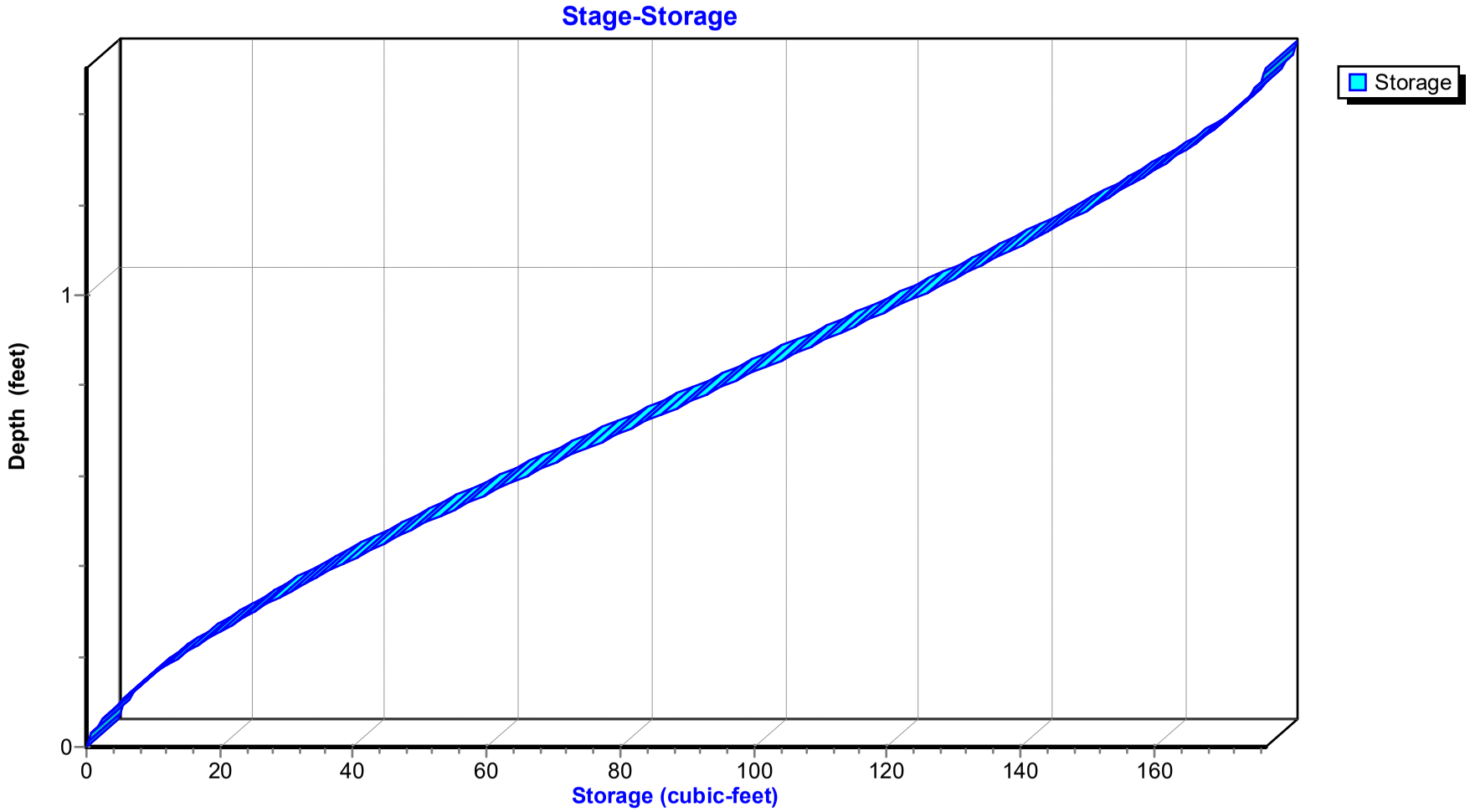
Reach 7R: SD-2


Hydrograph
Inflow
Outflow
2.46 cfs
2.45 cfs
Inflow Area=1.710 ac
Avg. Flow Depth=0.35'
Max Vel=7.88 fps
18.0"
Round Pipe
n=0.013
L=100.0'
S=0.0400 '/'
Capacity=21.01 cfs
Flow (cfs)
0
1
2
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time (hours)

Reach 7R: SD-2


Stage-Discharge
Primary
Depth (feet)
0
1
0
2
4
6
8
10
12
14
16
18
20
22
Discharge (cfs)

Reach 7R: SD-2


Stage-Storage
Storage
Depth (feet)
0
1
0
20
40
60
80
100
120
140
160
Storage (cubic-feet)

Hydrograph for Reach 7R: SD-2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	158.00	0.00
0.50	0.00	0	158.00	0.00
1.00	0.00	0	158.01	0.00
1.50	0.01	1	158.03	0.01
2.00	0.02	1	158.03	0.02
2.50	0.02	1	158.04	0.02
3.00	0.03	1	158.04	0.03
3.50	0.03	1	158.04	0.03
4.00	0.04	2	158.05	0.04
4.50	0.04	2	158.05	0.04
5.00	0.04	2	158.05	0.04
5.50	0.04	2	158.05	0.04
6.00	0.05	2	158.05	0.05
6.50	0.06	2	158.06	0.06
7.00	0.07	2	158.06	0.07
7.50	0.08	3	158.07	0.08
8.00	0.09	3	158.07	0.09
8.50	0.14	4	158.09	0.14
9.00	0.20	5	158.10	0.20
9.50	0.33	7	158.13	0.33
10.00	**2.34**	**30**	**158.34**	**2.36**
10.50	0.43	9	158.15	0.43
11.00	0.30	7	158.13	0.30
11.50	0.26	6	158.12	0.26
12.00	0.23	6	158.11	0.23
12.50	0.21	6	158.11	0.21
13.00	0.19	5	158.10	0.19
13.50	0.17	5	158.10	0.17
14.00	0.15	4	158.09	0.15
14.50	0.14	4	158.09	0.14
15.00	0.14	4	158.09	0.14
15.50	0.14	4	158.09	0.14
16.00	0.13	4	158.08	0.13
16.50	0.13	4	158.08	0.13
17.00	0.12	4	158.08	0.12
17.50	0.12	4	158.08	0.12
18.00	0.12	4	158.08	0.12
18.50	0.11	4	158.08	0.11
19.00	0.11	3	158.08	0.11
19.50	0.10	3	158.08	0.10
20.00	0.10	3	158.07	0.10
20.50	0.09	3	158.07	0.09
21.00	0.09	3	158.07	0.09
21.50	0.08	3	158.07	0.09
22.00	0.08	3	158.07	0.08
22.50	0.08	3	158.07	0.08
23.00	0.07	3	158.06	0.07
23.50	0.07	2	158.06	0.07
24.00	0.06	2	158.06	0.06

Stage-Discharge for Reach 7R: SD-2

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
158.00	0.00	0.00
158.02	1.26	0.01
158.04	2.02	0.03
158.06	2.64	0.06
158.08	3.18	0.12
158.10	3.68	0.19
158.12	4.14	0.27
158.14	4.56	0.38
158.16	4.97	0.50
158.18	5.35	0.64
158.20	5.71	0.80
158.22	6.06	0.98
158.24	6.39	1.17
158.26	6.71	1.38
158.28	7.02	1.60
158.30	7.31	1.84
158.32	7.60	2.10
158.34	7.87	2.37
158.36	8.14	2.65
158.38	8.39	2.96
158.40	8.64	3.27
158.42	8.88	3.60
158.44	9.11	3.94
158.46	9.34	4.29
158.48	9.56	4.66
158.50	9.77	5.04
158.52	9.97	5.43
158.54	10.17	5.82
158.56	10.36	6.23
158.58	10.55	6.65
158.60	10.73	7.08
158.62	10.90	7.52
158.64	11.07	7.96
158.66	11.23	8.41
158.68	11.38	8.87
158.70	11.53	9.33
158.72	11.68	9.80
158.74	11.82	10.27
158.76	11.95	10.74
158.78	12.08	11.22
158.80	12.21	11.70
158.82	12.33	12.18
158.84	12.44	12.67
158.86	12.55	13.15
158.88	12.65	13.63
158.90	12.75	14.11
158.92	12.84	14.59
158.94	12.93	15.07
158.96	13.01	15.54
158.98	13.09	16.01
159.00	13.16	16.47
159.02	13.22	16.92
159.04	13.28	17.37
159.06	13.34	17.81
159.08	13.39	18.24
159.10	13.43	18.65
159.12	13.47	19.06
159.14	13.50	19.45
159.16	13.52	19.83
159.18	13.54	20.19
159.20	13.55	20.54
159.22	**13.55**	20.86
159.24	13.55	21.17
159.26	13.54	21.45
159.28	13.52	21.71
159.30	13.49	21.94
159.32	13.45	22.15
159.34	13.40	22.32
159.36	13.33	22.45
159.38	13.26	22.55
159.40	13.16	**22.59**
159.42	13.05	**22.58**
159.44	12.91	22.51
159.46	12.73	22.33
159.48	12.48	21.99
159.50	11.89	21.01

Stage-Area-Storage for Reach 7R: SD-2

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
158.00	0.0	0	158.70	0.8	81	159.40	1.7	172
158.02	0.0	0	158.72	0.8	84	159.42	1.7	173
158.04	0.0	1	158.74	0.9	87	159.44	1.7	174
158.06	0.0	2	158.76	0.9	90	159.46	1.8	175
158.08	0.0	4	158.78	0.9	93	159.48	1.8	176
158.10	0.1	5	158.80	1.0	96	159.50	**1.8**	**177**
158.12	0.1	7	158.82	1.0	99			
158.14	0.1	8	158.84	1.0	102			
158.16	0.1	10	158.86	1.0	105			
158.18	0.1	12	158.88	1.1	108			
158.20	0.1	14	158.90	1.1	111			
158.22	0.2	16	158.92	1.1	114			
158.24	0.2	18	158.94	1.2	117			
158.26	0.2	20	158.96	1.2	119			
158.28	0.2	23	158.98	1.2	122			
158.30	0.3	25	159.00	1.3	125			
158.32	0.3	28	159.02	1.3	128			
158.34	0.3	30	159.04	1.3	131			
158.36	0.3	33	159.06	1.3	133			
158.38	0.4	35	159.08	1.4	136			
158.40	0.4	38	159.10	1.4	139			
158.42	0.4	41	159.12	1.4	142			
158.44	0.4	43	159.14	1.4	144			
158.46	0.5	46	159.16	1.5	147			
158.48	0.5	49	159.18	1.5	149			
158.50	0.5	52	159.20	1.5	152			
158.52	0.5	54	159.22	1.5	154			
158.54	0.6	57	159.24	1.6	156			
158.56	0.6	60	159.26	1.6	158			
158.58	0.6	63	159.28	1.6	161			
158.60	0.7	66	159.30	1.6	163			
158.62	0.7	69	159.32	1.6	165			
158.64	0.7	72	159.34	1.7	167			
158.66	0.7	75	159.36	1.7	168			
158.68	0.8	78	159.38	1.7	170			

Summary for Reach 10R: SD-3

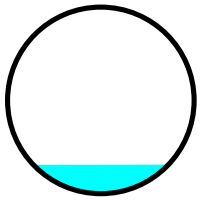
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 0.800 ac,100.00% Impervious, Inflow Depth > 2.97" for 2 Yr event
Inflow = 1.72 cfs @ 9.95 hrs, Volume= 0.198 af
Outflow = 1.71 cfs @ 9.95 hrs, Volume= 0.198 af, Atten= 1%, Lag= 0.2 min

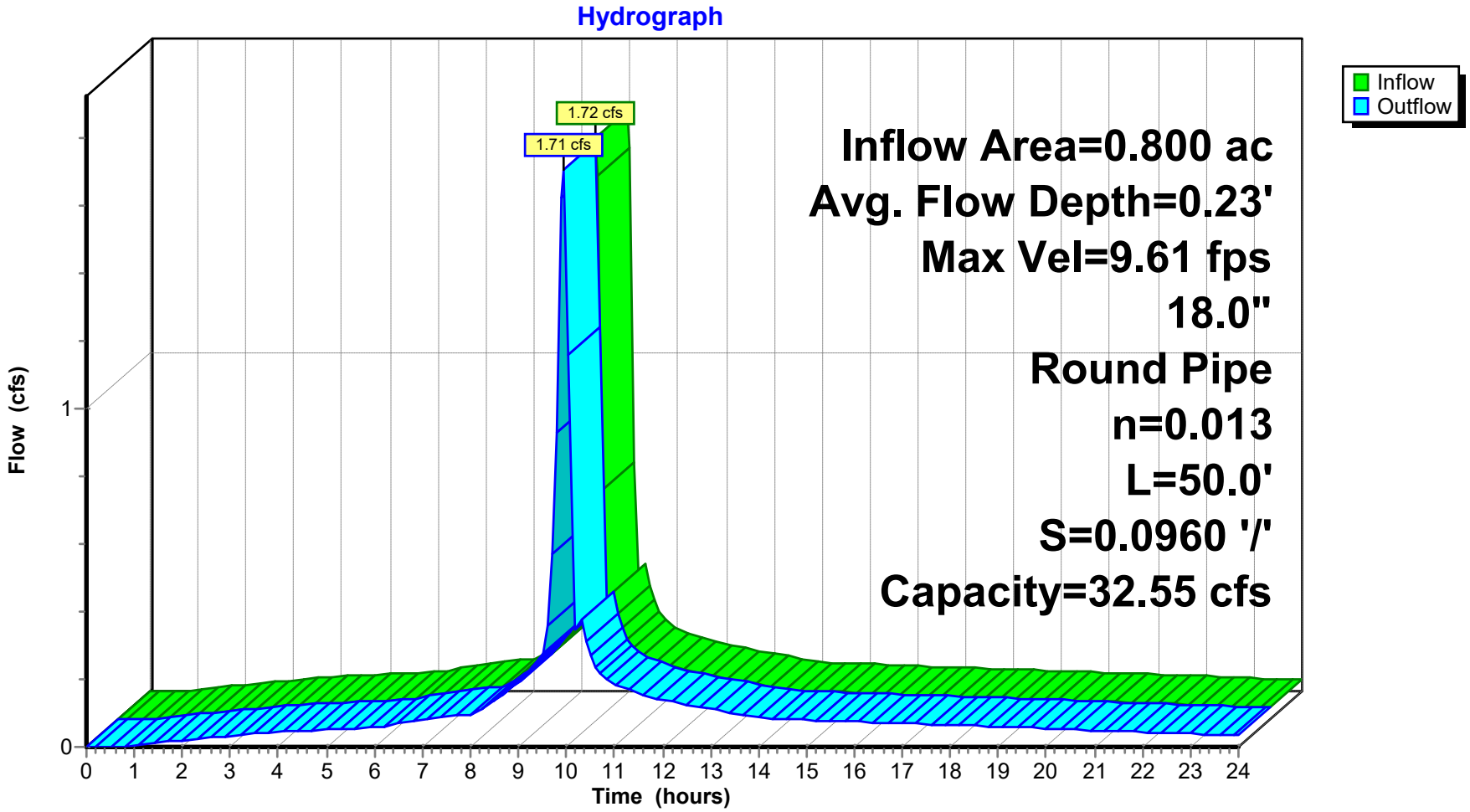
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Max. Velocity= 9.61 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.81 fps, Avg. Travel Time= 0.2 min

Peak Storage= 9 cf @ 9.95 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 32.55 cfs

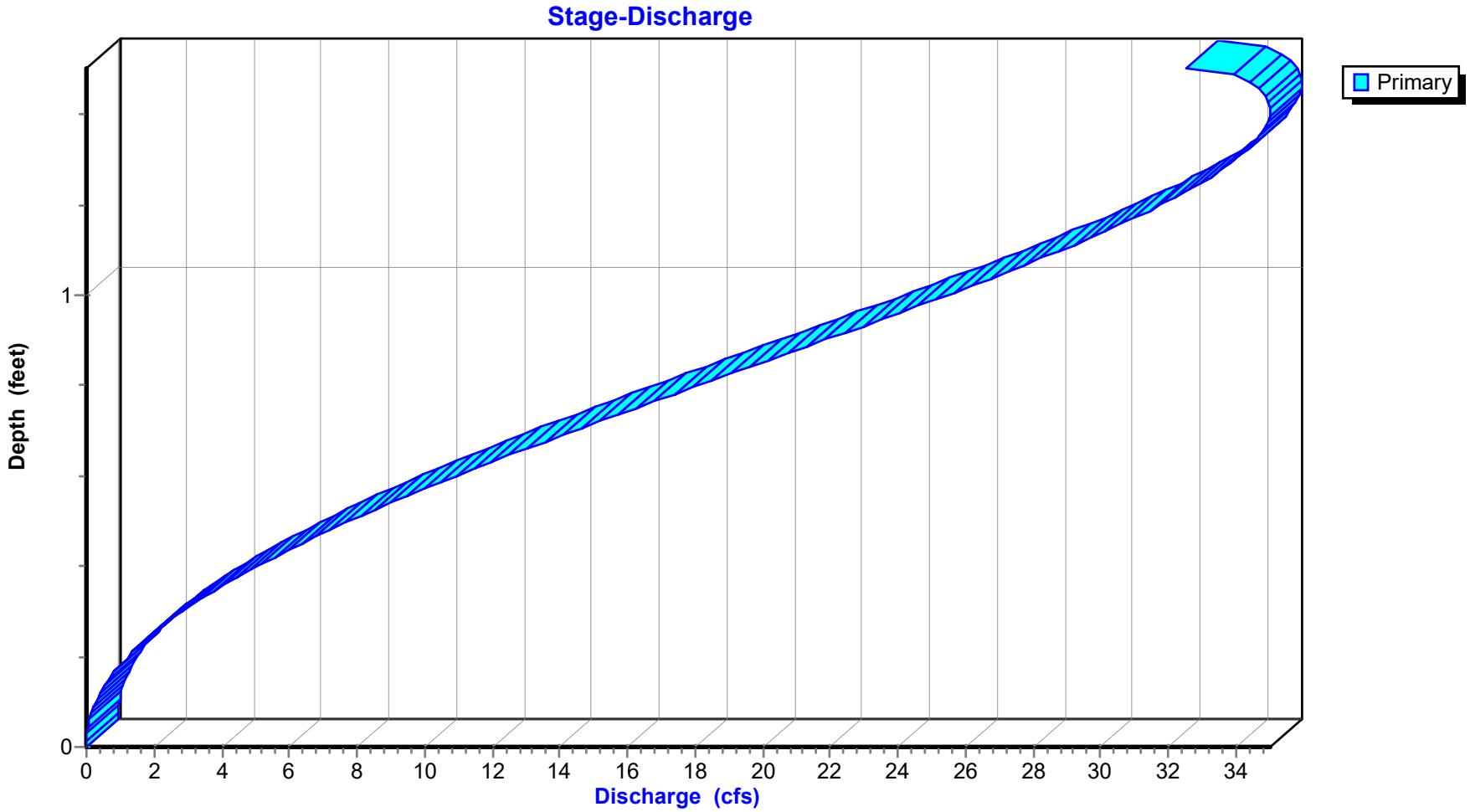
18.0" Round Pipe
n= 0.013
Length= 50.0' Slope= 0.0960 '/'
Inlet Invert= 144.80', Outlet Invert= 140.00'



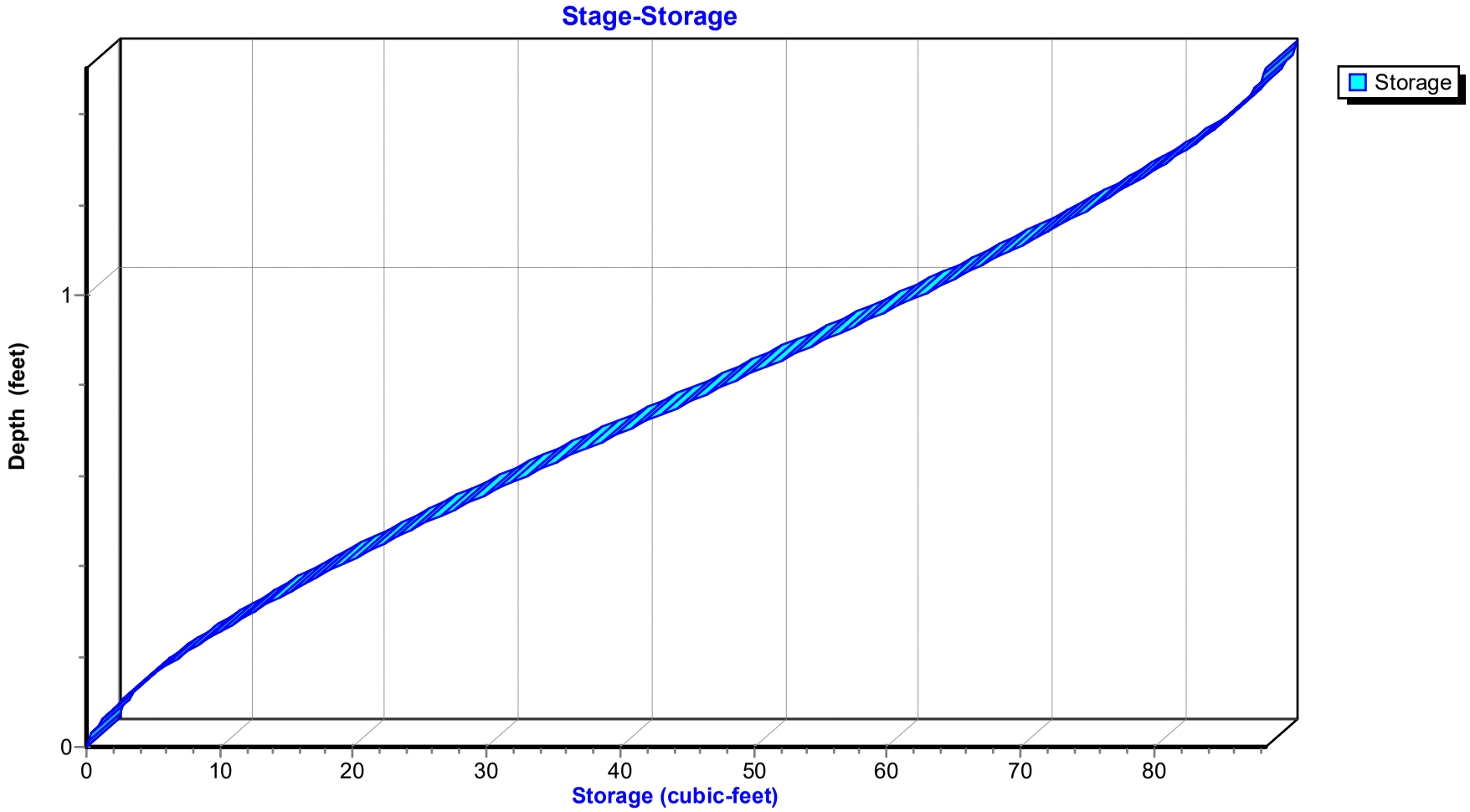
Reach 10R: SD-3



Reach 10R: SD-3



Reach 10R: SD-3



Hydrograph for Reach 10R: SD-3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	144.80	0.00
0.50	0.00	0	144.80	0.00
1.00	0.00	0	144.81	0.00
1.50	0.01	0	144.82	0.01
2.00	0.02	0	144.83	0.02
2.50	0.03	0	144.83	0.03
3.00	0.03	1	144.84	0.03
3.50	0.04	1	144.84	0.04
4.00	0.04	1	144.84	0.04
4.50	0.05	1	144.84	0.05
5.00	0.05	1	144.84	0.05
5.50	0.05	1	144.85	0.05
6.00	0.06	1	144.85	0.06
6.50	0.07	1	144.85	0.07
7.00	0.08	1	144.86	0.08
7.50	0.09	1	144.86	0.09
8.00	0.09	1	144.86	0.09
8.50	0.14	2	144.87	0.14
9.00	0.19	2	144.88	0.19
9.50	**0.28**	**2**	**144.90**	**0.28**
10.00	**1.61**	**8**	**145.03**	**1.62**
10.50	0.27	2	144.90	0.27
11.00	0.19	2	144.88	0.19
11.50	0.16	2	144.88	0.16
12.00	0.14	2	144.87	0.14
12.50	0.13	1	144.87	0.12
13.00	0.11	1	144.86	0.11
13.50	0.10	1	144.86	0.10
14.00	0.09	1	144.86	0.09
14.50	0.08	1	144.86	0.08
15.00	0.08	1	144.85	0.08
15.50	0.08	1	144.85	0.08
16.00	0.07	1	144.85	0.07
16.50	0.07	1	144.85	0.07
17.00	0.07	1	144.85	0.07
17.50	0.07	1	144.85	0.07
18.00	0.06	1	144.85	0.06
18.50	0.06	1	144.85	0.06
19.00	0.06	1	144.85	0.06
19.50	0.06	1	144.85	0.06
20.00	0.05	1	144.85	0.05
20.50	0.05	1	144.84	0.05
21.00	0.05	1	144.84	0.05
21.50	0.05	1	144.84	0.05
22.00	0.04	1	144.84	0.04
22.50	0.04	1	144.84	0.04
23.00	0.04	1	144.84	0.04
23.50	0.04	1	144.84	0.04
24.00	0.03	1	144.84	0.03

Stage-Discharge for Reach 10R: SD-3

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
144.80	0.00	0.00
144.82	1.96	0.01
144.84	3.12	0.04
144.86	4.09	0.10
144.88	4.93	0.18
144.90	5.70	0.29
144.92	6.41	0.42
144.94	7.07	0.59
144.96	7.69	0.78
144.98	8.29	1.00
145.00	8.85	1.24
145.02	9.39	1.51
145.04	9.90	1.81
145.06	10.39	2.13
145.08	10.87	2.48
145.10	11.33	2.85
145.12	11.77	3.25
145.14	12.19	3.67
145.16	12.61	4.11
145.18	13.00	4.58
145.20	13.39	5.07
145.22	13.76	5.57
145.24	14.12	6.10
145.26	14.47	6.65
145.28	14.80	7.22
145.30	15.13	7.80
145.32	15.45	8.41
145.34	15.75	9.02
145.36	16.05	9.66
145.38	16.34	10.31
145.40	16.62	10.97
145.42	16.88	11.64
145.44	17.14	12.33
145.46	17.39	13.03
145.48	17.64	13.73
145.50	17.87	14.45
145.52	18.10	15.17
145.54	18.31	15.91
145.56	18.52	16.64
145.58	18.72	17.38
145.60	18.91	18.13
145.62	19.10	18.88
145.64	19.27	19.62
145.66	19.44	20.37
145.68	19.60	21.12
145.70	19.75	21.87
145.72	19.89	22.61
145.74	20.03	23.34
145.76	20.16	24.08
145.78	20.27	24.80
145.80	20.38	25.51
145.82	20.49	26.22
145.84	20.58	26.91
145.86	20.66	27.59
145.88	20.74	28.25
145.90	20.81	28.90
145.92	20.86	29.52
145.94	20.91	30.13
145.96	20.95	30.72
145.98	20.97	31.28
146.00	20.99	31.81
146.02	**21.00**	32.32
146.04	20.99	32.79
146.06	20.97	33.23
146.08	20.94	33.63
146.10	20.89	33.99
146.12	20.83	34.31
146.14	20.75	34.57
146.16	20.65	34.78
146.18	20.54	34.93
146.20	20.39	**35.00**
146.22	20.21	**34.98**
146.24	20.00	34.87
146.26	19.72	34.59
146.28	19.33	34.07
146.30	18.42	32.55

Stage-Area-Storage for Reach 10R: SD-3

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
144.80	0.0	0	145.50	0.8	40	146.20	1.7	86
144.82	0.0	0	145.52	0.8	42	146.22	1.7	87
144.84	0.0	1	145.54	0.9	43	146.24	1.7	87
144.86	0.0	1	145.56	0.9	45	146.26	1.8	88
144.88	0.0	2	145.58	0.9	46	146.28	1.8	88
144.90	0.1	3	145.60	1.0	48	146.30	**1.8**	**88**
144.92	0.1	3	145.62	1.0	49			
144.94	0.1	4	145.64	1.0	51			
144.96	0.1	5	145.66	1.0	52			
144.98	0.1	6	145.68	1.1	54			
145.00	0.1	7	145.70	1.1	55			
145.02	0.2	8	145.72	1.1	57			
145.04	0.2	9	145.74	1.2	58			
145.06	0.2	10	145.76	1.2	60			
145.08	0.2	11	145.78	1.2	61			
145.10	0.3	13	145.80	1.3	63			
145.12	0.3	14	145.82	1.3	64			
145.14	0.3	15	145.84	1.3	65			
145.16	0.3	16	145.86	1.3	67			
145.18	0.4	18	145.88	1.4	68			
145.20	0.4	19	145.90	1.4	69			
145.22	0.4	20	145.92	1.4	71			
145.24	0.4	22	145.94	1.4	72			
145.26	0.5	23	145.96	1.5	73			
145.28	0.5	24	145.98	1.5	75			
145.30	0.5	26	146.00	1.5	76			
145.32	0.5	27	146.02	1.5	77			
145.34	0.6	29	146.04	1.6	78			
145.36	0.6	30	146.06	1.6	79			
145.38	0.6	32	146.08	1.6	80			
145.40	0.7	33	146.10	1.6	81			
145.42	0.7	34	146.12	1.6	82			
145.44	0.7	36	146.14	1.7	83			
145.46	0.7	37	146.16	1.7	84			
145.48	0.8	39	146.18	1.7	85			

Summary for Pond 8P: Detention Basin 2

[61] Hint: Exceeded Reach 3R outlet invert by 0.38' @ 10.10 hrs
[62] Hint: Exceeded Reach 7R OUTLET depth by 0.14' @ 10.10 hrs

Inflow Area = 6.010 ac, 38.00% Impervious, Inflow Depth > 1.99" for 2 Yr event
Inflow = 8.21 cfs @ 9.98 hrs, Volume= 0.999 af
Outflow = 5.10 cfs @ 9.90 hrs, Volume= 0.998 af, Atten= 38%, Lag= 0.0 min
Primary = 5.10 cfs @ 9.90 hrs, Volume= 0.998 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 154.38' @ 10.11 hrs Surf.Area= 0.134 ac Storage= 0.049 af

Plug-Flow detention time= 2.3 min calculated for 0.998 af (100% of inflow)
Center-of-Mass det. time= 2.0 min (760.2 - 758.2)

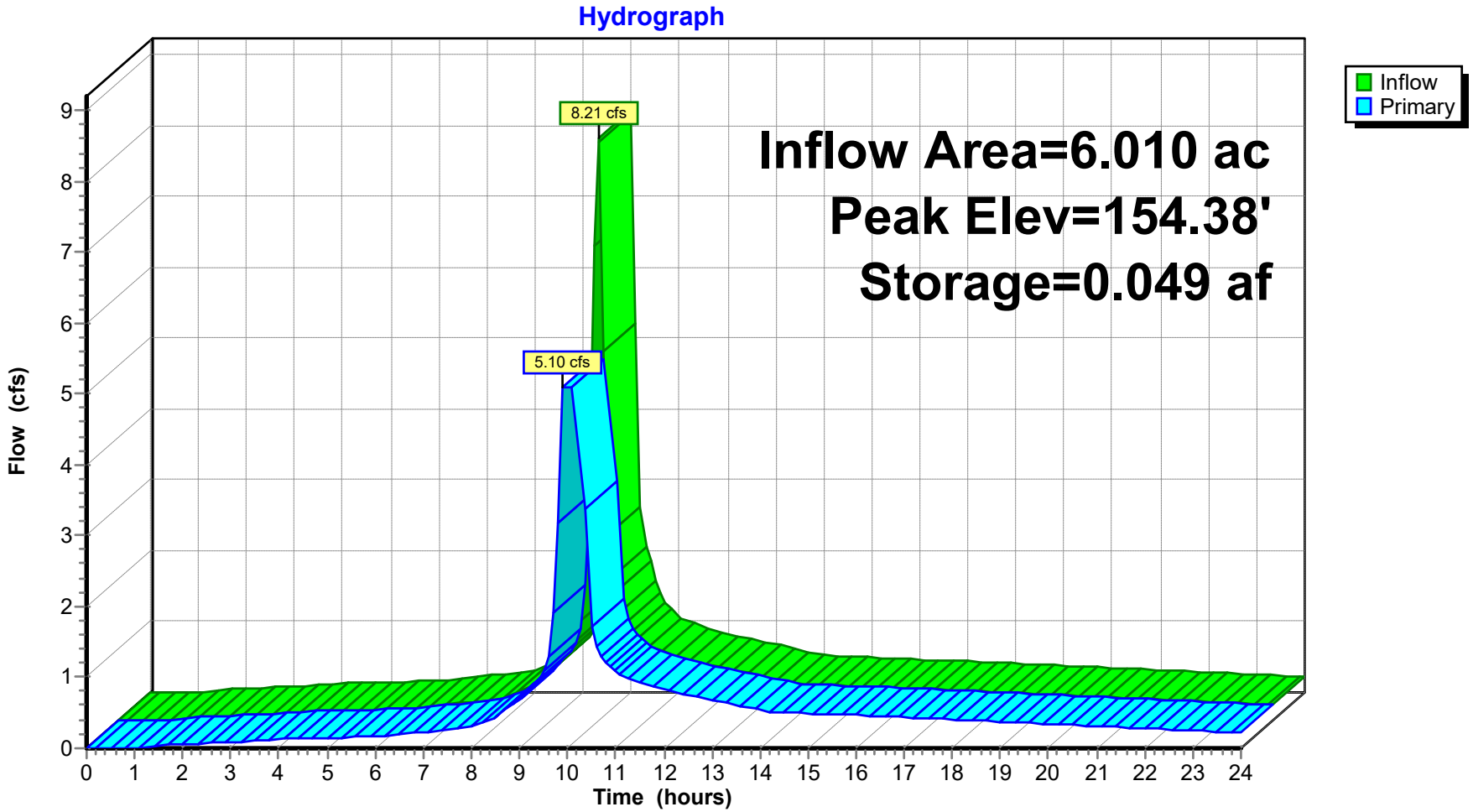
Volume	Invert	Avail.Storage	Storage Description
#1	154.00'	1.297 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
154.00	0.123	0.000	0.000
155.00	0.152	0.137	0.137
156.00	0.182	0.167	0.304
157.00	0.214	0.198	0.503
158.00	0.247	0.230	0.733
159.00	0.282	0.264	0.998
160.00	0.317	0.300	1.297

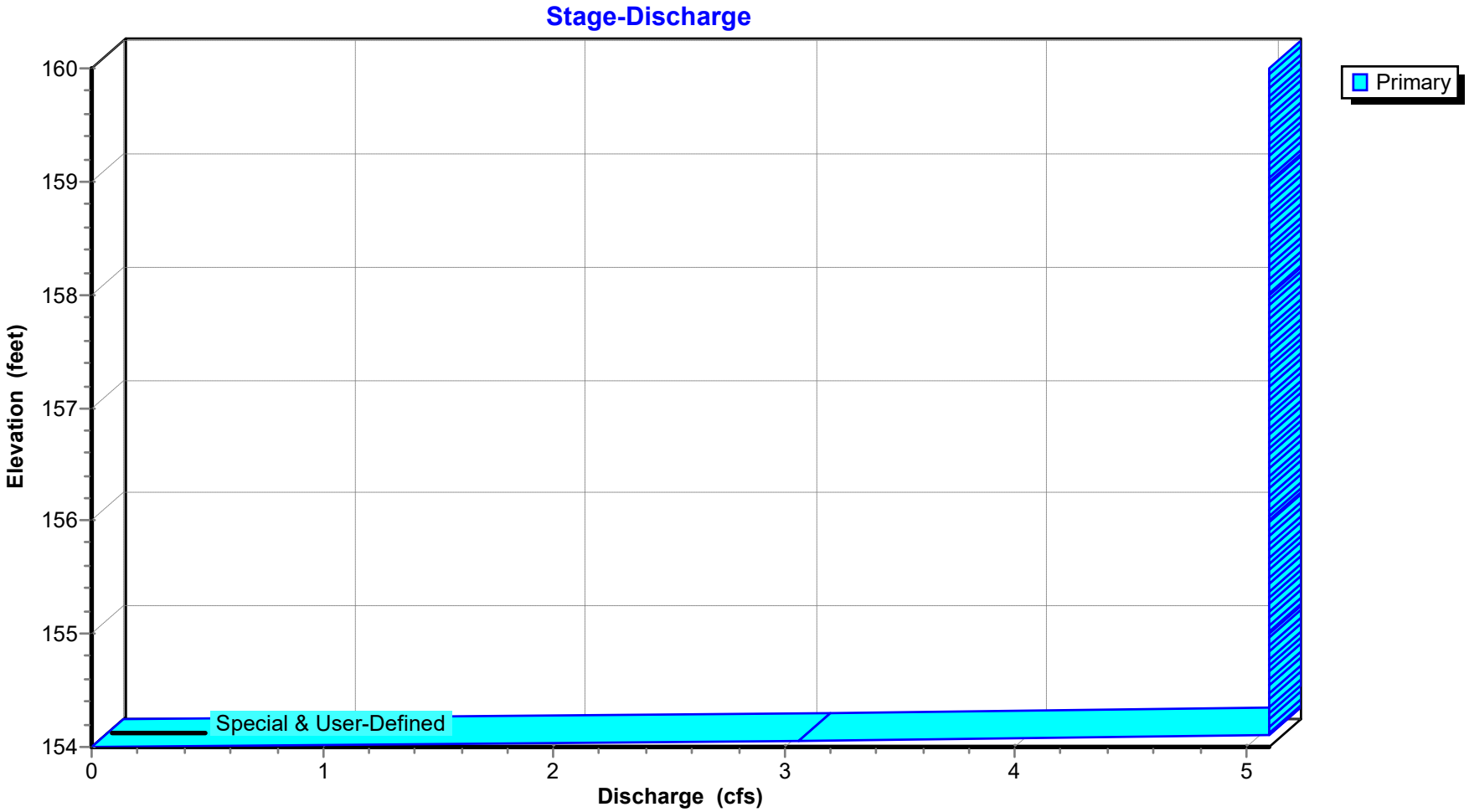
Device	Routing	Invert	Outlet Devices
#1	Primary	154.00'	**Special & User-Defined** Head (feet) 0.00 0.10 6.00 Disch. (cfs) 0.000 5.100 5.100

Primary OutFlow Max=5.10 cfs @ 9.90 hrs HW=154.13' (Free Discharge)
1=Special & User-Defined (Custom Controls 5.10 cfs)

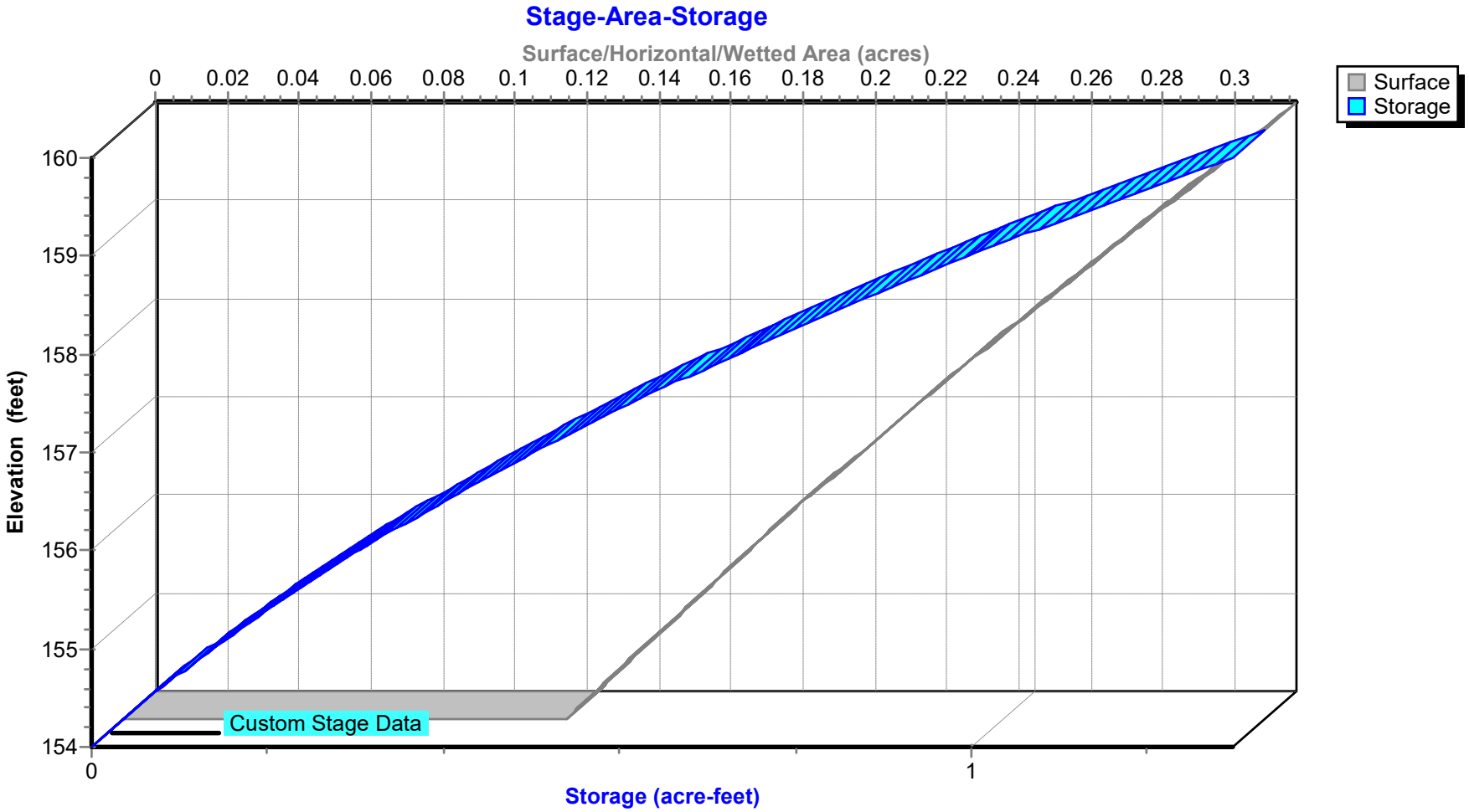
Pond 8P: Detention Basin 2



Pond 8P: Detention Basin 2



Pond 8P: Detention Basin 2



Hydrograph for Pond 8P: Detention Basin 2

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	154.00	0.00
0.50	0.00	0.000	154.00	0.00
1.00	0.01	0.000	154.00	0.01
1.50	0.04	0.000	154.00	0.03
2.00	0.05	0.000	154.00	0.05
2.50	0.07	0.000	154.00	0.07
3.00	0.09	0.000	154.00	0.09
3.50	0.11	0.000	154.00	0.11
4.00	0.12	0.000	154.00	0.12
4.50	0.14	0.000	154.00	0.14
5.00	0.15	0.000	154.00	0.15
5.50	0.15	0.000	154.00	0.15
6.00	0.16	0.000	154.00	0.16
6.50	0.19	0.000	154.00	0.19
7.00	0.23	0.001	154.00	0.23
7.50	0.27	0.001	154.01	0.27
8.00	0.31	0.001	154.01	0.30
8.50	0.47	0.001	154.01	0.46
9.00	0.70	0.002	154.01	0.69
9.50	1.12	0.003	154.02	**1.09**
10.00	**8.15**	**0.036**	**154.28**	**5.10**
10.50	1.58	**0.004**	**154.03**	1.73
11.00	1.08	0.003	154.02	1.10
11.50	0.93	0.002	154.02	0.94
12.00	0.82	0.002	154.02	0.83
12.50	0.75	0.002	154.01	0.75
13.00	0.68	0.002	154.01	0.68
13.50	0.61	0.001	154.01	0.61
14.00	0.53	0.001	154.01	0.54
14.50	0.50	0.001	154.01	0.51
15.00	0.49	0.001	154.01	0.49
15.50	0.48	0.001	154.01	0.48
16.00	0.46	0.001	154.01	0.47
16.50	0.45	0.001	154.01	0.45
17.00	0.44	0.001	154.01	0.44
17.50	0.42	0.001	154.01	0.42
18.00	0.41	0.001	154.01	0.41
18.50	0.39	0.001	154.01	0.39
19.00	0.38	0.001	154.01	0.38
19.50	0.36	0.001	154.01	0.36
20.00	0.35	0.001	154.01	0.35
20.50	0.33	0.001	154.01	0.33
21.00	0.32	0.001	154.01	0.32
21.50	0.30	0.001	154.01	0.30
22.00	0.28	0.001	154.01	0.29
22.50	0.27	0.001	154.01	0.27
23.00	0.25	0.001	154.00	0.25
23.50	0.24	0.001	154.00	0.24
24.00	0.22	0.001	154.00	0.22

Stage-Discharge for Pond 8P: Detention Basin 2

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
154.00	0.00	155.40	5.10	156.80	5.10	158.20	5.10	159.60	5.10
154.04	2.04	155.44	5.10	156.84	5.10	158.24	5.10	159.64	5.10
154.08	4.08	155.48	5.10	156.88	5.10	158.28	5.10	159.68	5.10
154.12	**5.10**	155.52	5.10	156.92	5.10	158.32	5.10	159.72	5.10
154.16	5.10	155.56	5.10	156.96	5.10	158.36	5.10	159.76	5.10
154.20	5.10	155.60	5.10	157.00	5.10	158.40	5.10	159.80	5.10
154.24	5.10	155.64	5.10	157.04	5.10	158.44	5.10	159.84	5.10
154.28	5.10	155.68	5.10	157.08	5.10	158.48	5.10	159.88	5.10
154.32	5.10	155.72	5.10	157.12	5.10	158.52	5.10	159.92	5.10
154.36	5.10	155.76	5.10	157.16	5.10	158.56	5.10	159.96	5.10
154.40	5.10	155.80	5.10	157.20	5.10	158.60	5.10	160.00	5.10
154.44	5.10	155.84	5.10	157.24	5.10	158.64	5.10		
154.48	5.10	155.88	5.10	157.28	5.10	158.68	5.10		
154.52	5.10	155.92	5.10	157.32	5.10	158.72	5.10		
154.56	5.10	155.96	5.10	157.36	5.10	158.76	5.10		
154.60	5.10	156.00	5.10	157.40	5.10	158.80	5.10		
154.64	5.10	156.04	5.10	157.44	5.10	158.84	5.10		
154.68	5.10	156.08	5.10	157.48	5.10	158.88	5.10		
154.72	5.10	156.12	5.10	157.52	5.10	158.92	5.10		
154.76	5.10	156.16	5.10	157.56	5.10	158.96	5.10		
154.80	5.10	156.20	5.10	157.60	5.10	159.00	5.10		
154.84	5.10	156.24	5.10	157.64	5.10	159.04	5.10		
154.88	5.10	156.28	5.10	157.68	5.10	159.08	5.10		
154.92	5.10	156.32	5.10	157.72	5.10	159.12	5.10		
154.96	5.10	156.36	5.10	157.76	5.10	159.16	5.10		
155.00	5.10	156.40	5.10	157.80	5.10	159.20	5.10		
155.04	5.10	156.44	5.10	157.84	5.10	159.24	5.10		
155.08	5.10	156.48	5.10	157.88	5.10	159.28	5.10		
155.12	5.10	156.52	5.10	157.92	5.10	159.32	5.10		
155.16	5.10	156.56	5.10	157.96	5.10	159.36	5.10		
155.20	5.10	156.60	5.10	158.00	5.10	159.40	5.10		
155.24	5.10	156.64	5.10	158.04	5.10	159.44	5.10		
155.28	5.10	156.68	5.10	158.08	5.10	159.48	5.10		
155.32	5.10	156.72	5.10	158.12	5.10	159.52	5.10		
155.36	5.10	156.76	5.10	158.16	5.10	159.56	5.10		

Stage-Area-Storage for Pond 8P: Detention Basin 2

Elevation (feet)	Surface (acres)	Storage (acre-feet)
154.00	0.123	0.000
154.10	0.126	0.012
154.20	0.129	0.025
154.30	0.132	0.038
154.40	0.135	0.052
154.50	0.137	0.065
154.60	0.140	0.079
154.70	0.143	0.093
154.80	0.146	0.108
154.90	0.149	0.122
155.00	0.152	0.137
155.10	0.155	0.153
155.20	0.158	0.168
155.30	0.161	0.184
155.40	0.164	0.201
155.50	0.167	0.217
155.60	0.170	0.234
155.70	0.173	0.251
155.80	0.176	0.269
155.90	0.179	0.286
156.00	0.182	0.304
156.10	0.185	0.323
156.20	0.188	0.342
156.30	0.192	0.361
156.40	0.195	0.380
156.50	0.198	0.400
156.60	0.201	0.419
156.70	0.204	0.440
156.80	0.208	0.460
156.90	0.211	0.481
157.00	0.214	0.503
157.10	0.217	0.524
157.20	0.221	0.546
157.30	0.224	0.568
157.40	0.227	0.591
157.50	0.230	0.614
157.60	0.234	0.637
157.70	0.237	0.660
157.80	0.240	0.684
157.90	0.244	0.708
158.00	0.247	0.733
158.10	0.250	0.758
158.20	0.254	0.783
158.30	0.258	0.809
158.40	0.261	0.835
158.50	0.264	0.861
158.60	0.268	0.887
158.70	0.271	0.914
158.80	0.275	0.942
158.90	0.279	0.969
159.00	0.282	0.998
159.10	0.285	1.026
159.20	0.289	1.055
159.30	0.293	1.084
159.40	0.296	1.113
159.50	0.300	1.143
159.60	0.303	1.173
159.70	0.306	1.203
159.80	0.310	1.234
159.90	0.314	1.265
160.00	**0.317**	**1.297**

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: B-1 Runoff Area=3.000 ac 38.00% Impervious Runoff Depth>3.24"
Flow Length=895' Tc=3.4 min CN=80/98 Runoff=6.83 cfs 0.811 af

Subcatchment 2S: B-2 Runoff Area=1.300 ac 38.00% Impervious Runoff Depth>3.24"
Flow Length=835' Tc=3.1 min CN=80/98 Runoff=2.99 cfs 0.351 af

Subcatchment 4S: C-1 Runoff Area=1.050 ac 38.00% Impervious Runoff Depth>3.24"
Flow Length=510' Tc=2.5 min CN=80/98 Runoff=2.47 cfs 0.284 af

Subcatchment 5S: C-2 Runoff Area=0.160 ac 38.00% Impervious Runoff Depth>3.25"
Flow Length=240' Slope=0.0400 '/' Tc=1.0 min CN=80/98 Runoff=0.39 cfs 0.043 af

Subcatchment 6S: C-3 Runoff Area=0.500 ac 38.00% Impervious Runoff Depth>3.25"
Flow Length=250' Slope=0.0200 '/' Tc=1.5 min CN=80/98 Runoff=1.20 cfs 0.135 af

Subcatchment 9S: D-1 Runoff Area=0.800 ac 100.00% Impervious Runoff Depth>4.37"
Flow Length=390' Slope=0.0350 '/' Tc=1.7 min CN=0/98 Runoff=2.50 cfs 0.291 af

Reach 3R: SD-1 Avg. Flow Depth=0.82' Max Vel=8.15 fps Inflow=9.83 cfs 1.162 af
24.0" Round Pipe n=0.013 L=290.0' S=0.0155 '/' Capacity=28.18 cfs Outflow=9.64 cfs 1.161 af

Reach 7R: SD-2 Avg. Flow Depth=0.45' Max Vel=9.09 fps Inflow=4.06 cfs 0.462 af
18.0" Round Pipe n=0.013 L=100.0' S=0.0400 '/' Capacity=21.01 cfs Outflow=4.05 cfs 0.462 af

Reach 10R: SD-3 Avg. Flow Depth=0.28' Max Vel=10.74 fps Inflow=2.50 cfs 0.291 af
18.0" Round Pipe n=0.013 L=50.0' S=0.0960 '/' Capacity=32.55 cfs Outflow=2.48 cfs 0.291 af

Pond 8P: Detention Basin 2 Peak Elev=155.17' Storage=0.164 af Inflow=13.64 cfs 1.624 af
Outflow=5.10 cfs 1.623 af

Total Runoff Area = 6.810 ac Runoff Volume = 1.916 af Average Runoff Depth = 3.38"
54.72% Pervious = 3.726 ac 45.28% Impervious = 3.084 ac

Summary for Subcatchment 1S: B-1

[49] Hint: Tc<2dt may require smaller dt

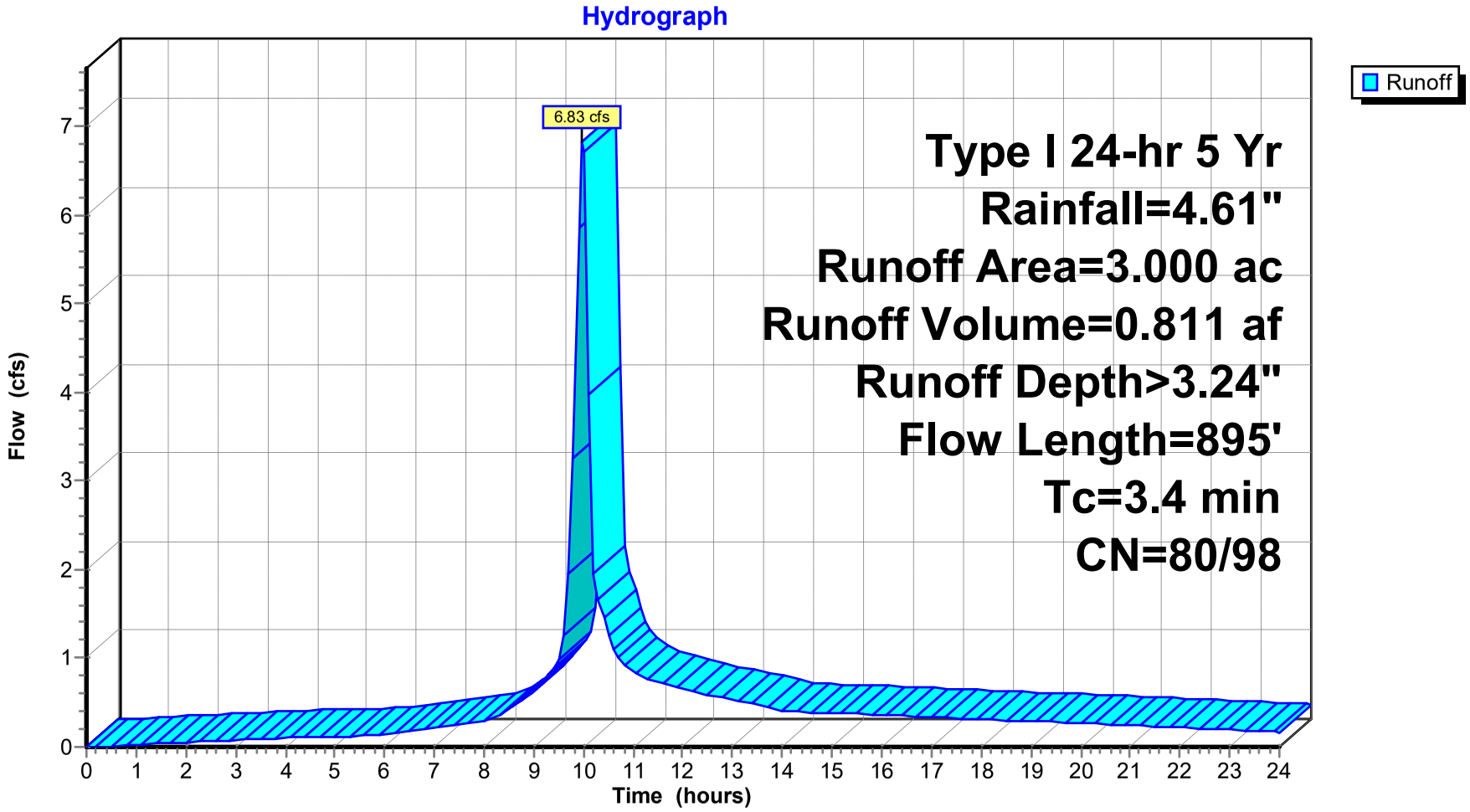
Runoff = 6.83 cfs @ 9.97 hrs, Volume= 0.811 af, Depth> 3.24"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 5 Yr Rainfall=4.61"

Area (ac)	CN	Description
3.000	87	1/4 acre lots, 38% imp, HSG D
1.860	80	62.00% Pervious Area
1.140	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	255	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.3	105	0.0900	6.09		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.5	155	0.0600	4.97		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.0	220	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.9	160	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
3.4	895	Total			

Subcatchment 1S: B-1



Hydrograph for Subcatchment 1S: B-1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.04	0.00	0.00	0.00
1.00	0.08	0.00	0.01	0.02
1.50	0.12	0.00	0.02	0.04
2.00	0.16	0.00	0.04	0.05
2.50	0.20	0.00	0.07	0.07
3.00	0.25	0.00	0.11	0.08
3.50	0.30	0.00	0.14	0.09
4.00	0.35	0.00	0.19	0.10
4.50	0.40	0.00	0.23	0.11
5.00	0.46	0.00	0.28	0.11
5.50	0.52	0.00	0.33	0.12
6.00	0.58	0.00	0.39	0.14
6.50	0.64	0.01	0.45	0.17
7.00	0.72	0.02	0.52	0.22
7.50	0.80	0.03	0.60	0.25
8.00	0.89	0.05	0.69	0.28
8.50	1.01	0.09	0.80	0.43
9.00	1.17	0.14	0.96	0.63
9.50	1.40	0.24	1.18	0.98
10.00	2.37	0.80	2.15	**6.71**
10.50	2.69	1.02	2.46	1.26
11.00	2.87	1.15	2.64	0.86
11.50	3.02	1.27	2.79	0.74
12.00	3.15	1.37	2.92	0.65
12.50	3.27	1.46	3.04	0.59
13.00	3.37	1.54	3.14	0.53
13.50	3.47	1.61	3.23	0.47
14.00	3.55	1.68	3.32	0.41
14.50	3.62	1.74	3.39	0.39
15.00	3.70	1.79	3.46	0.38
15.50	3.77	1.85	3.53	0.37
16.00	3.84	1.91	3.60	0.36
16.50	3.90	1.96	3.67	0.35
17.00	3.96	2.01	3.73	0.34
17.50	4.03	2.06	3.79	0.33
18.00	4.08	2.11	3.85	0.31
18.50	4.14	2.16	3.91	0.30
19.00	4.20	2.20	3.96	0.29
19.50	4.25	2.25	4.01	0.28
20.00	4.30	2.29	4.06	0.27
20.50	4.34	2.33	4.11	0.25
21.00	4.39	2.37	4.15	0.24
21.50	4.43	2.40	4.20	0.23
22.00	4.47	2.44	4.24	0.22
22.50	4.51	2.47	4.27	0.21
23.00	4.55	2.50	4.31	0.19
23.50	4.58	2.53	4.34	0.18
24.00	**4.61**	**2.56**	**4.37**	0.17

Summary for Subcatchment 2S: B-2

[49] Hint: Tc<2dt may require smaller dt

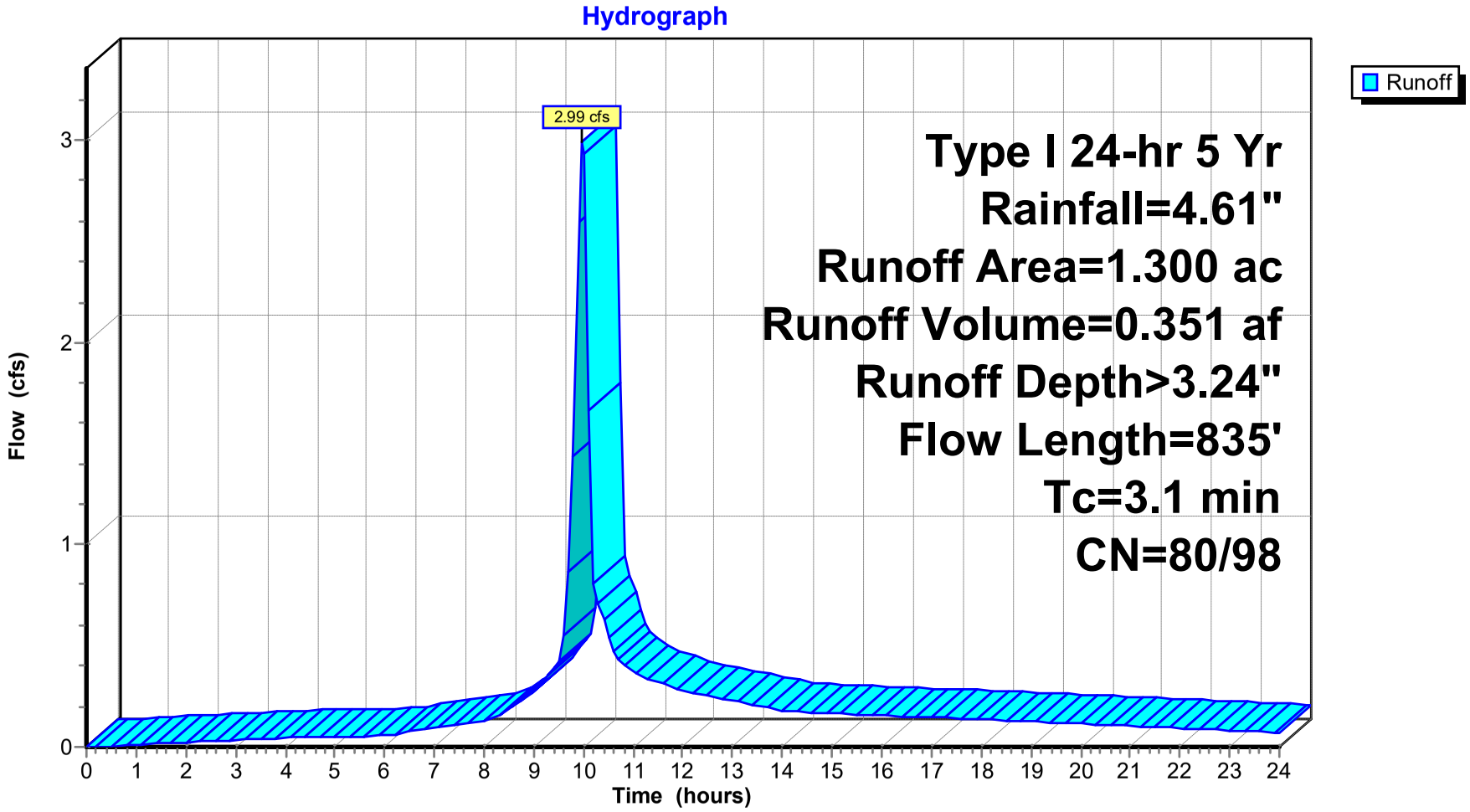
Runoff = 2.99 cfs @ 9.97 hrs, Volume= 0.351 af, Depth> 3.24"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 5 Yr Rainfall=4.61"

Area (ac)	CN	Description
1.300	87	1/4 acre lots, 38% imp, HSG D
0.806	80	62.00% Pervious Area
0.494	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	280	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.3	100	0.0900	6.09		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.5	150	0.0600	4.97		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.0	215	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.5	90	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
3.1	835	Total			

Subcatchment 2S: B-2



Hydrograph for Subcatchment 2S: B-2

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.04	0.00	0.00	0.00
1.00	0.08	0.00	0.01	0.01
1.50	0.12	0.00	0.02	0.02
2.00	0.16	0.00	0.04	0.02
2.50	0.20	0.00	0.07	0.03
3.00	0.25	0.00	0.11	0.03
3.50	0.30	0.00	0.14	0.04
4.00	0.35	0.00	0.19	0.04
4.50	0.40	0.00	0.23	0.05
5.00	0.46	0.00	0.28	0.05
5.50	0.52	0.00	0.33	0.05
6.00	0.58	0.00	0.39	0.06
6.50	0.64	0.01	0.45	0.07
7.00	0.72	0.02	0.52	0.10
7.50	0.80	0.03	0.60	0.11
8.00	0.89	0.05	0.69	0.12
8.50	1.01	0.09	0.80	0.19
9.00	1.17	0.14	0.96	0.27
9.50	1.40	0.24	1.18	0.43
10.00	2.37	0.80	2.15	**2.93**
10.50	2.69	1.02	2.46	0.54
11.00	2.87	1.15	2.64	0.37
11.50	3.02	1.27	2.79	0.32
12.00	3.15	1.37	2.92	0.28
12.50	3.27	1.46	3.04	0.25
13.00	3.37	1.54	3.14	0.23
13.50	3.47	1.61	3.23	0.20
14.00	3.55	1.68	3.32	0.18
14.50	3.62	1.74	3.39	0.17
15.00	3.70	1.79	3.46	0.17
15.50	3.77	1.85	3.53	0.16
16.00	3.84	1.91	3.60	0.16
16.50	3.90	1.96	3.67	0.15
17.00	3.96	2.01	3.73	0.15
17.50	4.03	2.06	3.79	0.14
18.00	4.08	2.11	3.85	0.14
18.50	4.14	2.16	3.91	0.13
19.00	4.20	2.20	3.96	0.13
19.50	4.25	2.25	4.01	0.12
20.00	4.30	2.29	4.06	0.12
20.50	4.34	2.33	4.11	0.11
21.00	4.39	2.37	4.15	0.10
21.50	4.43	2.40	4.20	0.10
22.00	4.47	2.44	4.24	0.09
22.50	4.51	2.47	4.27	0.09
23.00	4.55	2.50	4.31	0.08
23.50	4.58	2.53	4.34	0.08
24.00	**4.61**	**2.56**	**4.37**	0.07

Summary for Subcatchment 4S: C-1

[49] Hint: Tc<2dt may require smaller dt

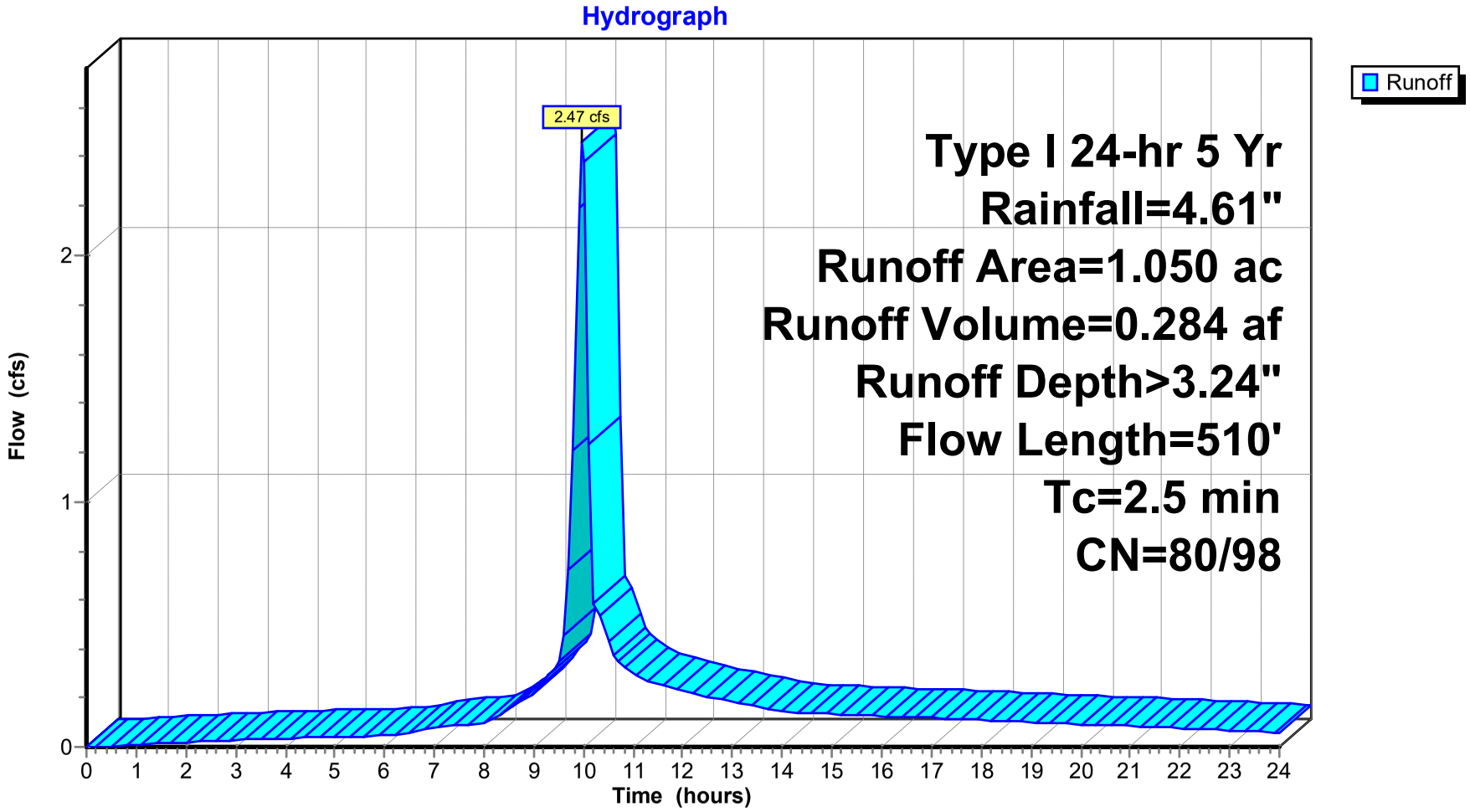
Runoff = 2.47 cfs @ 9.96 hrs, Volume= 0.284 af, Depth> 3.24"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 5 Yr Rainfall=4.61"

Area (ac)	CN	Description
1.050	87	1/4 acre lots, 38% imp, HSG D
0.651	80	62.00% Pervious Area
0.399	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	260	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.0	250	0.0400	4.06		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
2.5	510	Total			

Subcatchment 4S: C-1



Hydrograph for Subcatchment 4S: C-1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.04	0.00	0.00	0.00
1.00	0.08	0.00	0.01	0.01
1.50	0.12	0.00	0.02	0.01
2.00	0.16	0.00	0.04	0.02
2.50	0.20	0.00	0.07	0.02
3.00	0.25	0.00	0.11	0.03
3.50	0.30	0.00	0.14	0.03
4.00	0.35	0.00	0.19	0.04
4.50	0.40	0.00	0.23	0.04
5.00	0.46	0.00	0.28	0.04
5.50	0.52	0.00	0.33	0.04
6.00	0.58	0.00	0.39	0.05
6.50	0.64	0.01	0.45	0.06
7.00	0.72	0.02	0.52	0.08
7.50	0.80	0.03	0.60	0.09
8.00	0.89	0.05	0.69	0.10
8.50	1.01	0.09	0.80	0.15
9.00	1.17	0.14	0.96	0.22
9.50	1.40	0.24	1.18	0.35
10.00	2.37	0.80	2.15	**2.38**
10.50	2.69	1.02	2.46	0.43
11.00	2.87	1.15	2.64	0.30
11.50	3.02	1.27	2.79	0.26
12.00	3.15	1.37	2.92	0.23
12.50	3.27	1.46	3.04	0.20
13.00	3.37	1.54	3.14	0.19
13.50	3.47	1.61	3.23	0.16
14.00	3.55	1.68	3.32	0.14
14.50	3.62	1.74	3.39	0.14
15.00	3.70	1.79	3.46	0.13
15.50	3.77	1.85	3.53	0.13
16.00	3.84	1.91	3.60	0.13
16.50	3.90	1.96	3.67	0.12
17.00	3.96	2.01	3.73	0.12
17.50	4.03	2.06	3.79	0.11
18.00	4.08	2.11	3.85	0.11
18.50	4.14	2.16	3.91	0.11
19.00	4.20	2.20	3.96	0.10
19.50	4.25	2.25	4.01	0.10
20.00	4.30	2.29	4.06	0.09
20.50	4.34	2.33	4.11	0.09
21.00	4.39	2.37	4.15	0.08
21.50	4.43	2.40	4.20	0.08
22.00	4.47	2.44	4.24	0.08
22.50	4.51	2.47	4.27	0.07
23.00	4.55	2.50	4.31	0.07
23.50	4.58	2.53	4.34	0.06
24.00	**4.61**	**2.56**	**4.37**	0.06

Summary for Subcatchment 5S: C-2

[49] Hint: Tc<2dt may require smaller dt

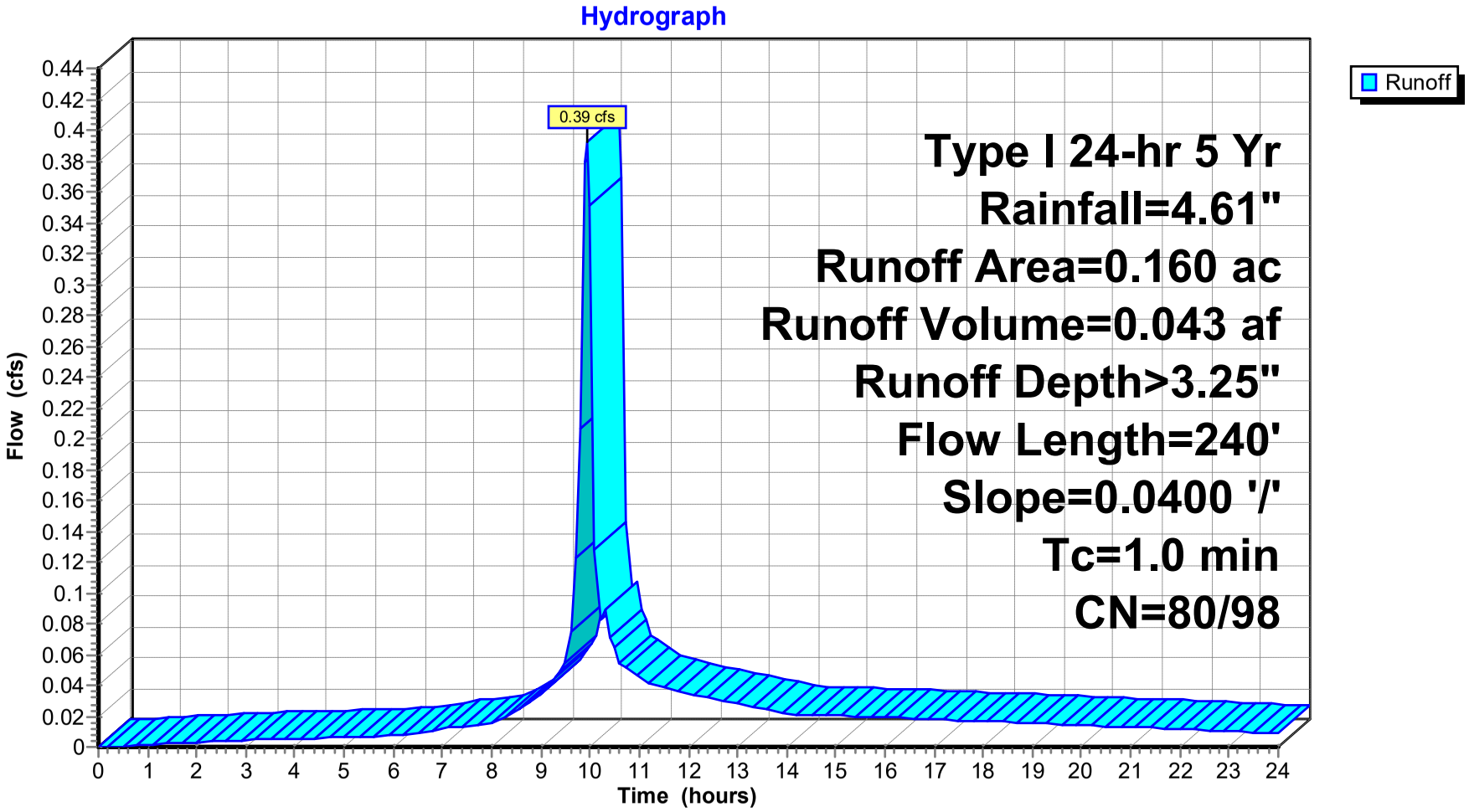
Runoff = 0.39 cfs @ 9.94 hrs, Volume= 0.043 af, Depth> 3.25"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 5 Yr Rainfall=4.61"

Area (ac)	CN	Description
0.160	87	1/4 acre lots, 38% imp, HSG D
0.099	80	62.00% Pervious Area
0.061	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	240	0.0400	4.06		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps

Subcatchment 5S: C-2



Hydrograph for Subcatchment 5S: C-2

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.04	0.00	0.00	0.00
1.00	0.08	0.00	0.01	0.00
1.50	0.12	0.00	0.02	0.00
2.00	0.16	0.00	0.04	0.00
2.50	0.20	0.00	0.07	0.00
3.00	0.25	0.00	0.11	0.00
3.50	0.30	0.00	0.14	0.00
4.00	0.35	0.00	0.19	0.01
4.50	0.40	0.00	0.23	0.01
5.00	0.46	0.00	0.28	0.01
5.50	0.52	0.00	0.33	0.01
6.00	0.58	0.00	0.39	0.01
6.50	0.64	0.01	0.45	0.01
7.00	0.72	0.02	0.52	0.01
7.50	0.80	0.03	0.60	0.01
8.00	0.89	0.05	0.69	0.02
8.50	1.01	0.09	0.80	0.02
9.00	1.17	0.14	0.96	0.03
9.50	1.40	0.24	1.18	**0.05**
10.00	2.37	0.80	2.15	**0.35**
10.50	2.69	1.02	2.46	0.06
11.00	2.87	1.15	2.64	0.04
11.50	3.02	1.27	2.79	0.04
12.00	3.15	1.37	2.92	0.03
12.50	3.27	1.46	3.04	0.03
13.00	3.37	1.54	3.14	0.03
13.50	3.47	1.61	3.23	0.02
14.00	3.55	1.68	3.32	0.02
14.50	3.62	1.74	3.39	0.02
15.00	3.70	1.79	3.46	0.02
15.50	3.77	1.85	3.53	0.02
16.00	3.84	1.91	3.60	0.02
16.50	3.90	1.96	3.67	0.02
17.00	3.96	2.01	3.73	0.02
17.50	4.03	2.06	3.79	0.02
18.00	4.08	2.11	3.85	0.02
18.50	4.14	2.16	3.91	0.02
19.00	4.20	2.20	3.96	0.02
19.50	4.25	2.25	4.01	0.01
20.00	4.30	2.29	4.06	0.01
20.50	4.34	2.33	4.11	0.01
21.00	4.39	2.37	4.15	0.01
21.50	4.43	2.40	4.20	0.01
22.00	4.47	2.44	4.24	0.01
22.50	4.51	2.47	4.27	0.01
23.00	4.55	2.50	4.31	0.01
23.50	4.58	2.53	4.34	0.01
24.00	**4.61**	**2.56**	**4.37**	0.01

Summary for Subcatchment 6S: C-3

[49] Hint: Tc<2dt may require smaller dt

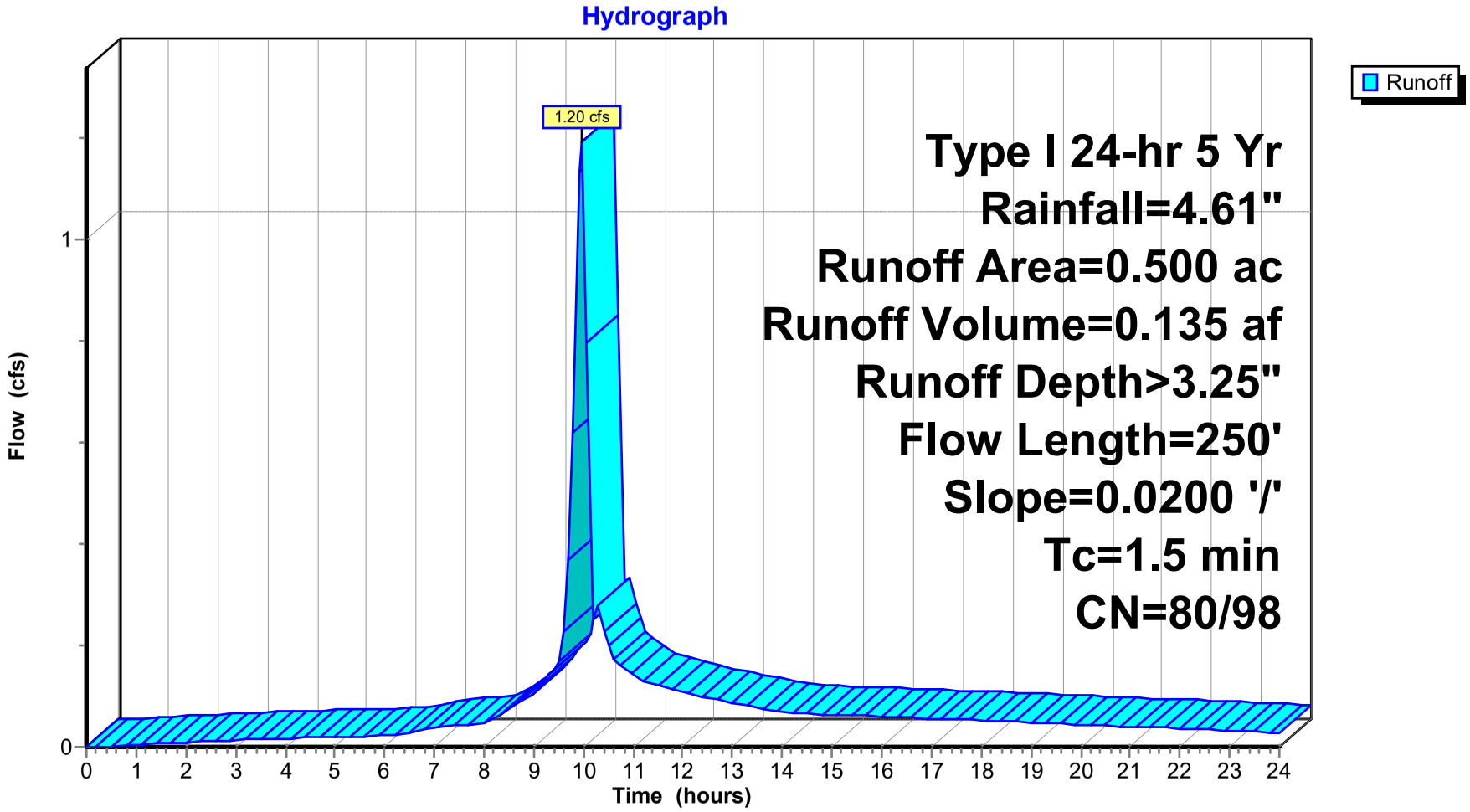
Runoff = 1.20 cfs @ 9.95 hrs, Volume= 0.135 af, Depth> 3.25"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 5 Yr Rainfall=4.61"

Area (ac)	CN	Description
0.500	87	1/4 acre lots, 38% imp, HSG D
0.310	80	62.00% Pervious Area
0.190	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	250	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps

Subcatchment 6S: C-3



Hydrograph for Subcatchment 6S: C-3

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.04	0.00	0.00	0.00
1.00	0.08	0.00	0.01	0.00
1.50	0.12	0.00	0.02	0.01
2.00	0.16	0.00	0.04	0.01
2.50	0.20	0.00	0.07	0.01
3.00	0.25	0.00	0.11	0.01
3.50	0.30	0.00	0.14	0.02
4.00	0.35	0.00	0.19	0.02
4.50	0.40	0.00	0.23	0.02
5.00	0.46	0.00	0.28	0.02
5.50	0.52	0.00	0.33	0.02
6.00	0.58	0.00	0.39	0.02
6.50	0.64	0.01	0.45	0.03
7.00	0.72	0.02	0.52	0.04
7.50	0.80	0.03	0.60	0.04
8.00	0.89	0.05	0.69	0.05
8.50	1.01	0.09	0.80	0.07
9.00	1.17	0.14	0.96	0.11
9.50	1.40	0.24	1.18	**0.17**
10.00	2.37	0.80	2.15	**1.12**
10.50	2.69	1.02	2.46	0.20
11.00	2.87	1.15	2.64	0.14
11.50	3.02	1.27	2.79	0.12
12.00	3.15	1.37	2.92	0.11
12.50	3.27	1.46	3.04	0.10
13.00	3.37	1.54	3.14	0.09
13.50	3.47	1.61	3.23	0.08
14.00	3.55	1.68	3.32	0.07
14.50	3.62	1.74	3.39	0.07
15.00	3.70	1.79	3.46	0.06
15.50	3.77	1.85	3.53	0.06
16.00	3.84	1.91	3.60	0.06
16.50	3.90	1.96	3.67	0.06
17.00	3.96	2.01	3.73	0.06
17.50	4.03	2.06	3.79	0.05
18.00	4.08	2.11	3.85	0.05
18.50	4.14	2.16	3.91	0.05
19.00	4.20	2.20	3.96	0.05
19.50	4.25	2.25	4.01	0.05
20.00	4.30	2.29	4.06	0.04
20.50	4.34	2.33	4.11	0.04
21.00	4.39	2.37	4.15	0.04
21.50	4.43	2.40	4.20	0.04
22.00	4.47	2.44	4.24	0.04
22.50	4.51	2.47	4.27	0.03
23.00	4.55	2.50	4.31	0.03
23.50	4.58	2.53	4.34	0.03
24.00	**4.61**	**2.56**	**4.37**	0.03

Summary for Subcatchment 9S: D-1

[49] Hint: Tc<2dt may require smaller dt

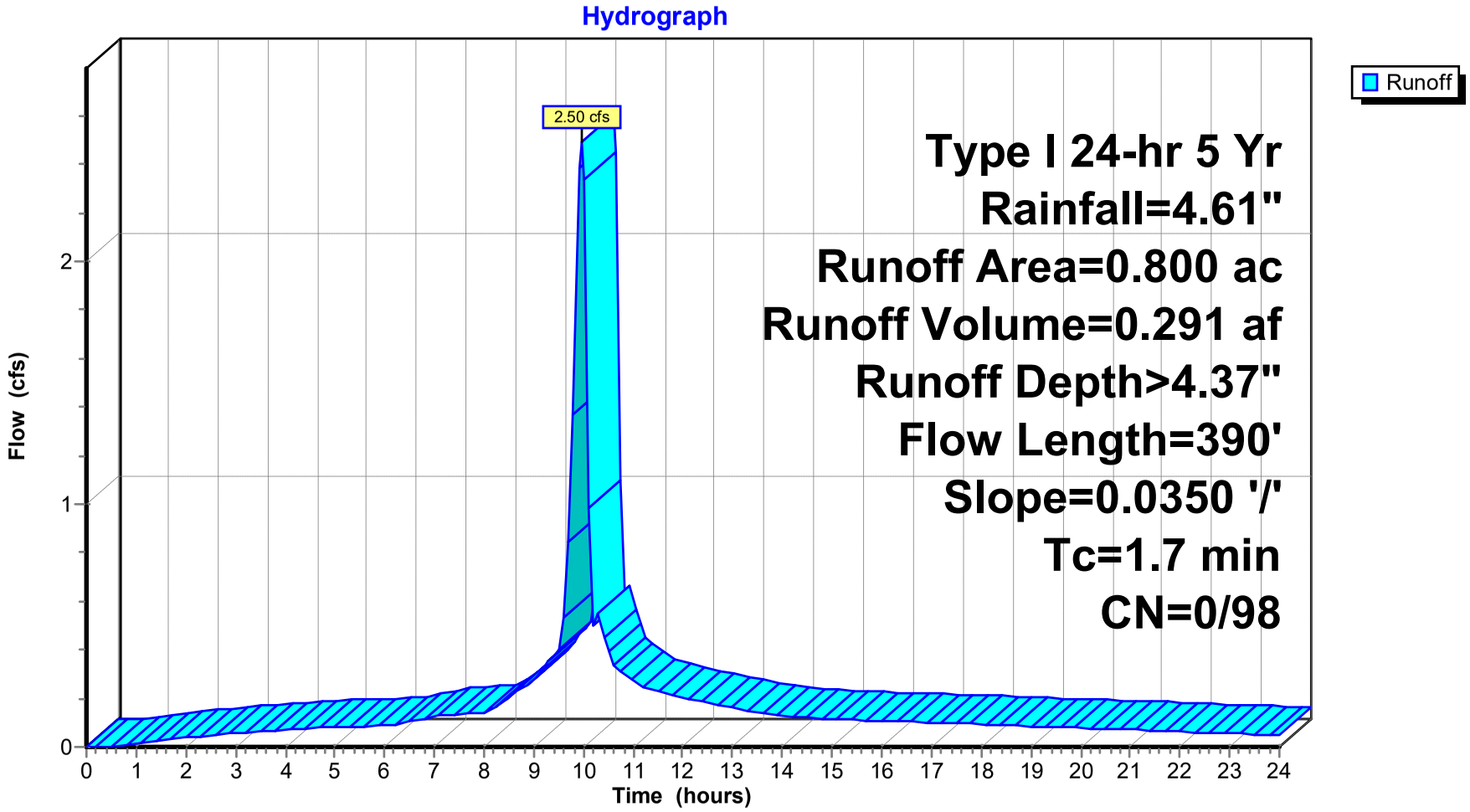
Runoff = 2.50 cfs @ 9.94 hrs, Volume= 0.291 af, Depth> 4.37"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 5 Yr Rainfall=4.61"

Area (ac)	CN	Description
0.800	98	Paved roads w/curbs & sewers, HSG D
0.800	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	390	0.0350	3.80		**Shallow Concentrated Flow, Lower Street Flow** Paved Kv= 20.3 fps

Subcatchment 9S: D-1



Hydrograph for Subcatchment 9S: D-1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	**0.00**	0.00	0.00
0.50	0.04	0.00	0.00	0.00
1.00	0.08	0.00	0.01	0.02
1.50	0.12	0.00	0.02	0.03
2.00	0.16	0.00	0.04	0.04
2.50	0.20	0.00	0.07	0.05
3.00	0.25	0.00	0.11	0.06
3.50	0.30	0.00	0.14	0.06
4.00	0.35	0.00	0.19	0.07
4.50	0.40	0.00	0.23	0.08
5.00	0.46	0.00	0.28	0.08
5.50	0.52	0.00	0.33	0.08
6.00	0.58	0.00	0.39	0.09
6.50	0.64	0.00	0.45	0.10
7.00	0.72	0.00	0.52	0.12
7.50	0.80	0.00	0.60	0.13
8.00	0.89	0.00	0.69	0.14
8.50	1.01	0.00	0.80	0.21
9.00	1.17	0.00	0.96	0.28
9.50	1.40	0.00	1.18	**0.40**
10.00	2.37	0.00	2.15	**2.33**
10.50	2.69	0.00	2.46	0.39
11.00	2.87	0.00	2.64	0.27
11.50	3.02	0.00	2.79	0.23
12.00	3.15	0.00	2.92	0.20
12.50	3.27	0.00	3.04	0.18
13.00	3.37	0.00	3.14	0.16
13.50	3.47	0.00	3.23	0.14
14.00	3.55	0.00	3.32	0.13
14.50	3.62	0.00	3.39	0.12
15.00	3.70	0.00	3.46	0.12
15.50	3.77	0.00	3.53	0.11
16.00	3.84	0.00	3.60	0.11
16.50	3.90	0.00	3.67	0.10
17.00	3.96	0.00	3.73	0.10
17.50	4.03	0.00	3.79	0.10
18.00	4.08	0.00	3.85	0.09
18.50	4.14	0.00	3.91	0.09
19.00	4.20	0.00	3.96	0.09
19.50	4.25	0.00	4.01	0.08
20.00	4.30	0.00	4.06	0.08
20.50	4.34	0.00	4.11	0.07
21.00	4.39	0.00	4.15	0.07
21.50	4.43	0.00	4.20	0.07
22.00	4.47	0.00	4.24	0.06
22.50	4.51	0.00	4.27	0.06
23.00	4.55	0.00	4.31	0.06
23.50	4.58	0.00	4.34	0.05
24.00	**4.61**	0.00	**4.37**	0.05

Summary for Reach 3R: SD-1

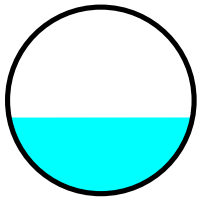
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 4.300 ac, 38.00% Impervious, Inflow Depth > 3.24" for 5 Yr event
Inflow = 9.83 cfs @ 9.97 hrs, Volume= 1.162 af
Outflow = 9.64 cfs @ 9.99 hrs, Volume= 1.161 af, Atten= 2%, Lag= 0.9 min

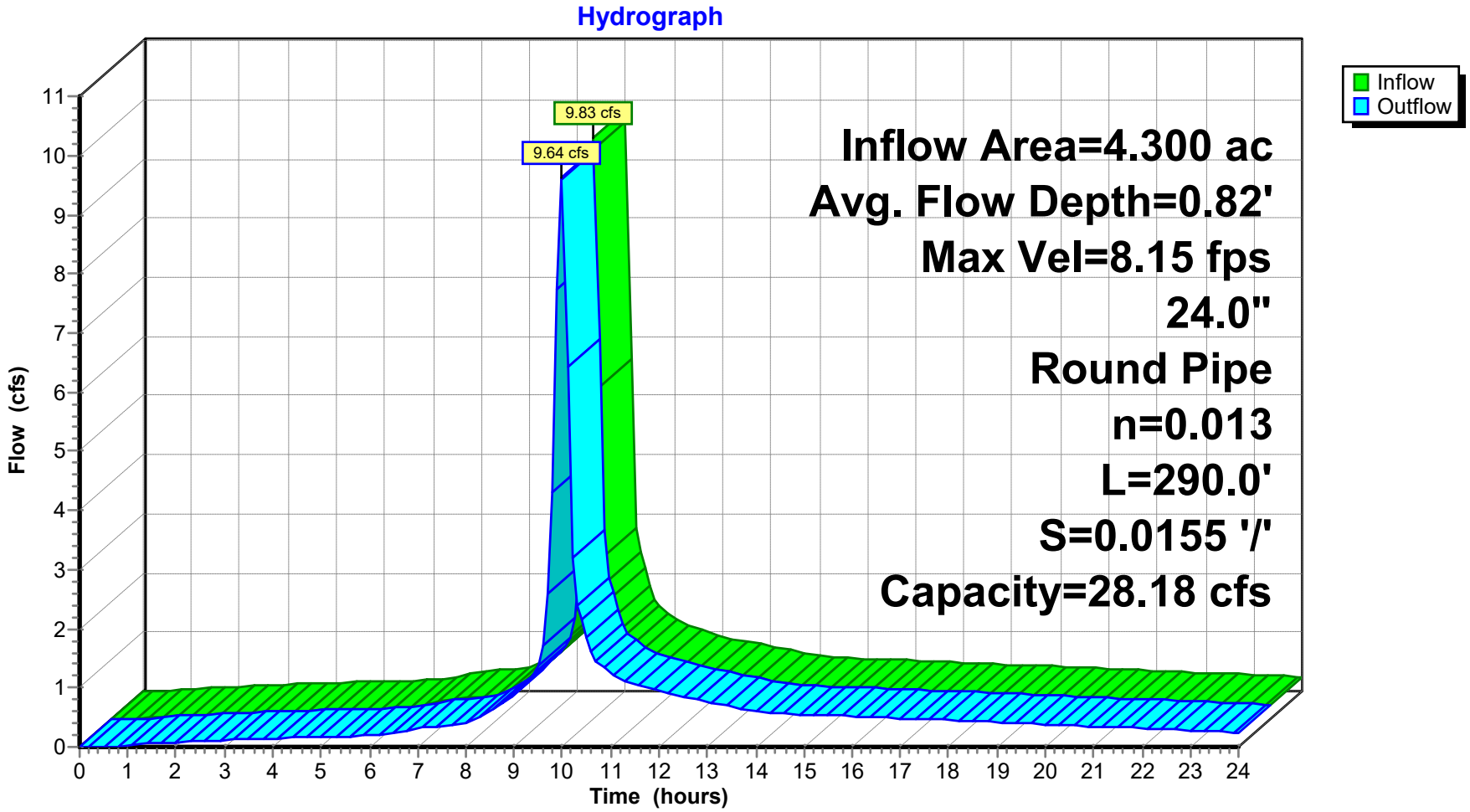
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Max. Velocity= 8.15 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 3.24 fps, Avg. Travel Time= 1.5 min

Peak Storage= 350 cf @ 9.98 hrs
Average Depth at Peak Storage= 0.82'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 28.18 cfs

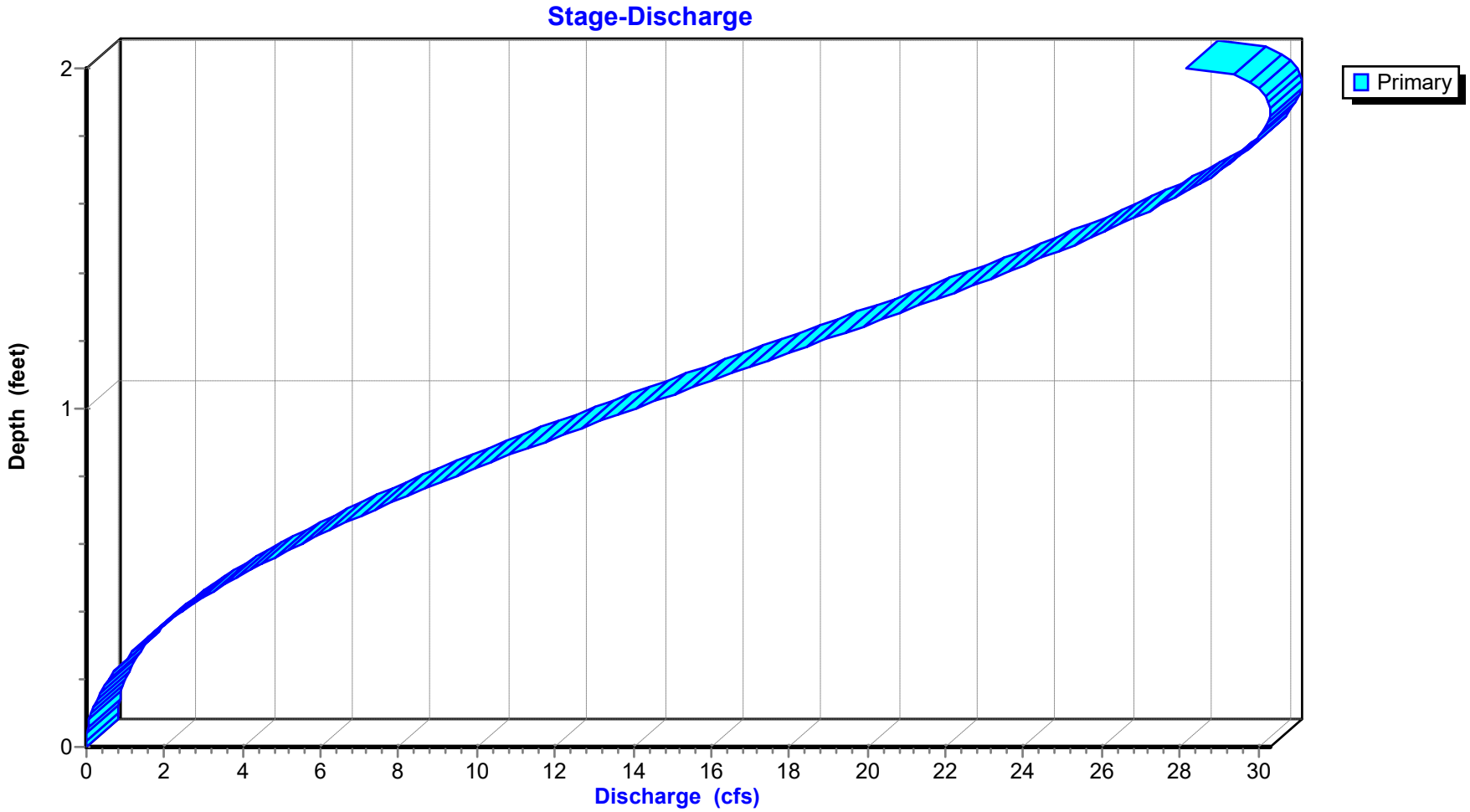
24.0" Round Pipe
n= 0.013
Length= 290.0' Slope= 0.0155 '/'
Inlet Invert= 158.50', Outlet Invert= 154.00'



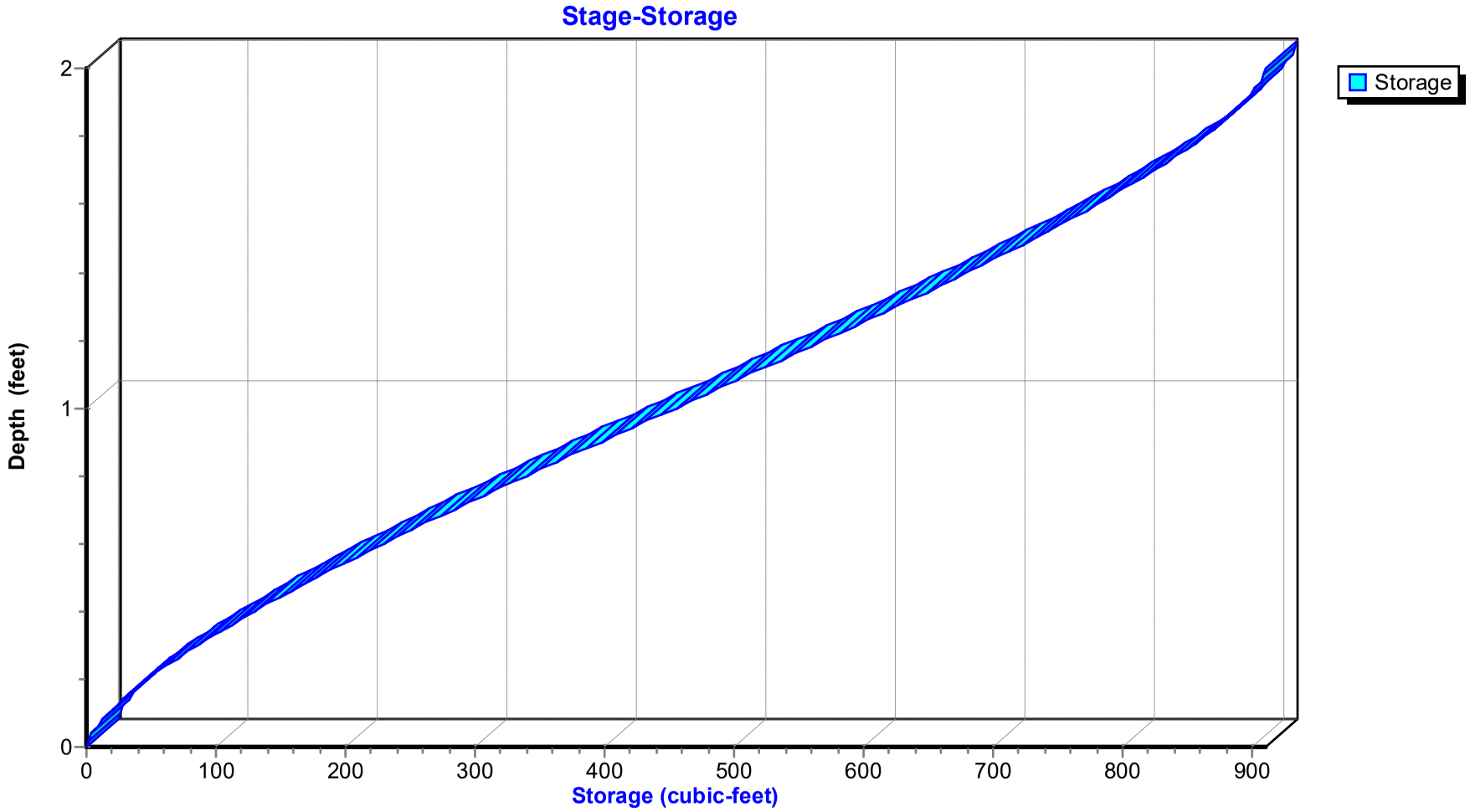
Reach 3R: SD-1


Hydrograph
Inflow
Outflow
9.83 cfs
9.64 cfs
Inflow Area=4.300 ac
Avg. Flow Depth=0.82'
Max Vel=8.15 fps
24.0"
Round Pipe
n=0.013
L=290.0'
S=0.0155 '/'
Capacity=28.18 cfs
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Reach 3R: SD-1


Stage-Discharge
Primary
Depth (feet)
0
1
2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Discharge (cfs)

Reach 3R: SD-1


Stage-Storage
Storage
Depth (feet)
0
1
2
0
100
200
300
400
500
600
700
800
900
Storage (cubic-feet)

Hydrograph for Reach 3R: SD-1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	158.50	0.00
0.50	0.00	0	158.50	0.00
1.00	0.03	6	158.55	0.03
1.50	0.06	9	158.57	0.06
2.00	0.08	11	158.58	0.08
2.50	0.10	13	158.58	0.09
3.00	0.11	15	158.59	0.11
3.50	0.13	17	158.60	0.13
4.00	0.15	18	158.60	0.15
4.50	0.16	19	158.61	0.16
5.00	0.16	19	158.61	0.16
5.50	0.17	20	158.61	0.17
6.00	0.19	22	158.62	0.19
6.50	0.25	26	158.63	0.24
7.00	0.32	30	158.65	0.31
7.50	0.36	34	158.66	0.36
8.00	0.41	36	158.67	0.40
8.50	0.62	49	158.70	0.60
9.00	0.90	63	158.74	0.89
9.50	1.40	87	158.80	1.38
10.00	**9.63**	**347**	**159.31**	**9.60**
10.50	1.80	104	158.84	1.84
11.00	1.23	80	158.79	1.24
11.50	1.06	72	158.76	1.06
12.00	0.93	65	158.75	0.94
12.50	0.84	61	158.74	0.84
13.00	0.76	57	158.73	0.76
13.50	0.68	52	158.71	0.68
14.00	0.59	48	158.70	0.60
14.50	0.56	46	158.70	0.56
15.00	0.55	45	158.69	0.55
15.50	0.53	44	158.69	0.53
16.00	0.52	43	158.69	0.52
16.50	0.50	42	158.69	0.50
17.00	0.48	41	158.68	0.48
17.50	0.47	40	158.68	0.47
18.00	0.45	39	158.68	0.45
18.50	0.43	38	158.67	0.43
19.00	0.42	37	158.67	0.42
19.50	0.40	36	158.67	0.40
20.00	0.38	35	158.66	0.38
20.50	0.36	34	158.66	0.37
21.00	0.35	33	158.66	0.35
21.50	0.33	32	158.65	0.33
22.00	0.31	30	158.65	0.31
22.50	0.29	29	158.64	0.30
23.00	0.28	28	158.64	0.28
23.50	0.26	27	158.64	0.26
24.00	0.24	25	158.63	0.24

Stage-Discharge for Reach 3R: SD-1

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
158.50	0.00	0.00
158.52	0.80	0.00
158.54	1.26	0.02
158.56	1.65	0.05
158.58	1.99	0.08
158.60	2.30	0.14
158.62	2.59	0.20
158.64	2.87	0.28
158.66	3.12	0.37
158.68	3.37	0.47
158.70	3.60	0.59
158.72	3.82	0.72
158.74	4.04	0.86
158.76	4.24	1.02
158.78	4.44	1.19
158.80	4.64	1.37
158.82	4.82	1.56
158.84	5.00	1.77
158.86	5.18	1.99
158.88	5.35	2.22
158.90	5.52	2.47
158.92	5.68	2.72
158.94	5.84	2.99
158.96	5.99	3.27
158.98	6.14	3.56
159.00	6.29	3.86
159.02	6.43	4.17
159.04	6.57	4.49
159.06	6.70	4.83
159.08	6.83	5.17
159.10	6.96	5.52
159.12	7.09	5.88
159.14	7.21	6.25
159.16	7.33	6.63
159.18	7.45	7.01
159.20	7.56	7.41
159.22	7.67	7.81
159.24	7.78	8.22
159.26	7.89	8.64
159.28	7.99	9.07
159.30	8.09	9.50
159.32	8.19	9.93
159.34	8.29	10.38
159.36	8.38	10.83
159.38	8.47	11.28
159.40	8.56	11.74
159.42	8.65	12.20
159.44	8.73	12.67
159.46	8.81	13.14
159.48	8.89	13.61
159.50	8.97	14.09
159.52	9.05	14.57
159.54	9.12	15.05
159.56	9.19	15.53
159.58	9.26	16.02
159.60	9.32	16.51
159.62	9.39	16.99
159.64	9.45	17.48
159.66	9.51	17.96
159.68	9.56	18.45
159.70	9.62	18.93
159.72	9.67	19.41
159.74	9.72	19.89
159.76	9.77	20.37
159.78	9.82	20.85
159.80	9.86	21.32
159.82	9.90	21.78
159.84	9.94	22.24
159.86	9.98	22.70
159.88	10.01	23.15
159.90	10.04	23.59
159.92	10.07	24.03
159.94	10.10	24.46
159.96	10.13	24.88
159.98	10.15	25.29
160.00	10.17	25.70
160.02	10.18	26.09
160.04	10.20	26.47
160.06	10.21	26.84
160.08	10.22	27.20
160.10	10.22	27.55
160.12	**10.23**	27.88
160.14	10.23	28.19
160.16	10.22	28.49
160.18	10.21	28.77
160.20	10.20	29.04
160.22	10.19	29.28
160.24	10.17	29.51
160.26	10.15	29.71
160.28	10.12	29.88
160.30	10.09	30.03
160.32	10.05	30.16
160.34	10.00	30.25
160.36	9.95	30.30
160.38	9.89	**30.31**
160.40	9.82	30.28
160.42	9.74	30.19
160.44	9.64	30.03
160.46	9.52	29.78
160.48	9.36	29.36
160.50	8.97	28.18

Stage-Area-Storage for Reach 3R: SD-1

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
158.50	0.0	0	159.20	1.0	284	159.90	2.3	681
158.52	0.0	2	159.22	1.0	295	159.92	2.4	692
158.54	0.0	4	159.24	1.1	306	159.94	2.4	702
158.56	0.0	8	159.26	1.1	318	159.96	2.5	713
158.58	0.0	12	159.28	1.1	329	159.98	2.5	723
158.60	0.1	17	159.30	1.2	340	160.00	2.5	733
158.62	0.1	22	159.32	1.2	352	160.02	2.6	743
158.64	0.1	28	159.34	1.3	363	160.04	2.6	753
158.66	0.1	34	159.36	1.3	375	160.06	2.6	762
158.68	0.1	41	159.38	1.3	386	160.08	2.7	772
158.70	0.2	47	159.40	1.4	398	160.10	2.7	781
158.72	0.2	55	159.42	1.4	409	160.12	2.7	791
158.74	0.2	62	159.44	1.5	421	160.14	2.8	800
158.76	0.2	70	159.46	1.5	432	160.16	2.8	808
158.78	0.3	78	159.48	1.5	444	160.18	2.8	817
158.80	0.3	86	159.50	1.6	456	160.20	2.8	825
158.82	0.3	94	159.52	1.6	467	160.22	2.9	834
158.84	0.4	103	159.54	1.7	479	160.24	2.9	841
158.86	0.4	112	159.56	1.7	490	160.26	2.9	849
158.88	0.4	121	159.58	1.7	502	160.28	3.0	857
158.90	0.4	130	159.60	1.8	513	160.30	3.0	864
158.92	0.5	139	159.62	1.8	525	160.32	3.0	870
158.94	0.5	149	159.64	1.8	536	160.34	3.0	877
158.96	0.5	158	159.66	1.9	548	160.36	3.0	883
158.98	0.6	168	159.68	1.9	559	160.38	3.1	889
159.00	0.6	178	159.70	2.0	571	160.40	3.1	894
159.02	0.6	188	159.72	2.0	582	160.42	3.1	899
159.04	0.7	198	159.74	2.0	593	160.44	3.1	903
159.06	0.7	209	159.76	2.1	605	160.46	3.1	907
159.08	0.8	219	159.78	2.1	616	160.48	3.1	910
159.10	0.8	230	159.80	2.2	627	160.50	**3.1**	**911**
159.12	0.8	241	159.82	2.2	638			
159.14	0.9	251	159.84	2.2	649			
159.16	0.9	262	159.86	2.3	660			
159.18	0.9	273	159.88	2.3	671			

Summary for Reach 7R: SD-2

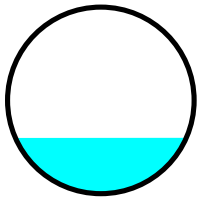
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 1.710 ac, 38.00% Impervious, Inflow Depth > 3.24" for 5 Yr event
Inflow = 4.06 cfs @ 9.96 hrs, Volume= 0.462 af
Outflow = 4.05 cfs @ 9.96 hrs, Volume= 0.462 af, Atten= 0%, Lag= 0.4 min

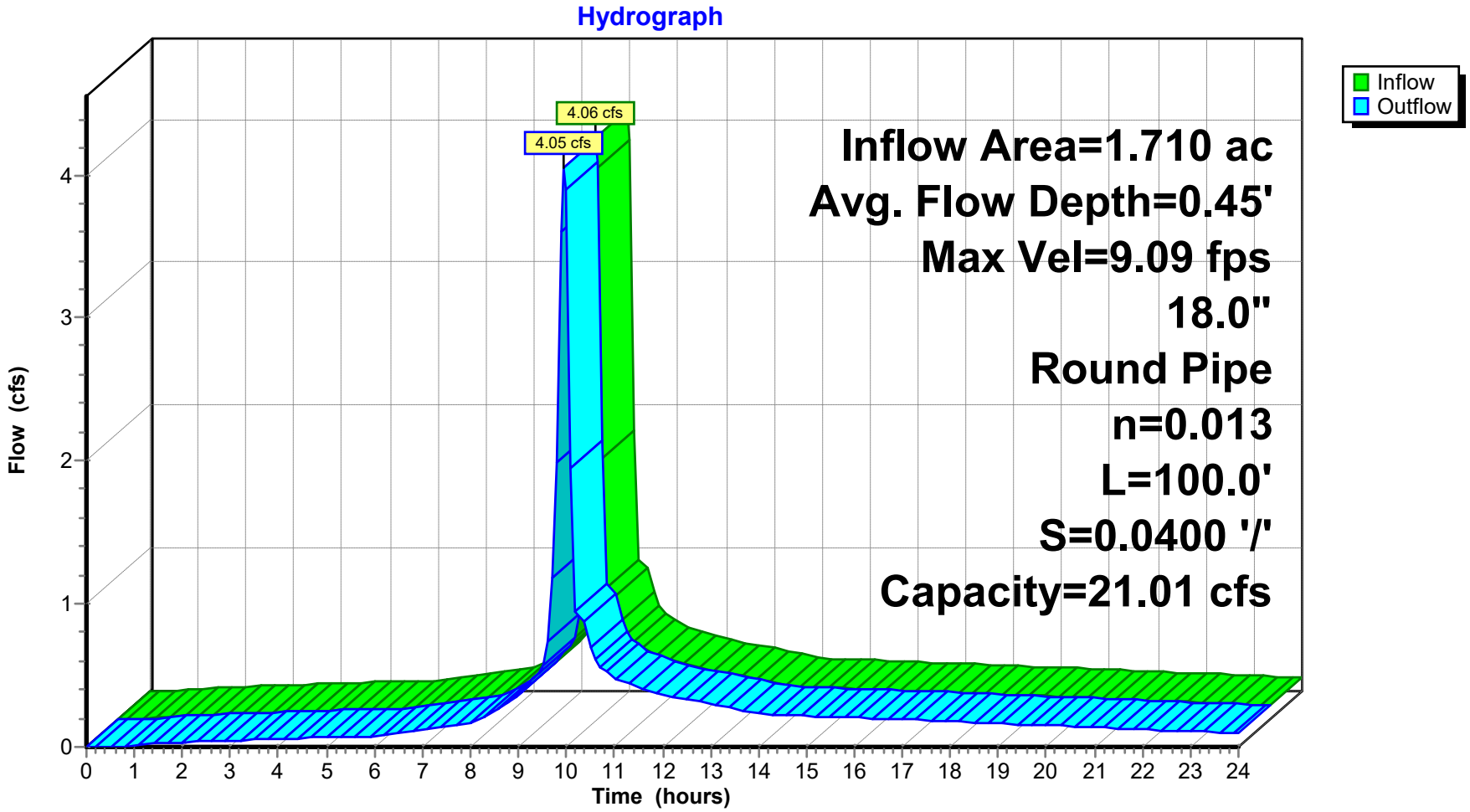
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Max. Velocity= 9.09 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 3.56 fps, Avg. Travel Time= 0.5 min

Peak Storage= 44 cf @ 9.96 hrs
Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 21.01 cfs

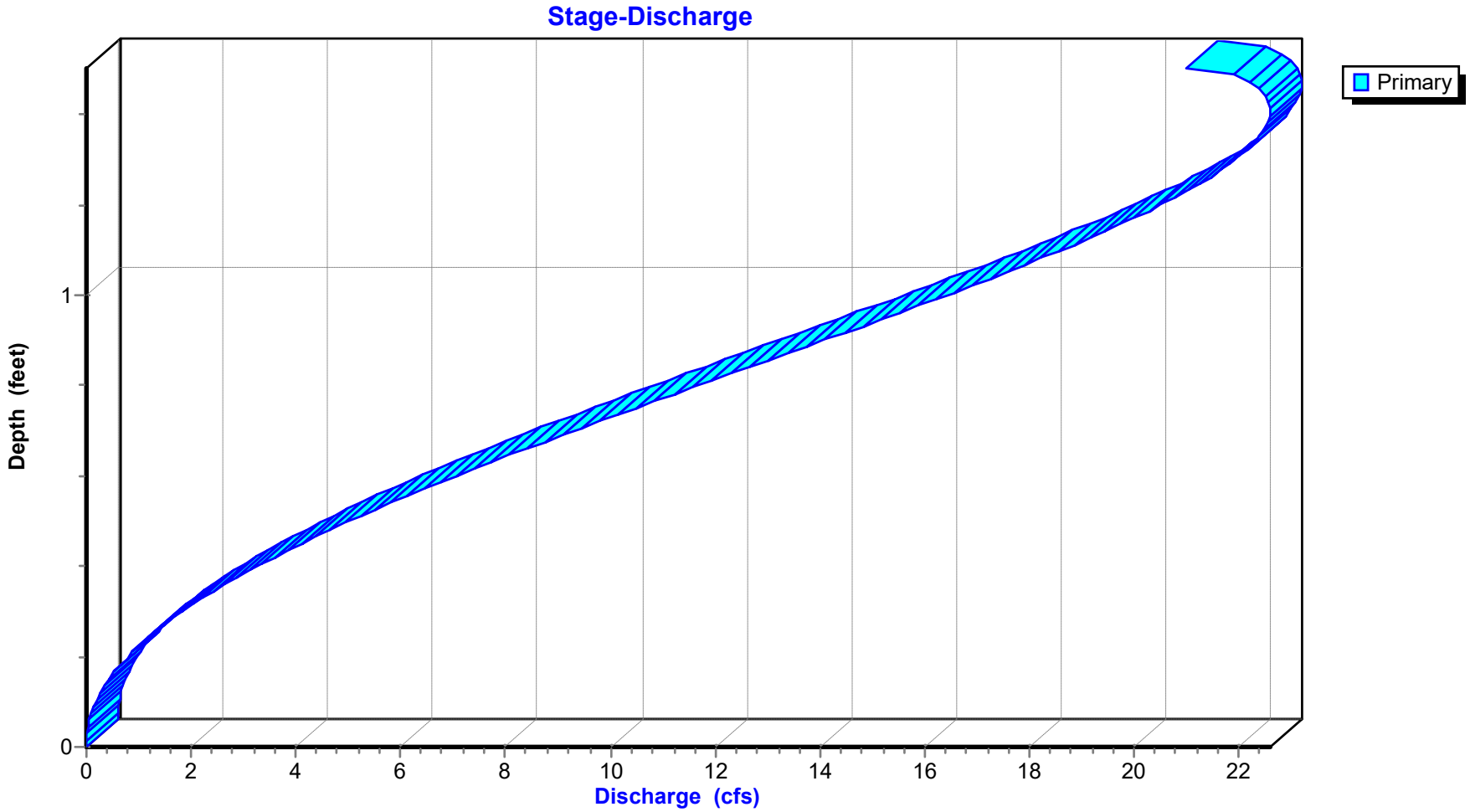
18.0" Round Pipe
n= 0.013
Length= 100.0' Slope= 0.0400 '/'
Inlet Invert= 158.00', Outlet Invert= 154.00'



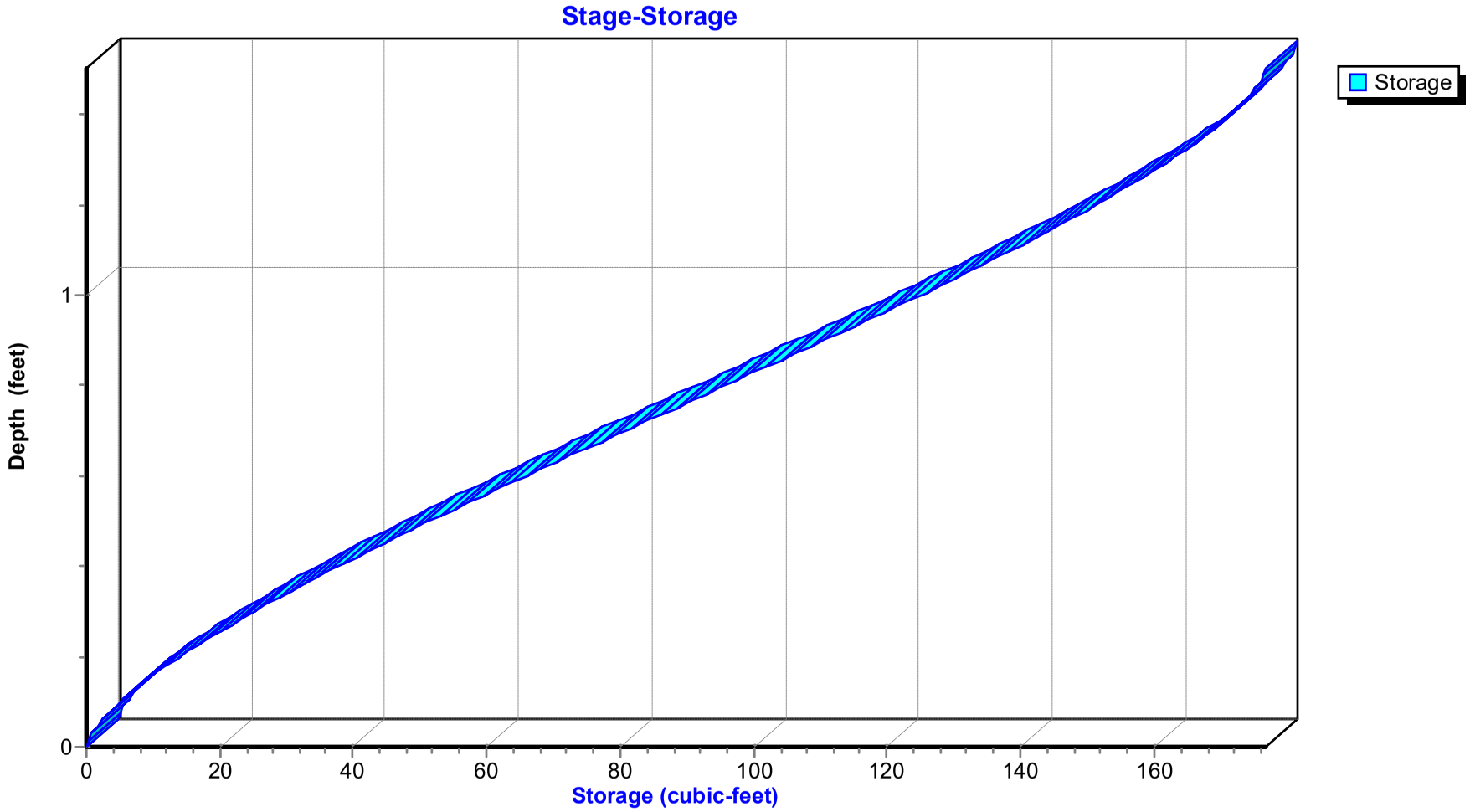
Reach 7R: SD-2


Hydrograph
Inflow
Outflow
4.06 cfs
4.05 cfs
Inflow Area=1.710 ac
Avg. Flow Depth=0.45'
Max Vel=9.09 fps
18.0"
Round Pipe
n=0.013
L=100.0'
S=0.0400 '/'
Capacity=21.01 cfs
Flow (cfs)
Time (hours)
0
1
2
3
4
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Reach 7R: SD-2


Stage-Discharge
Primary
Depth (feet)
0
1
0
2
4
6
8
10
12
14
16
18
20
22
Discharge (cfs)

Reach 7R: SD-2


Stage-Storage
Storage
Depth (feet)
0
1
0
20
40
60
80
100
120
140
160
Storage (cubic-feet)

Hydrograph for Reach 7R: SD-2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	158.00	0.00
0.50	0.00	0	158.00	0.00
1.00	0.01	1	158.03	0.01
1.50	0.02	1	158.04	0.02
2.00	0.03	1	158.04	0.03
2.50	0.04	2	158.05	0.04
3.00	0.05	2	158.05	0.05
3.50	0.05	2	158.05	0.05
4.00	0.06	2	158.06	0.06
4.50	0.06	2	158.06	0.06
5.00	0.07	2	158.06	0.07
5.50	0.07	3	158.06	0.07
6.00	0.08	3	158.07	0.08
6.50	0.10	3	158.07	0.10
7.00	0.13	4	158.08	0.13
7.50	0.15	4	158.09	0.15
8.00	0.16	5	158.09	0.16
8.50	0.25	6	158.11	0.25
9.00	0.36	8	158.14	0.36
9.50	0.57	11	158.17	0.56
10.00	**3.86**	**43**	**158.44**	**3.89**
10.50	0.69	13	158.19	0.69
11.00	0.48	10	158.16	0.49
11.50	0.42	9	158.15	0.42
12.00	0.37	8	158.14	0.37
12.50	0.33	8	158.13	0.33
13.00	0.30	7	158.13	0.30
13.50	0.27	7	158.12	0.27
14.00	0.23	6	158.11	0.24
14.50	0.22	6	158.11	0.22
15.00	0.22	6	158.11	0.22
15.50	0.21	6	158.11	0.21
16.00	0.21	5	158.10	0.21
16.50	0.20	5	158.10	0.20
17.00	0.19	5	158.10	0.19
17.50	0.19	5	158.10	0.19
18.00	0.18	5	158.10	0.18
18.50	0.17	5	158.10	0.17
19.00	0.17	5	158.09	0.17
19.50	0.16	5	158.09	0.16
20.00	0.15	4	158.09	0.15
20.50	0.14	4	158.09	0.14
21.00	0.14	4	158.09	0.14
21.50	0.13	4	158.08	0.13
22.00	0.12	4	158.08	0.12
22.50	0.12	4	158.08	0.12
23.00	0.11	3	158.08	0.11
23.50	0.10	3	158.08	0.10
24.00	0.10	3	158.07	0.10

Stage-Discharge for Reach 7R: SD-2

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
158.00	0.00	0.00
158.02	1.26	0.01
158.04	2.02	0.03
158.06	2.64	0.06
158.08	3.18	0.12
158.10	3.68	0.19
158.12	4.14	0.27
158.14	4.56	0.38
158.16	4.97	0.50
158.18	5.35	0.64
158.20	5.71	0.80
158.22	6.06	0.98
158.24	6.39	1.17
158.26	6.71	1.38
158.28	7.02	1.60
158.30	7.31	1.84
158.32	7.60	2.10
158.34	7.87	2.37
158.36	8.14	2.65
158.38	8.39	2.96
158.40	8.64	3.27
158.42	8.88	3.60
158.44	9.11	3.94
158.46	9.34	4.29
158.48	9.56	4.66
158.50	9.77	5.04
158.52	9.97	5.43
158.54	10.17	5.82
158.56	10.36	6.23
158.58	10.55	6.65
158.60	10.73	7.08
158.62	10.90	7.52
158.64	11.07	7.96
158.66	11.23	8.41
158.68	11.38	8.87
158.70	11.53	9.33
158.72	11.68	9.80
158.74	11.82	10.27
158.76	11.95	10.74
158.78	12.08	11.22
158.80	12.21	11.70
158.82	12.33	12.18
158.84	12.44	12.67
158.86	12.55	13.15
158.88	12.65	13.63
158.90	12.75	14.11
158.92	12.84	14.59
158.94	12.93	15.07
158.96	13.01	15.54
158.98	13.09	16.01
159.00	13.16	16.47
159.02	13.22	16.92
159.04	13.28	17.37
159.06	13.34	17.81
159.08	13.39	18.24
159.10	13.43	18.65
159.12	13.47	19.06
159.14	13.50	19.45
159.16	13.52	19.83
159.18	13.54	20.19
159.20	13.55	20.54
159.22	**13.55**	20.86
159.24	13.55	21.17
159.26	13.54	21.45
159.28	13.52	21.71
159.30	13.49	21.94
159.32	13.45	22.15
159.34	13.40	22.32
159.36	13.33	22.45
159.38	13.26	22.55
159.40	13.16	**22.59**
159.42	13.05	**22.58**
159.44	12.91	22.51
159.46	12.73	22.33
159.48	12.48	21.99
159.50	11.89	21.01

Stage-Area-Storage for Reach 7R: SD-2

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
158.00	0.0	0
158.02	0.0	0
158.04	0.0	1
158.06	0.0	2
158.08	0.0	4
158.10	0.1	5
158.12	0.1	7
158.14	0.1	8
158.16	0.1	10
158.18	0.1	12
158.20	0.1	14
158.22	0.2	16
158.24	0.2	18
158.26	0.2	20
158.28	0.2	23
158.30	0.3	25
158.32	0.3	28
158.34	0.3	30
158.36	0.3	33
158.38	0.4	35
158.40	0.4	38
158.42	0.4	41
158.44	0.4	43
158.46	0.5	46
158.48	0.5	49
158.50	0.5	52
158.52	0.5	54
158.54	0.6	57
158.56	0.6	60
158.58	0.6	63
158.60	0.7	66
158.62	0.7	69
158.64	0.7	72
158.66	0.7	75
158.68	0.8	78
158.70	0.8	81
158.72	0.8	84
158.74	0.9	87
158.76	0.9	90
158.78	0.9	93
158.80	1.0	96
158.82	1.0	99
158.84	1.0	102
158.86	1.0	105
158.88	1.1	108
158.90	1.1	111
158.92	1.1	114
158.94	1.2	117
158.96	1.2	119
158.98	1.2	122
159.00	1.3	125
159.02	1.3	128
159.04	1.3	131
159.06	1.3	133
159.08	1.4	136
159.10	1.4	139
159.12	1.4	142
159.14	1.4	144
159.16	1.5	147
159.18	1.5	149
159.20	1.5	152
159.22	1.5	154
159.24	1.6	156
159.26	1.6	158
159.28	1.6	161
159.30	1.6	163
159.32	1.6	165
159.34	1.7	167
159.36	1.7	168
159.38	1.7	170
159.40	1.7	172
159.42	1.7	173
159.44	1.7	174
159.46	1.8	175
159.48	1.8	176
159.50	**1.8**	**177**

Summary for Reach 10R: SD-3

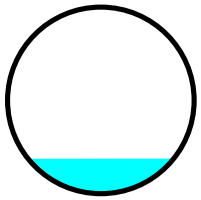
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 0.800 ac,100.00% Impervious, Inflow Depth > 4.37" for 5 Yr event
Inflow = 2.50 cfs @ 9.94 hrs, Volume= 0.291 af
Outflow = 2.48 cfs @ 9.95 hrs, Volume= 0.291 af, Atten= 1%, Lag= 0.2 min

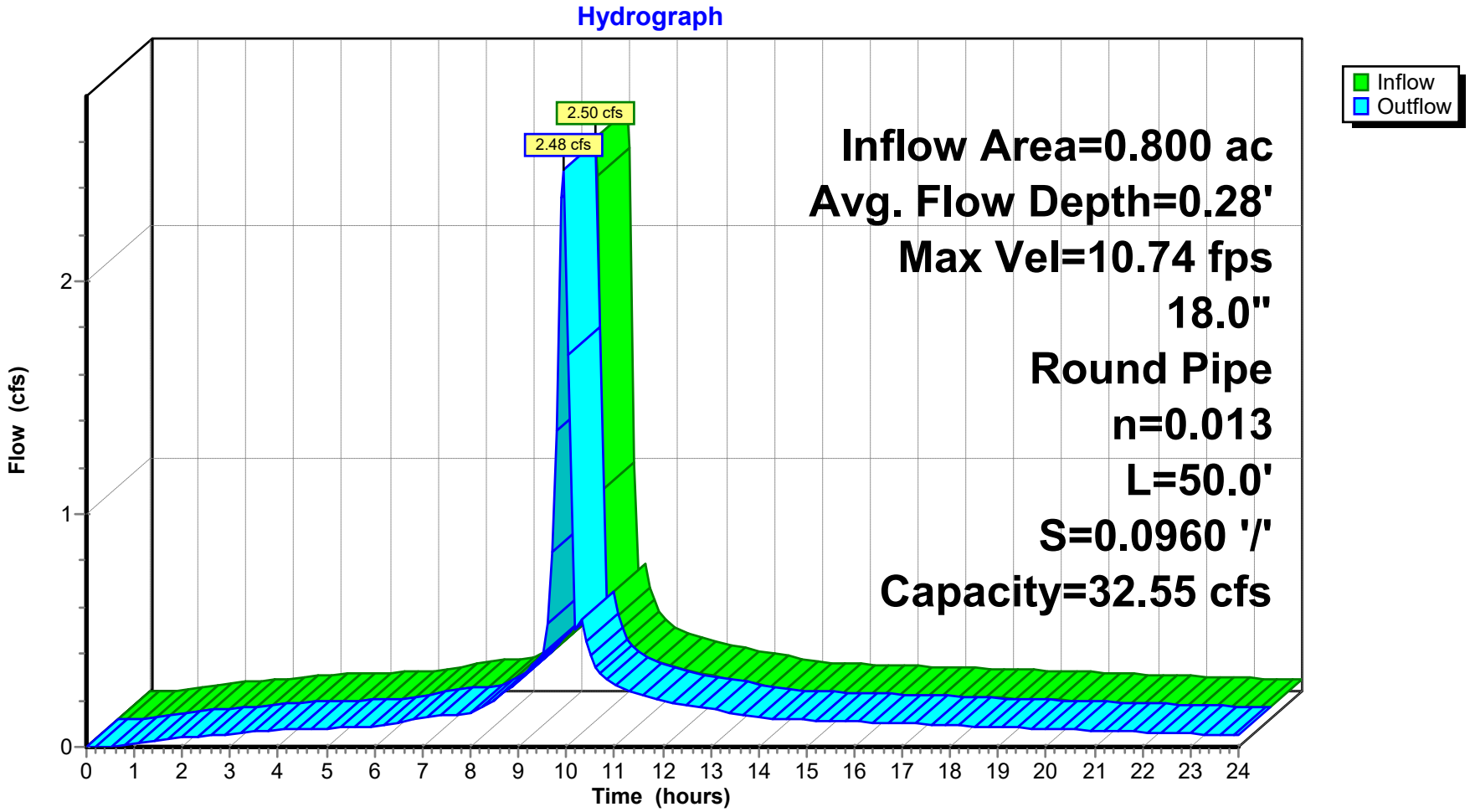
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Max. Velocity= 10.74 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.29 fps, Avg. Travel Time= 0.2 min

Peak Storage= 11 cf @ 9.95 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 32.55 cfs

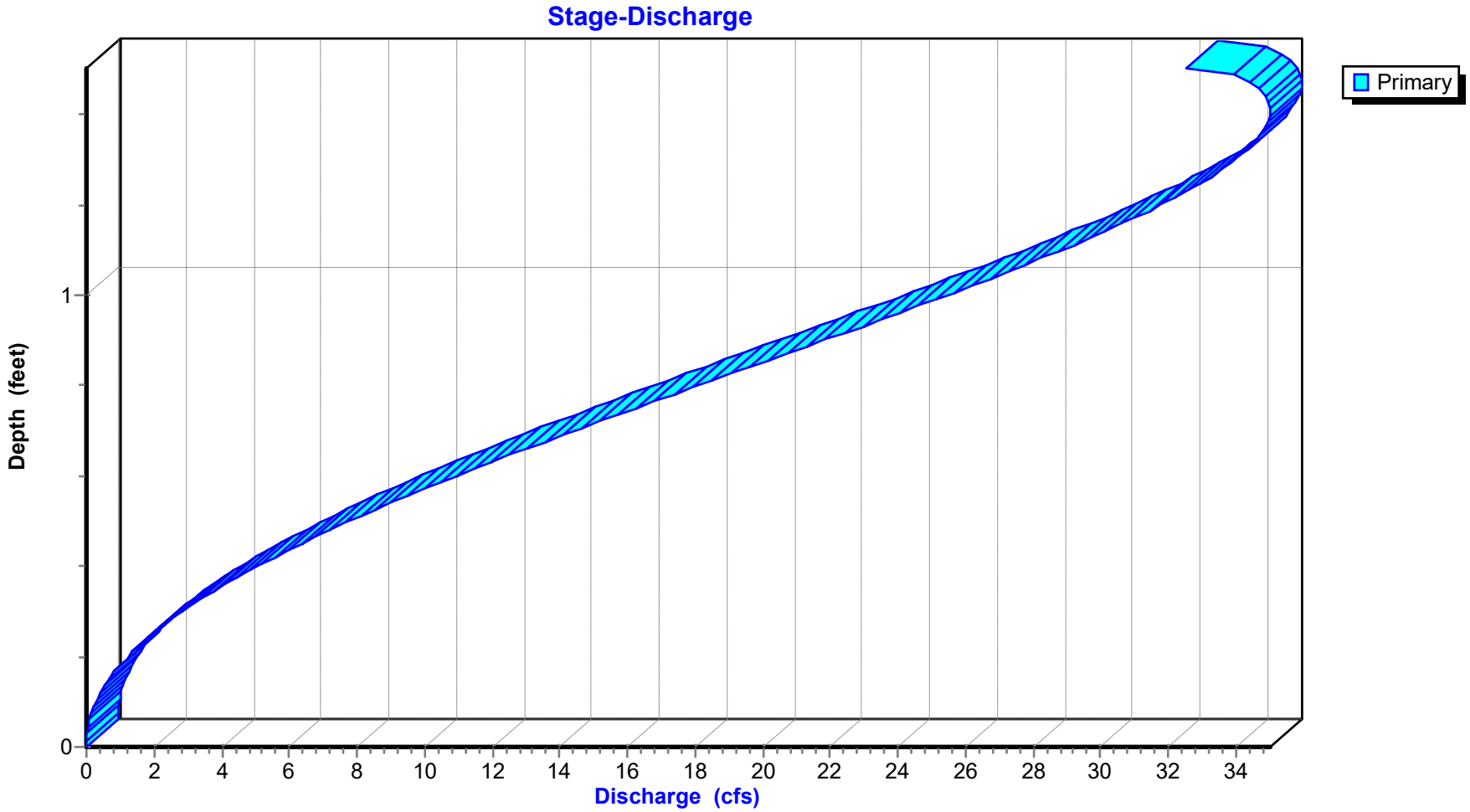
18.0" Round Pipe
n= 0.013
Length= 50.0' Slope= 0.0960 '/'
Inlet Invert= 144.80', Outlet Invert= 140.00'



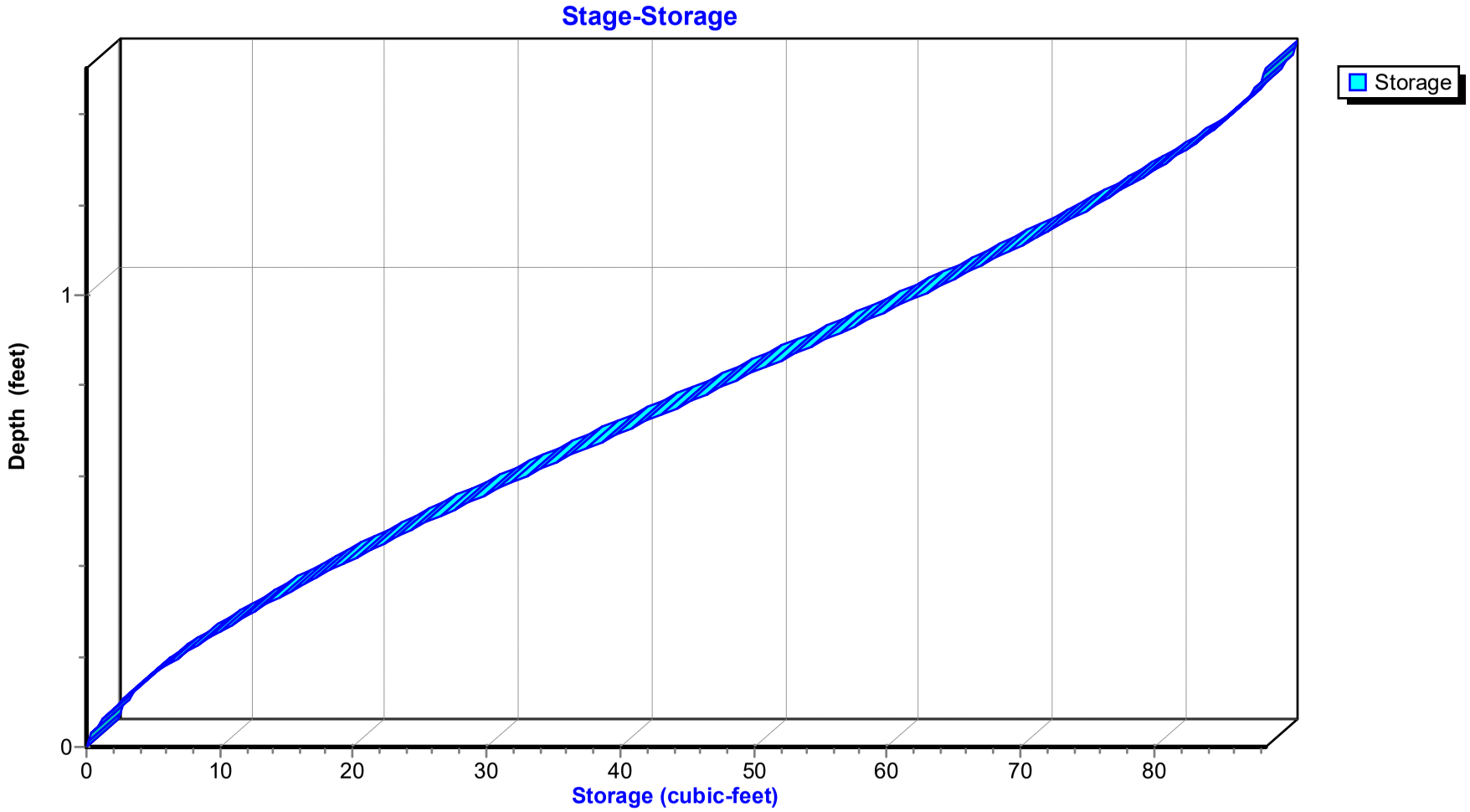
Reach 10R: SD-3



Reach 10R: SD-3



Reach 10R: SD-3



Hydrograph for Reach 10R: SD-3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	144.80	0.00
0.50	0.00	0	144.80	0.00
1.00	0.02	0	144.83	0.02
1.50	0.03	1	144.83	0.03
2.00	0.04	1	144.84	0.04
2.50	0.05	1	144.84	0.05
3.00	0.06	1	144.85	0.06
3.50	0.06	1	144.85	0.06
4.00	0.07	1	144.85	0.07
4.50	0.08	1	144.85	0.08
5.00	0.08	1	144.85	0.08
5.50	0.08	1	144.86	0.08
6.00	0.09	1	144.86	0.09
6.50	0.10	1	144.86	0.10
7.00	0.12	1	144.87	0.12
7.50	0.13	1	144.87	0.13
8.00	0.14	2	144.87	0.14
8.50	0.21	2	144.88	0.21
9.00	0.28	2	144.90	0.28
9.50	**0.40**	**3**	**144.92**	**0.40**
10.00	**2.33**	**11**	**145.07**	**2.35**
10.50	0.39	3	144.92	0.39
11.00	0.27	2	144.90	0.27
11.50	0.23	2	144.89	0.23
12.00	0.20	2	144.88	0.20
12.50	0.18	2	144.88	0.18
13.00	0.16	2	144.88	0.16
13.50	0.14	2	144.87	0.14
14.00	0.13	1	144.87	0.13
14.50	0.12	1	144.87	0.12
15.00	0.12	1	144.86	0.12
15.50	0.11	1	144.86	0.11
16.00	0.11	1	144.86	0.11
16.50	0.10	1	144.86	0.10
17.00	0.10	1	144.86	0.10
17.50	0.10	1	144.86	0.10
18.00	0.09	1	144.86	0.09
18.50	0.09	1	144.86	0.09
19.00	0.09	1	144.86	0.09
19.50	0.08	1	144.86	0.08
20.00	0.08	1	144.85	0.08
20.50	0.07	1	144.85	0.07
21.00	0.07	1	144.85	0.07
21.50	0.07	1	144.85	0.07
22.00	0.06	1	144.85	0.06
22.50	0.06	1	144.85	0.06
23.00	0.06	1	144.85	0.06
23.50	0.05	1	144.85	0.05
24.00	0.05	1	144.84	0.05

Stage-Discharge for Reach 10R: SD-3

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
144.80	0.00	0.00
144.82	1.96	0.01
144.84	3.12	0.04
144.86	4.09	0.10
144.88	4.93	0.18
144.90	5.70	0.29
144.92	6.41	0.42
144.94	7.07	0.59
144.96	7.69	0.78
144.98	8.29	1.00
145.00	8.85	1.24
145.02	9.39	1.51
145.04	9.90	1.81
145.06	10.39	2.13
145.08	10.87	2.48
145.10	11.33	2.85
145.12	11.77	3.25
145.14	12.19	3.67
145.16	12.61	4.11
145.18	13.00	4.58
145.20	13.39	5.07
145.22	13.76	5.57
145.24	14.12	6.10
145.26	14.47	6.65
145.28	14.80	7.22
145.30	15.13	7.80
145.32	15.45	8.41
145.34	15.75	9.02
145.36	16.05	9.66
145.38	16.34	10.31
145.40	16.62	10.97
145.42	16.88	11.64
145.44	17.14	12.33
145.46	17.39	13.03
145.48	17.64	13.73
145.50	17.87	14.45
145.52	18.10	15.17
145.54	18.31	15.91
145.56	18.52	16.64
145.58	18.72	17.38
145.60	18.91	18.13
145.62	19.10	18.88
145.64	19.27	19.62
145.66	19.44	20.37
145.68	19.60	21.12
145.70	19.75	21.87
145.72	19.89	22.61
145.74	20.03	23.34
145.76	20.16	24.08
145.78	20.27	24.80
145.80	20.38	25.51
145.82	20.49	26.22
145.84	20.58	26.91
145.86	20.66	27.59
145.88	20.74	28.25
145.90	20.81	28.90
145.92	20.86	29.52
145.94	20.91	30.13
145.96	20.95	30.72
145.98	20.97	31.28
146.00	20.99	31.81
146.02	**21.00**	32.32
146.04	20.99	32.79
146.06	20.97	33.23
146.08	20.94	33.63
146.10	20.89	33.99
146.12	20.83	34.31
146.14	20.75	34.57
146.16	20.65	34.78
146.18	20.54	34.93
146.20	20.39	**35.00**
146.22	20.21	**34.98**
146.24	20.00	34.87
146.26	19.72	34.59
146.28	19.33	34.07
146.30	18.42	32.55

Stage-Area-Storage for Reach 10R: SD-3

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
144.80	0.0	0	145.50	0.8	40	146.20	1.7	86
144.82	0.0	0	145.52	0.8	42	146.22	1.7	87
144.84	0.0	1	145.54	0.9	43	146.24	1.7	87
144.86	0.0	1	145.56	0.9	45	146.26	1.8	88
144.88	0.0	2	145.58	0.9	46	146.28	1.8	88
144.90	0.1	3	145.60	1.0	48	146.30	**1.8**	**88**
144.92	0.1	3	145.62	1.0	49			
144.94	0.1	4	145.64	1.0	51			
144.96	0.1	5	145.66	1.0	52			
144.98	0.1	6	145.68	1.1	54			
145.00	0.1	7	145.70	1.1	55			
145.02	0.2	8	145.72	1.1	57			
145.04	0.2	9	145.74	1.2	58			
145.06	0.2	10	145.76	1.2	60			
145.08	0.2	11	145.78	1.2	61			
145.10	0.3	13	145.80	1.3	63			
145.12	0.3	14	145.82	1.3	64			
145.14	0.3	15	145.84	1.3	65			
145.16	0.3	16	145.86	1.3	67			
145.18	0.4	18	145.88	1.4	68			
145.20	0.4	19	145.90	1.4	69			
145.22	0.4	20	145.92	1.4	71			
145.24	0.4	22	145.94	1.4	72			
145.26	0.5	23	145.96	1.5	73			
145.28	0.5	24	145.98	1.5	75			
145.30	0.5	26	146.00	1.5	76			
145.32	0.5	27	146.02	1.5	77			
145.34	0.6	29	146.04	1.6	78			
145.36	0.6	30	146.06	1.6	79			
145.38	0.6	32	146.08	1.6	80			
145.40	0.7	33	146.10	1.6	81			
145.42	0.7	34	146.12	1.6	82			
145.44	0.7	36	146.14	1.7	83			
145.46	0.7	37	146.16	1.7	84			
145.48	0.8	39	146.18	1.7	85			

Summary for Pond 8P: Detention Basin 2

[62] Hint: Exceeded Reach 3R OUTLET depth by 0.74' @ 10.20 hrs
[62] Hint: Exceeded Reach 7R OUTLET depth by 0.96' @ 10.20 hrs

Inflow Area = 6.010 ac, 38.00% Impervious, Inflow Depth > 3.24" for 5 Yr event
Inflow = 13.64 cfs @ 9.98 hrs, Volume= 1.624 af
Outflow = 5.10 cfs @ 9.90 hrs, Volume= 1.623 af, Atten= 63%, Lag= 0.0 min
Primary = 5.10 cfs @ 9.90 hrs, Volume= 1.623 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 155.17' @ 10.20 hrs Surf.Area= 0.157 ac Storage= 0.164 af

Plug-Flow detention time= 5.3 min calculated for 1.623 af (100% of inflow)
Center-of-Mass det. time= 5.0 min (752.0 - 747.0)

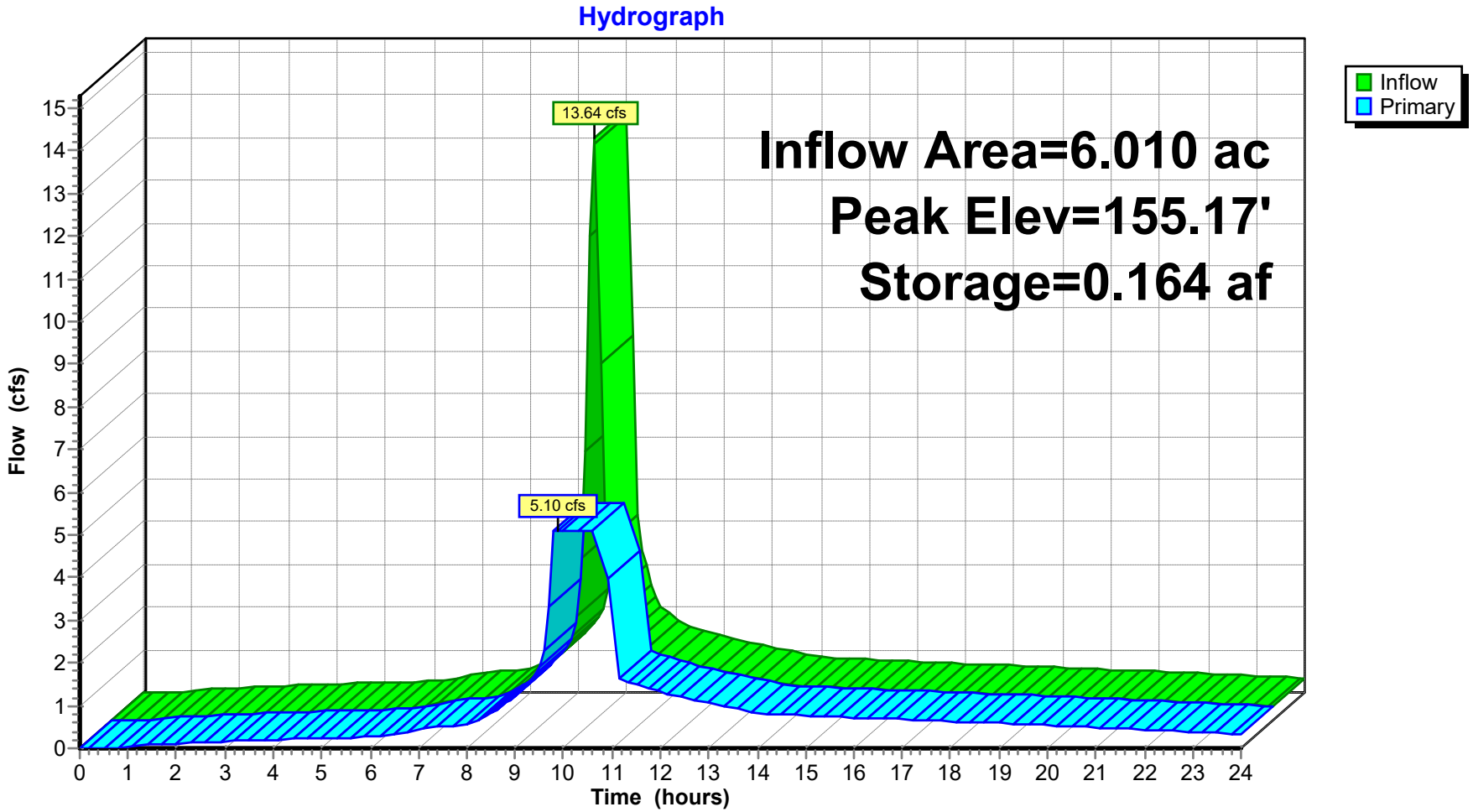
Volume	Invert	Avail.Storage	Storage Description
#1	154.00'	1.297 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
154.00	0.123	0.000	0.000
155.00	0.152	0.137	0.137
156.00	0.182	0.167	0.304
157.00	0.214	0.198	0.503
158.00	0.247	0.230	0.733
159.00	0.282	0.264	0.998
160.00	0.317	0.300	1.297

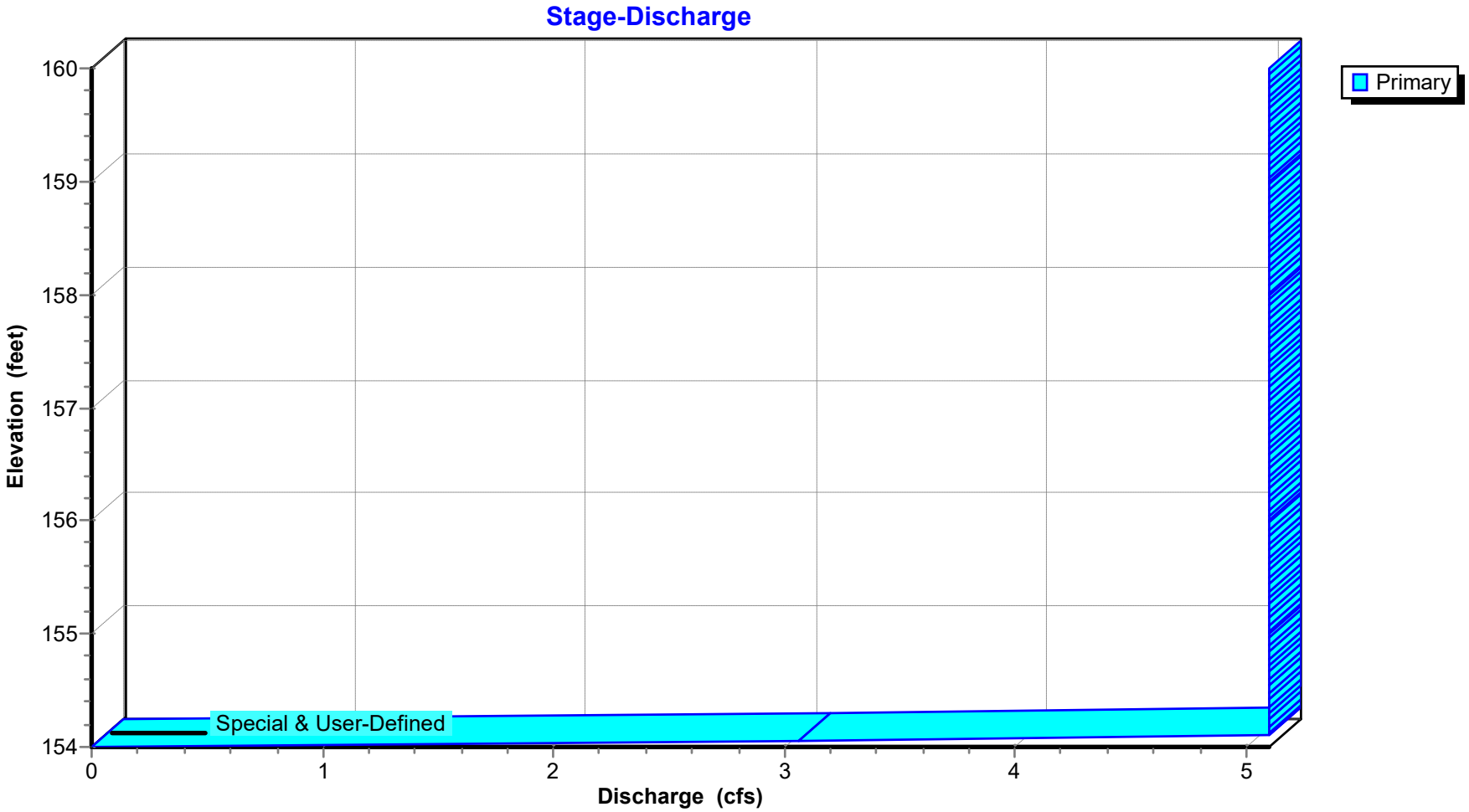
Device	Routing	Invert	Outlet Devices
#1	Primary	154.00'	**Special & User-Defined** Head (feet) 0.00 0.10 6.00 Disch. (cfs) 0.000 5.100 5.100

Primary OutFlow Max=5.10 cfs @ 9.90 hrs HW=154.36' (Free Discharge)
└**1=Special & User-Defined** (Custom Controls 5.10 cfs)

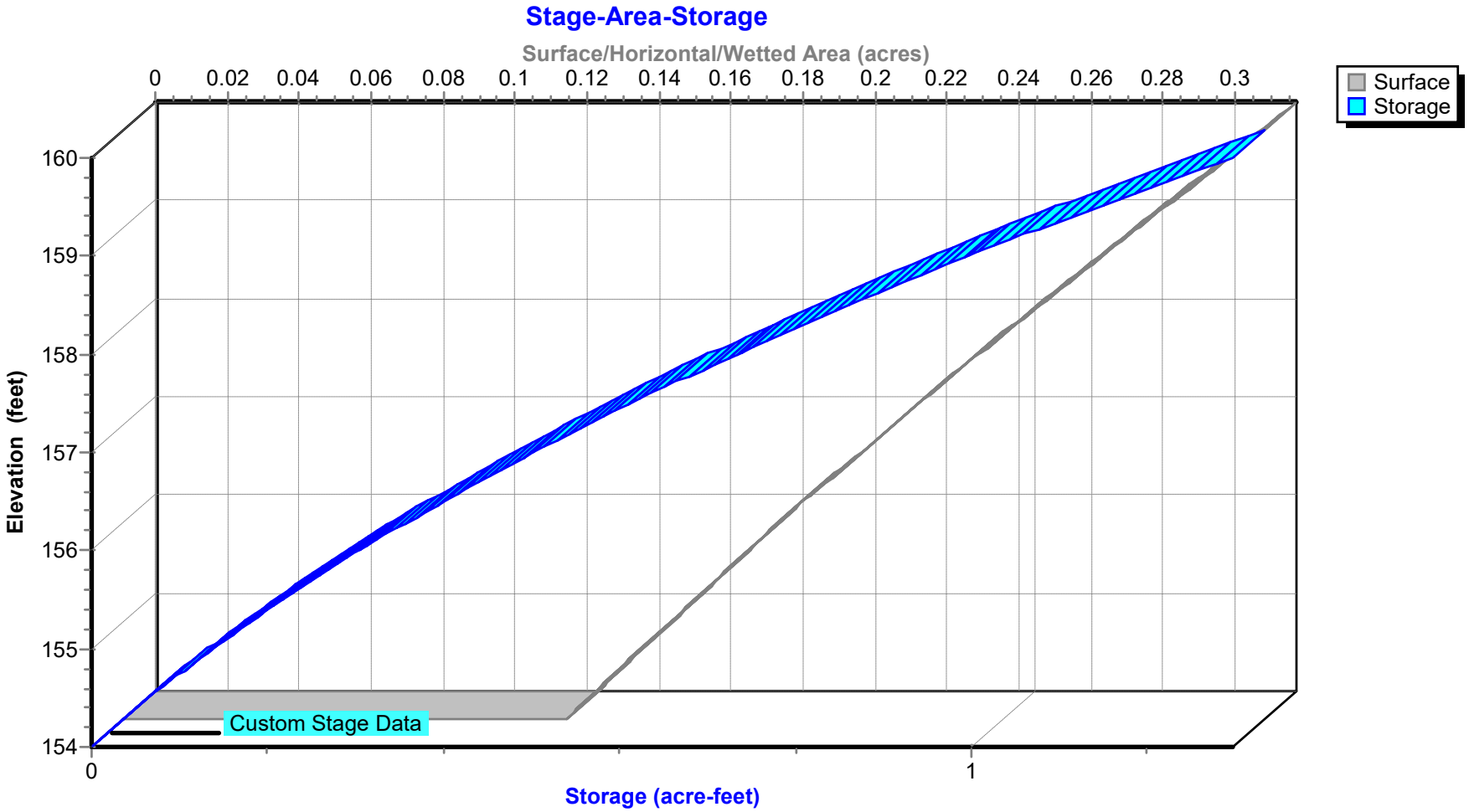
Pond 8P: Detention Basin 2



Pond 8P: Detention Basin 2



Pond 8P: Detention Basin 2



Hydrograph for Pond 8P: Detention Basin 2

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	154.00	0.00
0.50	0.00	0.000	154.00	0.00
1.00	0.04	0.000	154.00	0.04
1.50	0.08	0.000	154.00	0.08
2.00	0.11	0.000	154.00	0.11
2.50	0.13	0.000	154.00	0.13
3.00	0.16	0.000	154.00	0.16
3.50	0.18	0.000	154.00	0.18
4.00	0.20	0.000	154.00	0.20
4.50	0.22	0.001	154.00	0.22
5.00	0.23	0.001	154.00	0.23
5.50	0.24	0.001	154.00	0.24
6.00	0.27	0.001	154.01	0.27
6.50	0.34	0.001	154.01	0.34
7.00	0.44	0.001	154.01	0.43
7.50	0.51	0.001	154.01	0.50
8.00	0.56	0.001	154.01	0.56
8.50	0.85	0.002	154.02	0.83
9.00	1.25	0.003	154.02	1.22
9.50	1.94	0.005	154.04	**1.89**
10.00	**13.49**	**0.106**	**154.79**	**5.10**
10.50	2.54	**0.117**	**154.86**	5.10
11.00	1.73	0.004	154.03	1.68
11.50	1.48	0.004	154.03	1.49
12.00	1.31	0.003	154.03	1.32
12.50	1.18	0.003	154.02	1.19
13.00	1.07	0.003	154.02	1.07
13.50	0.95	0.002	154.02	0.96
14.00	0.83	0.002	154.02	0.84
14.50	0.79	0.002	154.02	0.79
15.00	0.77	0.002	154.02	0.77
15.50	0.74	0.002	154.01	0.75
16.00	0.72	0.002	154.01	0.72
16.50	0.70	0.002	154.01	0.70
17.00	0.68	0.002	154.01	0.68
17.50	0.65	0.002	154.01	0.66
18.00	0.63	0.002	154.01	0.63
18.50	0.61	0.001	154.01	0.61
19.00	0.58	0.001	154.01	0.58
19.50	0.56	0.001	154.01	0.56
20.00	0.53	0.001	154.01	0.54
20.50	0.51	0.001	154.01	0.51
21.00	0.49	0.001	154.01	0.49
21.50	0.46	0.001	154.01	0.46
22.00	0.44	0.001	154.01	0.44
22.50	0.41	0.001	154.01	0.41
23.00	0.39	0.001	154.01	0.39
23.50	0.36	0.001	154.01	0.36
24.00	0.34	0.001	154.01	0.34

Stage-Discharge for Pond 8P: Detention Basin 2

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
154.00	0.00	155.40	5.10	156.80	5.10	158.20	5.10	159.60	5.10
154.04	2.04	155.44	5.10	156.84	5.10	158.24	5.10	159.64	5.10
154.08	4.08	155.48	5.10	156.88	5.10	158.28	5.10	159.68	5.10
154.12	**5.10**	155.52	5.10	156.92	5.10	158.32	5.10	159.72	5.10
154.16	5.10	155.56	5.10	156.96	5.10	158.36	5.10	159.76	5.10
154.20	5.10	155.60	5.10	157.00	5.10	158.40	5.10	159.80	5.10
154.24	5.10	155.64	5.10	157.04	5.10	158.44	5.10	159.84	5.10
154.28	5.10	155.68	5.10	157.08	5.10	158.48	5.10	159.88	5.10
154.32	5.10	155.72	5.10	157.12	5.10	158.52	5.10	159.92	5.10
154.36	5.10	155.76	5.10	157.16	5.10	158.56	5.10	159.96	5.10
154.40	5.10	155.80	5.10	157.20	5.10	158.60	5.10	160.00	5.10
154.44	5.10	155.84	5.10	157.24	5.10	158.64	5.10		
154.48	5.10	155.88	5.10	157.28	5.10	158.68	5.10		
154.52	5.10	155.92	5.10	157.32	5.10	158.72	5.10		
154.56	5.10	155.96	5.10	157.36	5.10	158.76	5.10		
154.60	5.10	156.00	5.10	157.40	5.10	158.80	5.10		
154.64	5.10	156.04	5.10	157.44	5.10	158.84	5.10		
154.68	5.10	156.08	5.10	157.48	5.10	158.88	5.10		
154.72	5.10	156.12	5.10	157.52	5.10	158.92	5.10		
154.76	5.10	156.16	5.10	157.56	5.10	158.96	5.10		
154.80	5.10	156.20	5.10	157.60	5.10	159.00	5.10		
154.84	5.10	156.24	5.10	157.64	5.10	159.04	5.10		
154.88	5.10	156.28	5.10	157.68	5.10	159.08	5.10		
154.92	5.10	156.32	5.10	157.72	5.10	159.12	5.10		
154.96	5.10	156.36	5.10	157.76	5.10	159.16	5.10		
155.00	5.10	156.40	5.10	157.80	5.10	159.20	5.10		
155.04	5.10	156.44	5.10	157.84	5.10	159.24	5.10		
155.08	5.10	156.48	5.10	157.88	5.10	159.28	5.10		
155.12	5.10	156.52	5.10	157.92	5.10	159.32	5.10		
155.16	5.10	156.56	5.10	157.96	5.10	159.36	5.10		
155.20	5.10	156.60	5.10	158.00	5.10	159.40	5.10		
155.24	5.10	156.64	5.10	158.04	5.10	159.44	5.10		
155.28	5.10	156.68	5.10	158.08	5.10	159.48	5.10		
155.32	5.10	156.72	5.10	158.12	5.10	159.52	5.10		
155.36	5.10	156.76	5.10	158.16	5.10	159.56	5.10		

Stage-Area-Storage for Pond 8P: Detention Basin 2

Elevation (feet)	Surface (acres)	Storage (acre-feet)
154.00	0.123	0.000
154.10	0.126	0.012
154.20	0.129	0.025
154.30	0.132	0.038
154.40	0.135	0.052
154.50	0.137	0.065
154.60	0.140	0.079
154.70	0.143	0.093
154.80	0.146	0.108
154.90	0.149	0.122
155.00	0.152	0.137
155.10	0.155	0.153
155.20	0.158	0.168
155.30	0.161	0.184
155.40	0.164	0.201
155.50	0.167	0.217
155.60	0.170	0.234
155.70	0.173	0.251
155.80	0.176	0.269
155.90	0.179	0.286
156.00	0.182	0.304
156.10	0.185	0.323
156.20	0.188	0.342
156.30	0.192	0.361
156.40	0.195	0.380
156.50	0.198	0.400
156.60	0.201	0.419
156.70	0.204	0.440
156.80	0.208	0.460
156.90	0.211	0.481
157.00	0.214	0.503
157.10	0.217	0.524
157.20	0.221	0.546
157.30	0.224	0.568
157.40	0.227	0.591
157.50	0.230	0.614
157.60	0.234	0.637
157.70	0.237	0.660
157.80	0.240	0.684
157.90	0.244	0.708
158.00	0.247	0.733
158.10	0.250	0.758
158.20	0.254	0.783
158.30	0.258	0.809
158.40	0.261	0.835
158.50	0.264	0.861
158.60	0.268	0.887
158.70	0.271	0.914
158.80	0.275	0.942
158.90	0.279	0.969
159.00	0.282	0.998
159.10	0.285	1.026
159.20	0.289	1.055
159.30	0.293	1.084
159.40	0.296	1.113
159.50	0.300	1.143
159.60	0.303	1.173
159.70	0.306	1.203
159.80	0.310	1.234
159.90	0.314	1.265
160.00	**0.317**	**1.297**

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: B-1 Runoff Area=3.000 ac 38.00% Impervious Runoff Depth>4.11"
Flow Length=895' Tc=3.4 min CN=80/98 Runoff=8.70 cfs 1.027 af

Subcatchment 2S: B-2 Runoff Area=1.300 ac 38.00% Impervious Runoff Depth>4.11"
Flow Length=835' Tc=3.1 min CN=80/98 Runoff=3.81 cfs 0.445 af

Subcatchment 4S: C-1 Runoff Area=1.050 ac 38.00% Impervious Runoff Depth>4.11"
Flow Length=510' Tc=2.5 min CN=80/98 Runoff=3.14 cfs 0.360 af

Subcatchment 5S: C-2 Runoff Area=0.160 ac 38.00% Impervious Runoff Depth>4.11"
Flow Length=240' Slope=0.0400 '/' Tc=1.0 min CN=80/98 Runoff=0.50 cfs 0.055 af

Subcatchment 6S: C-3 Runoff Area=0.500 ac 38.00% Impervious Runoff Depth>4.11"
Flow Length=250' Slope=0.0200 '/' Tc=1.5 min CN=80/98 Runoff=1.52 cfs 0.171 af

Subcatchment 9S: D-1 Runoff Area=0.800 ac 100.00% Impervious Runoff Depth>5.31"
Flow Length=390' Slope=0.0350 '/' Tc=1.7 min CN=0/98 Runoff=3.01 cfs 0.354 af

Reach 3R: SD-1 Avg. Flow Depth=0.94' Max Vel=8.69 fps Inflow=12.51 cfs 1.472 af
24.0" Round Pipe n=0.013 L=290.0' S=0.0155 '/' Capacity=28.18 cfs Outflow=12.29 cfs 1.472 af

Reach 7R: SD-2 Avg. Flow Depth=0.51' Max Vel=9.72 fps Inflow=5.17 cfs 0.586 af
18.0" Round Pipe n=0.013 L=100.0' S=0.0400 '/' Capacity=21.01 cfs Outflow=5.15 cfs 0.586 af

Reach 10R: SD-3 Avg. Flow Depth=0.31' Max Vel=11.35 fps Inflow=3.01 cfs 0.354 af
18.0" Round Pipe n=0.013 L=50.0' S=0.0960 '/' Capacity=32.55 cfs Outflow=3.00 cfs 0.354 af

Pond 8P: Detention Basin 2 Peak Elev=155.77' Storage=0.263 af Inflow=17.39 cfs 2.057 af
Outflow=5.10 cfs 2.056 af

Total Runoff Area = 6.810 ac Runoff Volume = 2.412 af Average Runoff Depth = 4.25"
54.72% Pervious = 3.726 ac 45.28% Impervious = 3.084 ac

Summary for Subcatchment 1S: B-1

[49] Hint: Tc<2dt may require smaller dt

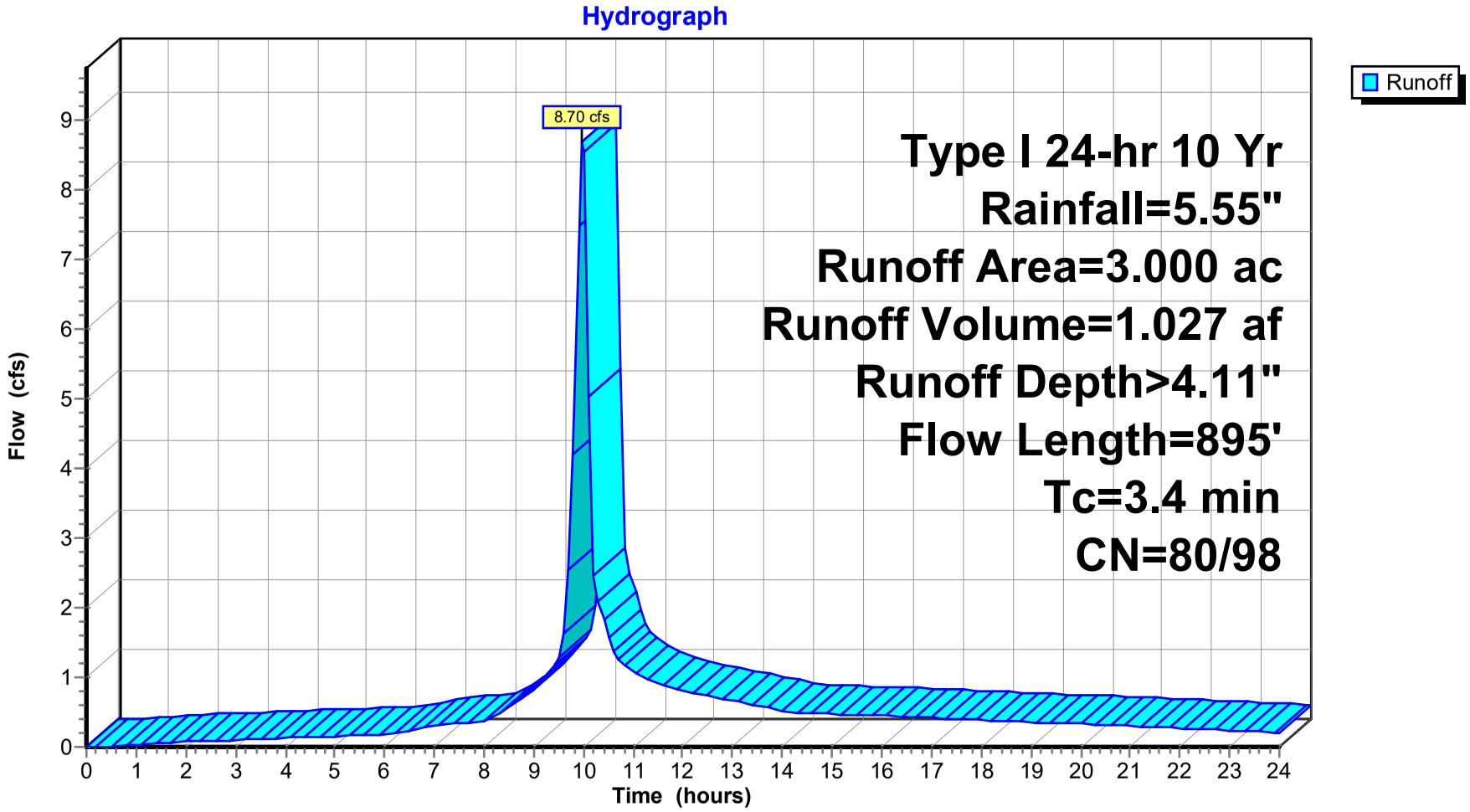
Runoff = 8.70 cfs @ 9.97 hrs, Volume= 1.027 af, Depth> 4.11"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 10 Yr Rainfall=5.55"

Area (ac)	CN	Description
3.000	87	1/4 acre lots, 38% imp, HSG D
1.860	80	62.00% Pervious Area
1.140	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	255	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.3	105	0.0900	6.09		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.5	155	0.0600	4.97		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.0	220	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.9	160	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
3.4	895	Total			

Subcatchment 1S: B-1



Hydrograph for Subcatchment 1S: B-1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.05	0.00	0.00	0.00
1.00	0.10	0.00	0.01	0.04
1.50	0.15	0.00	0.04	0.06
2.00	0.19	0.00	0.07	0.07
2.50	0.25	0.00	0.10	0.09
3.00	0.30	0.00	0.14	0.10
3.50	0.36	0.00	0.19	0.12
4.00	0.42	0.00	0.25	0.13
4.50	0.49	0.00	0.31	0.14
5.00	0.55	0.00	0.37	0.15
5.50	0.62	0.01	0.43	0.17
6.00	0.69	0.01	0.50	0.19
6.50	0.77	0.03	0.57	0.24
7.00	0.87	0.05	0.66	0.30
7.50	0.97	0.07	0.76	0.34
8.00	1.08	0.11	0.87	0.38
8.50	1.22	0.16	1.00	0.57
9.00	1.41	0.24	1.19	0.83
9.50	1.68	0.38	1.46	1.27
10.00	2.86	1.14	2.63	**8.53**
10.50	3.24	1.43	3.00	1.58
11.00	3.46	1.60	3.22	1.07
11.50	3.64	1.75	3.40	0.92
12.00	3.80	1.87	3.56	0.81
12.50	3.94	1.99	3.70	0.73
13.00	4.06	2.09	3.83	0.66
13.50	4.17	2.19	3.94	0.59
14.00	4.27	2.27	4.04	0.51
14.50	4.36	2.35	4.13	0.49
15.00	4.45	2.42	4.22	0.47
15.50	4.54	2.49	4.30	0.46
16.00	4.62	2.56	4.38	0.45
16.50	4.70	2.63	4.46	0.43
17.00	4.77	2.70	4.54	0.42
17.50	4.85	2.76	4.61	0.40
18.00	4.92	2.82	4.68	0.39
18.50	4.99	2.88	4.75	0.37
19.00	5.05	2.94	4.81	0.36
19.50	5.11	2.99	4.88	0.34
20.00	5.17	3.04	4.94	0.33
20.50	5.23	3.09	4.99	0.31
21.00	5.28	3.14	5.05	0.30
21.50	5.33	3.19	5.10	0.28
22.00	5.38	3.23	5.15	0.27
22.50	5.43	3.27	5.19	0.25
23.00	5.47	3.31	5.23	0.24
23.50	5.51	3.34	5.27	0.22
24.00	**5.55**	**3.38**	**5.31**	0.21

Summary for Subcatchment 2S: B-2

[49] Hint: Tc<2dt may require smaller dt

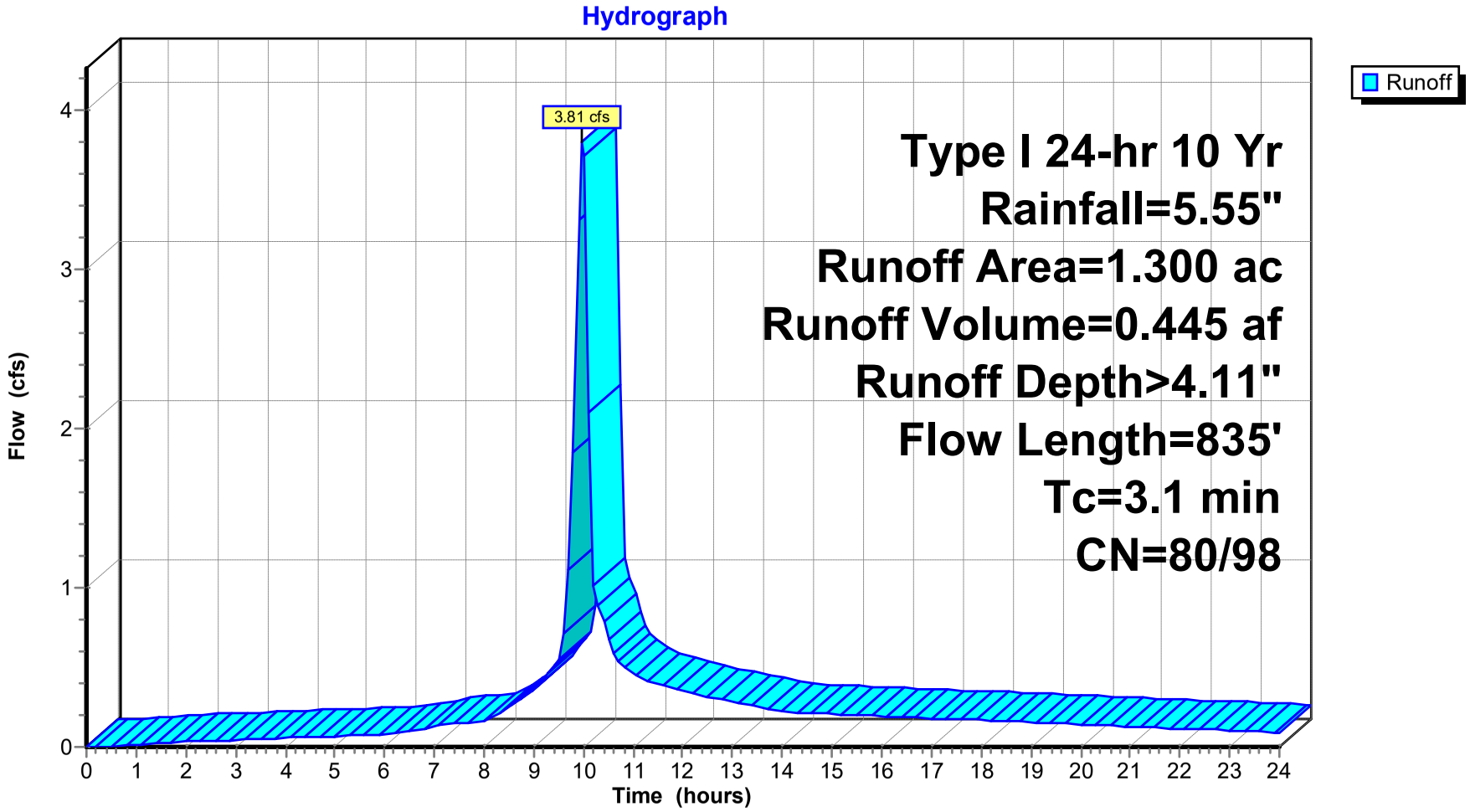
Runoff = 3.81 cfs @ 9.97 hrs, Volume= 0.445 af, Depth> 4.11"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 10 Yr Rainfall=5.55"

Area (ac)	CN	Description
1.300	87	1/4 acre lots, 38% imp, HSG D
0.806	80	62.00% Pervious Area
0.494	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	280	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.3	100	0.0900	6.09		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.5	150	0.0600	4.97		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.0	215	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.5	90	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
3.1	835	Total			

Subcatchment 2S: B-2



Hydrograph for Subcatchment 2S: B-2

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.05	0.00	0.00	0.00
1.00	0.10	0.00	0.01	0.02
1.50	0.15	0.00	0.04	0.03
2.00	0.19	0.00	0.07	0.03
2.50	0.25	0.00	0.10	0.04
3.00	0.30	0.00	0.14	0.04
3.50	0.36	0.00	0.19	0.05
4.00	0.42	0.00	0.25	0.06
4.50	0.49	0.00	0.31	0.06
5.00	0.55	0.00	0.37	0.07
5.50	0.62	0.01	0.43	0.07
6.00	0.69	0.01	0.50	0.08
6.50	0.77	0.03	0.57	0.10
7.00	0.87	0.05	0.66	0.13
7.50	0.97	0.07	0.76	0.15
8.00	1.08	0.11	0.87	0.16
8.50	1.22	0.16	1.00	0.25
9.00	1.41	0.24	1.19	0.36
9.50	1.68	0.38	1.46	0.55
10.00	2.86	1.14	2.63	**3.72**
10.50	3.24	1.43	3.00	0.68
11.00	3.46	1.60	3.22	0.46
11.50	3.64	1.75	3.40	0.40
12.00	3.80	1.87	3.56	0.35
12.50	3.94	1.99	3.70	0.32
13.00	4.06	2.09	3.83	0.29
13.50	4.17	2.19	3.94	0.25
14.00	4.27	2.27	4.04	0.22
14.50	4.36	2.35	4.13	0.21
15.00	4.45	2.42	4.22	0.21
15.50	4.54	2.49	4.30	0.20
16.00	4.62	2.56	4.38	0.19
16.50	4.70	2.63	4.46	0.19
17.00	4.77	2.70	4.54	0.18
17.50	4.85	2.76	4.61	0.17
18.00	4.92	2.82	4.68	0.17
18.50	4.99	2.88	4.75	0.16
19.00	5.05	2.94	4.81	0.16
19.50	5.11	2.99	4.88	0.15
20.00	5.17	3.04	4.94	0.14
20.50	5.23	3.09	4.99	0.14
21.00	5.28	3.14	5.05	0.13
21.50	5.33	3.19	5.10	0.12
22.00	5.38	3.23	5.15	0.12
22.50	5.43	3.27	5.19	0.11
23.00	5.47	3.31	5.23	0.10
23.50	5.51	3.34	5.27	0.10
24.00	**5.55**	**3.38**	**5.31**	0.09

Summary for Subcatchment 4S: C-1

[49] Hint: Tc<2dt may require smaller dt

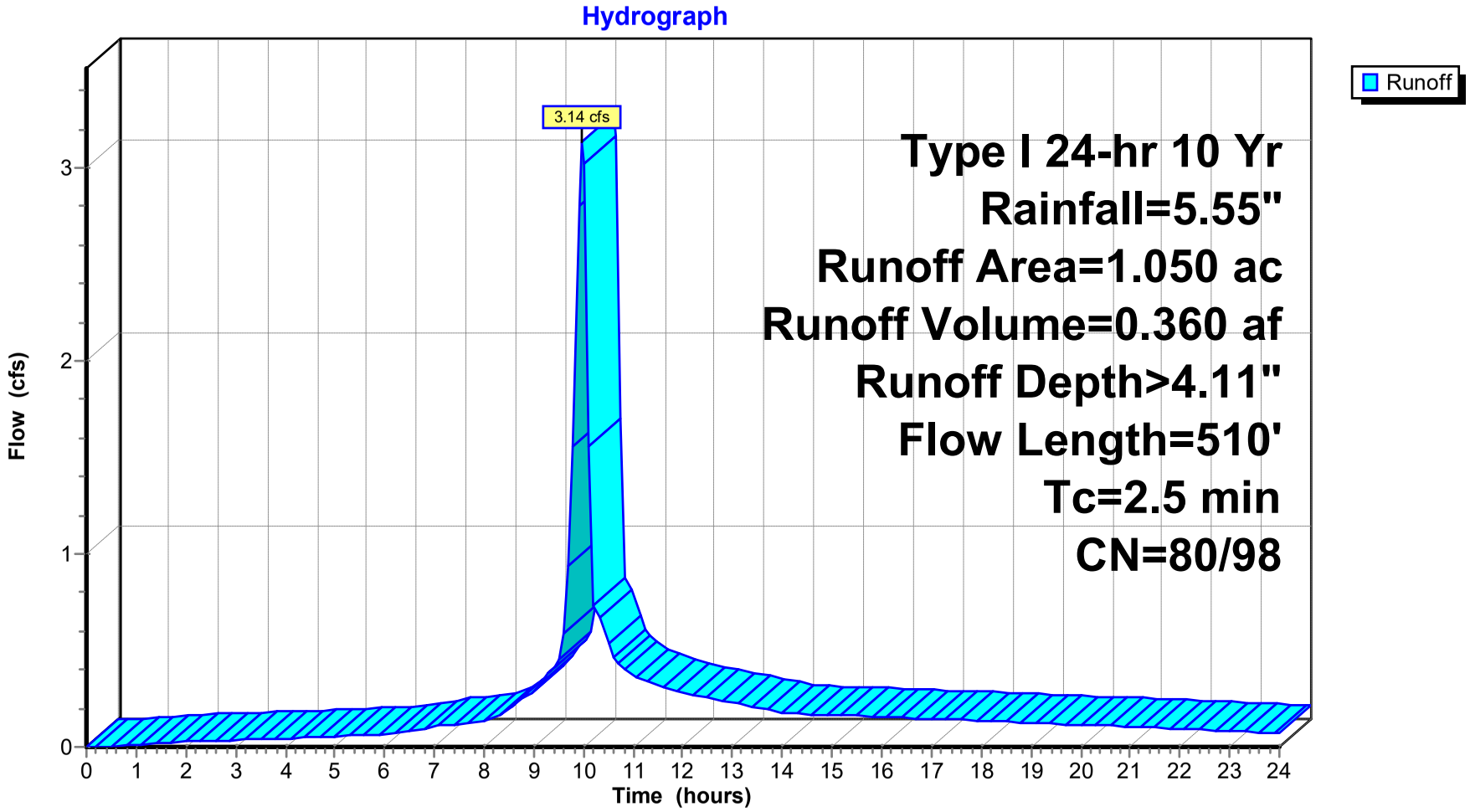
Runoff = 3.14 cfs @ 9.96 hrs, Volume= 0.360 af, Depth> 4.11"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 10 Yr Rainfall=5.55"

Area (ac)	CN	Description
1.050	87	1/4 acre lots, 38% imp, HSG D
0.651	80	62.00% Pervious Area
0.399	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	260	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.0	250	0.0400	4.06		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
2.5	510	Total			

Subcatchment 4S: C-1



Hydrograph for Subcatchment 4S: C-1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.05	0.00	0.00	0.00
1.00	0.10	0.00	0.01	0.01
1.50	0.15	0.00	0.04	0.02
2.00	0.19	0.00	0.07	0.03
2.50	0.25	0.00	0.10	0.03
3.00	0.30	0.00	0.14	0.04
3.50	0.36	0.00	0.19	0.04
4.00	0.42	0.00	0.25	0.05
4.50	0.49	0.00	0.31	0.05
5.00	0.55	0.00	0.37	0.05
5.50	0.62	0.01	0.43	0.06
6.00	0.69	0.01	0.50	0.07
6.50	0.77	0.03	0.57	0.08
7.00	0.87	0.05	0.66	0.11
7.50	0.97	0.07	0.76	0.12
8.00	1.08	0.11	0.87	0.13
8.50	1.22	0.16	1.00	0.20
9.00	1.41	0.24	1.19	0.29
9.50	1.68	0.38	1.46	0.45
10.00	2.86	1.14	2.63	**3.03**
10.50	3.24	1.43	3.00	0.54
11.00	3.46	1.60	3.22	0.37
11.50	3.64	1.75	3.40	0.32
12.00	3.80	1.87	3.56	0.28
12.50	3.94	1.99	3.70	0.26
13.00	4.06	2.09	3.83	0.23
13.50	4.17	2.19	3.94	0.21
14.00	4.27	2.27	4.04	0.18
14.50	4.36	2.35	4.13	0.17
15.00	4.45	2.42	4.22	0.17
15.50	4.54	2.49	4.30	0.16
16.00	4.62	2.56	4.38	0.16
16.50	4.70	2.63	4.46	0.15
17.00	4.77	2.70	4.54	0.15
17.50	4.85	2.76	4.61	0.14
18.00	4.92	2.82	4.68	0.14
18.50	4.99	2.88	4.75	0.13
19.00	5.05	2.94	4.81	0.13
19.50	5.11	2.99	4.88	0.12
20.00	5.17	3.04	4.94	0.12
20.50	5.23	3.09	4.99	0.11
21.00	5.28	3.14	5.05	0.10
21.50	5.33	3.19	5.10	0.10
22.00	5.38	3.23	5.15	0.09
22.50	5.43	3.27	5.19	0.09
23.00	5.47	3.31	5.23	0.08
23.50	5.51	3.34	5.27	0.08
24.00	**5.55**	**3.38**	**5.31**	0.07

Summary for Subcatchment 5S: C-2

[49] Hint: Tc<2dt may require smaller dt

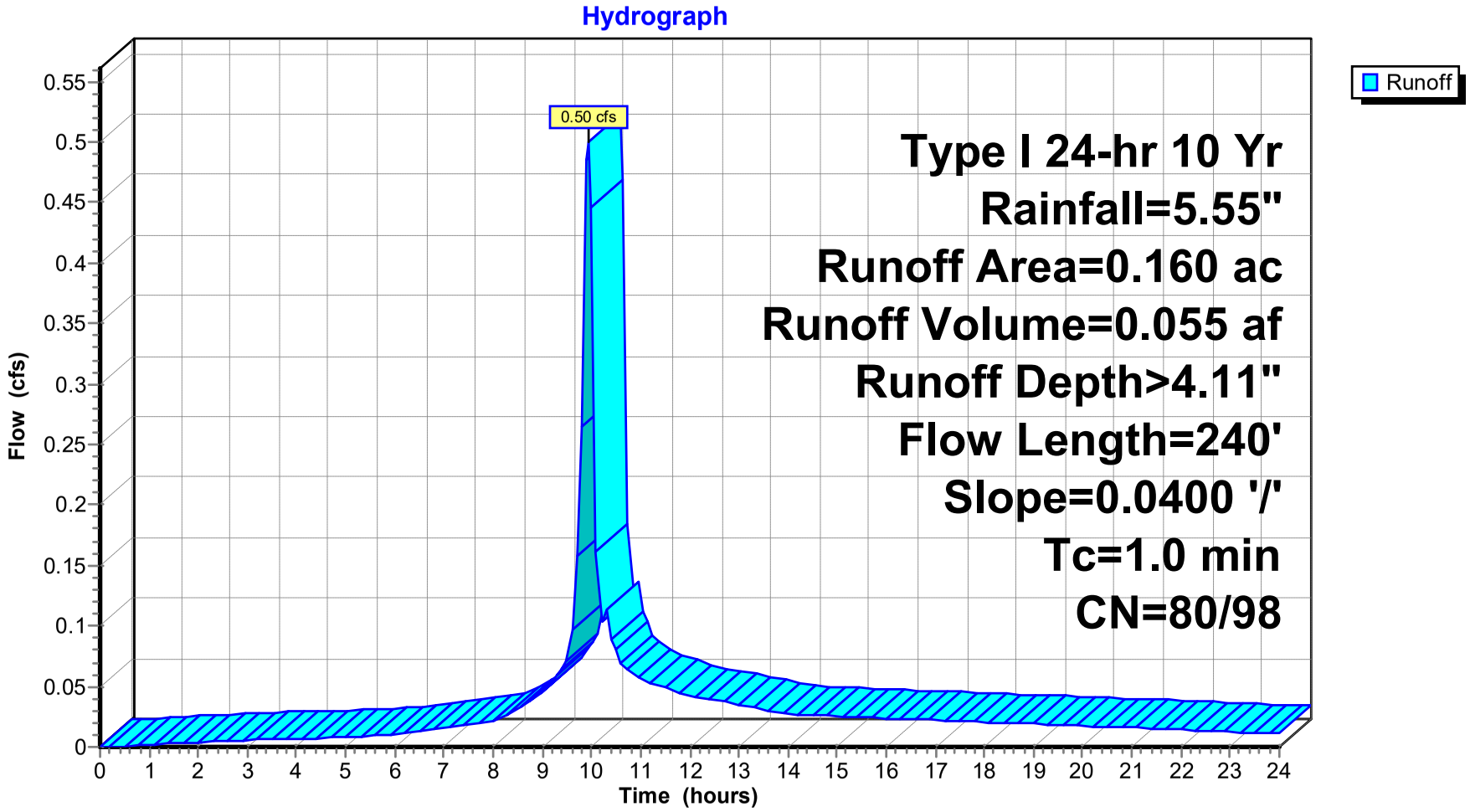
Runoff = 0.50 cfs @ 9.93 hrs, Volume= 0.055 af, Depth> 4.11"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 10 Yr Rainfall=5.55"

Area (ac)	CN	Description
0.160	87	1/4 acre lots, 38% imp, HSG D
0.099	80	62.00% Pervious Area
0.061	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	240	0.0400	4.06		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps

Subcatchment 5S: C-2



Hydrograph for Subcatchment 5S: C-2

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.05	0.00	0.00	0.00
1.00	0.10	0.00	0.01	0.00
1.50	0.15	0.00	0.04	0.00
2.00	0.19	0.00	0.07	0.00
2.50	0.25	0.00	0.10	0.00
3.00	0.30	0.00	0.14	0.01
3.50	0.36	0.00	0.19	0.01
4.00	0.42	0.00	0.25	0.01
4.50	0.49	0.00	0.31	0.01
5.00	0.55	0.00	0.37	0.01
5.50	0.62	0.01	0.43	0.01
6.00	0.69	0.01	0.50	0.01
6.50	0.77	0.03	0.57	0.01
7.00	0.87	0.05	0.66	0.02
7.50	0.97	0.07	0.76	0.02
8.00	1.08	0.11	0.87	0.02
8.50	1.22	0.16	1.00	0.03
9.00	1.41	0.24	1.19	0.05
9.50	1.68	0.38	1.46	**0.07**
10.00	2.86	1.14	2.63	**0.45**
10.50	3.24	1.43	3.00	0.08
11.00	3.46	1.60	3.22	0.06
11.50	3.64	1.75	3.40	0.05
12.00	3.80	1.87	3.56	0.04
12.50	3.94	1.99	3.70	0.04
13.00	4.06	2.09	3.83	0.03
13.50	4.17	2.19	3.94	0.03
14.00	4.27	2.27	4.04	0.03
14.50	4.36	2.35	4.13	0.03
15.00	4.45	2.42	4.22	0.03
15.50	4.54	2.49	4.30	0.02
16.00	4.62	2.56	4.38	0.02
16.50	4.70	2.63	4.46	0.02
17.00	4.77	2.70	4.54	0.02
17.50	4.85	2.76	4.61	0.02
18.00	4.92	2.82	4.68	0.02
18.50	4.99	2.88	4.75	0.02
19.00	5.05	2.94	4.81	0.02
19.50	5.11	2.99	4.88	0.02
20.00	5.17	3.04	4.94	0.02
20.50	5.23	3.09	4.99	0.02
21.00	5.28	3.14	5.05	0.02
21.50	5.33	3.19	5.10	0.02
22.00	5.38	3.23	5.15	0.01
22.50	5.43	3.27	5.19	0.01
23.00	5.47	3.31	5.23	0.01
23.50	5.51	3.34	5.27	0.01
24.00	**5.55**	**3.38**	**5.31**	0.01

Summary for Subcatchment 6S: C-3

[49] Hint: Tc<2dt may require smaller dt

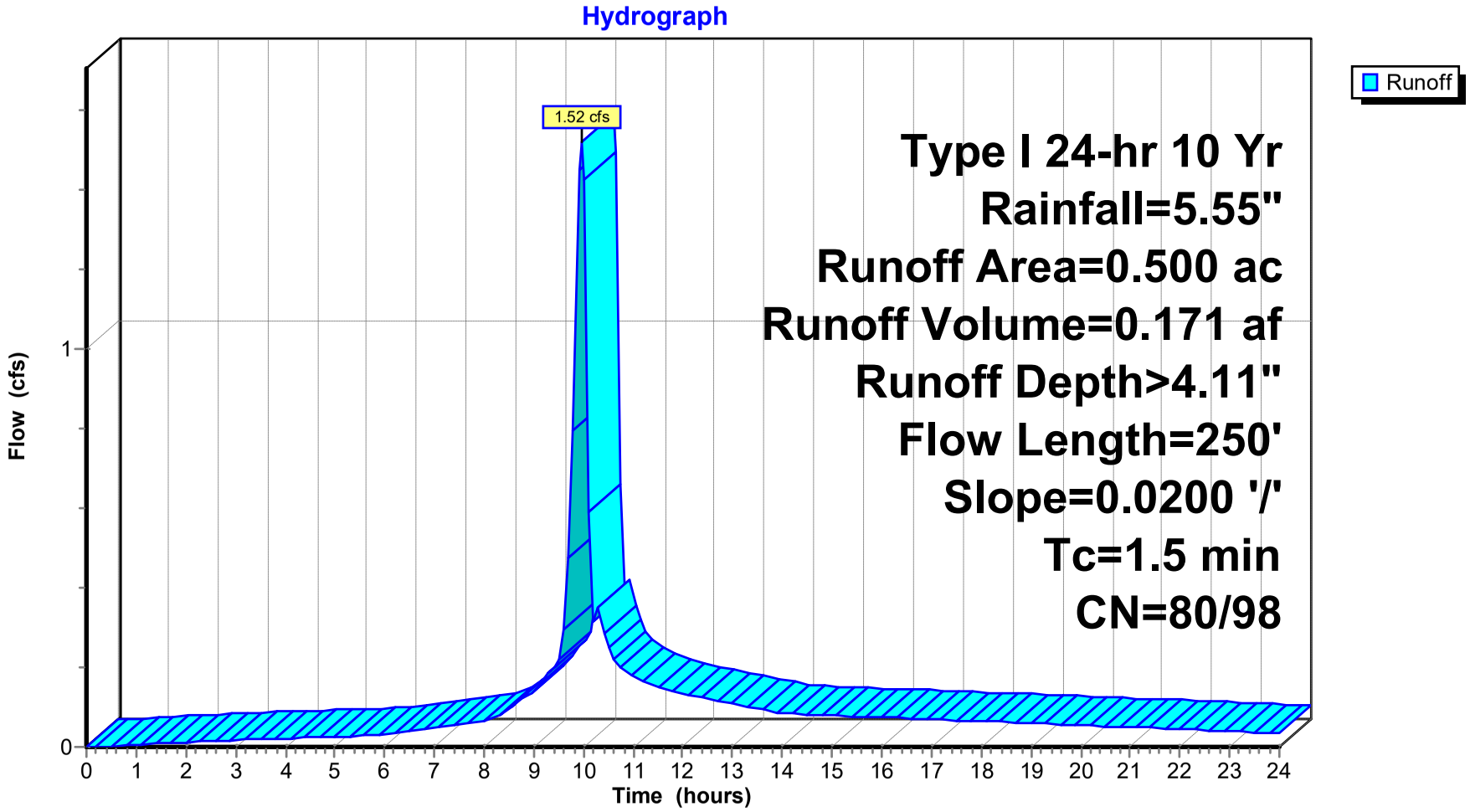
Runoff = 1.52 cfs @ 9.95 hrs, Volume= 0.171 af, Depth> 4.11"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 10 Yr Rainfall=5.55"

Area (ac)	CN	Description
0.500	87	1/4 acre lots, 38% imp, HSG D
0.310	80	62.00% Pervious Area
0.190	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	250	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps

Subcatchment 6S: C-3



Hydrograph for Subcatchment 6S: C-3

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.05	0.00	0.00	0.00
1.00	0.10	0.00	0.01	0.01
1.50	0.15	0.00	0.04	0.01
2.00	0.19	0.00	0.07	0.01
2.50	0.25	0.00	0.10	0.01
3.00	0.30	0.00	0.14	0.02
3.50	0.36	0.00	0.19	0.02
4.00	0.42	0.00	0.25	0.02
4.50	0.49	0.00	0.31	0.02
5.00	0.55	0.00	0.37	0.03
5.50	0.62	0.01	0.43	0.03
6.00	0.69	0.01	0.50	0.03
6.50	0.77	0.03	0.57	0.04
7.00	0.87	0.05	0.66	0.05
7.50	0.97	0.07	0.76	0.06
8.00	1.08	0.11	0.87	0.06
8.50	1.22	0.16	1.00	0.10
9.00	1.41	0.24	1.19	0.14
9.50	1.68	0.38	1.46	**0.22**
10.00	2.86	1.14	2.63	**1.43**
10.50	3.24	1.43	3.00	0.25
11.00	3.46	1.60	3.22	0.18
11.50	3.64	1.75	3.40	0.15
12.00	3.80	1.87	3.56	0.13
12.50	3.94	1.99	3.70	0.12
13.00	4.06	2.09	3.83	0.11
13.50	4.17	2.19	3.94	0.10
14.00	4.27	2.27	4.04	0.09
14.50	4.36	2.35	4.13	0.08
15.00	4.45	2.42	4.22	0.08
15.50	4.54	2.49	4.30	0.08
16.00	4.62	2.56	4.38	0.07
16.50	4.70	2.63	4.46	0.07
17.00	4.77	2.70	4.54	0.07
17.50	4.85	2.76	4.61	0.07
18.00	4.92	2.82	4.68	0.06
18.50	4.99	2.88	4.75	0.06
19.00	5.05	2.94	4.81	0.06
19.50	5.11	2.99	4.88	0.06
20.00	5.17	3.04	4.94	0.05
20.50	5.23	3.09	4.99	0.05
21.00	5.28	3.14	5.05	0.05
21.50	5.33	3.19	5.10	0.05
22.00	5.38	3.23	5.15	0.04
22.50	5.43	3.27	5.19	0.04
23.00	5.47	3.31	5.23	0.04
23.50	5.51	3.34	5.27	0.04
24.00	**5.55**	**3.38**	**5.31**	0.03

Summary for Subcatchment 9S: D-1

[49] Hint: Tc<2dt may require smaller dt

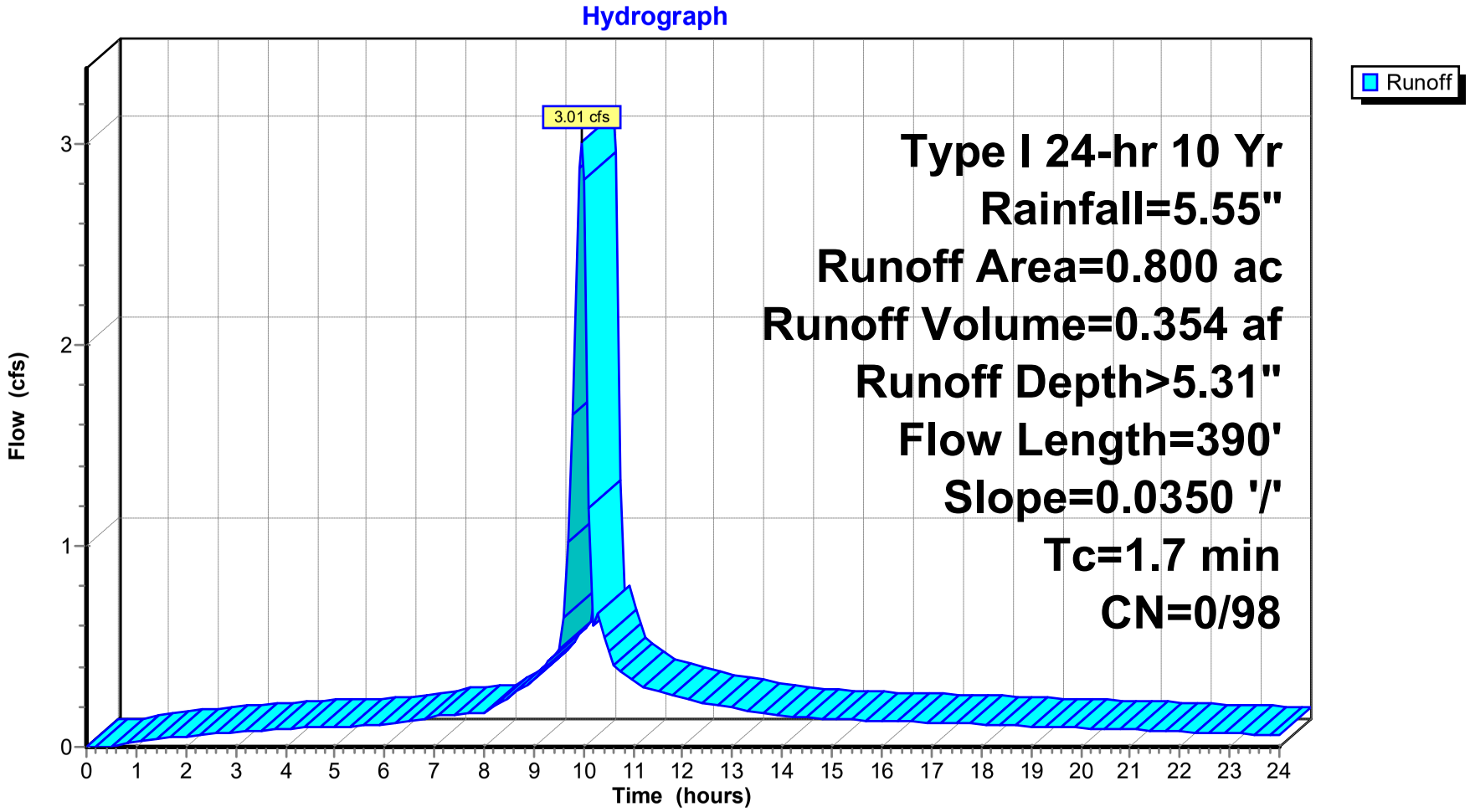
Runoff = 3.01 cfs @ 9.94 hrs, Volume= 0.354 af, Depth> 5.31"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 10 Yr Rainfall=5.55"

Area (ac)	CN	Description
0.800	98	Paved roads w/curbs & sewers, HSG D
0.800	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	390	0.0350	3.80		**Shallow Concentrated Flow, Lower Street Flow** Paved Kv= 20.3 fps

Subcatchment 9S: D-1



Hydrograph for Subcatchment 9S: D-1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	**0.00**	0.00	0.00
0.50	0.05	0.00	0.00	0.00
1.00	0.10	0.00	0.01	0.03
1.50	0.15	0.00	0.04	0.04
2.00	0.19	0.00	0.07	0.05
2.50	0.25	0.00	0.10	0.06
3.00	0.30	0.00	0.14	0.07
3.50	0.36	0.00	0.19	0.08
4.00	0.42	0.00	0.25	0.09
4.50	0.49	0.00	0.31	0.10
5.00	0.55	0.00	0.37	0.10
5.50	0.62	0.00	0.43	0.10
6.00	0.69	0.00	0.50	0.11
6.50	0.77	0.00	0.57	0.13
7.00	0.87	0.00	0.66	0.15
7.50	0.97	0.00	0.76	0.16
8.00	1.08	0.00	0.87	0.17
8.50	1.22	0.00	1.00	0.25
9.00	1.41	0.00	1.19	0.34
9.50	1.68	0.00	1.46	**0.49**
10.00	2.86	0.00	2.63	**2.81**
10.50	3.24	0.00	3.00	0.47
11.00	3.46	0.00	3.22	0.32
11.50	3.64	0.00	3.40	0.28
12.00	3.80	0.00	3.56	0.24
12.50	3.94	0.00	3.70	0.22
13.00	4.06	0.00	3.83	0.20
13.50	4.17	0.00	3.94	0.17
14.00	4.27	0.00	4.04	0.15
14.50	4.36	0.00	4.13	0.14
15.00	4.45	0.00	4.22	0.14
15.50	4.54	0.00	4.30	0.13
16.00	4.62	0.00	4.38	0.13
16.50	4.70	0.00	4.46	0.13
17.00	4.77	0.00	4.54	0.12
17.50	4.85	0.00	4.61	0.12
18.00	4.92	0.00	4.68	0.11
18.50	4.99	0.00	4.75	0.11
19.00	5.05	0.00	4.81	0.10
19.50	5.11	0.00	4.88	0.10
20.00	5.17	0.00	4.94	0.09
20.50	5.23	0.00	4.99	0.09
21.00	5.28	0.00	5.05	0.09
21.50	5.33	0.00	5.10	0.08
22.00	5.38	0.00	5.15	0.08
22.50	5.43	0.00	5.19	0.07
23.00	5.47	0.00	5.23	0.07
23.50	5.51	0.00	5.27	0.06
24.00	**5.55**	0.00	**5.31**	0.06

Summary for Reach 3R: SD-1

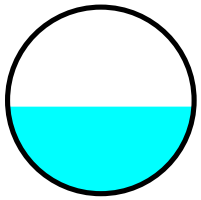
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 4.300 ac, 38.00% Impervious, Inflow Depth > 4.11" for 10 Yr event
Inflow = 12.51 cfs @ 9.97 hrs, Volume= 1.472 af
Outflow = 12.29 cfs @ 9.99 hrs, Volume= 1.472 af, Atten= 2%, Lag= 0.8 min

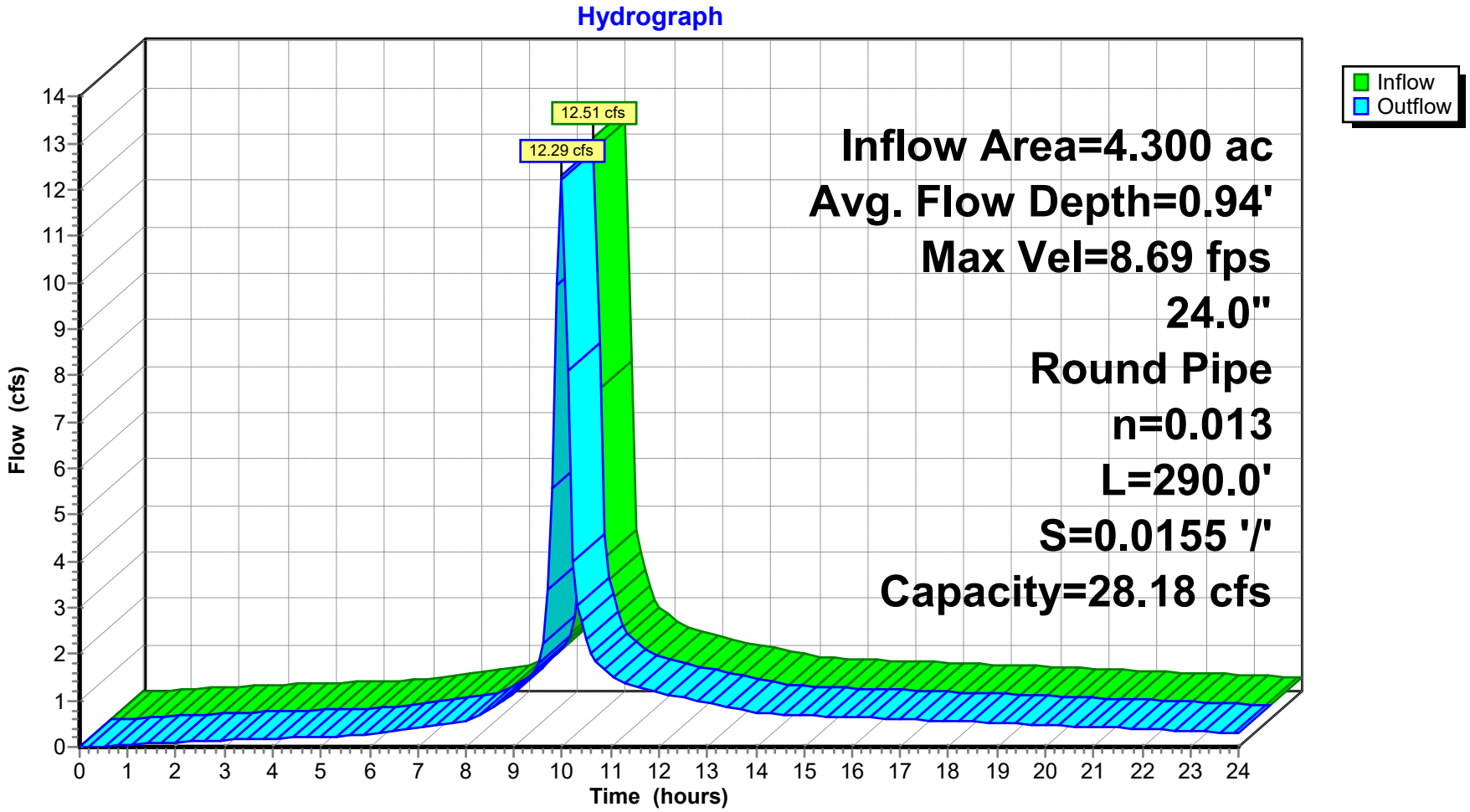
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Max. Velocity= 8.69 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 3.47 fps, Avg. Travel Time= 1.4 min

Peak Storage= 418 cf @ 9.98 hrs
Average Depth at Peak Storage= 0.94'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 28.18 cfs

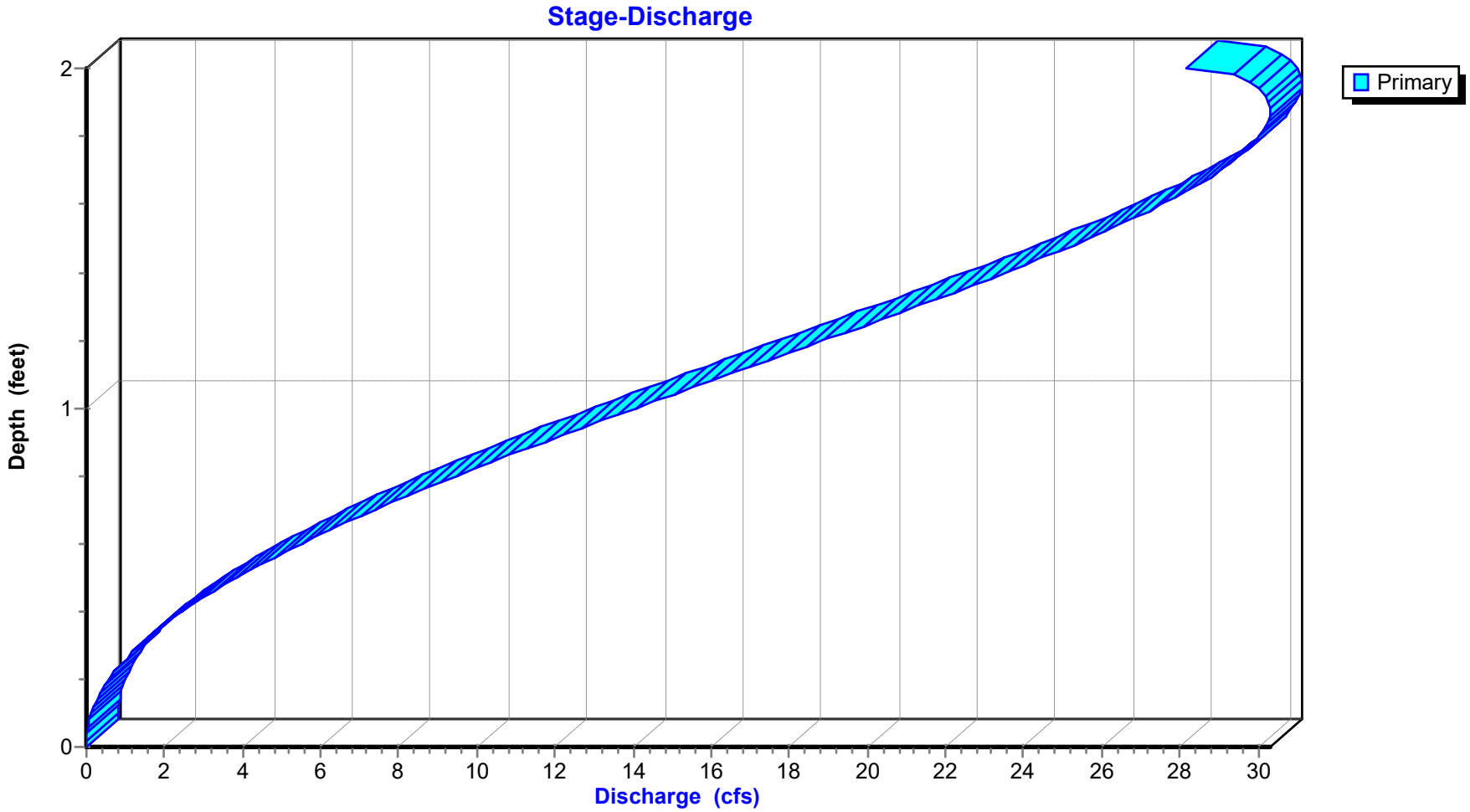
24.0" Round Pipe
n= 0.013
Length= 290.0' Slope= 0.0155 '/'
Inlet Invert= 158.50', Outlet Invert= 154.00'



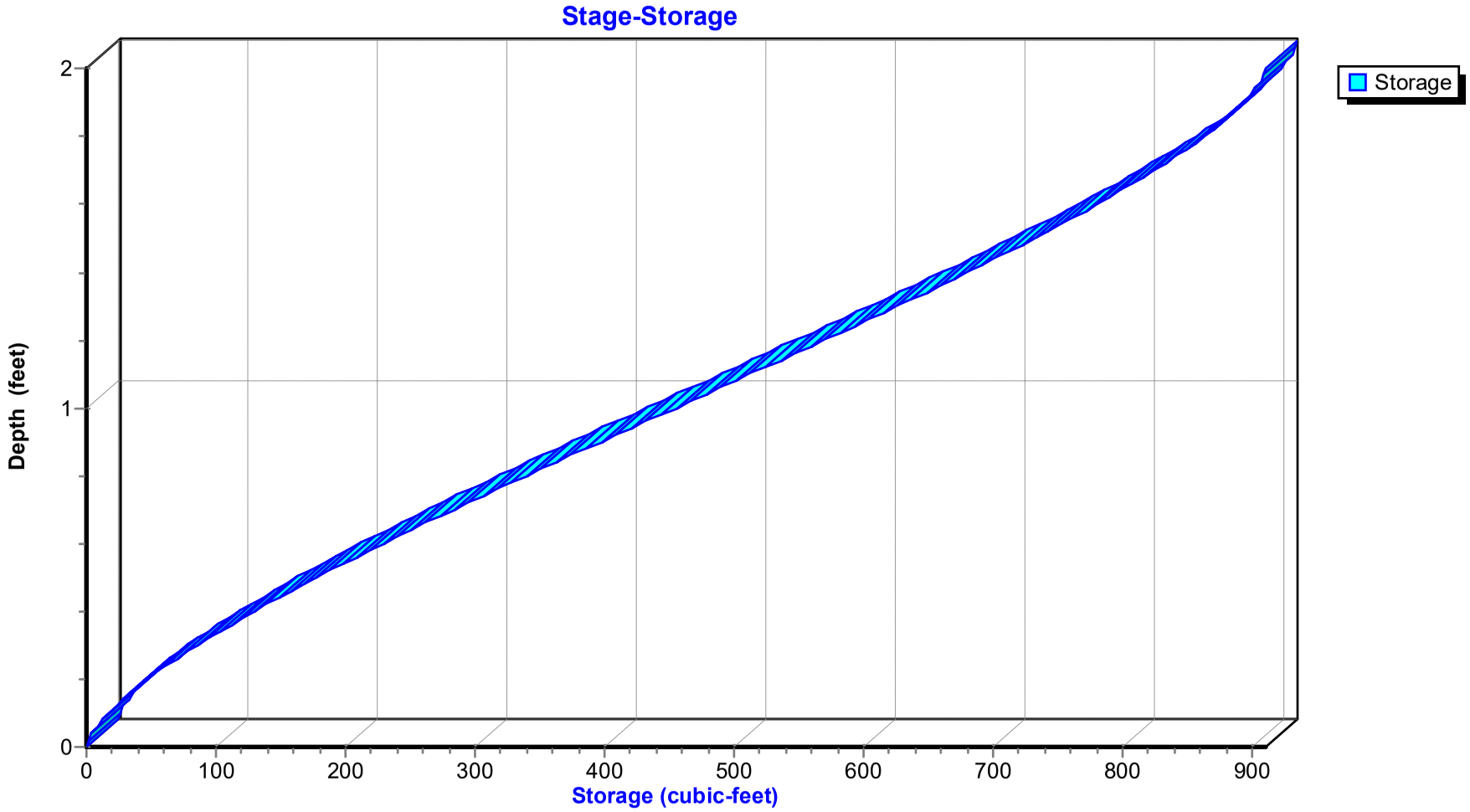
Reach 3R: SD-1


Hydrograph
Inflow
Outflow
12.51 cfs
12.29 cfs
Inflow Area=4.300 ac
Avg. Flow Depth=0.94'
Max Vel=8.69 fps
24.0"
Round Pipe
n=0.013
L=290.0'
S=0.0155 '/'
Capacity=28.18 cfs
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Reach 3R: SD-1


Stage-Discharge
Primary
Depth (feet)
0
1
2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Discharge (cfs)

Reach 3R: SD-1


Stage-Storage
Storage
Depth (feet)
0
1
2
0
100
200
300
400
500
600
700
800
900
Storage (cubic-feet)

Hydrograph for Reach 3R: SD-1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	158.50	0.00
0.50	0.00	0	158.50	0.00
1.00	0.05	9	158.56	0.05
1.50	0.09	12	158.58	0.08
2.00	0.11	14	158.59	0.10
2.50	0.13	16	158.60	0.12
3.00	0.15	18	158.60	0.15
3.50	0.17	19	158.61	0.16
4.00	0.18	21	158.61	0.18
4.50	0.20	22	158.62	0.19
5.00	0.22	23	158.62	0.21
5.50	0.24	25	158.63	0.24
6.00	0.27	27	158.64	0.27
6.50	0.34	32	158.65	0.33
7.00	0.43	38	158.67	0.42
7.50	0.49	42	158.68	0.49
8.00	0.54	45	158.69	0.54
8.50	0.82	59	158.73	0.80
9.00	1.18	77	158.78	1.17
9.50	1.83	104	158.84	1.80
10.00	**12.25**	**414**	**159.43**	**12.22**
10.50	2.26	122	158.88	2.31
11.00	1.54	93	158.82	1.56
11.50	1.32	84	158.79	1.33
12.00	1.16	76	158.78	1.17
12.50	1.05	71	158.76	1.05
13.00	0.95	66	158.75	0.95
13.50	0.84	61	158.74	0.85
14.00	0.74	56	158.72	0.74
14.50	0.70	54	158.72	0.70
15.00	0.68	52	158.71	0.68
15.50	0.66	51	158.71	0.66
16.00	0.64	50	158.71	0.64
16.50	0.62	49	158.70	0.62
17.00	0.60	48	158.70	0.60
17.50	0.58	47	158.70	0.58
18.00	0.56	46	158.69	0.56
18.50	0.54	44	158.69	0.54
19.00	0.51	43	158.69	0.52
19.50	0.49	42	158.68	0.49
20.00	0.47	41	158.68	0.47
20.50	0.45	39	158.68	0.45
21.00	0.43	38	158.67	0.43
21.50	0.41	37	158.67	0.41
22.00	0.38	35	158.66	0.39
22.50	0.36	34	158.66	0.36
23.00	0.34	32	158.65	0.34
23.50	0.32	31	158.65	0.32
24.00	0.30	29	158.64	0.30

Stage-Discharge for Reach 3R: SD-1

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)	Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)	Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
158.50	0.00	0.00	159.20	7.56	7.41	159.90	10.04	23.59
158.52	0.80	0.00	159.22	7.67	7.81	159.92	10.07	24.03
158.54	1.26	0.02	159.24	7.78	8.22	159.94	10.10	24.46
158.56	1.65	0.05	159.26	7.89	8.64	159.96	10.13	24.88
158.58	1.99	0.08	159.28	7.99	9.07	159.98	10.15	25.29
158.60	2.30	0.14	159.30	8.09	9.50	160.00	10.17	25.70
158.62	2.59	0.20	159.32	8.19	9.93	160.02	10.18	26.09
158.64	2.87	0.28	159.34	8.29	10.38	160.04	10.20	26.47
158.66	3.12	0.37	159.36	8.38	10.83	160.06	10.21	26.84
158.68	3.37	0.47	159.38	8.47	11.28	160.08	10.22	27.20
158.70	3.60	0.59	159.40	8.56	11.74	160.10	10.22	27.55
158.72	3.82	0.72	159.42	8.65	12.20	160.12	**10.23**	27.88
158.74	4.04	0.86	159.44	8.73	12.67	160.14	10.23	28.19
158.76	4.24	1.02	159.46	8.81	13.14	160.16	10.22	28.49
158.78	4.44	1.19	159.48	8.89	13.61	160.18	10.21	28.77
158.80	4.64	1.37	159.50	8.97	14.09	160.20	10.20	29.04
158.82	4.82	1.56	159.52	9.05	14.57	160.22	10.19	29.28
158.84	5.00	1.77	159.54	9.12	15.05	160.24	10.17	29.51
158.86	5.18	1.99	159.56	9.19	15.53	160.26	10.15	29.71
158.88	5.35	2.22	159.58	9.26	16.02	160.28	10.12	29.88
158.90	5.52	2.47	159.60	9.32	16.51	160.30	10.09	30.03
158.92	5.68	2.72	159.62	9.39	16.99	160.32	10.05	30.16
158.94	5.84	2.99	159.64	9.45	17.48	160.34	10.00	30.25
158.96	5.99	3.27	159.66	9.51	17.96	160.36	9.95	30.30
158.98	6.14	3.56	159.68	9.56	18.45	160.38	9.89	**30.31**
159.00	6.29	3.86	159.70	9.62	18.93	160.40	9.82	30.28
159.02	6.43	4.17	159.72	9.67	19.41	160.42	9.74	30.19
159.04	6.57	4.49	159.74	9.72	19.89	160.44	9.64	30.03
159.06	6.70	4.83	159.76	9.77	20.37	160.46	9.52	29.78
159.08	6.83	5.17	159.78	9.82	20.85	160.48	9.36	29.36
159.10	6.96	5.52	159.80	9.86	21.32	160.50	8.97	28.18
159.12	7.09	5.88	159.82	9.90	21.78			
159.14	7.21	6.25	159.84	9.94	22.24			
159.16	7.33	6.63	159.86	9.98	22.70			
159.18	7.45	7.01	159.88	10.01	23.15			

Stage-Area-Storage for Reach 3R: SD-1

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
158.50	0.0	0	159.20	1.0	284	159.90	2.3	681
158.52	0.0	2	159.22	1.0	295	159.92	2.4	692
158.54	0.0	4	159.24	1.1	306	159.94	2.4	702
158.56	0.0	8	159.26	1.1	318	159.96	2.5	713
158.58	0.0	12	159.28	1.1	329	159.98	2.5	723
158.60	0.1	17	159.30	1.2	340	160.00	2.5	733
158.62	0.1	22	159.32	1.2	352	160.02	2.6	743
158.64	0.1	28	159.34	1.3	363	160.04	2.6	753
158.66	0.1	34	159.36	1.3	375	160.06	2.6	762
158.68	0.1	41	159.38	1.3	386	160.08	2.7	772
158.70	0.2	47	159.40	1.4	398	160.10	2.7	781
158.72	0.2	55	159.42	1.4	409	160.12	2.7	791
158.74	0.2	62	159.44	1.5	421	160.14	2.8	800
158.76	0.2	70	159.46	1.5	432	160.16	2.8	808
158.78	0.3	78	159.48	1.5	444	160.18	2.8	817
158.80	0.3	86	159.50	1.6	456	160.20	2.8	825
158.82	0.3	94	159.52	1.6	467	160.22	2.9	834
158.84	0.4	103	159.54	1.7	479	160.24	2.9	841
158.86	0.4	112	159.56	1.7	490	160.26	2.9	849
158.88	0.4	121	159.58	1.7	502	160.28	3.0	857
158.90	0.4	130	159.60	1.8	513	160.30	3.0	864
158.92	0.5	139	159.62	1.8	525	160.32	3.0	870
158.94	0.5	149	159.64	1.8	536	160.34	3.0	877
158.96	0.5	158	159.66	1.9	548	160.36	3.0	883
158.98	0.6	168	159.68	1.9	559	160.38	3.1	889
159.00	0.6	178	159.70	2.0	571	160.40	3.1	894
159.02	0.6	188	159.72	2.0	582	160.42	3.1	899
159.04	0.7	198	159.74	2.0	593	160.44	3.1	903
159.06	0.7	209	159.76	2.1	605	160.46	3.1	907
159.08	0.8	219	159.78	2.1	616	160.48	3.1	910
159.10	0.8	230	159.80	2.2	627	160.50	**3.1**	**911**
159.12	0.8	241	159.82	2.2	638			
159.14	0.9	251	159.84	2.2	649			
159.16	0.9	262	159.86	2.3	660			
159.18	0.9	273	159.88	2.3	671			

Summary for Reach 7R: SD-2

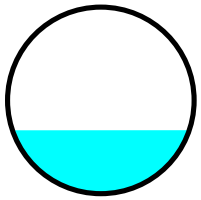
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 1.710 ac, 38.00% Impervious, Inflow Depth > 4.11" for 10 Yr event
Inflow = 5.17 cfs @ 9.96 hrs, Volume= 0.586 af
Outflow = 5.15 cfs @ 9.96 hrs, Volume= 0.586 af, Atten= 0%, Lag= 0.3 min

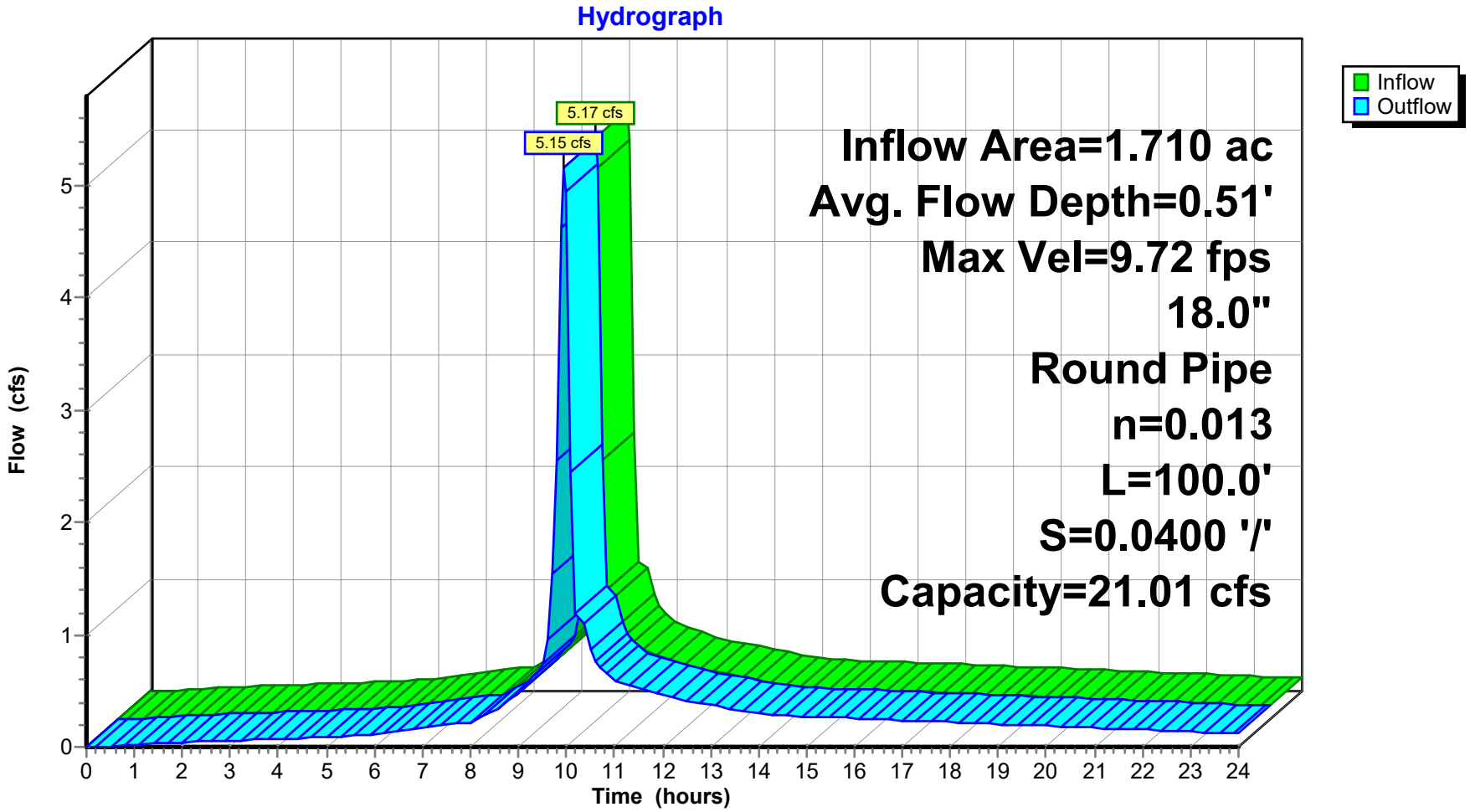
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Max. Velocity= 9.72 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 3.82 fps, Avg. Travel Time= 0.4 min

Peak Storage= 53 cf @ 9.96 hrs
Average Depth at Peak Storage= 0.51'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 21.01 cfs

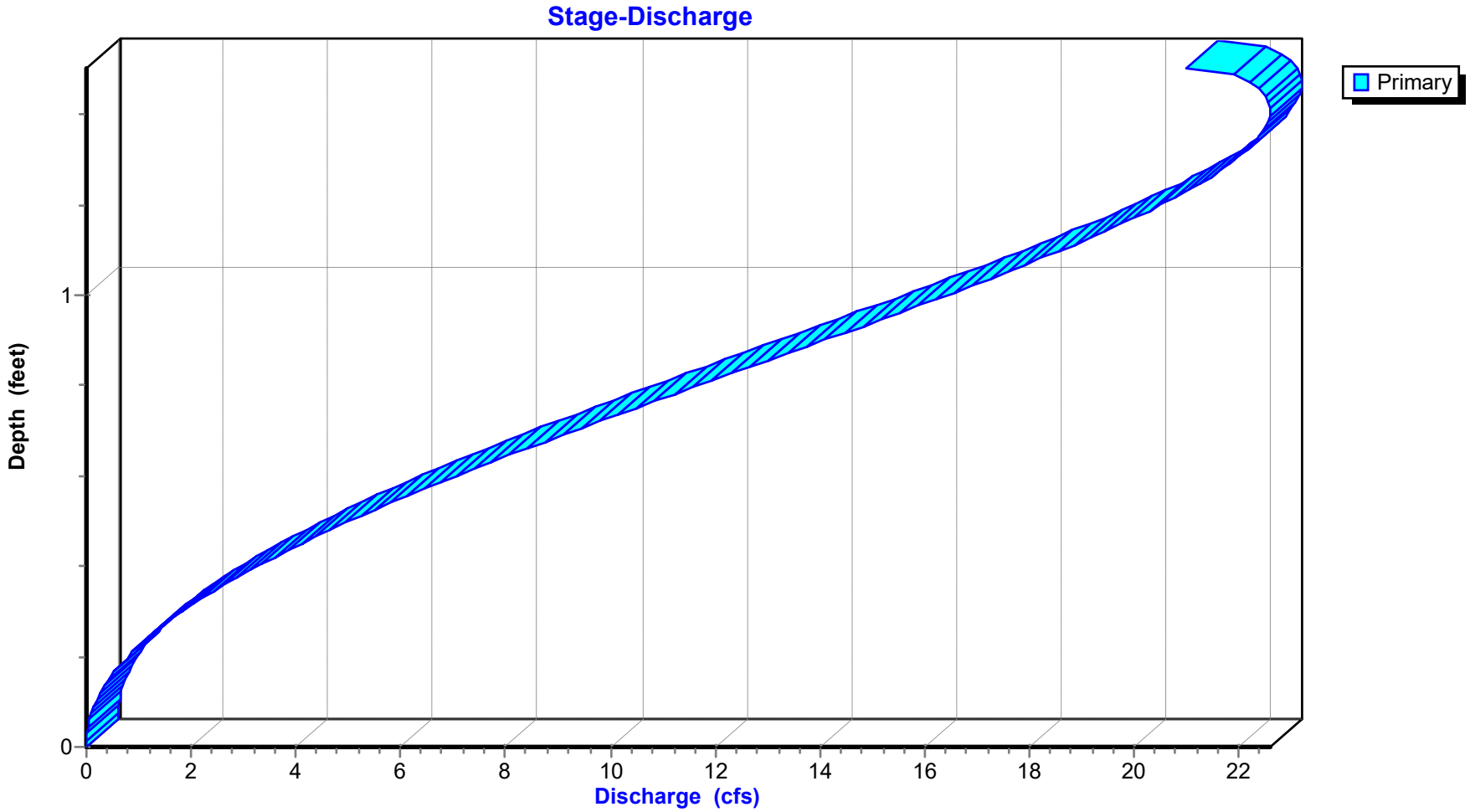
18.0" Round Pipe
n= 0.013
Length= 100.0' Slope= 0.0400 '/'
Inlet Invert= 158.00', Outlet Invert= 154.00'



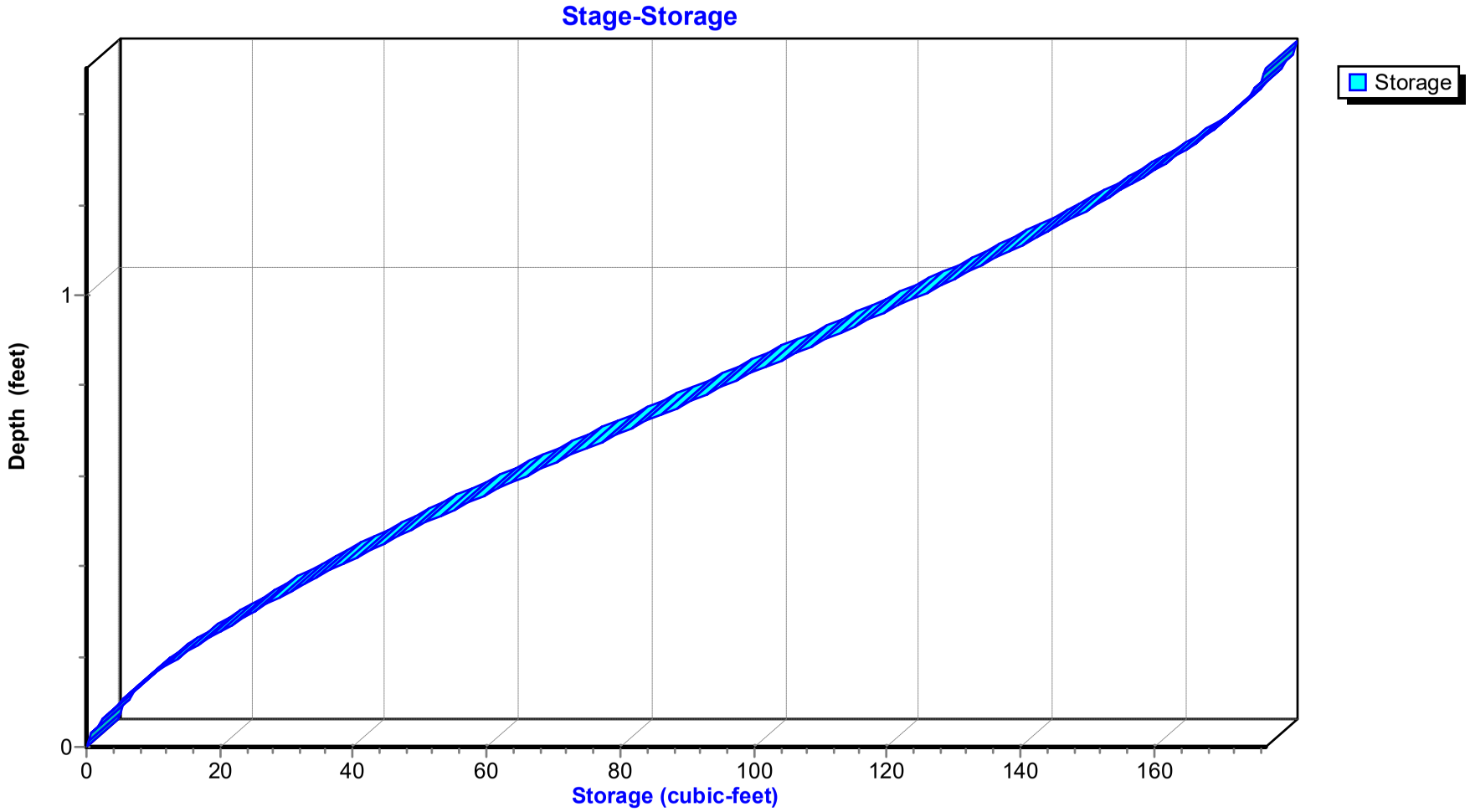
Reach 7R: SD-2


Hydrograph
Inflow
Outflow
5.17 cfs
5.15 cfs
Inflow Area=1.710 ac
Avg. Flow Depth=0.51'
Max Vel=9.72 fps
18.0"
Round Pipe
n=0.013
L=100.0'
S=0.0400 '/'
Capacity=21.01 cfs
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
0 1 2 3 4 5

Reach 7R: SD-2


Stage-Discharge
Primary
Depth (feet)
0
1
0
2
4
6
8
10
12
14
16
18
20
22
Discharge (cfs)

Reach 7R: SD-2


Stage-Storage
Storage
Depth (feet)
0
1
0
20
40
60
80
100
120
140
160
Storage (cubic-feet)

Hydrograph for Reach 7R: SD-2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	158.00	0.00
0.50	0.00	0	158.00	0.00
1.00	0.02	1	158.04	0.02
1.50	0.03	2	158.05	0.03
2.00	0.04	2	158.05	0.04
2.50	0.05	2	158.05	0.05
3.00	0.06	2	158.06	0.06
3.50	0.07	2	158.06	0.07
4.00	0.07	3	158.06	0.07
4.50	0.08	3	158.07	0.08
5.00	0.09	3	158.07	0.09
5.50	0.10	3	158.07	0.10
6.00	0.11	3	158.08	0.11
6.50	0.14	4	158.09	0.14
7.00	0.17	5	158.10	0.17
7.50	0.20	5	158.10	0.20
8.00	0.22	6	158.11	0.22
8.50	0.33	8	158.13	0.33
9.00	0.48	10	158.16	0.48
9.50	0.74	13	158.19	0.74
10.00	**4.90**	**51**	**158.50**	**4.94**
10.50	0.87	15	158.21	0.87
11.00	0.60	12	158.18	0.61
11.50	0.52	10	158.16	0.52
12.00	0.46	10	158.15	0.46
12.50	0.42	9	158.15	0.42
13.00	0.37	8	158.14	0.38
13.50	0.33	8	158.13	0.33
14.00	0.29	7	158.12	0.29
14.50	0.28	7	158.12	0.28
15.00	0.27	7	158.12	0.27
15.50	0.26	6	158.12	0.26
16.00	0.25	6	158.12	0.25
16.50	0.25	6	158.11	0.25
17.00	0.24	6	158.11	0.24
17.50	0.23	6	158.11	0.23
18.00	0.22	6	158.11	0.22
18.50	0.21	6	158.11	0.21
19.00	0.20	5	158.10	0.20
19.50	0.20	5	158.10	0.20
20.00	0.19	5	158.10	0.19
20.50	0.18	5	158.10	0.18
21.00	0.17	5	158.10	0.17
21.50	0.16	5	158.09	0.16
22.00	0.15	4	158.09	0.15
22.50	0.14	4	158.09	0.14
23.00	0.13	4	158.09	0.14
23.50	0.13	4	158.08	0.13
24.00	0.12	4	158.08	0.12

Stage-Discharge for Reach 7R: SD-2

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
158.00	0.00	0.00
158.02	1.26	0.01
158.04	2.02	0.03
158.06	2.64	0.06
158.08	3.18	0.12
158.10	3.68	0.19
158.12	4.14	0.27
158.14	4.56	0.38
158.16	4.97	0.50
158.18	5.35	0.64
158.20	5.71	0.80
158.22	6.06	0.98
158.24	6.39	1.17
158.26	6.71	1.38
158.28	7.02	1.60
158.30	7.31	1.84
158.32	7.60	2.10
158.34	7.87	2.37
158.36	8.14	2.65
158.38	8.39	2.96
158.40	8.64	3.27
158.42	8.88	3.60
158.44	9.11	3.94
158.46	9.34	4.29
158.48	9.56	4.66
158.50	9.77	5.04
158.52	9.97	5.43
158.54	10.17	5.82
158.56	10.36	6.23
158.58	10.55	6.65
158.60	10.73	7.08
158.62	10.90	7.52
158.64	11.07	7.96
158.66	11.23	8.41
158.68	11.38	8.87
158.70	11.53	9.33
158.72	11.68	9.80
158.74	11.82	10.27
158.76	11.95	10.74
158.78	12.08	11.22
158.80	12.21	11.70
158.82	12.33	12.18
158.84	12.44	12.67
158.86	12.55	13.15
158.88	12.65	13.63
158.90	12.75	14.11
158.92	12.84	14.59
158.94	12.93	15.07
158.96	13.01	15.54
158.98	13.09	16.01
159.00	13.16	16.47
159.02	13.22	16.92
159.04	13.28	17.37
159.06	13.34	17.81
159.08	13.39	18.24
159.10	13.43	18.65
159.12	13.47	19.06
159.14	13.50	19.45
159.16	13.52	19.83
159.18	13.54	20.19
159.20	13.55	20.54
159.22	**13.55**	20.86
159.24	13.55	21.17
159.26	13.54	21.45
159.28	13.52	21.71
159.30	13.49	21.94
159.32	13.45	22.15
159.34	13.40	22.32
159.36	13.33	22.45
159.38	13.26	22.55
159.40	13.16	**22.59**
159.42	13.05	**22.58**
159.44	12.91	22.51
159.46	12.73	22.33
159.48	12.48	21.99
159.50	11.89	21.01

Stage-Area-Storage for Reach 7R: SD-2

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
158.00	0.0	0
158.02	0.0	0
158.04	0.0	1
158.06	0.0	2
158.08	0.0	4
158.10	0.1	5
158.12	0.1	7
158.14	0.1	8
158.16	0.1	10
158.18	0.1	12
158.20	0.1	14
158.22	0.2	16
158.24	0.2	18
158.26	0.2	20
158.28	0.2	23
158.30	0.3	25
158.32	0.3	28
158.34	0.3	30
158.36	0.3	33
158.38	0.4	35
158.40	0.4	38
158.42	0.4	41
158.44	0.4	43
158.46	0.5	46
158.48	0.5	49
158.50	0.5	52
158.52	0.5	54
158.54	0.6	57
158.56	0.6	60
158.58	0.6	63
158.60	0.7	66
158.62	0.7	69
158.64	0.7	72
158.66	0.7	75
158.68	0.8	78
158.70	0.8	81
158.72	0.8	84
158.74	0.9	87
158.76	0.9	90
158.78	0.9	93
158.80	1.0	96
158.82	1.0	99
158.84	1.0	102
158.86	1.0	105
158.88	1.1	108
158.90	1.1	111
158.92	1.1	114
158.94	1.2	117
158.96	1.2	119
158.98	1.2	122
159.00	1.3	125
159.02	1.3	128
159.04	1.3	131
159.06	1.3	133
159.08	1.4	136
159.10	1.4	139
159.12	1.4	142
159.14	1.4	144
159.16	1.5	147
159.18	1.5	149
159.20	1.5	152
159.22	1.5	154
159.24	1.6	156
159.26	1.6	158
159.28	1.6	161
159.30	1.6	163
159.32	1.6	165
159.34	1.7	167
159.36	1.7	168
159.38	1.7	170
159.40	1.7	172
159.42	1.7	173
159.44	1.7	174
159.46	1.8	175
159.48	1.8	176
159.50	**1.8**	**177**

Summary for Reach 10R: SD-3

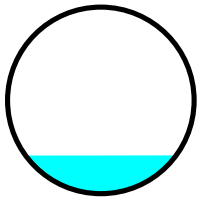
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 0.800 ac,100.00% Impervious, Inflow Depth > 5.31" for 10 Yr event
Inflow = 3.01 cfs @ 9.94 hrs, Volume= 0.354 af
Outflow = 3.00 cfs @ 9.95 hrs, Volume= 0.354 af, Atten= 1%, Lag= 0.2 min

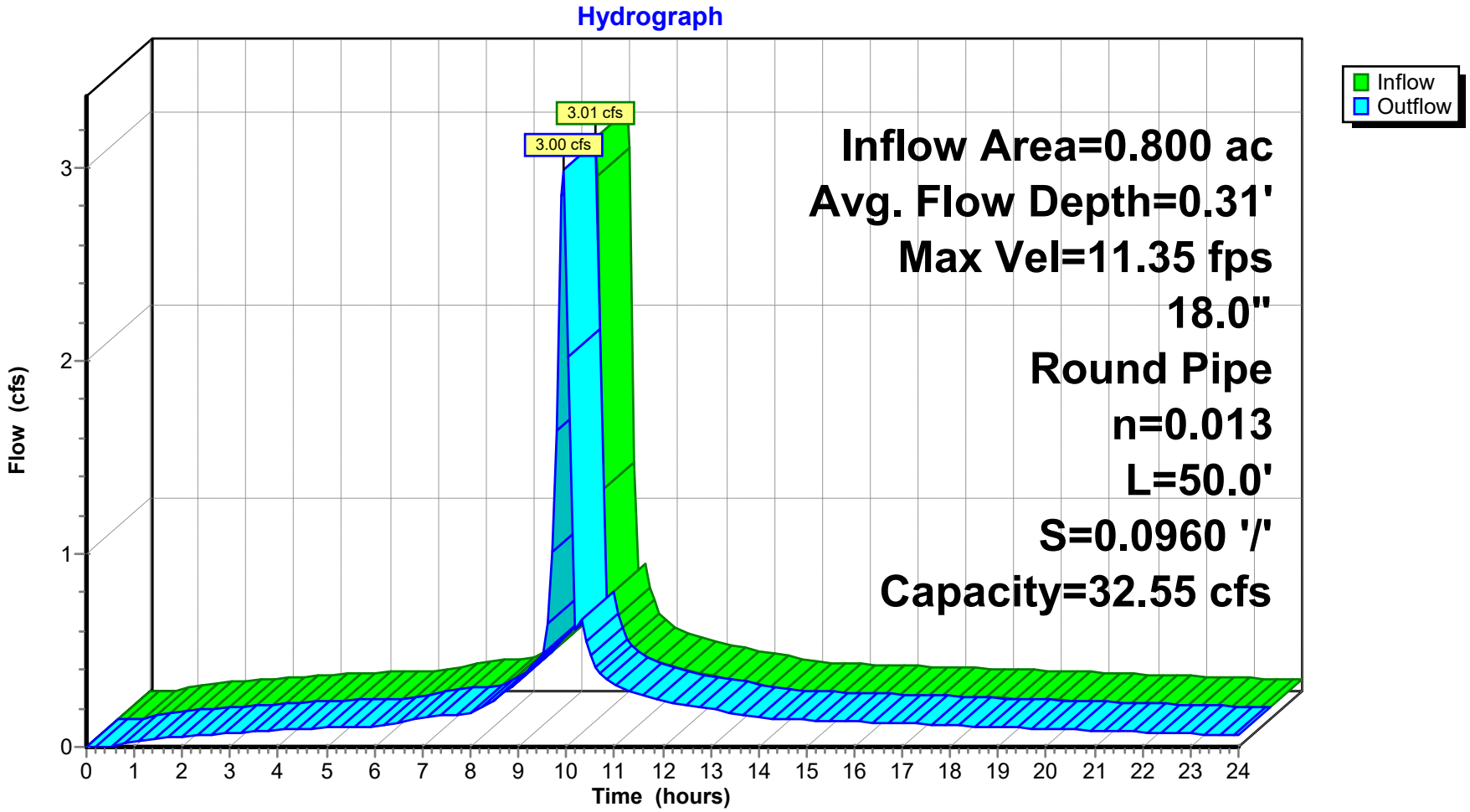
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Max. Velocity= 11.35 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.54 fps, Avg. Travel Time= 0.2 min

Peak Storage= 13 cf @ 9.95 hrs
Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 32.55 cfs

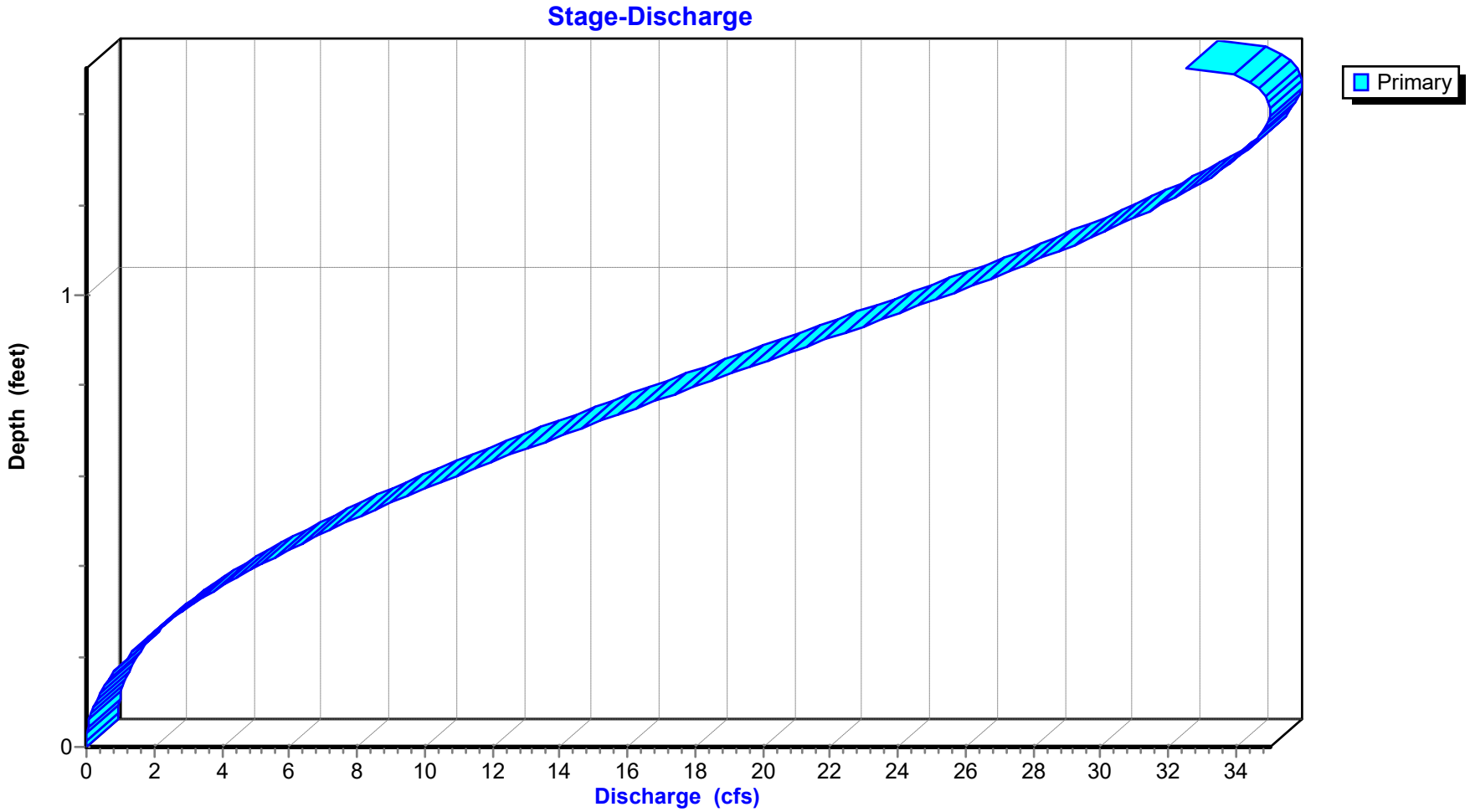
18.0" Round Pipe
n= 0.013
Length= 50.0' Slope= 0.0960 '/'
Inlet Invert= 144.80', Outlet Invert= 140.00'



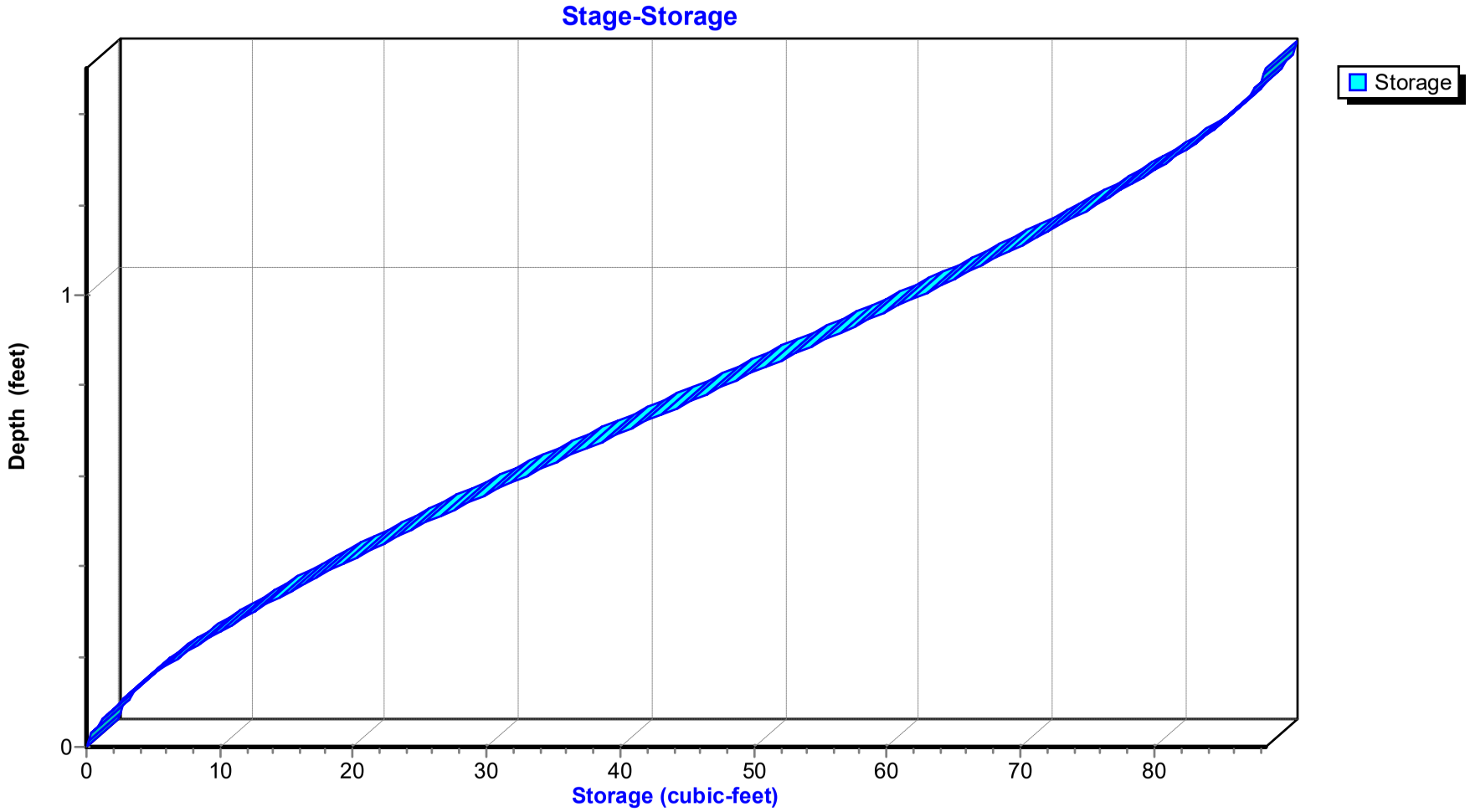
Reach 10R: SD-3



Reach 10R: SD-3



Reach 10R: SD-3



Hydrograph for Reach 10R: SD-3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	144.80	0.00
0.50	0.00	0	144.80	0.00
1.00	0.03	0	144.83	0.03
1.50	0.04	1	144.84	0.04
2.00	0.05	1	144.84	0.05
2.50	0.06	1	144.85	0.06
3.00	0.07	1	144.85	0.07
3.50	0.08	1	144.85	0.08
4.00	0.09	1	144.86	0.09
4.50	0.10	1	144.86	0.10
5.00	0.10	1	144.86	0.10
5.50	0.10	1	144.86	0.10
6.00	0.11	1	144.86	0.11
6.50	0.13	1	144.87	0.13
7.00	0.15	2	144.87	0.15
7.50	0.16	2	144.88	0.16
8.00	0.17	2	144.88	0.17
8.50	0.25	2	144.89	0.25
9.00	0.34	3	144.91	0.34
9.50	**0.49**	**4**	**144.93**	**0.49**
10.00	**2.81**	**13**	**145.10**	**2.83**
10.50	0.47	4	144.93	0.47
11.00	0.32	3	144.91	0.33
11.50	0.28	2	144.90	0.28
12.00	0.24	2	144.89	0.24
12.50	0.22	2	144.89	0.22
13.00	0.20	2	144.88	0.20
13.50	0.17	2	144.88	0.17
14.00	0.15	2	144.87	0.15
14.50	0.14	2	144.87	0.14
15.00	0.14	2	144.87	0.14
15.50	0.13	1	144.87	0.13
16.00	0.13	1	144.87	0.13
16.50	0.13	1	144.87	0.13
17.00	0.12	1	144.87	0.12
17.50	0.12	1	144.87	0.12
18.00	0.11	1	144.86	0.11
18.50	0.11	1	144.86	0.11
19.00	0.10	1	144.86	0.10
19.50	0.10	1	144.86	0.10
20.00	0.09	1	144.86	0.09
20.50	0.09	1	144.86	0.09
21.00	0.09	1	144.86	0.09
21.50	0.08	1	144.85	0.08
22.00	0.08	1	144.85	0.08
22.50	0.07	1	144.85	0.07
23.00	0.07	1	144.85	0.07
23.50	0.06	1	144.85	0.06
24.00	0.06	1	144.85	0.06

Stage-Discharge for Reach 10R: SD-3

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
144.80	0.00	0.00
144.82	1.96	0.01
144.84	3.12	0.04
144.86	4.09	0.10
144.88	4.93	0.18
144.90	5.70	0.29
144.92	6.41	0.42
144.94	7.07	0.59
144.96	7.69	0.78
144.98	8.29	1.00
145.00	8.85	1.24
145.02	9.39	1.51
145.04	9.90	1.81
145.06	10.39	2.13
145.08	10.87	2.48
145.10	11.33	2.85
145.12	11.77	3.25
145.14	12.19	3.67
145.16	12.61	4.11
145.18	13.00	4.58
145.20	13.39	5.07
145.22	13.76	5.57
145.24	14.12	6.10
145.26	14.47	6.65
145.28	14.80	7.22
145.30	15.13	7.80
145.32	15.45	8.41
145.34	15.75	9.02
145.36	16.05	9.66
145.38	16.34	10.31
145.40	16.62	10.97
145.42	16.88	11.64
145.44	17.14	12.33
145.46	17.39	13.03
145.48	17.64	13.73
145.50	17.87	14.45
145.52	18.10	15.17
145.54	18.31	15.91
145.56	18.52	16.64
145.58	18.72	17.38
145.60	18.91	18.13
145.62	19.10	18.88
145.64	19.27	19.62
145.66	19.44	20.37
145.68	19.60	21.12
145.70	19.75	21.87
145.72	19.89	22.61
145.74	20.03	23.34
145.76	20.16	24.08
145.78	20.27	24.80
145.80	20.38	25.51
145.82	20.49	26.22
145.84	20.58	26.91
145.86	20.66	27.59
145.88	20.74	28.25
145.90	20.81	28.90
145.92	20.86	29.52
145.94	20.91	30.13
145.96	20.95	30.72
145.98	20.97	31.28
146.00	20.99	31.81
146.02	**21.00**	32.32
146.04	20.99	32.79
146.06	20.97	33.23
146.08	20.94	33.63
146.10	20.89	33.99
146.12	20.83	34.31
146.14	20.75	34.57
146.16	20.65	34.78
146.18	20.54	34.93
146.20	20.39	**35.00**
146.22	20.21	**34.98**
146.24	20.00	34.87
146.26	19.72	34.59
146.28	19.33	34.07
146.30	18.42	32.55

Stage-Area-Storage for Reach 10R: SD-3

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
144.80	0.0	0
144.82	0.0	0
144.84	0.0	1
144.86	0.0	1
144.88	0.0	2
144.90	0.1	3
144.92	0.1	3
144.94	0.1	4
144.96	0.1	5
144.98	0.1	6
145.00	0.1	7
145.02	0.2	8
145.04	0.2	9
145.06	0.2	10
145.08	0.2	11
145.10	0.3	13
145.12	0.3	14
145.14	0.3	15
145.16	0.3	16
145.18	0.4	18
145.20	0.4	19
145.22	0.4	20
145.24	0.4	22
145.26	0.5	23
145.28	0.5	24
145.30	0.5	26
145.32	0.5	27
145.34	0.6	29
145.36	0.6	30
145.38	0.6	32
145.40	0.7	33
145.42	0.7	34
145.44	0.7	36
145.46	0.7	37
145.48	0.8	39
145.50	0.8	40
145.52	0.8	42
145.54	0.9	43
145.56	0.9	45
145.58	0.9	46
145.60	1.0	48
145.62	1.0	49
145.64	1.0	51
145.66	1.0	52
145.68	1.1	54
145.70	1.1	55
145.72	1.1	57
145.74	1.2	58
145.76	1.2	60
145.78	1.2	61
145.80	1.3	63
145.82	1.3	64
145.84	1.3	65
145.86	1.3	67
145.88	1.4	68
145.90	1.4	69
145.92	1.4	71
145.94	1.4	72
145.96	1.5	73
145.98	1.5	75
146.00	1.5	76
146.02	1.5	77
146.04	1.6	78
146.06	1.6	79
146.08	1.6	80
146.10	1.6	81
146.12	1.6	82
146.14	1.7	83
146.16	1.7	84
146.18	1.7	85
146.20	1.7	86
146.22	1.7	87
146.24	1.7	87
146.26	1.8	88
146.28	1.8	88
146.30	**1.8**	**88**

Summary for Pond 8P: Detention Basin 2

[62] Hint: Exceeded Reach 3R OUTLET depth by 1.30' @ 10.30 hrs
[62] Hint: Exceeded Reach 7R OUTLET depth by 1.52' @ 10.20 hrs

Inflow Area = 6.010 ac, 38.00% Impervious, Inflow Depth > 4.11" for 10 Yr event
Inflow = 17.39 cfs @ 9.98 hrs, Volume= 2.057 af
Outflow = 5.10 cfs @ 9.80 hrs, Volume= 2.056 af, Atten= 71%, Lag= 0.0 min
Primary = 5.10 cfs @ 9.80 hrs, Volume= 2.056 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 155.77' @ 10.24 hrs Surf.Area= 0.175 ac Storage= 0.263 af

Plug-Flow detention time= 8.9 min calculated for 2.056 af (100% of inflow)
Center-of-Mass det. time= 8.5 min (749.7 - 741.2)

Volume	Invert	Avail.Storage	Storage Description
#1	154.00'	1.297 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

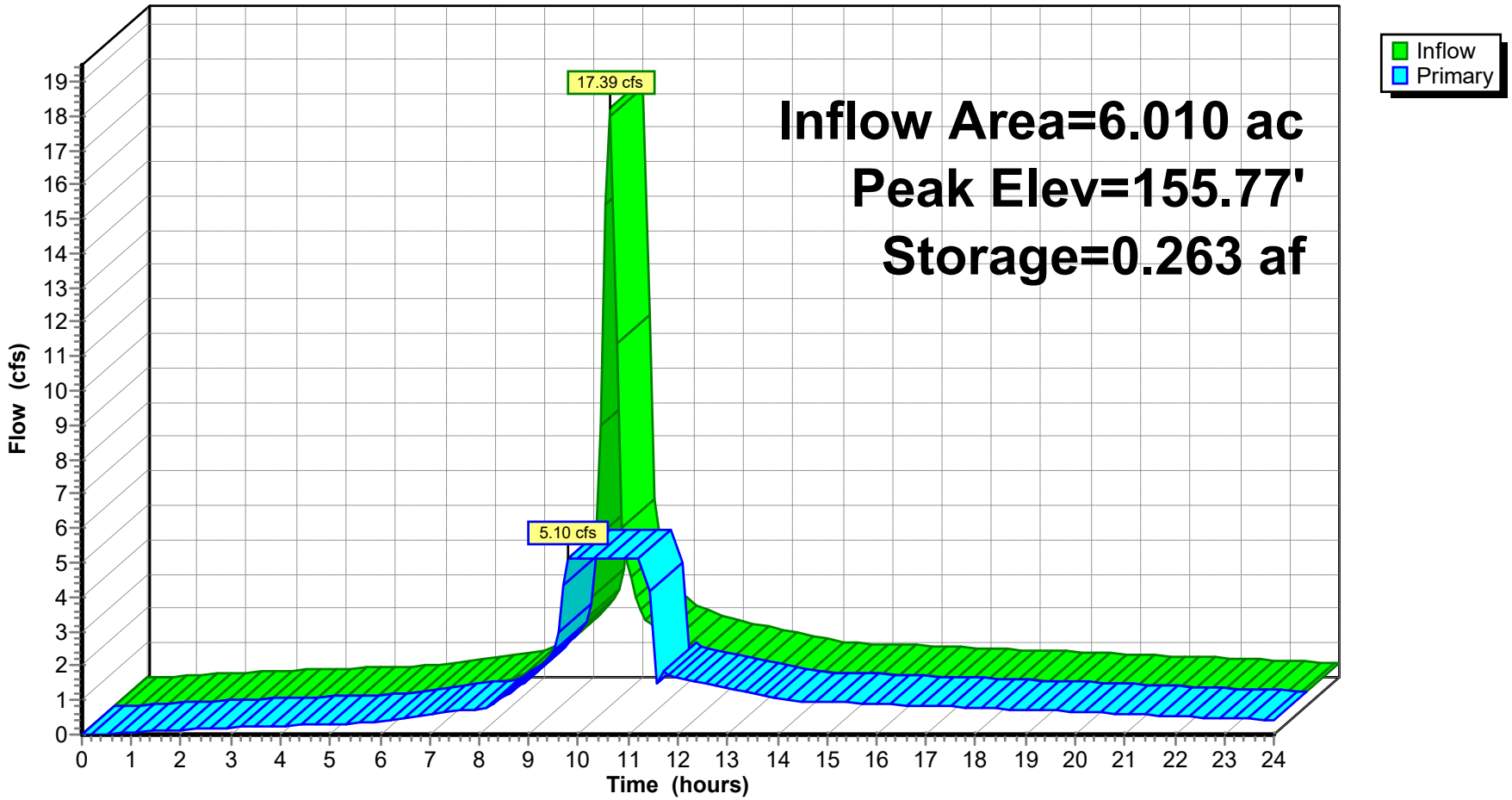
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
154.00	0.123	0.000	0.000
155.00	0.152	0.137	0.137
156.00	0.182	0.167	0.304
157.00	0.214	0.198	0.503
158.00	0.247	0.230	0.733
159.00	0.282	0.264	0.998
160.00	0.317	0.300	1.297

Device	Routing	Invert	Outlet Devices
#1	Primary	154.00'	**Special & User-Defined** Head (feet) 0.00 0.10 6.00 Disch. (cfs) 0.000 5.100 5.100

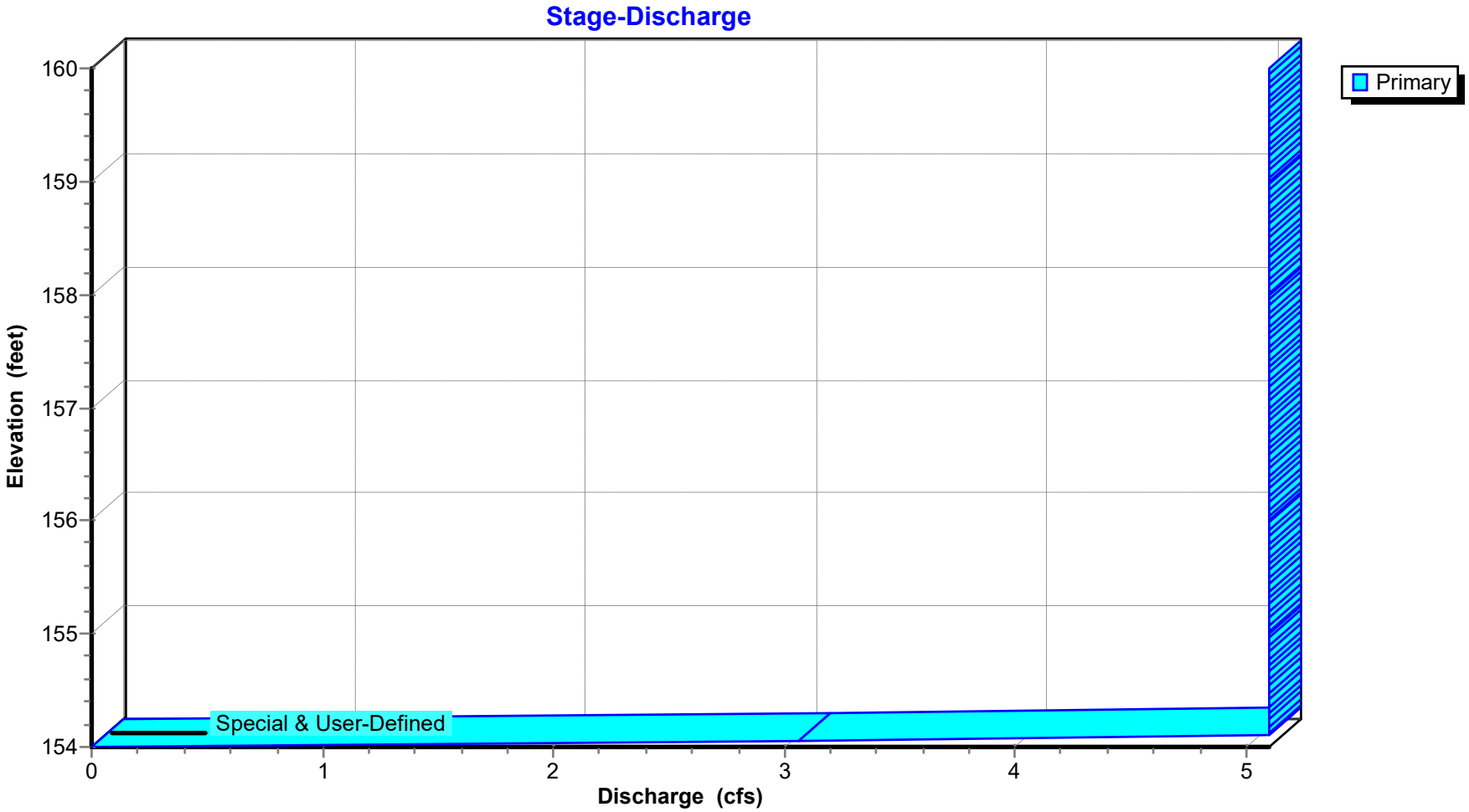
Primary OutFlow Max=5.10 cfs @ 9.80 hrs HW=154.20' (Free Discharge)
1=Special & User-Defined (Custom Controls 5.10 cfs)

Pond 8P: Detention Basin 2

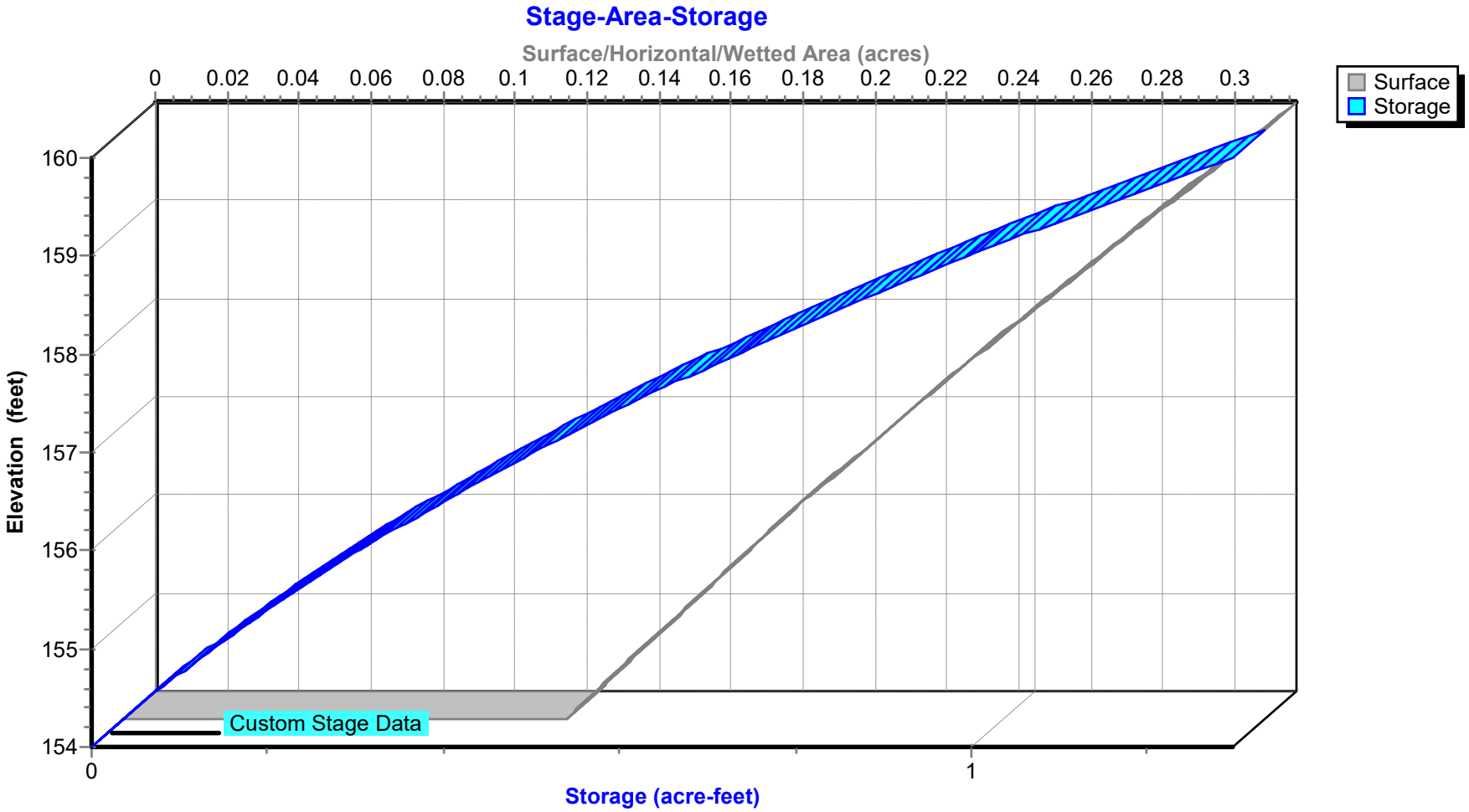
Hydrograph



Pond 8P: Detention Basin 2



Pond 8P: Detention Basin 2



Hydrograph for Pond 8P: Detention Basin 2

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	154.00	0.00
0.50	0.00	0.000	154.00	0.00
1.00	0.07	0.000	154.00	0.07
1.50	0.12	0.000	154.00	0.12
2.00	0.15	0.000	154.00	0.14
2.50	0.17	0.000	154.00	0.17
3.00	0.20	0.000	154.00	0.20
3.50	0.23	0.001	154.00	0.23
4.00	0.26	0.001	154.01	0.26
4.50	0.27	0.001	154.01	0.27
5.00	0.30	0.001	154.01	0.30
5.50	0.34	0.001	154.01	0.34
6.00	0.37	0.001	154.01	0.37
6.50	0.47	0.001	154.01	0.46
7.00	0.60	0.001	154.01	0.59
7.50	0.68	0.002	154.01	0.68
8.00	0.76	0.002	154.01	0.75
8.50	1.13	0.003	154.02	1.10
9.00	1.64	0.004	154.03	1.61
9.50	2.53	0.006	154.05	**2.47**
10.00	**17.17**	**0.166**	**155.19**	**5.10**
10.50	3.18	**0.235**	**155.61**	5.10
11.00	2.17	0.129	154.94	5.10
11.50	1.85	0.008	154.06	3.22
12.00	1.63	0.004	154.03	1.64
12.50	1.47	0.004	154.03	1.48
13.00	1.33	0.003	154.03	1.33
13.50	1.18	0.003	154.02	1.19
14.00	1.03	0.003	154.02	1.04
14.50	0.98	0.002	154.02	0.98
15.00	0.95	0.002	154.02	0.95
15.50	0.92	0.002	154.02	0.93
16.00	0.90	0.002	154.02	0.90
16.50	0.87	0.002	154.02	0.87
17.00	0.84	0.002	154.02	0.84
17.50	0.81	0.002	154.02	0.81
18.00	0.78	0.002	154.02	0.78
18.50	0.75	0.002	154.01	0.75
19.00	0.72	0.002	154.01	0.72
19.50	0.69	0.002	154.01	0.69
20.00	0.66	0.002	154.01	0.66
20.50	0.63	0.002	154.01	0.63
21.00	0.60	0.001	154.01	0.60
21.50	0.57	0.001	154.01	0.57
22.00	0.54	0.001	154.01	0.54
22.50	0.51	0.001	154.01	0.51
23.00	0.48	0.001	154.01	0.48
23.50	0.45	0.001	154.01	0.45
24.00	0.41	0.001	154.01	0.42

Stage-Discharge for Pond 8P: Detention Basin 2

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
154.00	0.00	155.40	5.10	156.80	5.10	158.20	5.10	159.60	5.10
154.04	2.04	155.44	5.10	156.84	5.10	158.24	5.10	159.64	5.10
154.08	4.08	155.48	5.10	156.88	5.10	158.28	5.10	159.68	5.10
154.12	**5.10**	155.52	5.10	156.92	5.10	158.32	5.10	159.72	5.10
154.16	5.10	155.56	5.10	156.96	5.10	158.36	5.10	159.76	5.10
154.20	5.10	155.60	5.10	157.00	5.10	158.40	5.10	159.80	5.10
154.24	5.10	155.64	5.10	157.04	5.10	158.44	5.10	159.84	5.10
154.28	5.10	155.68	5.10	157.08	5.10	158.48	5.10	159.88	5.10
154.32	5.10	155.72	5.10	157.12	5.10	158.52	5.10	159.92	5.10
154.36	5.10	155.76	5.10	157.16	5.10	158.56	5.10	159.96	5.10
154.40	5.10	155.80	5.10	157.20	5.10	158.60	5.10	160.00	5.10
154.44	5.10	155.84	5.10	157.24	5.10	158.64	5.10		
154.48	5.10	155.88	5.10	157.28	5.10	158.68	5.10		
154.52	5.10	155.92	5.10	157.32	5.10	158.72	5.10		
154.56	5.10	155.96	5.10	157.36	5.10	158.76	5.10		
154.60	5.10	156.00	5.10	157.40	5.10	158.80	5.10		
154.64	5.10	156.04	5.10	157.44	5.10	158.84	5.10		
154.68	5.10	156.08	5.10	157.48	5.10	158.88	5.10		
154.72	5.10	156.12	5.10	157.52	5.10	158.92	5.10		
154.76	5.10	156.16	5.10	157.56	5.10	158.96	5.10		
154.80	5.10	156.20	5.10	157.60	5.10	159.00	5.10		
154.84	5.10	156.24	5.10	157.64	5.10	159.04	5.10		
154.88	5.10	156.28	5.10	157.68	5.10	159.08	5.10		
154.92	5.10	156.32	5.10	157.72	5.10	159.12	5.10		
154.96	5.10	156.36	5.10	157.76	5.10	159.16	5.10		
155.00	5.10	156.40	5.10	157.80	5.10	159.20	5.10		
155.04	5.10	156.44	5.10	157.84	5.10	159.24	5.10		
155.08	5.10	156.48	5.10	157.88	5.10	159.28	5.10		
155.12	5.10	156.52	5.10	157.92	5.10	159.32	5.10		
155.16	5.10	156.56	5.10	157.96	5.10	159.36	5.10		
155.20	5.10	156.60	5.10	158.00	5.10	159.40	5.10		
155.24	5.10	156.64	5.10	158.04	5.10	159.44	5.10		
155.28	5.10	156.68	5.10	158.08	5.10	159.48	5.10		
155.32	5.10	156.72	5.10	158.12	5.10	159.52	5.10		
155.36	5.10	156.76	5.10	158.16	5.10	159.56	5.10		

Stage-Area-Storage for Pond 8P: Detention Basin 2

Elevation (feet)	Surface (acres)	Storage (acre-feet)
154.00	0.123	0.000
154.10	0.126	0.012
154.20	0.129	0.025
154.30	0.132	0.038
154.40	0.135	0.052
154.50	0.137	0.065
154.60	0.140	0.079
154.70	0.143	0.093
154.80	0.146	0.108
154.90	0.149	0.122
155.00	0.152	0.137
155.10	0.155	0.153
155.20	0.158	0.168
155.30	0.161	0.184
155.40	0.164	0.201
155.50	0.167	0.217
155.60	0.170	0.234
155.70	0.173	0.251
155.80	0.176	0.269
155.90	0.179	0.286
156.00	0.182	0.304
156.10	0.185	0.323
156.20	0.188	0.342
156.30	0.192	0.361
156.40	0.195	0.380
156.50	0.198	0.400
156.60	0.201	0.419
156.70	0.204	0.440
156.80	0.208	0.460
156.90	0.211	0.481
157.00	0.214	0.503
157.10	0.217	0.524
157.20	0.221	0.546
157.30	0.224	0.568
157.40	0.227	0.591
157.50	0.230	0.614
157.60	0.234	0.637
157.70	0.237	0.660
157.80	0.240	0.684
157.90	0.244	0.708
158.00	0.247	0.733
158.10	0.250	0.758
158.20	0.254	0.783
158.30	0.258	0.809
158.40	0.261	0.835
158.50	0.264	0.861
158.60	0.268	0.887
158.70	0.271	0.914
158.80	0.275	0.942
158.90	0.279	0.969
159.00	0.282	0.998
159.10	0.285	1.026
159.20	0.289	1.055
159.30	0.293	1.084
159.40	0.296	1.113
159.50	0.300	1.143
159.60	0.303	1.173
159.70	0.306	1.203
159.80	0.310	1.234
159.90	0.314	1.265
160.00	**0.317**	**1.297**

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: B-1 Runoff Area=3.000 ac 38.00% Impervious Runoff Depth>5.20"
Flow Length=895' Tc=3.4 min CN=80/98 Runoff=11.03 cfs 1.300 af

Subcatchment 2S: B-2 Runoff Area=1.300 ac 38.00% Impervious Runoff Depth>5.20"
Flow Length=835' Tc=3.1 min CN=80/98 Runoff=4.83 cfs 0.563 af

Subcatchment 4S: C-1 Runoff Area=1.050 ac 38.00% Impervious Runoff Depth>5.20"
Flow Length=510' Tc=2.5 min CN=80/98 Runoff=3.99 cfs 0.455 af

Subcatchment 5S: C-2 Runoff Area=0.160 ac 38.00% Impervious Runoff Depth>5.20"
Flow Length=240' Slope=0.0400 '/' Tc=1.0 min CN=80/98 Runoff=0.64 cfs 0.069 af

Subcatchment 6S: C-3 Runoff Area=0.500 ac 38.00% Impervious Runoff Depth>5.20"
Flow Length=250' Slope=0.0200 '/' Tc=1.5 min CN=80/98 Runoff=1.93 cfs 0.217 af

Subcatchment 9S: D-1 Runoff Area=0.800 ac 100.00% Impervious Runoff Depth>6.47"
Flow Length=390' Slope=0.0350 '/' Tc=1.7 min CN=0/98 Runoff=3.65 cfs 0.431 af

Reach 3R: SD-1 Avg. Flow Depth=1.08' Max Vel=9.22 fps Inflow=15.87 cfs 1.863 af
24.0" Round Pipe n=0.013 L=290.0' S=0.0155 '/' Capacity=28.18 cfs Outflow=15.61 cfs 1.862 af

Reach 7R: SD-2 Avg. Flow Depth=0.58' Max Vel=10.38 fps Inflow=6.56 cfs 0.741 af
18.0" Round Pipe n=0.013 L=100.0' S=0.0400 '/' Capacity=21.01 cfs Outflow=6.54 cfs 0.741 af

Reach 10R: SD-3 Avg. Flow Depth=0.34' Max Vel=12.01 fps Inflow=3.65 cfs 0.431 af
18.0" Round Pipe n=0.013 L=50.0' S=0.0960 '/' Capacity=32.55 cfs Outflow=3.63 cfs 0.431 af

Pond 8P: Detention Basin 2 Peak Elev=156.48' Storage=0.395 af Inflow=22.08 cfs 2.603 af
Outflow=5.10 cfs 2.602 af

Total Runoff Area = 6.810 ac Runoff Volume = 3.036 af Average Runoff Depth = 5.35"
54.72% Pervious = 3.726 ac 45.28% Impervious = 3.084 ac

Summary for Subcatchment 1S: B-1

[49] Hint: Tc<2dt may require smaller dt

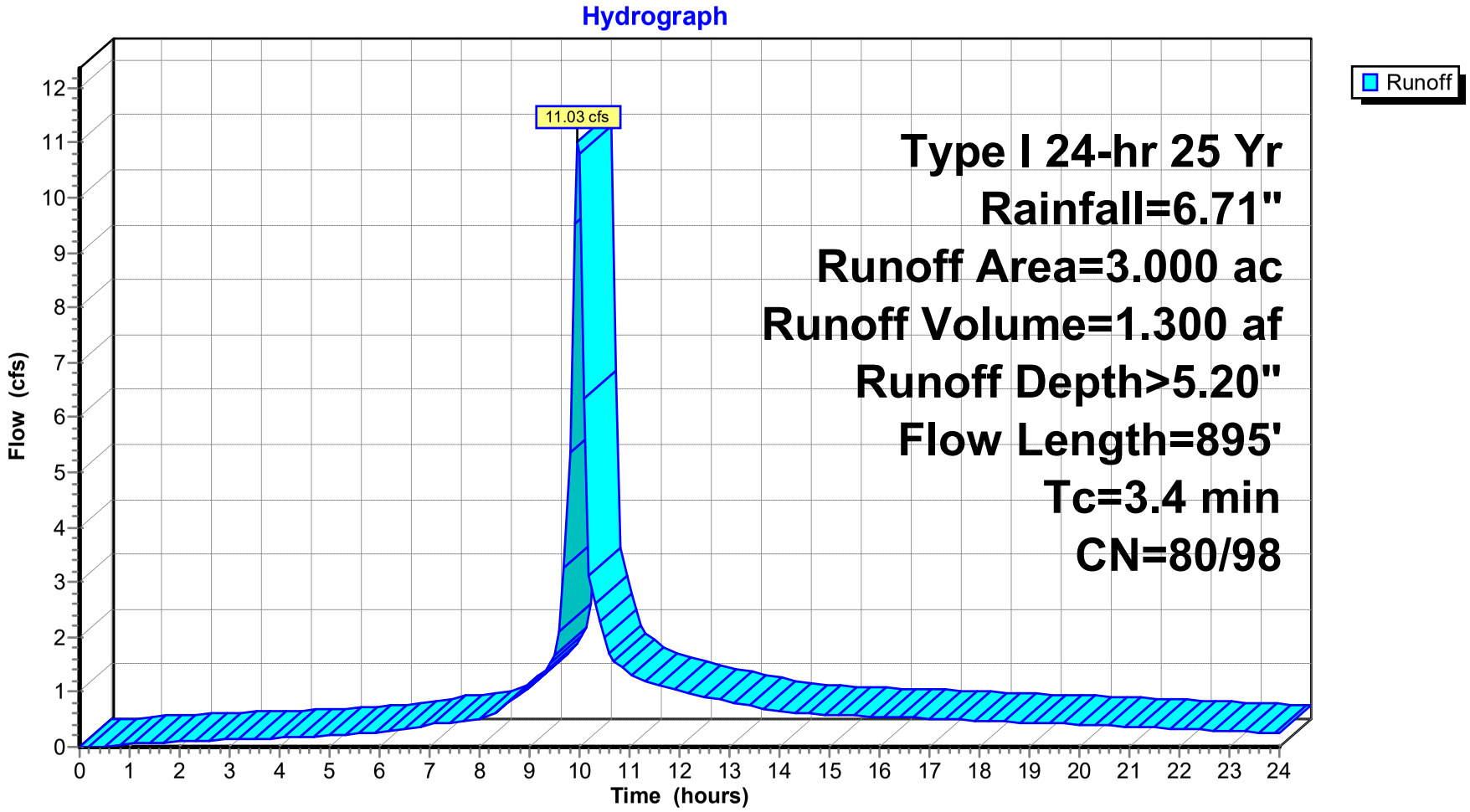
Runoff = 11.03 cfs @ 9.97 hrs, Volume= 1.300 af, Depth> 5.20"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 25 Yr Rainfall=6.71"

Area (ac)	CN	Description
3.000	87	1/4 acre lots, 38% imp, HSG D
1.860	80	62.00% Pervious Area
1.140	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	255	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.3	105	0.0900	6.09		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.5	155	0.0600	4.97		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.0	220	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.9	160	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
3.4	895	Total			

Subcatchment 1S: B-1



Hydrograph for Subcatchment 1S: B-1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.06	0.00	0.00	0.01
1.00	0.12	0.00	0.02	0.06
1.50	0.18	0.00	0.05	0.08
2.00	0.23	0.00	0.09	0.10
2.50	0.30	0.00	0.14	0.11
3.00	0.36	0.00	0.20	0.13
3.50	0.43	0.00	0.26	0.15
4.00	0.51	0.00	0.33	0.16
4.50	0.59	0.00	0.40	0.19
5.00	0.67	0.01	0.48	0.21
5.50	0.75	0.02	0.55	0.23
6.00	0.84	0.04	0.64	0.26
6.50	0.93	0.06	0.73	0.32
7.00	1.05	0.10	0.84	0.40
7.50	1.17	0.14	0.96	0.46
8.00	1.30	0.19	1.09	0.50
8.50	1.47	0.27	1.25	0.75
9.00	1.70	0.39	1.48	1.08
9.50	2.03	0.58	1.81	1.65
10.00	3.46	1.60	3.22	**10.81**
10.50	3.91	1.97	3.68	1.98
11.00	4.18	2.19	3.95	1.34
11.50	4.40	2.38	4.16	1.15
12.00	4.59	2.54	4.35	1.01
12.50	4.76	2.68	4.52	0.91
13.00	4.91	2.82	4.68	0.82
13.50	5.05	2.93	4.81	0.73
14.00	5.17	3.04	4.93	0.64
14.50	5.28	3.13	5.04	0.61
15.00	5.38	3.23	5.14	0.59
15.50	5.48	3.32	5.25	0.57
16.00	5.58	3.41	5.35	0.55
16.50	5.68	3.49	5.44	0.53
17.00	5.77	3.57	5.53	0.52
17.50	5.86	3.65	5.62	0.50
18.00	5.95	3.73	5.71	0.48
18.50	6.03	3.81	5.79	0.46
19.00	6.11	3.88	5.87	0.44
19.50	6.18	3.95	5.94	0.42
20.00	6.25	4.01	6.02	0.41
20.50	6.32	4.07	6.08	0.39
21.00	6.39	4.13	6.15	0.37
21.50	6.45	4.19	6.21	0.35
22.00	6.51	4.24	6.27	0.33
22.50	6.56	4.29	6.33	0.31
23.00	6.62	4.34	6.38	0.29
23.50	6.66	4.39	6.43	0.27
24.00	**6.71**	**4.43**	**6.47**	0.25

Summary for Subcatchment 2S: B-2

[49] Hint: Tc<2dt may require smaller dt

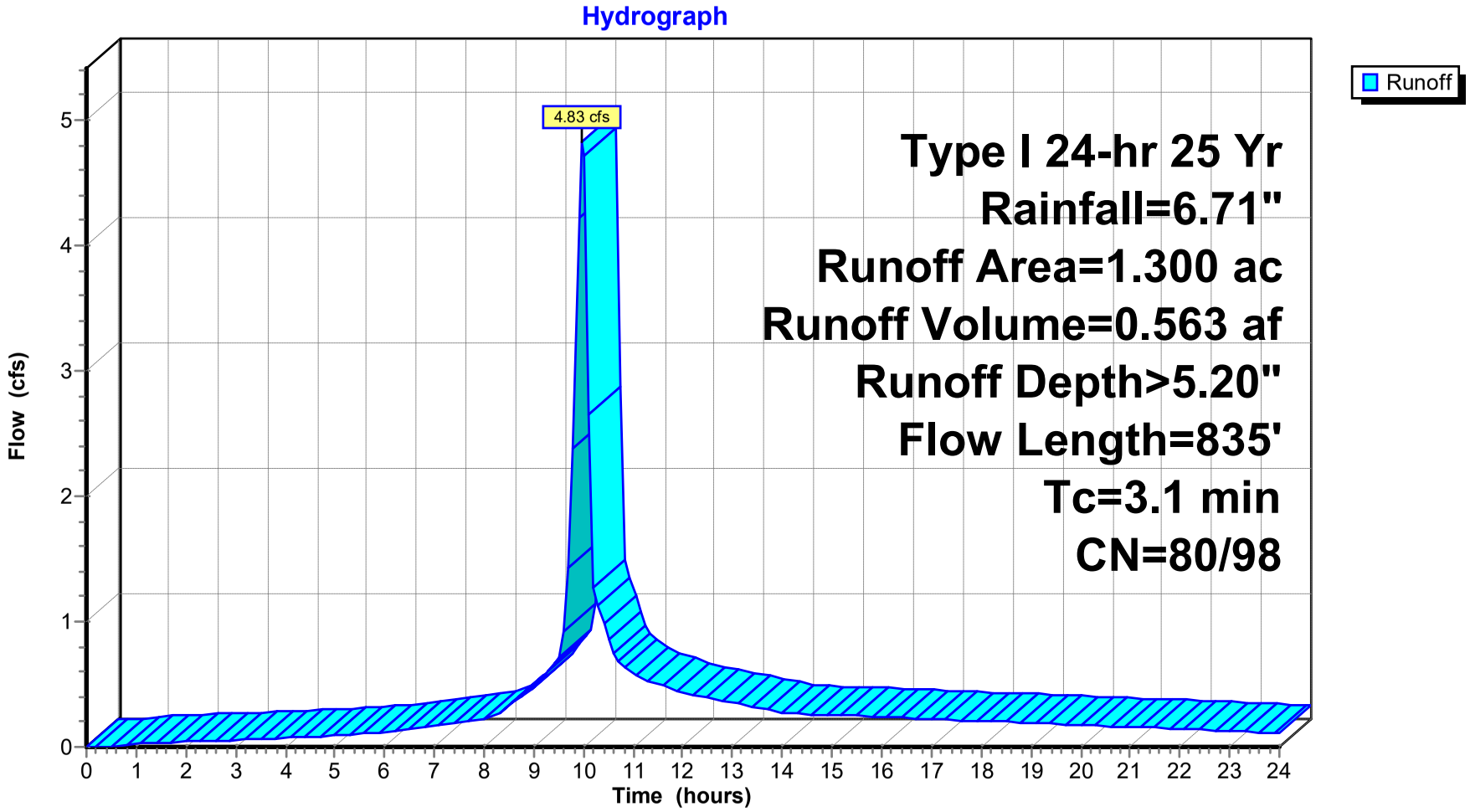
Runoff = 4.83 cfs @ 9.97 hrs, Volume= 0.563 af, Depth> 5.20"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 25 Yr Rainfall=6.71"

Area (ac)	CN	Description
1.300	87	1/4 acre lots, 38% imp, HSG D
0.806	80	62.00% Pervious Area
0.494	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	280	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.3	100	0.0900	6.09		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.5	150	0.0600	4.97		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.0	215	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.5	90	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
3.1	835	Total			

Subcatchment 2S: B-2



Hydrograph for Subcatchment 2S: B-2

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.06	0.00	0.00	0.00
1.00	0.12	0.00	0.02	0.02
1.50	0.18	0.00	0.05	0.04
2.00	0.23	0.00	0.09	0.04
2.50	0.30	0.00	0.14	0.05
3.00	0.36	0.00	0.20	0.06
3.50	0.43	0.00	0.26	0.06
4.00	0.51	0.00	0.33	0.07
4.50	0.59	0.00	0.40	0.08
5.00	0.67	0.01	0.48	0.09
5.50	0.75	0.02	0.55	0.10
6.00	0.84	0.04	0.64	0.11
6.50	0.93	0.06	0.73	0.14
7.00	1.05	0.10	0.84	0.18
7.50	1.17	0.14	0.96	0.20
8.00	1.30	0.19	1.09	0.22
8.50	1.47	0.27	1.25	0.33
9.00	1.70	0.39	1.48	0.47
9.50	2.03	0.58	1.81	0.72
10.00	3.46	1.60	3.22	**4.71**
10.50	3.91	1.97	3.68	0.85
11.00	4.18	2.19	3.95	0.58
11.50	4.40	2.38	4.16	0.50
12.00	4.59	2.54	4.35	0.44
12.50	4.76	2.68	4.52	0.39
13.00	4.91	2.82	4.68	0.36
13.50	5.05	2.93	4.81	0.32
14.00	5.17	3.04	4.93	0.28
14.50	5.28	3.13	5.04	0.26
15.00	5.38	3.23	5.14	0.25
15.50	5.48	3.32	5.25	0.25
16.00	5.58	3.41	5.35	0.24
16.50	5.68	3.49	5.44	0.23
17.00	5.77	3.57	5.53	0.22
17.50	5.86	3.65	5.62	0.22
18.00	5.95	3.73	5.71	0.21
18.50	6.03	3.81	5.79	0.20
19.00	6.11	3.88	5.87	0.19
19.50	6.18	3.95	5.94	0.18
20.00	6.25	4.01	6.02	0.18
20.50	6.32	4.07	6.08	0.17
21.00	6.39	4.13	6.15	0.16
21.50	6.45	4.19	6.21	0.15
22.00	6.51	4.24	6.27	0.14
22.50	6.56	4.29	6.33	0.13
23.00	6.62	4.34	6.38	0.13
23.50	6.66	4.39	6.43	0.12
24.00	**6.71**	**4.43**	**6.47**	0.11

Summary for Subcatchment 4S: C-1

[49] Hint: Tc<2dt may require smaller dt

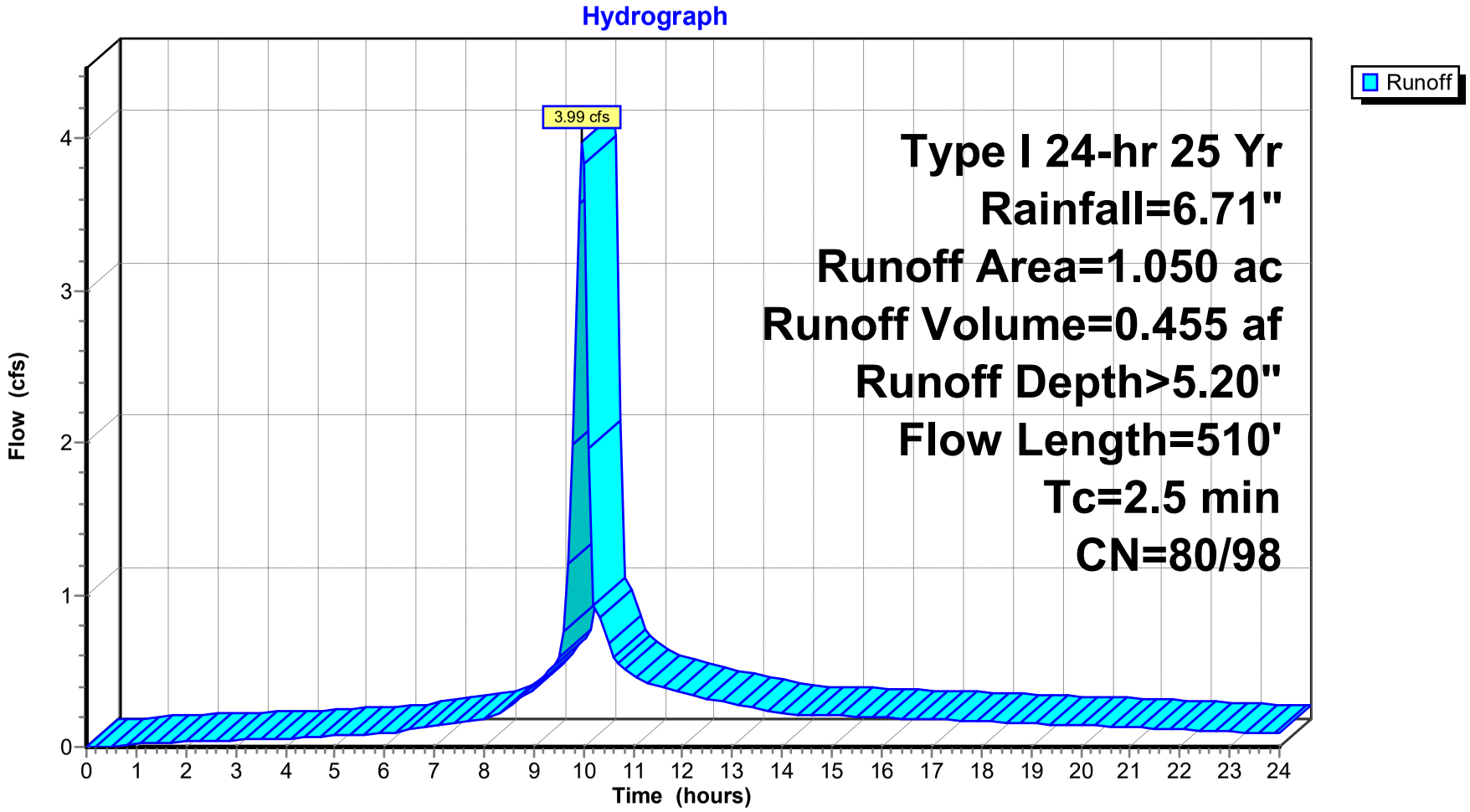
Runoff = 3.99 cfs @ 9.96 hrs, Volume= 0.455 af, Depth> 5.20"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 25 Yr Rainfall=6.71"

Area (ac)	CN	Description
1.050	87	1/4 acre lots, 38% imp, HSG D
0.651	80	62.00% Pervious Area
0.399	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	260	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.0	250	0.0400	4.06		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
2.5	510	Total			

Subcatchment 4S: C-1



Hydrograph for Subcatchment 4S: C-1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.06	0.00	0.00	0.00
1.00	0.12	0.00	0.02	0.02
1.50	0.18	0.00	0.05	0.03
2.00	0.23	0.00	0.09	0.03
2.50	0.30	0.00	0.14	0.04
3.00	0.36	0.00	0.20	0.05
3.50	0.43	0.00	0.26	0.05
4.00	0.51	0.00	0.33	0.06
4.50	0.59	0.00	0.40	0.07
5.00	0.67	0.01	0.48	0.07
5.50	0.75	0.02	0.55	0.08
6.00	0.84	0.04	0.64	0.09
6.50	0.93	0.06	0.73	0.11
7.00	1.05	0.10	0.84	0.14
7.50	1.17	0.14	0.96	0.16
8.00	1.30	0.19	1.09	0.18
8.50	1.47	0.27	1.25	0.27
9.00	1.70	0.39	1.48	0.38
9.50	2.03	0.58	1.81	0.58
10.00	3.46	1.60	3.22	**3.83**
10.50	3.91	1.97	3.68	0.68
11.00	4.18	2.19	3.95	0.46
11.50	4.40	2.38	4.16	0.40
12.00	4.59	2.54	4.35	0.35
12.50	4.76	2.68	4.52	0.32
13.00	4.91	2.82	4.68	0.29
13.50	5.05	2.93	4.81	0.25
14.00	5.17	3.04	4.93	0.22
14.50	5.28	3.13	5.04	0.21
15.00	5.38	3.23	5.14	0.21
15.50	5.48	3.32	5.25	0.20
16.00	5.58	3.41	5.35	0.19
16.50	5.68	3.49	5.44	0.19
17.00	5.77	3.57	5.53	0.18
17.50	5.86	3.65	5.62	0.17
18.00	5.95	3.73	5.71	0.17
18.50	6.03	3.81	5.79	0.16
19.00	6.11	3.88	5.87	0.15
19.50	6.18	3.95	5.94	0.15
20.00	6.25	4.01	6.02	0.14
20.50	6.32	4.07	6.08	0.14
21.00	6.39	4.13	6.15	0.13
21.50	6.45	4.19	6.21	0.12
22.00	6.51	4.24	6.27	0.12
22.50	6.56	4.29	6.33	0.11
23.00	6.62	4.34	6.38	0.10
23.50	6.66	4.39	6.43	0.10
24.00	**6.71**	**4.43**	**6.47**	0.09

Summary for Subcatchment 5S: C-2

[49] Hint: Tc<2dt may require smaller dt

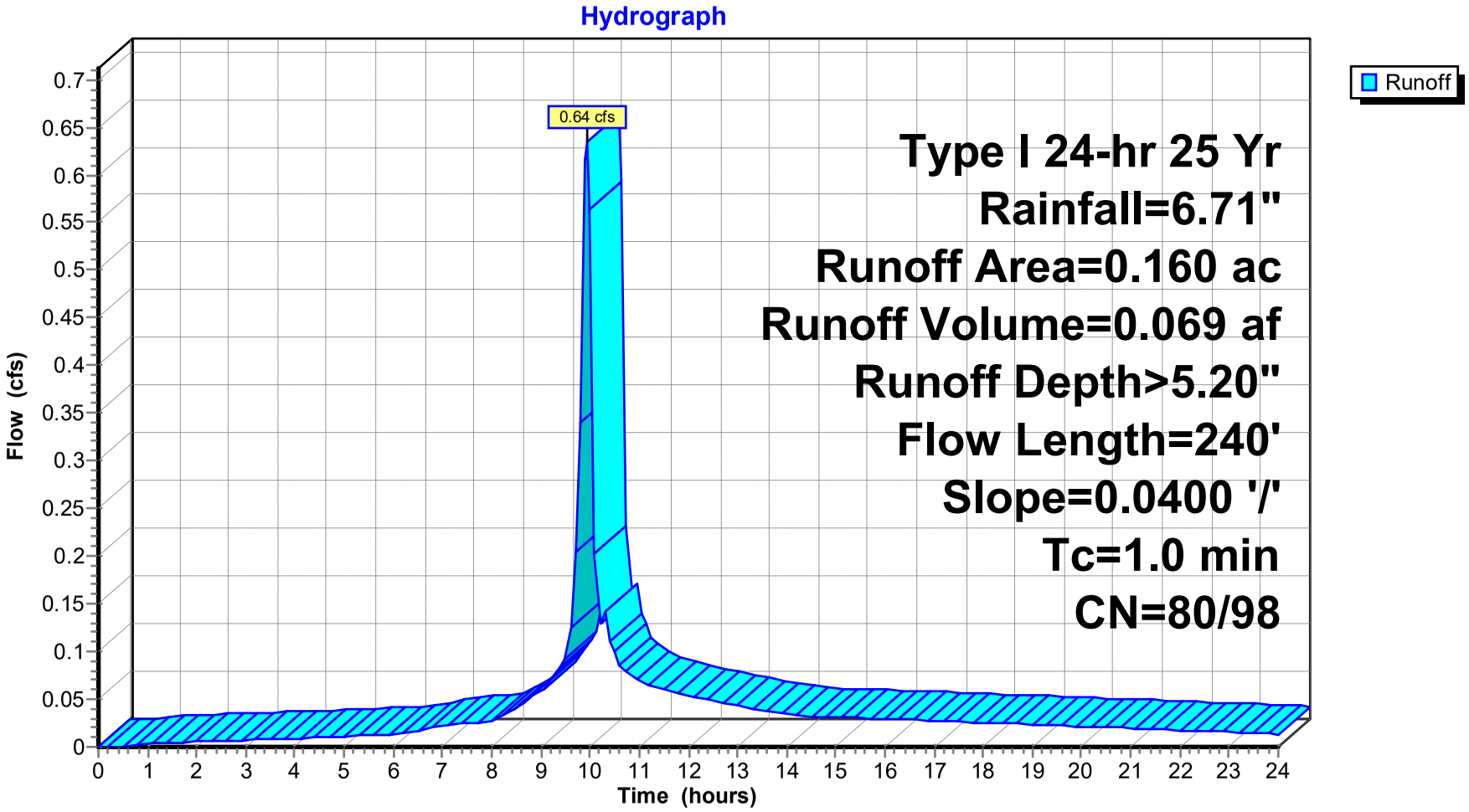
Runoff = 0.64 cfs @ 9.93 hrs, Volume= 0.069 af, Depth> 5.20"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 25 Yr Rainfall=6.71"

Area (ac)	CN	Description
0.160	87	1/4 acre lots, 38% imp, HSG D
0.099	80	62.00% Pervious Area
0.061	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	240	0.0400	4.06		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps

Subcatchment 5S: C-2



Hydrograph for Subcatchment 5S: C-2

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.06	0.00	0.00	0.00
1.00	0.12	0.00	0.02	0.00
1.50	0.18	0.00	0.05	0.00
2.00	0.23	0.00	0.09	0.01
2.50	0.30	0.00	0.14	0.01
3.00	0.36	0.00	0.20	0.01
3.50	0.43	0.00	0.26	0.01
4.00	0.51	0.00	0.33	0.01
4.50	0.59	0.00	0.40	0.01
5.00	0.67	0.01	0.48	0.01
5.50	0.75	0.02	0.55	0.01
6.00	0.84	0.04	0.64	0.01
6.50	0.93	0.06	0.73	0.02
7.00	1.05	0.10	0.84	0.02
7.50	1.17	0.14	0.96	0.02
8.00	1.30	0.19	1.09	0.03
8.50	1.47	0.27	1.25	0.04
9.00	1.70	0.39	1.48	0.06
9.50	2.03	0.58	1.81	**0.09**
10.00	3.46	1.60	3.22	**0.56**
10.50	3.91	1.97	3.68	0.10
11.00	4.18	2.19	3.95	0.07
11.50	4.40	2.38	4.16	0.06
12.00	4.59	2.54	4.35	0.05
12.50	4.76	2.68	4.52	0.05
13.00	4.91	2.82	4.68	0.04
13.50	5.05	2.93	4.81	0.04
14.00	5.17	3.04	4.93	0.03
14.50	5.28	3.13	5.04	0.03
15.00	5.38	3.23	5.14	0.03
15.50	5.48	3.32	5.25	0.03
16.00	5.58	3.41	5.35	0.03
16.50	5.68	3.49	5.44	0.03
17.00	5.77	3.57	5.53	0.03
17.50	5.86	3.65	5.62	0.03
18.00	5.95	3.73	5.71	0.03
18.50	6.03	3.81	5.79	0.02
19.00	6.11	3.88	5.87	0.02
19.50	6.18	3.95	5.94	0.02
20.00	6.25	4.01	6.02	0.02
20.50	6.32	4.07	6.08	0.02
21.00	6.39	4.13	6.15	0.02
21.50	6.45	4.19	6.21	0.02
22.00	6.51	4.24	6.27	0.02
22.50	6.56	4.29	6.33	0.02
23.00	6.62	4.34	6.38	0.02
23.50	6.66	4.39	6.43	0.01
24.00	**6.71**	**4.43**	**6.47**	0.01

Summary for Subcatchment 6S: C-3

[49] Hint: Tc<2dt may require smaller dt

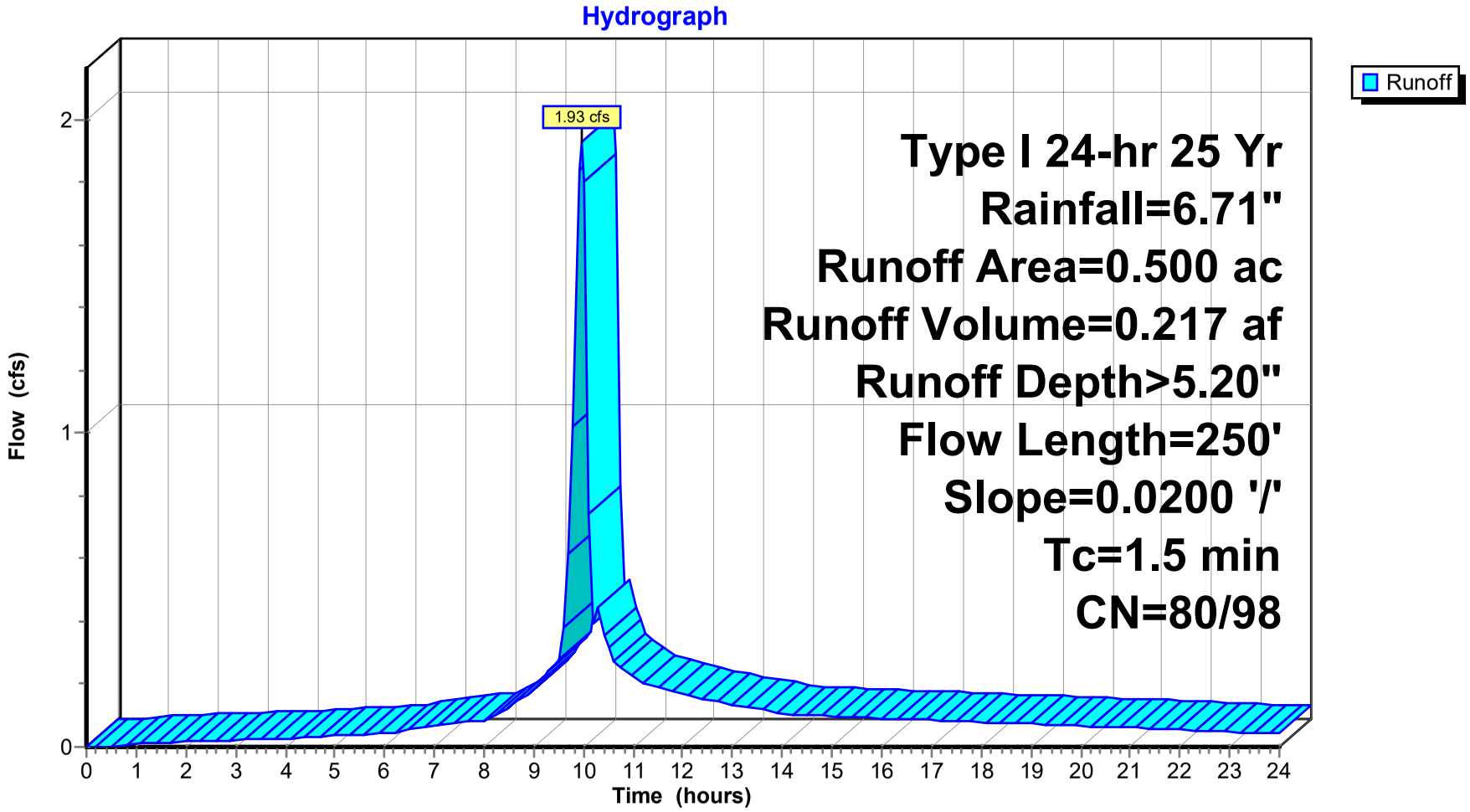
Runoff = 1.93 cfs @ 9.95 hrs, Volume= 0.217 af, Depth> 5.20"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 25 Yr Rainfall=6.71"

Area (ac)	CN	Description
0.500	87	1/4 acre lots, 38% imp, HSG D
0.310	80	62.00% Pervious Area
0.190	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	250	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps

Subcatchment 6S: C-3



Hydrograph for Subcatchment 6S: C-3

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.06	0.00	0.00	0.00
1.00	0.12	0.00	0.02	0.01
1.50	0.18	0.00	0.05	0.01
2.00	0.23	0.00	0.09	0.02
2.50	0.30	0.00	0.14	0.02
3.00	0.36	0.00	0.20	0.02
3.50	0.43	0.00	0.26	0.02
4.00	0.51	0.00	0.33	0.03
4.50	0.59	0.00	0.40	0.03
5.00	0.67	0.01	0.48	0.04
5.50	0.75	0.02	0.55	0.04
6.00	0.84	0.04	0.64	0.04
6.50	0.93	0.06	0.73	0.05
7.00	1.05	0.10	0.84	0.07
7.50	1.17	0.14	0.96	0.08
8.00	1.30	0.19	1.09	0.08
8.50	1.47	0.27	1.25	0.13
9.00	1.70	0.39	1.48	0.18
9.50	2.03	0.58	1.81	**0.28**
10.00	3.46	1.60	3.22	**1.81**
10.50	3.91	1.97	3.68	0.32
11.00	4.18	2.19	3.95	0.22
11.50	4.40	2.38	4.16	0.19
12.00	4.59	2.54	4.35	0.17
12.50	4.76	2.68	4.52	0.15
13.00	4.91	2.82	4.68	0.14
13.50	5.05	2.93	4.81	0.12
14.00	5.17	3.04	4.93	0.11
14.50	5.28	3.13	5.04	0.10
15.00	5.38	3.23	5.14	0.10
15.50	5.48	3.32	5.25	0.09
16.00	5.58	3.41	5.35	0.09
16.50	5.68	3.49	5.44	0.09
17.00	5.77	3.57	5.53	0.09
17.50	5.86	3.65	5.62	0.08
18.00	5.95	3.73	5.71	0.08
18.50	6.03	3.81	5.79	0.08
19.00	6.11	3.88	5.87	0.07
19.50	6.18	3.95	5.94	0.07
20.00	6.25	4.01	6.02	0.07
20.50	6.32	4.07	6.08	0.06
21.00	6.39	4.13	6.15	0.06
21.50	6.45	4.19	6.21	0.06
22.00	6.51	4.24	6.27	0.05
22.50	6.56	4.29	6.33	0.05
23.00	6.62	4.34	6.38	0.05
23.50	6.66	4.39	6.43	0.05
24.00	**6.71**	**4.43**	**6.47**	0.04

Summary for Subcatchment 9S: D-1

[49] Hint: Tc<2dt may require smaller dt

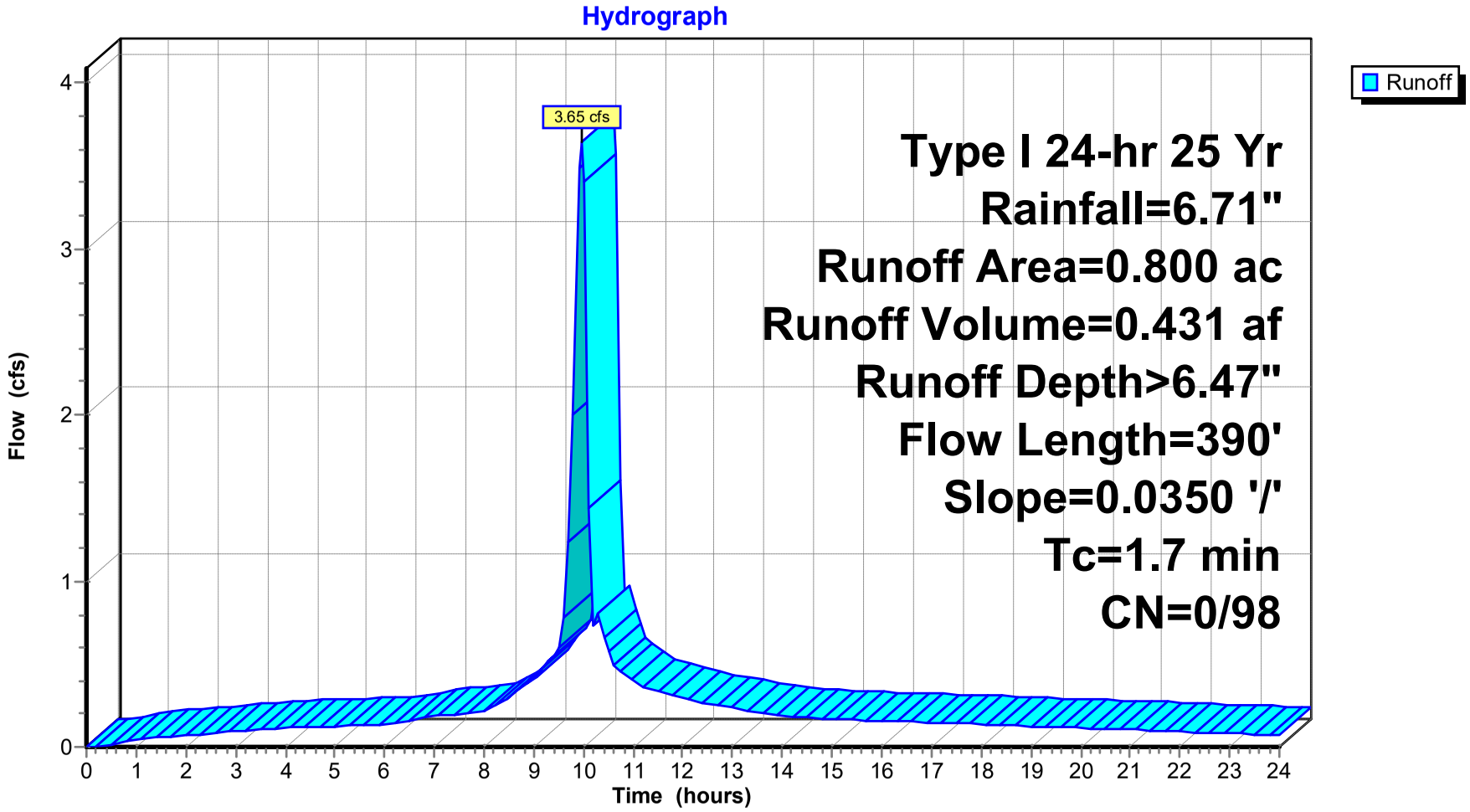
Runoff = 3.65 cfs @ 9.94 hrs, Volume= 0.431 af, Depth> 6.47"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 25 Yr Rainfall=6.71"

Area (ac)	CN	Description
0.800	98	Paved roads w/curbs & sewers, HSG D
0.800	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	390	0.0350	3.80		**Shallow Concentrated Flow, Lower Street Flow** Paved Kv= 20.3 fps

Subcatchment 9S: D-1



Hydrograph for Subcatchment 9S: D-1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	**0.00**	0.00	0.00
0.50	0.06	0.00	0.00	0.01
1.00	0.12	0.00	0.02	0.04
1.50	0.18	0.00	0.05	0.06
2.00	0.23	0.00	0.09	0.07
2.50	0.30	0.00	0.14	0.08
3.00	0.36	0.00	0.20	0.09
3.50	0.43	0.00	0.26	0.10
4.00	0.51	0.00	0.33	0.11
4.50	0.59	0.00	0.40	0.12
5.00	0.67	0.00	0.48	0.12
5.50	0.75	0.00	0.55	0.13
6.00	0.84	0.00	0.64	0.13
6.50	0.93	0.00	0.73	0.16
7.00	1.05	0.00	0.84	0.19
7.50	1.17	0.00	0.96	0.20
8.00	1.30	0.00	1.09	0.21
8.50	1.47	0.00	1.25	0.30
9.00	1.70	0.00	1.48	0.41
9.50	2.03	0.00	1.81	**0.59**
10.00	3.46	0.00	3.22	**3.41**
10.50	3.91	0.00	3.68	0.57
11.00	4.18	0.00	3.95	0.39
11.50	4.40	0.00	4.16	0.34
12.00	4.59	0.00	4.35	0.29
12.50	4.76	0.00	4.52	0.26
13.00	4.91	0.00	4.68	0.24
13.50	5.05	0.00	4.81	0.21
14.00	5.17	0.00	4.93	0.18
14.50	5.28	0.00	5.04	0.17
15.00	5.38	0.00	5.14	0.17
15.50	5.48	0.00	5.25	0.16
16.00	5.58	0.00	5.35	0.16
16.50	5.68	0.00	5.44	0.15
17.00	5.77	0.00	5.53	0.15
17.50	5.86	0.00	5.62	0.14
18.00	5.95	0.00	5.71	0.14
18.50	6.03	0.00	5.79	0.13
19.00	6.11	0.00	5.87	0.13
19.50	6.18	0.00	5.94	0.12
20.00	6.25	0.00	6.02	0.11
20.50	6.32	0.00	6.08	0.11
21.00	6.39	0.00	6.15	0.10
21.50	6.45	0.00	6.21	0.10
22.00	6.51	0.00	6.27	0.09
22.50	6.56	0.00	6.33	0.09
23.00	6.62	0.00	6.38	0.08
23.50	6.66	0.00	6.43	0.08
24.00	**6.71**	0.00	**6.47**	0.07

Summary for Reach 3R: SD-1

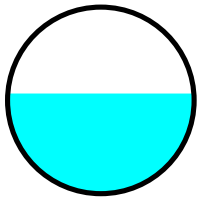
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 4.300 ac, 38.00% Impervious, Inflow Depth > 5.20" for 25 Yr event
Inflow = 15.87 cfs @ 9.97 hrs, Volume= 1.863 af
Outflow = 15.61 cfs @ 9.98 hrs, Volume= 1.862 af, Atten= 2%, Lag= 0.8 min

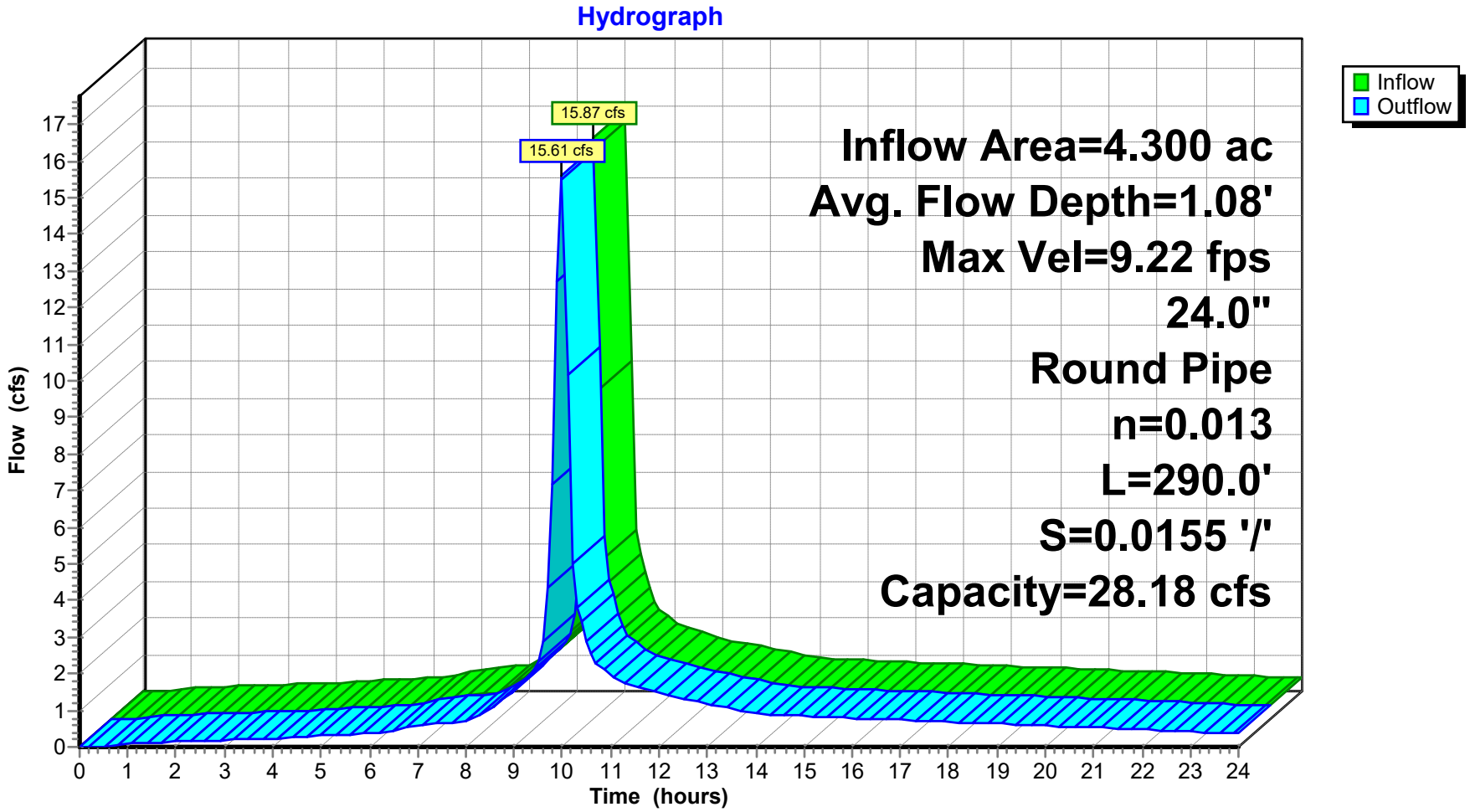
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Max. Velocity= 9.22 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 3.72 fps, Avg. Travel Time= 1.3 min

Peak Storage= 500 cf @ 9.98 hrs
Average Depth at Peak Storage= 1.08'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 28.18 cfs

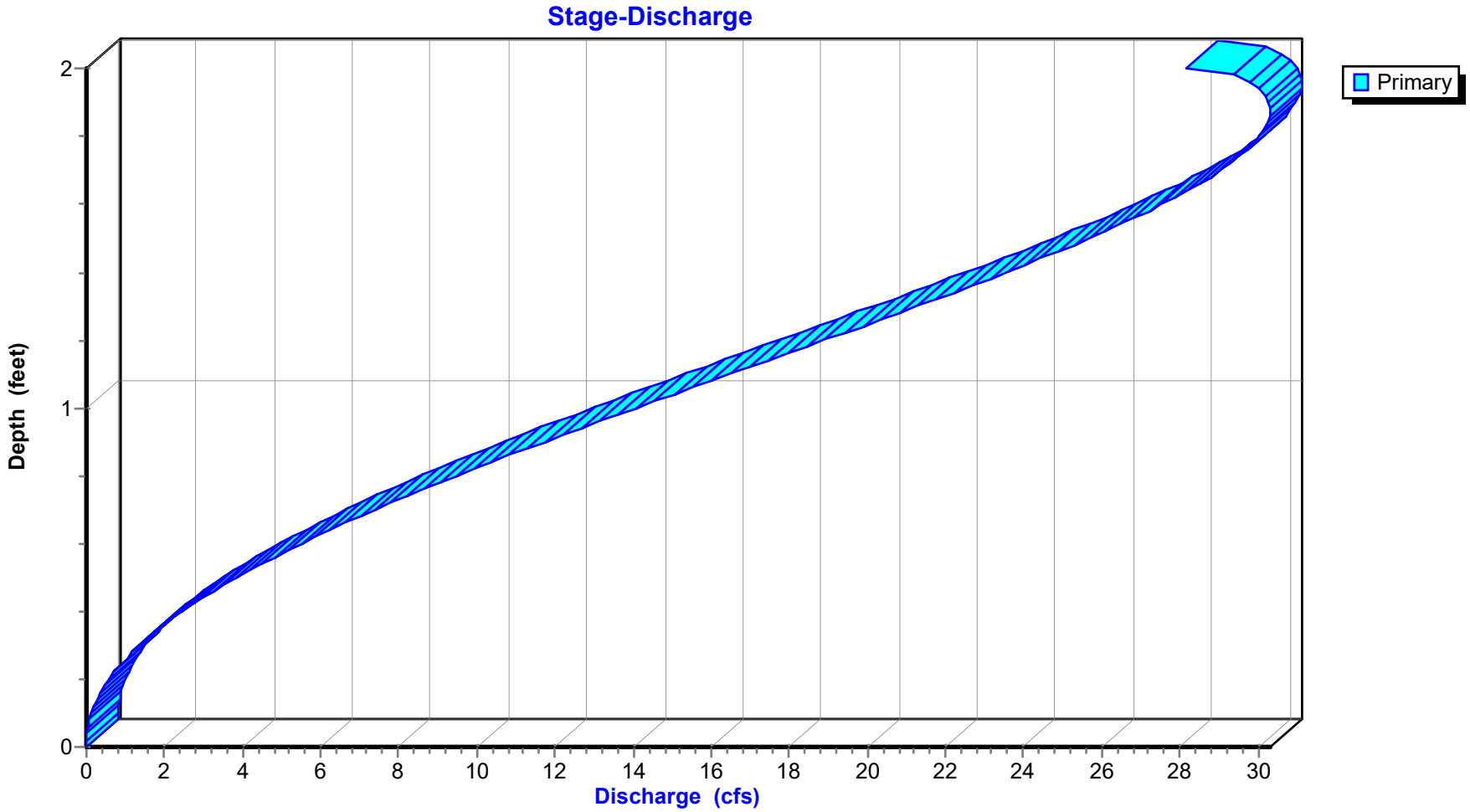
24.0" Round Pipe
n= 0.013
Length= 290.0' Slope= 0.0155 '/'
Inlet Invert= 158.50', Outlet Invert= 154.00'



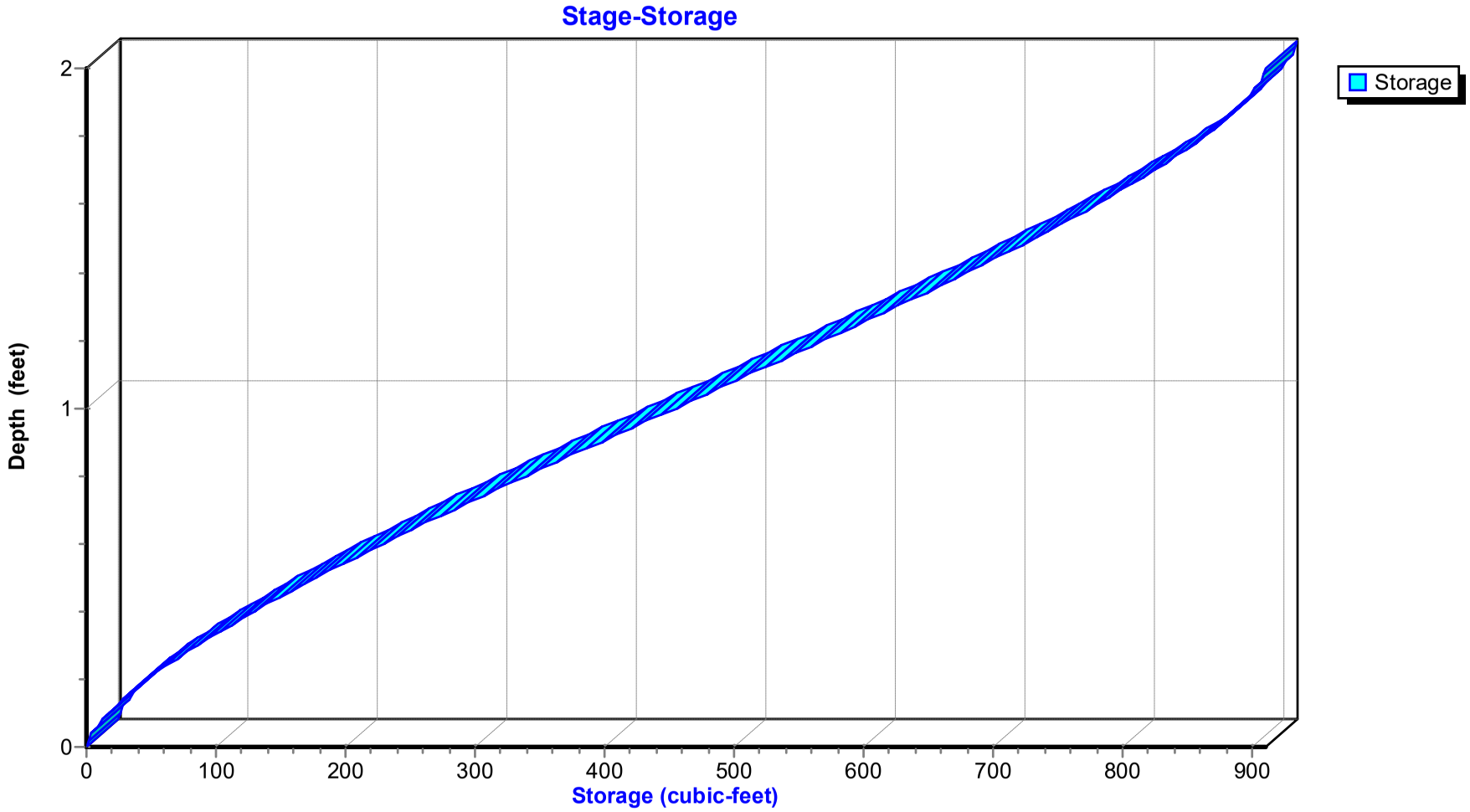
Reach 3R: SD-1


Hydrograph
Inflow
Outflow
15.87 cfs
15.61 cfs
Inflow Area=4.300 ac
Avg. Flow Depth=1.08'
Max Vel=9.22 fps
24.0"
Round Pipe
n=0.013
L=290.0'
S=0.0155 '/'
Capacity=28.18 cfs
Flow (cfs)
Time (hours)

Reach 3R: SD-1


Stage-Discharge
Primary
Depth (feet)
0
1
2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Discharge (cfs)

Reach 3R: SD-1


Stage-Storage
Storage
Depth (feet)
0
1
2
0
100
200
300
400
500
600
700
800
900
Storage (cubic-feet)

Hydrograph for Reach 3R: SD-1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	158.50	0.00
0.50	0.01	2	158.52	0.00
1.00	0.08	12	158.58	0.08
1.50	0.12	15	158.59	0.12
2.00	0.14	17	158.60	0.14
2.50	0.16	19	158.61	0.16
3.00	0.19	21	158.62	0.19
3.50	0.21	23	158.62	0.21
4.00	0.23	25	158.63	0.23
4.50	0.27	27	158.64	0.27
5.00	0.30	30	158.65	0.30
5.50	0.34	32	158.65	0.33
6.00	0.37	34	158.66	0.37
6.50	0.46	40	158.68	0.45
7.00	0.58	47	158.70	0.57
7.50	0.66	51	158.71	0.65
8.00	0.72	55	158.72	0.72
8.50	1.08	72	158.77	1.06
9.00	1.55	93	158.82	1.53
9.50	2.37	125	158.89	2.33
10.00	**15.52**	**495**	**159.57**	**15.51**
10.50	2.83	144	158.93	2.89
11.00	1.92	109	158.85	1.94
11.50	1.65	98	158.83	1.66
12.00	1.45	89	158.81	1.45
12.50	1.30	83	158.79	1.31
13.00	1.18	77	158.78	1.18
13.50	1.05	71	158.76	1.05
14.00	0.91	65	158.75	0.92
14.50	0.87	62	158.74	0.87
15.00	0.84	61	158.74	0.84
15.50	0.82	60	158.73	0.82
16.00	0.79	58	158.73	0.79
16.50	0.77	57	158.73	0.77
17.00	0.74	56	158.72	0.74
17.50	0.71	54	158.72	0.72
18.00	0.69	53	158.72	0.69
18.50	0.66	51	158.71	0.66
19.00	0.64	50	158.71	0.64
19.50	0.61	49	158.70	0.61
20.00	0.58	47	158.70	0.58
20.50	0.55	46	158.69	0.56
21.00	0.53	44	158.69	0.53
21.50	0.50	42	158.69	0.50
22.00	0.47	41	158.68	0.48
22.50	0.45	39	158.68	0.45
23.00	0.42	37	158.67	0.42
23.50	0.39	36	158.66	0.39
24.00	0.36	34	158.66	0.37

Stage-Discharge for Reach 3R: SD-1

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)	Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)	Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
158.50	0.00	0.00	159.20	7.56	7.41	159.90	10.04	23.59
158.52	0.80	0.00	159.22	7.67	7.81	159.92	10.07	24.03
158.54	1.26	0.02	159.24	7.78	8.22	159.94	10.10	24.46
158.56	1.65	0.05	159.26	7.89	8.64	159.96	10.13	24.88
158.58	1.99	0.08	159.28	7.99	9.07	159.98	10.15	25.29
158.60	2.30	0.14	159.30	8.09	9.50	160.00	10.17	25.70
158.62	2.59	0.20	159.32	8.19	9.93	160.02	10.18	26.09
158.64	2.87	0.28	159.34	8.29	10.38	160.04	10.20	26.47
158.66	3.12	0.37	159.36	8.38	10.83	160.06	10.21	26.84
158.68	3.37	0.47	159.38	8.47	11.28	160.08	10.22	27.20
158.70	3.60	0.59	159.40	8.56	11.74	160.10	10.22	27.55
158.72	3.82	0.72	159.42	8.65	12.20	160.12	**10.23**	27.88
158.74	4.04	0.86	159.44	8.73	12.67	160.14	10.23	28.19
158.76	4.24	1.02	159.46	8.81	13.14	160.16	10.22	28.49
158.78	4.44	1.19	159.48	8.89	13.61	160.18	10.21	28.77
158.80	4.64	1.37	159.50	8.97	14.09	160.20	10.20	29.04
158.82	4.82	1.56	159.52	9.05	14.57	160.22	10.19	29.28
158.84	5.00	1.77	159.54	9.12	15.05	160.24	10.17	29.51
158.86	5.18	1.99	159.56	9.19	15.53	160.26	10.15	29.71
158.88	5.35	2.22	159.58	9.26	16.02	160.28	10.12	29.88
158.90	5.52	2.47	159.60	9.32	16.51	160.30	10.09	30.03
158.92	5.68	2.72	159.62	9.39	16.99	160.32	10.05	30.16
158.94	5.84	2.99	159.64	9.45	17.48	160.34	10.00	30.25
158.96	5.99	3.27	159.66	9.51	17.96	160.36	9.95	30.30
158.98	6.14	3.56	159.68	9.56	18.45	160.38	9.89	**30.31**
159.00	6.29	3.86	159.70	9.62	18.93	160.40	9.82	30.28
159.02	6.43	4.17	159.72	9.67	19.41	160.42	9.74	30.19
159.04	6.57	4.49	159.74	9.72	19.89	160.44	9.64	30.03
159.06	6.70	4.83	159.76	9.77	20.37	160.46	9.52	29.78
159.08	6.83	5.17	159.78	9.82	20.85	160.48	9.36	29.36
159.10	6.96	5.52	159.80	9.86	21.32	160.50	8.97	28.18
159.12	7.09	5.88	159.82	9.90	21.78			
159.14	7.21	6.25	159.84	9.94	22.24			
159.16	7.33	6.63	159.86	9.98	22.70			
159.18	7.45	7.01	159.88	10.01	23.15			

Stage-Area-Storage for Reach 3R: SD-1

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
158.50	0.0	0	159.20	1.0	284	159.90	2.3	681
158.52	0.0	2	159.22	1.0	295	159.92	2.4	692
158.54	0.0	4	159.24	1.1	306	159.94	2.4	702
158.56	0.0	8	159.26	1.1	318	159.96	2.5	713
158.58	0.0	12	159.28	1.1	329	159.98	2.5	723
158.60	0.1	17	159.30	1.2	340	160.00	2.5	733
158.62	0.1	22	159.32	1.2	352	160.02	2.6	743
158.64	0.1	28	159.34	1.3	363	160.04	2.6	753
158.66	0.1	34	159.36	1.3	375	160.06	2.6	762
158.68	0.1	41	159.38	1.3	386	160.08	2.7	772
158.70	0.2	47	159.40	1.4	398	160.10	2.7	781
158.72	0.2	55	159.42	1.4	409	160.12	2.7	791
158.74	0.2	62	159.44	1.5	421	160.14	2.8	800
158.76	0.2	70	159.46	1.5	432	160.16	2.8	808
158.78	0.3	78	159.48	1.5	444	160.18	2.8	817
158.80	0.3	86	159.50	1.6	456	160.20	2.8	825
158.82	0.3	94	159.52	1.6	467	160.22	2.9	834
158.84	0.4	103	159.54	1.7	479	160.24	2.9	841
158.86	0.4	112	159.56	1.7	490	160.26	2.9	849
158.88	0.4	121	159.58	1.7	502	160.28	3.0	857
158.90	0.4	130	159.60	1.8	513	160.30	3.0	864
158.92	0.5	139	159.62	1.8	525	160.32	3.0	870
158.94	0.5	149	159.64	1.8	536	160.34	3.0	877
158.96	0.5	158	159.66	1.9	548	160.36	3.0	883
158.98	0.6	168	159.68	1.9	559	160.38	3.1	889
159.00	0.6	178	159.70	2.0	571	160.40	3.1	894
159.02	0.6	188	159.72	2.0	582	160.42	3.1	899
159.04	0.7	198	159.74	2.0	593	160.44	3.1	903
159.06	0.7	209	159.76	2.1	605	160.46	3.1	907
159.08	0.8	219	159.78	2.1	616	160.48	3.1	910
159.10	0.8	230	159.80	2.2	627	160.50	**3.1**	**911**
159.12	0.8	241	159.82	2.2	638			
159.14	0.9	251	159.84	2.2	649			
159.16	0.9	262	159.86	2.3	660			
159.18	0.9	273	159.88	2.3	671			

Summary for Reach 7R: SD-2

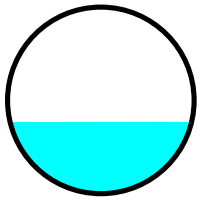
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 1.710 ac, 38.00% Impervious, Inflow Depth > 5.20" for 25 Yr event
Inflow = 6.56 cfs @ 9.95 hrs, Volume= 0.741 af
Outflow = 6.54 cfs @ 9.96 hrs, Volume= 0.741 af, Atten= 0%, Lag= 0.3 min

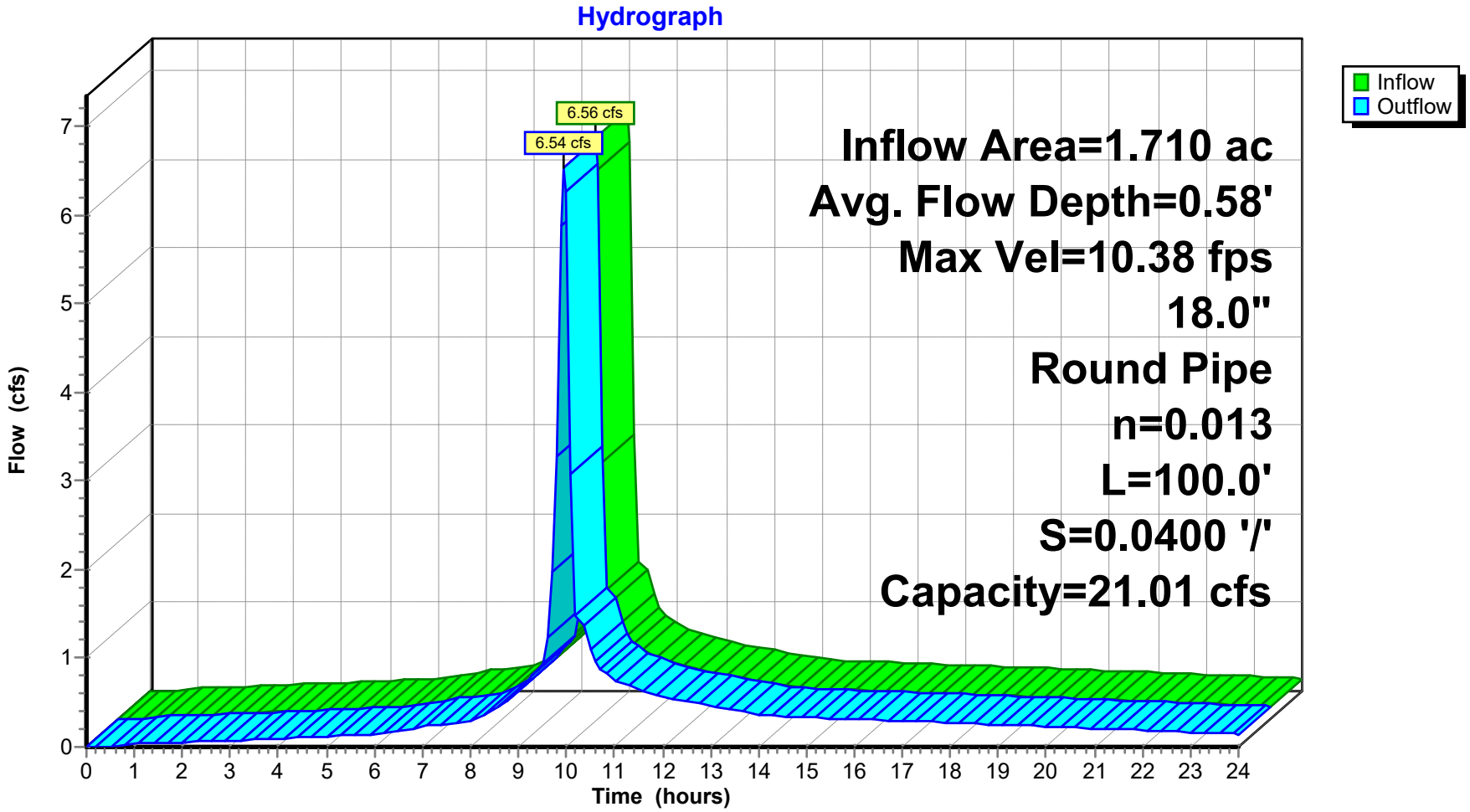
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Max. Velocity= 10.38 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 4.09 fps, Avg. Travel Time= 0.4 min

Peak Storage= 63 cf @ 9.96 hrs
Average Depth at Peak Storage= 0.58'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 21.01 cfs

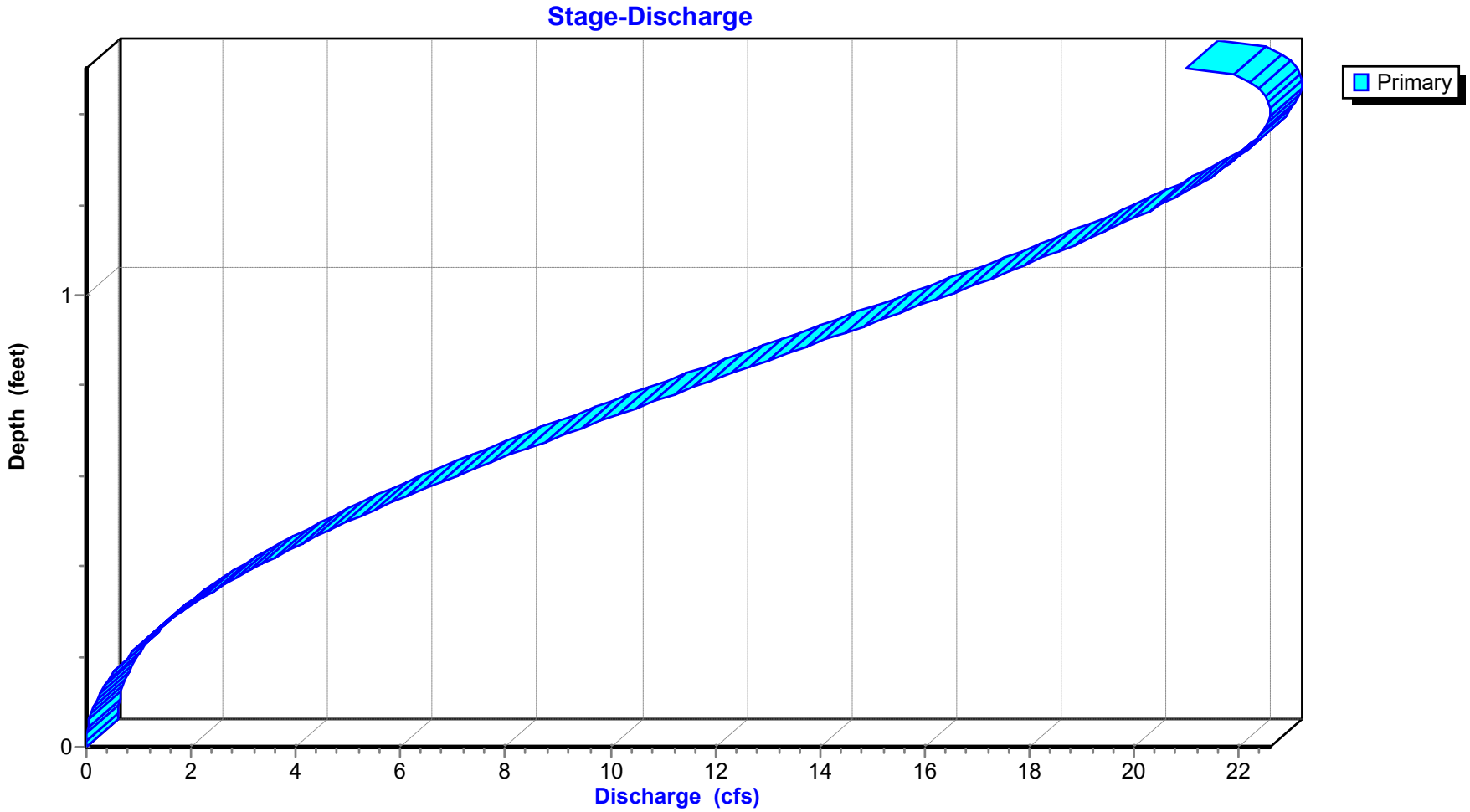
18.0" Round Pipe
n= 0.013
Length= 100.0' Slope= 0.0400 '/'
Inlet Invert= 158.00', Outlet Invert= 154.00'



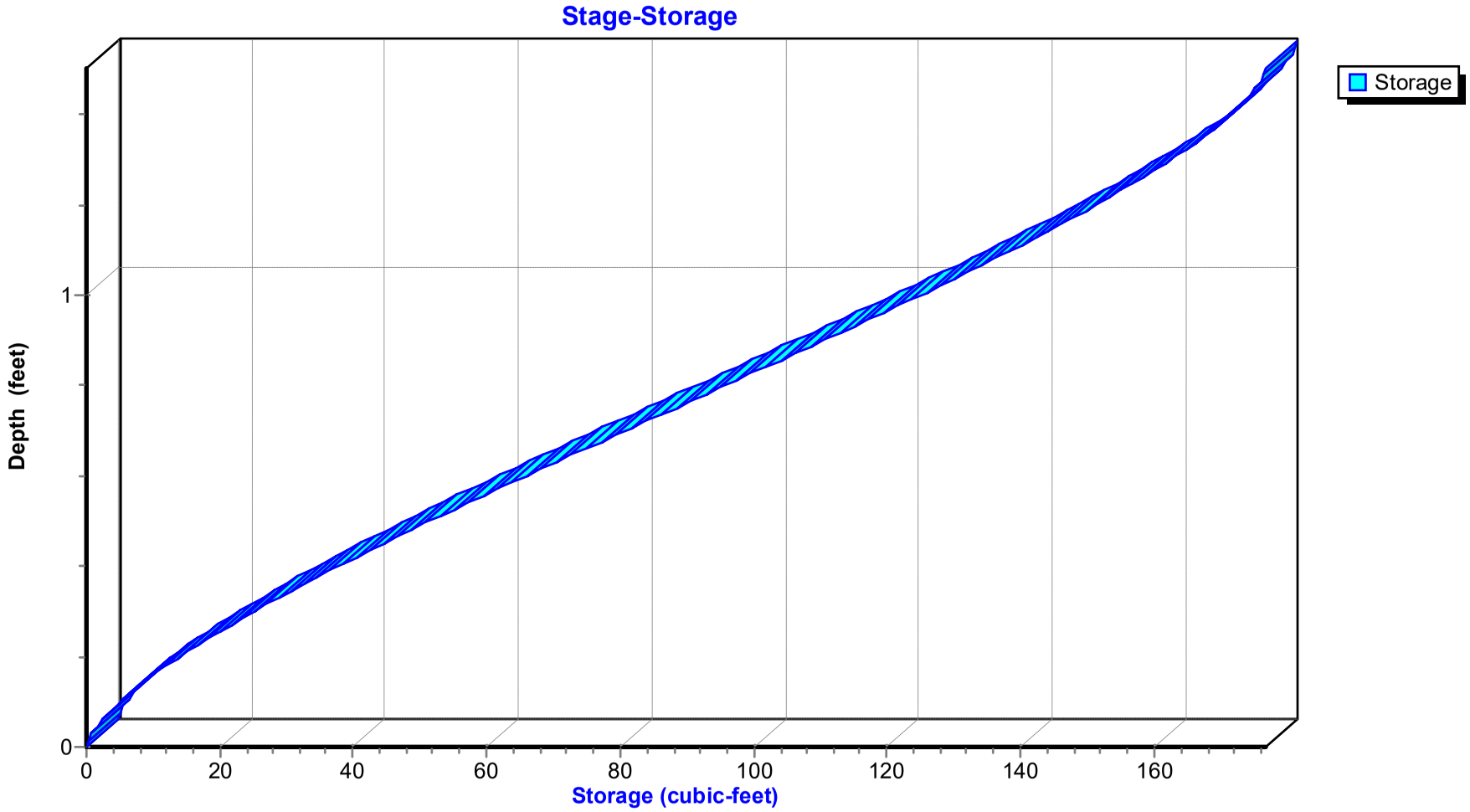
Reach 7R: SD-2


Hydrograph
Inflow
Outflow
6.56 cfs
6.54 cfs
Inflow Area=1.710 ac
Avg. Flow Depth=0.58'
Max Vel=10.38 fps
18.0"
Round Pipe
n=0.013
L=100.0'
S=0.0400 '/'
Capacity=21.01 cfs
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Reach 7R: SD-2


Stage-Discharge
Primary
Depth (feet)
0
1
0
2
4
6
8
10
12
14
16
18
20
22
Discharge (cfs)

Reach 7R: SD-2


Stage-Storage
Storage
Depth (feet)
0
1
0
20
40
60
80
100
120
140
160
Storage (cubic-feet)

Hydrograph for Reach 7R: SD-2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	158.00	0.00
0.50	0.01	0	158.02	0.00
1.00	0.03	2	158.04	0.03
1.50	0.05	2	158.05	0.05
2.00	0.06	2	158.06	0.06
2.50	0.07	2	158.06	0.07
3.00	0.08	3	158.06	0.07
3.50	0.08	3	158.07	0.08
4.00	0.09	3	158.07	0.09
4.50	0.11	3	158.08	0.11
5.00	0.12	4	158.08	0.12
5.50	0.13	4	158.09	0.13
6.00	0.15	4	158.09	0.15
6.50	0.18	5	158.10	0.18
7.00	0.23	6	158.11	0.23
7.50	0.26	6	158.12	0.26
8.00	0.29	7	158.12	0.29
8.50	0.44	9	158.15	0.44
9.00	0.62	12	158.18	0.62
9.50	0.96	16	158.22	0.95
10.00	**6.20**	**60**	**158.56**	**6.26**
10.50	1.09	17	158.23	1.09
11.00	0.75	14	158.20	0.76
11.50	0.65	12	158.18	0.65
12.00	0.57	11	158.17	0.57
12.50	0.52	10	158.16	0.52
13.00	0.47	10	158.15	0.47
13.50	0.41	9	158.15	0.41
14.00	0.36	8	158.14	0.36
14.50	0.34	8	158.13	0.34
15.00	0.33	8	158.13	0.33
15.50	0.32	7	158.13	0.32
16.00	0.31	7	158.13	0.31
16.50	0.30	7	158.13	0.30
17.00	0.29	7	158.12	0.29
17.50	0.28	7	158.12	0.28
18.00	0.27	7	158.12	0.27
18.50	0.26	6	158.12	0.26
19.00	0.25	6	158.12	0.25
19.50	0.24	6	158.11	0.24
20.00	0.23	6	158.11	0.23
20.50	0.22	6	158.11	0.22
21.00	0.21	5	158.11	0.21
21.50	0.20	5	158.10	0.20
22.00	0.19	5	158.10	0.19
22.50	0.18	5	158.10	0.18
23.00	0.17	5	158.09	0.17
23.50	0.16	4	158.09	0.16
24.00	0.14	4	158.09	0.14

Stage-Discharge for Reach 7R: SD-2

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
158.00	0.00	0.00
158.02	1.26	0.01
158.04	2.02	0.03
158.06	2.64	0.06
158.08	3.18	0.12
158.10	3.68	0.19
158.12	4.14	0.27
158.14	4.56	0.38
158.16	4.97	0.50
158.18	5.35	0.64
158.20	5.71	0.80
158.22	6.06	0.98
158.24	6.39	1.17
158.26	6.71	1.38
158.28	7.02	1.60
158.30	7.31	1.84
158.32	7.60	2.10
158.34	7.87	2.37
158.36	8.14	2.65
158.38	8.39	2.96
158.40	8.64	3.27
158.42	8.88	3.60
158.44	9.11	3.94
158.46	9.34	4.29
158.48	9.56	4.66
158.50	9.77	5.04
158.52	9.97	5.43
158.54	10.17	5.82
158.56	10.36	6.23
158.58	10.55	6.65
158.60	10.73	7.08
158.62	10.90	7.52
158.64	11.07	7.96
158.66	11.23	8.41
158.68	11.38	8.87
158.70	11.53	9.33
158.72	11.68	9.80
158.74	11.82	10.27
158.76	11.95	10.74
158.78	12.08	11.22
158.80	12.21	11.70
158.82	12.33	12.18
158.84	12.44	12.67
158.86	12.55	13.15
158.88	12.65	13.63
158.90	12.75	14.11
158.92	12.84	14.59
158.94	12.93	15.07
158.96	13.01	15.54
158.98	13.09	16.01
159.00	13.16	16.47
159.02	13.22	16.92
159.04	13.28	17.37
159.06	13.34	17.81
159.08	13.39	18.24
159.10	13.43	18.65
159.12	13.47	19.06
159.14	13.50	19.45
159.16	13.52	19.83
159.18	13.54	20.19
159.20	13.55	20.54
159.22	**13.55**	20.86
159.24	13.55	21.17
159.26	13.54	21.45
159.28	13.52	21.71
159.30	13.49	21.94
159.32	13.45	22.15
159.34	13.40	22.32
159.36	13.33	22.45
159.38	13.26	22.55
159.40	13.16	**22.59**
159.42	13.05	**22.58**
159.44	12.91	22.51
159.46	12.73	22.33
159.48	12.48	21.99
159.50	11.89	21.01

Stage-Area-Storage for Reach 7R: SD-2

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
158.00	0.0	0
158.02	0.0	0
158.04	0.0	1
158.06	0.0	2
158.08	0.0	4
158.10	0.1	5
158.12	0.1	7
158.14	0.1	8
158.16	0.1	10
158.18	0.1	12
158.20	0.1	14
158.22	0.2	16
158.24	0.2	18
158.26	0.2	20
158.28	0.2	23
158.30	0.3	25
158.32	0.3	28
158.34	0.3	30
158.36	0.3	33
158.38	0.4	35
158.40	0.4	38
158.42	0.4	41
158.44	0.4	43
158.46	0.5	46
158.48	0.5	49
158.50	0.5	52
158.52	0.5	54
158.54	0.6	57
158.56	0.6	60
158.58	0.6	63
158.60	0.7	66
158.62	0.7	69
158.64	0.7	72
158.66	0.7	75
158.68	0.8	78
158.70	0.8	81
158.72	0.8	84
158.74	0.9	87
158.76	0.9	90
158.78	0.9	93
158.80	1.0	96
158.82	1.0	99
158.84	1.0	102
158.86	1.0	105
158.88	1.1	108
158.90	1.1	111
158.92	1.1	114
158.94	1.2	117
158.96	1.2	119
158.98	1.2	122
159.00	1.3	125
159.02	1.3	128
159.04	1.3	131
159.06	1.3	133
159.08	1.4	136
159.10	1.4	139
159.12	1.4	142
159.14	1.4	144
159.16	1.5	147
159.18	1.5	149
159.20	1.5	152
159.22	1.5	154
159.24	1.6	156
159.26	1.6	158
159.28	1.6	161
159.30	1.6	163
159.32	1.6	165
159.34	1.7	167
159.36	1.7	168
159.38	1.7	170
159.40	1.7	172
159.42	1.7	173
159.44	1.7	174
159.46	1.8	175
159.48	1.8	176
159.50	**1.8**	**177**

Summary for Reach 10R: SD-3

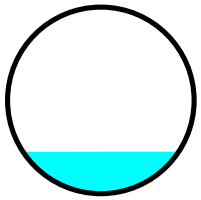
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 0.800 ac,100.00% Impervious, Inflow Depth > 6.47" for 25 Yr event
Inflow = 3.65 cfs @ 9.94 hrs, Volume= 0.431 af
Outflow = 3.63 cfs @ 9.95 hrs, Volume= 0.431 af, Atten= 0%, Lag= 0.2 min

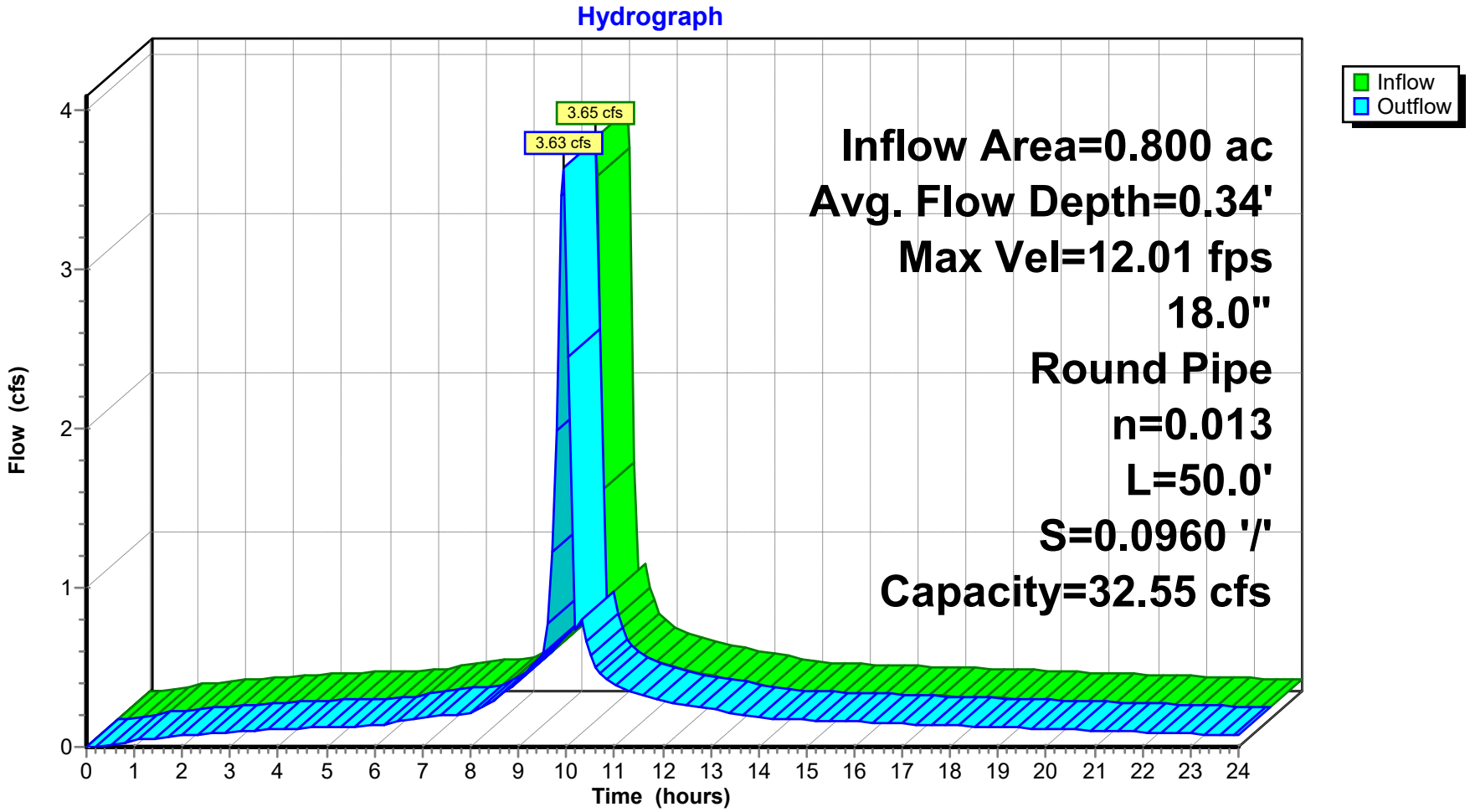
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Max. Velocity= 12.01 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.82 fps, Avg. Travel Time= 0.2 min

Peak Storage= 15 cf @ 9.95 hrs
Average Depth at Peak Storage= 0.34'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 32.55 cfs

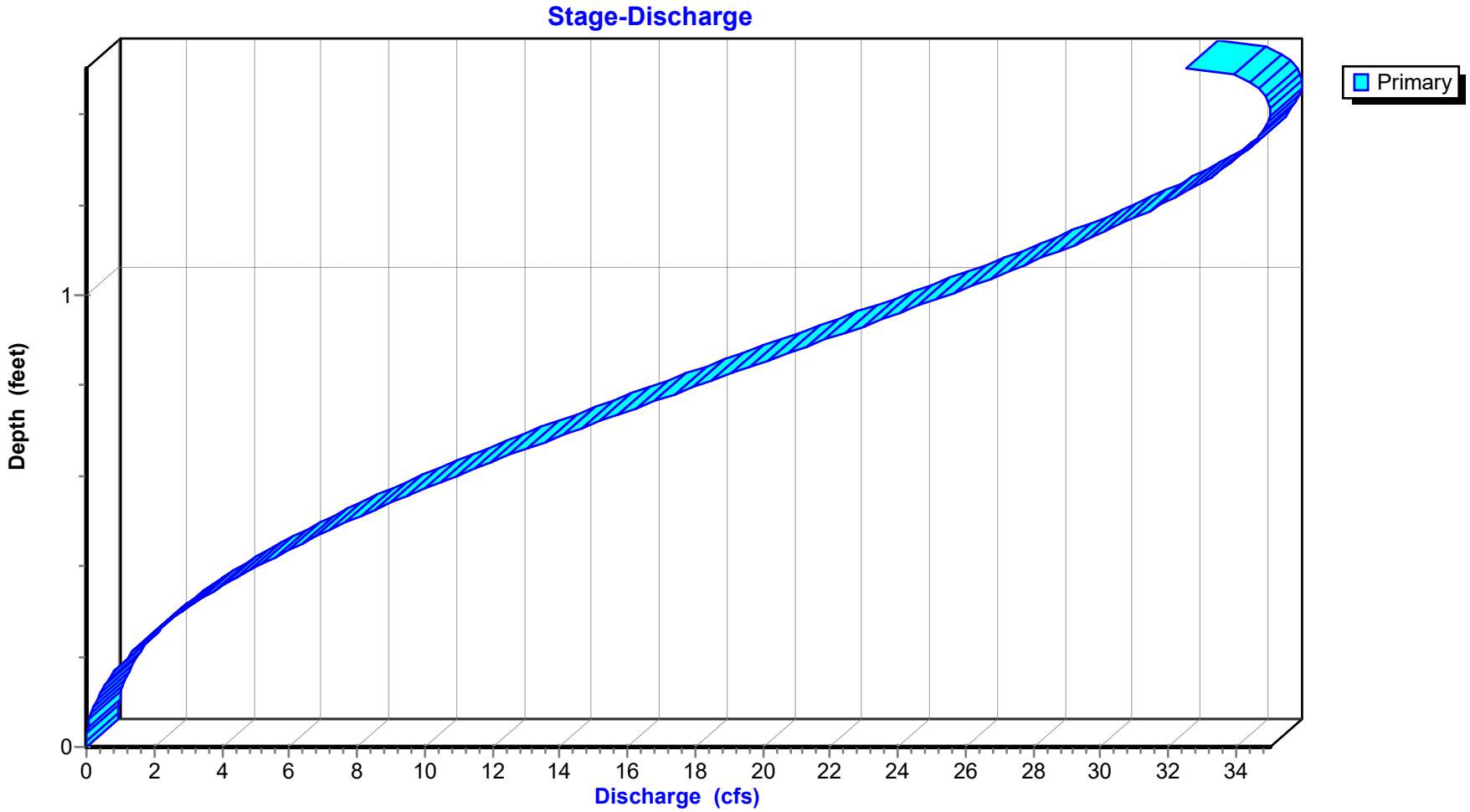
18.0" Round Pipe
n= 0.013
Length= 50.0' Slope= 0.0960 '/'
Inlet Invert= 144.80', Outlet Invert= 140.00'



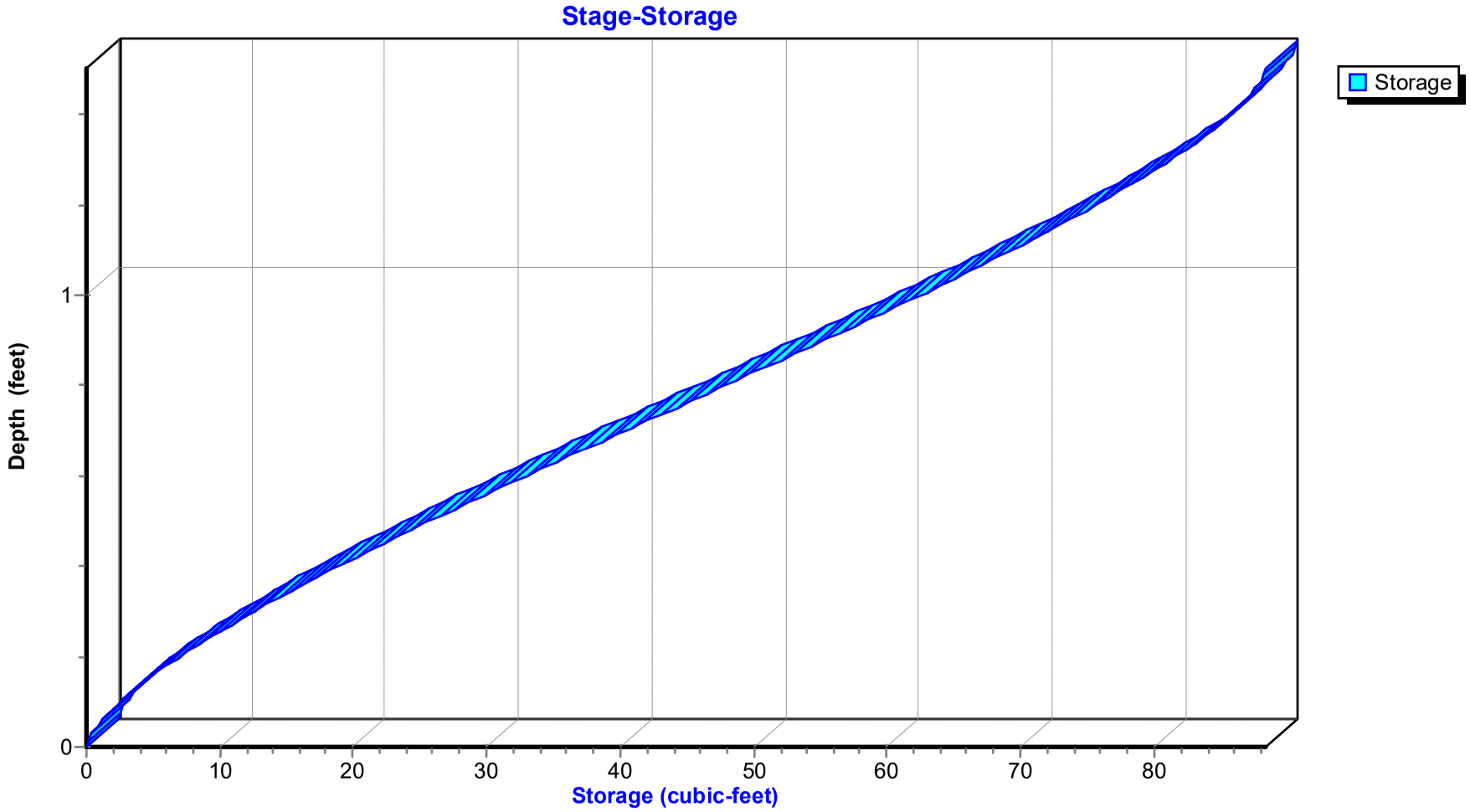
Reach 10R: SD-3



Reach 10R: SD-3



Reach 10R: SD-3



Hydrograph for Reach 10R: SD-3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	144.80	0.00
0.50	0.01	0	144.82	0.01
1.00	0.04	1	144.84	0.04
1.50	0.06	1	144.85	0.06
2.00	0.07	1	144.85	0.07
2.50	0.08	1	144.85	0.08
3.00	0.09	1	144.86	0.09
3.50	0.10	1	144.86	0.10
4.00	0.11	1	144.86	0.11
4.50	0.12	1	144.87	0.12
5.00	0.12	1	144.87	0.12
5.50	0.13	1	144.87	0.13
6.00	0.13	1	144.87	0.13
6.50	0.16	2	144.88	0.16
7.00	0.19	2	144.88	0.19
7.50	0.20	2	144.88	0.20
8.00	0.21	2	144.89	0.21
8.50	0.30	3	144.90	0.30
9.00	0.41	3	144.92	0.41
9.50	**0.59**	**4**	**144.94**	**0.59**
10.00	**3.41**	**14**	**145.13**	**3.43**
10.50	0.57	4	144.94	0.57
11.00	0.39	3	144.92	0.39
11.50	0.34	3	144.91	0.34
12.00	0.29	3	144.90	0.29
12.50	0.26	2	144.90	0.26
13.00	0.24	2	144.89	0.24
13.50	0.21	2	144.89	0.21
14.00	0.18	2	144.88	0.18
14.50	0.17	2	144.88	0.17
15.00	0.17	2	144.88	0.17
15.50	0.16	2	144.88	0.16
16.00	0.16	2	144.88	0.16
16.50	0.15	2	144.87	0.15
17.00	0.15	2	144.87	0.15
17.50	0.14	2	144.87	0.14
18.00	0.14	1	144.87	0.14
18.50	0.13	1	144.87	0.13
19.00	0.13	1	144.87	0.13
19.50	0.12	1	144.87	0.12
20.00	0.11	1	144.86	0.11
20.50	0.11	1	144.86	0.11
21.00	0.10	1	144.86	0.10
21.50	0.10	1	144.86	0.10
22.00	0.09	1	144.86	0.09
22.50	0.09	1	144.86	0.09
23.00	0.08	1	144.85	0.08
23.50	0.08	1	144.85	0.08
24.00	0.07	1	144.85	0.07

Stage-Discharge for Reach 10R: SD-3

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
144.80	0.00	0.00
144.82	1.96	0.01
144.84	3.12	0.04
144.86	4.09	0.10
144.88	4.93	0.18
144.90	5.70	0.29
144.92	6.41	0.42
144.94	7.07	0.59
144.96	7.69	0.78
144.98	8.29	1.00
145.00	8.85	1.24
145.02	9.39	1.51
145.04	9.90	1.81
145.06	10.39	2.13
145.08	10.87	2.48
145.10	11.33	2.85
145.12	11.77	3.25
145.14	12.19	3.67
145.16	12.61	4.11
145.18	13.00	4.58
145.20	13.39	5.07
145.22	13.76	5.57
145.24	14.12	6.10
145.26	14.47	6.65
145.28	14.80	7.22
145.30	15.13	7.80
145.32	15.45	8.41
145.34	15.75	9.02
145.36	16.05	9.66
145.38	16.34	10.31
145.40	16.62	10.97
145.42	16.88	11.64
145.44	17.14	12.33
145.46	17.39	13.03
145.48	17.64	13.73
145.50	17.87	14.45
145.52	18.10	15.17
145.54	18.31	15.91
145.56	18.52	16.64
145.58	18.72	17.38
145.60	18.91	18.13
145.62	19.10	18.88
145.64	19.27	19.62
145.66	19.44	20.37
145.68	19.60	21.12
145.70	19.75	21.87
145.72	19.89	22.61
145.74	20.03	23.34
145.76	20.16	24.08
145.78	20.27	24.80
145.80	20.38	25.51
145.82	20.49	26.22
145.84	20.58	26.91
145.86	20.66	27.59
145.88	20.74	28.25
145.90	20.81	28.90
145.92	20.86	29.52
145.94	20.91	30.13
145.96	20.95	30.72
145.98	20.97	31.28
146.00	20.99	31.81
146.02	**21.00**	32.32
146.04	20.99	32.79
146.06	20.97	33.23
146.08	20.94	33.63
146.10	20.89	33.99
146.12	20.83	34.31
146.14	20.75	34.57
146.16	20.65	34.78
146.18	20.54	34.93
146.20	20.39	**35.00**
146.22	20.21	**34.98**
146.24	20.00	34.87
146.26	19.72	34.59
146.28	19.33	34.07
146.30	18.42	32.55

Stage-Area-Storage for Reach 10R: SD-3

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
144.80	0.0	0	145.50	0.8	40	146.20	1.7	86
144.82	0.0	0	145.52	0.8	42	146.22	1.7	87
144.84	0.0	1	145.54	0.9	43	146.24	1.7	87
144.86	0.0	1	145.56	0.9	45	146.26	1.8	88
144.88	0.0	2	145.58	0.9	46	146.28	1.8	88
144.90	0.1	3	145.60	1.0	48	146.30	**1.8**	**88**
144.92	0.1	3	145.62	1.0	49			
144.94	0.1	4	145.64	1.0	51			
144.96	0.1	5	145.66	1.0	52			
144.98	0.1	6	145.68	1.1	54			
145.00	0.1	7	145.70	1.1	55			
145.02	0.2	8	145.72	1.1	57			
145.04	0.2	9	145.74	1.2	58			
145.06	0.2	10	145.76	1.2	60			
145.08	0.2	11	145.78	1.2	61			
145.10	0.3	13	145.80	1.3	63			
145.12	0.3	14	145.82	1.3	64			
145.14	0.3	15	145.84	1.3	65			
145.16	0.3	16	145.86	1.3	67			
145.18	0.4	18	145.88	1.4	68			
145.20	0.4	19	145.90	1.4	69			
145.22	0.4	20	145.92	1.4	71			
145.24	0.4	22	145.94	1.4	72			
145.26	0.5	23	145.96	1.5	73			
145.28	0.5	24	145.98	1.5	75			
145.30	0.5	26	146.00	1.5	76			
145.32	0.5	27	146.02	1.5	77			
145.34	0.6	29	146.04	1.6	78			
145.36	0.6	30	146.06	1.6	79			
145.38	0.6	32	146.08	1.6	80			
145.40	0.7	33	146.10	1.6	81			
145.42	0.7	34	146.12	1.6	82			
145.44	0.7	36	146.14	1.7	83			
145.46	0.7	37	146.16	1.7	84			
145.48	0.8	39	146.18	1.7	85			

Summary for Pond 8P: Detention Basin 2

[62] Hint: Exceeded Reach 3R OUTLET depth by 2.01' @ 10.50 hrs
[62] Hint: Exceeded Reach 7R OUTLET depth by 2.22' @ 10.40 hrs

Inflow Area = 6.010 ac, 38.00% Impervious, Inflow Depth > 5.20" for 25 Yr event
Inflow = 22.08 cfs @ 9.98 hrs, Volume= 2.603 af
Outflow = 5.10 cfs @ 9.70 hrs, Volume= 2.602 af, Atten= 77%, Lag= 0.0 min
Primary = 5.10 cfs @ 9.70 hrs, Volume= 2.602 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 156.48' @ 10.34 hrs Surf.Area= 0.197 ac Storage= 0.395 af

Plug-Flow detention time= 14.8 min calculated for 2.591 af (100% of inflow)
Center-of-Mass det. time= 14.5 min (749.7 - 735.3)

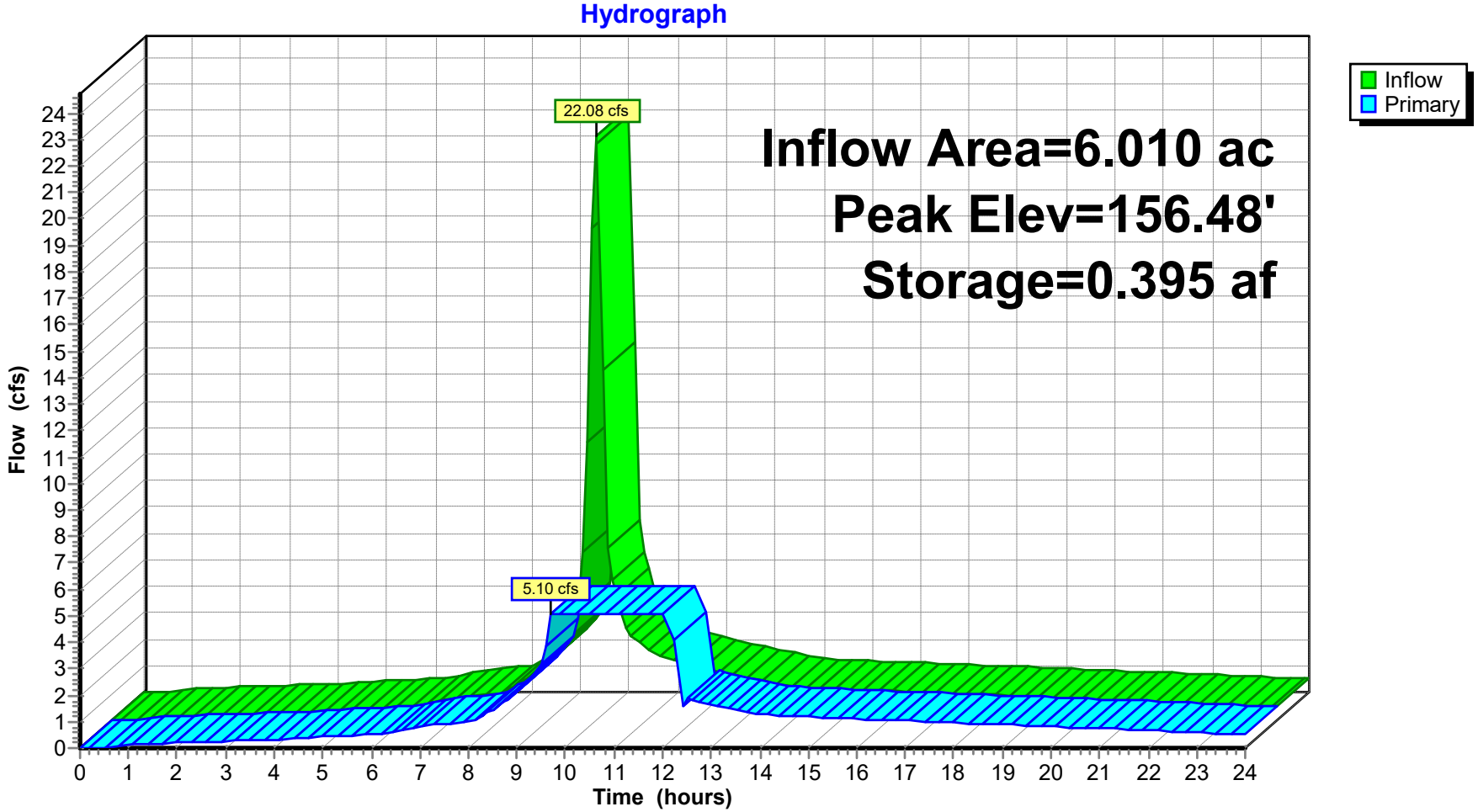
Volume	Invert	Avail.Storage	Storage Description
#1	154.00'	1.297 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
154.00	0.123	0.000	0.000
155.00	0.152	0.137	0.137
156.00	0.182	0.167	0.304
157.00	0.214	0.198	0.503
158.00	0.247	0.230	0.733
159.00	0.282	0.264	0.998
160.00	0.317	0.300	1.297

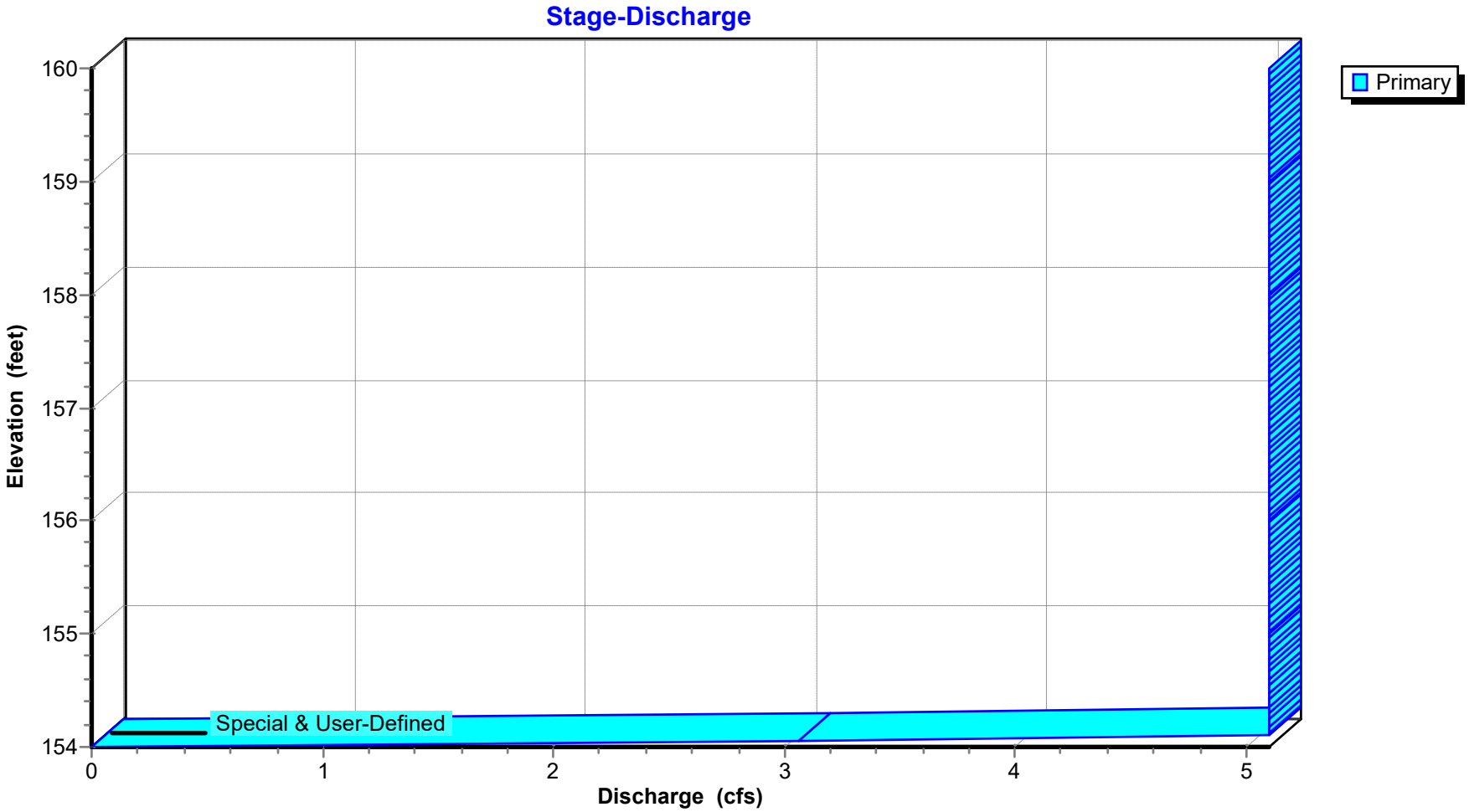
Device	Routing	Invert	Outlet Devices
#1	Primary	154.00'	**Special & User-Defined** Head (feet) 0.00 0.10 6.00 Disch. (cfs) 0.000 5.100 5.100

Primary OutFlow Max=5.10 cfs @ 9.70 hrs HW=154.13' (Free Discharge)
└**1=Special & User-Defined** (Custom Controls 5.10 cfs)

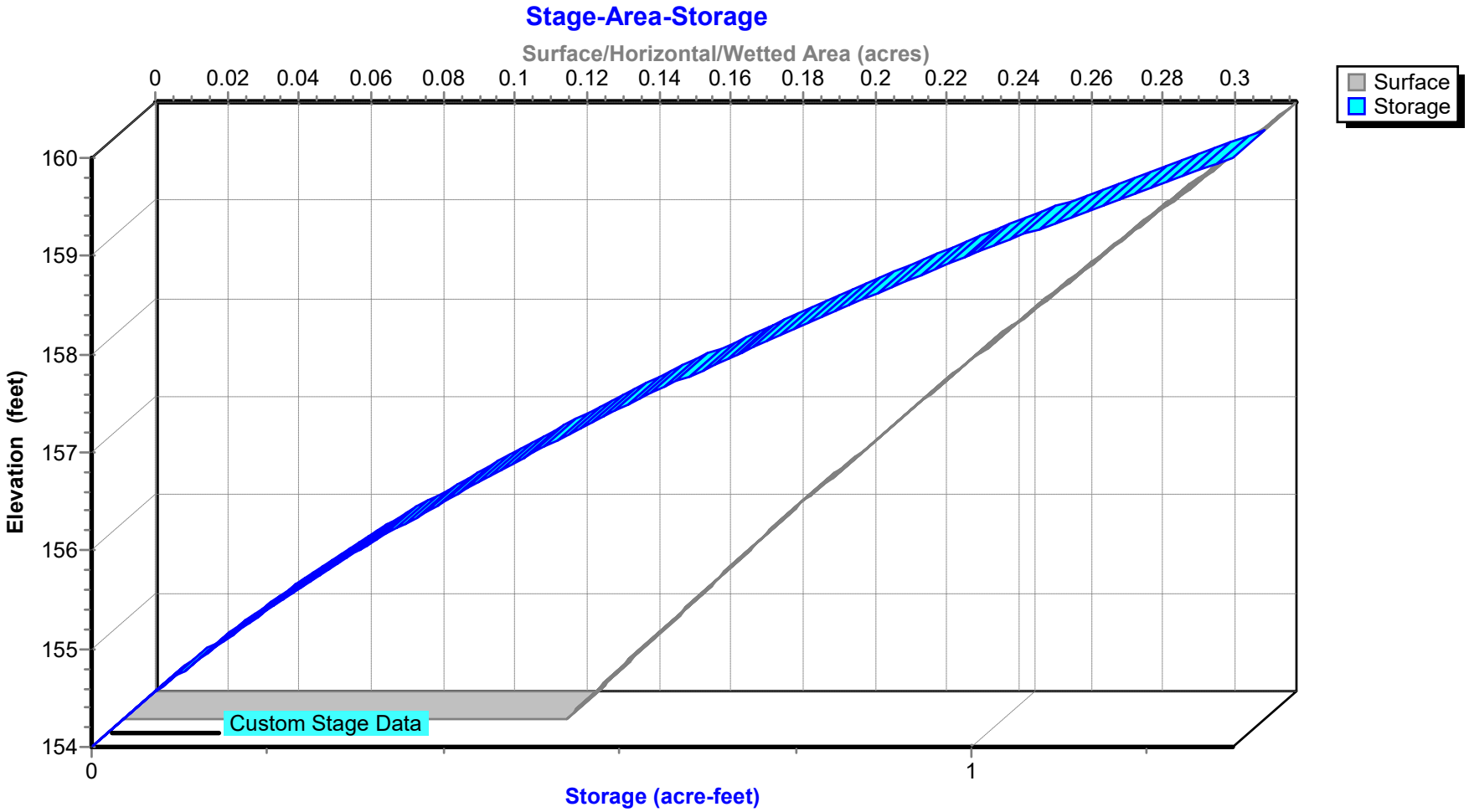
Pond 8P: Detention Basin 2



Pond 8P: Detention Basin 2



Pond 8P: Detention Basin 2



Hydrograph for Pond 8P: Detention Basin 2

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	154.00	0.00
0.50	0.01	0.000	154.00	0.01
1.00	0.11	0.000	154.00	0.11
1.50	0.16	0.000	154.00	0.16
2.00	0.19	0.000	154.00	0.19
2.50	0.23	0.001	154.00	0.23
3.00	0.26	0.001	154.01	0.26
3.50	0.29	0.001	154.01	0.29
4.00	0.32	0.001	154.01	0.32
4.50	0.37	0.001	154.01	0.37
5.00	0.42	0.001	154.01	0.42
5.50	0.47	0.001	154.01	0.47
6.00	0.51	0.001	154.01	0.51
6.50	0.64	0.002	154.01	0.63
7.00	0.80	0.002	154.02	0.79
7.50	0.91	0.002	154.02	0.91
8.00	1.00	0.002	154.02	1.00
8.50	1.50	0.004	154.03	1.46
9.00	2.15	0.005	154.04	2.11
9.50	3.28	0.008	154.06	**3.21**
10.00	**21.76**	**0.246**	**155.67**	**5.10**
10.50	3.99	**0.387**	**156.44**	5.10
11.00	2.71	0.307	156.01	5.10
11.50	2.31	0.198	155.38	5.10
12.00	2.03	0.077	154.59	5.10
12.50	1.83	0.005	154.04	1.92
13.00	1.65	0.004	154.03	1.66
13.50	1.47	0.004	154.03	1.48
14.00	1.28	0.003	154.03	1.29
14.50	1.21	0.003	154.02	1.22
15.00	1.18	0.003	154.02	1.18
15.50	1.14	0.003	154.02	1.15
16.00	1.11	0.003	154.02	1.11
16.50	1.07	0.003	154.02	1.07
17.00	1.04	0.003	154.02	1.04
17.50	1.00	0.002	154.02	1.00
18.00	0.96	0.002	154.02	0.96
18.50	0.93	0.002	154.02	0.93
19.00	0.89	0.002	154.02	0.89
19.50	0.85	0.002	154.02	0.85
20.00	0.81	0.002	154.02	0.82
20.50	0.78	0.002	154.02	0.78
21.00	0.74	0.002	154.01	0.74
21.50	0.70	0.002	154.01	0.70
22.00	0.66	0.002	154.01	0.67
22.50	0.63	0.002	154.01	0.63
23.00	0.59	0.001	154.01	0.59
23.50	0.55	0.001	154.01	0.55
24.00	0.51	0.001	154.01	0.51

Stage-Discharge for Pond 8P: Detention Basin 2

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
154.00	0.00	155.40	5.10	156.80	5.10	158.20	5.10	159.60	5.10
154.04	2.04	155.44	5.10	156.84	5.10	158.24	5.10	159.64	5.10
154.08	4.08	155.48	5.10	156.88	5.10	158.28	5.10	159.68	5.10
154.12	**5.10**	155.52	5.10	156.92	5.10	158.32	5.10	159.72	5.10
154.16	5.10	155.56	5.10	156.96	5.10	158.36	5.10	159.76	5.10
154.20	5.10	155.60	5.10	157.00	5.10	158.40	5.10	159.80	5.10
154.24	5.10	155.64	5.10	157.04	5.10	158.44	5.10	159.84	5.10
154.28	5.10	155.68	5.10	157.08	5.10	158.48	5.10	159.88	5.10
154.32	5.10	155.72	5.10	157.12	5.10	158.52	5.10	159.92	5.10
154.36	5.10	155.76	5.10	157.16	5.10	158.56	5.10	159.96	5.10
154.40	5.10	155.80	5.10	157.20	5.10	158.60	5.10	160.00	5.10
154.44	5.10	155.84	5.10	157.24	5.10	158.64	5.10		
154.48	5.10	155.88	5.10	157.28	5.10	158.68	5.10		
154.52	5.10	155.92	5.10	157.32	5.10	158.72	5.10		
154.56	5.10	155.96	5.10	157.36	5.10	158.76	5.10		
154.60	5.10	156.00	5.10	157.40	5.10	158.80	5.10		
154.64	5.10	156.04	5.10	157.44	5.10	158.84	5.10		
154.68	5.10	156.08	5.10	157.48	5.10	158.88	5.10		
154.72	5.10	156.12	5.10	157.52	5.10	158.92	5.10		
154.76	5.10	156.16	5.10	157.56	5.10	158.96	5.10		
154.80	5.10	156.20	5.10	157.60	5.10	159.00	5.10		
154.84	5.10	156.24	5.10	157.64	5.10	159.04	5.10		
154.88	5.10	156.28	5.10	157.68	5.10	159.08	5.10		
154.92	5.10	156.32	5.10	157.72	5.10	159.12	5.10		
154.96	5.10	156.36	5.10	157.76	5.10	159.16	5.10		
155.00	5.10	156.40	5.10	157.80	5.10	159.20	5.10		
155.04	5.10	156.44	5.10	157.84	5.10	159.24	5.10		
155.08	5.10	156.48	5.10	157.88	5.10	159.28	5.10		
155.12	5.10	156.52	5.10	157.92	5.10	159.32	5.10		
155.16	5.10	156.56	5.10	157.96	5.10	159.36	5.10		
155.20	5.10	156.60	5.10	158.00	5.10	159.40	5.10		
155.24	5.10	156.64	5.10	158.04	5.10	159.44	5.10		
155.28	5.10	156.68	5.10	158.08	5.10	159.48	5.10		
155.32	5.10	156.72	5.10	158.12	5.10	159.52	5.10		
155.36	5.10	156.76	5.10	158.16	5.10	159.56	5.10		

Stage-Area-Storage for Pond 8P: Detention Basin 2

Elevation (feet)	Surface (acres)	Storage (acre-feet)
154.00	0.123	0.000
154.10	0.126	0.012
154.20	0.129	0.025
154.30	0.132	0.038
154.40	0.135	0.052
154.50	0.137	0.065
154.60	0.140	0.079
154.70	0.143	0.093
154.80	0.146	0.108
154.90	0.149	0.122
155.00	0.152	0.137
155.10	0.155	0.153
155.20	0.158	0.168
155.30	0.161	0.184
155.40	0.164	0.201
155.50	0.167	0.217
155.60	0.170	0.234
155.70	0.173	0.251
155.80	0.176	0.269
155.90	0.179	0.286
156.00	0.182	0.304
156.10	0.185	0.323
156.20	0.188	0.342
156.30	0.192	0.361
156.40	0.195	0.380
156.50	0.198	0.400
156.60	0.201	0.419
156.70	0.204	0.440
156.80	0.208	0.460
156.90	0.211	0.481
157.00	0.214	0.503
157.10	0.217	0.524
157.20	0.221	0.546
157.30	0.224	0.568
157.40	0.227	0.591
157.50	0.230	0.614
157.60	0.234	0.637
157.70	0.237	0.660
157.80	0.240	0.684
157.90	0.244	0.708
158.00	0.247	0.733
158.10	0.250	0.758
158.20	0.254	0.783
158.30	0.258	0.809
158.40	0.261	0.835
158.50	0.264	0.861
158.60	0.268	0.887
158.70	0.271	0.914
158.80	0.275	0.942
158.90	0.279	0.969
159.00	0.282	0.998
159.10	0.285	1.026
159.20	0.289	1.055
159.30	0.293	1.084
159.40	0.296	1.113
159.50	0.300	1.143
159.60	0.303	1.173
159.70	0.306	1.203
159.80	0.310	1.234
159.90	0.314	1.265
160.00	**0.317**	**1.297**

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: B-1 Runoff Area=3.000 ac 38.00% Impervious Runoff Depth>6.01"
Flow Length=895' Tc=3.4 min CN=80/98 Runoff=12.76 cfs 1.502 af

Subcatchment 2S: B-2 Runoff Area=1.300 ac 38.00% Impervious Runoff Depth>6.01"
Flow Length=835' Tc=3.1 min CN=80/98 Runoff=5.59 cfs 0.651 af

Subcatchment 4S: C-1 Runoff Area=1.050 ac 38.00% Impervious Runoff Depth>6.01"
Flow Length=510' Tc=2.5 min CN=80/98 Runoff=4.61 cfs 0.526 af

Subcatchment 5S: C-2 Runoff Area=0.160 ac 38.00% Impervious Runoff Depth>6.01"
Flow Length=240' Slope=0.0400 '/' Tc=1.0 min CN=80/98 Runoff=0.73 cfs 0.080 af

Subcatchment 6S: C-3 Runoff Area=0.500 ac 38.00% Impervious Runoff Depth>6.01"
Flow Length=250' Slope=0.0200 '/' Tc=1.5 min CN=80/98 Runoff=2.24 cfs 0.250 af

Subcatchment 9S: D-1 Runoff Area=0.800 ac 100.00% Impervious Runoff Depth>7.32"
Flow Length=390' Slope=0.0350 '/' Tc=1.7 min CN=0/98 Runoff=4.12 cfs 0.488 af

Reach 3R: SD-1 Avg. Flow Depth=1.18' Max Vel=9.53 fps Inflow=18.34 cfs 2.153 af
24.0" Round Pipe n=0.013 L=290.0' S=0.0155 '/' Capacity=28.18 cfs Outflow=18.06 cfs 2.152 af

Reach 7R: SD-2 Avg. Flow Depth=0.63' Max Vel=10.79 fps Inflow=7.58 cfs 0.857 af
18.0" Round Pipe n=0.013 L=100.0' S=0.0400 '/' Capacity=21.01 cfs Outflow=7.55 cfs 0.856 af

Reach 10R: SD-3 Avg. Flow Depth=0.36' Max Vel=12.44 fps Inflow=4.12 cfs 0.488 af
18.0" Round Pipe n=0.013 L=50.0' S=0.0960 '/' Capacity=32.55 cfs Outflow=4.10 cfs 0.488 af

Pond 8P: Detention Basin 2 Peak Elev=157.01' Storage=0.505 af Inflow=25.53 cfs 3.009 af
Outflow=5.10 cfs 3.007 af

Total Runoff Area = 6.810 ac Runoff Volume = 3.498 af Average Runoff Depth = 6.16"
54.72% Pervious = 3.726 ac 45.28% Impervious = 3.084 ac

Summary for Subcatchment 1S: B-1

[49] Hint: Tc<2dt may require smaller dt

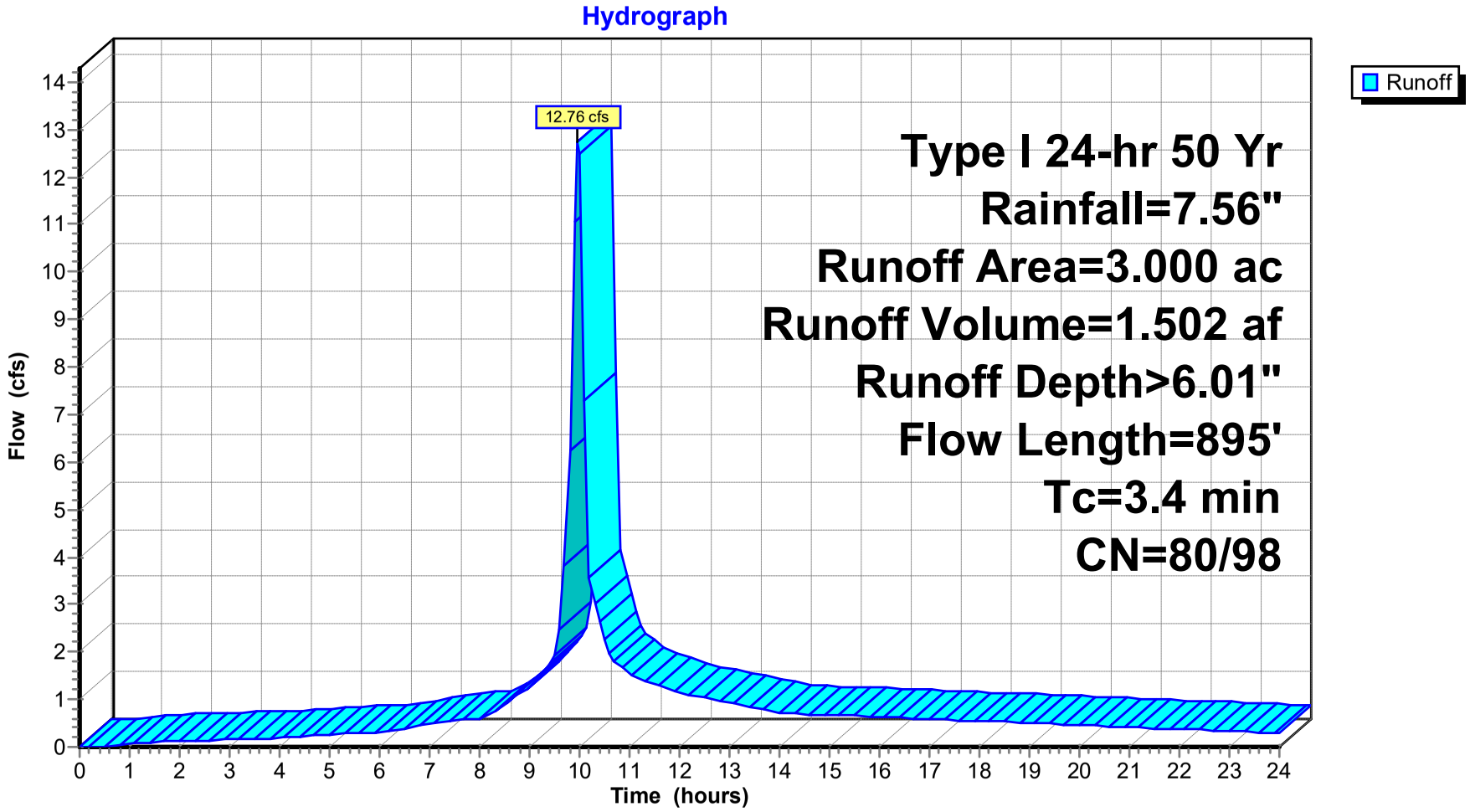
Runoff = 12.76 cfs @ 9.97 hrs, Volume= 1.502 af, Depth> 6.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 50 Yr Rainfall=7.56"

Area (ac)	CN	Description
3.000	87	1/4 acre lots, 38% imp, HSG D
1.860	80	62.00% Pervious Area
1.140	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	255	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.3	105	0.0900	6.09		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.5	155	0.0600	4.97		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.0	220	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.9	160	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
3.4	895	Total			

Subcatchment 1S: B-1



Hydrograph for Subcatchment 1S: B-1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.07	0.00	0.00	0.01
1.00	0.13	0.00	0.03	0.07
1.50	0.20	0.00	0.07	0.10
2.00	0.26	0.00	0.12	0.12
2.50	0.33	0.00	0.17	0.13
3.00	0.41	0.00	0.24	0.15
3.50	0.49	0.00	0.31	0.17
4.00	0.57	0.00	0.39	0.20
4.50	0.66	0.01	0.47	0.23
5.00	0.76	0.02	0.56	0.26
5.50	0.85	0.04	0.65	0.28
6.00	0.95	0.07	0.74	0.31
6.50	1.05	0.10	0.84	0.39
7.00	1.18	0.15	0.97	0.48
7.50	1.32	0.20	1.10	0.55
8.00	1.47	0.27	1.25	0.60
8.50	1.66	0.37	1.43	0.89
9.00	1.92	0.51	1.70	1.27
9.50	2.29	0.75	2.06	1.93
10.00	3.89	1.95	3.66	**12.49**
10.50	4.41	2.38	4.17	2.27
11.00	4.71	2.64	4.47	1.54
11.50	4.96	2.85	4.72	1.32
12.00	5.17	3.04	4.93	1.15
12.50	5.36	3.21	5.12	1.04
13.00	5.53	3.36	5.30	0.94
13.50	5.69	3.50	5.45	0.83
14.00	5.82	3.62	5.58	0.73
14.50	5.94	3.73	5.71	0.69
15.00	6.06	3.84	5.82	0.67
15.50	6.18	3.94	5.94	0.65
16.00	6.29	4.04	6.05	0.63
16.50	6.40	4.14	6.16	0.61
17.00	6.50	4.24	6.26	0.59
17.50	6.60	4.33	6.36	0.57
18.00	6.70	4.42	6.46	0.55
18.50	6.79	4.50	6.55	0.53
19.00	6.88	4.58	6.64	0.50
19.50	6.96	4.66	6.73	0.48
20.00	7.05	4.74	6.81	0.46
20.50	7.12	4.81	6.88	0.44
21.00	7.20	4.88	6.96	0.42
21.50	7.27	4.94	7.03	0.40
22.00	7.33	5.00	7.09	0.38
22.50	7.40	5.06	7.16	0.35
23.00	7.45	5.12	7.21	0.33
23.50	7.51	5.17	7.27	0.31
24.00	**7.56**	**5.21**	**7.32**	0.29

Summary for Subcatchment 2S: B-2

[49] Hint: Tc<2dt may require smaller dt

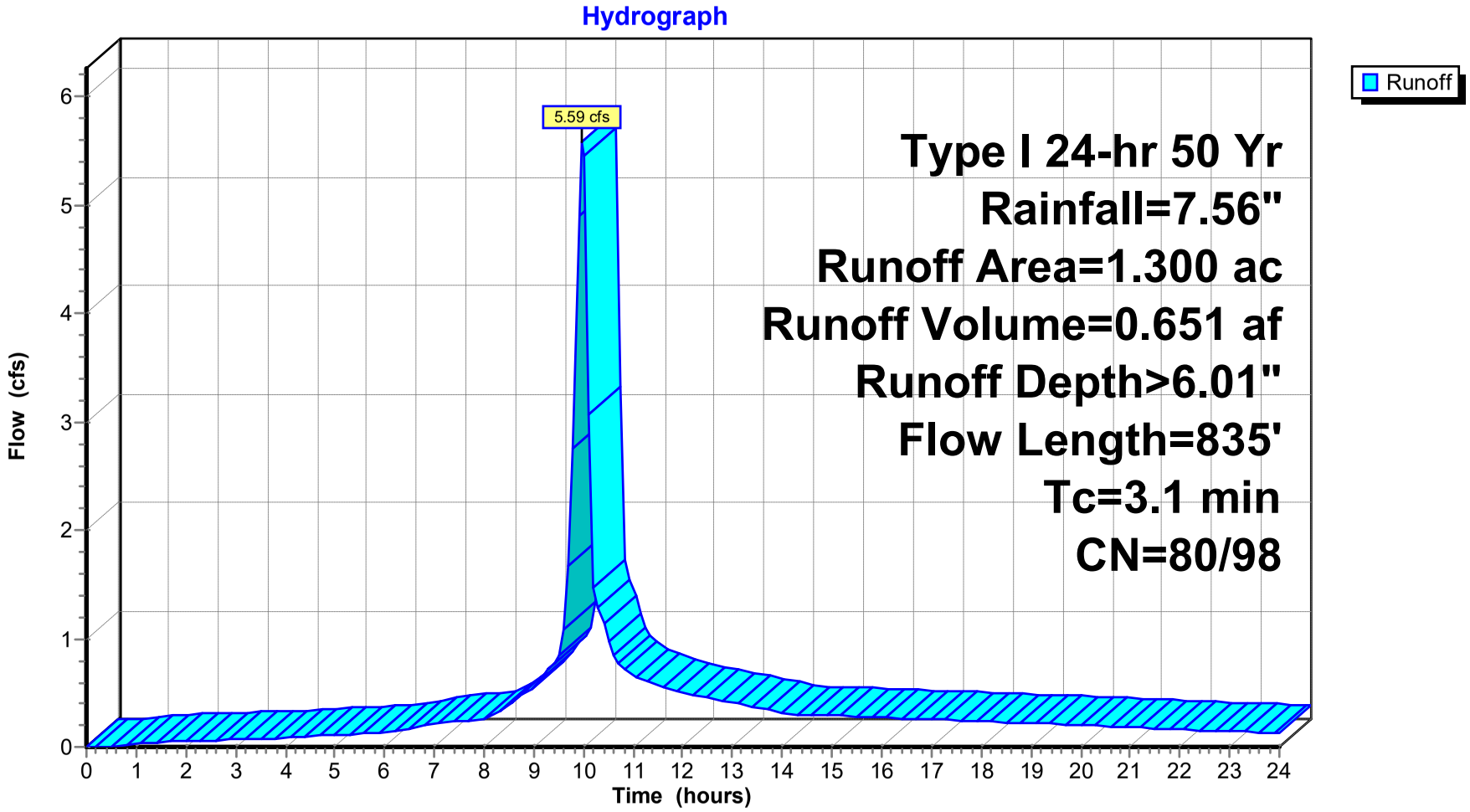
Runoff = 5.59 cfs @ 9.97 hrs, Volume= 0.651 af, Depth> 6.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 50 Yr Rainfall=7.56"

Area (ac)	CN	Description
1.300	87	1/4 acre lots, 38% imp, HSG D
0.806	80	62.00% Pervious Area
0.494	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	280	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.3	100	0.0900	6.09		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.5	150	0.0600	4.97		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.0	215	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.5	90	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
3.1	835	Total			

Subcatchment 2S: B-2



Hydrograph for Subcatchment 2S: B-2

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.07	0.00	0.00	0.01
1.00	0.13	0.00	0.03	0.03
1.50	0.20	0.00	0.07	0.04
2.00	0.26	0.00	0.12	0.05
2.50	0.33	0.00	0.17	0.06
3.00	0.41	0.00	0.24	0.07
3.50	0.49	0.00	0.31	0.07
4.00	0.57	0.00	0.39	0.09
4.50	0.66	0.01	0.47	0.10
5.00	0.76	0.02	0.56	0.11
5.50	0.85	0.04	0.65	0.12
6.00	0.95	0.07	0.74	0.13
6.50	1.05	0.10	0.84	0.17
7.00	1.18	0.15	0.97	0.21
7.50	1.32	0.20	1.10	0.24
8.00	1.47	0.27	1.25	0.26
8.50	1.66	0.37	1.43	0.39
9.00	1.92	0.51	1.70	0.55
9.50	2.29	0.75	2.06	0.84
10.00	3.89	1.95	3.66	**5.44**
10.50	4.41	2.38	4.17	0.98
11.00	4.71	2.64	4.47	0.66
11.50	4.96	2.85	4.72	0.57
12.00	5.17	3.04	4.93	0.50
12.50	5.36	3.21	5.12	0.45
13.00	5.53	3.36	5.30	0.41
13.50	5.69	3.50	5.45	0.36
14.00	5.82	3.62	5.58	0.32
14.50	5.94	3.73	5.71	0.30
15.00	6.06	3.84	5.82	0.29
15.50	6.18	3.94	5.94	0.28
16.00	6.29	4.04	6.05	0.27
16.50	6.40	4.14	6.16	0.26
17.00	6.50	4.24	6.26	0.25
17.50	6.60	4.33	6.36	0.25
18.00	6.70	4.42	6.46	0.24
18.50	6.79	4.50	6.55	0.23
19.00	6.88	4.58	6.64	0.22
19.50	6.96	4.66	6.73	0.21
20.00	7.05	4.74	6.81	0.20
20.50	7.12	4.81	6.88	0.19
21.00	7.20	4.88	6.96	0.18
21.50	7.27	4.94	7.03	0.17
22.00	7.33	5.00	7.09	0.16
22.50	7.40	5.06	7.16	0.15
23.00	7.45	5.12	7.21	0.14
23.50	7.51	5.17	7.27	0.13
24.00	**7.56**	**5.21**	**7.32**	0.13

Summary for Subcatchment 4S: C-1

[49] Hint: Tc<2dt may require smaller dt

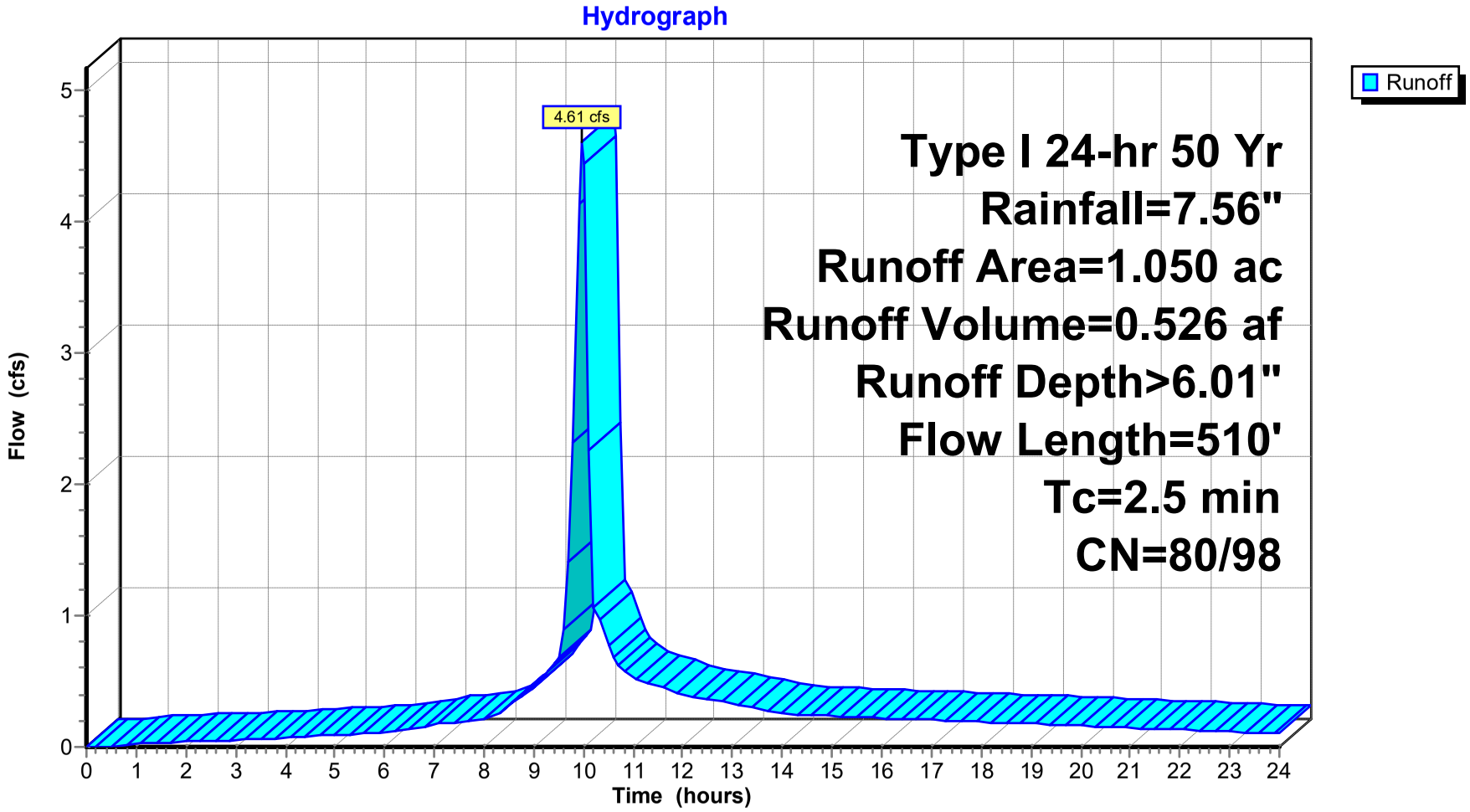
Runoff = 4.61 cfs @ 9.96 hrs, Volume= 0.526 af, Depth> 6.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 50 Yr Rainfall=7.56"

Area (ac)	CN	Description
1.050	87	1/4 acre lots, 38% imp, HSG D
0.651	80	62.00% Pervious Area
0.399	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	260	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.0	250	0.0400	4.06		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
2.5	510	Total			

Subcatchment 4S: C-1



Hydrograph for Subcatchment 4S: C-1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.07	0.00	0.00	0.01
1.00	0.13	0.00	0.03	0.03
1.50	0.20	0.00	0.07	0.04
2.00	0.26	0.00	0.12	0.04
2.50	0.33	0.00	0.17	0.05
3.00	0.41	0.00	0.24	0.05
3.50	0.49	0.00	0.31	0.06
4.00	0.57	0.00	0.39	0.07
4.50	0.66	0.01	0.47	0.08
5.00	0.76	0.02	0.56	0.09
5.50	0.85	0.04	0.65	0.10
6.00	0.95	0.07	0.74	0.11
6.50	1.05	0.10	0.84	0.14
7.00	1.18	0.15	0.97	0.17
7.50	1.32	0.20	1.10	0.19
8.00	1.47	0.27	1.25	0.21
8.50	1.66	0.37	1.43	0.32
9.00	1.92	0.51	1.70	0.45
9.50	2.29	0.75	2.06	0.68
10.00	3.89	1.95	3.66	**4.43**
10.50	4.41	2.38	4.17	0.78
11.00	4.71	2.64	4.47	0.53
11.50	4.96	2.85	4.72	0.46
12.00	5.17	3.04	4.93	0.40
12.50	5.36	3.21	5.12	0.36
13.00	5.53	3.36	5.30	0.33
13.50	5.69	3.50	5.45	0.29
14.00	5.82	3.62	5.58	0.25
14.50	5.94	3.73	5.71	0.24
15.00	6.06	3.84	5.82	0.23
15.50	6.18	3.94	5.94	0.23
16.00	6.29	4.04	6.05	0.22
16.50	6.40	4.14	6.16	0.21
17.00	6.50	4.24	6.26	0.21
17.50	6.60	4.33	6.36	0.20
18.00	6.70	4.42	6.46	0.19
18.50	6.79	4.50	6.55	0.18
19.00	6.88	4.58	6.64	0.18
19.50	6.96	4.66	6.73	0.17
20.00	7.05	4.74	6.81	0.16
20.50	7.12	4.81	6.88	0.15
21.00	7.20	4.88	6.96	0.15
21.50	7.27	4.94	7.03	0.14
22.00	7.33	5.00	7.09	0.13
22.50	7.40	5.06	7.16	0.12
23.00	7.45	5.12	7.21	0.12
23.50	7.51	5.17	7.27	0.11
24.00	**7.56**	**5.21**	**7.32**	0.10

Summary for Subcatchment 5S: C-2

[49] Hint: Tc<2dt may require smaller dt

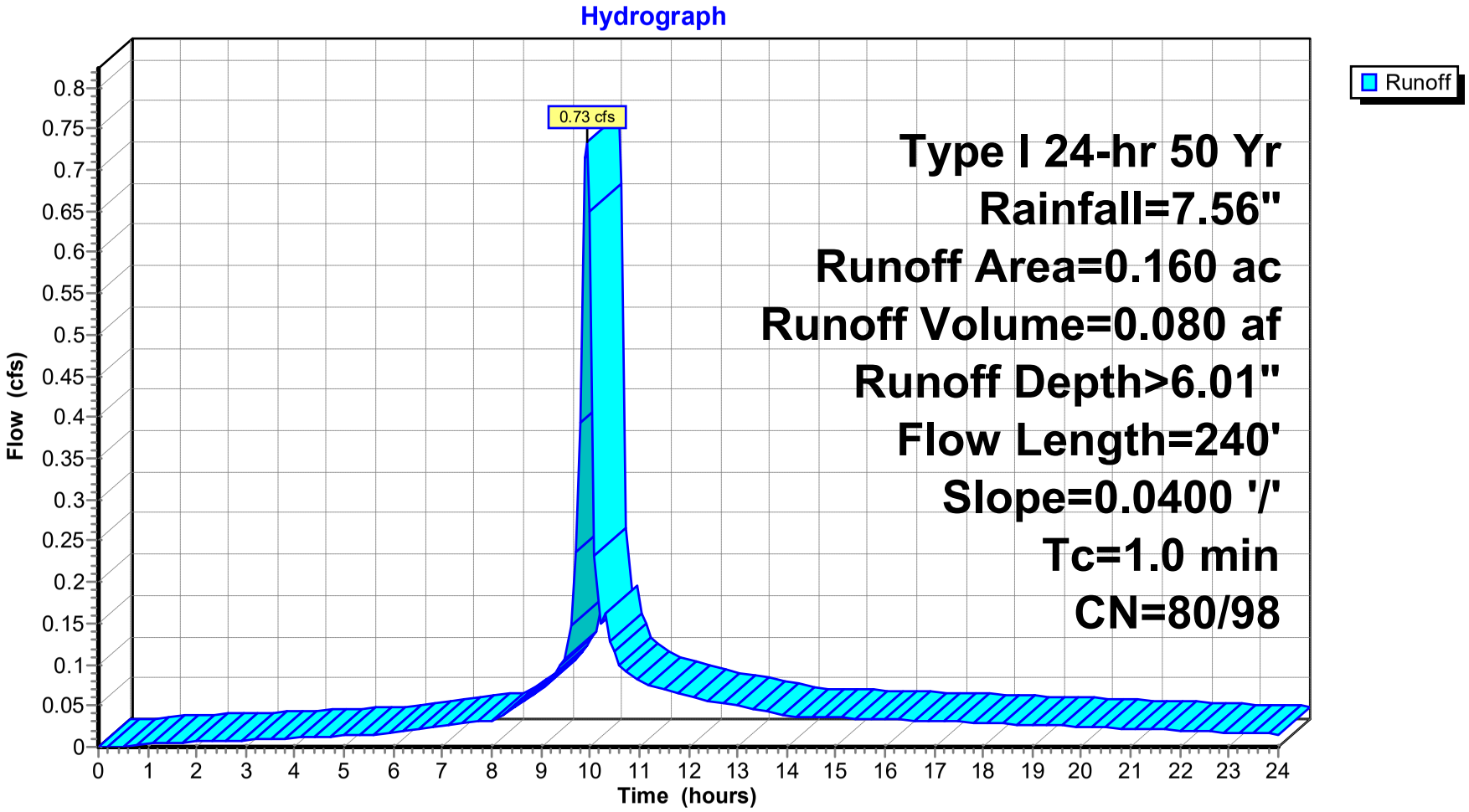
Runoff = 0.73 cfs @ 9.93 hrs, Volume= 0.080 af, Depth> 6.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 50 Yr Rainfall=7.56"

Area (ac)	CN	Description
0.160	87	1/4 acre lots, 38% imp, HSG D
0.099	80	62.00% Pervious Area
0.061	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	240	0.0400	4.06		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps

Subcatchment 5S: C-2



Hydrograph for Subcatchment 5S: C-2

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.07	0.00	0.00	0.00
1.00	0.13	0.00	0.03	0.00
1.50	0.20	0.00	0.07	0.01
2.00	0.26	0.00	0.12	0.01
2.50	0.33	0.00	0.17	0.01
3.00	0.41	0.00	0.24	0.01
3.50	0.49	0.00	0.31	0.01
4.00	0.57	0.00	0.39	0.01
4.50	0.66	0.01	0.47	0.01
5.00	0.76	0.02	0.56	0.01
5.50	0.85	0.04	0.65	0.02
6.00	0.95	0.07	0.74	0.02
6.50	1.05	0.10	0.84	0.02
7.00	1.18	0.15	0.97	0.03
7.50	1.32	0.20	1.10	0.03
8.00	1.47	0.27	1.25	0.03
8.50	1.66	0.37	1.43	0.05
9.00	1.92	0.51	1.70	0.07
9.50	2.29	0.75	2.06	**0.11**
10.00	3.89	1.95	3.66	**0.65**
10.50	4.41	2.38	4.17	0.12
11.00	4.71	2.64	4.47	0.08
11.50	4.96	2.85	4.72	0.07
12.00	5.17	3.04	4.93	0.06
12.50	5.36	3.21	5.12	0.06
13.00	5.53	3.36	5.30	0.05
13.50	5.69	3.50	5.45	0.04
14.00	5.82	3.62	5.58	0.04
14.50	5.94	3.73	5.71	0.04
15.00	6.06	3.84	5.82	0.04
15.50	6.18	3.94	5.94	0.03
16.00	6.29	4.04	6.05	0.03
16.50	6.40	4.14	6.16	0.03
17.00	6.50	4.24	6.26	0.03
17.50	6.60	4.33	6.36	0.03
18.00	6.70	4.42	6.46	0.03
18.50	6.79	4.50	6.55	0.03
19.00	6.88	4.58	6.64	0.03
19.50	6.96	4.66	6.73	0.03
20.00	7.05	4.74	6.81	0.02
20.50	7.12	4.81	6.88	0.02
21.00	7.20	4.88	6.96	0.02
21.50	7.27	4.94	7.03	0.02
22.00	7.33	5.00	7.09	0.02
22.50	7.40	5.06	7.16	0.02
23.00	7.45	5.12	7.21	0.02
23.50	7.51	5.17	7.27	0.02
24.00	**7.56**	**5.21**	**7.32**	0.02

Summary for Subcatchment 6S: C-3

[49] Hint: Tc<2dt may require smaller dt

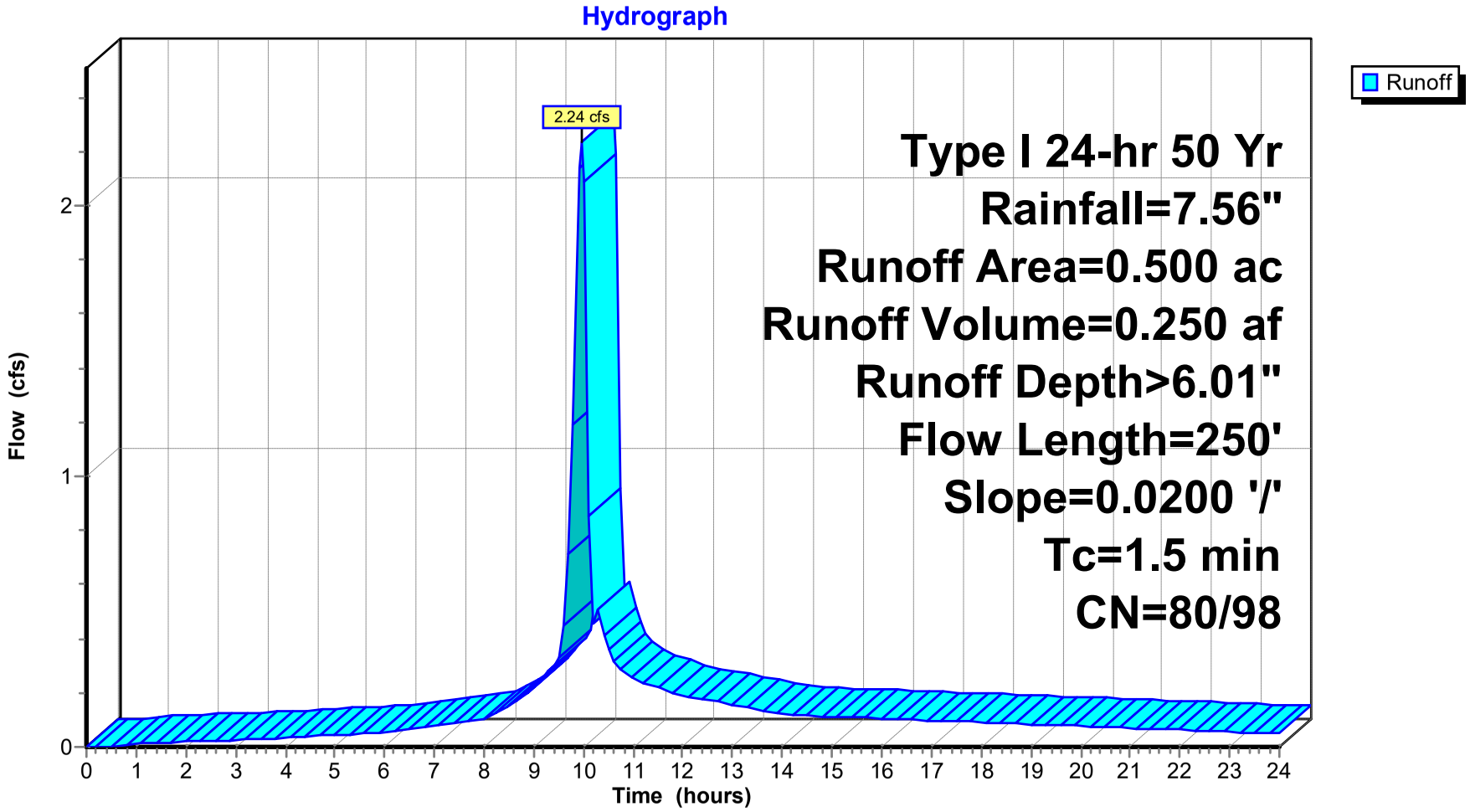
Runoff = 2.24 cfs @ 9.94 hrs, Volume= 0.250 af, Depth> 6.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 50 Yr Rainfall=7.56"

Area (ac)	CN	Description
0.500	87	1/4 acre lots, 38% imp, HSG D
0.310	80	62.00% Pervious Area
0.190	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	250	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps

Subcatchment 6S: C-3



Hydrograph for Subcatchment 6S: C-3

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.07	0.00	0.00	0.00
1.00	0.13	0.00	0.03	0.01
1.50	0.20	0.00	0.07	0.02
2.00	0.26	0.00	0.12	0.02
2.50	0.33	0.00	0.17	0.02
3.00	0.41	0.00	0.24	0.03
3.50	0.49	0.00	0.31	0.03
4.00	0.57	0.00	0.39	0.03
4.50	0.66	0.01	0.47	0.04
5.00	0.76	0.02	0.56	0.04
5.50	0.85	0.04	0.65	0.05
6.00	0.95	0.07	0.74	0.05
6.50	1.05	0.10	0.84	0.07
7.00	1.18	0.15	0.97	0.08
7.50	1.32	0.20	1.10	0.09
8.00	1.47	0.27	1.25	0.10
8.50	1.66	0.37	1.43	0.15
9.00	1.92	0.51	1.70	0.22
9.50	2.29	0.75	2.06	**0.33**
10.00	3.89	1.95	3.66	**2.08**
10.50	4.41	2.38	4.17	0.36
11.00	4.71	2.64	4.47	0.25
11.50	4.96	2.85	4.72	0.22
12.00	5.17	3.04	4.93	0.19
12.50	5.36	3.21	5.12	0.17
13.00	5.53	3.36	5.30	0.16
13.50	5.69	3.50	5.45	0.14
14.00	5.82	3.62	5.58	0.12
14.50	5.94	3.73	5.71	0.11
15.00	6.06	3.84	5.82	0.11
15.50	6.18	3.94	5.94	0.11
16.00	6.29	4.04	6.05	0.10
16.50	6.40	4.14	6.16	0.10
17.00	6.50	4.24	6.26	0.10
17.50	6.60	4.33	6.36	0.09
18.00	6.70	4.42	6.46	0.09
18.50	6.79	4.50	6.55	0.09
19.00	6.88	4.58	6.64	0.08
19.50	6.96	4.66	6.73	0.08
20.00	7.05	4.74	6.81	0.08
20.50	7.12	4.81	6.88	0.07
21.00	7.20	4.88	6.96	0.07
21.50	7.27	4.94	7.03	0.07
22.00	7.33	5.00	7.09	0.06
22.50	7.40	5.06	7.16	0.06
23.00	7.45	5.12	7.21	0.06
23.50	7.51	5.17	7.27	0.05
24.00	**7.56**	**5.21**	**7.32**	0.05

Summary for Subcatchment 9S: D-1

[49] Hint: Tc<2dt may require smaller dt

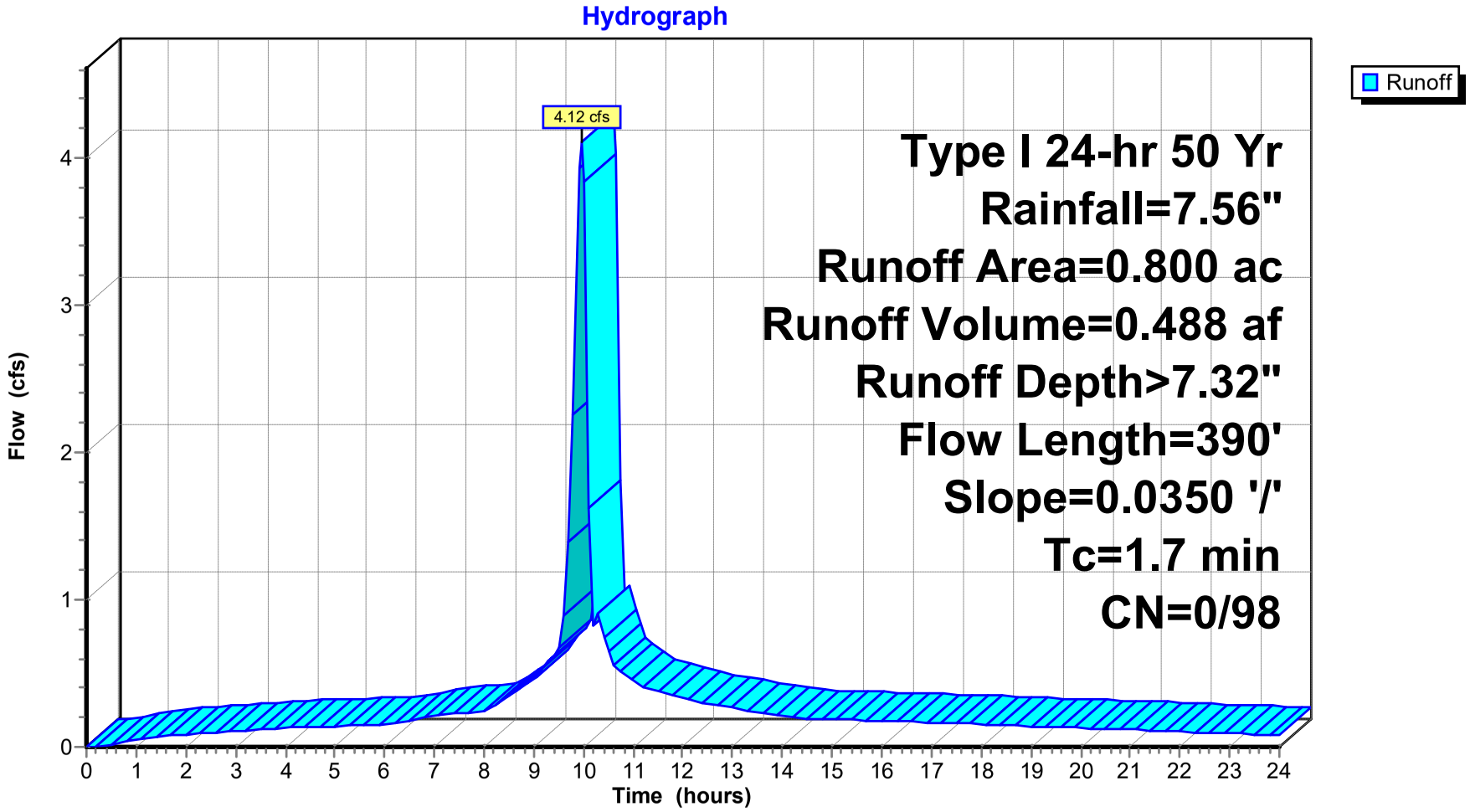
Runoff = 4.12 cfs @ 9.94 hrs, Volume= 0.488 af, Depth> 7.32"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 50 Yr Rainfall=7.56"

Area (ac)	CN	Description
0.800	98	Paved roads w/curbs & sewers, HSG D
0.800	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	390	0.0350	3.80		**Shallow Concentrated Flow, Lower Street Flow** Paved Kv= 20.3 fps

Subcatchment 9S: D-1



Hydrograph for Subcatchment 9S: D-1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	**0.00**	0.00	0.00
0.50	0.07	0.00	0.00	0.01
1.00	0.13	0.00	0.03	0.05
1.50	0.20	0.00	0.07	0.07
2.00	0.26	0.00	0.12	0.08
2.50	0.33	0.00	0.17	0.09
3.00	0.41	0.00	0.24	0.11
3.50	0.49	0.00	0.31	0.12
4.00	0.57	0.00	0.39	0.13
4.50	0.66	0.00	0.47	0.14
5.00	0.76	0.00	0.56	0.14
5.50	0.85	0.00	0.65	0.15
6.00	0.95	0.00	0.74	0.15
6.50	1.05	0.00	0.84	0.18
7.00	1.18	0.00	0.97	0.21
7.50	1.32	0.00	1.10	0.23
8.00	1.47	0.00	1.25	0.24
8.50	1.66	0.00	1.43	0.34
9.00	1.92	0.00	1.70	0.46
9.50	2.29	0.00	2.06	**0.67**
10.00	3.89	0.00	3.66	**3.84**
10.50	4.41	0.00	4.17	0.64
11.00	4.71	0.00	4.47	0.44
11.50	4.96	0.00	4.72	0.38
12.00	5.17	0.00	4.93	0.33
12.50	5.36	0.00	5.12	0.30
13.00	5.53	0.00	5.30	0.27
13.50	5.69	0.00	5.45	0.24
14.00	5.82	0.00	5.58	0.21
14.50	5.94	0.00	5.71	0.20
15.00	6.06	0.00	5.82	0.19
15.50	6.18	0.00	5.94	0.18
16.00	6.29	0.00	6.05	0.18
16.50	6.40	0.00	6.16	0.17
17.00	6.50	0.00	6.26	0.17
17.50	6.60	0.00	6.36	0.16
18.00	6.70	0.00	6.46	0.15
18.50	6.79	0.00	6.55	0.15
19.00	6.88	0.00	6.64	0.14
19.50	6.96	0.00	6.73	0.14
20.00	7.05	0.00	6.81	0.13
20.50	7.12	0.00	6.88	0.12
21.00	7.20	0.00	6.96	0.12
21.50	7.27	0.00	7.03	0.11
22.00	7.33	0.00	7.09	0.10
22.50	7.40	0.00	7.16	0.10
23.00	7.45	0.00	7.21	0.09
23.50	7.51	0.00	7.27	0.09
24.00	**7.56**	0.00	**7.32**	0.08

Summary for Reach 3R: SD-1

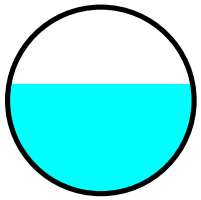
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 4.300 ac, 38.00% Impervious, Inflow Depth > 6.01" for 50 Yr event
Inflow = 18.34 cfs @ 9.97 hrs, Volume= 2.153 af
Outflow = 18.06 cfs @ 9.98 hrs, Volume= 2.152 af, Atten= 2%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Max. Velocity= 9.53 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 3.89 fps, Avg. Travel Time= 1.2 min

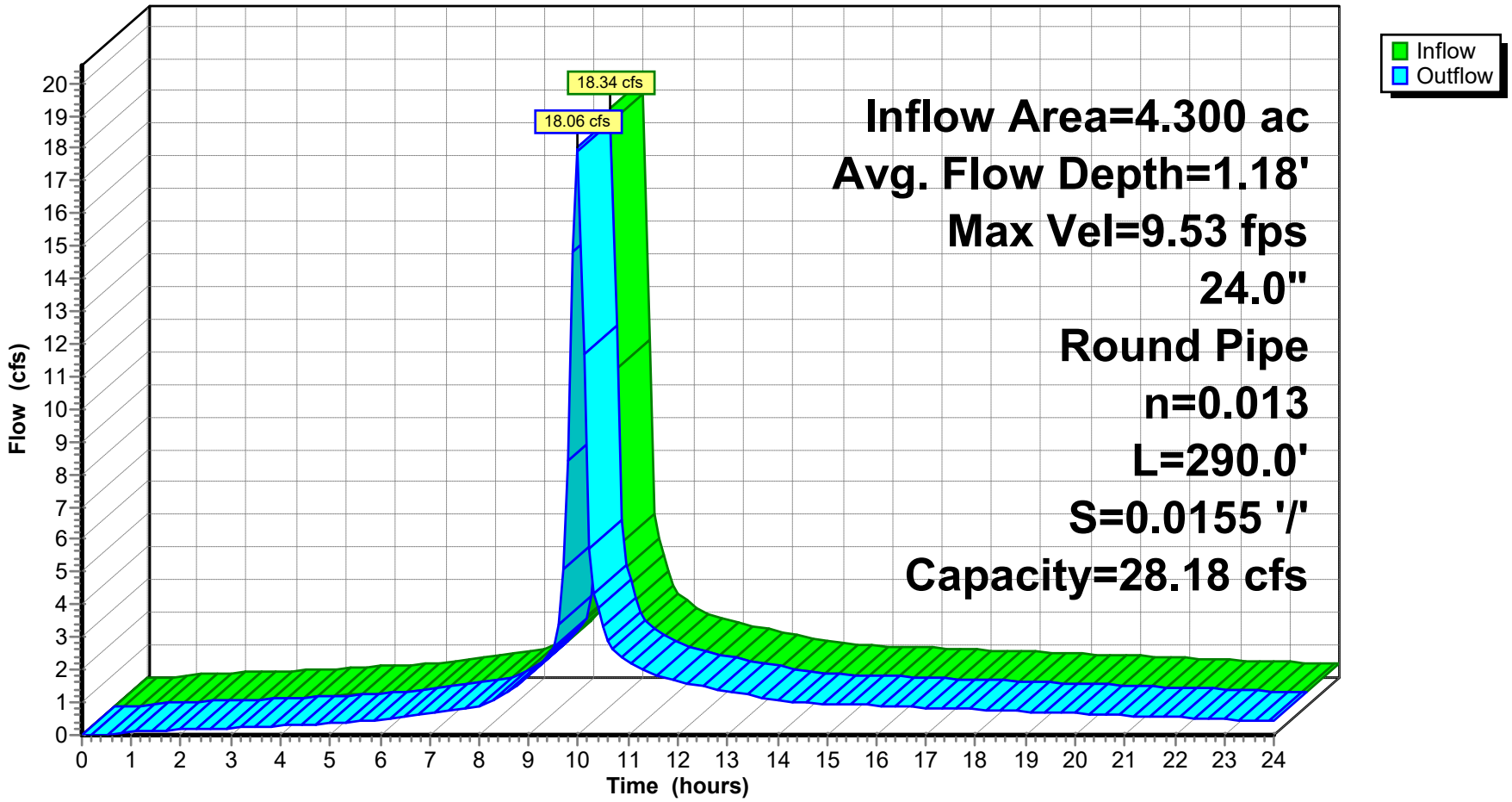
Peak Storage= 558 cf @ 9.98 hrs
Average Depth at Peak Storage= 1.18'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 28.18 cfs

24.0" Round Pipe
n= 0.013
Length= 290.0' Slope= 0.0155 '/'
Inlet Invert= 158.50', Outlet Invert= 154.00'

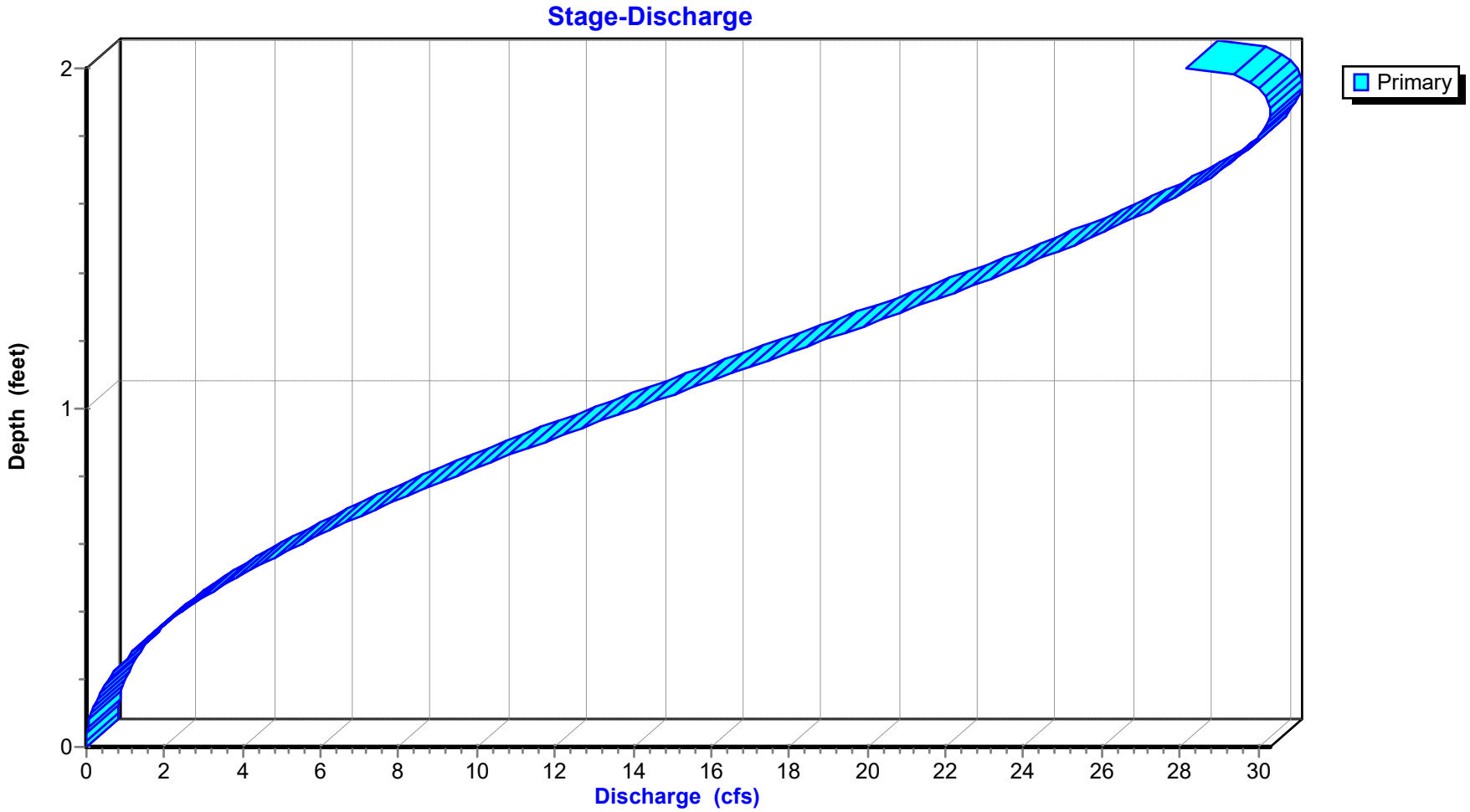


Reach 3R: SD-1

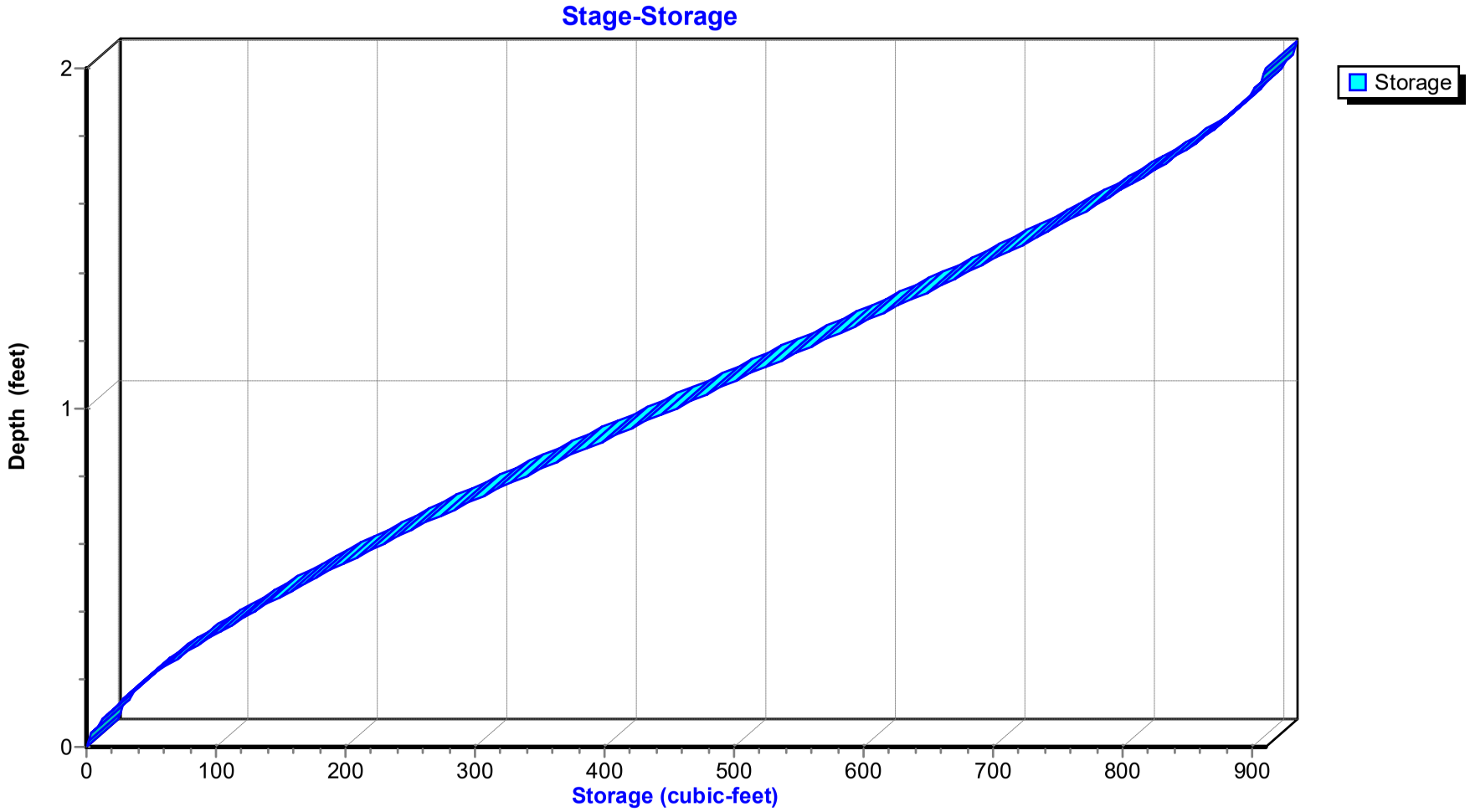
Hydrograph



Reach 3R: SD-1


Stage-Discharge
Primary
Depth (feet)
0
1
2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Discharge (cfs)

Reach 3R: SD-1


Stage-Storage
Storage
Depth (feet)
0
1
2
0
100
200
300
400
500
600
700
800
900
Storage (cubic-feet)

Hydrograph for Reach 3R: SD-1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	158.50	0.00
0.50	0.02	3	158.53	0.01
1.00	0.10	14	158.59	0.10
1.50	0.14	18	158.60	0.14
2.00	0.17	19	158.61	0.16
2.50	0.19	22	158.62	0.19
3.00	0.22	24	158.62	0.22
3.50	0.24	25	158.63	0.24
4.00	0.28	28	158.64	0.28
4.50	0.33	31	158.65	0.33
5.00	0.37	34	158.66	0.37
5.50	0.41	37	158.67	0.41
6.00	0.45	39	158.67	0.44
6.50	0.55	45	158.69	0.55
7.00	0.69	53	158.72	0.69
7.50	0.78	58	158.73	0.78
8.00	0.86	62	158.74	0.85
8.50	1.28	81	158.79	1.26
9.00	1.82	104	158.84	1.80
9.50	2.77	140	158.92	2.73
10.00	**17.93**	**553**	**159.67**	**17.93**
10.50	3.25	158	158.96	3.32
11.00	2.20	120	158.88	2.23
11.50	1.89	107	158.85	1.90
12.00	1.65	98	158.83	1.66
12.50	1.49	91	158.81	1.50
13.00	1.34	85	158.80	1.35
13.50	1.19	78	158.78	1.20
14.00	1.04	71	158.76	1.05
14.50	0.99	68	158.76	0.99
15.00	0.96	67	158.75	0.96
15.50	0.93	65	158.75	0.93
16.00	0.90	64	158.75	0.90
16.50	0.87	63	158.74	0.87
17.00	0.84	61	158.74	0.84
17.50	0.81	59	158.73	0.81
18.00	0.78	58	158.73	0.78
18.50	0.75	56	158.72	0.75
19.00	0.72	55	158.72	0.72
19.50	0.69	53	158.72	0.69
20.00	0.66	51	158.71	0.66
20.50	0.63	50	158.71	0.63
21.00	0.60	48	158.70	0.60
21.50	0.57	46	158.70	0.57
22.00	0.54	45	158.69	0.54
22.50	0.51	43	158.69	0.51
23.00	0.48	41	158.68	0.48
23.50	0.45	39	158.68	0.45
24.00	0.41	37	158.67	0.42

Stage-Discharge for Reach 3R: SD-1

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)	Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)	Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
158.50	0.00	0.00	159.20	7.56	7.41	159.90	10.04	23.59
158.52	0.80	0.00	159.22	7.67	7.81	159.92	10.07	24.03
158.54	1.26	0.02	159.24	7.78	8.22	159.94	10.10	24.46
158.56	1.65	0.05	159.26	7.89	8.64	159.96	10.13	24.88
158.58	1.99	0.08	159.28	7.99	9.07	159.98	10.15	25.29
158.60	2.30	0.14	159.30	8.09	9.50	160.00	10.17	25.70
158.62	2.59	0.20	159.32	8.19	9.93	160.02	10.18	26.09
158.64	2.87	0.28	159.34	8.29	10.38	160.04	10.20	26.47
158.66	3.12	0.37	159.36	8.38	10.83	160.06	10.21	26.84
158.68	3.37	0.47	159.38	8.47	11.28	160.08	10.22	27.20
158.70	3.60	0.59	159.40	8.56	11.74	160.10	10.22	27.55
158.72	3.82	0.72	159.42	8.65	12.20	160.12	**10.23**	27.88
158.74	4.04	0.86	159.44	8.73	12.67	160.14	10.23	28.19
158.76	4.24	1.02	159.46	8.81	13.14	160.16	10.22	28.49
158.78	4.44	1.19	159.48	8.89	13.61	160.18	10.21	28.77
158.80	4.64	1.37	159.50	8.97	14.09	160.20	10.20	29.04
158.82	4.82	1.56	159.52	9.05	14.57	160.22	10.19	29.28
158.84	5.00	1.77	159.54	9.12	15.05	160.24	10.17	29.51
158.86	5.18	1.99	159.56	9.19	15.53	160.26	10.15	29.71
158.88	5.35	2.22	159.58	9.26	16.02	160.28	10.12	29.88
158.90	5.52	2.47	159.60	9.32	16.51	160.30	10.09	30.03
158.92	5.68	2.72	159.62	9.39	16.99	160.32	10.05	30.16
158.94	5.84	2.99	159.64	9.45	17.48	160.34	10.00	30.25
158.96	5.99	3.27	159.66	9.51	17.96	160.36	9.95	30.30
158.98	6.14	3.56	159.68	9.56	18.45	160.38	9.89	**30.31**
159.00	6.29	3.86	159.70	9.62	18.93	160.40	9.82	30.28
159.02	6.43	4.17	159.72	9.67	19.41	160.42	9.74	30.19
159.04	6.57	4.49	159.74	9.72	19.89	160.44	9.64	30.03
159.06	6.70	4.83	159.76	9.77	20.37	160.46	9.52	29.78
159.08	6.83	5.17	159.78	9.82	20.85	160.48	9.36	29.36
159.10	6.96	5.52	159.80	9.86	21.32	160.50	8.97	28.18
159.12	7.09	5.88	159.82	9.90	21.78			
159.14	7.21	6.25	159.84	9.94	22.24			
159.16	7.33	6.63	159.86	9.98	22.70			
159.18	7.45	7.01	159.88	10.01	23.15			

Stage-Area-Storage for Reach 3R: SD-1

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
158.50	0.0	0	159.20	1.0	284	159.90	2.3	681
158.52	0.0	2	159.22	1.0	295	159.92	2.4	692
158.54	0.0	4	159.24	1.1	306	159.94	2.4	702
158.56	0.0	8	159.26	1.1	318	159.96	2.5	713
158.58	0.0	12	159.28	1.1	329	159.98	2.5	723
158.60	0.1	17	159.30	1.2	340	160.00	2.5	733
158.62	0.1	22	159.32	1.2	352	160.02	2.6	743
158.64	0.1	28	159.34	1.3	363	160.04	2.6	753
158.66	0.1	34	159.36	1.3	375	160.06	2.6	762
158.68	0.1	41	159.38	1.3	386	160.08	2.7	772
158.70	0.2	47	159.40	1.4	398	160.10	2.7	781
158.72	0.2	55	159.42	1.4	409	160.12	2.7	791
158.74	0.2	62	159.44	1.5	421	160.14	2.8	800
158.76	0.2	70	159.46	1.5	432	160.16	2.8	808
158.78	0.3	78	159.48	1.5	444	160.18	2.8	817
158.80	0.3	86	159.50	1.6	456	160.20	2.8	825
158.82	0.3	94	159.52	1.6	467	160.22	2.9	834
158.84	0.4	103	159.54	1.7	479	160.24	2.9	841
158.86	0.4	112	159.56	1.7	490	160.26	2.9	849
158.88	0.4	121	159.58	1.7	502	160.28	3.0	857
158.90	0.4	130	159.60	1.8	513	160.30	3.0	864
158.92	0.5	139	159.62	1.8	525	160.32	3.0	870
158.94	0.5	149	159.64	1.8	536	160.34	3.0	877
158.96	0.5	158	159.66	1.9	548	160.36	3.0	883
158.98	0.6	168	159.68	1.9	559	160.38	3.1	889
159.00	0.6	178	159.70	2.0	571	160.40	3.1	894
159.02	0.6	188	159.72	2.0	582	160.42	3.1	899
159.04	0.7	198	159.74	2.0	593	160.44	3.1	903
159.06	0.7	209	159.76	2.1	605	160.46	3.1	907
159.08	0.8	219	159.78	2.1	616	160.48	3.1	910
159.10	0.8	230	159.80	2.2	627	160.50	**3.1**	**911**
159.12	0.8	241	159.82	2.2	638			
159.14	0.9	251	159.84	2.2	649			
159.16	0.9	262	159.86	2.3	660			
159.18	0.9	273	159.88	2.3	671			

Summary for Reach 7R: SD-2

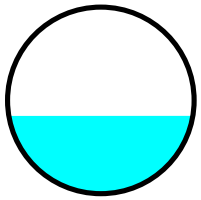
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 1.710 ac, 38.00% Impervious, Inflow Depth > 6.01" for 50 Yr event
Inflow = 7.58 cfs @ 9.95 hrs, Volume= 0.857 af
Outflow = 7.55 cfs @ 9.96 hrs, Volume= 0.856 af, Atten= 0%, Lag= 0.3 min

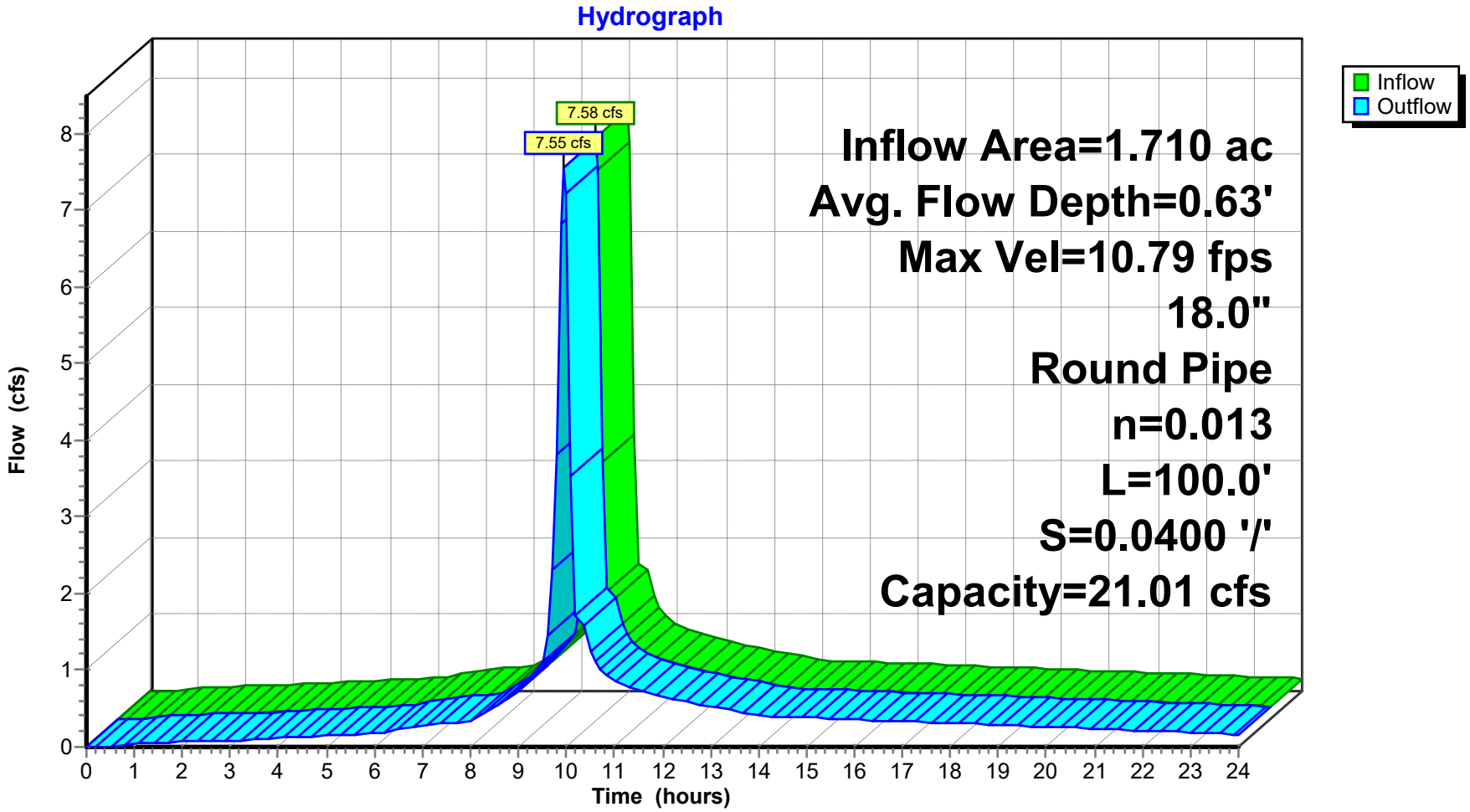
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Max. Velocity= 10.79 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 4.28 fps, Avg. Travel Time= 0.4 min

Peak Storage= 70 cf @ 9.96 hrs
Average Depth at Peak Storage= 0.63'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 21.01 cfs

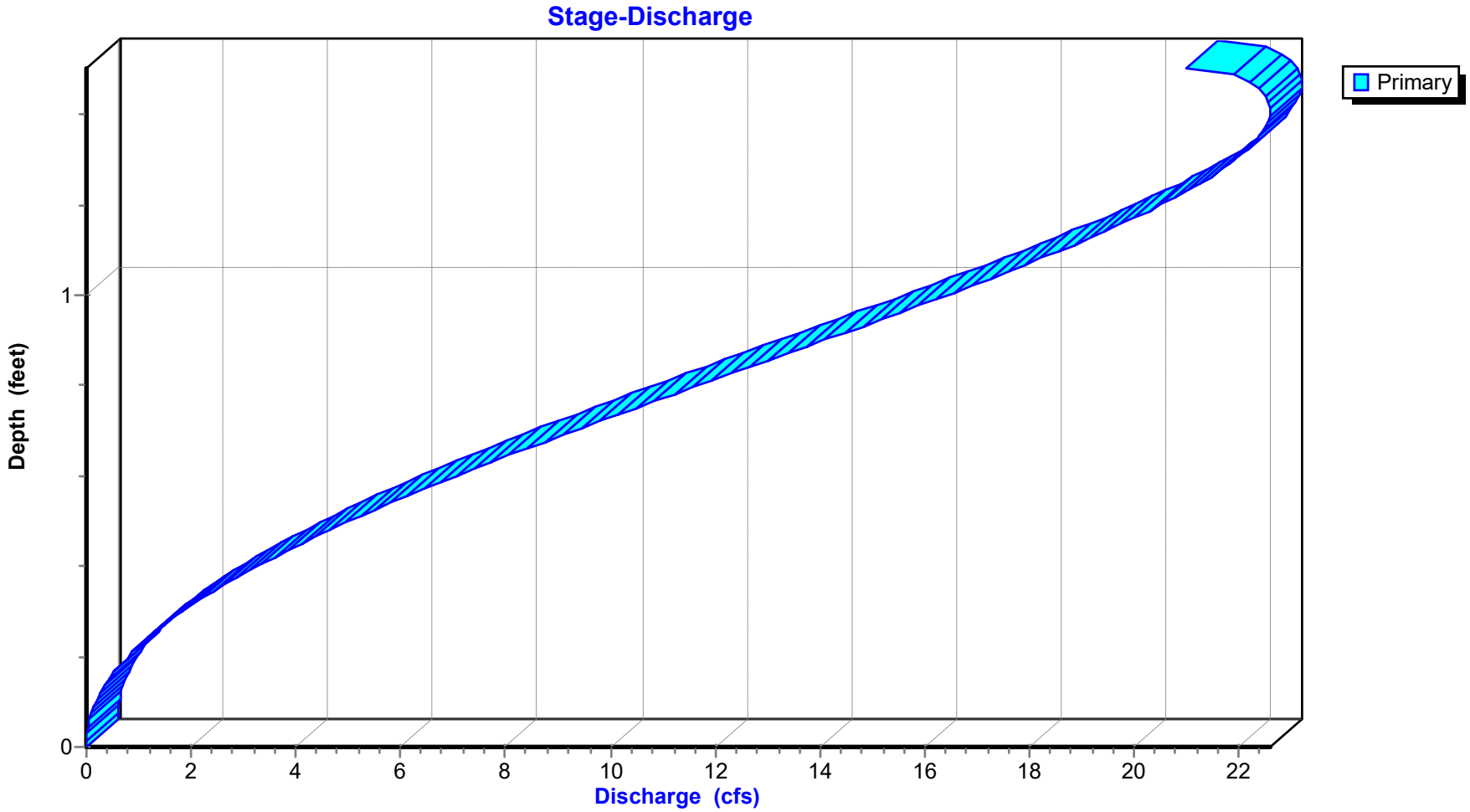
18.0" Round Pipe
n= 0.013
Length= 100.0' Slope= 0.0400 '/'
Inlet Invert= 158.00', Outlet Invert= 154.00'



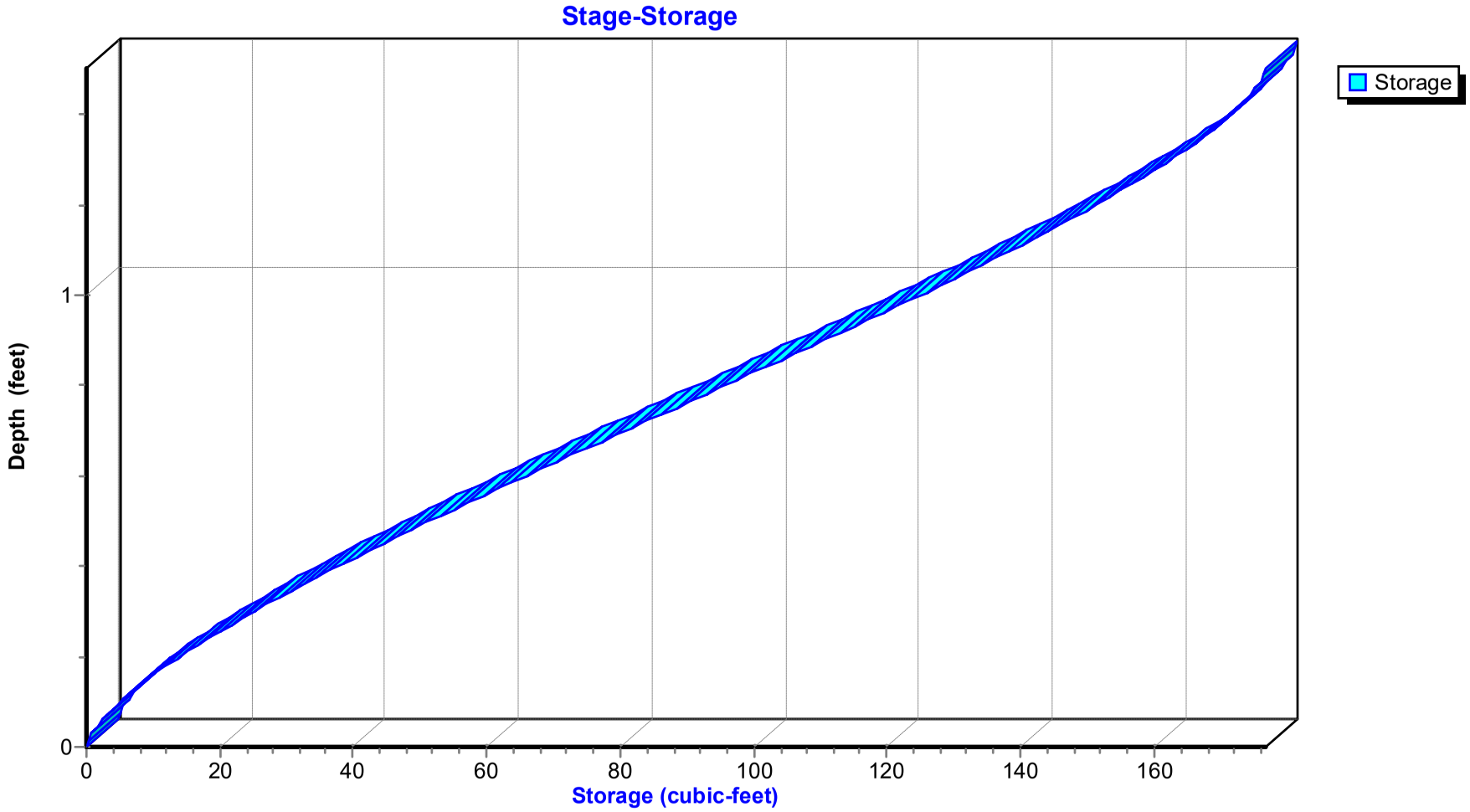
Reach 7R: SD-2


Hydrograph
Inflow
Outflow
7.58 cfs
7.55 cfs
Inflow Area=1.710 ac
Avg. Flow Depth=0.63'
Max Vel=10.79 fps
18.0"
Round Pipe
n=0.013
L=100.0'
S=0.0400 '/'
Capacity=21.01 cfs
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Reach 7R: SD-2


Stage-Discharge
Primary
Depth (feet)
0
1
0
2
4
6
8
10
12
14
16
18
20
22
Discharge (cfs)

Reach 7R: SD-2


Stage-Storage
Storage
Depth (feet)
0
1
0
20
40
60
80
100
120
140
160
Storage (cubic-feet)

Hydrograph for Reach 7R: SD-2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	158.00	0.00
0.50	0.01	1	158.02	0.01
1.00	0.04	2	158.05	0.04
1.50	0.06	2	158.06	0.06
2.00	0.07	2	158.06	0.07
2.50	0.08	3	158.07	0.08
3.00	0.09	3	158.07	0.09
3.50	0.10	3	158.07	0.10
4.00	0.11	4	158.08	0.11
4.50	0.13	4	158.08	0.13
5.00	0.15	4	158.09	0.15
5.50	0.16	5	158.09	0.16
6.00	0.18	5	158.10	0.18
6.50	0.22	6	158.11	0.22
7.00	0.28	7	158.12	0.28
7.50	0.31	7	158.13	0.31
8.00	0.34	8	158.13	0.34
8.50	0.52	10	158.16	0.52
9.00	0.73	13	158.19	0.73
9.50	1.12	18	158.23	1.11
10.00	**7.16**	**67**	**158.61**	**7.22**
10.50	1.26	19	158.25	1.26
11.00	0.86	15	158.21	0.87
11.50	0.75	13	158.19	0.74
12.00	0.65	12	158.18	0.66
12.50	0.59	11	158.17	0.59
13.00	0.53	11	158.16	0.53
13.50	0.47	10	158.16	0.47
14.00	0.41	9	158.15	0.41
14.50	0.39	9	158.14	0.39
15.00	0.38	8	158.14	0.38
15.50	0.37	8	158.14	0.37
16.00	0.36	8	158.14	0.36
16.50	0.35	8	158.13	0.35
17.00	0.33	8	158.13	0.34
17.50	0.32	7	158.13	0.32
18.00	0.31	7	158.13	0.31
18.50	0.30	7	158.12	0.30
19.00	0.29	7	158.12	0.29
19.50	0.27	7	158.12	0.28
20.00	0.26	6	158.12	0.26
20.50	0.25	6	158.11	0.25
21.00	0.24	6	158.11	0.24
21.50	0.23	6	158.11	0.23
22.00	0.21	6	158.11	0.21
22.50	0.20	5	158.10	0.20
23.00	0.19	5	158.10	0.19
23.50	0.18	5	158.10	0.18
24.00	0.16	5	158.09	0.16

Stage-Discharge for Reach 7R: SD-2

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
158.00	0.00	0.00
158.02	1.26	0.01
158.04	2.02	0.03
158.06	2.64	0.06
158.08	3.18	0.12
158.10	3.68	0.19
158.12	4.14	0.27
158.14	4.56	0.38
158.16	4.97	0.50
158.18	5.35	0.64
158.20	5.71	0.80
158.22	6.06	0.98
158.24	6.39	1.17
158.26	6.71	1.38
158.28	7.02	1.60
158.30	7.31	1.84
158.32	7.60	2.10
158.34	7.87	2.37
158.36	8.14	2.65
158.38	8.39	2.96
158.40	8.64	3.27
158.42	8.88	3.60
158.44	9.11	3.94
158.46	9.34	4.29
158.48	9.56	4.66
158.50	9.77	5.04
158.52	9.97	5.43
158.54	10.17	5.82
158.56	10.36	6.23
158.58	10.55	6.65
158.60	10.73	7.08
158.62	10.90	7.52
158.64	11.07	7.96
158.66	11.23	8.41
158.68	11.38	8.87
158.70	11.53	9.33
158.72	11.68	9.80
158.74	11.82	10.27
158.76	11.95	10.74
158.78	12.08	11.22
158.80	12.21	11.70
158.82	12.33	12.18
158.84	12.44	12.67
158.86	12.55	13.15
158.88	12.65	13.63
158.90	12.75	14.11
158.92	12.84	14.59
158.94	12.93	15.07
158.96	13.01	15.54
158.98	13.09	16.01
159.00	13.16	16.47
159.02	13.22	16.92
159.04	13.28	17.37
159.06	13.34	17.81
159.08	13.39	18.24
159.10	13.43	18.65
159.12	13.47	19.06
159.14	13.50	19.45
159.16	13.52	19.83
159.18	13.54	20.19
159.20	13.55	20.54
159.22	**13.55**	20.86
159.24	13.55	21.17
159.26	13.54	21.45
159.28	13.52	21.71
159.30	13.49	21.94
159.32	13.45	22.15
159.34	13.40	22.32
159.36	13.33	22.45
159.38	13.26	22.55
159.40	13.16	**22.59**
159.42	13.05	**22.58**
159.44	12.91	22.51
159.46	12.73	22.33
159.48	12.48	21.99
159.50	11.89	21.01

Stage-Area-Storage for Reach 7R: SD-2

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
158.00	0.0	0	158.70	0.8	81	159.40	1.7	172
158.02	0.0	0	158.72	0.8	84	159.42	1.7	173
158.04	0.0	1	158.74	0.9	87	159.44	1.7	174
158.06	0.0	2	158.76	0.9	90	159.46	1.8	175
158.08	0.0	4	158.78	0.9	93	159.48	1.8	176
158.10	0.1	5	158.80	1.0	96	159.50	**1.8**	**177**
158.12	0.1	7	158.82	1.0	99			
158.14	0.1	8	158.84	1.0	102			
158.16	0.1	10	158.86	1.0	105			
158.18	0.1	12	158.88	1.1	108			
158.20	0.1	14	158.90	1.1	111			
158.22	0.2	16	158.92	1.1	114			
158.24	0.2	18	158.94	1.2	117			
158.26	0.2	20	158.96	1.2	119			
158.28	0.2	23	158.98	1.2	122			
158.30	0.3	25	159.00	1.3	125			
158.32	0.3	28	159.02	1.3	128			
158.34	0.3	30	159.04	1.3	131			
158.36	0.3	33	159.06	1.3	133			
158.38	0.4	35	159.08	1.4	136			
158.40	0.4	38	159.10	1.4	139			
158.42	0.4	41	159.12	1.4	142			
158.44	0.4	43	159.14	1.4	144			
158.46	0.5	46	159.16	1.5	147			
158.48	0.5	49	159.18	1.5	149			
158.50	0.5	52	159.20	1.5	152			
158.52	0.5	54	159.22	1.5	154			
158.54	0.6	57	159.24	1.6	156			
158.56	0.6	60	159.26	1.6	158			
158.58	0.6	63	159.28	1.6	161			
158.60	0.7	66	159.30	1.6	163			
158.62	0.7	69	159.32	1.6	165			
158.64	0.7	72	159.34	1.7	167			
158.66	0.7	75	159.36	1.7	168			
158.68	0.8	78	159.38	1.7	170			

Summary for Reach 10R: SD-3

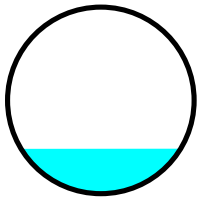
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 0.800 ac,100.00% Impervious, Inflow Depth > 7.32" for 50 Yr event
Inflow = 4.12 cfs @ 9.94 hrs, Volume= 0.488 af
Outflow = 4.10 cfs @ 9.95 hrs, Volume= 0.488 af, Atten= 0%, Lag= 0.2 min

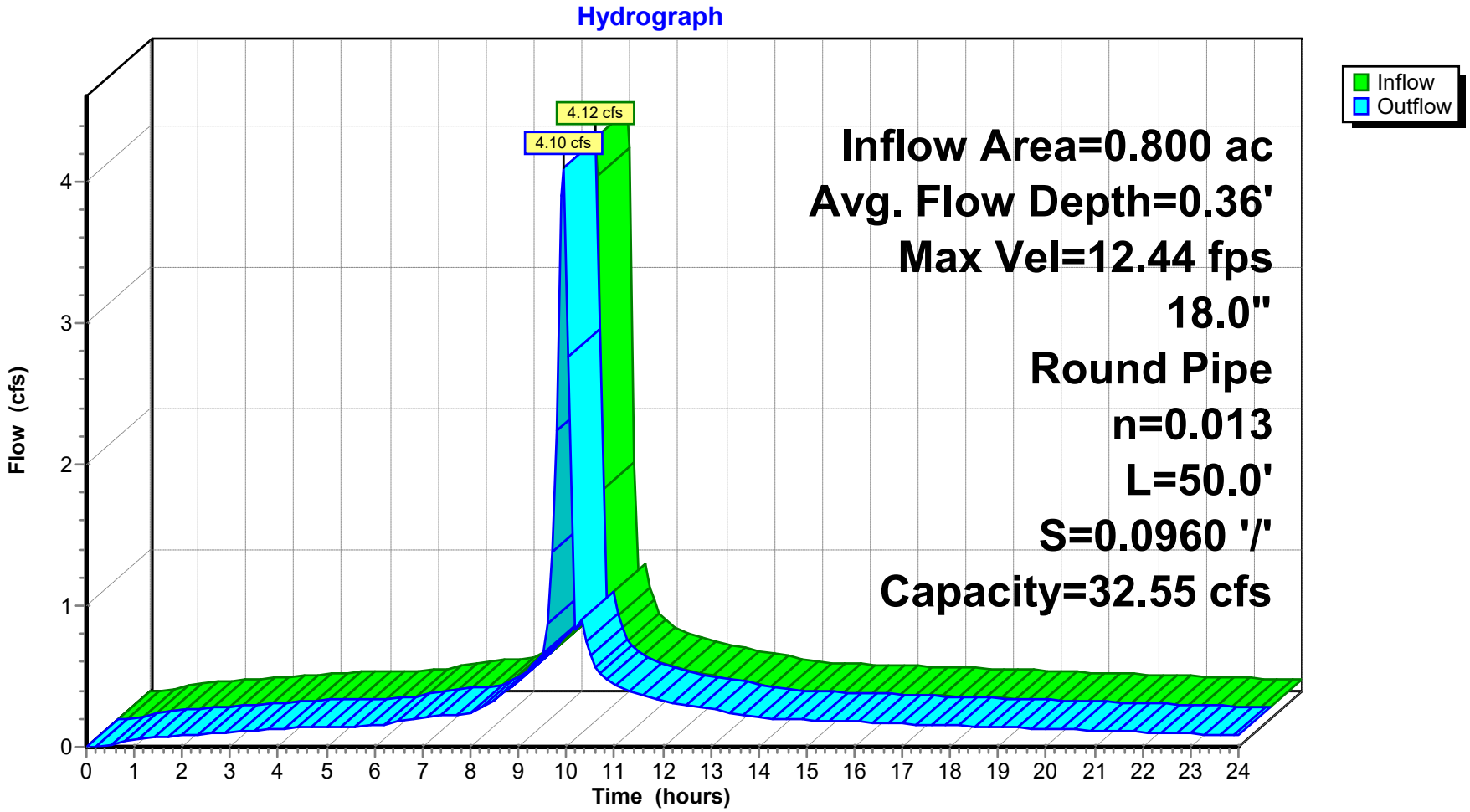
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Max. Velocity= 12.44 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 5.01 fps, Avg. Travel Time= 0.2 min

Peak Storage= 16 cf @ 9.95 hrs
Average Depth at Peak Storage= 0.36'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 32.55 cfs

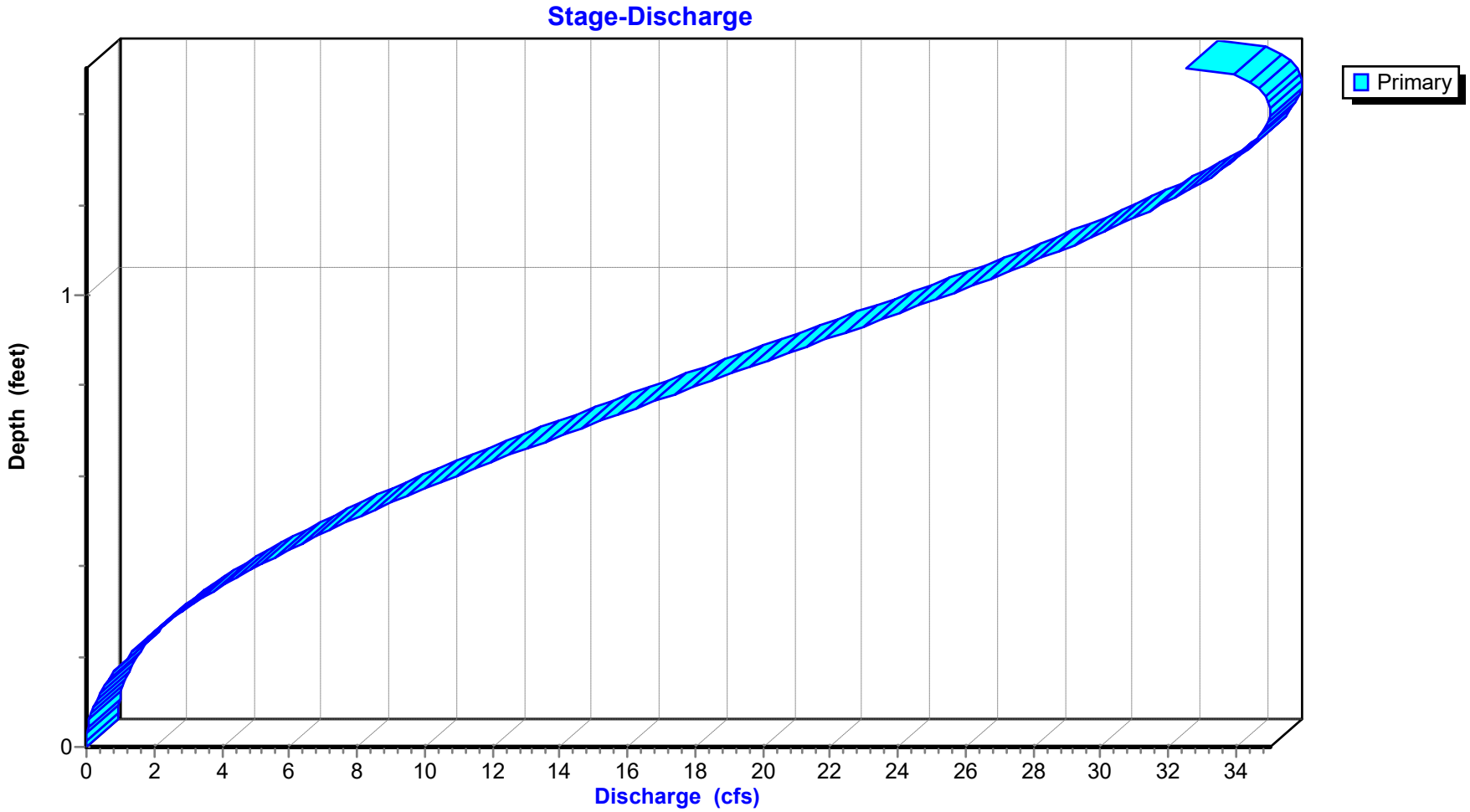
18.0" Round Pipe
n= 0.013
Length= 50.0' Slope= 0.0960 '/'
Inlet Invert= 144.80', Outlet Invert= 140.00'



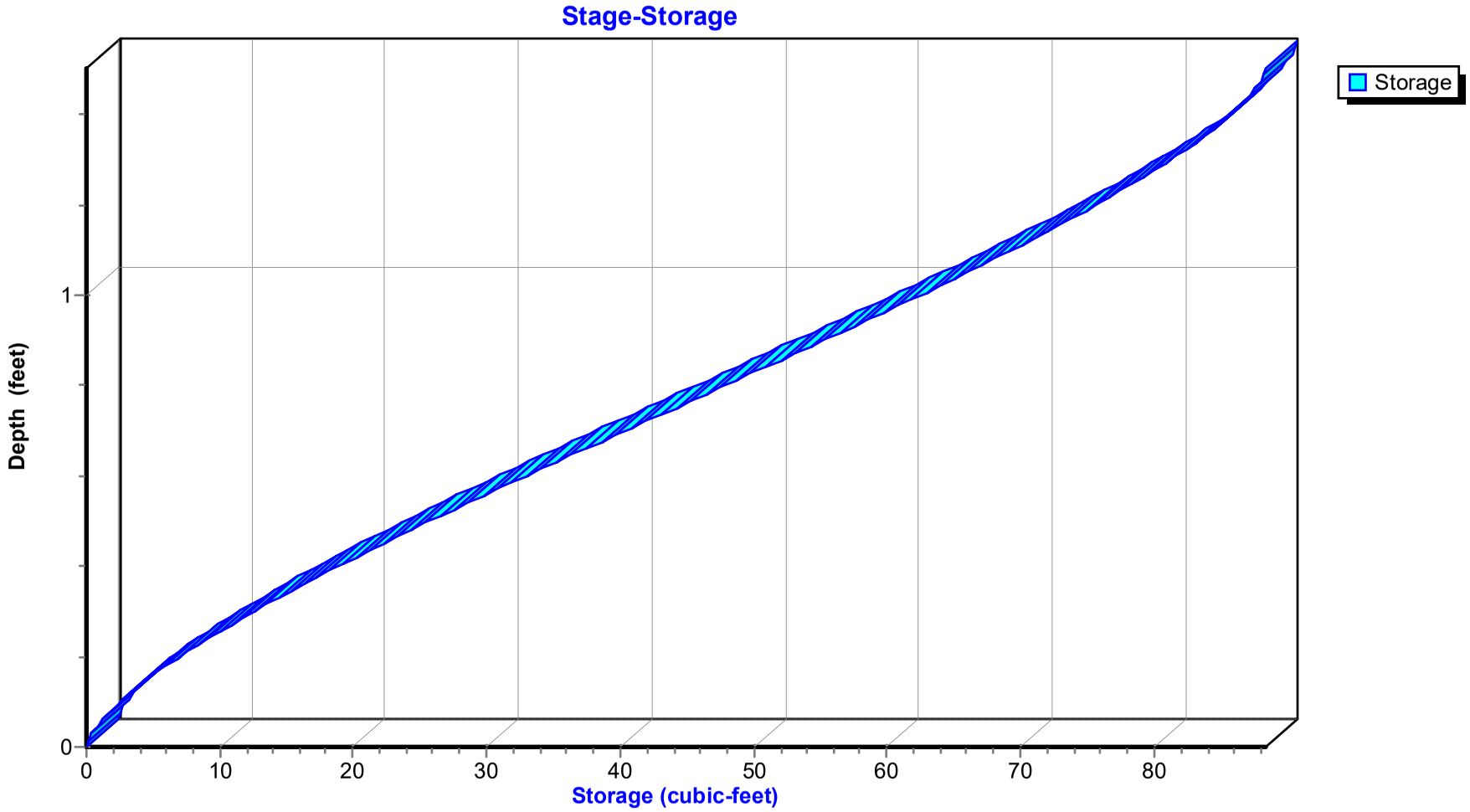
Reach 10R: SD-3



Reach 10R: SD-3



Reach 10R: SD-3



Hydrograph for Reach 10R: SD-3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	144.80	0.00
0.50	0.01	0	144.82	0.01
1.00	0.05	1	144.84	0.05
1.50	0.07	1	144.85	0.07
2.00	0.08	1	144.85	0.08
2.50	0.09	1	144.86	0.09
3.00	0.11	1	144.86	0.11
3.50	0.12	1	144.87	0.12
4.00	0.13	1	144.87	0.13
4.50	0.14	1	144.87	0.14
5.00	0.14	2	144.87	0.14
5.50	0.15	2	144.87	0.15
6.00	0.15	2	144.87	0.15
6.50	0.18	2	144.88	0.18
7.00	0.21	2	144.89	0.21
7.50	0.23	2	144.89	0.23
8.00	0.24	2	144.89	0.24
8.50	0.34	3	144.91	0.34
9.00	0.46	4	144.92	0.46
9.50	**0.67**	**5**	**144.95**	**0.67**
10.00	**3.84**	**16**	**145.15**	**3.86**
10.50	0.64	4	144.95	0.64
11.00	0.44	3	144.92	0.44
11.50	0.38	3	144.91	0.38
12.00	0.33	3	144.91	0.33
12.50	0.30	3	144.90	0.30
13.00	0.27	2	144.90	0.27
13.50	0.24	2	144.89	0.24
14.00	0.21	2	144.89	0.21
14.50	0.20	2	144.88	0.20
15.00	0.19	2	144.88	0.19
15.50	0.18	2	144.88	0.18
16.00	0.18	2	144.88	0.18
16.50	0.17	2	144.88	0.17
17.00	0.17	2	144.88	0.17
17.50	0.16	2	144.88	0.16
18.00	0.15	2	144.87	0.15
18.50	0.15	2	144.87	0.15
19.00	0.14	2	144.87	0.14
19.50	0.14	1	144.87	0.14
20.00	0.13	1	144.87	0.13
20.50	0.12	1	144.87	0.12
21.00	0.12	1	144.87	0.12
21.50	0.11	1	144.86	0.11
22.00	0.10	1	144.86	0.10
22.50	0.10	1	144.86	0.10
23.00	0.09	1	144.86	0.09
23.50	0.09	1	144.86	0.09
24.00	0.08	1	144.85	0.08

Stage-Discharge for Reach 10R: SD-3

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)	Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)	Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
144.80	0.00	0.00	145.50	17.87	14.45	146.20	20.39	**35.00**
144.82	1.96	0.01	145.52	18.10	15.17	146.22	20.21	**34.98**
144.84	3.12	0.04	145.54	18.31	15.91	146.24	20.00	34.87
144.86	4.09	0.10	145.56	18.52	16.64	146.26	19.72	34.59
144.88	4.93	0.18	145.58	18.72	17.38	146.28	19.33	34.07
144.90	5.70	0.29	145.60	18.91	18.13	146.30	18.42	32.55
144.92	6.41	0.42	145.62	19.10	18.88			
144.94	7.07	0.59	145.64	19.27	19.62			
144.96	7.69	0.78	145.66	19.44	20.37			
144.98	8.29	1.00	145.68	19.60	21.12			
145.00	8.85	1.24	145.70	19.75	21.87			
145.02	9.39	1.51	145.72	19.89	22.61			
145.04	9.90	1.81	145.74	20.03	23.34			
145.06	10.39	2.13	145.76	20.16	24.08			
145.08	10.87	2.48	145.78	20.27	24.80			
145.10	11.33	2.85	145.80	20.38	25.51			
145.12	11.77	3.25	145.82	20.49	26.22			
145.14	12.19	3.67	145.84	20.58	26.91			
145.16	12.61	4.11	145.86	20.66	27.59			
145.18	13.00	4.58	145.88	20.74	28.25			
145.20	13.39	5.07	145.90	20.81	28.90			
145.22	13.76	5.57	145.92	20.86	29.52			
145.24	14.12	6.10	145.94	20.91	30.13			
145.26	14.47	6.65	145.96	20.95	30.72			
145.28	14.80	7.22	145.98	20.97	31.28			
145.30	15.13	7.80	146.00	20.99	31.81			
145.32	15.45	8.41	146.02	**21.00**	32.32			
145.34	15.75	9.02	146.04	20.99	32.79			
145.36	16.05	9.66	146.06	20.97	33.23			
145.38	16.34	10.31	146.08	20.94	33.63			
145.40	16.62	10.97	146.10	20.89	33.99			
145.42	16.88	11.64	146.12	20.83	34.31			
145.44	17.14	12.33	146.14	20.75	34.57			
145.46	17.39	13.03	146.16	20.65	34.78			
145.48	17.64	13.73	146.18	20.54	34.93			

Stage-Area-Storage for Reach 10R: SD-3

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
144.80	0.0	0	145.50	0.8	40	146.20	1.7	86
144.82	0.0	0	145.52	0.8	42	146.22	1.7	87
144.84	0.0	1	145.54	0.9	43	146.24	1.7	87
144.86	0.0	1	145.56	0.9	45	146.26	1.8	88
144.88	0.0	2	145.58	0.9	46	146.28	1.8	88
144.90	0.1	3	145.60	1.0	48	146.30	**1.8**	**88**
144.92	0.1	3	145.62	1.0	49			
144.94	0.1	4	145.64	1.0	51			
144.96	0.1	5	145.66	1.0	52			
144.98	0.1	6	145.68	1.1	54			
145.00	0.1	7	145.70	1.1	55			
145.02	0.2	8	145.72	1.1	57			
145.04	0.2	9	145.74	1.2	58			
145.06	0.2	10	145.76	1.2	60			
145.08	0.2	11	145.78	1.2	61			
145.10	0.3	13	145.80	1.3	63			
145.12	0.3	14	145.82	1.3	64			
145.14	0.3	15	145.84	1.3	65			
145.16	0.3	16	145.86	1.3	67			
145.18	0.4	18	145.88	1.4	68			
145.20	0.4	19	145.90	1.4	69			
145.22	0.4	20	145.92	1.4	71			
145.24	0.4	22	145.94	1.4	72			
145.26	0.5	23	145.96	1.5	73			
145.28	0.5	24	145.98	1.5	75			
145.30	0.5	26	146.00	1.5	76			
145.32	0.5	27	146.02	1.5	77			
145.34	0.6	29	146.04	1.6	78			
145.36	0.6	30	146.06	1.6	79			
145.38	0.6	32	146.08	1.6	80			
145.40	0.7	33	146.10	1.6	81			
145.42	0.7	34	146.12	1.6	82			
145.44	0.7	36	146.14	1.7	83			
145.46	0.7	37	146.16	1.7	84			
145.48	0.8	39	146.18	1.7	85			

Summary for Pond 8P: Detention Basin 2

[62] Hint: Exceeded Reach 3R OUTLET depth by 2.54' @ 10.50 hrs
[62] Hint: Exceeded Reach 7R OUTLET depth by 2.76' @ 10.50 hrs

Inflow Area = 6.010 ac, 38.00% Impervious, Inflow Depth > 6.01" for 50 Yr event
Inflow = 25.53 cfs @ 9.98 hrs, Volume= 3.009 af
Outflow = 5.10 cfs @ 9.70 hrs, Volume= 3.007 af, Atten= 80%, Lag= 0.0 min
Primary = 5.10 cfs @ 9.70 hrs, Volume= 3.007 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 157.01' @ 10.43 hrs Surf.Area= 0.214 ac Storage= 0.505 af

Plug-Flow detention time= 20.5 min calculated for 3.007 af (100% of inflow)
Center-of-Mass det. time= 20.1 min (751.7 - 731.6)

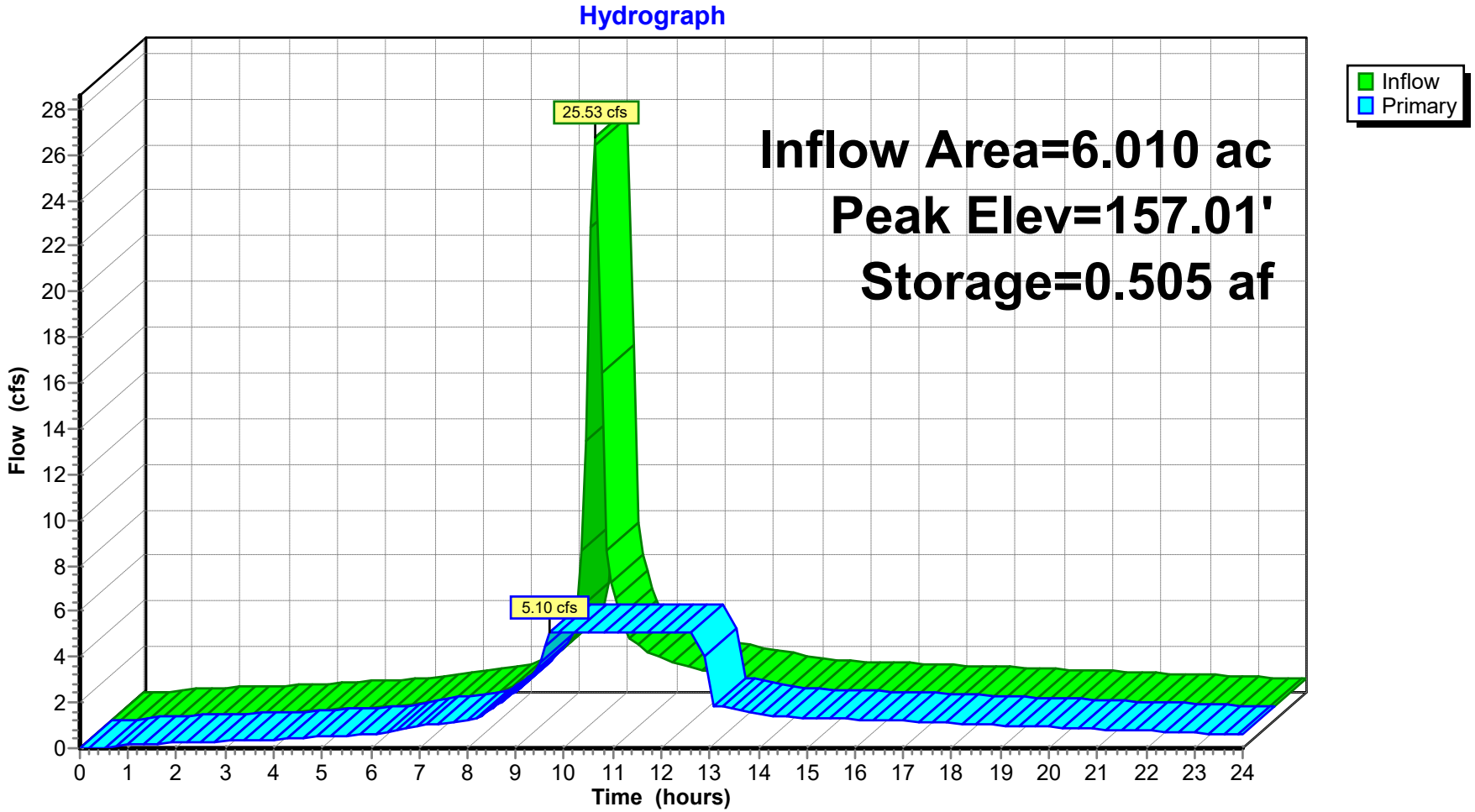
Volume	Invert	Avail.Storage	Storage Description
#1	154.00'	1.297 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
154.00	0.123	0.000	0.000
155.00	0.152	0.137	0.137
156.00	0.182	0.167	0.304
157.00	0.214	0.198	0.503
158.00	0.247	0.230	0.733
159.00	0.282	0.264	0.998
160.00	0.317	0.300	1.297

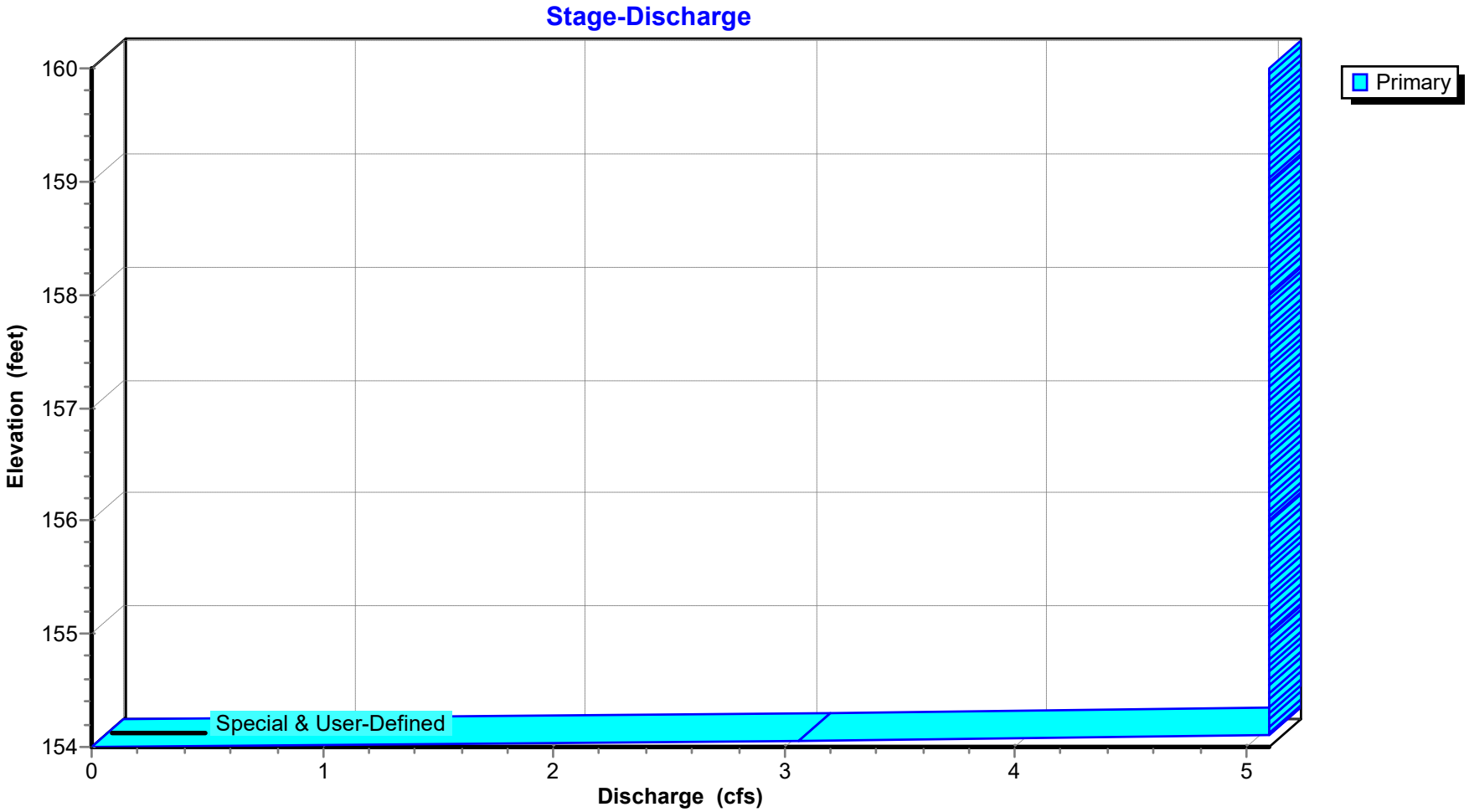
Device	Routing	Invert	Outlet Devices
#1	Primary	154.00'	**Special & User-Defined** Head (feet) 0.00 0.10 6.00 Disch. (cfs) 0.000 5.100 5.100

Primary OutFlow Max=5.10 cfs @ 9.70 hrs HW=154.17' (Free Discharge)
└**1=Special & User-Defined** (Custom Controls 5.10 cfs)

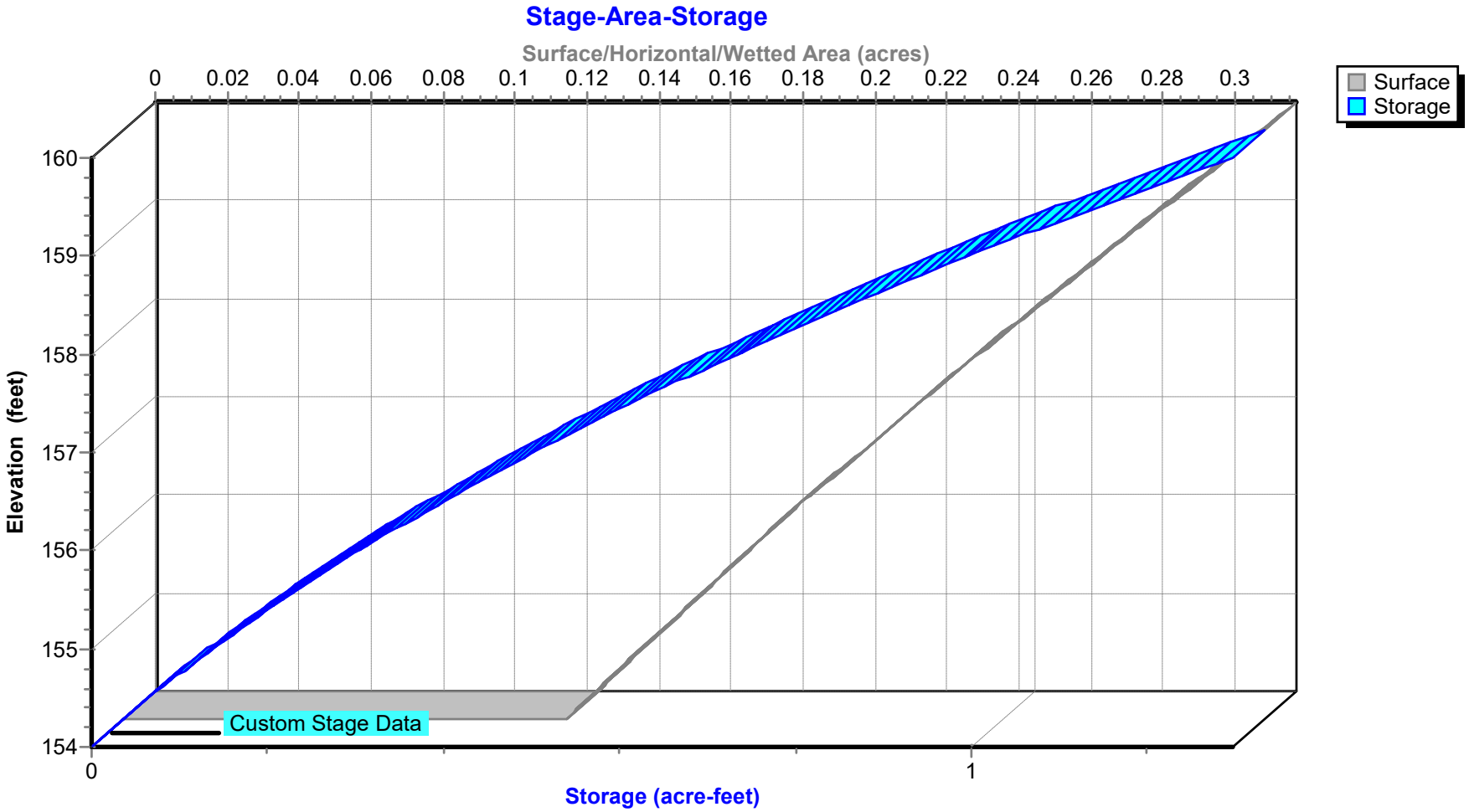
Pond 8P: Detention Basin 2



Pond 8P: Detention Basin 2



Pond 8P: Detention Basin 2



Hydrograph for Pond 8P: Detention Basin 2

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	154.00	0.00
0.50	0.02	0.000	154.00	0.01
1.00	0.14	0.000	154.00	0.14
1.50	0.20	0.000	154.00	0.20
2.00	0.23	0.001	154.00	0.23
2.50	0.27	0.001	154.01	0.26
3.00	0.30	0.001	154.01	0.30
3.50	0.34	0.001	154.01	0.33
4.00	0.40	0.001	154.01	0.39
4.50	0.46	0.001	154.01	0.46
5.00	0.52	0.001	154.01	0.51
5.50	0.57	0.001	154.01	0.57
6.00	0.62	0.002	154.01	0.62
6.50	0.77	0.002	154.01	0.76
7.00	0.97	0.002	154.02	0.95
7.50	1.09	0.003	154.02	1.09
8.00	1.19	0.003	154.02	1.19
8.50	1.77	0.004	154.03	1.73
9.00	2.53	0.006	154.05	2.49
9.50	3.85	0.009	154.07	**3.75**
10.00	**25.15**	**0.310**	**156.03**	**5.10**
10.50	4.58	**0.503**	**157.00**	5.10
11.00	3.10	0.443	156.72	5.10
11.50	2.64	0.349	156.24	5.10
12.00	2.32	0.241	155.64	5.10
12.50	2.09	0.121	154.89	5.10
13.00	1.88	0.005	154.04	1.99
13.50	1.67	0.004	154.03	1.69
14.00	1.46	0.004	154.03	1.48
14.50	1.38	0.003	154.03	1.39
15.00	1.34	0.003	154.03	1.35
15.50	1.30	0.003	154.03	1.31
16.00	1.26	0.003	154.02	1.27
16.50	1.22	0.003	154.02	1.22
17.00	1.18	0.003	154.02	1.18
17.50	1.14	0.003	154.02	1.14
18.00	1.10	0.003	154.02	1.10
18.50	1.05	0.003	154.02	1.06
19.00	1.01	0.002	154.02	1.01
19.50	0.97	0.002	154.02	0.97
20.00	0.93	0.002	154.02	0.93
20.50	0.88	0.002	154.02	0.89
21.00	0.84	0.002	154.02	0.84
21.50	0.80	0.002	154.02	0.80
22.00	0.75	0.002	154.01	0.76
22.50	0.71	0.002	154.01	0.71
23.00	0.67	0.002	154.01	0.67
23.50	0.62	0.002	154.01	0.63
24.00	0.58	0.001	154.01	0.58

Stage-Discharge for Pond 8P: Detention Basin 2

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
154.00	0.00	155.40	5.10	156.80	5.10	158.20	5.10	159.60	5.10
154.04	2.04	155.44	5.10	156.84	5.10	158.24	5.10	159.64	5.10
154.08	4.08	155.48	5.10	156.88	5.10	158.28	5.10	159.68	5.10
154.12	**5.10**	155.52	5.10	156.92	5.10	158.32	5.10	159.72	5.10
154.16	5.10	155.56	5.10	156.96	5.10	158.36	5.10	159.76	5.10
154.20	5.10	155.60	5.10	157.00	5.10	158.40	5.10	159.80	5.10
154.24	5.10	155.64	5.10	157.04	5.10	158.44	5.10	159.84	5.10
154.28	5.10	155.68	5.10	157.08	5.10	158.48	5.10	159.88	5.10
154.32	5.10	155.72	5.10	157.12	5.10	158.52	5.10	159.92	5.10
154.36	5.10	155.76	5.10	157.16	5.10	158.56	5.10	159.96	5.10
154.40	5.10	155.80	5.10	157.20	5.10	158.60	5.10	160.00	5.10
154.44	5.10	155.84	5.10	157.24	5.10	158.64	5.10		
154.48	5.10	155.88	5.10	157.28	5.10	158.68	5.10		
154.52	5.10	155.92	5.10	157.32	5.10	158.72	5.10		
154.56	5.10	155.96	5.10	157.36	5.10	158.76	5.10		
154.60	5.10	156.00	5.10	157.40	5.10	158.80	5.10		
154.64	5.10	156.04	5.10	157.44	5.10	158.84	5.10		
154.68	5.10	156.08	5.10	157.48	5.10	158.88	5.10		
154.72	5.10	156.12	5.10	157.52	5.10	158.92	5.10		
154.76	5.10	156.16	5.10	157.56	5.10	158.96	5.10		
154.80	5.10	156.20	5.10	157.60	5.10	159.00	5.10		
154.84	5.10	156.24	5.10	157.64	5.10	159.04	5.10		
154.88	5.10	156.28	5.10	157.68	5.10	159.08	5.10		
154.92	5.10	156.32	5.10	157.72	5.10	159.12	5.10		
154.96	5.10	156.36	5.10	157.76	5.10	159.16	5.10		
155.00	5.10	156.40	5.10	157.80	5.10	159.20	5.10		
155.04	5.10	156.44	5.10	157.84	5.10	159.24	5.10		
155.08	5.10	156.48	5.10	157.88	5.10	159.28	5.10		
155.12	5.10	156.52	5.10	157.92	5.10	159.32	5.10		
155.16	5.10	156.56	5.10	157.96	5.10	159.36	5.10		
155.20	5.10	156.60	5.10	158.00	5.10	159.40	5.10		
155.24	5.10	156.64	5.10	158.04	5.10	159.44	5.10		
155.28	5.10	156.68	5.10	158.08	5.10	159.48	5.10		
155.32	5.10	156.72	5.10	158.12	5.10	159.52	5.10		
155.36	5.10	156.76	5.10	158.16	5.10	159.56	5.10		

Stage-Area-Storage for Pond 8P: Detention Basin 2

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
154.00	0.123	0.000	157.50	0.230	0.614
154.10	0.126	0.012	157.60	0.234	0.637
154.20	0.129	0.025	157.70	0.237	0.660
154.30	0.132	0.038	157.80	0.240	0.684
154.40	0.135	0.052	157.90	0.244	0.708
154.50	0.137	0.065	158.00	0.247	0.733
154.60	0.140	0.079	158.10	0.250	0.758
154.70	0.143	0.093	158.20	0.254	0.783
154.80	0.146	0.108	158.30	0.258	0.809
154.90	0.149	0.122	158.40	0.261	0.835
155.00	0.152	0.137	158.50	0.264	0.861
155.10	0.155	0.153	158.60	0.268	0.887
155.20	0.158	0.168	158.70	0.271	0.914
155.30	0.161	0.184	158.80	0.275	0.942
155.40	0.164	0.201	158.90	0.279	0.969
155.50	0.167	0.217	159.00	0.282	0.998
155.60	0.170	0.234	159.10	0.285	1.026
155.70	0.173	0.251	159.20	0.289	1.055
155.80	0.176	0.269	159.30	0.293	1.084
155.90	0.179	0.286	159.40	0.296	1.113
156.00	0.182	0.304	159.50	0.300	1.143
156.10	0.185	0.323	159.60	0.303	1.173
156.20	0.188	0.342	159.70	0.306	1.203
156.30	0.192	0.361	159.80	0.310	1.234
156.40	0.195	0.380	159.90	0.314	1.265
156.50	0.198	0.400	160.00	**0.317**	**1.297**
156.60	0.201	0.419			
156.70	0.204	0.440			
156.80	0.208	0.460			
156.90	0.211	0.481			
157.00	0.214	0.503			
157.10	0.217	0.524			
157.20	0.221	0.546			
157.30	0.224	0.568			
157.40	0.227	0.591			

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: B-1 Runoff Area=3.000 ac 38.00% Impervious Runoff Depth>6.80"
Flow Length=895' Tc=3.4 min CN=80/98 Runoff=14.42 cfs 1.699 af

Subcatchment 2S: B-2 Runoff Area=1.300 ac 38.00% Impervious Runoff Depth>6.80"
Flow Length=835' Tc=3.1 min CN=80/98 Runoff=6.32 cfs 0.736 af

Subcatchment 4S: C-1 Runoff Area=1.050 ac 38.00% Impervious Runoff Depth>6.80"
Flow Length=510' Tc=2.5 min CN=80/98 Runoff=5.21 cfs 0.595 af

Subcatchment 5S: C-2 Runoff Area=0.160 ac 38.00% Impervious Runoff Depth>6.80"
Flow Length=240' Slope=0.0400 '/' Tc=1.0 min CN=80/98 Runoff=0.83 cfs 0.091 af

Subcatchment 6S: C-3 Runoff Area=0.500 ac 38.00% Impervious Runoff Depth>6.80"
Flow Length=250' Slope=0.0200 '/' Tc=1.5 min CN=80/98 Runoff=2.53 cfs 0.283 af

Subcatchment 9S: D-1 Runoff Area=0.800 ac 100.00% Impervious Runoff Depth>8.14"
Flow Length=390' Slope=0.0350 '/' Tc=1.7 min CN=0/98 Runoff=4.56 cfs 0.542 af

Reach 3R: SD-1 Avg. Flow Depth=1.28' Max Vel=9.79 fps Inflow=20.74 cfs 2.435 af
24.0" Round Pipe n=0.013 L=290.0' S=0.0155 '/' Capacity=28.18 cfs Outflow=20.42 cfs 2.434 af

Reach 7R: SD-2 Avg. Flow Depth=0.67' Max Vel=11.14 fps Inflow=8.57 cfs 0.969 af
18.0" Round Pipe n=0.013 L=100.0' S=0.0400 '/' Capacity=21.01 cfs Outflow=8.54 cfs 0.969 af

Reach 10R: SD-3 Avg. Flow Depth=0.38' Max Vel=12.81 fps Inflow=4.56 cfs 0.542 af
18.0" Round Pipe n=0.013 L=50.0' S=0.0960 '/' Capacity=32.55 cfs Outflow=4.54 cfs 0.542 af

Pond 8P: Detention Basin 2 Peak Elev=157.51' Storage=0.616 af Inflow=28.87 cfs 3.403 af
Outflow=5.10 cfs 3.401 af

Total Runoff Area = 6.810 ac Runoff Volume = 3.947 af Average Runoff Depth = 6.95"
54.72% Pervious = 3.726 ac 45.28% Impervious = 3.084 ac

Summary for Subcatchment 1S: B-1

[49] Hint: Tc<2dt may require smaller dt

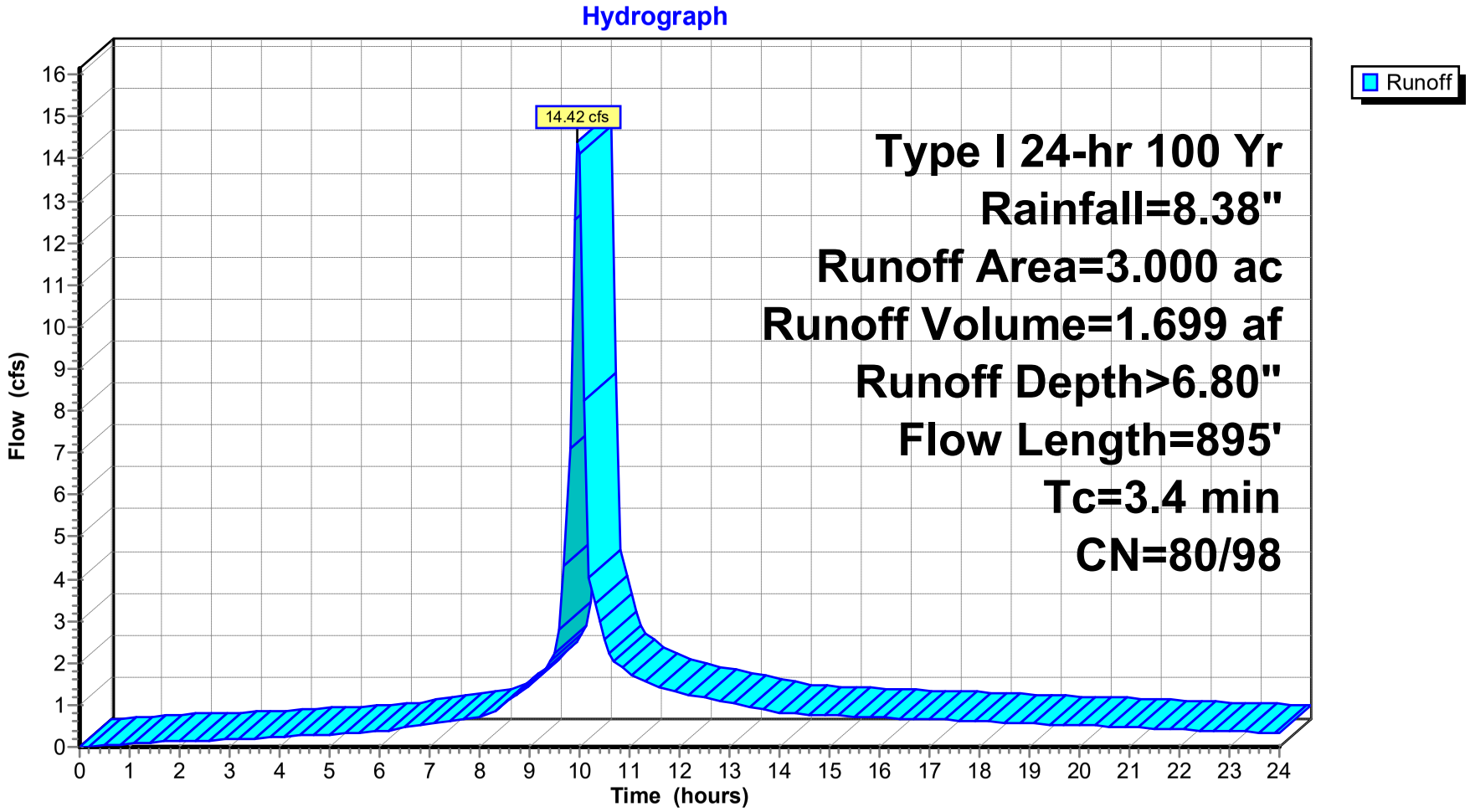
Runoff = 14.42 cfs @ 9.97 hrs, Volume= 1.699 af, Depth> 6.80"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 100 Yr Rainfall=8.38"

Area (ac)	CN	Description
3.000	87	1/4 acre lots, 38% imp, HSG D
1.860	80	62.00% Pervious Area
1.140	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	255	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.3	105	0.0900	6.09		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.5	155	0.0600	4.97		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.0	220	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.9	160	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
3.4	895	Total			

Subcatchment 1S: B-1



Hydrograph for Subcatchment 1S: B-1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.07	0.00	0.00	0.02
1.00	0.15	0.00	0.04	0.09
1.50	0.22	0.00	0.08	0.12
2.00	0.29	0.00	0.14	0.13
2.50	0.37	0.00	0.20	0.15
3.00	0.45	0.00	0.28	0.17
3.50	0.54	0.00	0.36	0.20
4.00	0.64	0.01	0.44	0.24
4.50	0.74	0.02	0.54	0.27
5.00	0.84	0.04	0.63	0.31
5.50	0.94	0.07	0.73	0.34
6.00	1.05	0.10	0.84	0.37
6.50	1.17	0.14	0.95	0.45
7.00	1.31	0.20	1.09	0.56
7.50	1.46	0.27	1.24	0.63
8.00	1.63	0.35	1.40	0.69
8.50	1.84	0.46	1.61	1.03
9.00	2.13	0.64	1.90	1.46
9.50	2.54	0.92	2.31	2.20
10.00	4.32	2.31	4.08	**14.11**
10.50	4.89	2.79	4.65	2.56
11.00	5.22	3.09	4.98	1.73
11.50	5.49	3.33	5.26	1.48
12.00	5.73	3.54	5.49	1.30
12.50	5.94	3.73	5.71	1.17
13.00	6.13	3.90	5.90	1.05
13.50	6.30	4.06	6.07	0.93
14.00	6.45	4.19	6.21	0.82
14.50	6.59	4.32	6.35	0.77
15.00	6.72	4.44	6.48	0.75
15.50	6.85	4.55	6.61	0.73
16.00	6.97	4.67	6.73	0.70
16.50	7.09	4.78	6.85	0.68
17.00	7.21	4.89	6.97	0.66
17.50	7.32	4.99	7.08	0.63
18.00	7.42	5.09	7.19	0.61
18.50	7.53	5.18	7.29	0.59
19.00	7.63	5.28	7.39	0.56
19.50	7.72	5.36	7.48	0.54
20.00	7.81	5.45	7.57	0.52
20.50	7.90	5.53	7.66	0.49
21.00	7.98	5.60	7.74	0.47
21.50	8.06	5.68	7.82	0.44
22.00	8.13	5.75	7.89	0.42
22.50	8.20	5.81	7.96	0.40
23.00	8.26	5.87	8.02	0.37
23.50	8.32	5.93	8.08	0.35
24.00	**8.38**	**5.98**	**8.14**	0.32

Summary for Subcatchment 2S: B-2

[49] Hint: Tc<2dt may require smaller dt

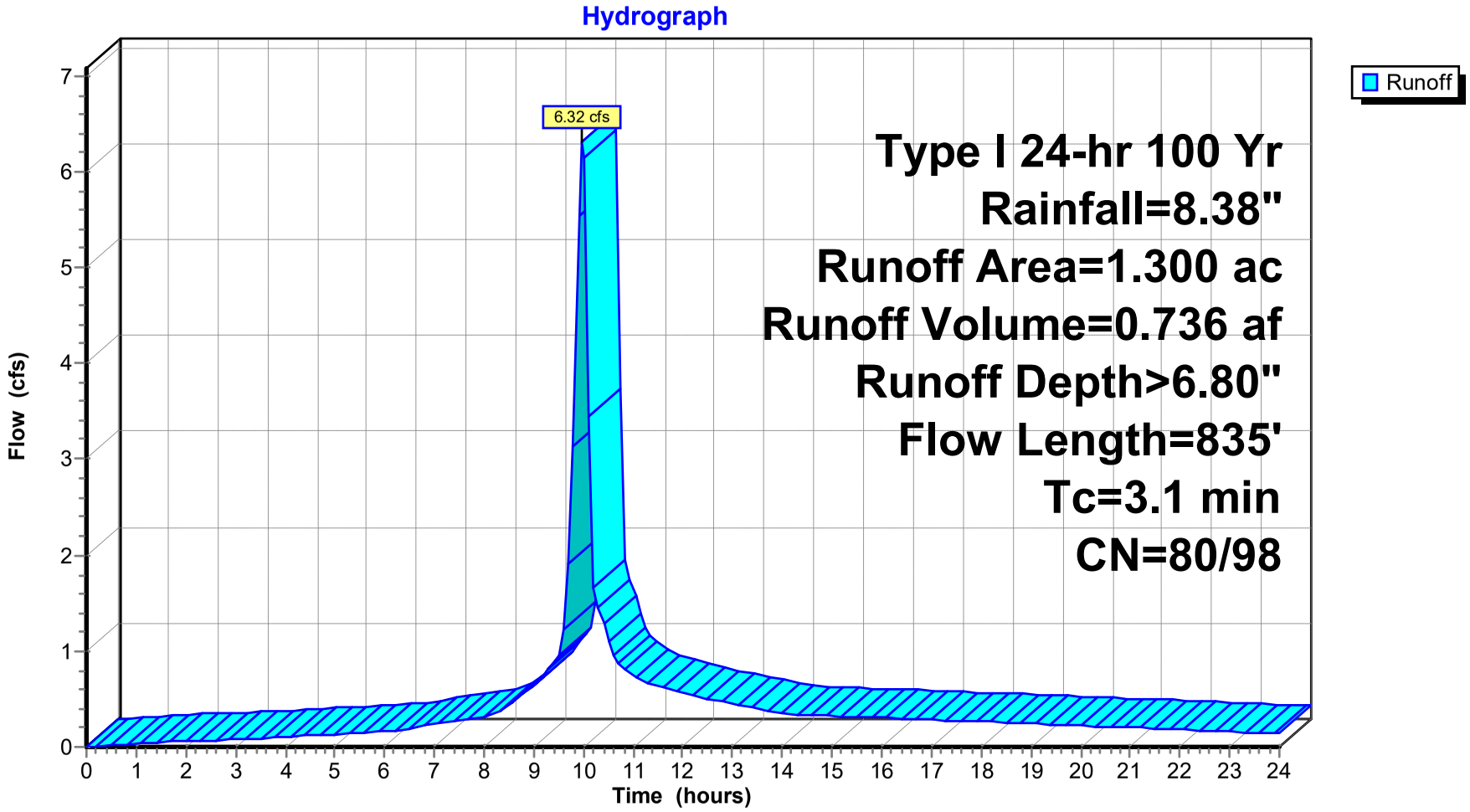
Runoff = 6.32 cfs @ 9.97 hrs, Volume= 0.736 af, Depth> 6.80"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 100 Yr Rainfall=8.38"

Area (ac)	CN	Description
1.300	87	1/4 acre lots, 38% imp, HSG D
0.806	80	62.00% Pervious Area
0.494	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	280	0.0800	5.74		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.3	100	0.0900	6.09		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.5	150	0.0600	4.97		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.0	215	0.0300	3.52		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.5	90	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
3.1	835	Total			

Subcatchment 2S: B-2



Hydrograph for Subcatchment 2S: B-2

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.07	0.00	0.00	0.01
1.00	0.15	0.00	0.04	0.04
1.50	0.22	0.00	0.08	0.05
2.00	0.29	0.00	0.14	0.06
2.50	0.37	0.00	0.20	0.07
3.00	0.45	0.00	0.28	0.07
3.50	0.54	0.00	0.36	0.09
4.00	0.64	0.01	0.44	0.10
4.50	0.74	0.02	0.54	0.12
5.00	0.84	0.04	0.63	0.13
5.50	0.94	0.07	0.73	0.15
6.00	1.05	0.10	0.84	0.16
6.50	1.17	0.14	0.95	0.20
7.00	1.31	0.20	1.09	0.24
7.50	1.46	0.27	1.24	0.28
8.00	1.63	0.35	1.40	0.30
8.50	1.84	0.46	1.61	0.45
9.00	2.13	0.64	1.90	0.63
9.50	2.54	0.92	2.31	0.96
10.00	4.32	2.31	4.08	**6.15**
10.50	4.89	2.79	4.65	1.10
11.00	5.22	3.09	4.98	0.75
11.50	5.49	3.33	5.26	0.64
12.00	5.73	3.54	5.49	0.56
12.50	5.94	3.73	5.71	0.50
13.00	6.13	3.90	5.90	0.45
13.50	6.30	4.06	6.07	0.40
14.00	6.45	4.19	6.21	0.35
14.50	6.59	4.32	6.35	0.33
15.00	6.72	4.44	6.48	0.33
15.50	6.85	4.55	6.61	0.32
16.00	6.97	4.67	6.73	0.31
16.50	7.09	4.78	6.85	0.30
17.00	7.21	4.89	6.97	0.29
17.50	7.32	4.99	7.08	0.27
18.00	7.42	5.09	7.19	0.26
18.50	7.53	5.18	7.29	0.25
19.00	7.63	5.28	7.39	0.24
19.50	7.72	5.36	7.48	0.23
20.00	7.81	5.45	7.57	0.22
20.50	7.90	5.53	7.66	0.21
21.00	7.98	5.60	7.74	0.20
21.50	8.06	5.68	7.82	0.19
22.00	8.13	5.75	7.89	0.18
22.50	8.20	5.81	7.96	0.17
23.00	8.26	5.87	8.02	0.16
23.50	8.32	5.93	8.08	0.15
24.00	**8.38**	**5.98**	**8.14**	0.14

Summary for Subcatchment 4S: C-1

[49] Hint: Tc<2dt may require smaller dt

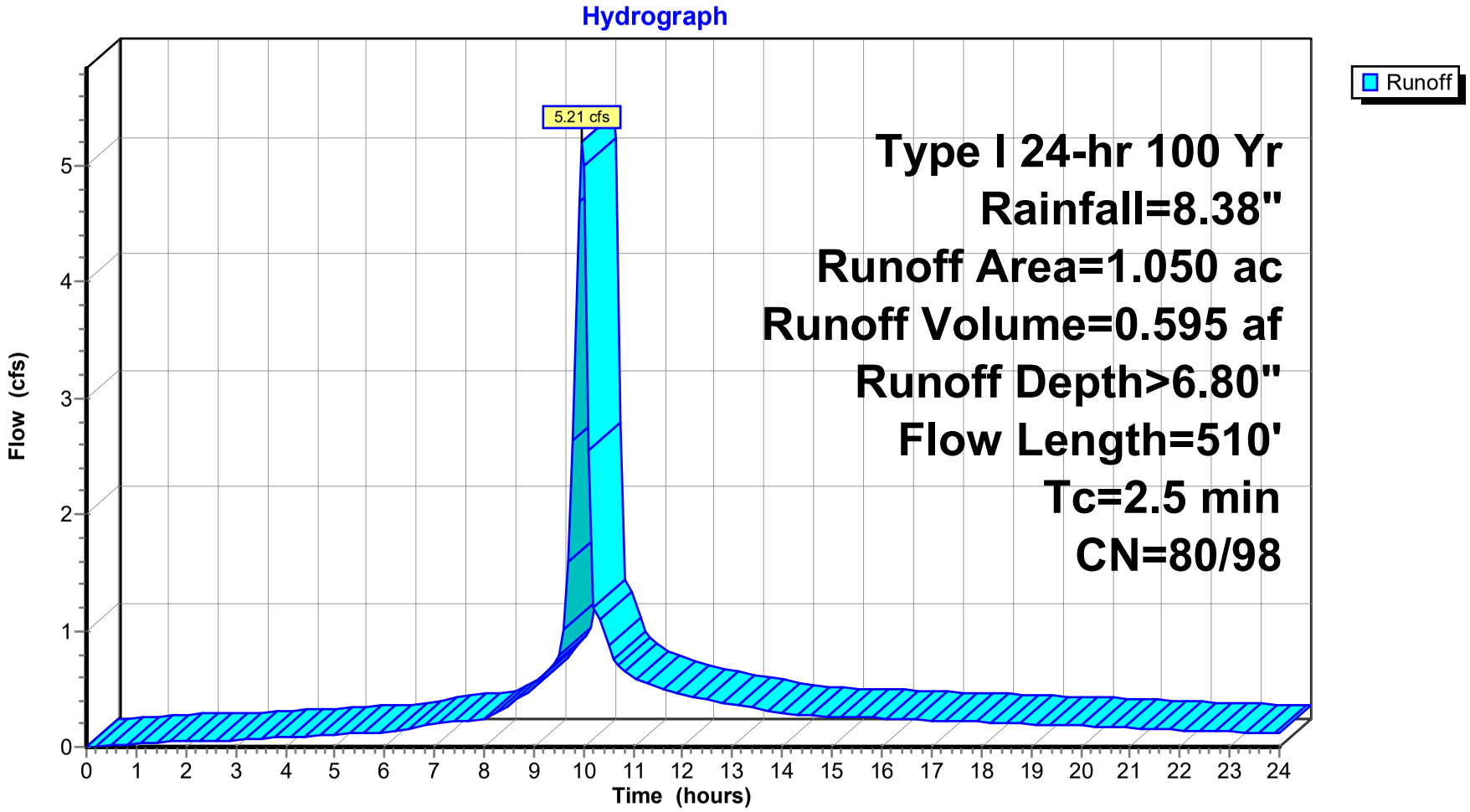
Runoff = 5.21 cfs @ 9.96 hrs, Volume= 0.595 af, Depth> 6.80"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 100 Yr Rainfall=8.38"

Area (ac)	CN	Description
1.050	87	1/4 acre lots, 38% imp, HSG D
0.651	80	62.00% Pervious Area
0.399	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	260	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
1.0	250	0.0400	4.06		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
2.5	510	Total			

Subcatchment 4S: C-1



Hydrograph for Subcatchment 4S: C-1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.07	0.00	0.00	0.01
1.00	0.15	0.00	0.04	0.03
1.50	0.22	0.00	0.08	0.04
2.00	0.29	0.00	0.14	0.05
2.50	0.37	0.00	0.20	0.05
3.00	0.45	0.00	0.28	0.06
3.50	0.54	0.00	0.36	0.07
4.00	0.64	0.01	0.44	0.08
4.50	0.74	0.02	0.54	0.10
5.00	0.84	0.04	0.63	0.11
5.50	0.94	0.07	0.73	0.12
6.00	1.05	0.10	0.84	0.13
6.50	1.17	0.14	0.95	0.16
7.00	1.31	0.20	1.09	0.20
7.50	1.46	0.27	1.24	0.22
8.00	1.63	0.35	1.40	0.24
8.50	1.84	0.46	1.61	0.36
9.00	2.13	0.64	1.90	0.51
9.50	2.54	0.92	2.31	0.78
10.00	4.32	2.31	4.08	**5.00**
10.50	4.89	2.79	4.65	0.87
11.00	5.22	3.09	4.98	0.60
11.50	5.49	3.33	5.26	0.52
12.00	5.73	3.54	5.49	0.45
12.50	5.94	3.73	5.71	0.41
13.00	6.13	3.90	5.90	0.37
13.50	6.30	4.06	6.07	0.33
14.00	6.45	4.19	6.21	0.28
14.50	6.59	4.32	6.35	0.27
15.00	6.72	4.44	6.48	0.26
15.50	6.85	4.55	6.61	0.25
16.00	6.97	4.67	6.73	0.25
16.50	7.09	4.78	6.85	0.24
17.00	7.21	4.89	6.97	0.23
17.50	7.32	4.99	7.08	0.22
18.00	7.42	5.09	7.19	0.21
18.50	7.53	5.18	7.29	0.21
19.00	7.63	5.28	7.39	0.20
19.50	7.72	5.36	7.48	0.19
20.00	7.81	5.45	7.57	0.18
20.50	7.90	5.53	7.66	0.17
21.00	7.98	5.60	7.74	0.16
21.50	8.06	5.68	7.82	0.16
22.00	8.13	5.75	7.89	0.15
22.50	8.20	5.81	7.96	0.14
23.00	8.26	5.87	8.02	0.13
23.50	8.32	5.93	8.08	0.12
24.00	**8.38**	**5.98**	**8.14**	0.11

Summary for Subcatchment 5S: C-2

[49] Hint: Tc<2dt may require smaller dt

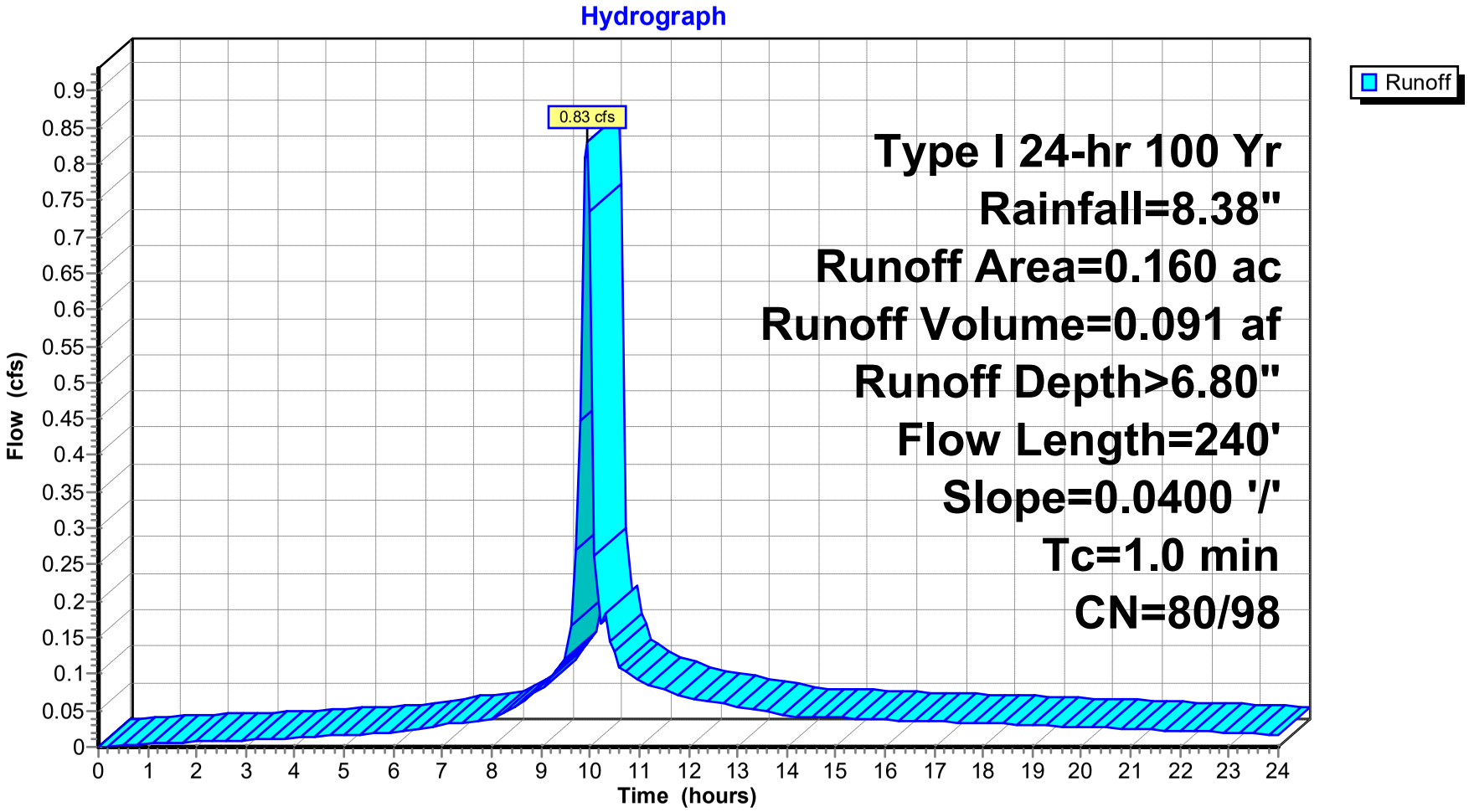
Runoff = 0.83 cfs @ 9.93 hrs, Volume= 0.091 af, Depth> 6.80"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 100 Yr Rainfall=8.38"

Area (ac)	CN	Description
0.160	87	1/4 acre lots, 38% imp, HSG D
0.099	80	62.00% Pervious Area
0.061	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	240	0.0400	4.06		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps

Subcatchment 5S: C-2



Hydrograph for Subcatchment 5S: C-2

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.07	0.00	0.00	0.00
1.00	0.15	0.00	0.04	0.00
1.50	0.22	0.00	0.08	0.01
2.00	0.29	0.00	0.14	0.01
2.50	0.37	0.00	0.20	0.01
3.00	0.45	0.00	0.28	0.01
3.50	0.54	0.00	0.36	0.01
4.00	0.64	0.01	0.44	0.01
4.50	0.74	0.02	0.54	0.01
5.00	0.84	0.04	0.63	0.02
5.50	0.94	0.07	0.73	0.02
6.00	1.05	0.10	0.84	0.02
6.50	1.17	0.14	0.95	0.02
7.00	1.31	0.20	1.09	0.03
7.50	1.46	0.27	1.24	0.03
8.00	1.63	0.35	1.40	0.04
8.50	1.84	0.46	1.61	0.06
9.00	2.13	0.64	1.90	0.08
9.50	2.54	0.92	2.31	**0.12**
10.00	4.32	2.31	4.08	**0.73**
10.50	4.89	2.79	4.65	0.13
11.00	5.22	3.09	4.98	0.09
11.50	5.49	3.33	5.26	0.08
12.00	5.73	3.54	5.49	0.07
12.50	5.94	3.73	5.71	0.06
13.00	6.13	3.90	5.90	0.06
13.50	6.30	4.06	6.07	0.05
14.00	6.45	4.19	6.21	0.04
14.50	6.59	4.32	6.35	0.04
15.00	6.72	4.44	6.48	0.04
15.50	6.85	4.55	6.61	0.04
16.00	6.97	4.67	6.73	0.04
16.50	7.09	4.78	6.85	0.04
17.00	7.21	4.89	6.97	0.03
17.50	7.32	4.99	7.08	0.03
18.00	7.42	5.09	7.19	0.03
18.50	7.53	5.18	7.29	0.03
19.00	7.63	5.28	7.39	0.03
19.50	7.72	5.36	7.48	0.03
20.00	7.81	5.45	7.57	0.03
20.50	7.90	5.53	7.66	0.03
21.00	7.98	5.60	7.74	0.02
21.50	8.06	5.68	7.82	0.02
22.00	8.13	5.75	7.89	0.02
22.50	8.20	5.81	7.96	0.02
23.00	8.26	5.87	8.02	0.02
23.50	8.32	5.93	8.08	0.02
24.00	**8.38**	**5.98**	**8.14**	0.02

Summary for Subcatchment 6S: C-3

[49] Hint: Tc<2dt may require smaller dt

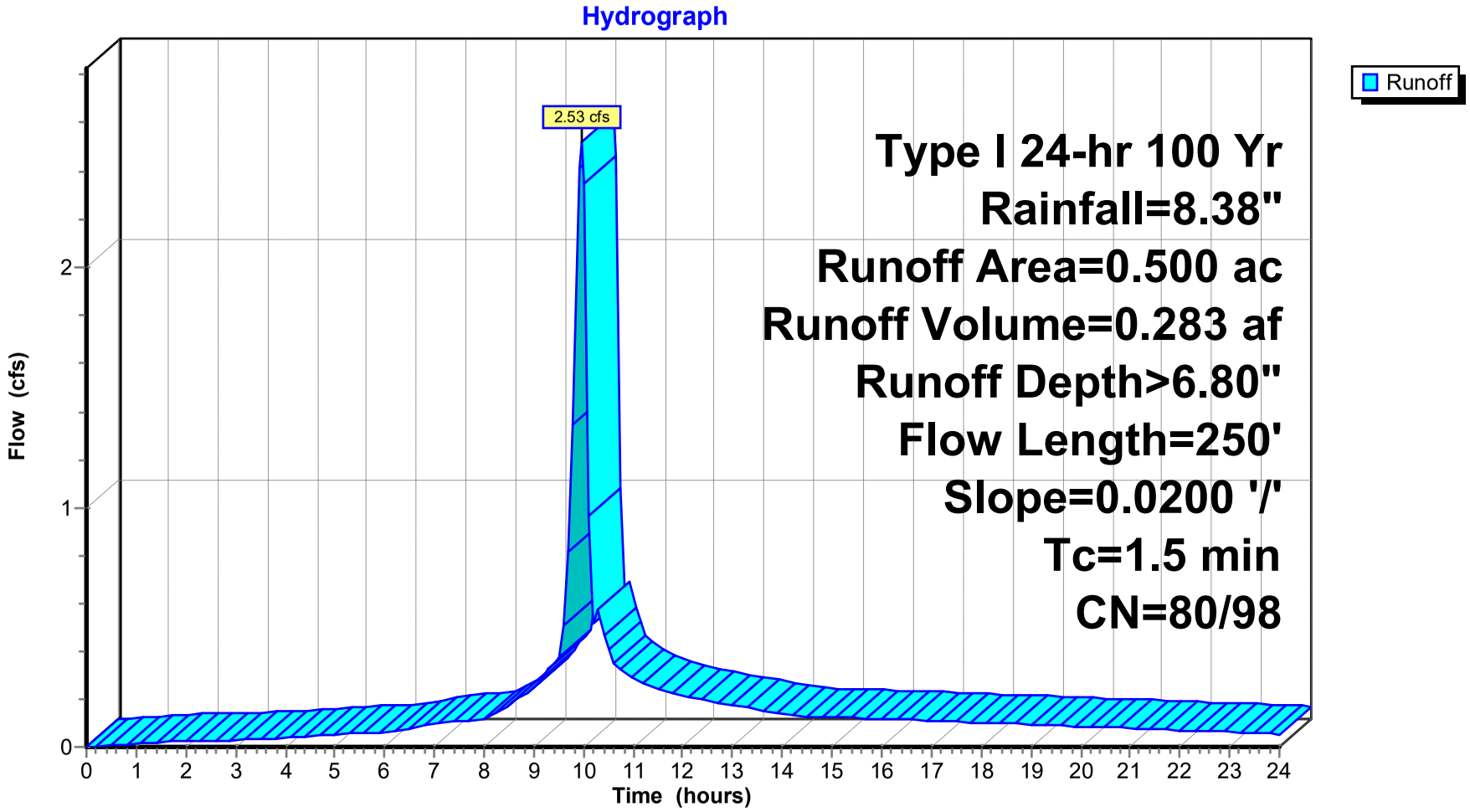
Runoff = 2.53 cfs @ 9.94 hrs, Volume= 0.283 af, Depth> 6.80"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 100 Yr Rainfall=8.38"

Area (ac)	CN	Description
0.500	87	1/4 acre lots, 38% imp, HSG D
0.310	80	62.00% Pervious Area
0.190	98	38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	250	0.0200	2.87		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps

Subcatchment 6S: C-3



Hydrograph for Subcatchment 6S: C-3

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
0.50	0.07	0.00	0.00	0.00
1.00	0.15	0.00	0.04	0.01
1.50	0.22	0.00	0.08	0.02
2.00	0.29	0.00	0.14	0.02
2.50	0.37	0.00	0.20	0.03
3.00	0.45	0.00	0.28	0.03
3.50	0.54	0.00	0.36	0.03
4.00	0.64	0.01	0.44	0.04
4.50	0.74	0.02	0.54	0.05
5.00	0.84	0.04	0.63	0.05
5.50	0.94	0.07	0.73	0.06
6.00	1.05	0.10	0.84	0.06
6.50	1.17	0.14	0.95	0.08
7.00	1.31	0.20	1.09	0.10
7.50	1.46	0.27	1.24	0.11
8.00	1.63	0.35	1.40	0.12
8.50	1.84	0.46	1.61	0.18
9.00	2.13	0.64	1.90	0.25
9.50	2.54	0.92	2.31	**0.38**
10.00	4.32	2.31	4.08	**2.35**
10.50	4.89	2.79	4.65	0.41
11.00	5.22	3.09	4.98	0.28
11.50	5.49	3.33	5.26	0.24
12.00	5.73	3.54	5.49	0.21
12.50	5.94	3.73	5.71	0.19
13.00	6.13	3.90	5.90	0.17
13.50	6.30	4.06	6.07	0.15
14.00	6.45	4.19	6.21	0.13
14.50	6.59	4.32	6.35	0.13
15.00	6.72	4.44	6.48	0.12
15.50	6.85	4.55	6.61	0.12
16.00	6.97	4.67	6.73	0.12
16.50	7.09	4.78	6.85	0.11
17.00	7.21	4.89	6.97	0.11
17.50	7.32	4.99	7.08	0.11
18.00	7.42	5.09	7.19	0.10
18.50	7.53	5.18	7.29	0.10
19.00	7.63	5.28	7.39	0.09
19.50	7.72	5.36	7.48	0.09
20.00	7.81	5.45	7.57	0.09
20.50	7.90	5.53	7.66	0.08
21.00	7.98	5.60	7.74	0.08
21.50	8.06	5.68	7.82	0.07
22.00	8.13	5.75	7.89	0.07
22.50	8.20	5.81	7.96	0.07
23.00	8.26	5.87	8.02	0.06
23.50	8.32	5.93	8.08	0.06
24.00	**8.38**	**5.98**	**8.14**	0.05

Summary for Subcatchment 9S: D-1

[49] Hint: Tc<2dt may require smaller dt

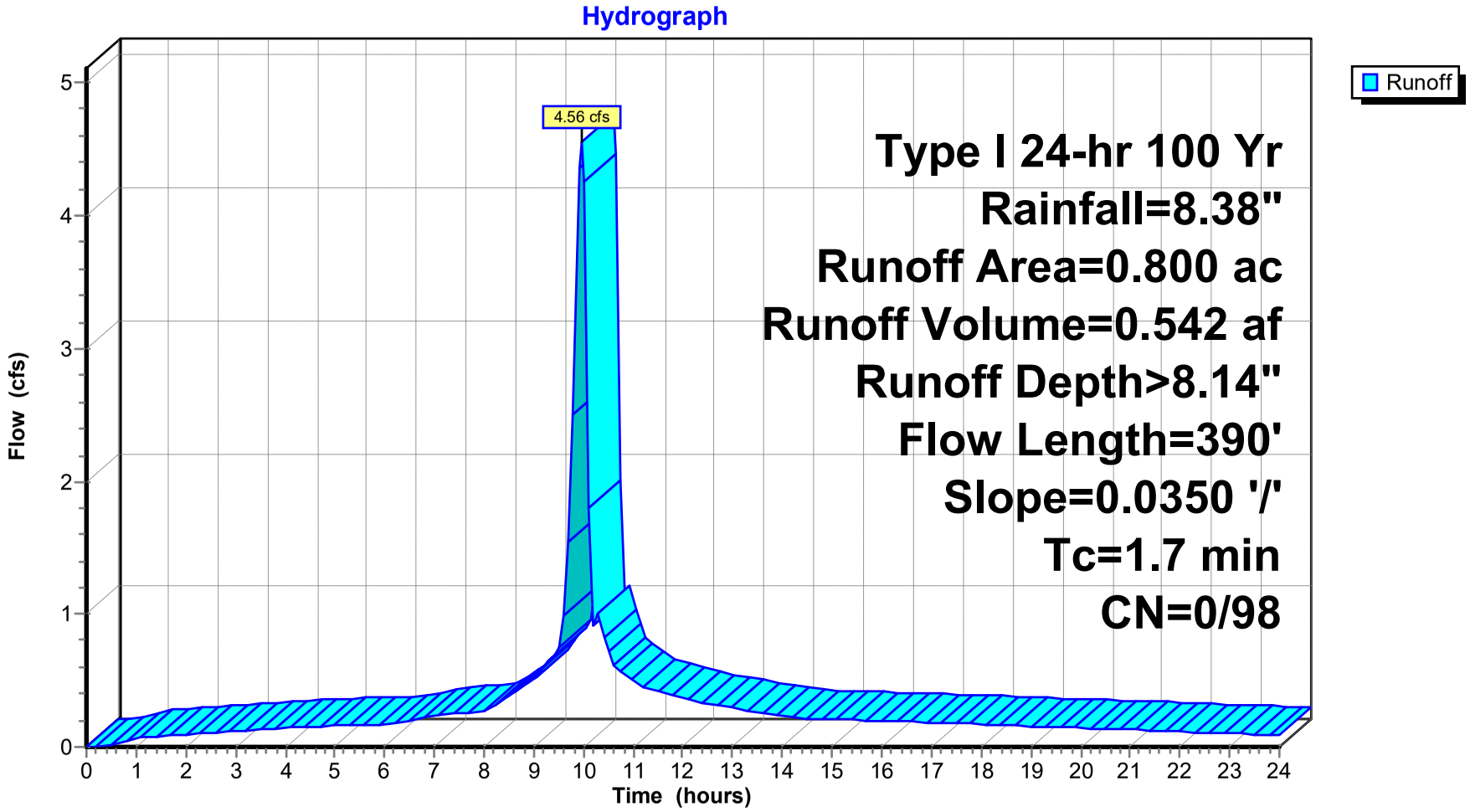
Runoff = 4.56 cfs @ 9.94 hrs, Volume= 0.542 af, Depth> 8.14"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 100 Yr Rainfall=8.38"

Area (ac)	CN	Description
0.800	98	Paved roads w/curbs & sewers, HSG D
0.800	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	390	0.0350	3.80		**Shallow Concentrated Flow, Lower Street Flow** Paved Kv= 20.3 fps

Subcatchment 9S: D-1



Hydrograph for Subcatchment 9S: D-1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	**0.00**	0.00	0.00
0.50	0.07	0.00	0.00	0.02
1.00	0.15	0.00	0.04	0.06
1.50	0.22	0.00	0.08	0.08
2.00	0.29	0.00	0.14	0.09
2.50	0.37	0.00	0.20	0.11
3.00	0.45	0.00	0.28	0.12
3.50	0.54	0.00	0.36	0.13
4.00	0.64	0.00	0.44	0.15
4.50	0.74	0.00	0.54	0.15
5.00	0.84	0.00	0.63	0.16
5.50	0.94	0.00	0.73	0.16
6.00	1.05	0.00	0.84	0.17
6.50	1.17	0.00	0.95	0.20
7.00	1.31	0.00	1.09	0.24
7.50	1.46	0.00	1.24	0.25
8.00	1.63	0.00	1.40	0.26
8.50	1.84	0.00	1.61	0.38
9.00	2.13	0.00	1.90	0.51
9.50	2.54	0.00	2.31	**0.74**
10.00	4.32	0.00	4.08	**4.26**
10.50	4.89	0.00	4.65	0.71
11.00	5.22	0.00	4.98	0.49
11.50	5.49	0.00	5.26	0.42
12.00	5.73	0.00	5.49	0.37
12.50	5.94	0.00	5.71	0.33
13.00	6.13	0.00	5.90	0.30
13.50	6.30	0.00	6.07	0.26
14.00	6.45	0.00	6.21	0.23
14.50	6.59	0.00	6.35	0.22
15.00	6.72	0.00	6.48	0.21
15.50	6.85	0.00	6.61	0.20
16.00	6.97	0.00	6.73	0.20
16.50	7.09	0.00	6.85	0.19
17.00	7.21	0.00	6.97	0.18
17.50	7.32	0.00	7.08	0.18
18.00	7.42	0.00	7.19	0.17
18.50	7.53	0.00	7.29	0.16
19.00	7.63	0.00	7.39	0.16
19.50	7.72	0.00	7.48	0.15
20.00	7.81	0.00	7.57	0.14
20.50	7.90	0.00	7.66	0.14
21.00	7.98	0.00	7.74	0.13
21.50	8.06	0.00	7.82	0.12
22.00	8.13	0.00	7.89	0.12
22.50	8.20	0.00	7.96	0.11
23.00	8.26	0.00	8.02	0.10
23.50	8.32	0.00	8.08	0.10
24.00	**8.38**	0.00	**8.14**	0.09

Summary for Reach 3R: SD-1

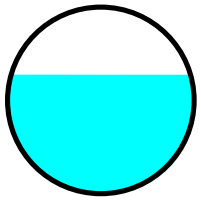
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 4.300 ac, 38.00% Impervious, Inflow Depth > 6.80" for 100 Yr event
Inflow = 20.74 cfs @ 9.97 hrs, Volume= 2.435 af
Outflow = 20.42 cfs @ 9.98 hrs, Volume= 2.434 af, Atten= 2%, Lag= 0.8 min

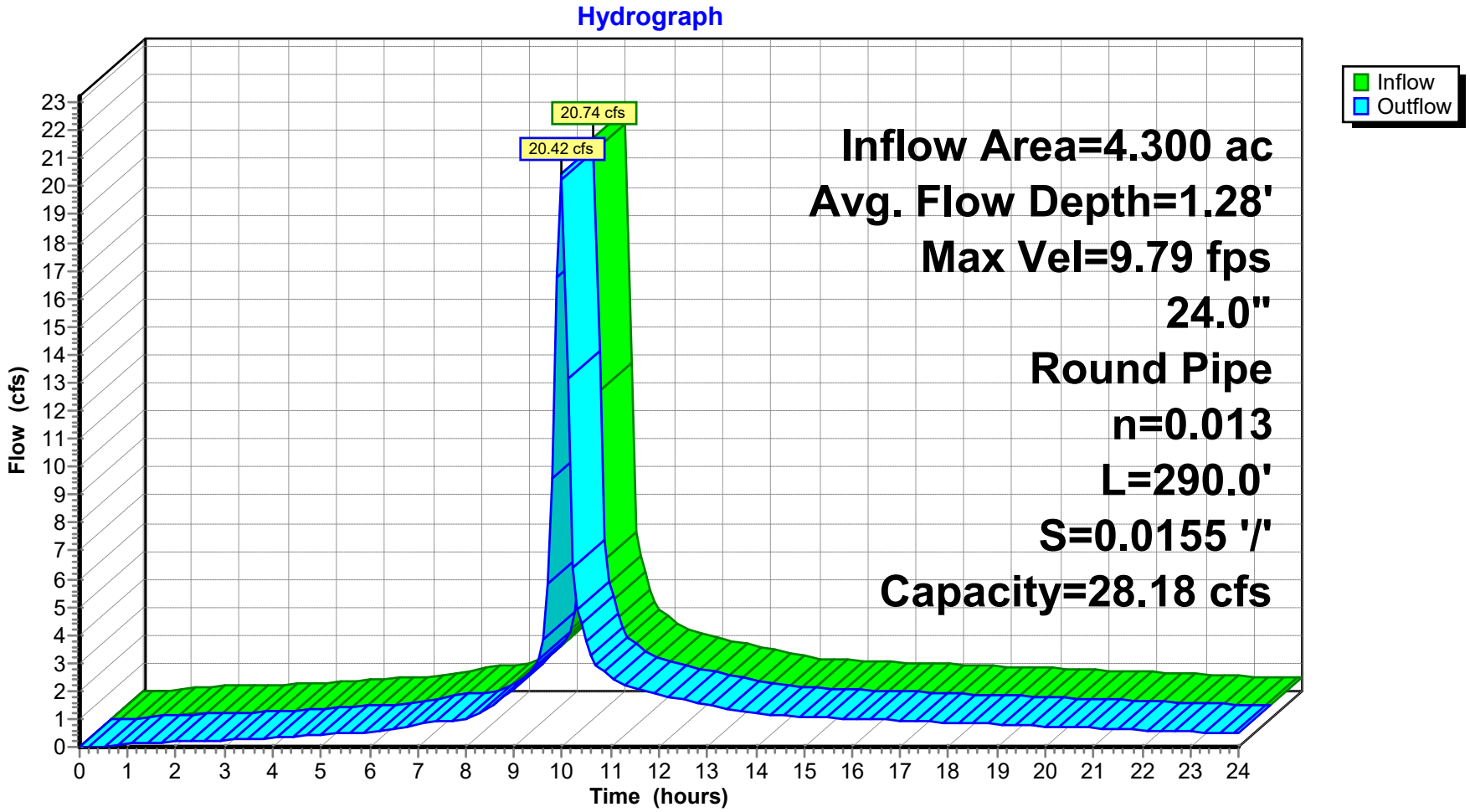
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Max. Velocity= 9.79 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 4.03 fps, Avg. Travel Time= 1.2 min

Peak Storage= 615 cf @ 9.98 hrs
Average Depth at Peak Storage= 1.28'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 28.18 cfs

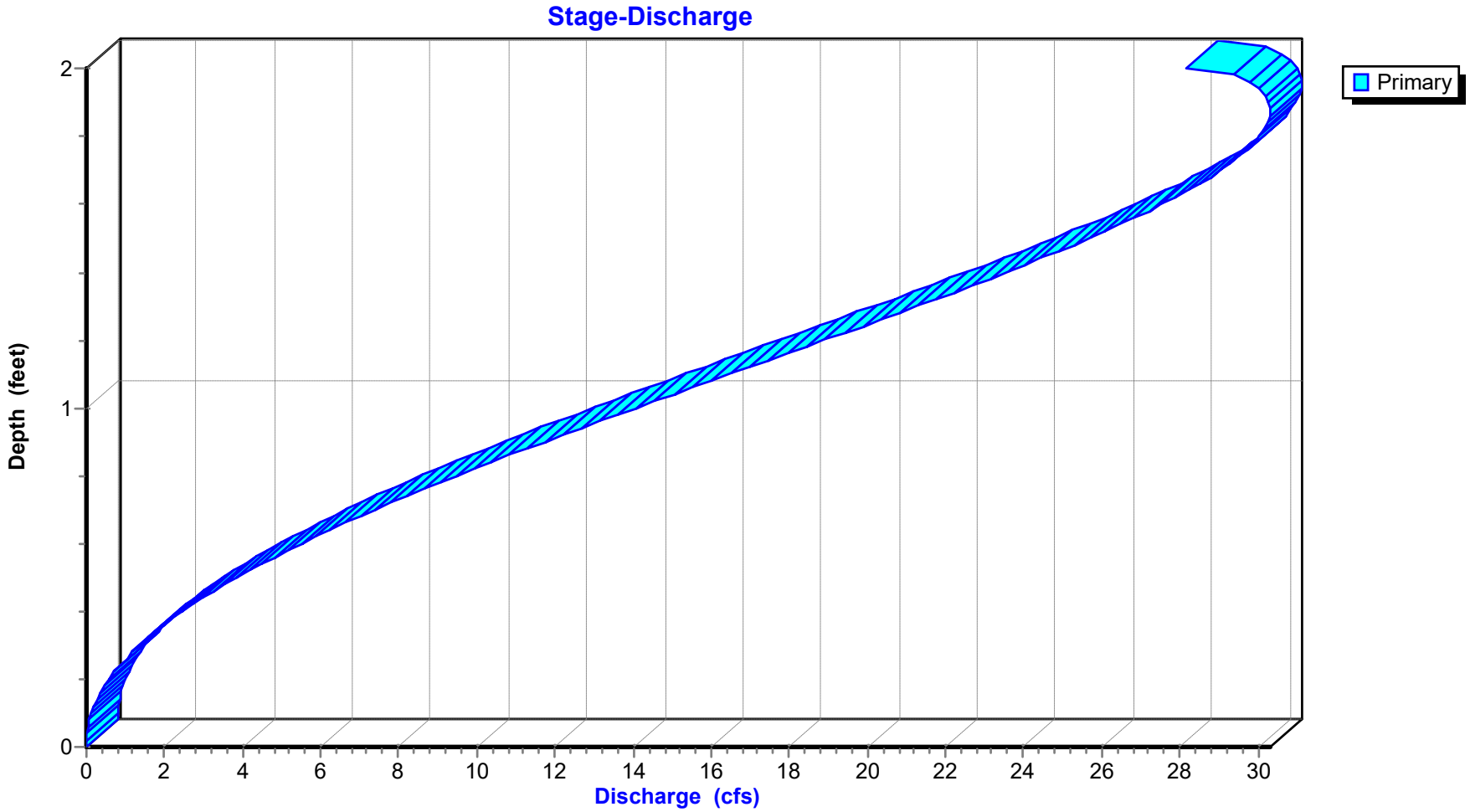
24.0" Round Pipe
n= 0.013
Length= 290.0' Slope= 0.0155 '/'
Inlet Invert= 158.50', Outlet Invert= 154.00'



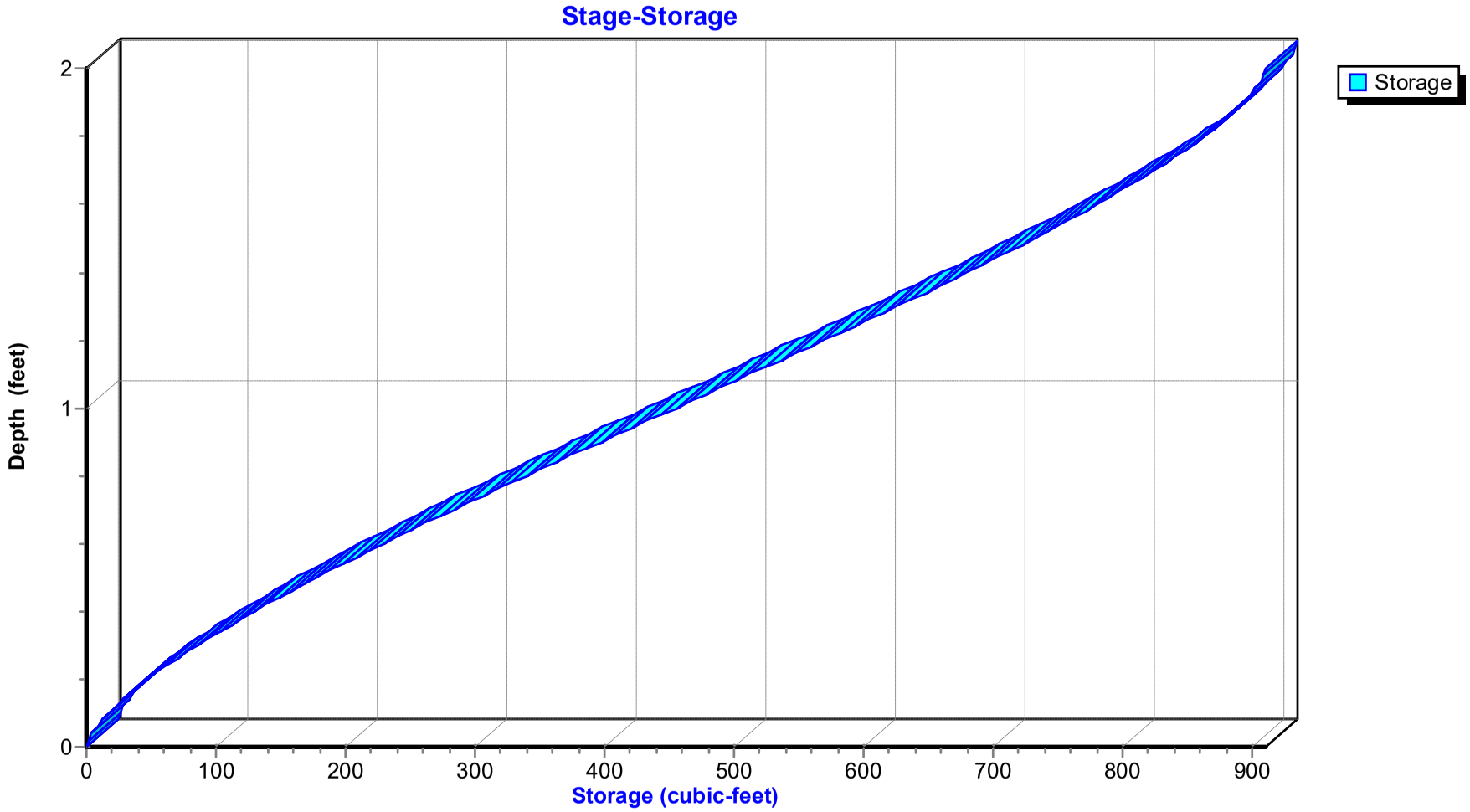
Reach 3R: SD-1


Hydrograph
Inflow
Outflow
20.74 cfs
20.42 cfs
Inflow Area=4.300 ac
Avg. Flow Depth=1.28'
Max Vel=9.79 fps
24.0"
Round Pipe
n=0.013
L=290.0'
S=0.0155 '/'
Capacity=28.18 cfs
Flow (cfs)
Time (hours)

Reach 3R: SD-1


Stage-Discharge
Primary
Depth (feet)
0
1
2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Discharge (cfs)

Reach 3R: SD-1


Stage-Storage
Storage
Depth (feet)
0
1
2
0
100
200
300
400
500
600
700
800
900
Storage (cubic-feet)

Hydrograph for Reach 3R: SD-1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	158.50	0.00
0.50	0.03	5	158.54	0.02
1.00	0.12	16	158.59	0.12
1.50	0.17	20	158.61	0.17
2.00	0.19	22	158.62	0.19
2.50	0.22	24	158.62	0.22
3.00	0.25	26	158.63	0.24
3.50	0.28	28	158.64	0.28
4.00	0.34	32	158.65	0.34
4.50	0.39	36	158.66	0.39
5.00	0.44	38	158.67	0.44
5.50	0.48	41	158.68	0.48
6.00	0.52	44	158.69	0.52
6.50	0.65	50	158.71	0.64
7.00	0.81	59	158.73	0.80
7.50	0.91	64	158.75	0.91
8.00	0.99	68	158.76	0.99
8.50	1.48	90	158.81	1.45
9.00	2.09	115	158.87	2.07
9.50	3.16	154	158.95	3.12
10.00	**20.26**	**608**	**159.77**	**20.27**
10.50	3.66	172	158.99	3.74
11.00	2.47	131	158.90	2.50
11.50	2.12	117	158.87	2.13
12.00	1.86	106	158.85	1.87
12.50	1.67	99	158.83	1.68
13.00	1.51	92	158.81	1.51
13.50	1.34	84	158.80	1.34
14.00	1.17	77	158.78	1.18
14.50	1.11	74	158.77	1.11
15.00	1.08	72	158.77	1.08
15.50	1.04	71	158.76	1.04
16.00	1.01	69	158.76	1.01
16.50	0.98	68	158.75	0.98
17.00	0.94	66	158.75	0.94
17.50	0.91	64	158.75	0.91
18.00	0.88	63	158.74	0.88
18.50	0.84	61	158.74	0.84
19.00	0.81	59	158.73	0.81
19.50	0.77	57	158.73	0.78
20.00	0.74	56	158.72	0.74
20.50	0.70	54	158.72	0.71
21.00	0.67	52	158.71	0.67
21.50	0.64	50	158.71	0.64
22.00	0.60	48	158.70	0.60
22.50	0.57	46	158.70	0.57
23.00	0.53	44	158.69	0.53
23.50	0.50	42	158.68	0.50
24.00	0.46	40	158.68	0.46

Stage-Discharge for Reach 3R: SD-1

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)	Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)	Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
158.50	0.00	0.00	159.20	7.56	7.41	159.90	10.04	23.59
158.52	0.80	0.00	159.22	7.67	7.81	159.92	10.07	24.03
158.54	1.26	0.02	159.24	7.78	8.22	159.94	10.10	24.46
158.56	1.65	0.05	159.26	7.89	8.64	159.96	10.13	24.88
158.58	1.99	0.08	159.28	7.99	9.07	159.98	10.15	25.29
158.60	2.30	0.14	159.30	8.09	9.50	160.00	10.17	25.70
158.62	2.59	0.20	159.32	8.19	9.93	160.02	10.18	26.09
158.64	2.87	0.28	159.34	8.29	10.38	160.04	10.20	26.47
158.66	3.12	0.37	159.36	8.38	10.83	160.06	10.21	26.84
158.68	3.37	0.47	159.38	8.47	11.28	160.08	10.22	27.20
158.70	3.60	0.59	159.40	8.56	11.74	160.10	10.22	27.55
158.72	3.82	0.72	159.42	8.65	12.20	160.12	**10.23**	27.88
158.74	4.04	0.86	159.44	8.73	12.67	160.14	10.23	28.19
158.76	4.24	1.02	159.46	8.81	13.14	160.16	10.22	28.49
158.78	4.44	1.19	159.48	8.89	13.61	160.18	10.21	28.77
158.80	4.64	1.37	159.50	8.97	14.09	160.20	10.20	29.04
158.82	4.82	1.56	159.52	9.05	14.57	160.22	10.19	29.28
158.84	5.00	1.77	159.54	9.12	15.05	160.24	10.17	29.51
158.86	5.18	1.99	159.56	9.19	15.53	160.26	10.15	29.71
158.88	5.35	2.22	159.58	9.26	16.02	160.28	10.12	29.88
158.90	5.52	2.47	159.60	9.32	16.51	160.30	10.09	30.03
158.92	5.68	2.72	159.62	9.39	16.99	160.32	10.05	30.16
158.94	5.84	2.99	159.64	9.45	17.48	160.34	10.00	30.25
158.96	5.99	3.27	159.66	9.51	17.96	160.36	9.95	30.30
158.98	6.14	3.56	159.68	9.56	18.45	160.38	9.89	**30.31**
159.00	6.29	3.86	159.70	9.62	18.93	160.40	9.82	30.28
159.02	6.43	4.17	159.72	9.67	19.41	160.42	9.74	30.19
159.04	6.57	4.49	159.74	9.72	19.89	160.44	9.64	30.03
159.06	6.70	4.83	159.76	9.77	20.37	160.46	9.52	29.78
159.08	6.83	5.17	159.78	9.82	20.85	160.48	9.36	29.36
159.10	6.96	5.52	159.80	9.86	21.32	160.50	8.97	28.18
159.12	7.09	5.88	159.82	9.90	21.78			
159.14	7.21	6.25	159.84	9.94	22.24			
159.16	7.33	6.63	159.86	9.98	22.70			
159.18	7.45	7.01	159.88	10.01	23.15			

Stage-Area-Storage for Reach 3R: SD-1

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
158.50	0.0	0	159.20	1.0	284	159.90	2.3	681
158.52	0.0	2	159.22	1.0	295	159.92	2.4	692
158.54	0.0	4	159.24	1.1	306	159.94	2.4	702
158.56	0.0	8	159.26	1.1	318	159.96	2.5	713
158.58	0.0	12	159.28	1.1	329	159.98	2.5	723
158.60	0.1	17	159.30	1.2	340	160.00	2.5	733
158.62	0.1	22	159.32	1.2	352	160.02	2.6	743
158.64	0.1	28	159.34	1.3	363	160.04	2.6	753
158.66	0.1	34	159.36	1.3	375	160.06	2.6	762
158.68	0.1	41	159.38	1.3	386	160.08	2.7	772
158.70	0.2	47	159.40	1.4	398	160.10	2.7	781
158.72	0.2	55	159.42	1.4	409	160.12	2.7	791
158.74	0.2	62	159.44	1.5	421	160.14	2.8	800
158.76	0.2	70	159.46	1.5	432	160.16	2.8	808
158.78	0.3	78	159.48	1.5	444	160.18	2.8	817
158.80	0.3	86	159.50	1.6	456	160.20	2.8	825
158.82	0.3	94	159.52	1.6	467	160.22	2.9	834
158.84	0.4	103	159.54	1.7	479	160.24	2.9	841
158.86	0.4	112	159.56	1.7	490	160.26	2.9	849
158.88	0.4	121	159.58	1.7	502	160.28	3.0	857
158.90	0.4	130	159.60	1.8	513	160.30	3.0	864
158.92	0.5	139	159.62	1.8	525	160.32	3.0	870
158.94	0.5	149	159.64	1.8	536	160.34	3.0	877
158.96	0.5	158	159.66	1.9	548	160.36	3.0	883
158.98	0.6	168	159.68	1.9	559	160.38	3.1	889
159.00	0.6	178	159.70	2.0	571	160.40	3.1	894
159.02	0.6	188	159.72	2.0	582	160.42	3.1	899
159.04	0.7	198	159.74	2.0	593	160.44	3.1	903
159.06	0.7	209	159.76	2.1	605	160.46	3.1	907
159.08	0.8	219	159.78	2.1	616	160.48	3.1	910
159.10	0.8	230	159.80	2.2	627	160.50	**3.1**	**911**
159.12	0.8	241	159.82	2.2	638			
159.14	0.9	251	159.84	2.2	649			
159.16	0.9	262	159.86	2.3	660			
159.18	0.9	273	159.88	2.3	671			

Summary for Reach 7R: SD-2

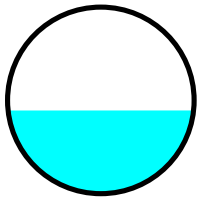
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 1.710 ac, 38.00% Impervious, Inflow Depth > 6.80" for 100 Yr event
Inflow = 8.57 cfs @ 9.95 hrs, Volume= 0.969 af
Outflow = 8.54 cfs @ 9.96 hrs, Volume= 0.969 af, Atten= 0%, Lag= 0.3 min

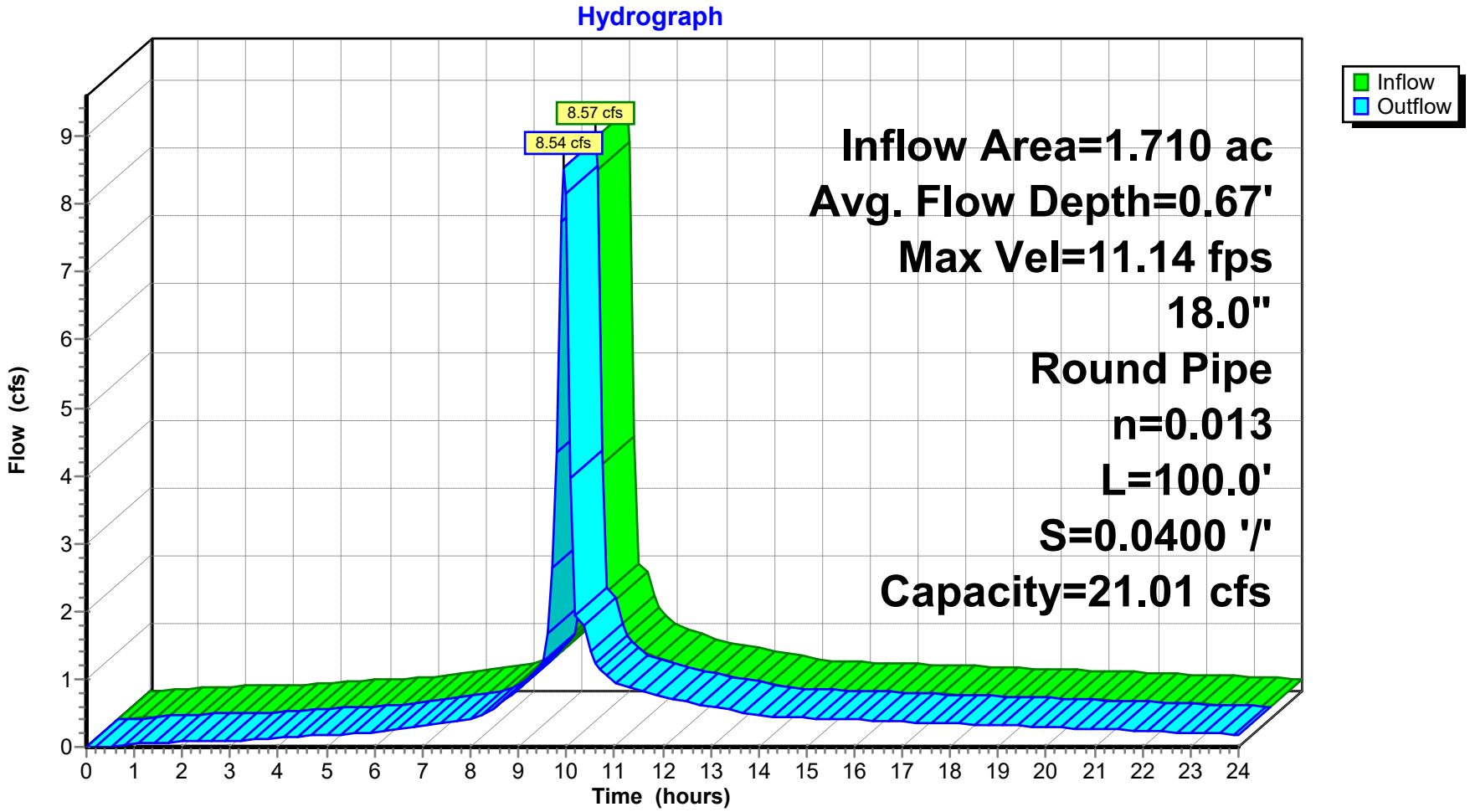
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Max. Velocity= 11.14 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.43 fps, Avg. Travel Time= 0.4 min

Peak Storage= 76 cf @ 9.96 hrs
Average Depth at Peak Storage= 0.67'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 21.01 cfs

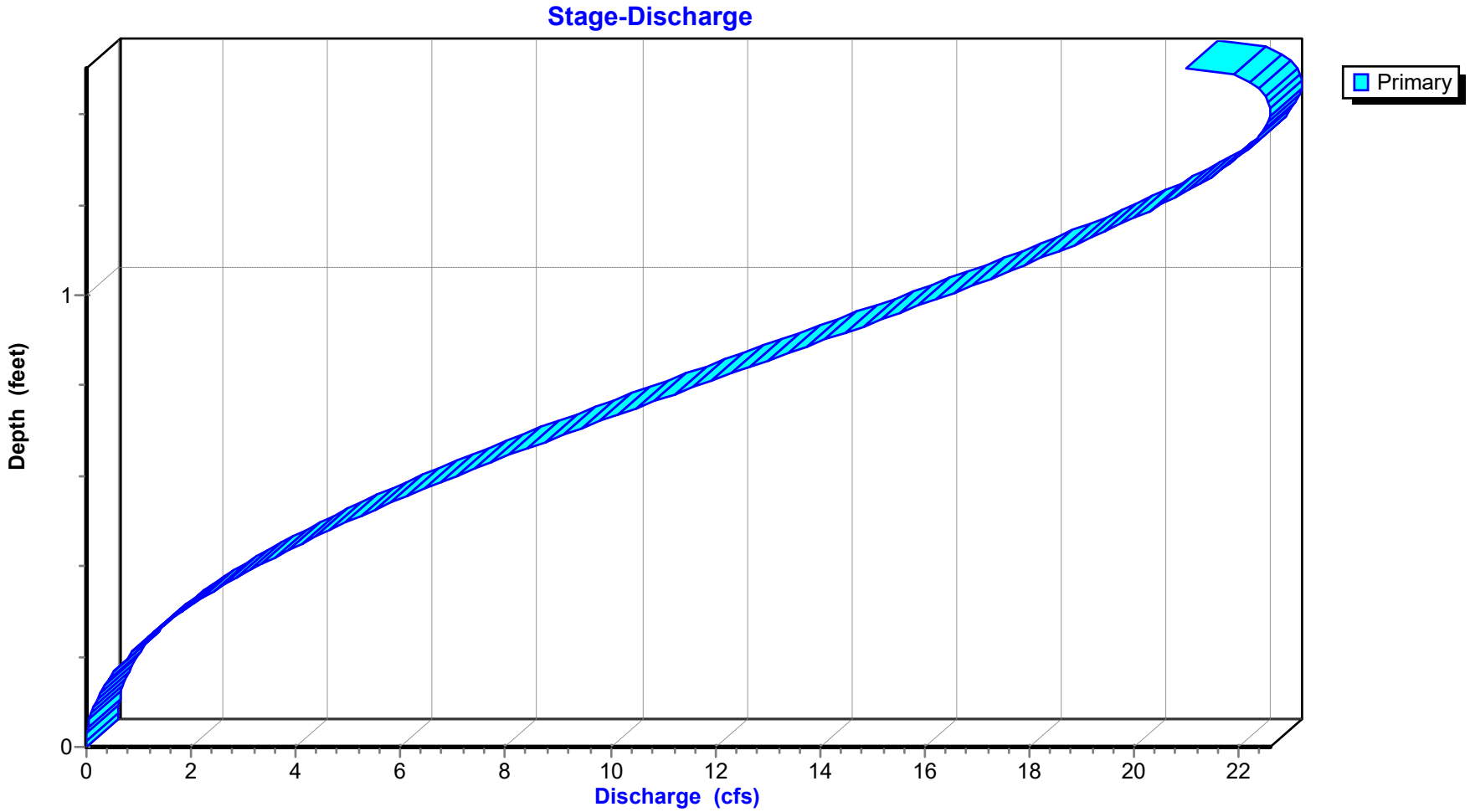
18.0" Round Pipe
n= 0.013
Length= 100.0' Slope= 0.0400 '/'
Inlet Invert= 158.00', Outlet Invert= 154.00'



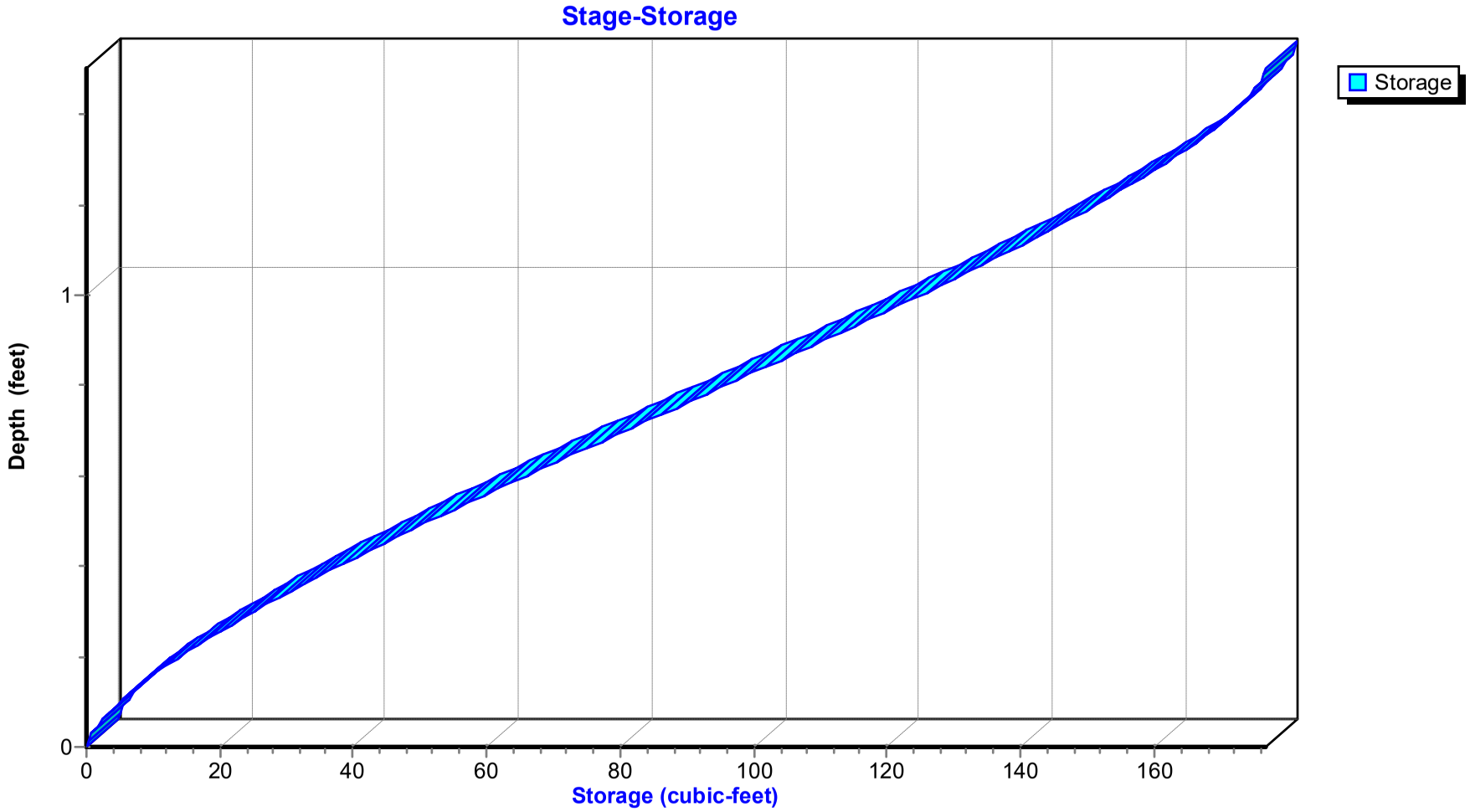
Reach 7R: SD-2


Hydrograph
Inflow
Outflow
8.57 cfs
8.54 cfs
Inflow Area=1.710 ac
Avg. Flow Depth=0.67'
Max Vel=11.14 fps
18.0"
Round Pipe
n=0.013
L=100.0'
S=0.0400 '/'
Capacity=21.01 cfs
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Reach 7R: SD-2


Stage-Discharge
Primary
Depth (feet)
0
1
0
2
4
6
8
10
12
14
16
18
20
22
Discharge (cfs)

Reach 7R: SD-2


Stage-Storage
Storage
Depth (feet)
0
1
0
20
40
60
80
100
120
140
160
Storage (cubic-feet)

Hydrograph for Reach 7R: SD-2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	158.00	0.00
0.50	0.02	1	158.03	0.01
1.00	0.05	2	158.05	0.05
1.50	0.07	2	158.06	0.07
2.00	0.08	3	158.07	0.08
2.50	0.09	3	158.07	0.09
3.00	0.10	3	158.07	0.10
3.50	0.11	4	158.08	0.11
4.00	0.14	4	158.09	0.14
4.50	0.16	4	158.09	0.16
5.00	0.18	5	158.10	0.17
5.50	0.19	5	158.10	0.19
6.00	0.21	5	158.11	0.21
6.50	0.26	6	158.12	0.26
7.00	0.32	7	158.13	0.32
7.50	0.36	8	158.14	0.36
8.00	0.40	9	158.14	0.39
8.50	0.60	11	158.17	0.59
9.00	0.84	14	158.20	0.84
9.50	1.28	19	158.25	1.27
10.00	**8.09**	**73**	**158.65**	**8.16**
10.50	1.41	21	158.26	1.41
11.00	0.97	16	158.22	0.98
11.50	0.84	14	158.20	0.84
12.00	0.73	13	158.19	0.74
12.50	0.66	12	158.18	0.66
13.00	0.60	11	158.17	0.60
13.50	0.53	10	158.16	0.53
14.00	0.46	10	158.15	0.46
14.50	0.44	9	158.15	0.44
15.00	0.43	9	158.15	0.43
15.50	0.41	9	158.15	0.41
16.00	0.40	9	158.14	0.40
16.50	0.39	8	158.14	0.39
17.00	0.37	8	158.14	0.37
17.50	0.36	8	158.14	0.36
18.00	0.35	8	158.13	0.35
18.50	0.33	8	158.13	0.33
19.00	0.32	7	158.13	0.32
19.50	0.31	7	158.13	0.31
20.00	0.29	7	158.12	0.29
20.50	0.28	7	158.12	0.28
21.00	0.27	6	158.12	0.27
21.50	0.25	6	158.12	0.25
22.00	0.24	6	158.11	0.24
22.50	0.22	6	158.11	0.23
23.00	0.21	6	158.11	0.21
23.50	0.20	5	158.10	0.20
24.00	0.18	5	158.10	0.18

Stage-Discharge for Reach 7R: SD-2

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
158.00	0.00	0.00
158.02	1.26	0.01
158.04	2.02	0.03
158.06	2.64	0.06
158.08	3.18	0.12
158.10	3.68	0.19
158.12	4.14	0.27
158.14	4.56	0.38
158.16	4.97	0.50
158.18	5.35	0.64
158.20	5.71	0.80
158.22	6.06	0.98
158.24	6.39	1.17
158.26	6.71	1.38
158.28	7.02	1.60
158.30	7.31	1.84
158.32	7.60	2.10
158.34	7.87	2.37
158.36	8.14	2.65
158.38	8.39	2.96
158.40	8.64	3.27
158.42	8.88	3.60
158.44	9.11	3.94
158.46	9.34	4.29
158.48	9.56	4.66
158.50	9.77	5.04
158.52	9.97	5.43
158.54	10.17	5.82
158.56	10.36	6.23
158.58	10.55	6.65
158.60	10.73	7.08
158.62	10.90	7.52
158.64	11.07	7.96
158.66	11.23	8.41
158.68	11.38	8.87
158.70	11.53	9.33
158.72	11.68	9.80
158.74	11.82	10.27
158.76	11.95	10.74
158.78	12.08	11.22
158.80	12.21	11.70
158.82	12.33	12.18
158.84	12.44	12.67
158.86	12.55	13.15
158.88	12.65	13.63
158.90	12.75	14.11
158.92	12.84	14.59
158.94	12.93	15.07
158.96	13.01	15.54
158.98	13.09	16.01
159.00	13.16	16.47
159.02	13.22	16.92
159.04	13.28	17.37
159.06	13.34	17.81
159.08	13.39	18.24
159.10	13.43	18.65
159.12	13.47	19.06
159.14	13.50	19.45
159.16	13.52	19.83
159.18	13.54	20.19
159.20	13.55	20.54
159.22	**13.55**	20.86
159.24	13.55	21.17
159.26	13.54	21.45
159.28	13.52	21.71
159.30	13.49	21.94
159.32	13.45	22.15
159.34	13.40	22.32
159.36	13.33	22.45
159.38	13.26	22.55
159.40	13.16	**22.59**
159.42	13.05	**22.58**
159.44	12.91	22.51
159.46	12.73	22.33
159.48	12.48	21.99
159.50	11.89	21.01

Stage-Area-Storage for Reach 7R: SD-2

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
158.00	0.0	0
158.02	0.0	0
158.04	0.0	1
158.06	0.0	2
158.08	0.0	4
158.10	0.1	5
158.12	0.1	7
158.14	0.1	8
158.16	0.1	10
158.18	0.1	12
158.20	0.1	14
158.22	0.2	16
158.24	0.2	18
158.26	0.2	20
158.28	0.2	23
158.30	0.3	25
158.32	0.3	28
158.34	0.3	30
158.36	0.3	33
158.38	0.4	35
158.40	0.4	38
158.42	0.4	41
158.44	0.4	43
158.46	0.5	46
158.48	0.5	49
158.50	0.5	52
158.52	0.5	54
158.54	0.6	57
158.56	0.6	60
158.58	0.6	63
158.60	0.7	66
158.62	0.7	69
158.64	0.7	72
158.66	0.7	75
158.68	0.8	78
158.70	0.8	81
158.72	0.8	84
158.74	0.9	87
158.76	0.9	90
158.78	0.9	93
158.80	1.0	96
158.82	1.0	99
158.84	1.0	102
158.86	1.0	105
158.88	1.1	108
158.90	1.1	111
158.92	1.1	114
158.94	1.2	117
158.96	1.2	119
158.98	1.2	122
159.00	1.3	125
159.02	1.3	128
159.04	1.3	131
159.06	1.3	133
159.08	1.4	136
159.10	1.4	139
159.12	1.4	142
159.14	1.4	144
159.16	1.5	147
159.18	1.5	149
159.20	1.5	152
159.22	1.5	154
159.24	1.6	156
159.26	1.6	158
159.28	1.6	161
159.30	1.6	163
159.32	1.6	165
159.34	1.7	167
159.36	1.7	168
159.38	1.7	170
159.40	1.7	172
159.42	1.7	173
159.44	1.7	174
159.46	1.8	175
159.48	1.8	176
159.50	**1.8**	**177**

Summary for Reach 10R: SD-3

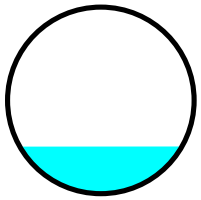
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 0.800 ac,100.00% Impervious, Inflow Depth > 8.14" for 100 Yr event
Inflow = 4.56 cfs @ 9.94 hrs, Volume= 0.542 af
Outflow = 4.54 cfs @ 9.95 hrs, Volume= 0.542 af, Atten= 0%, Lag= 0.2 min

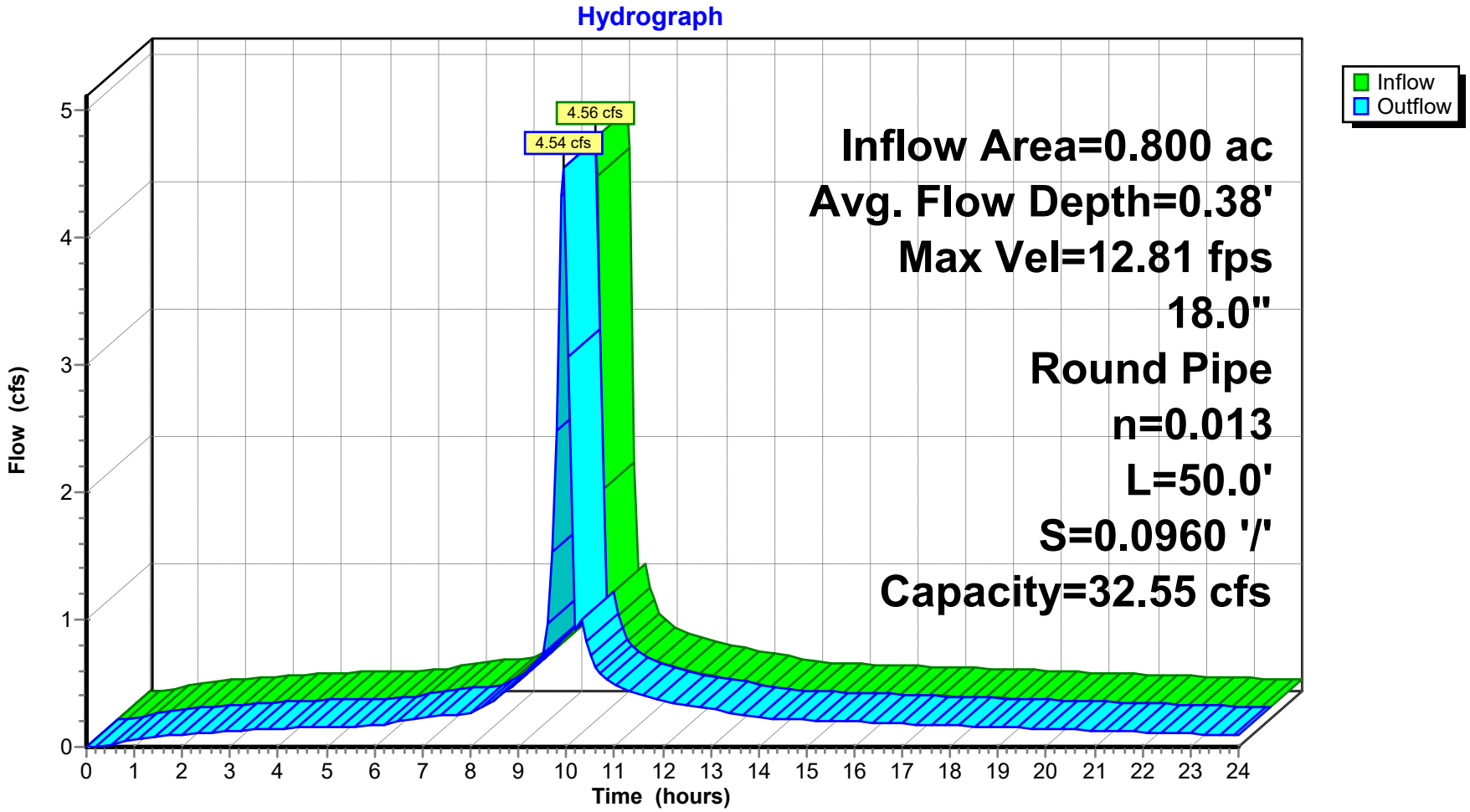
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Max. Velocity= 12.81 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 5.17 fps, Avg. Travel Time= 0.2 min

Peak Storage= 18 cf @ 9.95 hrs
Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 32.55 cfs

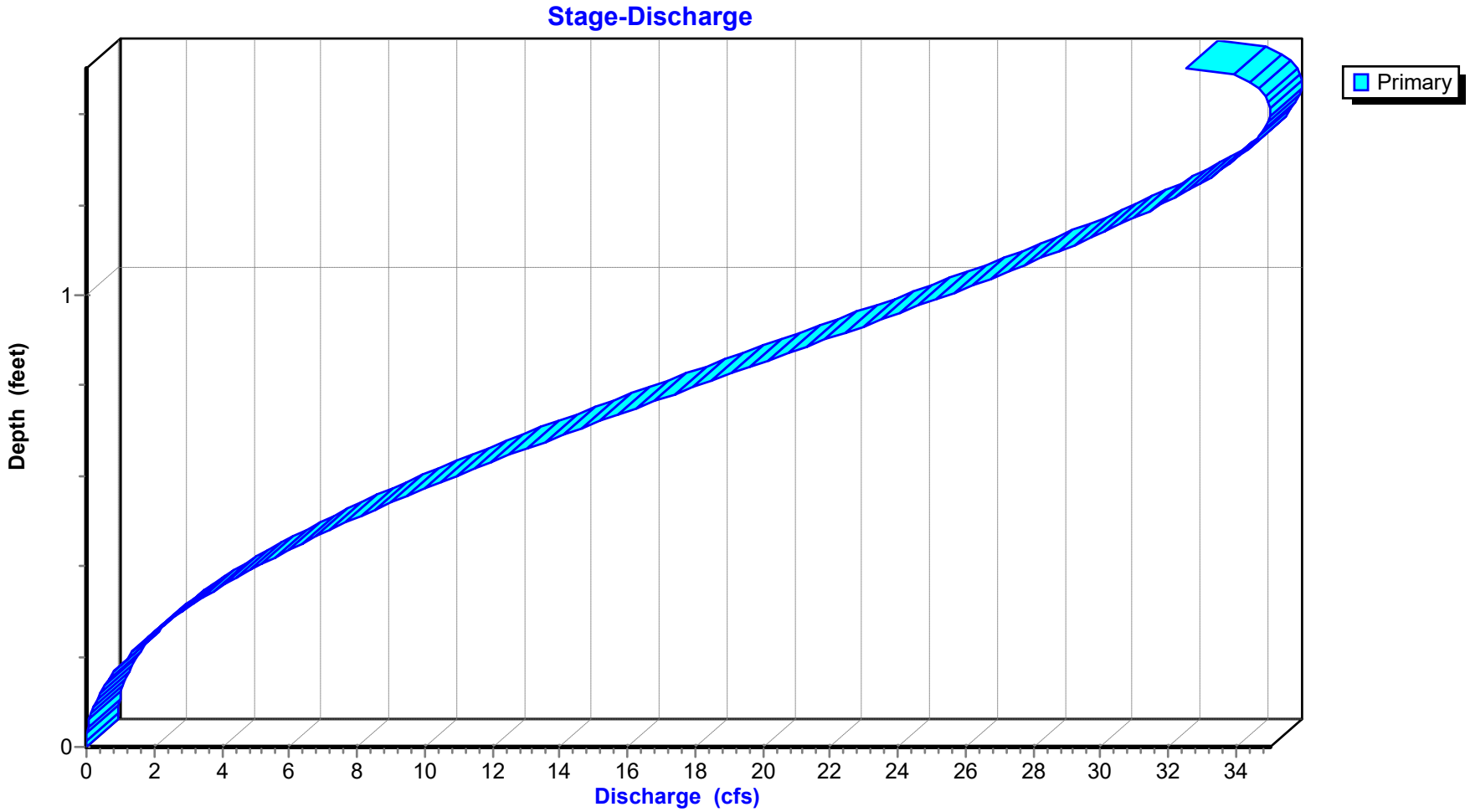
18.0" Round Pipe
n= 0.013
Length= 50.0' Slope= 0.0960 '/'
Inlet Invert= 144.80', Outlet Invert= 140.00'



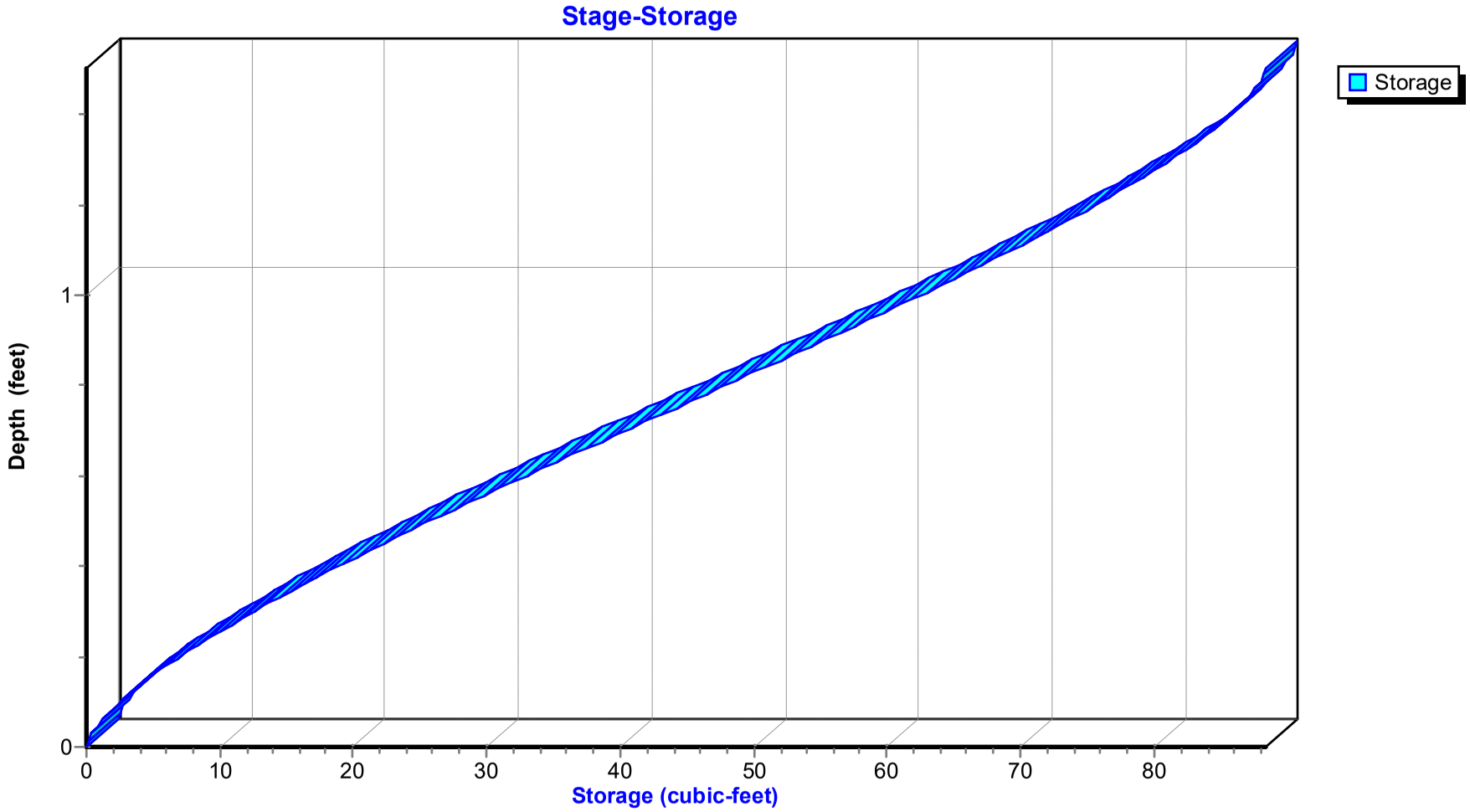
Reach 10R: SD-3



Reach 10R: SD-3



Reach 10R: SD-3



Hydrograph for Reach 10R: SD-3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	144.80	0.00
0.50	0.02	0	144.83	0.02
1.00	0.06	1	144.85	0.06
1.50	0.08	1	144.86	0.08
2.00	0.09	1	144.86	0.09
2.50	0.11	1	144.86	0.11
3.00	0.12	1	144.87	0.12
3.50	0.13	1	144.87	0.13
4.00	0.15	2	144.87	0.15
4.50	0.15	2	144.87	0.15
5.00	0.16	2	144.88	0.16
5.50	0.16	2	144.88	0.16
6.00	0.17	2	144.88	0.17
6.50	0.20	2	144.88	0.20
7.00	0.24	2	144.89	0.24
7.50	0.25	2	144.89	0.25
8.00	0.26	2	144.90	0.26
8.50	0.38	3	144.91	0.38
9.00	0.51	4	144.93	0.51
9.50	**0.74**	**5**	**144.96**	**0.74**
10.00	**4.26**	**17**	**145.17**	**4.28**
10.50	0.71	5	144.95	0.71
11.00	0.49	4	144.93	0.49
11.50	0.42	3	144.92	0.42
12.00	0.37	3	144.91	0.37
12.50	0.33	3	144.91	0.33
13.00	0.30	3	144.90	0.30
13.50	0.26	2	144.90	0.26
14.00	0.23	2	144.89	0.23
14.50	0.22	2	144.89	0.22
15.00	0.21	2	144.89	0.21
15.50	0.20	2	144.88	0.20
16.00	0.20	2	144.88	0.20
16.50	0.19	2	144.88	0.19
17.00	0.18	2	144.88	0.18
17.50	0.18	2	144.88	0.18
18.00	0.17	2	144.88	0.17
18.50	0.16	2	144.88	0.16
19.00	0.16	2	144.88	0.16
19.50	0.15	2	144.87	0.15
20.00	0.14	2	144.87	0.14
20.50	0.14	1	144.87	0.14
21.00	0.13	1	144.87	0.13
21.50	0.12	1	144.87	0.12
22.00	0.12	1	144.86	0.12
22.50	0.11	1	144.86	0.11
23.00	0.10	1	144.86	0.10
23.50	0.10	1	144.86	0.10
24.00	0.09	1	144.86	0.09

Stage-Discharge for Reach 10R: SD-3

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
144.80	0.00	0.00
144.82	1.96	0.01
144.84	3.12	0.04
144.86	4.09	0.10
144.88	4.93	0.18
144.90	5.70	0.29
144.92	6.41	0.42
144.94	7.07	0.59
144.96	7.69	0.78
144.98	8.29	1.00
145.00	8.85	1.24
145.02	9.39	1.51
145.04	9.90	1.81
145.06	10.39	2.13
145.08	10.87	2.48
145.10	11.33	2.85
145.12	11.77	3.25
145.14	12.19	3.67
145.16	12.61	4.11
145.18	13.00	4.58
145.20	13.39	5.07
145.22	13.76	5.57
145.24	14.12	6.10
145.26	14.47	6.65
145.28	14.80	7.22
145.30	15.13	7.80
145.32	15.45	8.41
145.34	15.75	9.02
145.36	16.05	9.66
145.38	16.34	10.31
145.40	16.62	10.97
145.42	16.88	11.64
145.44	17.14	12.33
145.46	17.39	13.03
145.48	17.64	13.73
145.50	17.87	14.45
145.52	18.10	15.17
145.54	18.31	15.91
145.56	18.52	16.64
145.58	18.72	17.38
145.60	18.91	18.13
145.62	19.10	18.88
145.64	19.27	19.62
145.66	19.44	20.37
145.68	19.60	21.12
145.70	19.75	21.87
145.72	19.89	22.61
145.74	20.03	23.34
145.76	20.16	24.08
145.78	20.27	24.80
145.80	20.38	25.51
145.82	20.49	26.22
145.84	20.58	26.91
145.86	20.66	27.59
145.88	20.74	28.25
145.90	20.81	28.90
145.92	20.86	29.52
145.94	20.91	30.13
145.96	20.95	30.72
145.98	20.97	31.28
146.00	20.99	31.81
146.02	**21.00**	32.32
146.04	20.99	32.79
146.06	20.97	33.23
146.08	20.94	33.63
146.10	20.89	33.99
146.12	20.83	34.31
146.14	20.75	34.57
146.16	20.65	34.78
146.18	20.54	34.93
146.20	20.39	**35.00**
146.22	20.21	**34.98**
146.24	20.00	34.87
146.26	19.72	34.59
146.28	19.33	34.07
146.30	18.42	32.55

Stage-Area-Storage for Reach 10R: SD-3

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)	Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
144.80	0.0	0	145.50	0.8	40	146.20	1.7	86
144.82	0.0	0	145.52	0.8	42	146.22	1.7	87
144.84	0.0	1	145.54	0.9	43	146.24	1.7	87
144.86	0.0	1	145.56	0.9	45	146.26	1.8	88
144.88	0.0	2	145.58	0.9	46	146.28	1.8	88
144.90	0.1	3	145.60	1.0	48	146.30	**1.8**	**88**
144.92	0.1	3	145.62	1.0	49			
144.94	0.1	4	145.64	1.0	51			
144.96	0.1	5	145.66	1.0	52			
144.98	0.1	6	145.68	1.1	54			
145.00	0.1	7	145.70	1.1	55			
145.02	0.2	8	145.72	1.1	57			
145.04	0.2	9	145.74	1.2	58			
145.06	0.2	10	145.76	1.2	60			
145.08	0.2	11	145.78	1.2	61			
145.10	0.3	13	145.80	1.3	63			
145.12	0.3	14	145.82	1.3	64			
145.14	0.3	15	145.84	1.3	65			
145.16	0.3	16	145.86	1.3	67			
145.18	0.4	18	145.88	1.4	68			
145.20	0.4	19	145.90	1.4	69			
145.22	0.4	20	145.92	1.4	71			
145.24	0.4	22	145.94	1.4	72			
145.26	0.5	23	145.96	1.5	73			
145.28	0.5	24	145.98	1.5	75			
145.30	0.5	26	146.00	1.5	76			
145.32	0.5	27	146.02	1.5	77			
145.34	0.6	29	146.04	1.6	78			
145.36	0.6	30	146.06	1.6	79			
145.38	0.6	32	146.08	1.6	80			
145.40	0.7	33	146.10	1.6	81			
145.42	0.7	34	146.12	1.6	82			
145.44	0.7	36	146.14	1.7	83			
145.46	0.7	37	146.16	1.7	84			
145.48	0.8	39	146.18	1.7	85			

Summary for Pond 8P: Detention Basin 2

[62] Hint: Exceeded Reach 3R OUTLET depth by 3.04' @ 10.60 hrs
[62] Hint: Exceeded Reach 7R OUTLET depth by 3.26' @ 10.60 hrs

Inflow Area = 6.010 ac, 38.00% Impervious, Inflow Depth > 6.79" for 100 Yr event
Inflow = 28.87 cfs @ 9.98 hrs, Volume= 3.403 af
Outflow = 5.10 cfs @ 9.70 hrs, Volume= 3.401 af, Atten= 82%, Lag= 0.0 min
Primary = 5.10 cfs @ 9.70 hrs, Volume= 3.401 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 157.51' @ 10.51 hrs Surf.Area= 0.231 ac Storage= 0.616 af

Plug-Flow detention time= 26.8 min calculated for 3.401 af (100% of inflow)
Center-of-Mass det. time= 26.5 min (755.0 - 728.5)

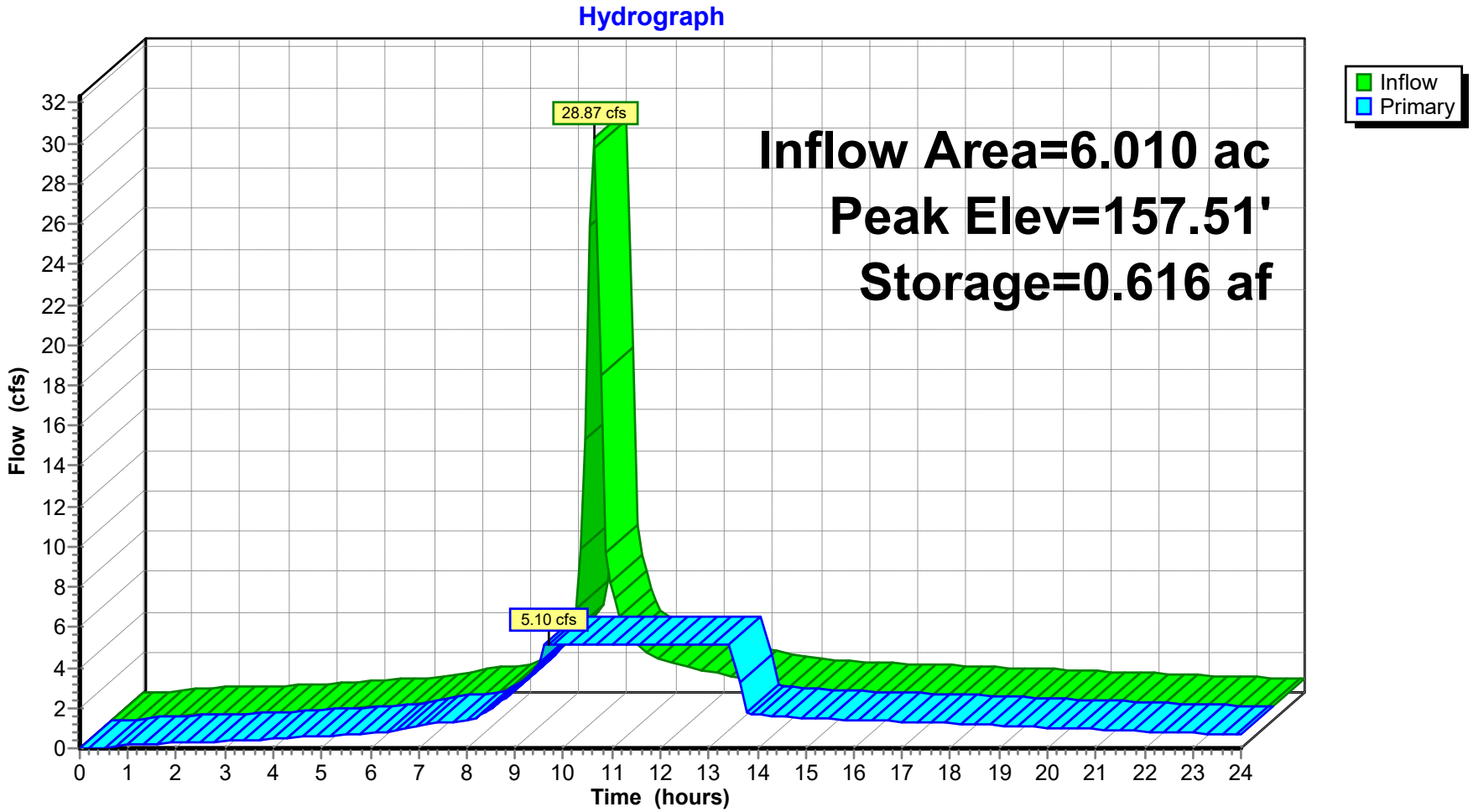
Volume	Invert	Avail.Storage	Storage Description
#1	154.00'	1.297 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
154.00	0.123	0.000	0.000
155.00	0.152	0.137	0.137
156.00	0.182	0.167	0.304
157.00	0.214	0.198	0.503
158.00	0.247	0.230	0.733
159.00	0.282	0.264	0.998
160.00	0.317	0.300	1.297

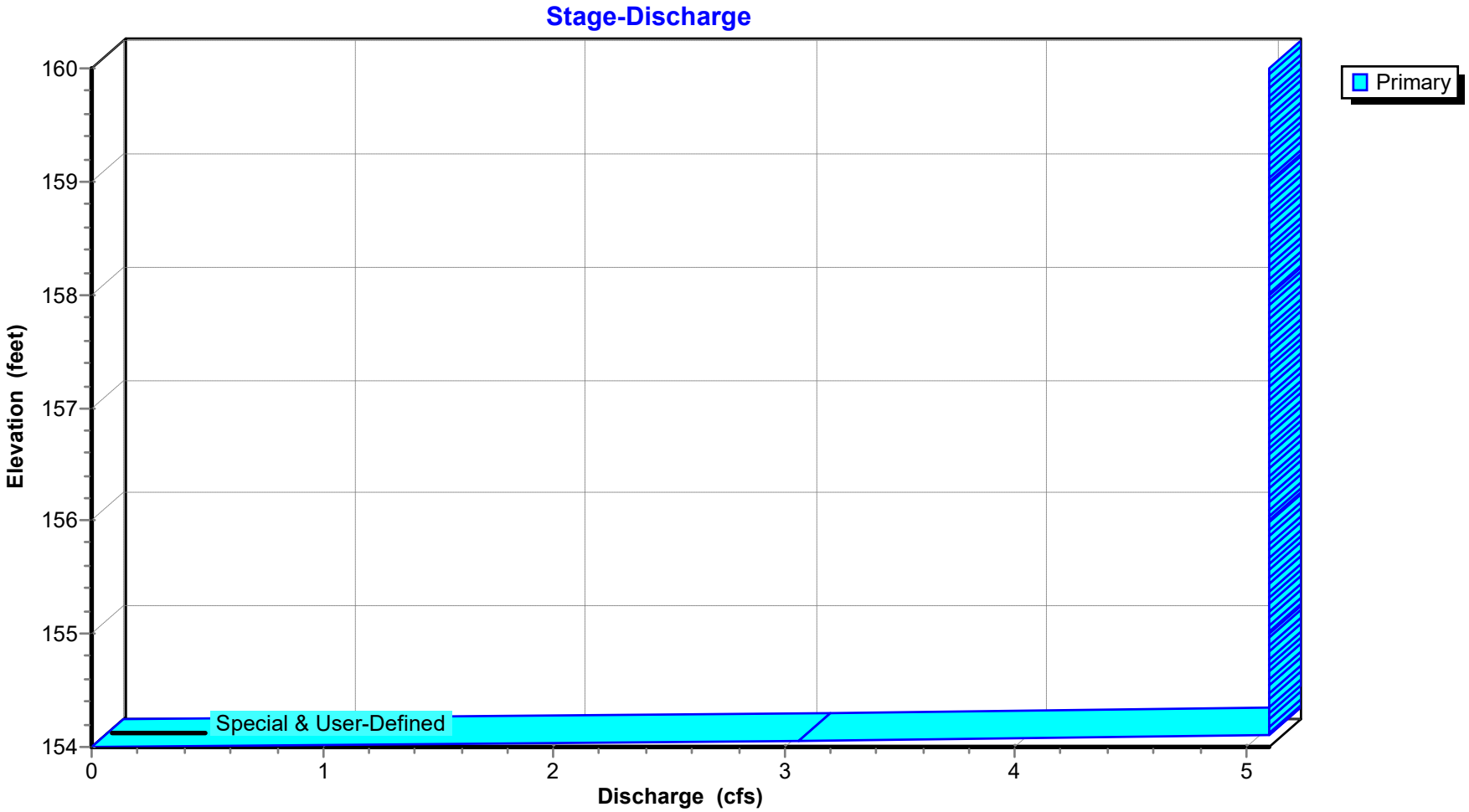
Device	Routing	Invert	Outlet Devices
#1	Primary	154.00'	**Special & User-Defined** Head (feet) 0.00 0.10 6.00 Disch. (cfs) 0.000 5.100 5.100

Primary OutFlow Max=5.10 cfs @ 9.70 hrs HW=154.22' (Free Discharge)
1=Special & User-Defined (Custom Controls 5.10 cfs)

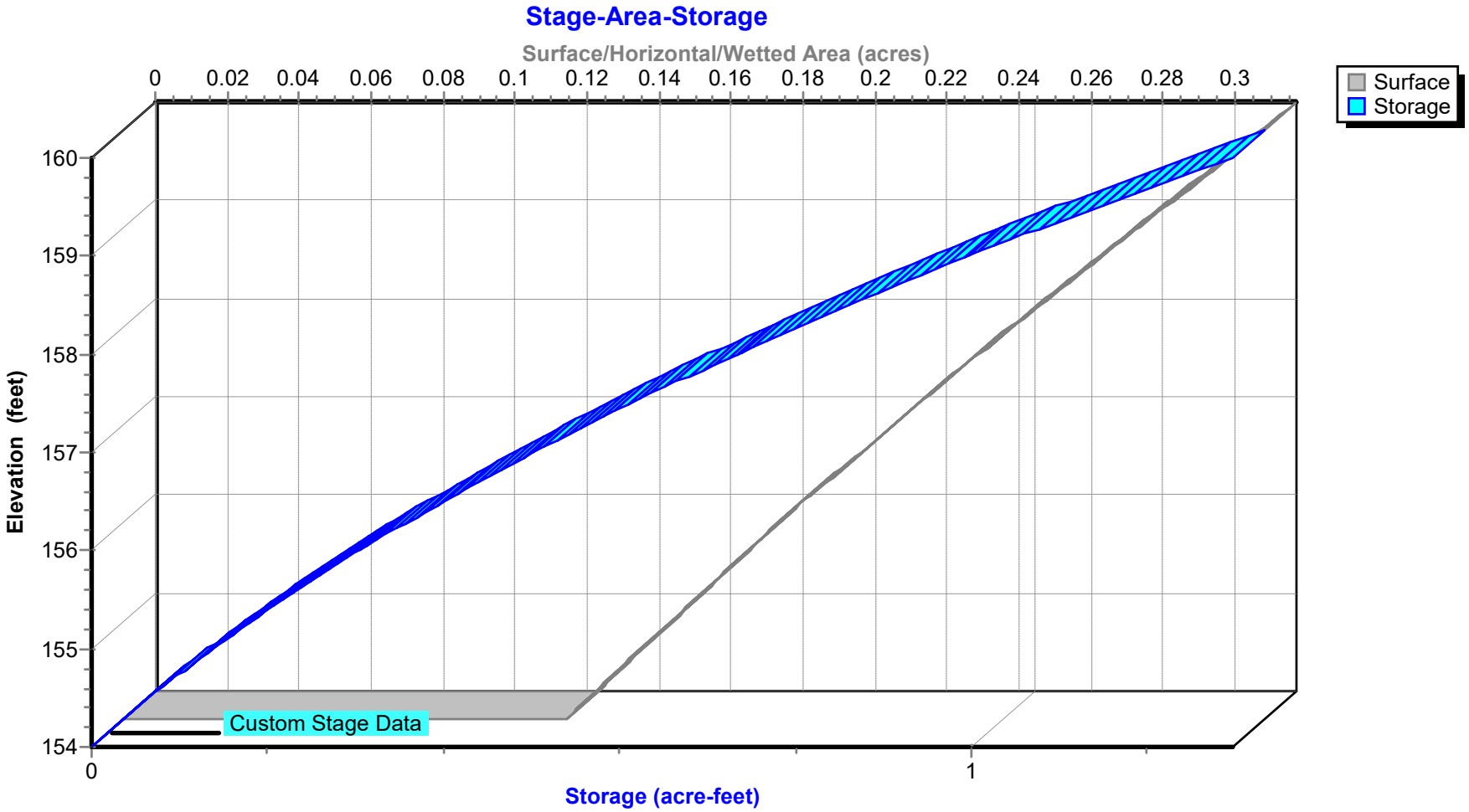
Pond 8P: Detention Basin 2



Pond 8P: Detention Basin 2



Pond 8P: Detention Basin 2



Hydrograph for Pond 8P: Detention Basin 2

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	154.00	0.00
0.50	0.04	0.000	154.00	0.03
1.00	0.17	0.000	154.00	0.17
1.50	0.23	0.001	154.00	0.23
2.00	0.27	0.001	154.01	0.26
2.50	0.30	0.001	154.01	0.30
3.00	0.34	0.001	154.01	0.34
3.50	0.39	0.001	154.01	0.39
4.00	0.48	0.001	154.01	0.47
4.50	0.55	0.001	154.01	0.54
5.00	0.61	0.001	154.01	0.61
5.50	0.67	0.002	154.01	0.67
6.00	0.73	0.002	154.01	0.73
6.50	0.90	0.002	154.02	0.89
7.00	1.12	0.003	154.02	1.11
7.50	1.27	0.003	154.02	1.26
8.00	1.38	0.003	154.03	1.38
8.50	2.05	0.005	154.04	2.00
9.00	2.91	0.007	154.06	2.86
9.50	4.39	0.010	154.08	**4.29**
10.00	**28.42**	0.372	156.36	**5.10**
10.50	5.15	**0.616**	**157.51**	5.10
11.00	3.48	0.575	157.33	5.10
11.50	2.96	0.495	156.96	5.10
12.00	2.60	0.399	156.50	5.10
12.50	2.34	0.290	155.92	5.10
13.00	2.11	0.171	155.22	5.10
13.50	1.87	0.043	154.33	5.10
14.00	1.64	0.004	154.03	1.66
14.50	1.55	0.004	154.03	1.55
15.00	1.50	0.004	154.03	1.51
15.50	1.46	0.004	154.03	1.46
16.00	1.41	0.003	154.03	1.41
16.50	1.37	0.003	154.03	1.37
17.00	1.32	0.003	154.03	1.32
17.50	1.27	0.003	154.02	1.27
18.00	1.22	0.003	154.02	1.23
18.50	1.18	0.003	154.02	1.18
19.00	1.13	0.003	154.02	1.13
19.50	1.08	0.003	154.02	1.09
20.00	1.03	0.003	154.02	1.04
20.50	0.99	0.002	154.02	0.99
21.00	0.94	0.002	154.02	0.94
21.50	0.89	0.002	154.02	0.89
22.00	0.84	0.002	154.02	0.84
22.50	0.79	0.002	154.02	0.80
23.00	0.75	0.002	154.01	0.75
23.50	0.70	0.002	154.01	0.70
24.00	0.65	0.002	154.01	0.65

Stage-Discharge for Pond 8P: Detention Basin 2

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
154.00	0.00	155.40	5.10	156.80	5.10	158.20	5.10	159.60	5.10
154.04	2.04	155.44	5.10	156.84	5.10	158.24	5.10	159.64	5.10
154.08	4.08	155.48	5.10	156.88	5.10	158.28	5.10	159.68	5.10
154.12	**5.10**	155.52	5.10	156.92	5.10	158.32	5.10	159.72	5.10
154.16	5.10	155.56	5.10	156.96	5.10	158.36	5.10	159.76	5.10
154.20	5.10	155.60	5.10	157.00	5.10	158.40	5.10	159.80	5.10
154.24	5.10	155.64	5.10	157.04	5.10	158.44	5.10	159.84	5.10
154.28	5.10	155.68	5.10	157.08	5.10	158.48	5.10	159.88	5.10
154.32	5.10	155.72	5.10	157.12	5.10	158.52	5.10	159.92	5.10
154.36	5.10	155.76	5.10	157.16	5.10	158.56	5.10	159.96	5.10
154.40	5.10	155.80	5.10	157.20	5.10	158.60	5.10	160.00	5.10
154.44	5.10	155.84	5.10	157.24	5.10	158.64	5.10		
154.48	5.10	155.88	5.10	157.28	5.10	158.68	5.10		
154.52	5.10	155.92	5.10	157.32	5.10	158.72	5.10		
154.56	5.10	155.96	5.10	157.36	5.10	158.76	5.10		
154.60	5.10	156.00	5.10	157.40	5.10	158.80	5.10		
154.64	5.10	156.04	5.10	157.44	5.10	158.84	5.10		
154.68	5.10	156.08	5.10	157.48	5.10	158.88	5.10		
154.72	5.10	156.12	5.10	157.52	5.10	158.92	5.10		
154.76	5.10	156.16	5.10	157.56	5.10	158.96	5.10		
154.80	5.10	156.20	5.10	157.60	5.10	159.00	5.10		
154.84	5.10	156.24	5.10	157.64	5.10	159.04	5.10		
154.88	5.10	156.28	5.10	157.68	5.10	159.08	5.10		
154.92	5.10	156.32	5.10	157.72	5.10	159.12	5.10		
154.96	5.10	156.36	5.10	157.76	5.10	159.16	5.10		
155.00	5.10	156.40	5.10	157.80	5.10	159.20	5.10		
155.04	5.10	156.44	5.10	157.84	5.10	159.24	5.10		
155.08	5.10	156.48	5.10	157.88	5.10	159.28	5.10		
155.12	5.10	156.52	5.10	157.92	5.10	159.32	5.10		
155.16	5.10	156.56	5.10	157.96	5.10	159.36	5.10		
155.20	5.10	156.60	5.10	158.00	5.10	159.40	5.10		
155.24	5.10	156.64	5.10	158.04	5.10	159.44	5.10		
155.28	5.10	156.68	5.10	158.08	5.10	159.48	5.10		
155.32	5.10	156.72	5.10	158.12	5.10	159.52	5.10		
155.36	5.10	156.76	5.10	158.16	5.10	159.56	5.10		

Stage-Area-Storage for Pond 8P: Detention Basin 2

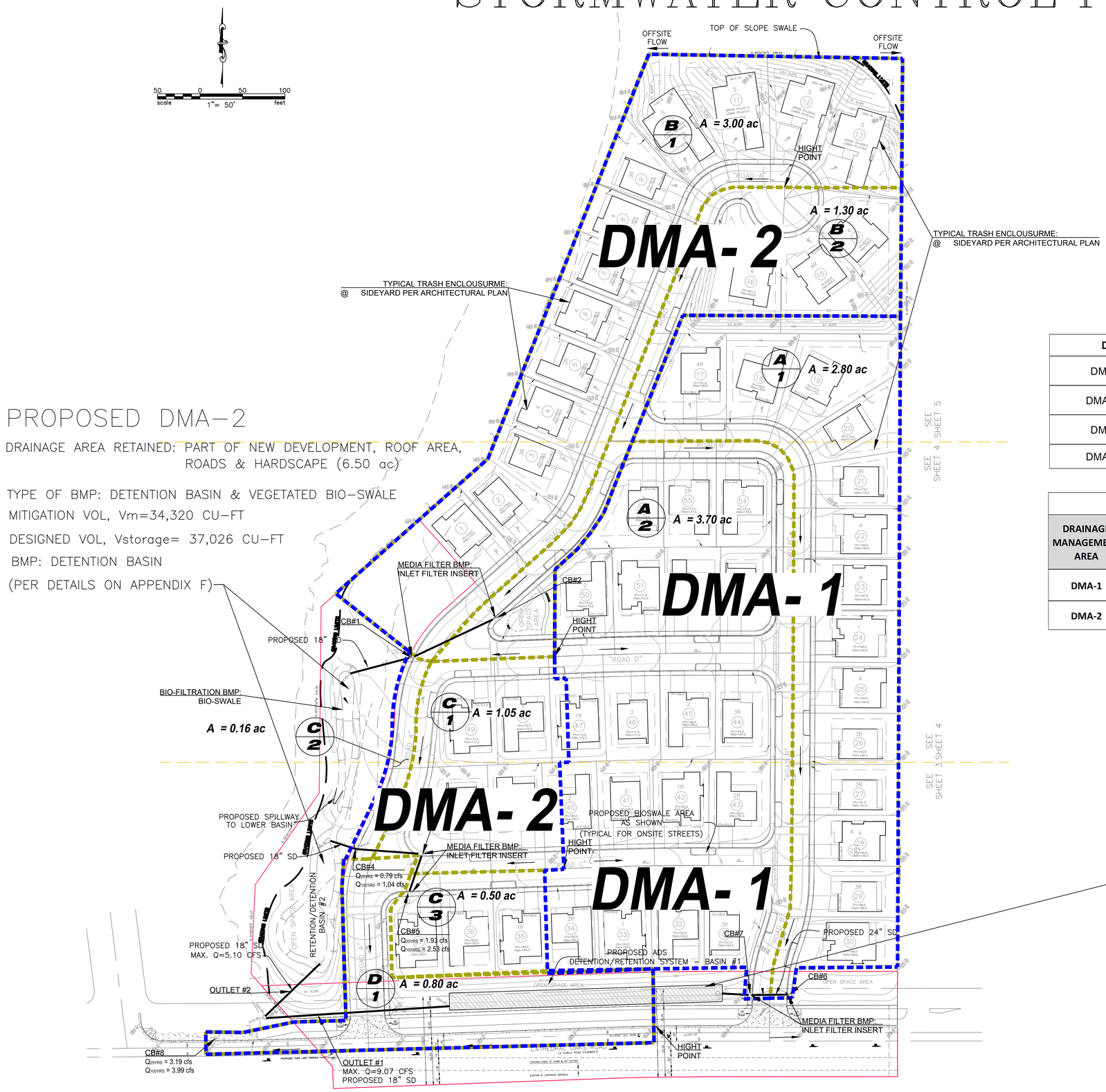
Elevation (feet)	Surface (acres)	Storage (acre-feet)
154.00	0.123	0.000
154.10	0.126	0.012
154.20	0.129	0.025
154.30	0.132	0.038
154.40	0.135	0.052
154.50	0.137	0.065
154.60	0.140	0.079
154.70	0.143	0.093
154.80	0.146	0.108
154.90	0.149	0.122
155.00	0.152	0.137
155.10	0.155	0.153
155.20	0.158	0.168
155.30	0.161	0.184
155.40	0.164	0.201
155.50	0.167	0.217
155.60	0.170	0.234
155.70	0.173	0.251
155.80	0.176	0.269
155.90	0.179	0.286
156.00	0.182	0.304
156.10	0.185	0.323
156.20	0.188	0.342
156.30	0.192	0.361
156.40	0.195	0.380
156.50	0.198	0.400
156.60	0.201	0.419
156.70	0.204	0.440
156.80	0.208	0.460
156.90	0.211	0.481
157.00	0.214	0.503
157.10	0.217	0.524
157.20	0.221	0.546
157.30	0.224	0.568
157.40	0.227	0.591
157.50	0.230	0.614
157.60	0.234	0.637
157.70	0.237	0.660
157.80	0.240	0.684
157.90	0.244	0.708
158.00	0.247	0.733
158.10	0.250	0.758
158.20	0.254	0.783
158.30	0.258	0.809
158.40	0.261	0.835
158.50	0.264	0.861
158.60	0.268	0.887
158.70	0.271	0.914
158.80	0.275	0.942
158.90	0.279	0.969
159.00	0.282	0.998
159.10	0.285	1.026
159.20	0.289	1.055
159.30	0.293	1.084
159.40	0.296	1.113
159.50	0.300	1.143
159.60	0.303	1.173
159.70	0.306	1.203
159.80	0.310	1.234
159.90	0.314	1.265
160.00	**0.317**	**1.297**

Appendix E:
LID PLAN

STORMWATER CONTROL PLAN

VESTING TENTATIVE TRACT MAP
AND
FINAL DEVELOPMENT PLAN
(05-154-GPA/RZN/TM 32,045/FDP)

DEVELOPED HYDROLOGY MAP



DMA Name	DMA Type	Area (sf)	Surface Type	Drains to
DMA-1 New Imp	Drains to SCM	118919	Concrete, Asphalt, Roof	Bio-retention Basin (ADS Chamber)
DMA-1 Landscape	Self Treating	164221		Bio-retention Basin (ADS Chamber)
DMA-2 New Imp	Drains to SCM	124590	Concrete, Asphalt, Roof	Detention Basin
DMA-2 Landscape	Self Treating	172053		Detention Basin

TABLE 4: LOW IMPACT DEVELOPMENT RETENTION BMP SIZING SUMMARY

DRAINAGE MANAGEMENT AREA	AREA (ACRE)	IMPERVIOUS AREA (ACRE)	C (RUNOFF COEFFICIENT)	RAINFALL (INCH)	Q (DESIGN DISCHARGE)	RETENTION VOLUME REQUIRED, CU-FT	VOLUME PROVIDED, CU-FT	BMP NAME
DMA-1	6.5	2.73	0.29	2.4	16480	32354	32500	ADS STORMTECH MC-7200
DMA-2	6.81	2.86	0.29	2.4	17484	34320	37026	DETENTION BASIN

TABLE 5: BMP SUMMARY

DMA	BMP TYPE	BMP NAME	NOTE
DMA-1	Retention Chamber	StormTech Chamber MC-7200	LID Plans in Appendix E and BMP details in Appendix F
	Media Filter	Stormdrain Inlet Filter Insert	
	Bio-Filtration	Onsite Bio-Swale	
DMA-2	Detention Basin	Onsite Detention Basin	
	Water Quality Inlet	Orifice Detention Basin Outlet	
	Media Filter	Stormdrain Inlet Filter Insert	
	Bio-Filtration	Onsite Bio-Swale	

PROPOSED DMA-2

DRAINAGE AREA RETAINED: PART OF NEW DEVELOPMENT, ROOF AREA, ROADS & HARDSCAPE (6.50 ac)

TYPE OF BMP: DETENTION BASIN & VEGETATED BIO-SWALE
MITIGATION VOL, Vm=34,320 CU-FT
DESIGNED VOL, Vstorage= 37,026 CU-FT
BMP: DETENTION BASIN
(PER DETAILS ON APPENDIX F)

PROPOSED DMA-1

DRAINAGE AREA RETAINED: PART OF NEW DEVELOPMENT, ROOF AREA, ROADS & HARDSCAPE (6.50 ac)

TYPE OF BMP: UNDERGROUND RETENTION SYSTEM (CAPTURE & REUSE)
MITIGATION VOL, Vm=32,354 CU-FT
DESIGNED VOL, Vstorage= 32,500 CU-FT
BMP MODEL: ADS STORMTECH MC-7200
(PER DETAILS ON APPENDIX F)

NO.	REVISION	PREP.	APPVD.	DATE

ACCEPTED:

DIRECTOR OF PUBLIC WORKS — DATE

REVIEWED: SENIOR ENGINEER — DATE

RECOMMENDED: DEPUTY DIRECTOR — DATE

CITY OF GOLETA
DEPARTMENT OF PUBLIC WORKS

PREPARED BY:
MQ DESIGN TECH
Engineering • Planning • Land Development
MQ DESIGN TECH, INC.
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Phone: 818-219-7258
email: mohammadq@mqdesigntech.com
DATE:
MOHAMMAD QUAYUM P.E. C7411 EXP. 06/30/2027

REGISTERED PROFESSIONAL ENGINEER
MOHAMMAD QUAYUM
No.74111
CIVIL
EXP. 06/30/27
STATE OF CALIFORNIA

VESTING TENTATIVE TRACT MAP 32,045
7400 CATHEDAL OAK ROD
P.N. 01-023.01

STORMWATER CONTROL PLAN

SHEET NUMBER: 1 OF 1

DRAWING NUMBER (CITY OF GOLETA)

PLOT DATE:
08-10-2025

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

Advanced Drainage Systems, Inc.

SiteAssist™
FOR STORMTECH
INSTALLATION INSTRUCTIONS
VISIT OUR APP

7400 CATHEDRAL OAKS @ GOLETA

GOLETA, CA, USA

MC-7200 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-7200.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 500 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.
10. MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE. DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
11. ADS DOES NOT DESIGN OR PROVIDE MEMBRANE LINER SYSTEMS. TO MINIMIZE THE LEAKAGE POTENTIAL OF LINER SYSTEMS, THE MEMBRANE LINER SYSTEM SHOULD BE DESIGNED BY A KNOWLEDGEABLE GEOTEXTILE PROFESSIONAL AND INSTALLED BY A QUALIFIED CONTRACTOR.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-7200 CHAMBER SYSTEM

1. STORMTECH MC-7200 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-7200 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE; AASHTO M43 #3, 357, 4, 467, 5, 56, OR 57.
9. STONE SHALL BE BROUGHT UP EVENLY AROUND CHAMBERS SO AS NOT TO DISTORT THE CHAMBER SHAPE. STONE DEPTHS SHOULD NEVER DIFFER BY MORE THAN 12" (300 mm) BETWEEN ADJACENT CHAMBER ROWS.
10. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
11. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIAL BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
12. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-7200 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-7200 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-7200 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

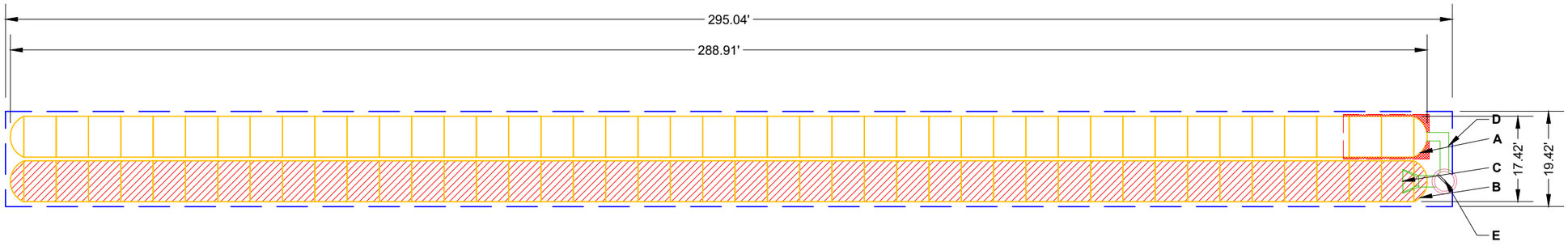
CONTACT STORMTECH AT 1-800-821-6710 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

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PROPOSED LAYOUT		PROPOSED ELEVATIONS	
86	STORMTECH MC-7200 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	159.75
4	STORMTECH MC-7200 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	155.25
12	STONE ABOVE (in)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	154.75
9	STONE BELOW (in)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	154.75
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	154.75
24639	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	153.75
		TOP OF MC-7200 CHAMBER:	152.75
		24" ISOLATOR ROW PLUS INVERT:	147.94
		18" x 18" BOTTOM MANIFOLD INVERT:	147.91
5729	SYSTEM AREA (SF)	BOTTOM OF MC-7200 CHAMBER:	147.75
628.9	SYSTEM PERIMETER (ft)	BOTTOM OF STONE:	147.00

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	18" BOTTOM PARTIAL CUT END CAP, PART#: MC7200IEPP18B / TYP OF ALL 18" BOTTOM CONNECTIONS	1.97"	
PREFABRICATED END CAP	B	24" BOTTOM PARTIAL CUT END CAP, PART#: MC7200IEPP24B / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.26"	
FLAMP	C	INSTALL FLAMP ON 24" ACCESS PIPE / PART#: MCFLAMP		
MANIFOLD	D	18" x 18" BOTTOM MANIFOLD, ADS N-12	1.97"	
CONCRETE STRUCTURE W/WEIR	E	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		5.5 CFS IN



ISOLATOR ROW PLUS
(SEE DETAIL)

PLACE MINIMUM 17.50' OF ADSPLUS125 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

BED LIMITS

NOTES

- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- **NOT FOR CONSTRUCTION**: THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

7400 CATHEDRAL OAKS @ GOLETA
GOLETA, CA, USA

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DATE	DWN	CHK

StormTech® Chamber System

4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

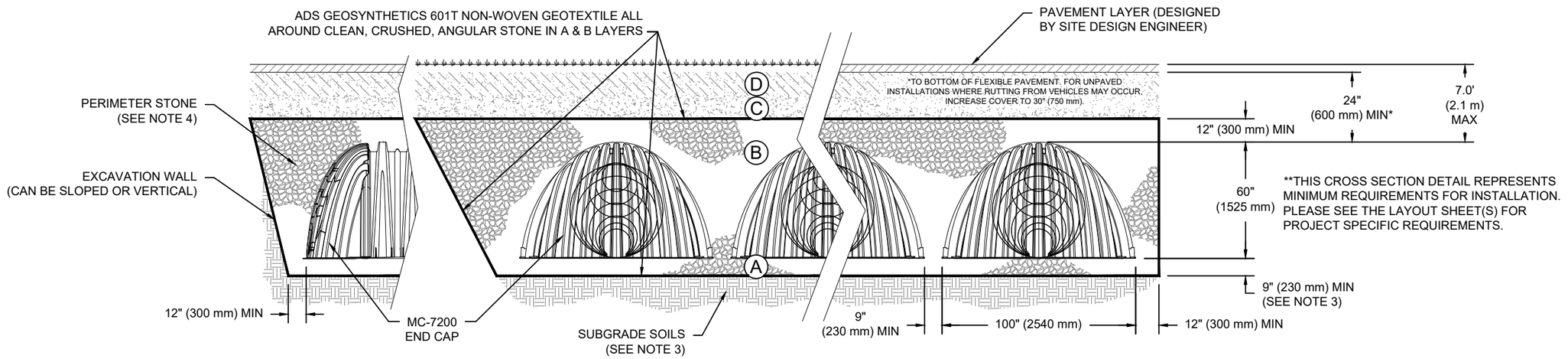
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ACCEPTABLE FILL MATERIALS: STORMTECH MC-7200 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[5]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[5]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.
5. WHERE RECYCLED CONCRETE AGGREGATE IS USED IN LAYERS 'A' OR 'B' THE MATERIAL SHOULD ALSO MEET THE ACCEPTABILITY CRITERIA OUTLINED IN TECHNICAL NOTE 6.20 "RECYCLED CONCRETE STRUCTURAL BACKFILL".



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
2. MC-7200 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS. REFERENCE STORMTECH DESIGN MANUAL FOR BEARING CAPACITY GUIDANCE.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 500 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

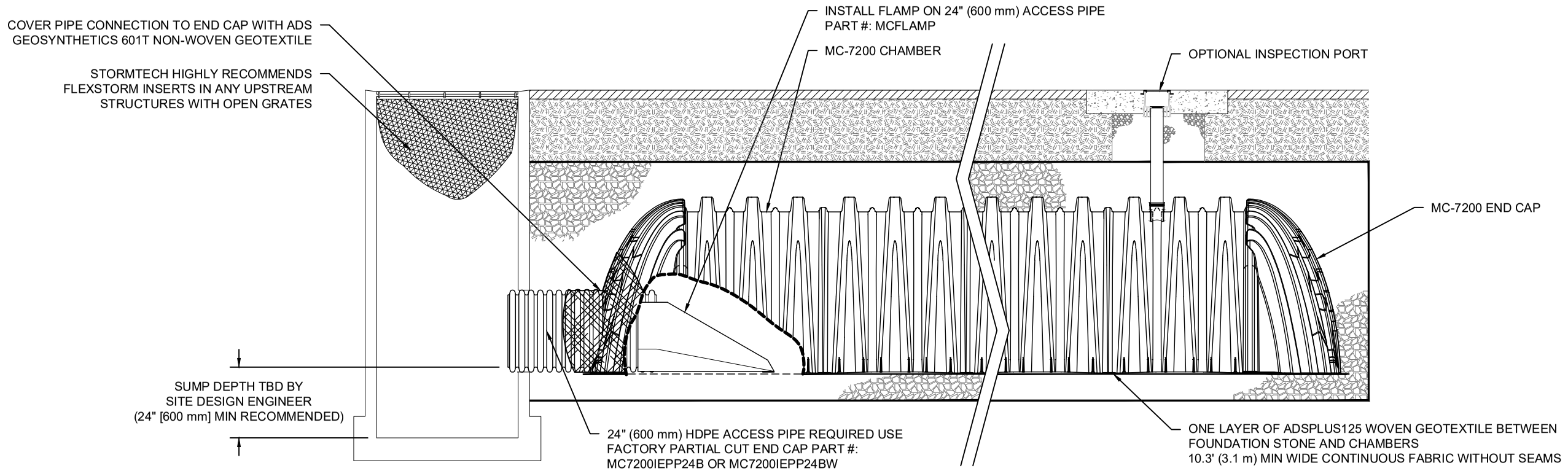
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GOLETA, CA, USA
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PROJECT #:

DATE	DWN	CHK

StormTech® Chamber System

4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

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MC-7200 ISOLATOR ROW PLUS DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.

2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

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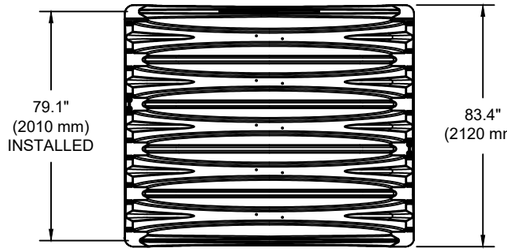
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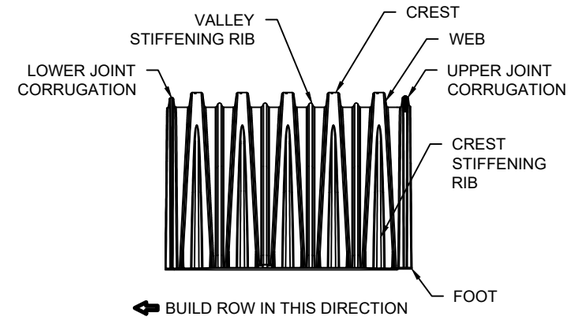
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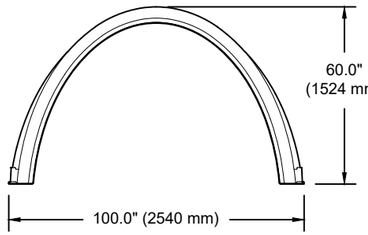
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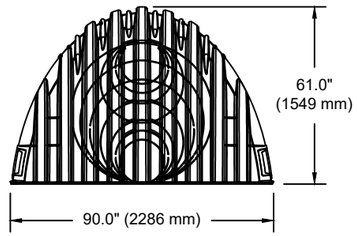
MC-7200 TECHNICAL SPECIFICATION

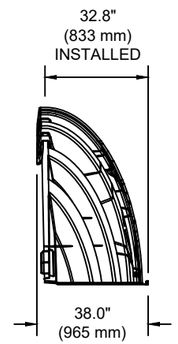
NTS











NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 79.1"	(2540 mm X 1524 mm X 2010 mm)
CHAMBER STORAGE	175.9 CUBIC FEET	(4.98 m³)
MINIMUM INSTALLED STORAGE*	267.3 CUBIC FEET	(7.56 m³)
WEIGHT (NOMINAL)	205 lbs.	(92.9 kg)

NOMINAL END CAP SPECIFICATIONS

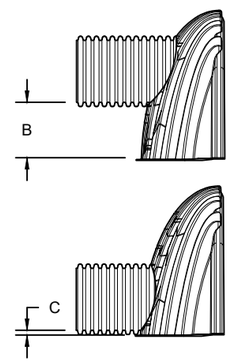
SIZE (W X H X INSTALLED LENGTH)	90.0" X 61.0" X 32.8"	(2286 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m³)
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m³)
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC7200IEPP06T	6" (150 mm)	42.54" (1081 mm)	---
MC7200IEPP06B		---	0.86" (22 mm)
MC7200IEPP08T	8" (200 mm)	40.50" (1029 mm)	---
MC7200IEPP08B		---	1.01" (26 mm)
MC7200IEPP10T	10" (250 mm)	38.37" (975 mm)	---
MC7200IEPP10B		---	1.33" (34 mm)
MC7200IEPP12T	12" (300 mm)	35.69" (907 mm)	---
MC7200IEPP12B		---	1.55" (39 mm)
MC7200IEPP15T	15" (375 mm)	32.72" (831 mm)	---
MC7200IEPP15B		---	1.70" (43 mm)
MC7200IEPP18T	18" (450 mm)	29.36" (746 mm)	---
MC7200IEPP18TW			
MC7200IEPP18B		---	1.97" (50 mm)
MC7200IEPP18BW			
MC7200IEPP24T	24" (600 mm)	23.05" (585 mm)	---
MC7200IEPP24TW			
MC7200IEPP24B		---	2.26" (57 mm)
MC7200IEPP24BW			
MC7200IEPP30BW	30" (750 mm)	---	2.95" (75 mm)
MC7200IEPP36BW	36" (900 mm)	---	3.25" (83 mm)
MC7200IEPP42BW	42" (1050 mm)	---	3.55" (90 mm)

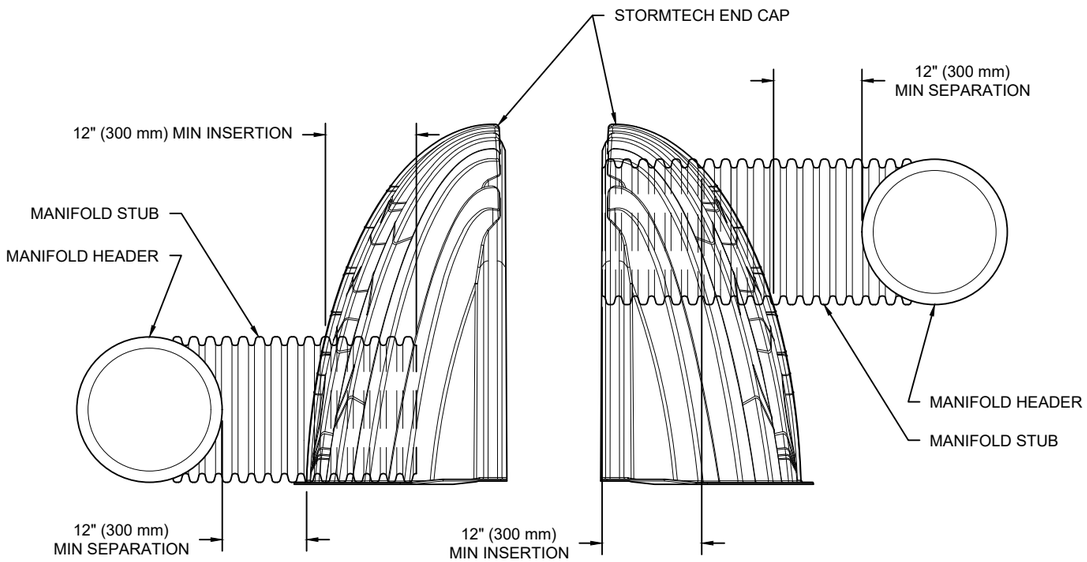
NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PREFABRICATED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-7200 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

MC-SERIES END CAP INSERTION DETAIL

NTS



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

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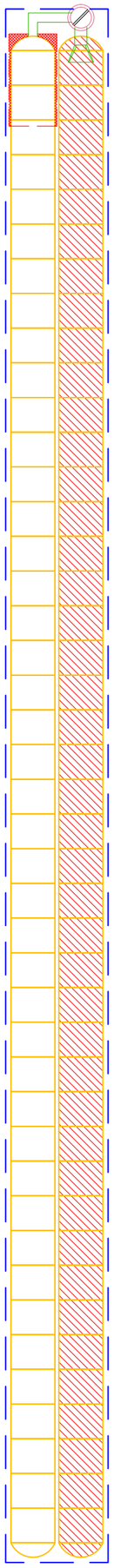
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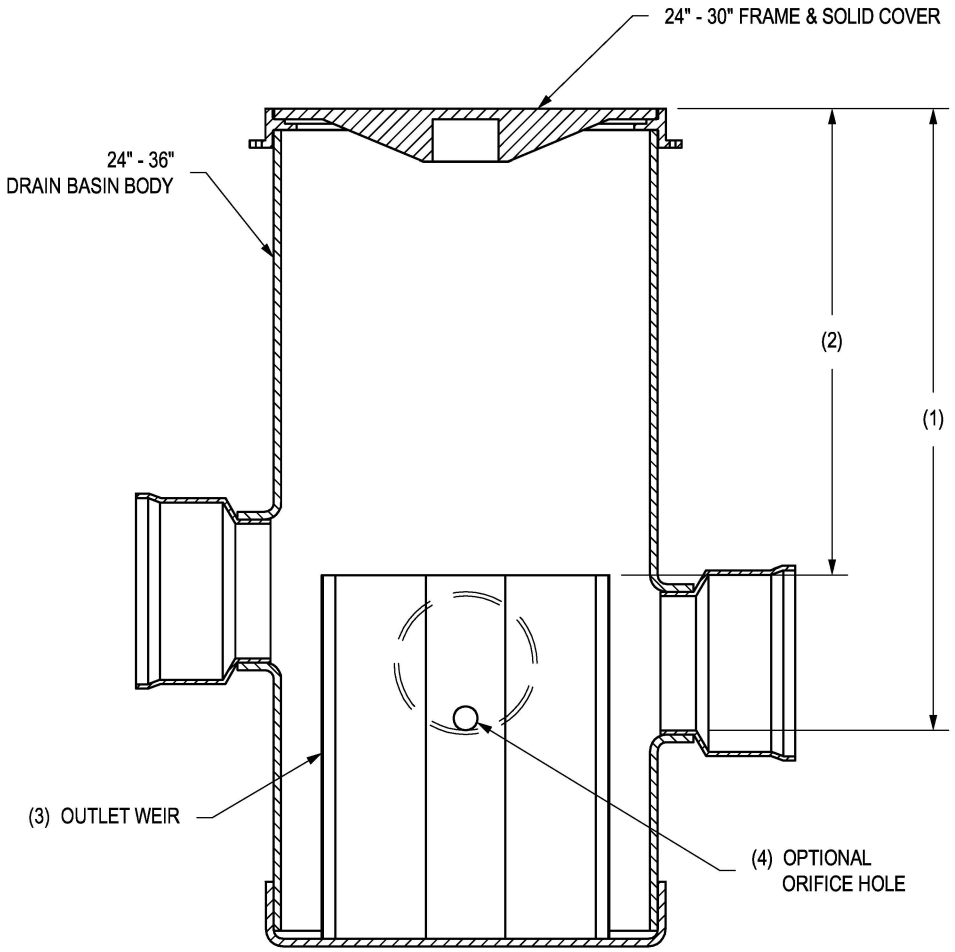
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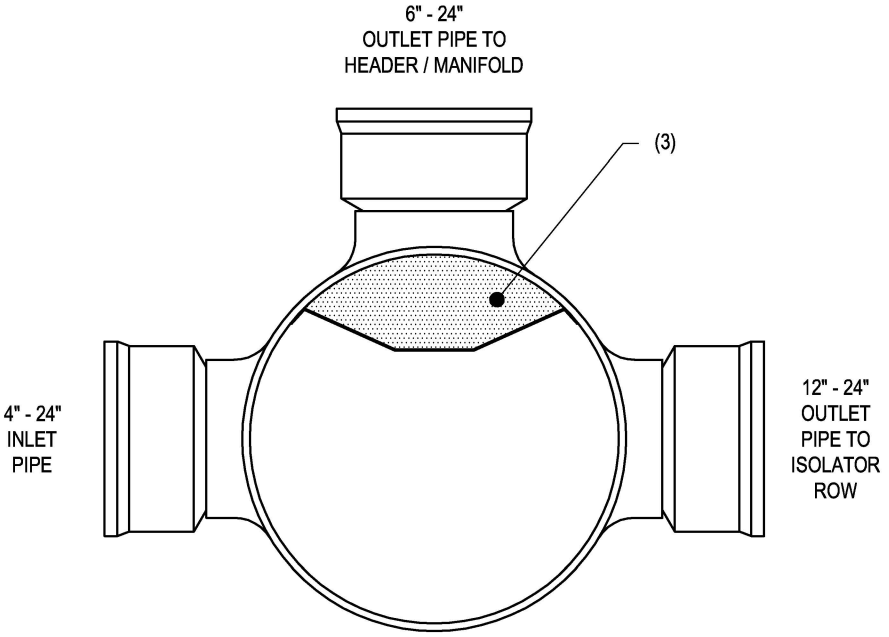
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SIDE SECTION VIEW



TOP VIEW W/ FRAME &
COVER REMOVED

1 - INVERT ELEVATIONS & LOCATIONS TO BE DETERMINED BY ENGINEER.
2 - HEIGHT OF WEIR TO BE DETERMINED BY ENGINEER. WEIR HEIGHT CANNOT EXCEED 84" DUE TO MANUFACTURING AND SHIPPING RESTRICTIONS.
3 - WEIR MANUFACTURED TO MINIMIZE LOSS OF OUTLET PIPE OPEN AREA SEE DRAWING NO. 7004-110-058 FOR DETAILS.
4 - ORIFICE HOLES AND SLOTS AVAILABLE AS REQUIRED BY ENGINEER DESIGN AND PERMITTED BY MANUFACTURING RESTRICTIONS.
5 - NYLOPLAST 36" DRAIN BASIN REQUIRES 36" X 30" REDUCING CONE TO ADAPT 30" CASTING.

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DATE 10-28-03			
REVISED BY NMH	PROJECT NO./NAME	TITLE TYPICAL DRAIN BASIN WITH OUTLET WEIR FOR STORMTECH	
DATE 09-22-20			
DWG SIZE A	SCALE 1:16 SHEET 1 OF 1	DWG NO. 7004-110-007	REV G

Appendix F:
BMP Details

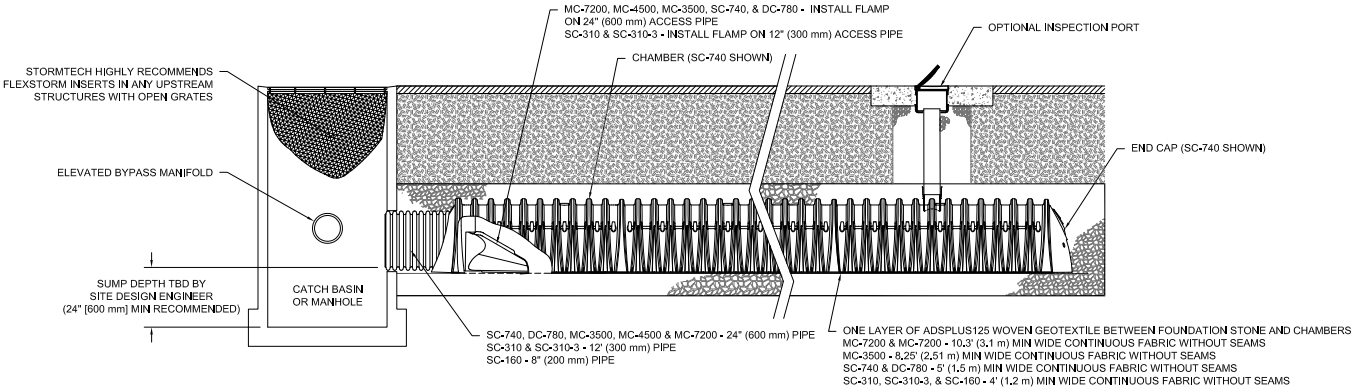
Green Infrastructure



StormTech and Stormwater Quality

StormTech's Isolator® Row is a row of chambers wrapped in a geotextile which filters the stormwater trapping pollutants in the row. The Isolator Row Plus provides a way to inspect and maintain the system

ISOLATOR ROW PLUS



NOTE: For many applications, the optional non-woven geotextile over the DC-780 Isolator Row Plus chambers can be eliminated or substituted with the AASHTO Class 1 woven geotextile. Contact your StormTech representative for assistance.

Isolator Row Plus Field Verification Testing at the University of New Hampshire Stormwater Center

- Lab and field (TARP tier II protocol) tested.
- Removal efficiencies for TSS have improved as the filter cake has built up on the bottom fabric of the Isolator Row Plus.
- Removal efficiency of 80% for TSS which meets most municipal recommended levels for water quality treatment
- NJCAT Verified

Removal Efficiency Results:

- Total Suspended Solids = 80%
- Phosphorous = 49%
- Total Petroleum Hydrocarbons = 90%
- Zinc = 53%

This system achieves a removal efficiency of 80% for TSS which meets most municipal recommended levels for water quality treatment.

Inspection and Maintenance

- The Isolator Row Plus can be inspected through the upstream manhole or optional inspection port.
- Maintenance is easily accomplished with the Jet-Vac process.
- The frequency of inspection and maintenance varies by location. Contact StormTech for assistance with inspection and maintenance scheduling.







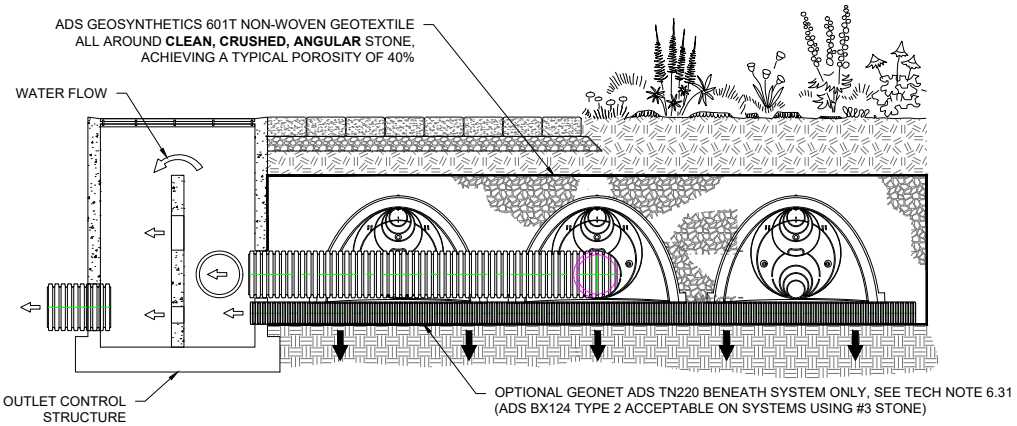
StormTech and Recycled Materials

Recycled Concrete Structural Backfill

- Thermoplastic structures utilize aggregate for conveyance, strength and volume.
- Recycled, crushed concrete can be an excellent structural backfill.
- Care must be taken to ensure that the material is structurally competent before being used as a structural backfill for StormTech chambers.
- StormTech Tech Sheet #4 Recycled Concrete Structural Backfill provides guidance for the acceptability of recycled crushed concrete and limestone when used as the structural foundation (bedding) and embedment materials for StormTech chambers.

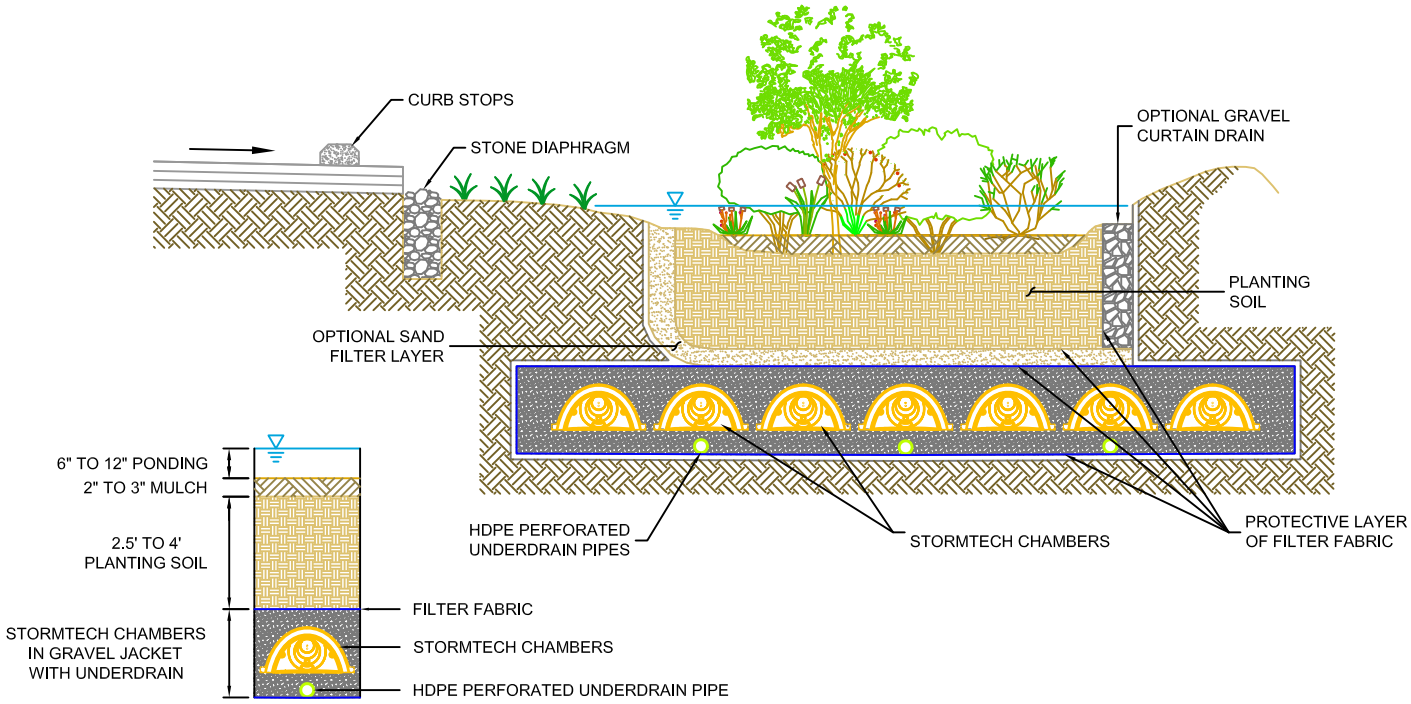
StormTech and Downspout Applications

The StormTech chamber system can connect with roof downspouts for commercial and residential applications.









StormTech and Bioretention/Rain Gardens

What is a Rain Garden?

A shallow depression planted with suitable vegetation which is used to store and possibly treat stormwater runoff from impervious areas.

Benefits of Using Rain Gardens

- Bioretention
- Pollutant Removal – TSS, Phosphorous, Metals, Nitrogen, Hydrocarbons
- Groundwater recharge
- No standing water (proper design will allow water to infiltrate in a specified amount of time)
- Preserve pre-development hydrologic cycle
- Efficient land use & Aesthetics

Maintenance

- Plant watering initially until plants are established, weeding
- Removal of dead plant material and replacement of mulch as needed
- Regular inspection and cleaning of any overflow structures

Benefits of Rain Gardens and StormTech

- Increased storage capacity due to 100% chamber storage
  - Enables the use of rain gardens in areas with low soil permeability
- StormTech system can act as an emergency overflow to the rain garden

General Design Considerations

Always refer to local design specifications for rain garden design guidelines

Hydraulics:

- Soil infiltration rate
- Design flow rate (potential for erosion)
- Maximum ponding depth in rain garden
- Optional overflow bypass
- Proximity to buildings
- Depth to ground water

Planting:

- Native plants are best – see local specifications for plant recommendations
- Root systems may govern the depth of soil

Construction:

- Presoak soil for natural compaction after installation
- Limit compaction of soil during installation





StormTech and Pervious Pavements

What is a Pervious Pavement?

Paving methods for roads, parking lots and walk-ways that allow the movement of water and air through the paving material.





Pervious Pavement

Environmental:

- May assist in groundwater recharge
- Flood mitigation
- Reduce runoff temperature

Safety:

- Pervious pavement limits surface water
- No black ice
- Reduces hydroplaning

Economic:

- Higher initial cost
- Efficient land use
- In colder climates, the use of pervious pavement may save money on deicing salts

Maintenance

- Routine vacuum sweeping and/or jet hosing is required to prevent clogging which can reduce the infiltration rate of the pervious pavement.
- Installation of pervious pavement must be staged so no erosion or sediment debris enters pavement.

StormTech with Pervious Pavement

- StormTech Chamber provides 100% void, increasing storage volume
- Bare chamber volume allows increased storage. Relying only on stone does not provide long-term factor of safety.
- Enables the use of pervious pavement in areas with low soil permeability.
- Reduced footprint
- Allows pretreatment in conjunction with Isolator Row Plus

General Design Considerations

Always refer to local design specifications for pervious pavement design guidelines.

Hydraulics:

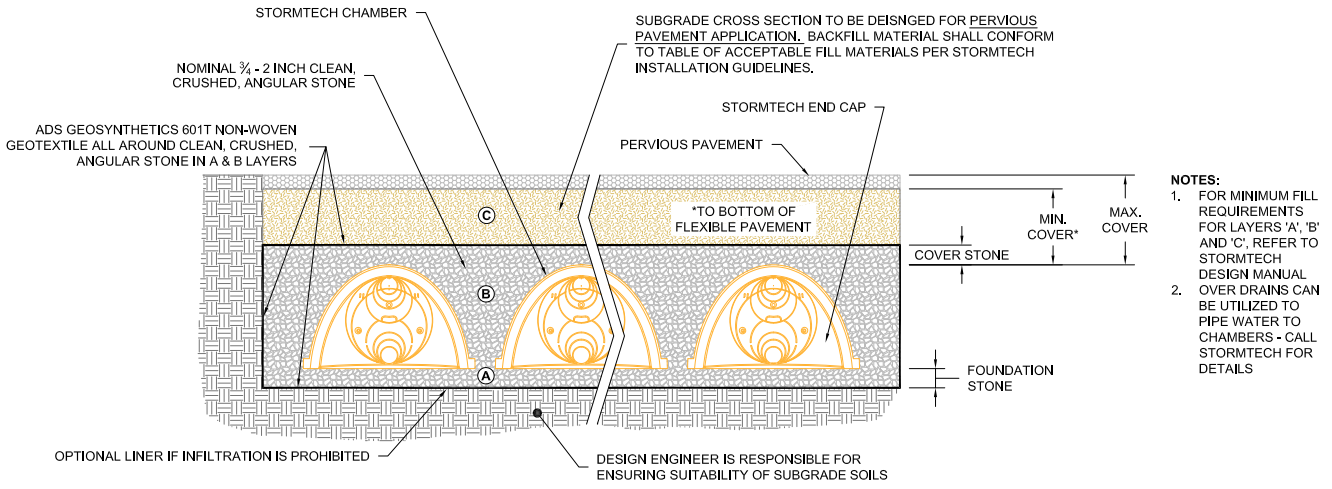
- Underlying soil properties
- Pervious pavement infiltration rate/max. slope for design
- Separation from seasonal high groundwater table
- Proximity to buildings

Construction:

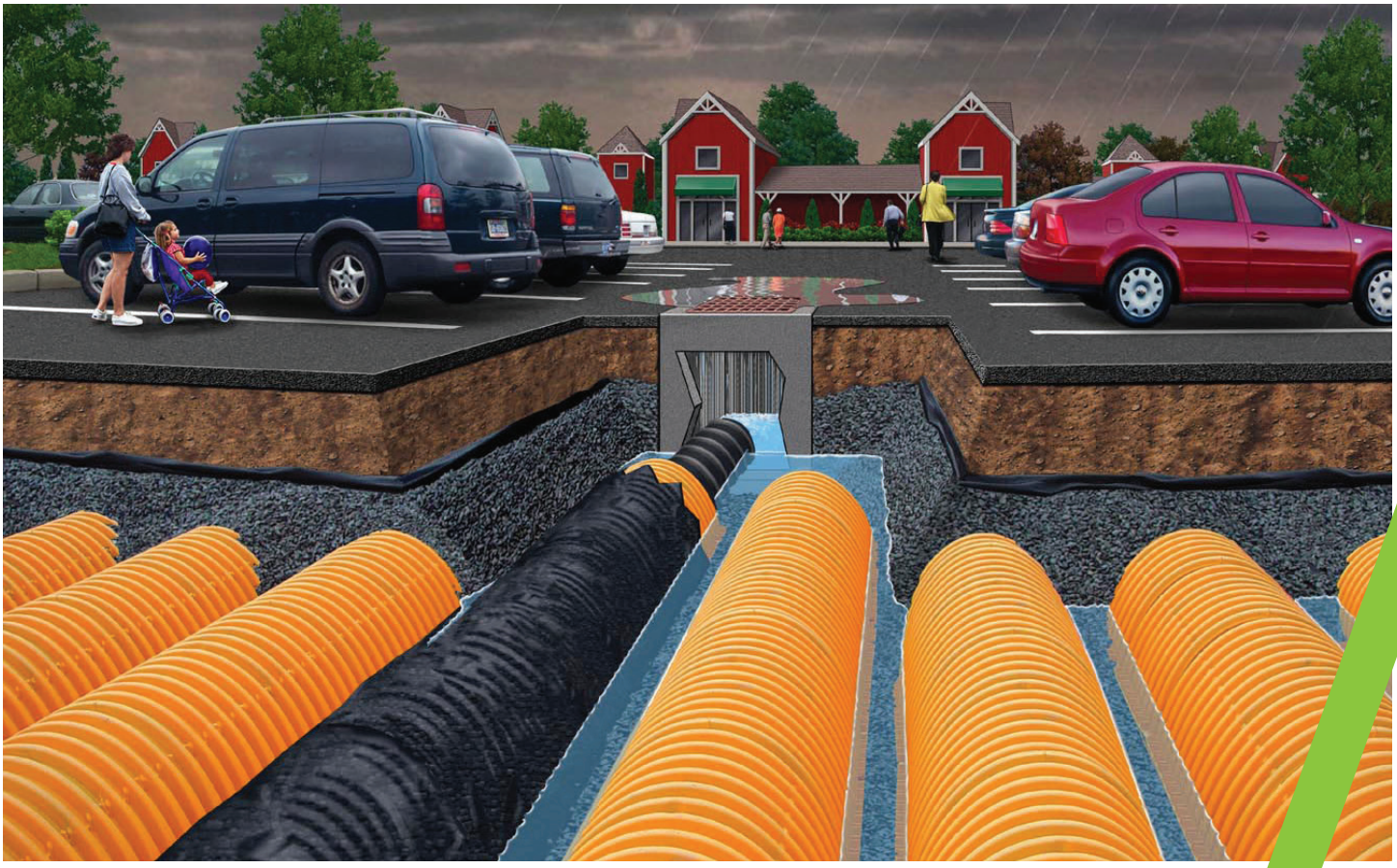
- Contractor must be knowledgeable of pervious pavement installation
- Tight control must exist on batch quantities
- Pervious pavement can be installation sensitive
- Erosion and sediment control crucial

Environmental:

- Measures for frost protection should be taken
- Pervious pavement is not recommended for sites containing potentially hazardous runoff (gas stations, industrial sites, etc.). No pre-treatment mechanism!



Save Valuable Land and Protect Water Resources



StormTech + Green Infrastructure Benefits

When used together, StormTech chambers and green infrastructure offer the most cost-effective method to save valuable land and protect water resources. Together they allow for a design that both treats a required water quality volume, while also providing attenuation for peak flow volumes.

adspipe.com
800-821-6710

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Summary of Testing

StormTech® Isolator® Row Plus – Pollutant Removal

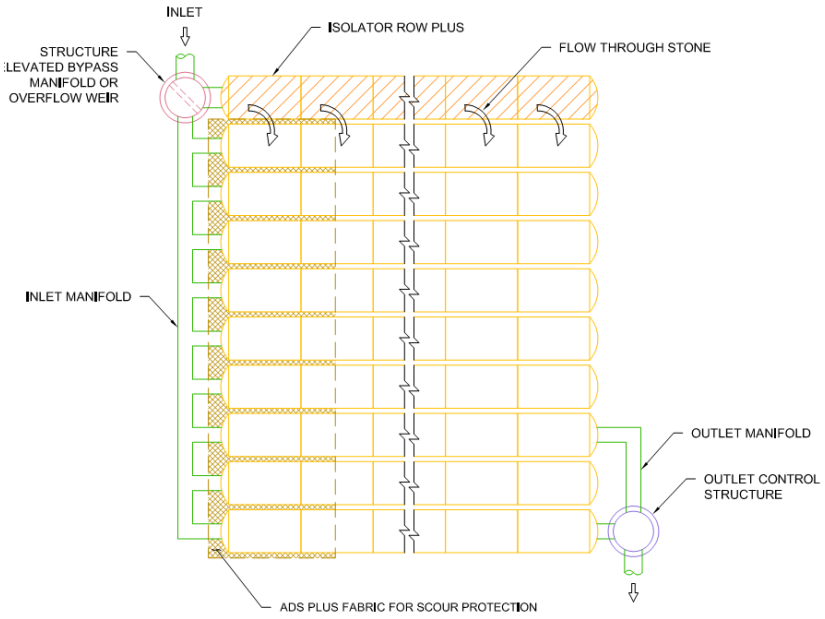
The following information is intended to provide a general overview of the pollutant removal capability of the StormTech Isolator Row Plus, which is a patented filtration type BMP manufactured by StormTech, LLC. The StormTech Isolator Row Plus is covered under several US and International patents.

I. Description:

The StormTech Isolator Row Plus is a row or rows of thermoplastic chambers that sit on a layer of ADS Plus fabric and are connected to a closely located structure for easy access. The chambers provide for settling and filtration of sediment and other contaminants as stormwater rises in the Isolator Row Plus and ultimately passes through the fabric. The open-bottom chambers allow stormwater to flow out of the chambers. Sediment is captured in the Isolator Row Plus, protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

The StormTech Isolator Row Plus is designed to capture the “first flush” and offers the versatility to be sized on a volume basis or a flow-rate basis. An upstream manhole not only provides access to the Isolator Row but includes a high low/concept such that stormwater flow rates or volumes that exceed the capacity of the Isolator Row bypass through a manifold to the other chambers. This is achieved with either a high-flow weir or an elevated manifold. This creates a differential between the Isolator Row Plus and the manifold, thus allowing for settlement time in the Isolator Row Plus.

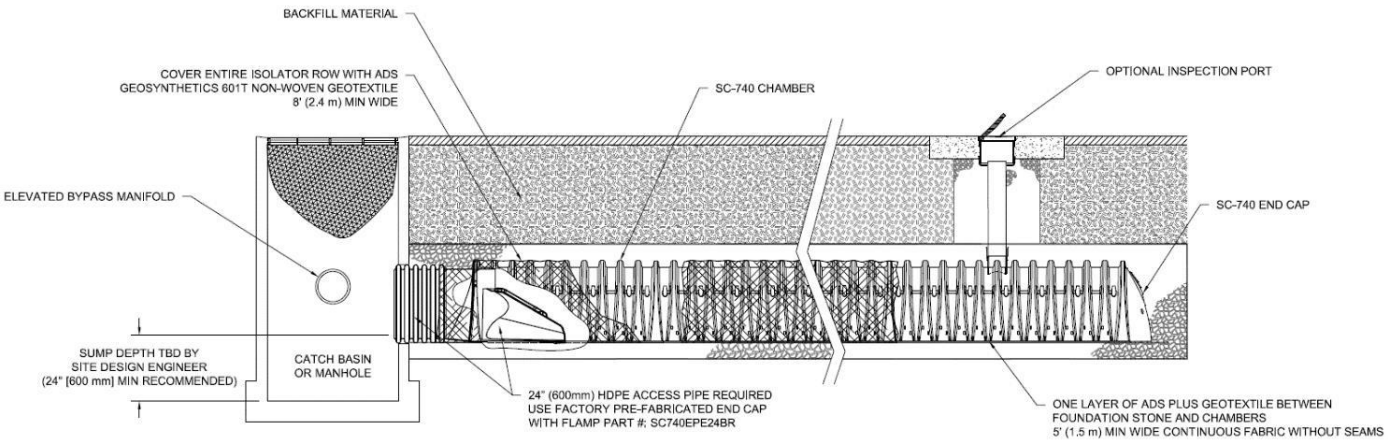
Figure 1: Schematic of the StormTech Isolator Row Plus System



Some of the unique features of the Isolator Row that contribute to its effectiveness and practicality include:

- Vast filtration surface area
- Large sediment storage volume
- Easily maintainable by most pipe and sewer maintenance companies
- Large network of ADS personnel that can help with designs and provide onsite guidance
- A state-of-the-art structural design that meets ASTM standards and incorporates AASHTO safety factors for both live loads and permanent dead loads

Figure 2: Isolator Row Plus Cross Section Detail



II. Applicable Sites:

The Isolator Row Plus can be effectively used for essentially all developed sites. The most common applications are highly impervious sites such as paved parking areas, roads as well as developed sites that include grassy or other landscaped areas. It is not intended to be used for construction sediments.

III. StormTech System & Isolator Row Testing:

October 2006 – Tennessee Tech University's Civil and Environmental Department prepared the "Performance Evaluation of Sediment Removal Efficiency – StormTech Isolator Row". Testing on a full-scale Isolator Row in a laboratory was done to determine the sediment removal efficiency with two different silica-water slurries in accordance with NJCAT protocols. In August of 2007, the technology was verified by NJCAT. Results are shown in Table 1.

September 2010 – The University of New Hampshire Stormwater Center released the "Final Report on Field Verification Testing of the StormTech Isolator Row Treatment Unit". Testing consisted of determining the water quality performance for multiple stormwater pollutants in accordance with TARP Tier II protocol. Testing was done for a system only consisting of the StormTech Isolator Row. Data was recorded for 23 storm events. Results are shown in Table 1.

January 2020 – BaySaver Technologies prepared the "NJCAT Technology Verification of Isolator Row Plus". Testing on a full-scale Isolator Row Plus in a laboratory was done to determine the sediment removal efficiency with a silica-water slurry in accordance with the updated NJCAT protocols. In July of 2020, the technology was verified by NJCAT. Results are shown in Table 1.

June 2020 – North Carolina State University Department of Biological and Agricultural Engineering prepared the technical report "An Evaluation of the StormTech Isolator Row and Subsurface Stormwater Management System at Capital Oaks Retirement Resort, Raleigh, North Carolina". 14 months of monitoring and over 73 precipitation events were completed to study the hydrologic and water quality performance of a StormTech MC-4500 system in Raleigh, NC. Results are shown in Table 1.

Table 1: StormTech Isolator Row 3rd Party Pollutant Removal Efficiency Data

Pollutant	University of New Hampshire (Isolator Row Only) Median	Raleigh, North Carolina (StormTech system with Isolator Row)	Tennessee Tech University (Isolator Row Only)	NJCAT Verification (Isolator Row Plus only)
Total Suspended Solids	83%*	91%*	84%*	81%**
Total Phosphorus	33%	68%	Not Tested	Not Tested
Total Nitrogen	Not Tested	35%	Not Tested	Not Tested
Total Zinc	81%	Not Tested	Not Tested	Not Tested
Total Petroleum Hydrocarbons	91%	Not Tested	Not Tested	Not Tested

*Based on a flow rate of 2.5 gpm/sf (1.70 L/s/m^2) (Isolator Row)
** Based on a flow rate of 4.1 gpm/sf (2.78 L/s/m^2) (Isolator Row Plus)

IV. Product Performance and Design:

Minimum 80% TSS removal is achieved by sizing the Isolator Row PLUS to treat the water quality at a specific flow rate per chamber floor area using a single layer of ADS Plus fabric. The design flow rates for each chamber size are listed below.

Model	Specific Flow Rate	Bottom Area	Flow Per Model
StormTech SC-160LP	4.1 gpm/sf (2.78 L/s/m^2)	11.45 sf (1.06 m^2)	0.11 cfs (3.11 L/s)
StormTech SC-310	4.1 gpm/sf (2.78 L/s/m^2)	17.7 sf (1.64 m^2)	0.16 cfs (4.53 L/s)
StormTech SC-740	4.1 gpm/sf (2.78 L/s/m^2)	27.8 sf (2.58 m^2)	0.26 cfs (7.36 L/s)
StormTech DC-780	4.1 gpm/sf (2.78 L/s/m^2)	27.8 sf (2.58 m^2)	0.26 cfs (7.36 L/s)
StormTech MC-3500	4.1 gpm/sf (2.78 L/s/m^2)	42.9 sf (3.99 m^2)	0.40 cfs (11.33 L/s)
StormTech MC-4500	4.1 gpm/sf (2.78 L/s/m^2)	30.1 sf (2.80 m^2)	0.28 cfs (7.93 L/s)
StormTech MC-7200	4.1 gpm/sf (2.78 L/s/m^2)	50.0 sf (4.65 m^2)	0.45 cfs (12.74 L/s)

V. StormTech Isolator Row Approvals:

The StormTech Isolator Row and Isolator Row Plus have been approved on a project by project basis for tens of thousands of projects around the world. Following are some examples:

- The Isolator Row Plus is a verified filtration manufactured treatment device by the New Jersey Corporation for Advanced Testing (NJCAT) in accordance with NJDEP Filter Protocols.
- In Ohio, the Isolator Row is approved per the Ohio EPA as a pretreatment to underground storage and can be used for both storage volume and pretreatment as the water quality volume all passes through the Isolator Row.
- The Metropolitan St. Louis Sewer District (MSD) has approved the StormTech Isolator Row as a standalone post-construction stormwater Best Management Practice.
- In Massachusetts, approvals for the State DEP requirement of 80% TSS removal on an annual load basis are issued at the Conservation Commission level, and the Isolator Row is commonly used to meet these criteria.
- In Oregon, the Rogue Valley Storm Water Advisory Team (SWAT) has incorporated the StormTech Isolator Row into their Stormwater Design Manual as a pre-approved proprietary device for stormwater quality treatment.
- The Kansas City Metro Chapter of the American Public Works have included the StormTech Isolator Row wit a value rating of 3.0 in their Manual of Best Management Practices for Stormwater Quality.
- Maine DEP has approved the Isolator Row pollutant removal efficiency based on laboratory testing of 110 micron (US Silica OK-110) particle size
- In Texas, the City of Houston PWE as well as Harris county, has recognized the Isolator Row as an official water quality device.
- Under the New Environmental Technology Evaluation program, the Ontario (Canada) Ministry of the Environment has evaluated the Isolator row and issued a Certificate of Technology Assessment
- The Isolator Row Plus has been evaluated and approved for Canadian Environment Technology Verification (ETV) by VerifiGlobal.

V. Isolator Row Maintenance:

The frequency of Inspection and Maintenance varies by location. A routine inspection schedule needs to be established for each individual location, based upon site-specific variables. The type of land use (i.e. industrial, commercial, public, residential), anticipated pollutant load, percent imperviousness, climate, rainfall data, etc., all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection schedule should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If, upon visual inspection, it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

The Isolator Row was designed to reduce the cost of periodic maintenance. By “isolating” sediment to just one row, costs are dramatically reduced by eliminating the need to clean out

each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout.

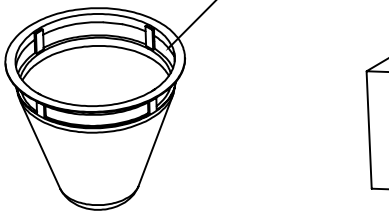
Maintenance is accomplished with the jetvac process. The jetvac process utilizes a high-pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediment. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/jetvac combination vehicles. Selection of an appropriate jetvac nozzle will improve maintenance efficiency.

Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear-facing jets with an effective spread of at least 45” are best. Most jetvac reels have 200 feet of hose, allowing maintenance of an Isolator Row up to 50 chambers long. The jetvac process shall only be performed on StormTech Isolator Rows that have fabric specified by StormTech over their angular base stone.

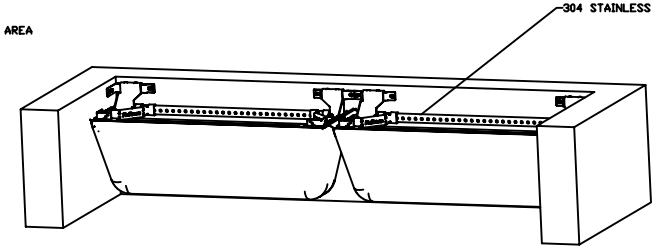
Complete details of the design, operation, and maintenance of the Isolator Row Plus can be found in the StormTech Isolator Row and Isolator Row Plus O&M Manuals.

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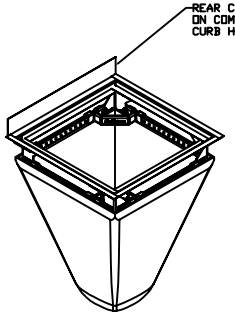
FLEXSTORM PURE FILTERS FOR PERMANENT INLET PROTECTION
PRODUCT SELECTION AND SPECIFICATION DRAWING



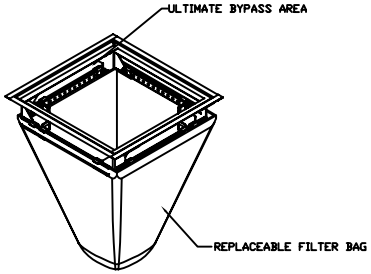
FLEXSTORM PURE INLET FILTERS
FOR ROUND OPENINGS



FLEXSTORM PURE WALL MOUNT INLET
FILTERS FOR OPEN THROAT GUTTERS



FLEXSTORM PURE INLET FILTERS
FOR COMBINATION INLETS



FLEXSTORM PURE INLET FILTERS
FOR RECTANGULAR OPENINGS
WITH GRATES

For Round Openings with Grates		Minimum Bypass Flow Rates (CFS)*
Drop Thru Opening Size Dia	Flexstorm Frame P/N	Based on Nominal Frame Size with minimum 2" Bypass flow gap
Small: 10.0" - 18.0"	62SHDR	1.6
Medium: 18.1" - 24.0"	62MHDR	2.7
Large: 24.1" - 36.0"	62LHDR	3.8

For Open Throat Curb Inlets - Mounted to Wall Beneath Curb Opening	
Curb Opening Size	Flexstorm Frame P/N
Up to 4' curb openings (1 Filter)	62HDWM1
Between 4' and 8' curb openings (2 Filters)	62HDWM2
Between 8' and 12' curb openings (3 Filters)	62HDWM3
Between 12' and 16' curb openings (4 Filters)	62HDWM4

For Rectangular/Square Openings with Grates			Minimum Bypass Flow Rates (CFS)*
Clear Drop Thru Opening Size *(not grate or seat size)*	Flexstorm Frame P/N	Combination P/N	Based on Nominal Frame Size with minimum 2" Bypass flow gap
Small: 12" x 12" up to 16" x 16" (or 64" max perimeter)	62SHD	62SHDCB	2.4
Medium: 18" x 18" up to 24" x 24" (or 96" max perimeter)	62MHD	62MHDCB	3.5
Large: 26" x 26" up to 30" x 30" (or 120" max perimeter)	62LHD	62LHDCB	5.0
XL: 32" x 32" up to 48" x 48" (or 192" max perimeter) typ 2 pc set	62XLHD	62XLHDCB	7.2

CREATE YOUR ADS FLEXSTORM PART NUMBER BY COMBINING FRAME P/N AND BAG P/N

1. IDENTIFY YOUR FLEXSTORM FRAME PART NUMBER FROM TABLES ABOVE
2. SELECT YOUR BAG PART NUMBER BASED ON APPLICATION NEEDS

FLEXSTORM FILTER BAGS	(22" depth) STD Bag P/N	(12" depth) Short Bag P/N	Clean Water Flow Rate (GPM/SqFt)	Min A.O.S. (US Sieve)
FX: Standard Woven Bag	FX	FX-S	200	40
FX+: Woven w/ MyCelx	FXP	FXP-S	200	40
FXO: Woven w/ Oil Boom	FXO	FXO-S	200	40
PC: Post Construction Bag	PC	PC-S	137	140
PC+: PC Bag w/ MyCelx	PCP	PCP-S	137	140
LL: Litter and Leaf Bag	LL	LL-S	High	3.5
IL: IDOT Non-Woven Bag	IL	IL-S	145	70

SPECIFICATIONS FOR STANDARD BAGS BY NOMINAL BAG / FRAME SIZE

Nominal Bag Size *Matched to Frame Size*	Solids Storage (CuFt)	Filtered Flow Rate at 50% Max (CFS) FX (Woven)	PC (Post Constr)	IL (NonWoven)	* PC Oil Retention (Oz)	**PC+ Oil Retention (Oz)	**FX+ Oil Retention (Oz)
Small	1.6	1.2	0.8	0.9	79	168	89
Medium	2.1	1.7	1.2	1.3	115	204	89
Large	3.8	2.7	1.8	1.9	173	262	89
XL	4.2	3.6	2.4	2.6	230	319	178
Filtration Efficiency		82%	NA	Large scale 3rd party testing per ASTM D 7351 using 7% concentration USDA Sandy Loam			
TSS (total suspended solids rem)		NA	99%	Large Scale testing at 90 GPM using US Silica OK-110 sand at 1750 mg/L measuring TSS per SM 2540D.			
TPH (tot petroleum hydrocarbons)		NA	96%	Large Scale testing at 90 GPM with used motor oil at 243 mg/L measuring per EPA Method 1664A.			

* PC filter bag at 50% max adsorption capacity

** PC filter bag at 50% capacity and MyCelx skimmer at 100% capacity

3. CREATE YOUR FLEXSTORM INLET FILTER PART NUMBER

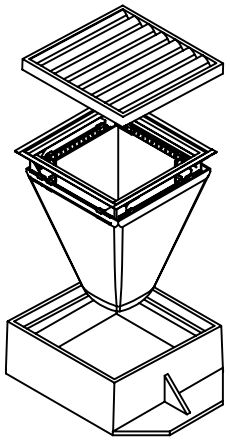
Frame P/N from Step 1. Filter Bag P/N from Step 2.

NOTES:

1. ALL FRAMING IS CONSTRUCTED OF 304 STAINLESS STEEL FOR 25 YEAR SERVICE LIFE RATING
2. TOTAL BYPASS CAPACITY: BYPASS CAPACITY WILL VARY WITH EACH SIZE DRAINAGE STRUCTURE. FLEXSTORM DESIGNS FRAMING BYPASS TO MEET OR EXCEED THE DESIGN FLOW OF THE PARTICULAR DRAINAGE STRUCTURE.
3. UPON ORDERING CONFIRMATION OF THE DOT CALLOUT, PRECAST OR CASTING MAKE AND MODEL, OR DETAILED DIMENSIONAL FORMS MUST BE PROVIDED TO CONFIGURE AND ASSEMBLE YOUR CUSTOMIZED FLEXSTORM INLET FILTER. PART NUMBER ALONE IS NOT SUFFICIENT.
4. FOR WRITTEN SPECIFICATIONS AND MAINTENANCE GUIDELINES VISIT WWW.INLETFILTERS.COM

INSTALLATION:

1. REMOVE GRATE
2. DROP FLEXSTORM INLET FILTER ONTO LOAD BEARING LIP OF CASTING OR CONCRETE STRUCTURE
3. REPLACE GRATE



FLEXSTORM INLET FILTERS™

PURE

ALL PRODUCTS MANUFACTURED
BY INLET & PIPE PROTECTION, INC
A DIVISION OF ADS, INC.
WWW.INLETFILTERS.COM
(866) 287-8655 PH
(630) 355-3477 FX
INFO@INLETFILTERS.COM

SIZE	DWG NO	REV
C	FLEXSTORM_PURE	A
SCALE		SHEET 1 OF 1

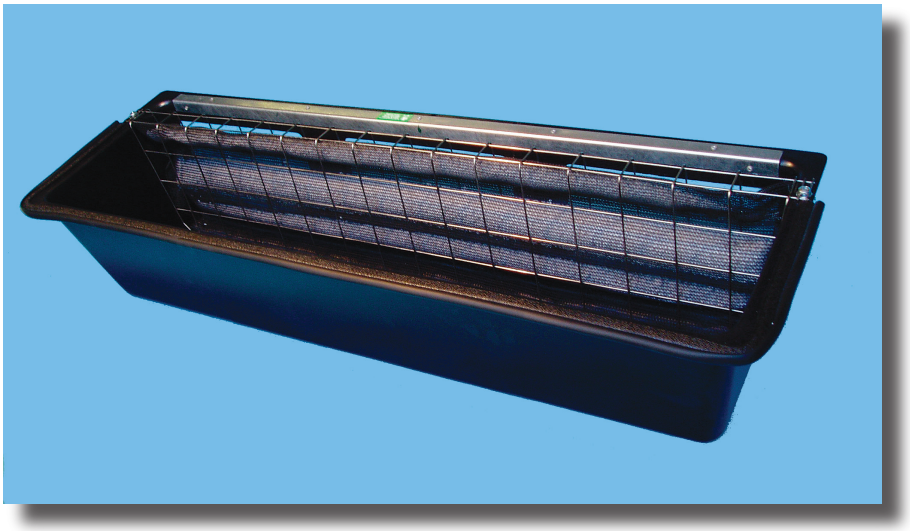
TRITON FILTER™

Product Specification

CURB INLET FILTER INSERT

THE TRITON FILTER

- Non-reactive High Impact Polystyrene Plastic construction with U.V. inhibitors.
- Over 40 percent of the plastic used comes from recycled content.
- Filter Media-Pak available for the removal of hydrocarbons, metals, sand, silt, and litter.
- Disposable Media-Pak is constructed from durable geotextile polypropylene fabric.
- Optional StormWeb™, polypropylene system designed to assist in the removal of trash and debris, in compliance with TMDL requirements.
- Media-Pak may be removed through the curb opening for ease of maintenance.
- Media is nonhazardous, per EPA and OSHA standards.
- Patent Pending design with high nominal flow and high overflow capacities.
- Easy to install in new and existing curb inlets.
- Meets Best Available Technology for use in Stormwater Best Management Practices (BMP).
- Maintenance contracts, including recycling of all spent absorbents are available through REM Service Department.
- Servicing of filters on a regular basis is a requirement to meet most local and state BMP's.



MODEL TRC3.5

TRITON CURB INLET FILTER INSERT

REM has developed the TRITON CURB Inlet Filter Insert to help eliminate hydrocarbons and other contaminants such as metals, sand, silt and litter from stormwater runoff.

The TRITON Curb Inlet is designed to be inserted below the street/curb opening of storm drain inlets.

Patent Pending

REM - HELPING KEEP YOUR WATERWAYS CLEAN

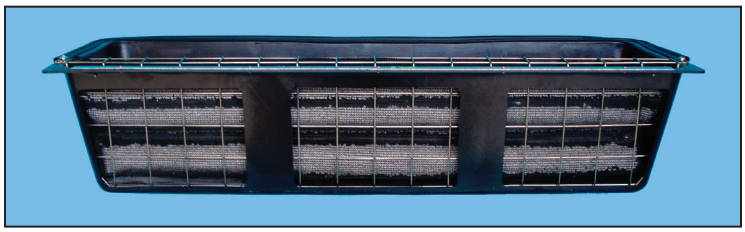
The most recent National Water Quality Inventory reports that runoff from urban areas is the leading source of impairments to surveyed estuaries and the third largest source of water quality impairments to surveyed lakes. In addition, population and development trends indicate that by 2010 more than half of the Nation will live in coastal towns and cities. Runoff from these rapidly growing urban areas will continue to degrade coastal waters.[1]

[1]Environmental Protection Agency's Office of Water EPA841–F–96–004G

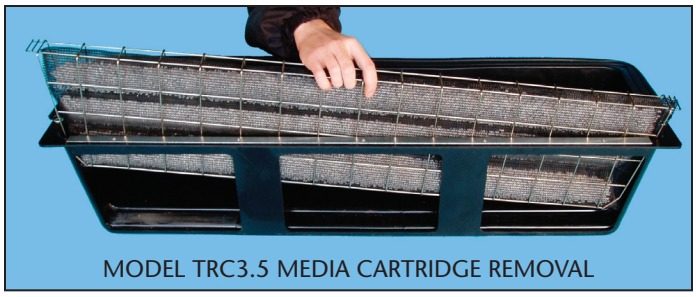
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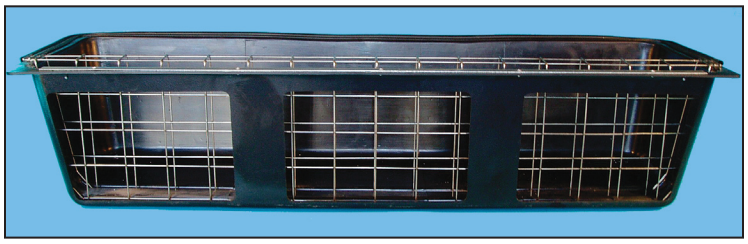
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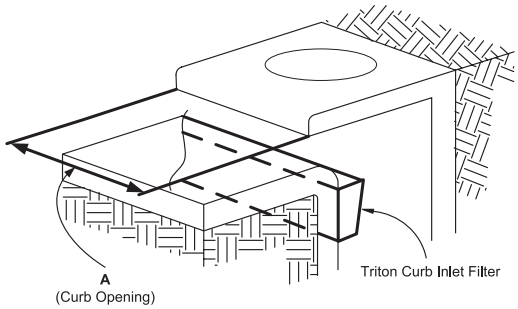
MODEL TRC3.5



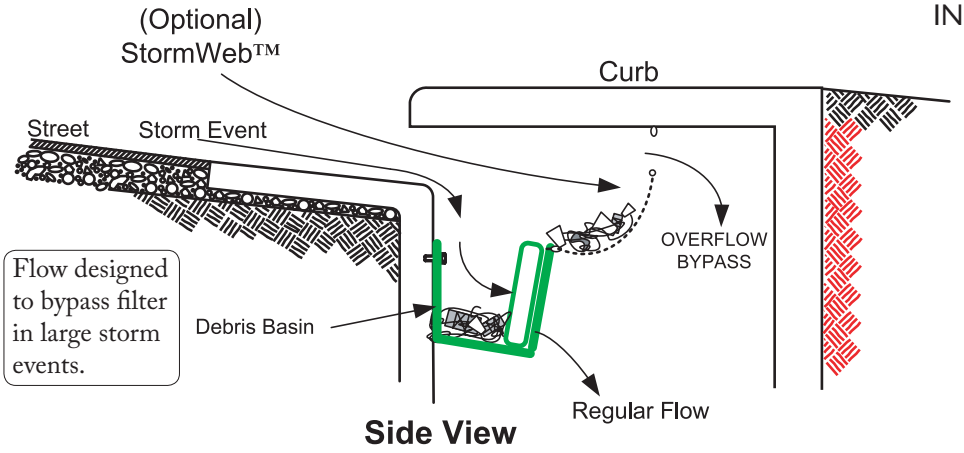
MODEL TRC3.5 MEDIA CARTRIDGE REMOVAL



MODEL TRC3.5 - LITTER ONLY



INSTALLED ISOMETRIC VIEW



Side View

STANDARD DIMENSIONS

MODEL	A (CURB OPENING)
TRC2	2.00
TRC2.5	2.50
TRC3	3.00
TRC3.5	3.50
TRC4	4.00
TRC5	5.00
TRC6	6.00
TRC7	7.00
TRC8	8.00
TRC9	9.00
TRC10	10.00
TRC12	12.00
TRC14	14.00
TRC21	21.00
TRC28	28.00

NOTES:
1. All dimensions are in feet. Custom sizes also available.
2. Filter is constructed of High Impact Polystyrene Plastic, with U.V. inhibitors. Over 40% recycled content.
3. Disposable Media-Pak is constructed of durable geotextile fabric, woven with perforated poly-propylene.
4. Media-Pak cage is constructed using 8 gauge Type 304 Stainless Steel.
5. Filter body is secured to inside wall using (2) 1/4" thick brackets per section, attached using 3/8" x 3" expansion anchor bolts.
6. Optional StormWeb™, designed for capturing larger trash and debris.
7. Filter media is non-hazardous per EPA and OSHA standards.
8. Filter shall be installed and maintained in accordance with manufacturer recommendations.
9. Please refer to manufacturer recommendations for an approved maintenance program.

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Vegetated Swale TC-30



Design Considerations

- Tributary Area
- Area Required
- Slope
- Water Availability

Description

Vegetated swales are open, shallow channels with vegetation covering the side slopes and bottom that collect and slowly convey runoff flow to downstream discharge points. They are designed to treat runoff through filtering by the vegetation in the channel, filtering through a subsoil matrix, and/or infiltration into the underlying soils. Swales can be natural or manmade. They trap particulate pollutants (suspended solids and trace metals), promote infiltration, and reduce the flow velocity of stormwater runoff. Vegetated swales can serve as part of a stormwater drainage system and can replace curbs, gutters and storm sewer systems.

Targeted Constituents

☑	Sediment	▲
☑	Nutrients	●
☑	Trash	●
☑	Metals	▲
☑	Bacteria	●
☑	Oil and Grease	▲
☑	Organics	▲

Legend ***(Removal Effectiveness)***

● Low ■ High

▲ Medium

California Experience

Caltrans constructed and monitored six vegetated swales in southern California. These swales were generally effective in reducing the volume and mass of pollutants in runoff. Even in the areas where the annual rainfall was only about 10 inches/yr, the vegetation did not require additional irrigation. One factor that strongly affected performance was the presence of large numbers of gophers at most of the sites. The gophers created earthen mounds, destroyed vegetation, and generally reduced the effectiveness of the controls for TSS reduction.

Advantages

- If properly designed, vegetated, and operated, swales can serve as an aesthetic, potentially inexpensive urban development or roadway drainage conveyance measure with significant collateral water quality benefits.

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- Roadside ditches should be regarded as significant potential swale/buffer strip sites and should be utilized for this purpose whenever possible.

Limitations

- Can be difficult to avoid channelization.
- May not be appropriate for industrial sites or locations where spills may occur
- Grassed swales cannot treat a very large drainage area. Large areas may be divided and treated using multiple swales.
- A thick vegetative cover is needed for these practices to function properly.
- They are impractical in areas with steep topography.
- They are not effective and may even erode when flow velocities are high, if the grass cover is not properly maintained.
- In some places, their use is restricted by law: many local municipalities require curb and gutter systems in residential areas.
- Swales are mores susceptible to failure if not properly maintained than other treatment BMPs.

Design and Sizing Guidelines

- Flow rate based design determined by local requirements or sized so that 85% of the annual runoff volume is discharged at less than the design rainfall intensity.
- Swale should be designed so that the water level does not exceed 2/3rds the height of the grass or 4 inches, which ever is less, at the design treatment rate.
- Longitudinal slopes should not exceed 2.5%
- Trapezoidal channels are normally recommended but other configurations, such as parabolic, can also provide substantial water quality improvement and may be easier to mow than designs with sharp breaks in slope.
- Swales constructed in cut are preferred, or in fill areas that are far enough from an adjacent slope to minimize the potential for gopher damage. Do not use side slopes constructed of fill, which are prone to structural damage by gophers and other burrowing animals.
- A diverse selection of low growing, plants that thrive under the specific site, climatic, and watering conditions should be specified. Vegetation whose growing season corresponds to the wet season are preferred. Drought tolerant vegetation should be considered especially for swales that are not part of a regularly irrigated landscaped area.
- The width of the swale should be determined using Manning's Equation using a value of 0.25 for Manning's n.

Construction/Inspection Considerations

- Include directions in the specifications for use of appropriate fertilizer and soil amendments based on soil properties determined through testing and compared to the needs of the vegetation requirements.
- Install swales at the time of the year when there is a reasonable chance of successful establishment without irrigation; however, it is recognized that rainfall in a given year may not be sufficient and temporary irrigation may be used.
- If sod tiles must be used, they should be placed so that there are no gaps between the tiles; stagger the ends of the tiles to prevent the formation of channels along the swale or strip.
- Use a roller on the sod to ensure that no air pockets form between the sod and the soil.
- Where seeds are used, erosion controls will be necessary to protect seeds for at least 75 days after the first rainfall of the season.

Performance

The literature suggests that vegetated swales represent a practical and potentially effective technique for controlling urban runoff quality. While limited quantitative performance data exists for vegetated swales, it is known that check dams, slight slopes, permeable soils, dense grass cover, increased contact time, and small storm events all contribute to successful pollutant removal by the swale system. Factors decreasing the effectiveness of swales include compacted soils, short runoff contact time, large storm events, frozen ground, short grass heights, steep slopes, and high runoff velocities and discharge rates.

Conventional vegetated swale designs have achieved mixed results in removing particulate pollutants. A study performed by the Nationwide Urban Runoff Program (NURP) monitored three grass swales in the Washington, D.C., area and found no significant improvement in urban runoff quality for the pollutants analyzed. However, the weak performance of these swales was attributed to the high flow velocities in the swales, soil compaction, steep slopes, and short grass height.

Another project in Durham, NC, monitored the performance of a carefully designed artificial swale that received runoff from a commercial parking lot. The project tracked 11 storms and concluded that particulate concentrations of heavy metals (Cu, Pb, Zn, and Cd) were reduced by approximately 50 percent. However, the swale proved largely ineffective for removing soluble nutrients.

The effectiveness of vegetated swales can be enhanced by adding check dams at approximately 17 meter (50 foot) increments along their length (See Figure 1). These dams maximize the retention time within the swale, decrease flow velocities, and promote particulate settling. Finally, the incorporation of vegetated filter strips parallel to the top of the channel banks can help to treat sheet flows entering the swale.

Only 9 studies have been conducted on all grassed channels designed for water quality (Table 1). The data suggest relatively high removal rates for some pollutants, but negative removals for some bacteria, and fair performance for phosphorus.

Table 1 Grassed swale pollutant removal efficiency data							
	Removal Efficiencies (% Removal)						
Study	TSS	TP	TN	NO_3	Metals	Bacteria	Type
Caltrans 2002	77	8	67	66	83-90	-33	dry swales
Goldberg 1993	67.8	4.5	-	31.4	42–62	-100	grassed channel
Seattle Metro and Washington Department of Ecology 1992	60	45	-	-25	2–16	-25	grassed channel
Seattle Metro and Washington Department of Ecology, 1992	83	29	-	-25	46–73	-25	grassed channel
Wang et al., 1981	80	-	-	-	70–80	-	dry swale
Dorman et al., 1989	98	18	-	45	37–81	-	dry swale
Harper, 1988	87	83	84	80	88–90	-	dry swale
Kercher et al., 1983	99	99	99	99	99	-	dry swale
Harper, 1988.	81	17	40	52	37–69	-	wet swale
Koon, 1995	67	39	-	9	-35 to 6	-	wet swale

While it is difficult to distinguish between different designs based on the small amount of available data, grassed channels generally have poorer removal rates than wet and dry swales, although some swales appear to export soluble phosphorus (Harper, 1988; Koon, 1995). It is not clear why swales export bacteria. One explanation is that bacteria thrive in the warm swale soils.

Siting Criteria

The suitability of a swale at a site will depend on land use, size of the area serviced, soil type, slope, imperviousness of the contributing watershed, and dimensions and slope of the swale system (Schueler et al., 1992). In general, swales can be used to serve areas of less than 10 acres, with slopes no greater than 5 %. Use of natural topographic lows is encouraged and natural drainage courses should be regarded as significant local resources to be kept in use (Young et al., 1996).

Selection Criteria (NCTCOG, 1993)

- Comparable performance to wet basins
- Limited to treating a few acres
- Availability of water during dry periods to maintain vegetation
- Sufficient available land area

Research in the Austin area indicates that vegetated controls are effective at removing pollutants even when dormant. Therefore, irrigation is not required to maintain growth during dry periods, but may be necessary only to prevent the vegetation from dying.

The topography of the site should permit the design of a channel with appropriate slope and cross-sectional area. Site topography may also dictate a need for additional structural controls. Recommendations for longitudinal slopes range between 2 and 6 percent. Flatter slopes can be used, if sufficient to provide adequate conveyance. Steep slopes increase flow velocity, decrease detention time, and may require energy dissipating and grade check. Steep slopes also can be managed using a series of check dams to terrace the swale and reduce the slope to within acceptable limits. The use of check dams with swales also promotes infiltration.

Additional Design Guidelines

Most of the design guidelines adopted for swale design specify a minimum hydraulic residence time of 9 minutes. This criterion is based on the results of a single study conducted in Seattle, Washington (Seattle Metro and Washington Department of Ecology, 1992), and is not well supported. Analysis of the data collected in that study indicates that pollutant removal at a residence time of 5 minutes was not significantly different, although there is more variability in that data. Therefore, additional research in the design criteria for swales is needed. Substantial pollutant removal has also been observed for vegetated controls designed solely for conveyance (Barrett et al, 1998); consequently, some flexibility in the design is warranted.

Many design guidelines recommend that grass be frequently mowed to maintain dense coverage near the ground surface. Recent research (Colwell et al., 2000) has shown mowing frequency or grass height has little or no effect on pollutant removal.

Summary of Design Recommendations

1) The swale should have a length that provides a minimum hydraulic residence time of at least 10 minutes. The maximum bottom width should not exceed 10 feet unless a dividing berm is provided. The depth of flow should not exceed 2/3rds the height of the grass at the peak of the water quality design storm intensity. The channel slope should not exceed 2.5%.

2) A design grass height of 6 inches is recommended.

3) Regardless of the recommended detention time, the swale should be not less than 100 feet in length.

4) The width of the swale should be determined using Manning's Equation, at the peak of the design storm, using a Manning's n of 0.25.

5) The swale can be sized as both a treatment facility for the design storm and as a conveyance system to pass the peak hydraulic flows of the 100-year storm if it is located "on-line." The side slopes should be no steeper than 3:1 (H:V).

6) Roadside ditches should be regarded as significant potential swale/buffer strip sites and should be utilized for this purpose whenever possible. If flow is to be introduced through curb cuts, place pavement slightly above the elevation of the vegetated areas. Curb cuts should be at least 12 inches wide to prevent clogging.

7) Swales must be vegetated in order to provide adequate treatment of runoff. It is important to maximize water contact with vegetation and the soil surface. For general purposes, select fine, close-growing, water-resistant grasses. If possible, divert runoff (other than necessary irrigation) during the period of vegetation

establishment. Where runoff diversion is not possible, cover graded and seeded areas with suitable erosion control materials.

Maintenance

The useful life of a vegetated swale system is directly proportional to its maintenance frequency. If properly designed and regularly maintained, vegetated swales can last indefinitely. The maintenance objectives for vegetated swale systems include keeping up the hydraulic and removal efficiency of the channel and maintaining a dense, healthy grass cover.

Maintenance activities should include periodic mowing (with grass never cut shorter than the design flow depth), weed control, watering during drought conditions, reseeding of bare areas, and clearing of debris and blockages. Cuttings should be removed from the channel and disposed in a local composting facility. Accumulated sediment should also be removed manually to avoid concentrated flows in the swale. The application of fertilizers and pesticides should be minimal.

Another aspect of a good maintenance plan is repairing damaged areas within a channel. For example, if the channel develops ruts or holes, it should be repaired utilizing a suitable soil that is properly tamped and seeded. The grass cover should be thick; if it is not, reseed as necessary. Any standing water removed during the maintenance operation must be disposed to a sanitary sewer at an approved discharge location. Residuals (e.g., silt, grass cuttings) must be disposed in accordance with local or State requirements. Maintenance of grassed swales mostly involves maintenance of the grass or wetland plant cover. Typical maintenance activities are summarized below:

- Inspect swales at least twice annually for erosion, damage to vegetation, and sediment and debris accumulation preferably at the end of the wet season to schedule summer maintenance and before major fall runoff to be sure the swale is ready for winter. However, additional inspection after periods of heavy runoff is desirable. The swale should be checked for debris and litter, and areas of sediment accumulation.

- Grass height and mowing frequency may not have a large impact on pollutant removal. Consequently, mowing may only be necessary once or twice a year for safety or aesthetics or to suppress weeds and woody vegetation.

- Trash tends to accumulate in swale areas, particularly along highways. The need for litter removal is determined through periodic inspection, but litter should always be removed prior to mowing.

- Sediment accumulating near culverts and in channels should be removed when it builds up to 75 mm (3 in.) at any spot, or covers vegetation.

- Regularly inspect swales for pools of standing water. Swales can become a nuisance due to mosquito breeding in standing water if obstructions develop (e.g. debris accumulation, invasive vegetation) and/or if proper drainage slopes are not implemented and maintained.

Cost

Construction Cost

Little data is available to estimate the difference in cost between various swale designs. One study (SWRPC, 1991) estimated the construction cost of grassed channels at approximately $0.25 per ft². This price does not include design costs or contingencies. Brown and Schueler (1997) estimate these costs at approximately 32 percent of construction costs for most stormwater management practices. For swales, however, these costs would probably be significantly higher since the construction costs are so low compared with other practices. A more realistic estimate would be a total cost of approximately $0.50 per ft², which compares favorably with other stormwater management practices.

Table 2 Swale Cost Estimate (SEWRPC, 1991)

Component	Unit	Extent	Unit Cost			Total Cost		
			Low	Moderate	High	Low	Moderate	High
Mobilization / Demobilization-Light	Swale	1	$107	$274	$441	$107	$274	$441
Site Preparation								
Clearing[b]	Acre	0.5	$2,200	$3,800	$5,400	$1,100	$1,900	$2,700
Grubbing[c]	Acre	0.25	$3,800	$5,200	$6,600	$950	$1,300	$1,650
General Excavation[d]	Yd^3	372	$2.10	$3.70	$5.30	$781	$1,376	$1,972
Level and Till[e]	Yd^2	1,210	$0.20	$0.35	$0.50	$242	$424	$605
Sites Development								
Salvaged Topsoil Seed, and Mulch[f]	Yd^2	1,210	$0.40	$1.00	$1.60	$484	$1,210	$1,936
Sod[g]	Yd^2	1,210	$1.20	$2.40	$3.60	$1,452	$2,904	$4,356
Subtotal	--	–	--	–	--	$5,116	$9,388	$13,660
Contingencies	Swale	1	25%	25%	25%	$1,279	$2,347	$3,415
Total	--	–	--	–	--	$6,395	$11,735	$17,075

Source: (SEWRPC, 1991)

Note: Mobilization/demobilization refers to the organization and planning involved in establishing a vegetative swale.

[a] Swale has a bottom width of 1.0 foot, a top width of 10 feet with 1:3 side slopes, and a 1,000-foot length.

[b] Area cleared = (top width + 10 feet) x swale length.

[c] Area grubbed = (top width x swale length).

[d] Volume excavated = (0.67 x top width x swale depth) x swale length (parabolic cross-section).

[e] Area tilled = $\left(\text{top width} + \frac{8(\text{swale depth}^2)}{3(\text{top width})}\right) \times$ swale length (parabolic cross-section).

[f] Area seeded = area cleared x 0.5.

[g] Area sodded = area cleared x 0.5.

Table 3 Estimated Maintenance Costs (SEWRPC. 1991)

Component	Unit Cost	Swale Size (Depth and Top Width)		Comment
		1.5 Foot Depth, One-Foot Bottom Width, 10-Foot Top Width	3-Foot Depth, 3-Foot Bottom Width, 21-Foot Top Width	
Lawn Mowing	$0.85 / 1,000 ft^2/ mowing	$0.14 / linear foot	$0.21 / linear foot	Lawn maintenance area=(top width + 10 feet) x length. Mow eight times per year
General Lawn Care	$9.00 / 1,000 ft^2/ year	$0.18 / linear foot	$0.28 / linear foot	Lawn maintenance area = (top width + 10 feet) x length
Swale Debris and Litter Removal	$0.10 / linear foot / year	$0.10 / linear foot	$0.10 / linear foot	–
Grass Reseeding with Mulch and Fertilizer	$0.30 / yd^2	$0.01 / linear foot	$0.01 / linear foot	Area revegetated equals 1% of lawn maintenance area per year
Program Administration and Swale Inspection	$0.15 / linear foot / year, plus $25 / inspection	$0.15 / linear foot	$0.15 / linear foot	Inspect four times per year
Total	--	**$0.58 / linear foot**	**$ 0.75 / linear foot**	--

Maintenance Cost

Caltrans (2002) estimated the expected annual maintenance cost for a swale with a tributary area of approximately 2 ha at approximately $2,700. Since almost all maintenance consists of mowing, the cost is fundamentally a function of the mowing frequency. Unit costs developed by SEWRPC are shown in Table 3. In many cases vegetated channels would be used to convey runoff and would require periodic mowing as well, so there may be little additional cost for the water quality component. Since essentially all the activities are related to vegetation management, no special training is required for maintenance personnel.

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Information Resources

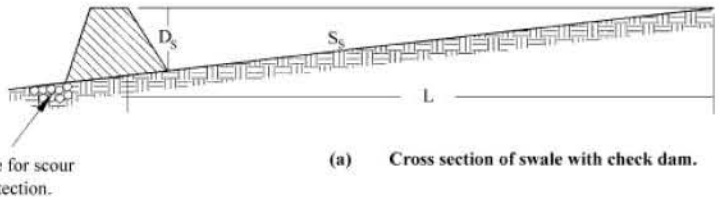
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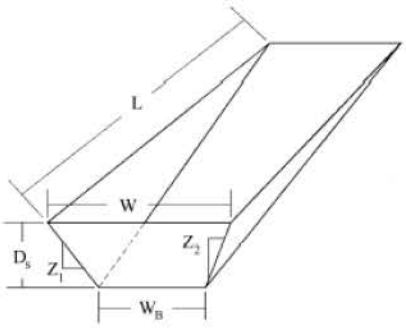
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Provide for scour protection.

(a) **Cross section of swale with check dam.**



Notation:

L = Length of swale impoundment area per check dam (ft)
D_S = Depth of check dam (ft)
S_S = Bottom slpe of swale (ft/ft)
W = Top width of check dam (ft)
W_B = Bottom width of check dam (ft)
$Z_{1\&2}$ = Ratio of horizontal to vertical change in swale side slope (ft/ft)

(b) **Dimensional view of swale impoundment area.**

Vegetated Swale Filter Worksheet

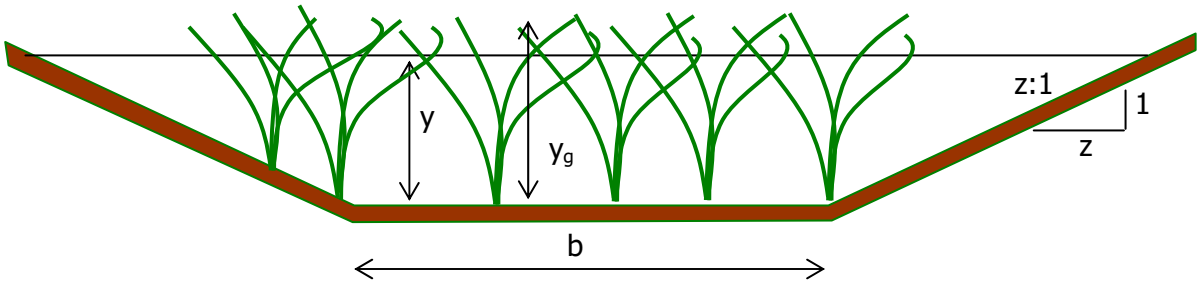


Figure D-2: Vegetated swale filter cross-section

Refer to Figure D-2, Figure 6-5, and Figure D-2 for a diagrammatic description of the geometric variables.

Step 1: Determine design volume reduction, $V_{reduction}$ (if applicable)		
1-1. Enter the volume difference between the pre- and post-development conditions for the 25-yr, 24-hr design storm, V_{25}, calculated using SBUH method, Appendix C	V_{25} = _____	ft^3
1-2. Enter the volume generated from a one-inch, 24-hr storm event, $V_{one\text{-}inch}$, calculated using SBUH method, Appendix C	$V_{one\text{-}inch}$ = _____	ft^3
1-3. Determine the design volume reduction, $V_{reduction}$, which is the larger of V_{25} and $V_{one\text{-}inch}$ and is the volume to be retained on-site	$V_{reduction}$ = _____	ft^3
Note: Volume reduction credit is only provided for vegetated swale filters that include a gravel drainage layer to encourage infiltration.		
Step 2: Determine storm water quality design flow rate, Q_{wq}		
2-1. Enter drainage area, A	A = _____	acres
2-2. Enter impervious fraction, Imp	Imp = _____	
2-3. Calculate runoff coefficient, C = (0.9•Imp + 0.05)	C = _____	
2-4. Calculate the water quality design flow rate, Q_{wq}, based on a constant rainfall intensity of 0.25 in/hr, Appendix C	Q_{wq} = _____	cfs
Step 3: Determine design volume for sizing gravel drainage layer, if applicable		
3-1. $V_{design} = V_{reduction}$	V_{design} = _____	ft^3
3-2. Please follow Steps 3 through 5 of the Permeable Pavement Worksheet, Appendix D to calculate the size of the gravel drainage layer		

Step 4: Calculate flow depth, d, and swale bottom width, b			
4-1. Enter Manning's roughness coefficient for shallow flow conditions (0.2 typical), n	$n =$	_____	
4-2. Enter expected vegetation height, y_v	$y_v =$	_____	in
4-3. Calculate design flow depth (0.33 ft max), $d = y_v/18$	$d =$	_____	ft
4-4. Enter longitudinal slope (along direction of flow), s	$s =$	_____	ft/ft
4-5. Enter side slope length per unit height (e.g. 3 if side slope are 3H :1V), Z	$Z =$	_____	
4-6. Calculate bottom width of swale assuming a trapezoidal channel shape, $b = Q_{wq}n_{wq}/1.49y^{1.67}s^{0.5}$	$b =$	_____	ft
4-7. Calculate $AR^{2/3}$, using $Q_{wq}n/1.49s^{0.5}$ (Equation 6-5)	$AR^{2/3} =$	_____	
4-8. Calculate the wetted area, A	$A =$	_____	ft^2
4-9. Calculate the wetted perimeter, P	$P =$	_____	ft
4-10. Calculate the hydraulic radius, R	$R =$	_____	ft
4-11. Re-calculate $AR^{2/3}$, using the A and R calculated in steps 4-8 and 4-10. Change b until the $AR^{2/3}$ calculated in this step is equal to $AR^{2/3}$ calculated in 4-7.	$AR^{2/3} =$	_____	
4-12. If b is between 2 and 10 feet, go to Step 5			
4-13. If b < 2 ft, set b = 2 ft and go to Step 4-4 and decrease swale slope (0.015 ft/ft max.). If slope cannot be changed due to site constraints, go to Step 4-14.			
4-14. If b < 2 ft and slope is maximized, set b= 2 ft and go to Step 4-2 and decrease vegetation height			
4-15. If b is greater than 10 ft, one of the following design adjustments must be made: 1) increase the longitudinal slope to a maximum of 0.06 ft/ft, and repeat steps 4-7 to 4-11 above. 2) include a flow splitter longitudinally along the swale bottom (Figure 6-6 and Appendix F) at least three-quarters of the swale length (beginning at the inlet)			
Step 5: Determine design flow velocity			
5-1. Calculate design flow velocity, $v_{wq} = Q_{wq}/A$	$v_{wq} =$	_____	ft/s
5-2. If the design flow velocity is higher than 1ft/s go to Step 4-4 and decrease the slope, if possible			
Step 6: Calculate swale length			
6-1. Enter target residence time (10 minutes minimum), t_{HR}	$t_{HR} =$	_____	min
6-1. Calculate swale length, $L = v_{wq} \cdot 60 \cdot t_{HR}$	$L =$	_____	ft
6-2. If L is too long for the site, proceed to step 5 to adjust the swale layout			

Step 7: Adjust swale layout to fit within site constraints	
7-1. Choose a reduced swale length, L_f	L_f = _____ ft
7-2. Recalculate flow velocity, $v_{wq} = L_f / (t_{HR} \cdot 60)$	v_{wq} = _____ ft/s
7-3. Recalculate cross-sectional area, $A_{wq} = Q_{wq} / v_{wq}$	A_{wq} = _____ ft^2
7-4. Calculate an increased bottom width, $b_f = (A_{wq} - Zy^2) / y$	b_f = _____ ft
7-5. Recalculate longitudinal slope assuming a rectangular channel shape, $s_{f\ =} [Q_{wq} n_{wq/(} 1.49\ A_{wq}\ y^{0.67})]^2$	s_f = _____ ft/ft
7-6. If s_f is between 1.5% and 6%, the swale design is acceptable for water quality, proceed to Step 6 7-7. If s_f is between 1% and 1.5%, the swale design is acceptable for water quality with underdrains (see design requirements). Proceed to Step 6. 7-8. If s_f is <1%, the swale design is unacceptable. Consider subdividing drainage area and repeat all above steps, or choose a different BMP for the site.	
Step 8: Provide conveyance capacity for flows higher than Q_{wq}	
8-1. If the swale already includes a high-flow bypass to convey flows higher than the water quality design flow rate, skip this step and verify that all parameters meet design requirements to complete sizing.	
8-2. If swale does not include a high-flow bypass, check the swale size for the peak discharge rate that will be conveyed in the swale. If online, the peak discharge rate is the 100-yr, 24-hr design storm calculated using the SBUH method (See Appendix C). Calculate the peak discharge velocity, $v_{peak} = Q_{peak}/A_{swale,}$ where Q_{peak} = the peak discharge rate (cfs) and A_{swale} = the cross-sectional area of the swale including freeboard (ft^2)	V_{peak} = _____ ft/s
8-3. If V_{peak} > 3.0 feet per second, return to Step 2 and increase the bottom width or flatten the longitudinal slope as necessary to reduce the peak discharge flow velocity to 3.0 feet per second or less. If the longitudinal slope is flattened, the swale bottom width must be recalculated (Step 2) and must meet all design criteria.	

Appendix G:
Proposed Storm Drain Hydraulics

Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 28 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 28.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 4.00
Gutter n-value	= 0.013

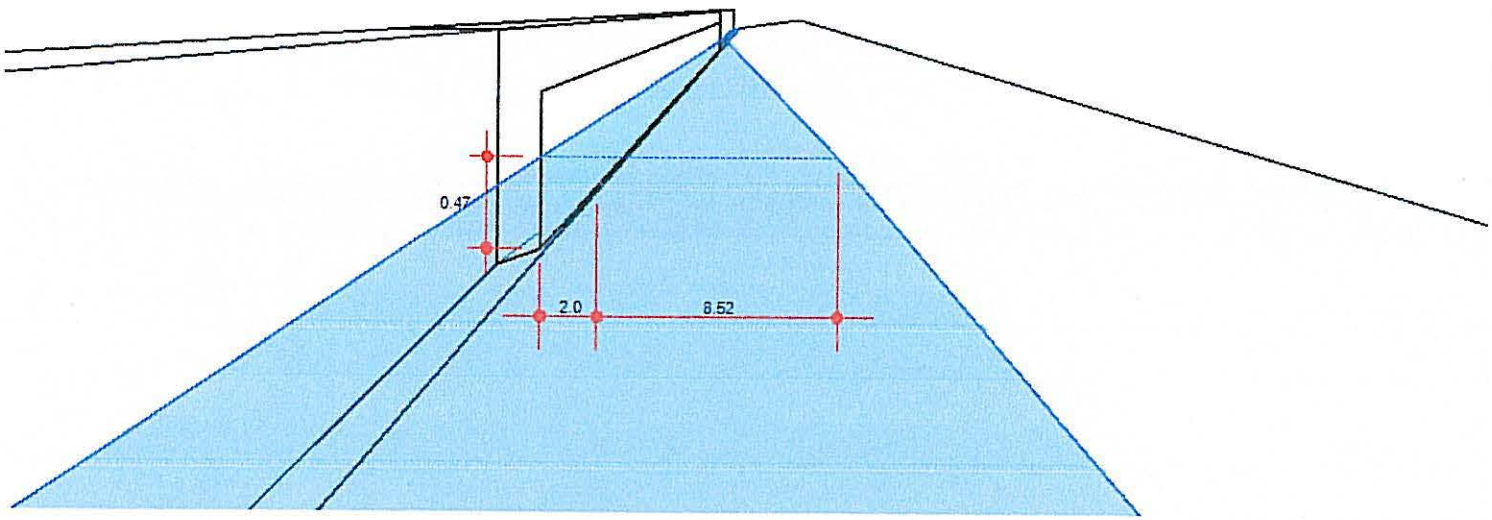
Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 11.00
Q Capt (cfs)	= 10.66
Q Bypass (cfs)	= 0.34
Depth at Inlet (in)	= 5.66
Efficiency (%)	= 97
Gutter Spread (ft)	= 11.85
Gutter Vel (ft/s)	= 7.22
Bypass Spread (ft)	= 1.50
Bypass Depth (in)	= 1.44

Dimensions in feet



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 28 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 28.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

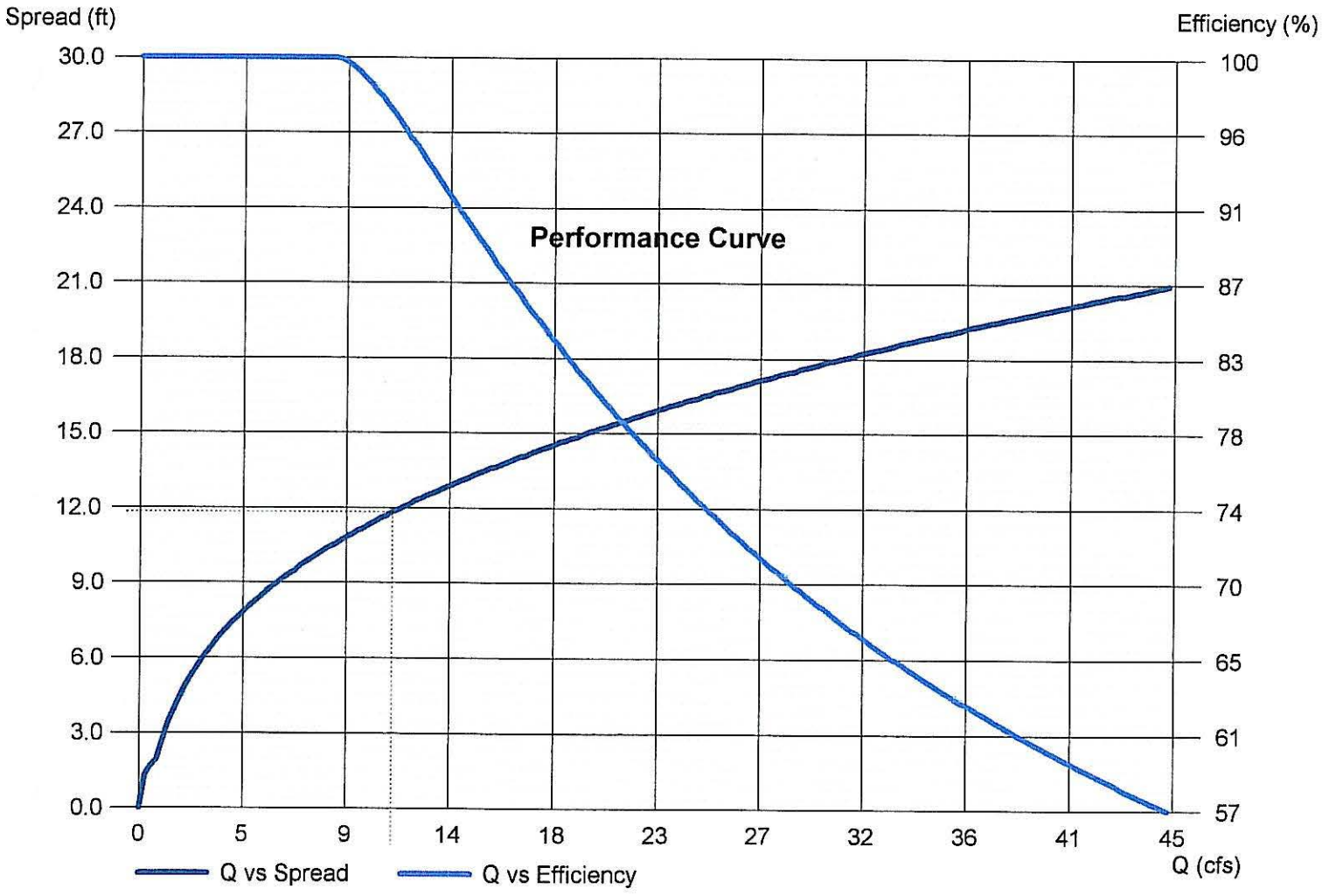
Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 4.00
Gutter n-value	= 0.013

Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 11.00
Q Capt (cfs)	= 10.66
Q Bypass (cfs)	= 0.34
Depth at Inlet (in)	= 5.66
Efficiency (%)	= 97
Gutter Spread (ft)	= 11.85
Gutter Vel (ft/s)	= 7.22
Bypass Spread (ft)	= 1.50
Bypass Depth (in)	= 1.44



Inlet Report

Goleta - Catch Basin Hydraulics - 28 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 28.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 4.00
Gutter n-value	= 0.013

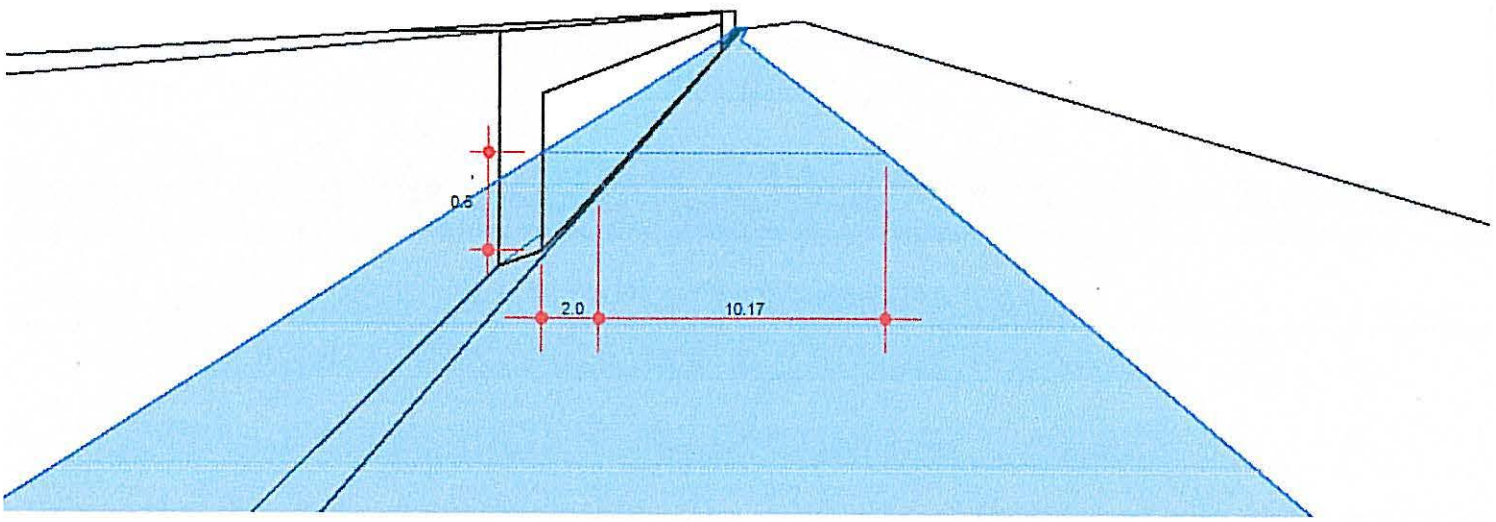
Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 14.50
Q Capt (cfs)	= 13.06
Q Bypass (cfs)	= 1.44
Depth at Inlet (in)	= 6.06
Efficiency (%)	= 90
Gutter Spread (ft)	= 13.30
Gutter Vel (ft/s)	= 7.68
Bypass Spread (ft)	= 4.00
Bypass Depth (in)	= 2.40

dimensions in feet



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 28 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 28.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

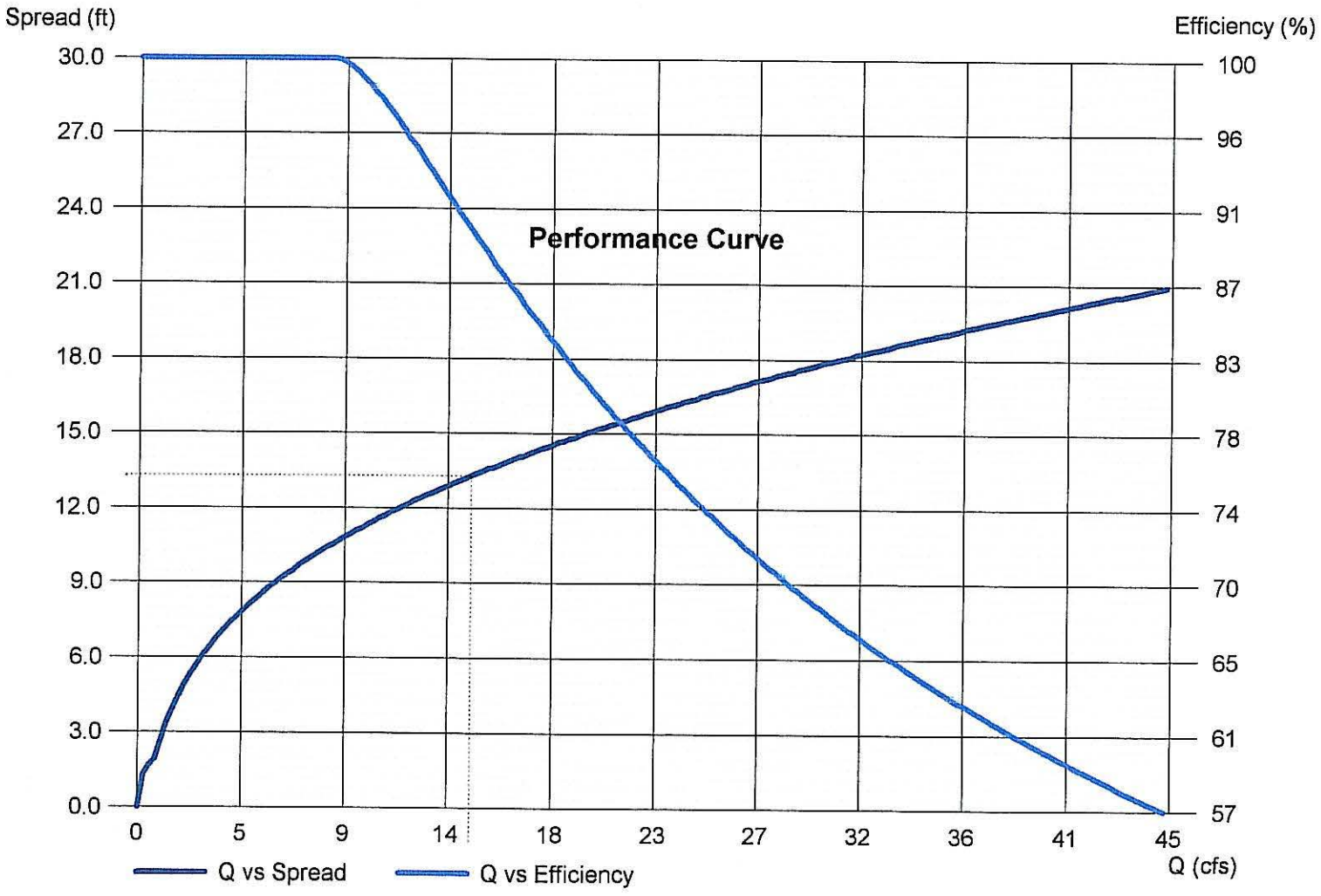
Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 4.00
Gutter n-value	= 0.013

Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 14.50
Q Capt (cfs)	= 13.06
Q Bypass (cfs)	= 1.44
Depth at Inlet (in)	= 6.06
Efficiency (%)	= 90
Gutter Spread (ft)	= 13.30
Gutter Vel (ft/s)	= 7.68
Bypass Spread (ft)	= 4.00
Bypass Depth (in)	= 2.40



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 14 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 14.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 2.00
Gutter n-value	= 0.013

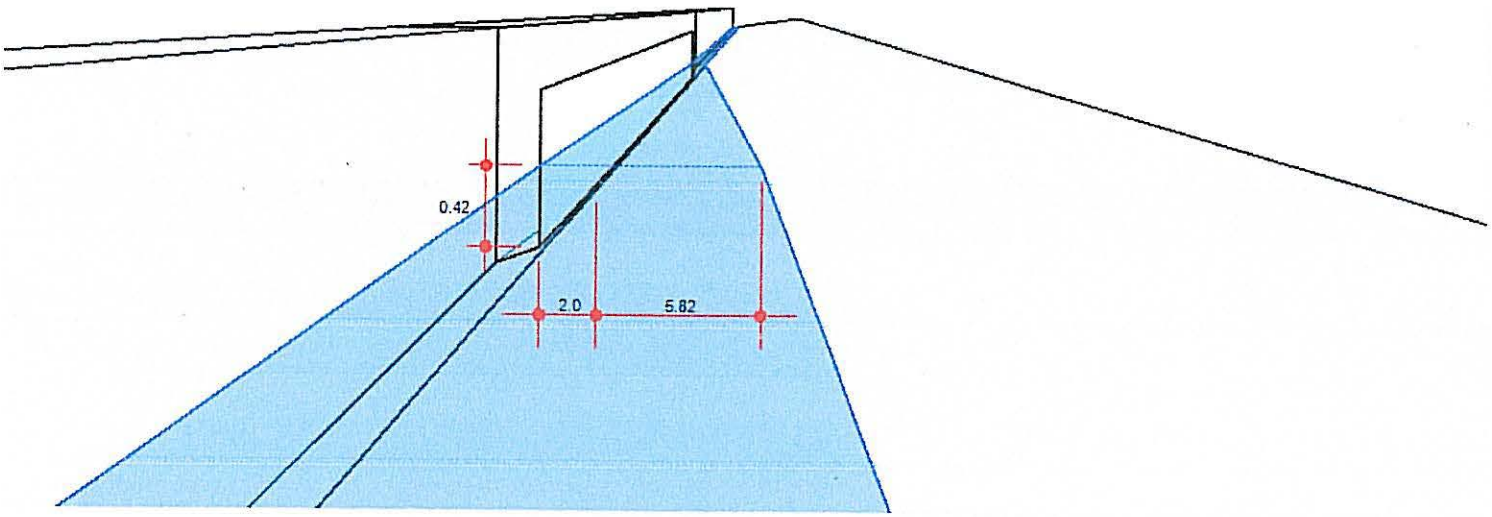
Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 4.75
Q Capt (cfs)	= 4.53
Q Bypass (cfs)	= 0.22
Depth at Inlet (in)	= 5.02
Efficiency (%)	= 95
Gutter Spread (ft)	= 9.50
Gutter Vel (ft/s)	= 4.65
Bypass Spread (ft)	= 1.50
Bypass Depth (in)	= 1.44

dimensions in feet



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 14 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 14.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

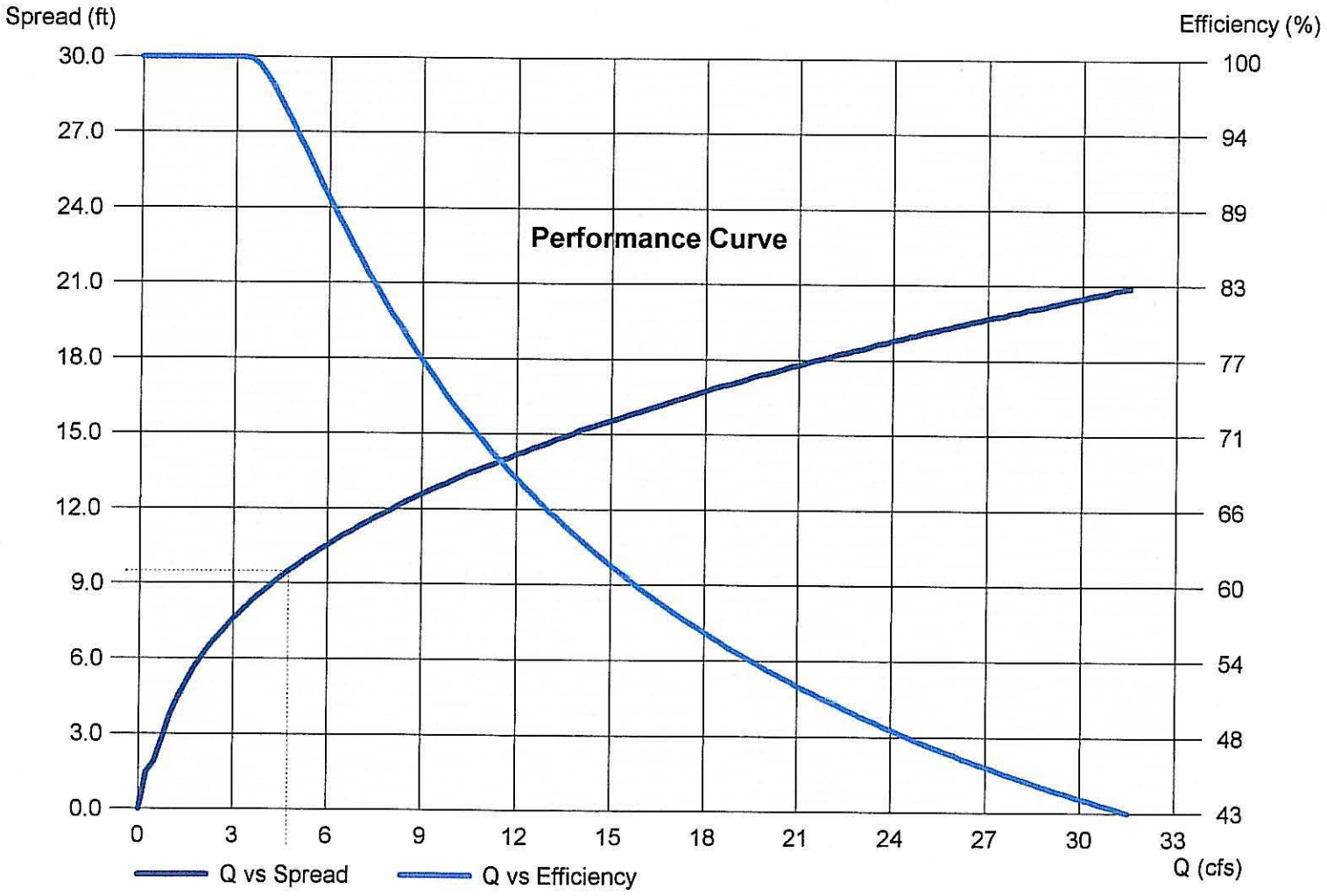
Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 2.00
Gutter n-value	= 0.013

Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 4.75
Q Capt (cfs)	= 4.53
Q Bypass (cfs)	= 0.22
Depth at Inlet (in)	= 5.02
Efficiency (%)	= 95
Gutter Spread (ft)	= 9.50
Gutter Vel (ft/s)	= 4.65
Bypass Spread (ft)	= 1.50
Bypass Depth (in)	= 1.44



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 14 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 14.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 2.00
Gutter n-value	= 0.013

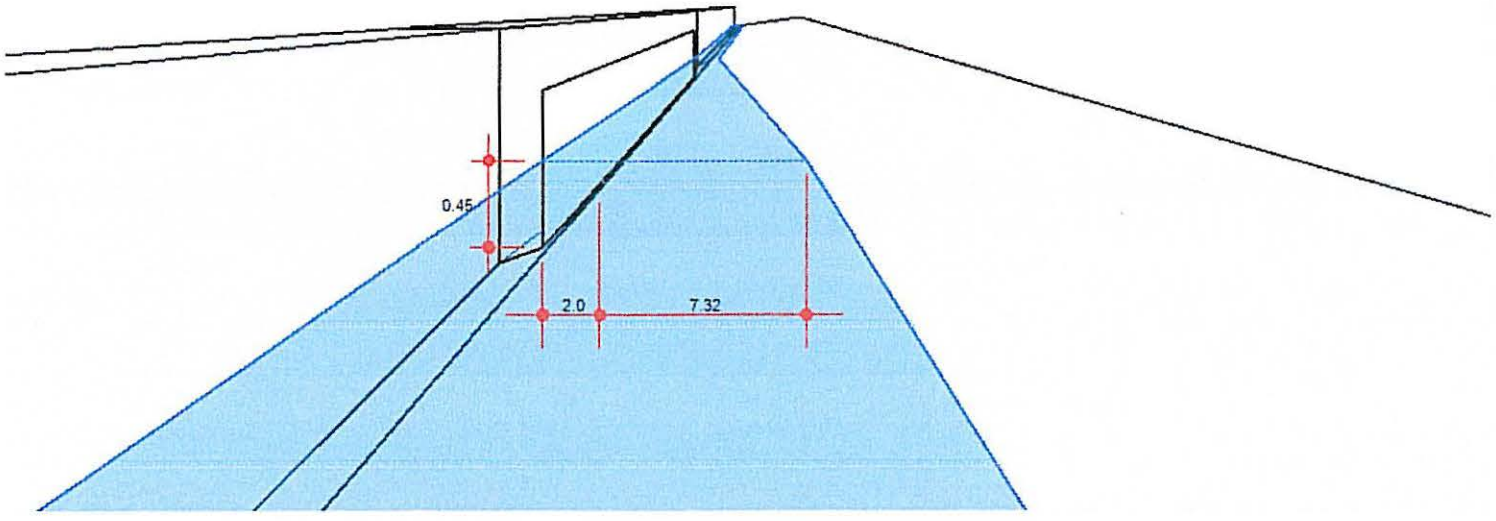
Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 6.25
Q Capt (cfs)	= 5.50
Q Bypass (cfs)	= 0.75
Depth at Inlet (in)	= 5.38
Efficiency (%)	= 88
Gutter Spread (ft)	= 10.75
Gutter Vel (ft/s)	= 4.90
Bypass Spread (ft)	= 3.00
Bypass Depth (in)	= 2.16

dimensions in feet



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 14 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 14.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

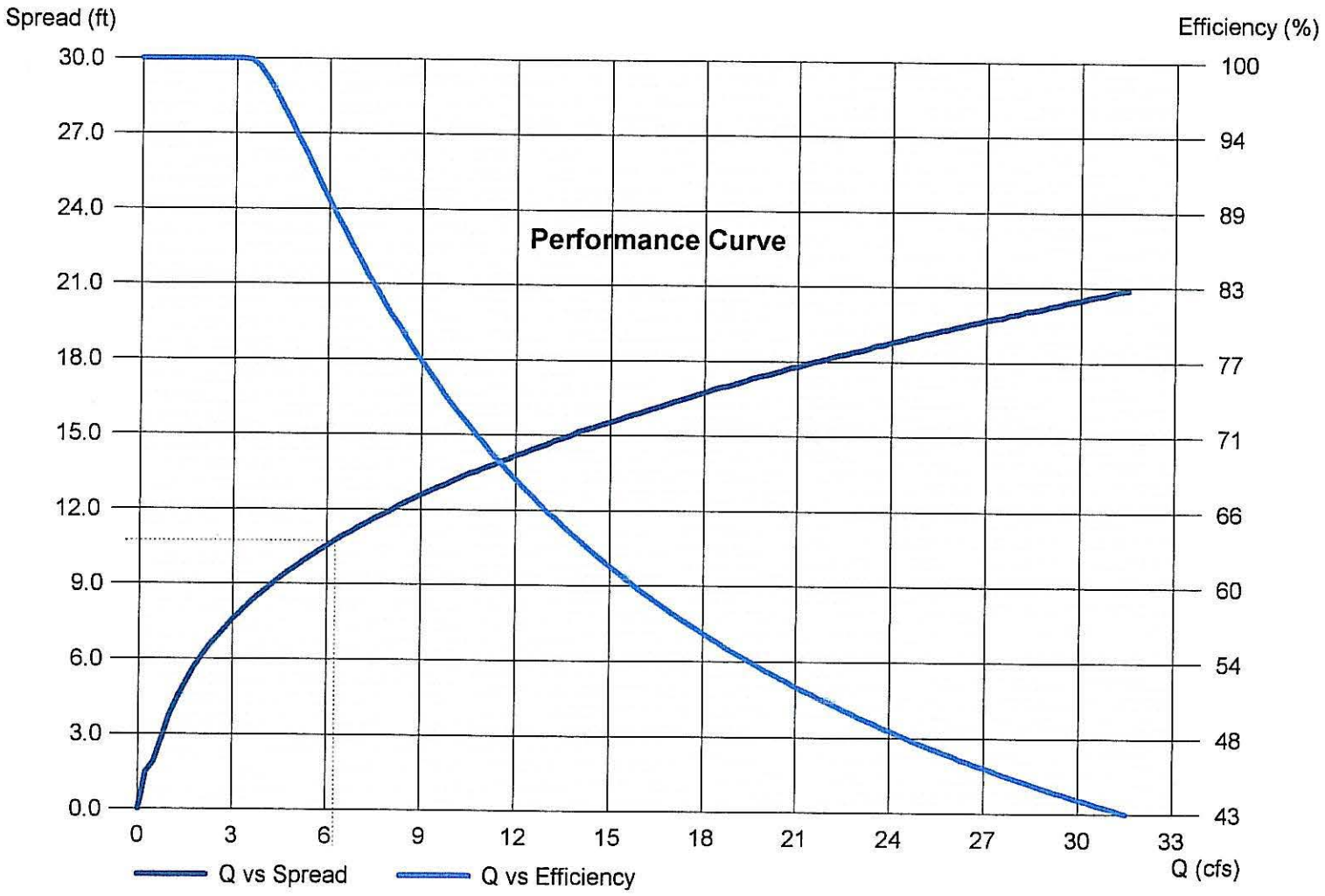
Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 2.00
Gutter n-value	= 0.013

Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 6.25
Q Capt (cfs)	= 5.50
Q Bypass (cfs)	= 0.75
Depth at Inlet (in)	= 5.38
Efficiency (%)	= 88
Gutter Spread (ft)	= 10.75
Gutter Vel (ft/s)	= 4.90
Bypass Spread (ft)	= 3.00
Bypass Depth (in)	= 2.16



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 14 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 14.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 2.00
Gutter n-value	= 0.013

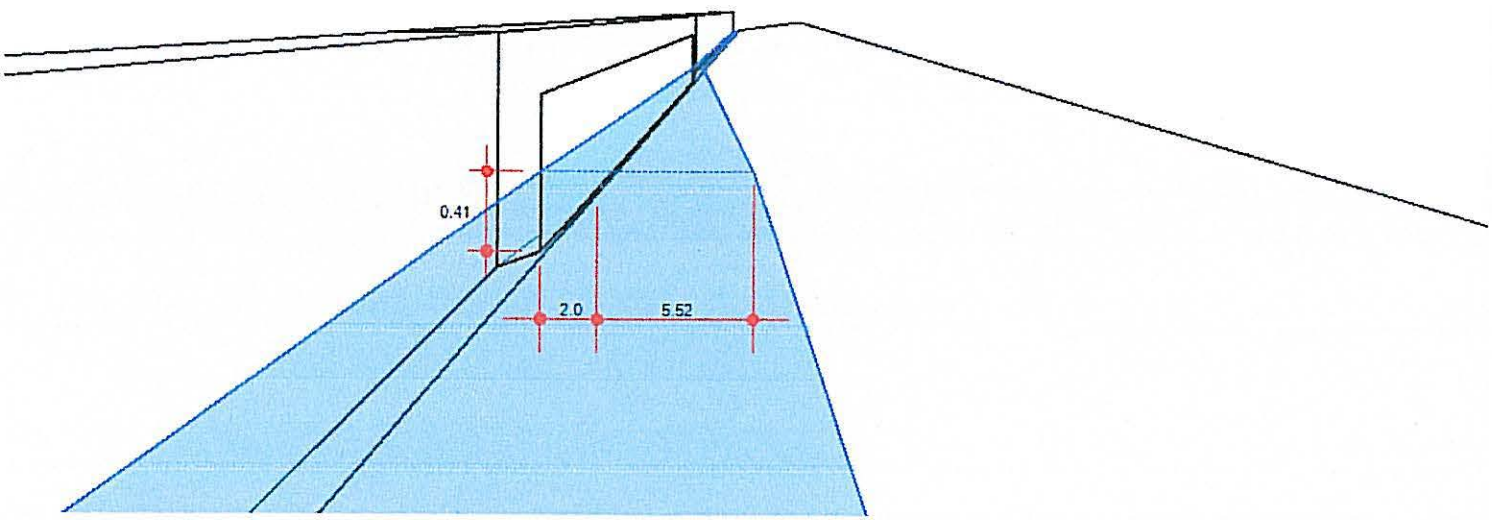
Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 4.50
Q Capt (cfs)	= 4.34
Q Bypass (cfs)	= 0.16
Depth at Inlet (in)	= 4.94
Efficiency (%)	= 96
Gutter Spread (ft)	= 9.25
Gutter Vel (ft/s)	= 4.61
Bypass Spread (ft)	= 1.25
Bypass Depth (in)	= 1.20

dimensions in feet



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 14 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 14.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

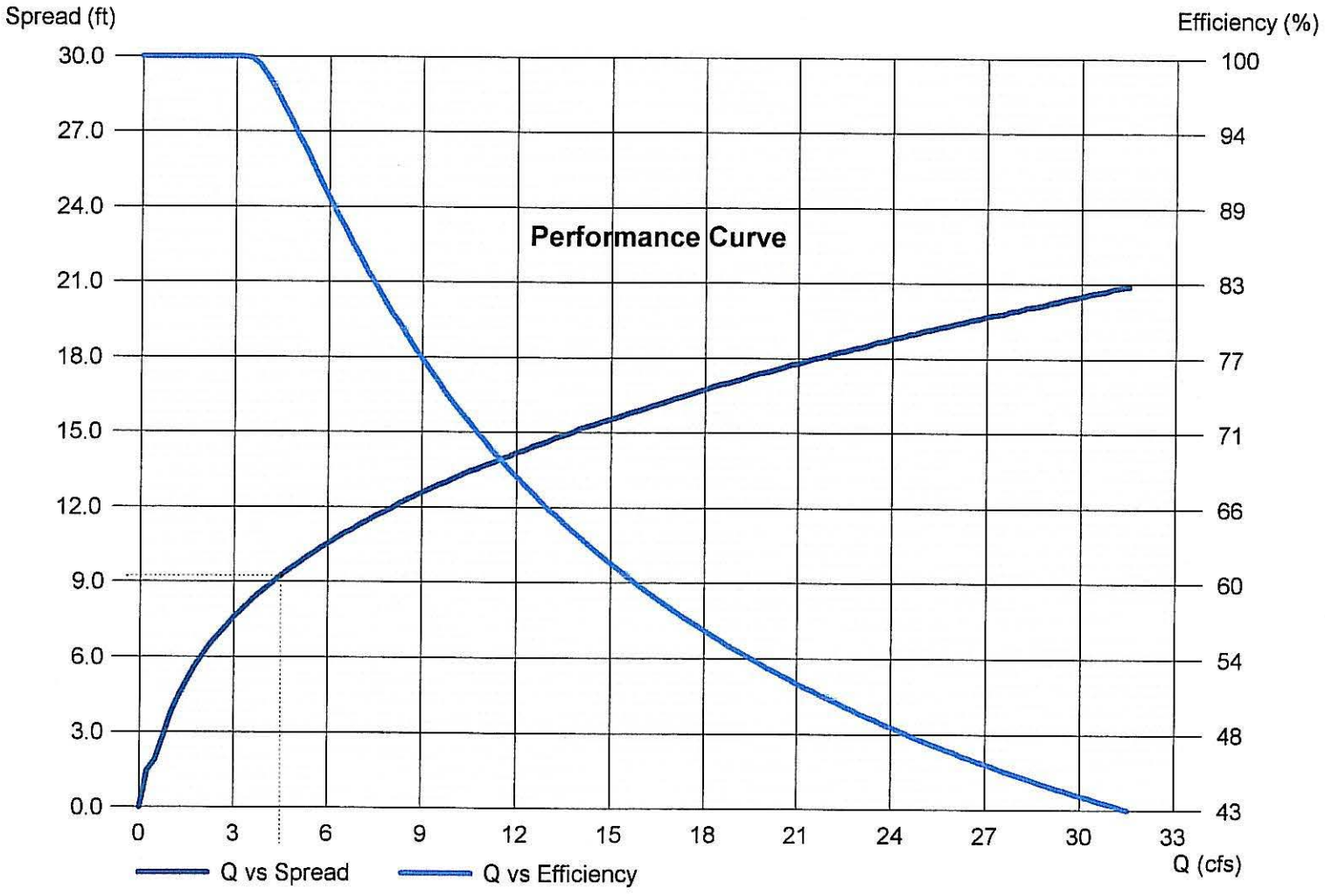
Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 2.00
Gutter n-value	= 0.013

Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 4.50
Q Capt (cfs)	= 4.34
Q Bypass (cfs)	= 0.16
Depth at Inlet (in)	= 4.94
Efficiency (%)	= 96
Gutter Spread (ft)	= 9.25
Gutter Vel (ft/s)	= 4.61
Bypass Spread (ft)	= 1.25
Bypass Depth (in)	= 1.20



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 14 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 14.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 2.00
Gutter n-value	= 0.013

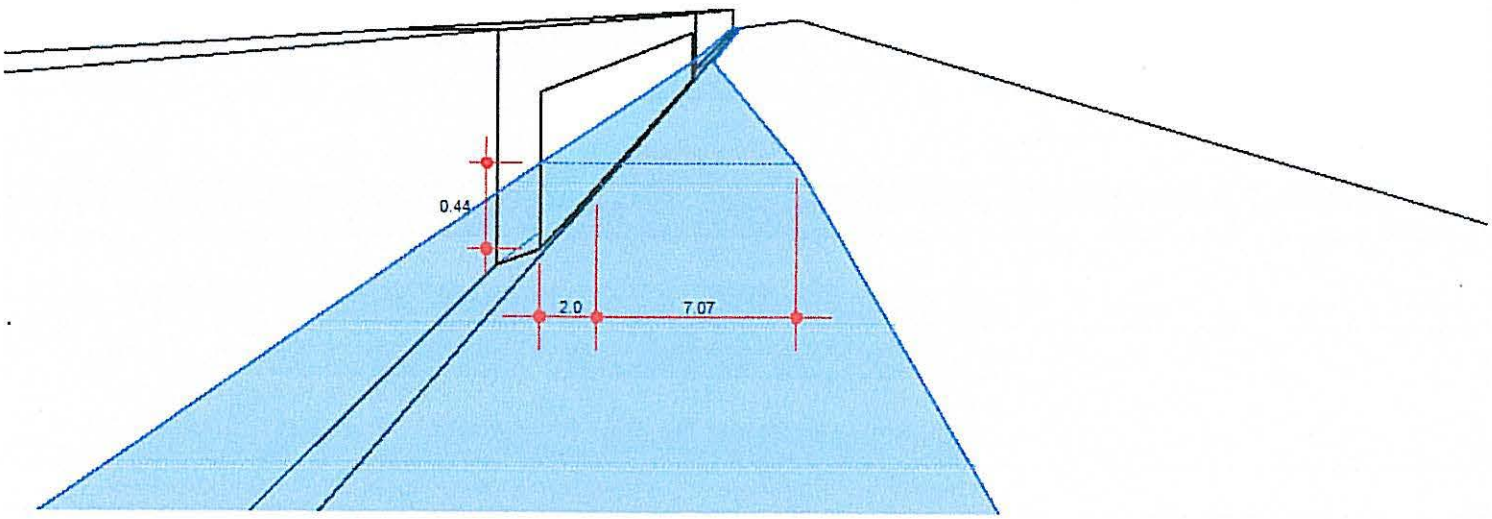
Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 6.00
Q Capt (cfs)	= 5.35
Q Bypass (cfs)	= 0.65
Depth at Inlet (in)	= 5.32
Efficiency (%)	= 89
Gutter Spread (ft)	= 10.55
Gutter Vel (ft/s)	= 4.87
Bypass Spread (ft)	= 2.50
Bypass Depth (in)	= 2.04

dimensions in feet



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 14 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 14.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

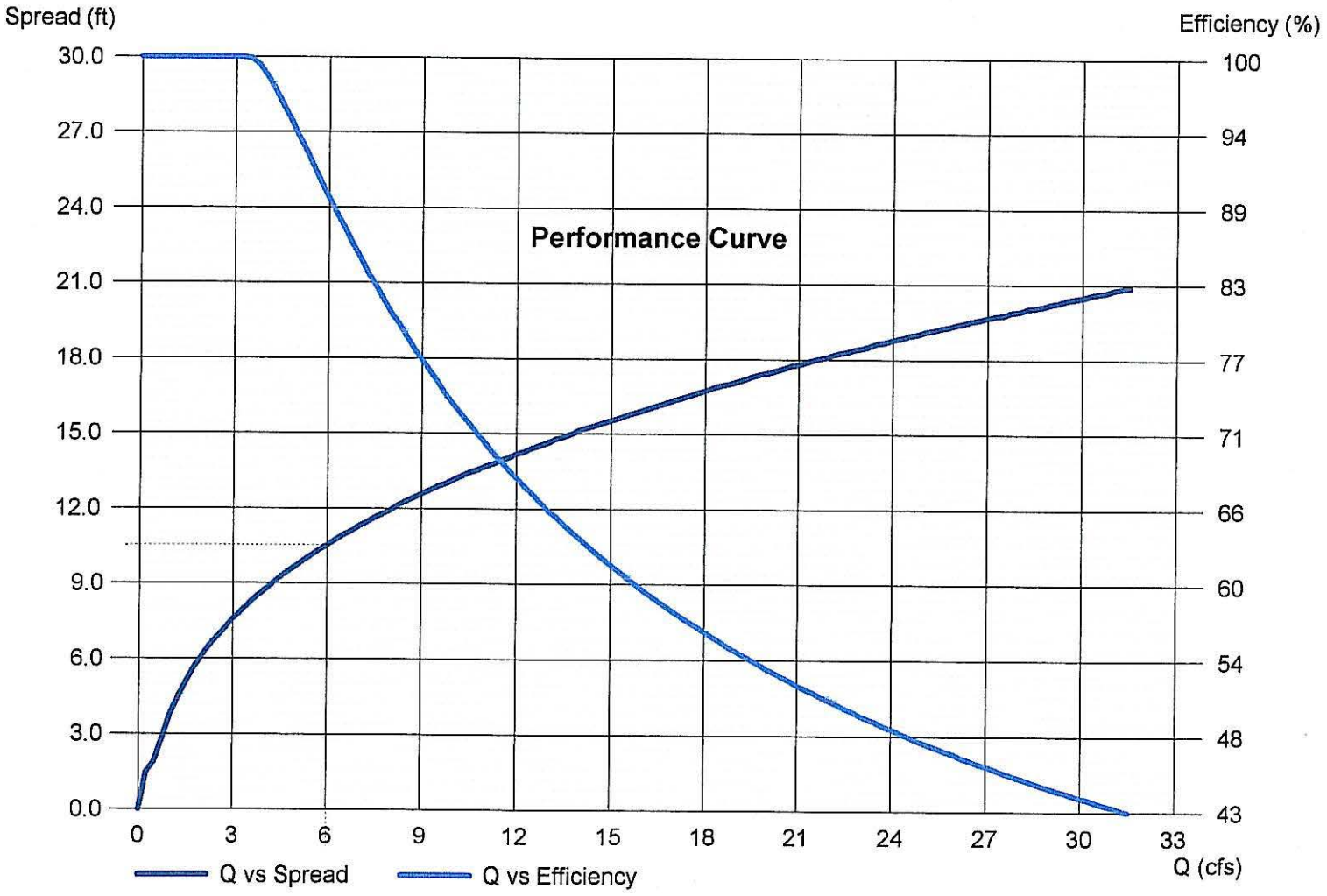
Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 2.00
Gutter n-value	= 0.013

Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 6.00
Q Capt (cfs)	= 5.35
Q Bypass (cfs)	= 0.65
Depth at Inlet (in)	= 5.32
Efficiency (%)	= 89
Gutter Spread (ft)	= 10.55
Gutter Vel (ft/s)	= 4.87
Bypass Spread (ft)	= 2.50
Bypass Depth (in)	= 2.04



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 7 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 7.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 4.00
Gutter n-value	= 0.013

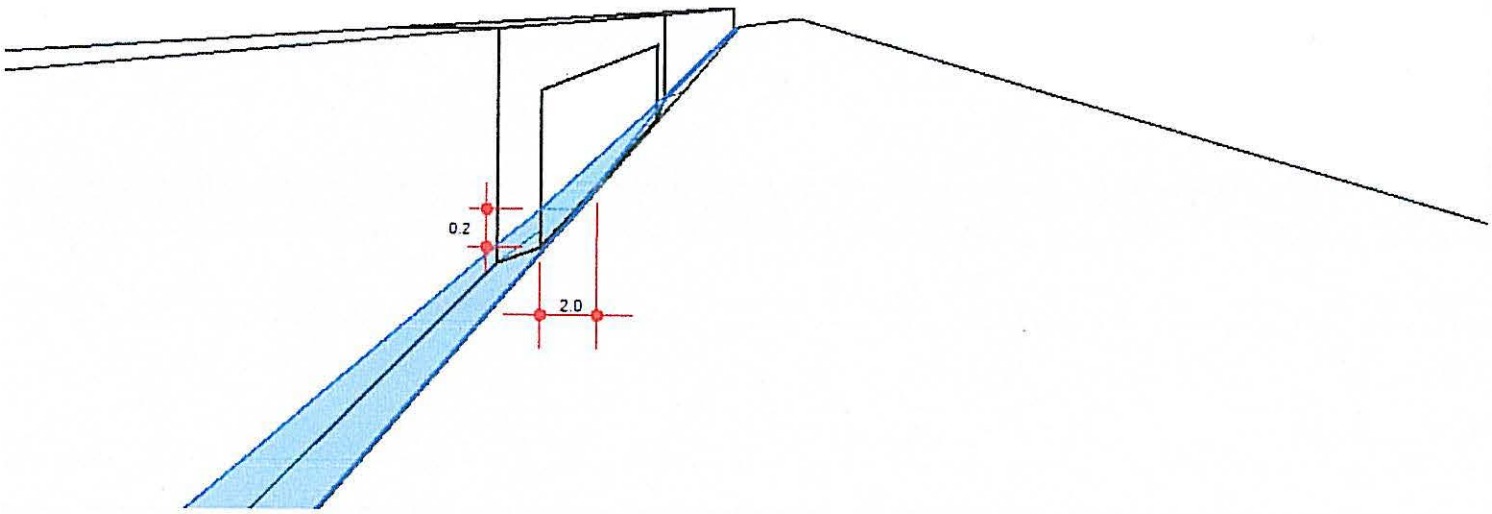
Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 0.75
Q Capt (cfs)	= 0.74
Q Bypass (cfs)	= 0.01
Depth at Inlet (in)	= 2.38
Efficiency (%)	= 99
Gutter Spread (ft)	= 1.95
Gutter Vel (ft/s)	= 4.93
Bypass Spread (ft)	= 0.38
Bypass Depth (in)	= 0.36

Dimensions in feet



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 7 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 7.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

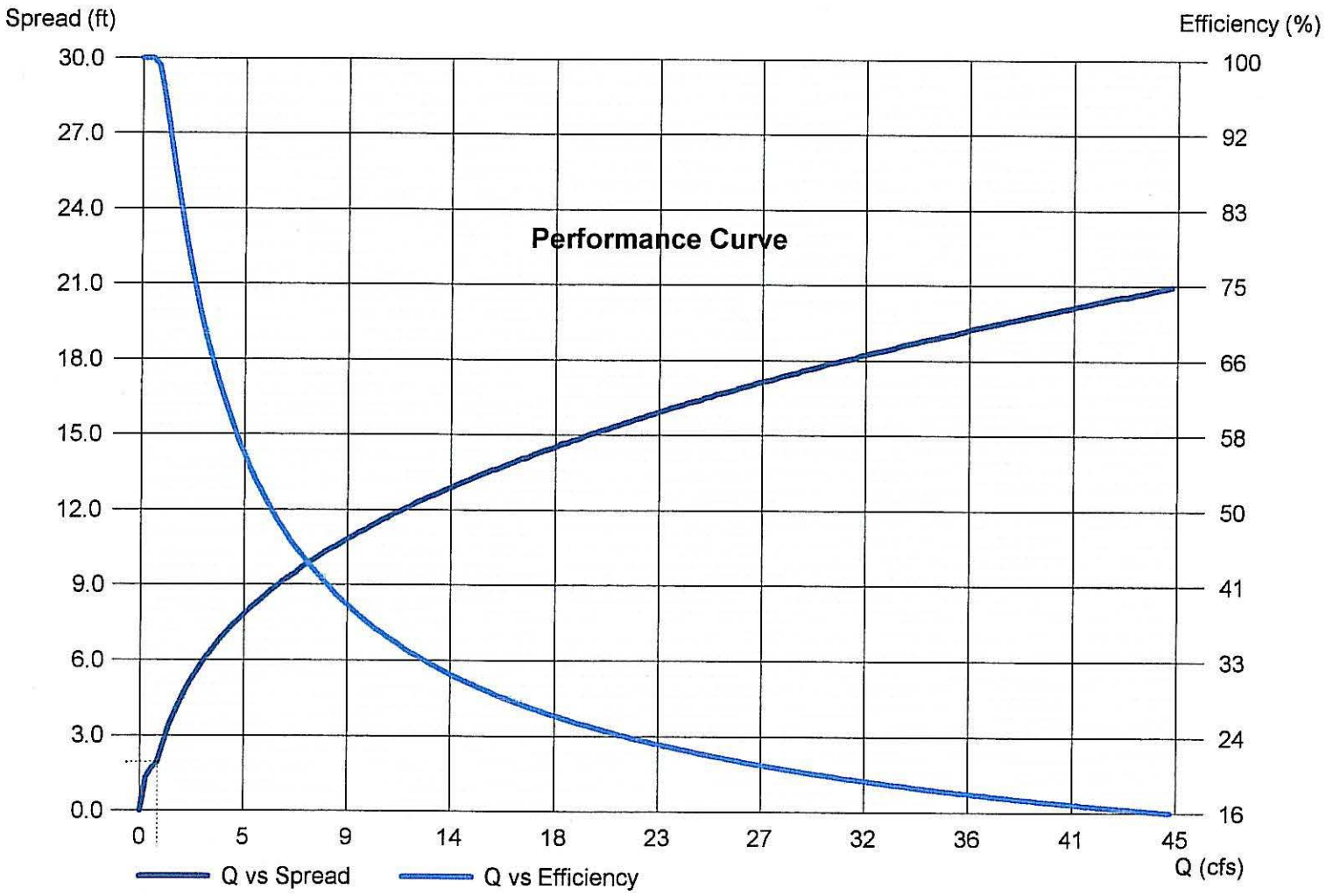
Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 4.00
Gutter n-value	= 0.013

Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 0.75
Q Capt (cfs)	= 0.74
Q Bypass (cfs)	= 0.01
Depth at Inlet (in)	= 2.38
Efficiency (%)	= 99
Gutter Spread (ft)	= 1.95
Gutter Vel (ft/s)	= 4.93
Bypass Spread (ft)	= 0.38
Bypass Depth (in)	= 0.36



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 7 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 7.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 4.00
Gutter n-value	= 0.013

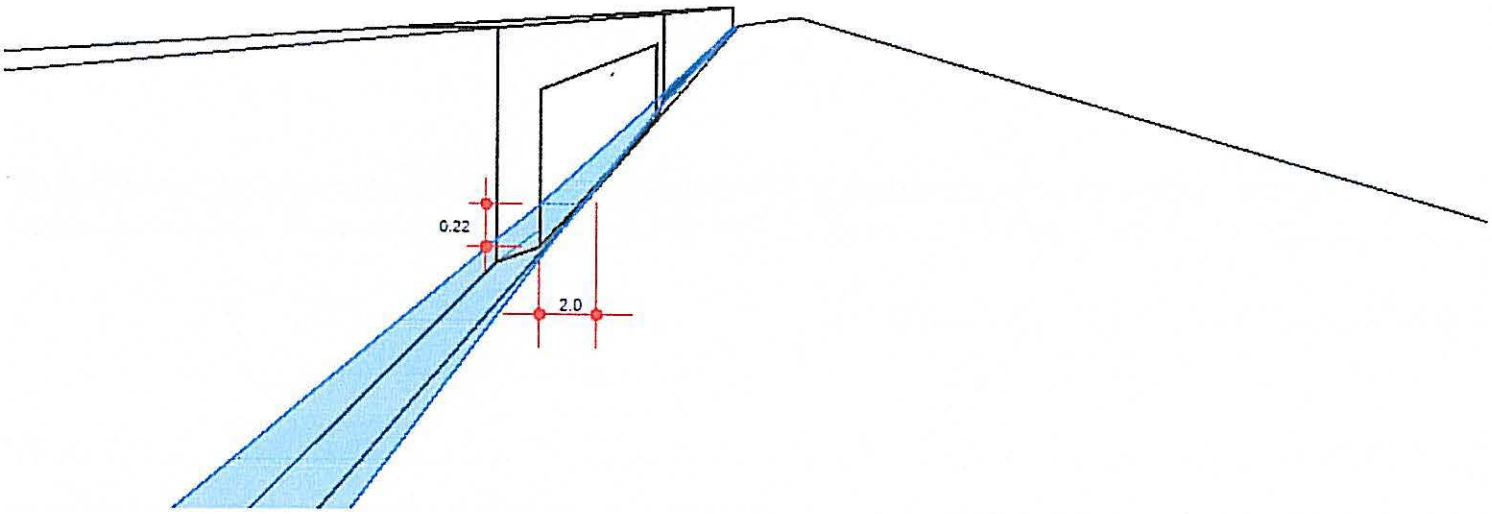
Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 1.00
Q Capt (cfs)	= 0.96
Q Bypass (cfs)	= 0.04
Depth at Inlet (in)	= 2.64
Efficiency (%)	= 96
Gutter Spread (ft)	= 2.70
Gutter Vel (ft/s)	= 5.18
Bypass Spread (ft)	= 0.75
Bypass Depth (in)	= 0.72

All dimensions in feet



Inlet Report

Goleta - Catch Basin Hydraulics - 7 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 7.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

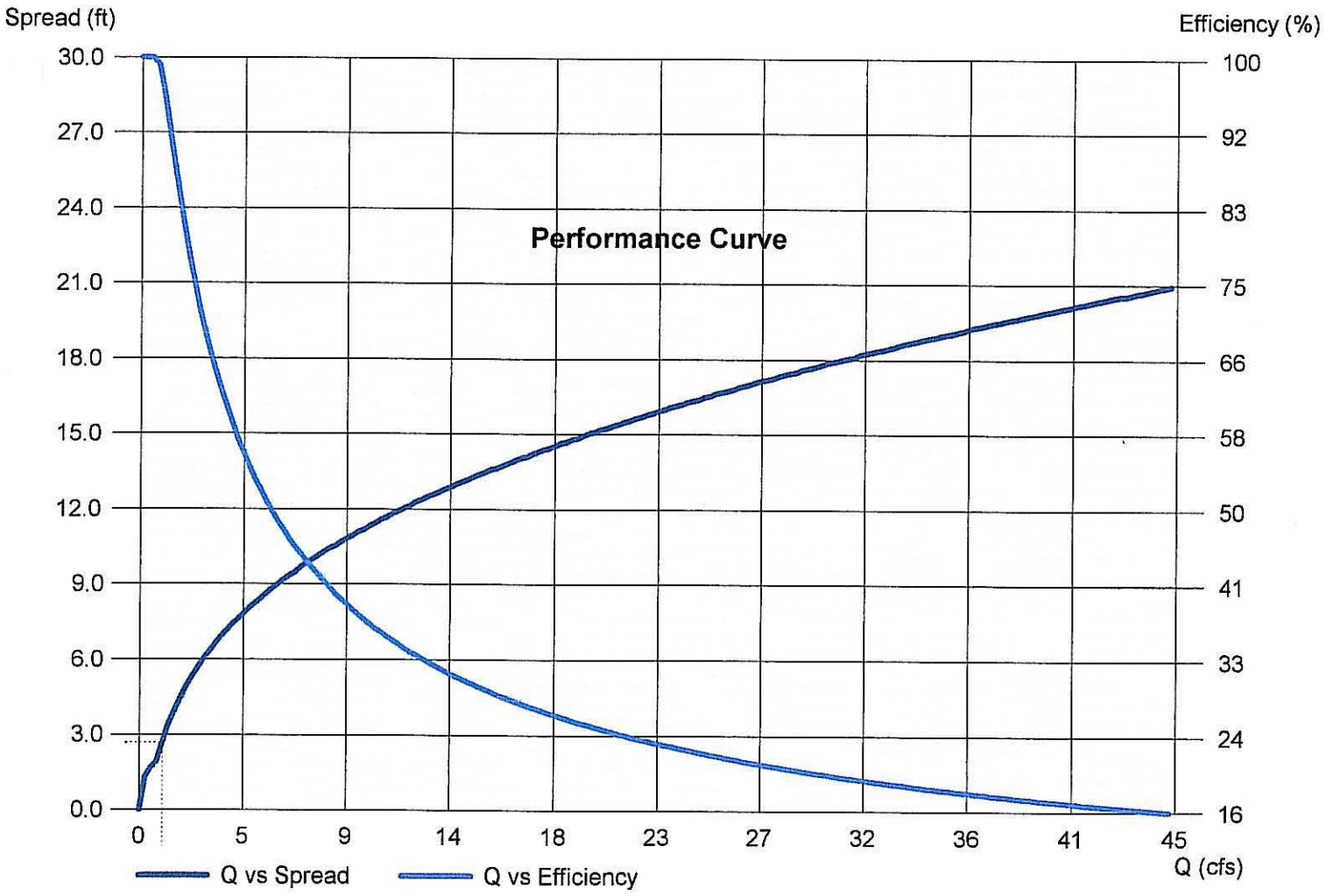
Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 4.00
Gutter n-value	= 0.013

Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 1.00
Q Capt (cfs)	= 0.96
Q Bypass (cfs)	= 0.04
Depth at Inlet (in)	= 2.64
Efficiency (%)	= 96
Gutter Spread (ft)	= 2.70
Gutter Vel (ft/s)	= 5.18
Bypass Spread (ft)	= 0.75
Bypass Depth (in)	= 0.72



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 14 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 14.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 2.00
Gutter n-value	= 0.013

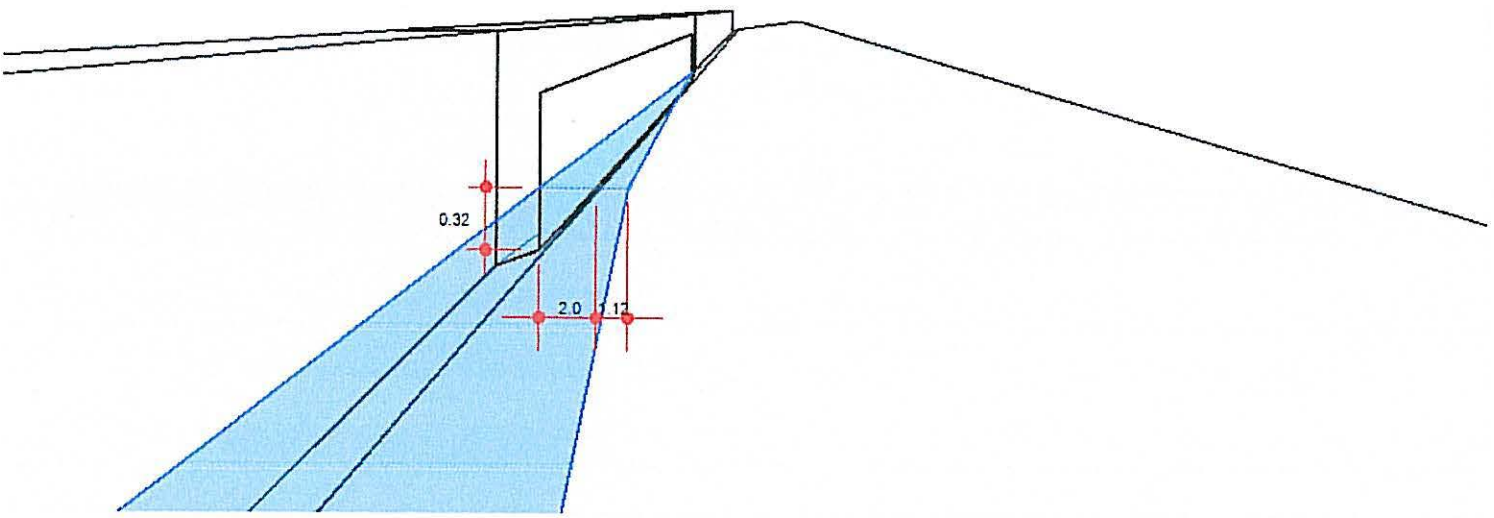
Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 2.00
Q Capt (cfs)	= 2.00
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 3.89
Efficiency (%)	= 100
Gutter Spread (ft)	= 6.10
Gutter Vel (ft/s)	= 4.06
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-

All dimensions in feet



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 14 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 14.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

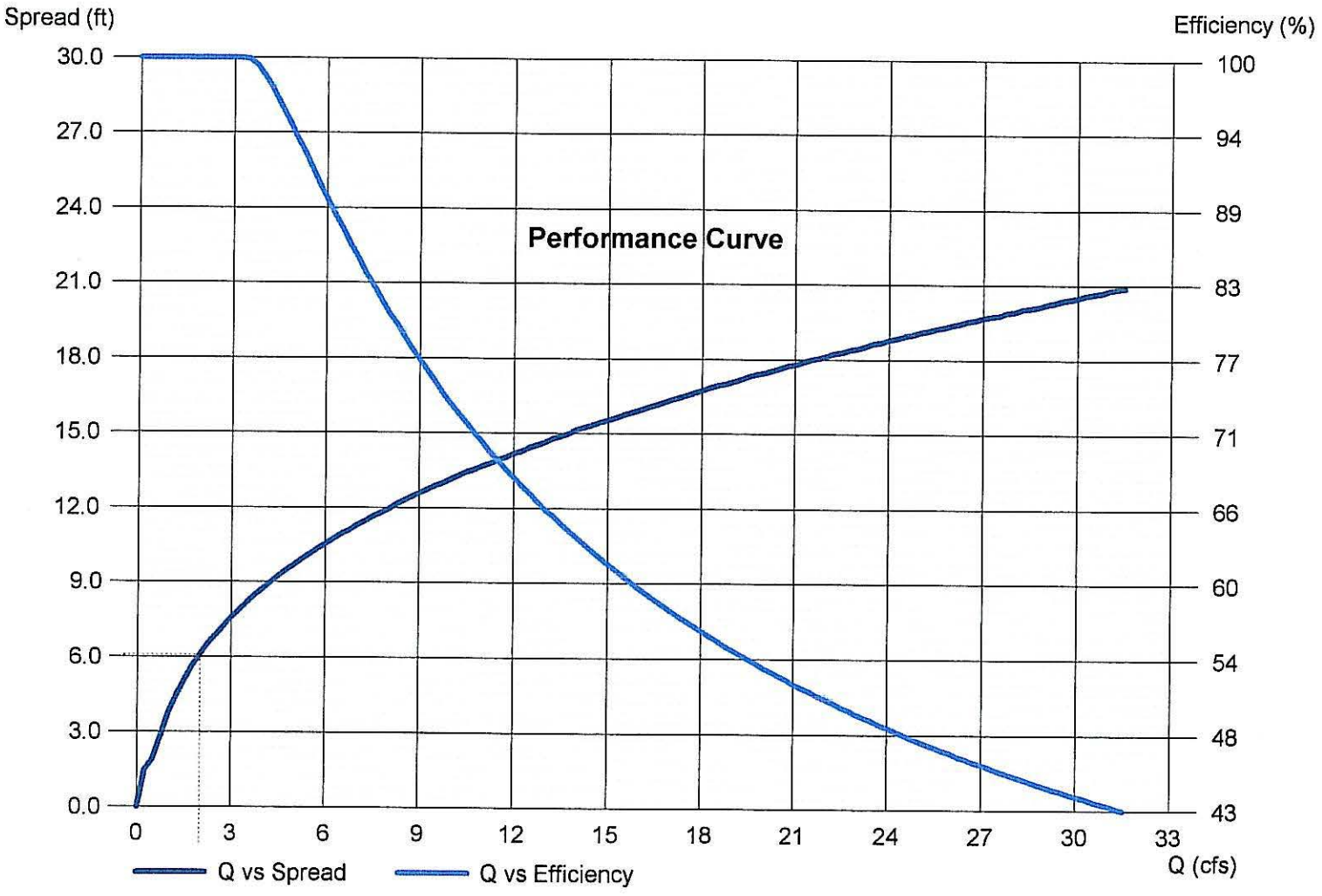
Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 2.00
Gutter n-value	= 0.013

Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 2.00
Q Capt (cfs)	= 2.00
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 3.89
Efficiency (%)	= 100
Gutter Spread (ft)	= 6.10
Gutter Vel (ft/s)	= 4.06
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 14 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 14.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 2.00
Gutter n-value	= 0.013

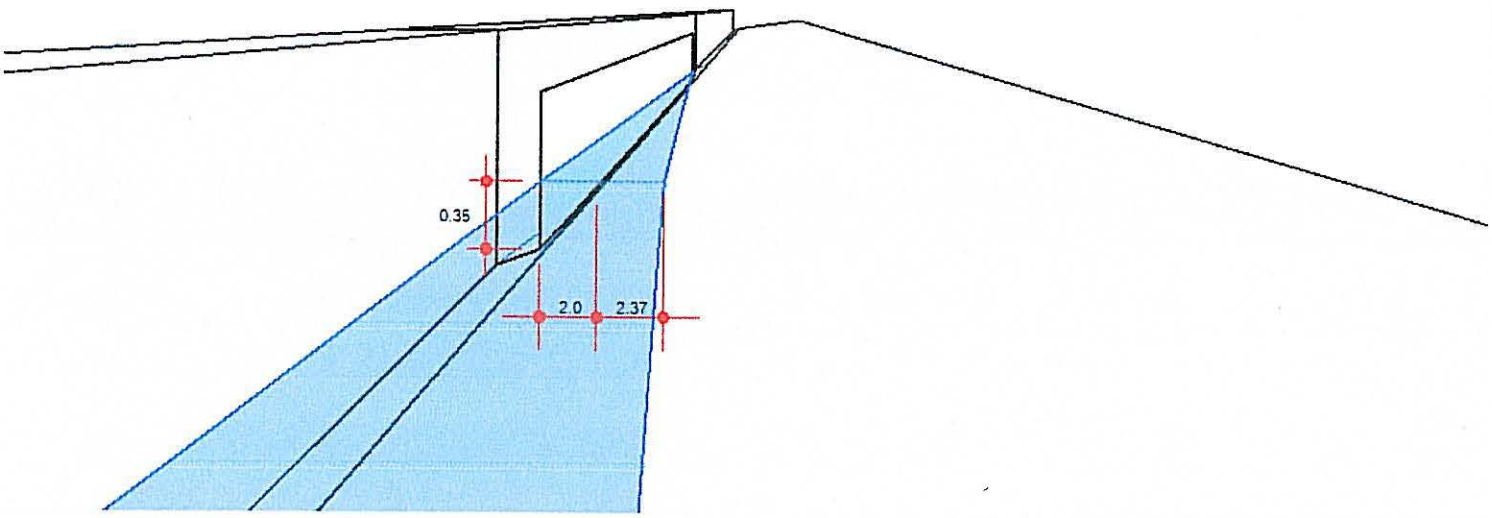
Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 2.50
Q Capt (cfs)	= 2.50
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 4.19
Efficiency (%)	= 100
Gutter Spread (ft)	= 6.90
Gutter Vel (ft/s)	= 4.19
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-

dimensions in feet



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 14 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 14.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

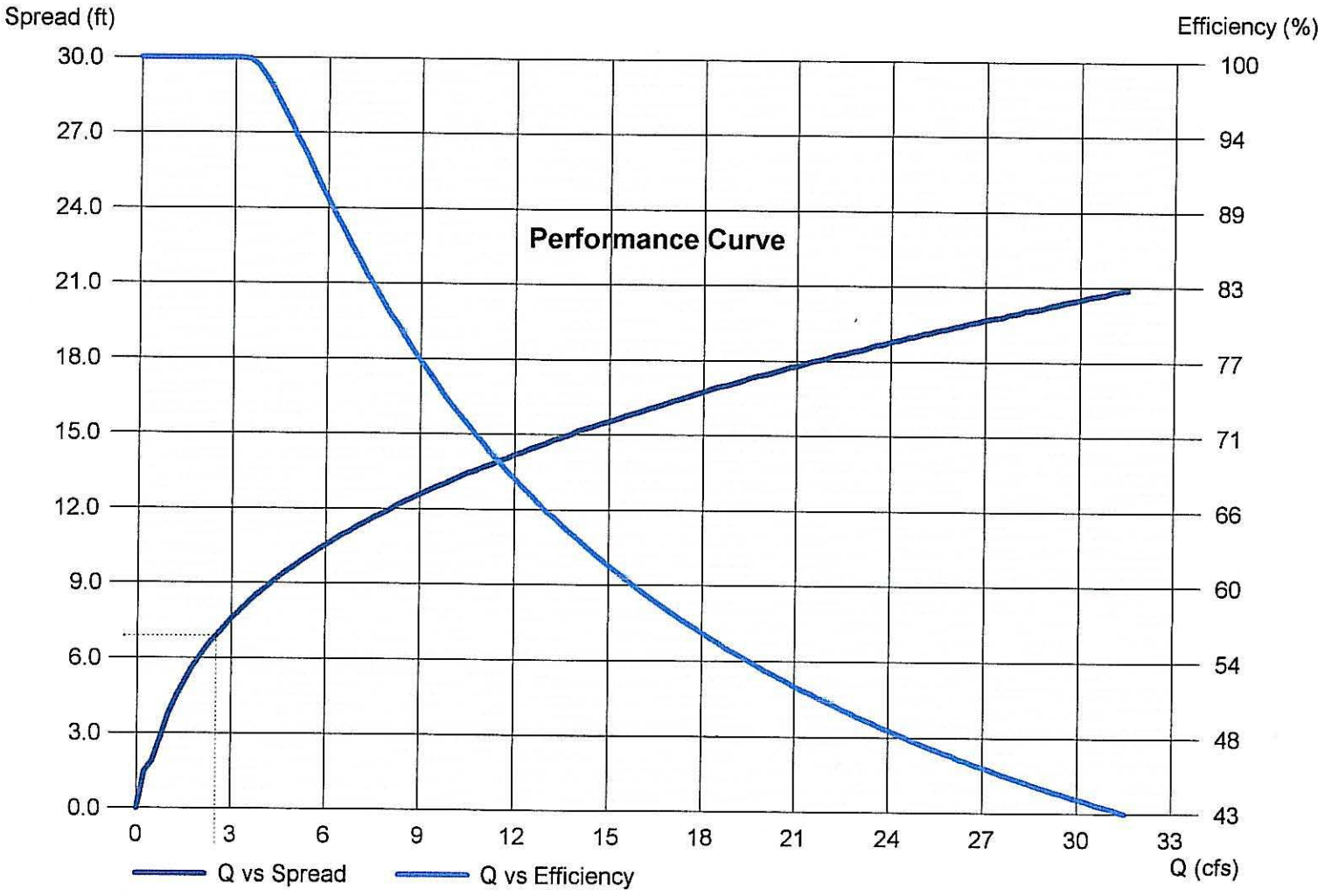
Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 2.00
Gutter n-value	= 0.013

Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 2.50
Q Capt (cfs)	= 2.50
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 4.19
Efficiency (%)	= 100
Gutter Spread (ft)	= 6.90
Gutter Vel (ft/s)	= 4.19
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 28 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 28.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 8.00
Gutter n-value	= 0.013

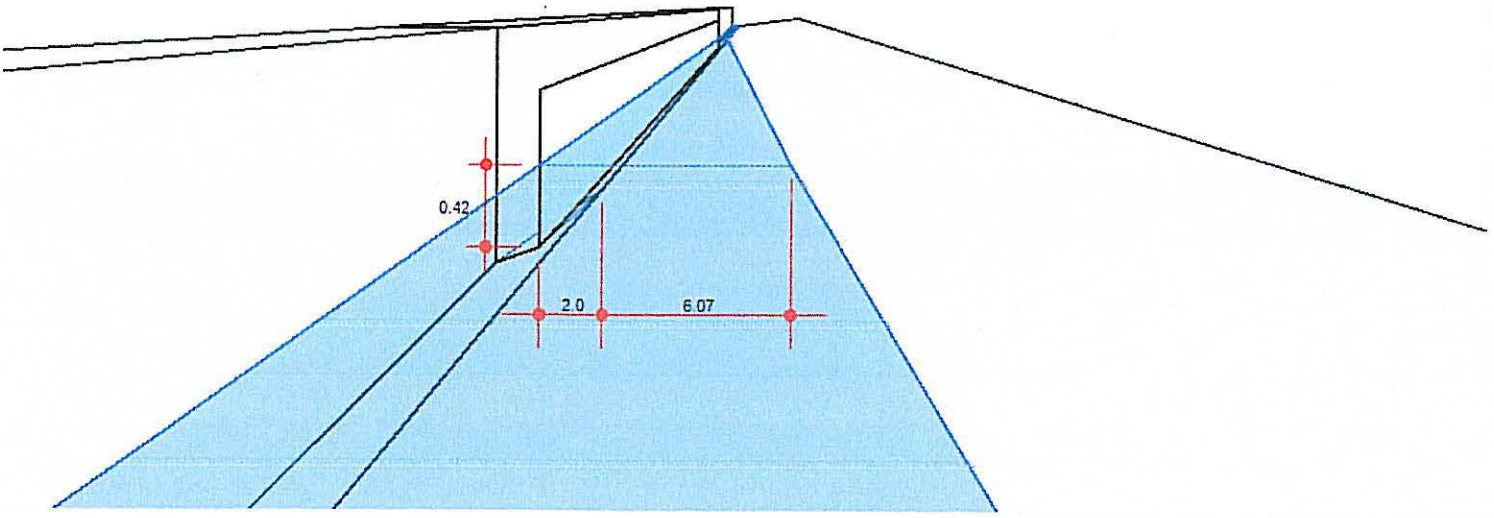
Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 10.00
Q Capt (cfs)	= 9.35
Q Bypass (cfs)	= 0.65
Depth at Inlet (in)	= 5.08
Efficiency (%)	= 93
Gutter Spread (ft)	= 9.70
Gutter Vel (ft/s)	= 9.43
Bypass Spread (ft)	= 1.63
Bypass Depth (in)	= 1.56

I dimensions in feet



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 28 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 28.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

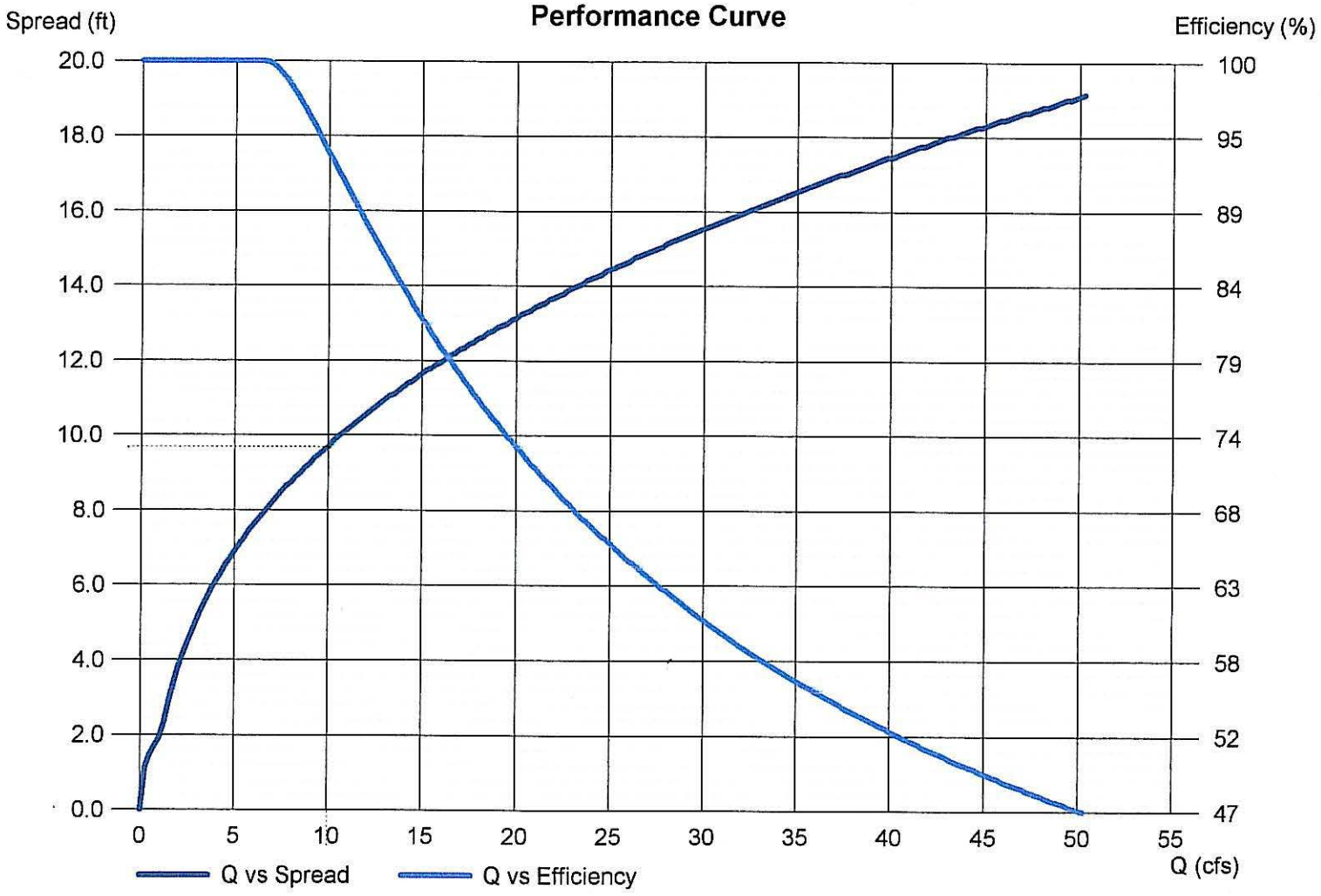
Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 8.00
Gutter n-value	= 0.013

Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 10.00
Q Capt (cfs)	= 9.35
Q Bypass (cfs)	= 0.65
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Bypass Spread (ft)	= 1.63
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Inlet Report

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Goleta - Catch Basin Hydraulics - 28 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 28.00
Throat Height (in)	= 4.86
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Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 8.00
Gutter n-value	= 0.013

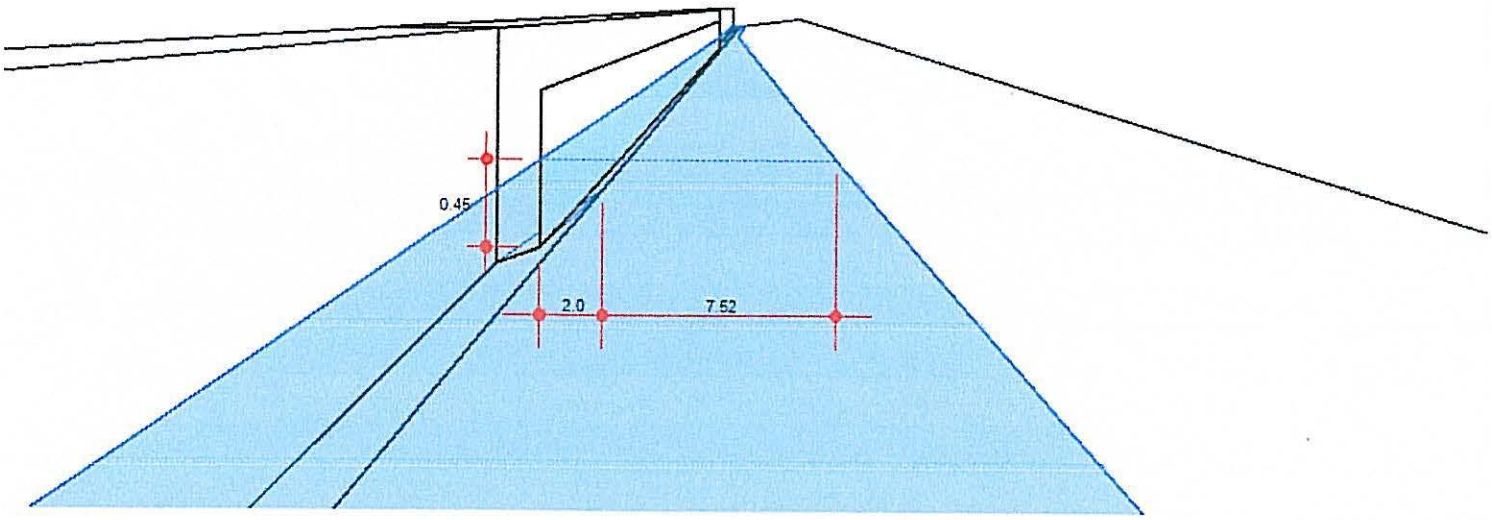
Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 13.00
Q Capt (cfs)	= 11.21
Q Bypass (cfs)	= 1.79
Depth at Inlet (in)	= 5.42
Efficiency (%)	= 86
Gutter Spread (ft)	= 10.95
Gutter Vel (ft/s)	= 9.86
Bypass Spread (ft)	= 3.50
Bypass Depth (in)	= 2.28

Dimensions in feet



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 28 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 28.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

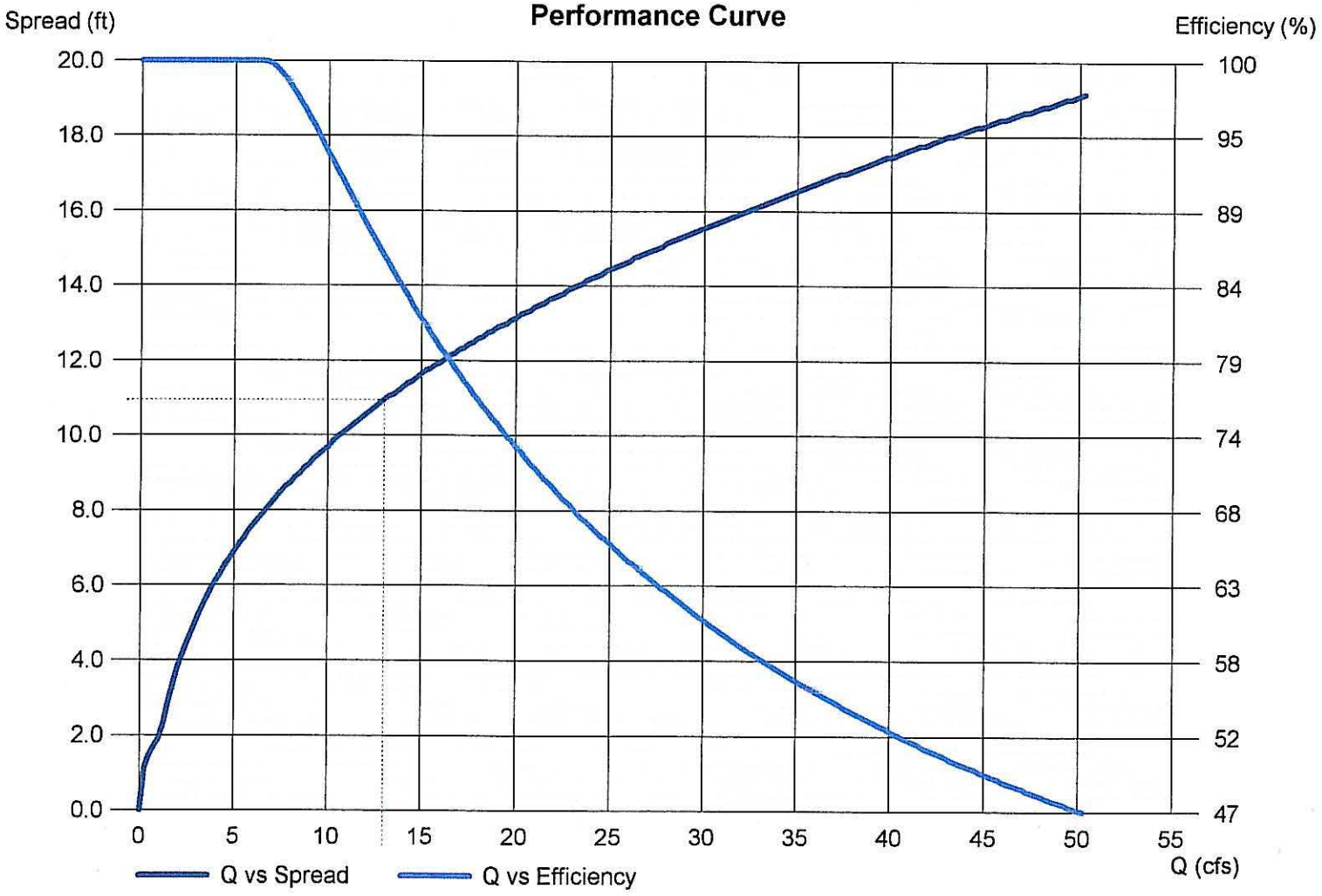
Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 8.00
Gutter n-value	= 0.013

Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 13.00
Q Capt (cfs)	= 11.21
Q Bypass (cfs)	= 1.79
Depth at Inlet (in)	= 5.42
Efficiency (%)	= 86
Gutter Spread (ft)	= 10.95
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Bypass Spread (ft)	= 3.50
Bypass Depth (in)	= 2.28



Inlet Report

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Goleta - Catch Basin Hydraulics - 28 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 28.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 8.00
Gutter n-value	= 0.013

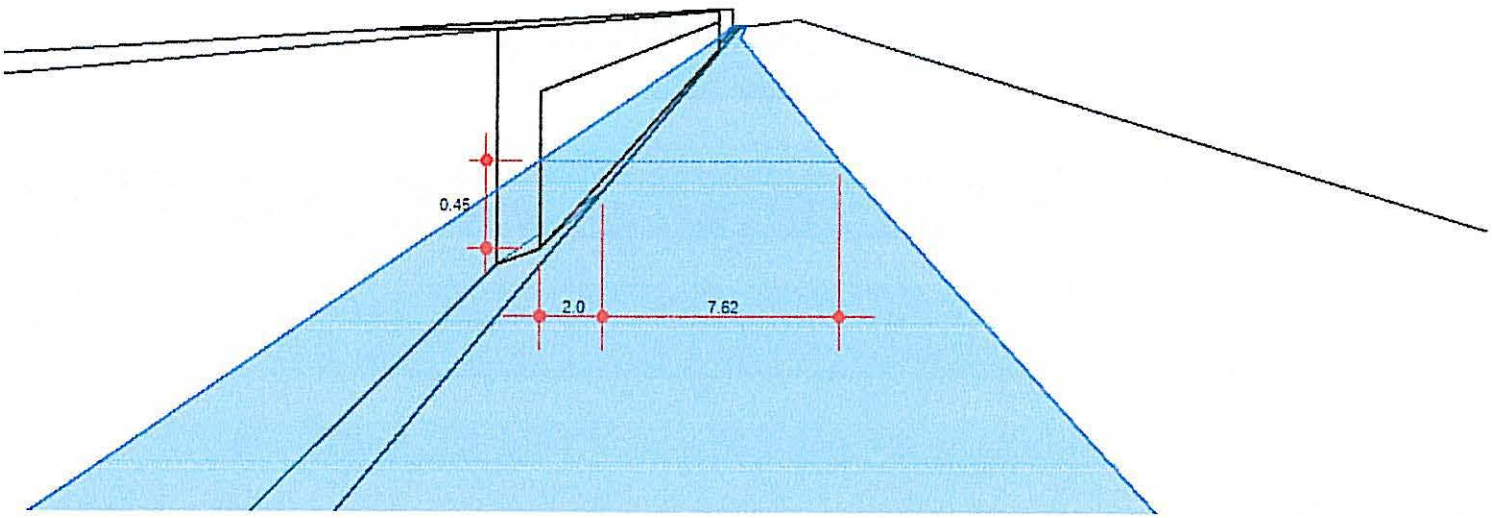
Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 13.25
Q Capt (cfs)	= 11.36
Q Bypass (cfs)	= 1.89
Depth at Inlet (in)	= 5.45
Efficiency (%)	= 86
Gutter Spread (ft)	= 11.05
Gutter Vel (ft/s)	= 9.88
Bypass Spread (ft)	= 4.00
Bypass Depth (in)	= 2.40

All dimensions in feet



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 28 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 28.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

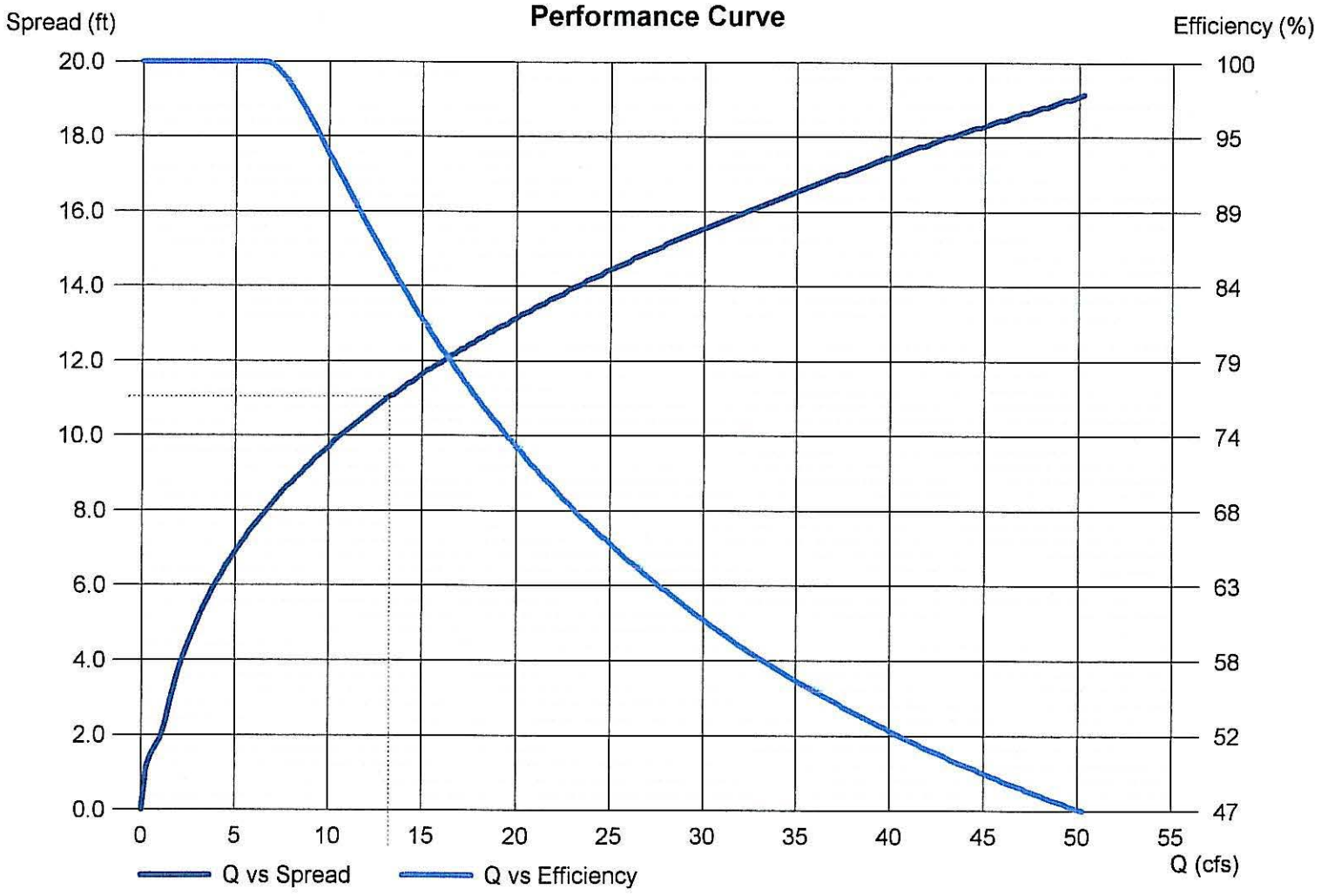
Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 8.00
Gutter n-value	= 0.013

Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 13.25
Q Capt (cfs)	= 11.36
Q Bypass (cfs)	= 1.89
Depth at Inlet (in)	= 5.45
Efficiency (%)	= 86
Gutter Spread (ft)	= 11.05
Gutter Vel (ft/s)	= 9.88
Bypass Spread (ft)	= 4.00
Bypass Depth (in)	= 2.40



Inlet Report

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Curb Inlet

Location	= On grade
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Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 8.00
Gutter n-value	= 0.013

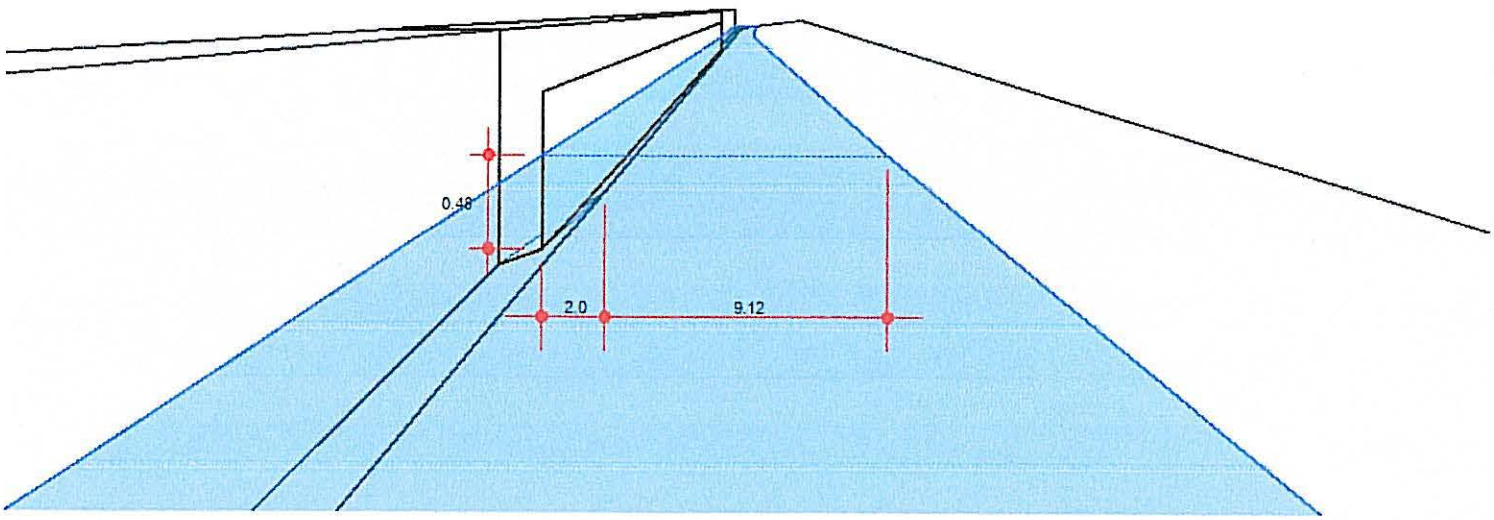
Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 17.25
Q Capt (cfs)	= 13.36
Q Bypass (cfs)	= 3.89
Depth at Inlet (in)	= 5.81
Efficiency (%)	= 77
Gutter Spread (ft)	= 12.35
Gutter Vel (ft/s)	= 10.48
Bypass Spread (ft)	= 6.00
Bypass Depth (in)	= 2.88

All dimensions in feet



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 28 ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 28.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

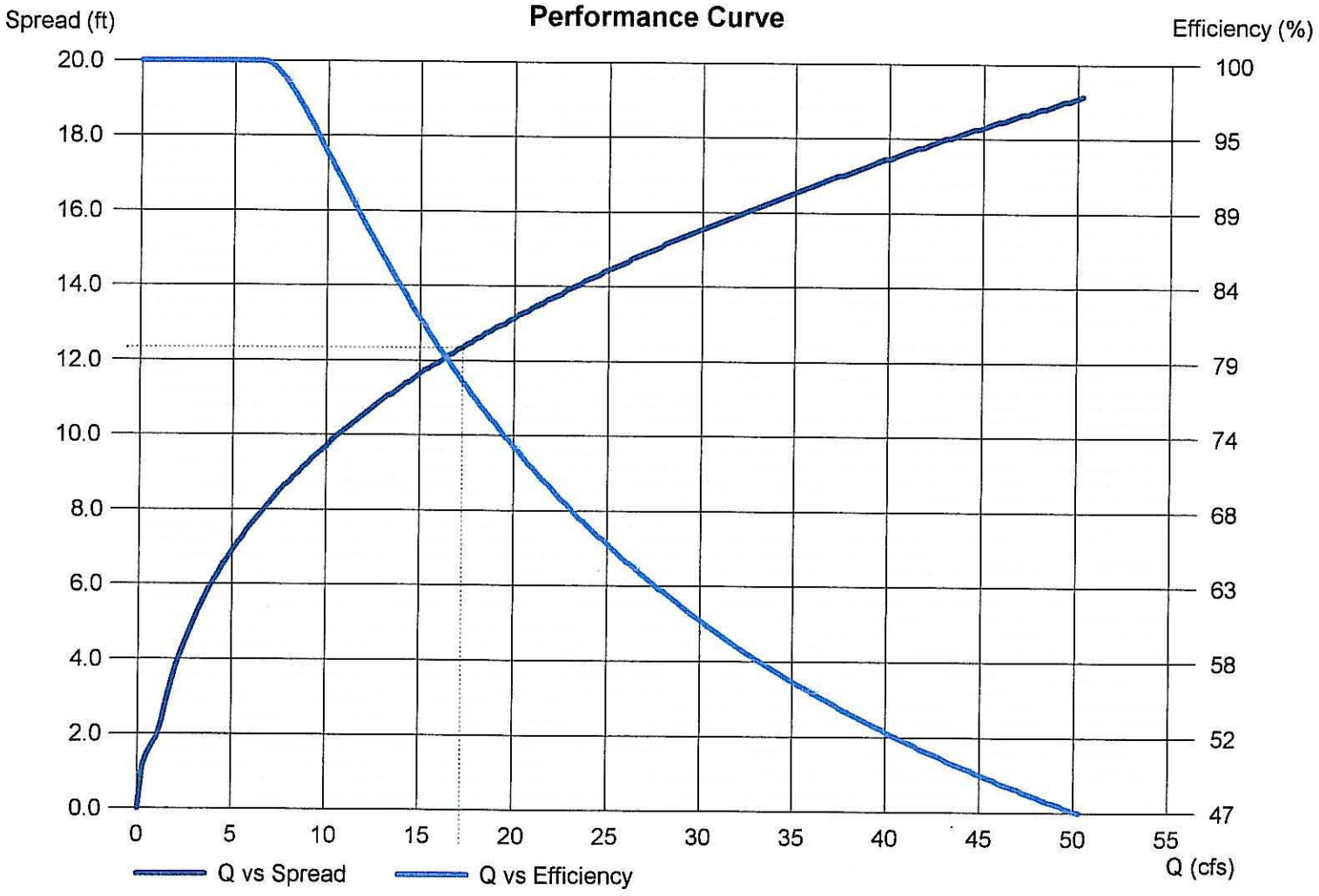
Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 8.00
Gutter n-value	= 0.013

Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 8

Highlighted

Q Total (cfs)	= 17.25
Q Capt (cfs)	= 13.36
Q Bypass (cfs)	= 3.89
Depth at Inlet (in)	= 5.81
Efficiency (%)	= 77
Gutter Spread (ft)	= 12.35
Gutter Vel (ft/s)	= 10.48
Bypass Spread (ft)	= 6.00
Bypass Depth (in)	= 2.88



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 14ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 14.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 1.00
Gutter n-value	= 0.013

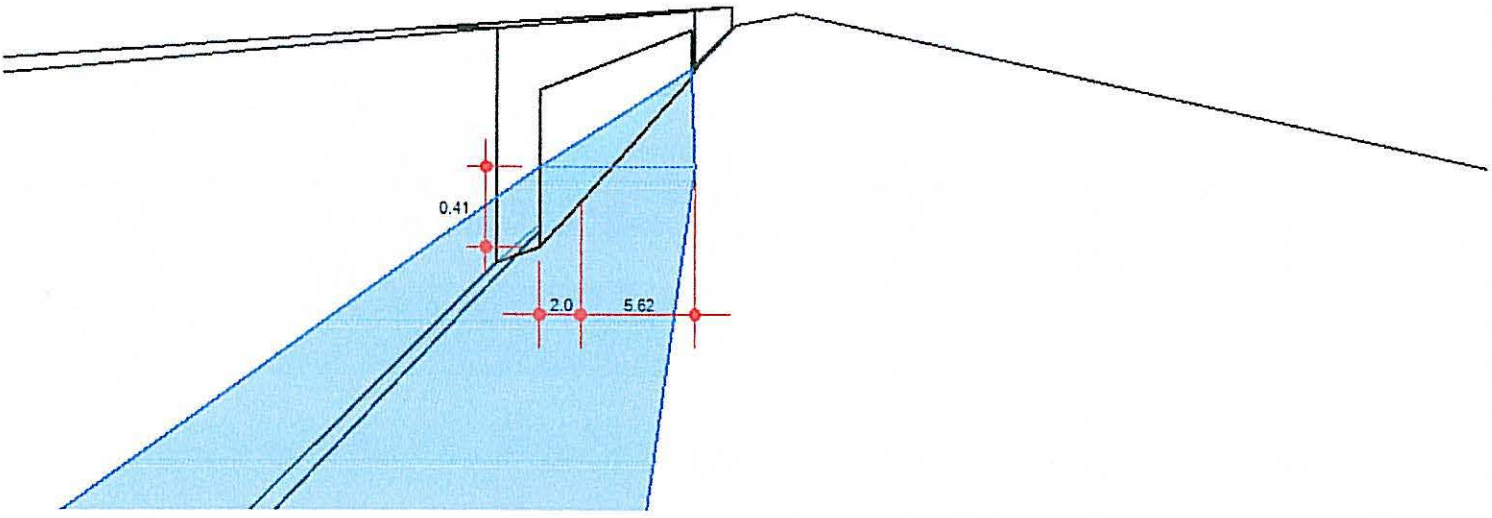
Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 20

Highlighted

Q Total (cfs)	= 3.25
Q Capt (cfs)	= 3.25
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 4.97
Efficiency (%)	= 100
Gutter Spread (ft)	= 9.35
Gutter Vel (ft/s)	= 3.27
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-

All dimensions in feet



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 14ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 14.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

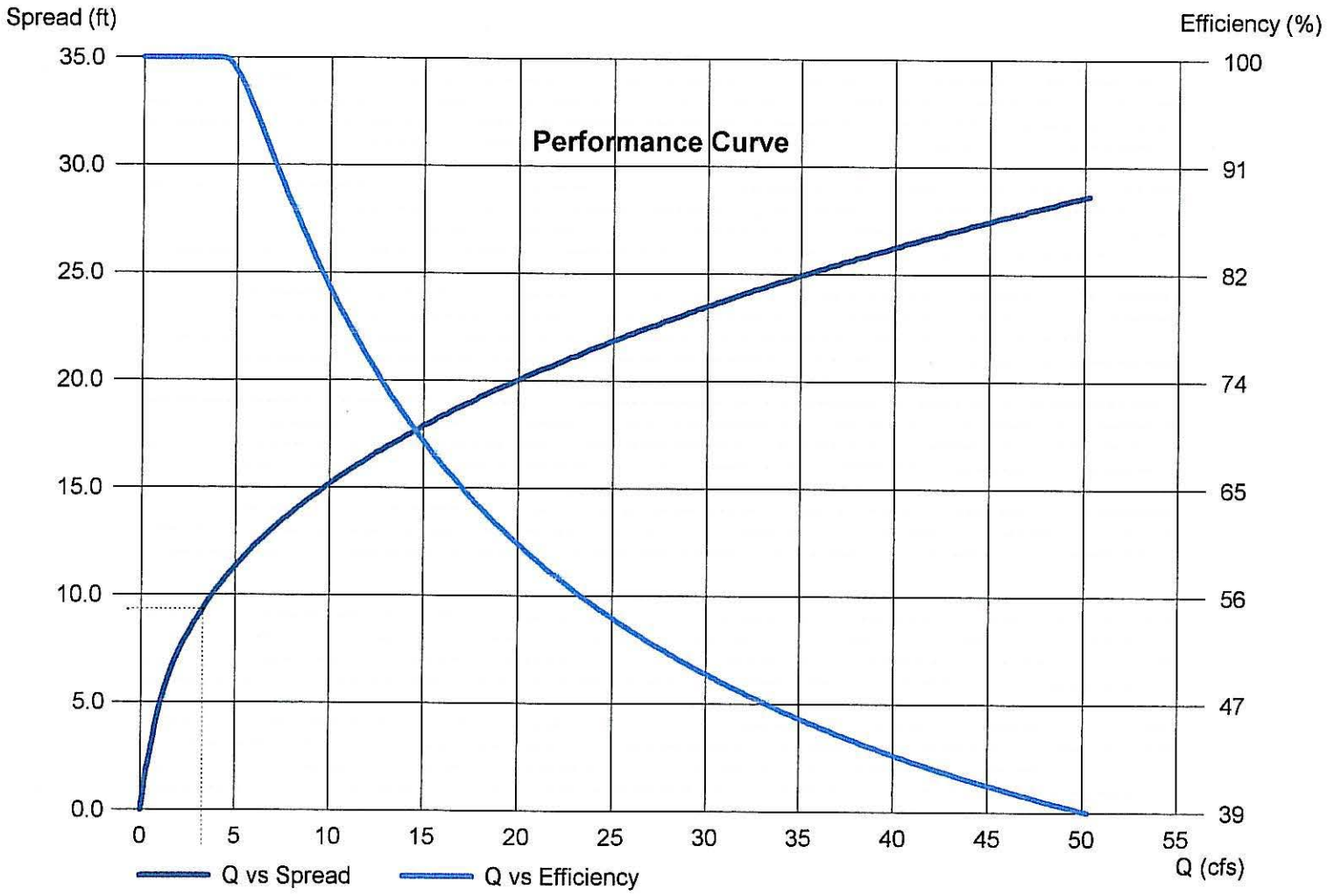
Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 1.00
Gutter n-value	= 0.013

Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 20

Highlighted

Q Total (cfs)	= 3.25
Q Capt (cfs)	= 3.25
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 4.97
Efficiency (%)	= 100
Gutter Spread (ft)	= 9.35
Gutter Vel (ft/s)	= 3.27
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 14ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 14.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 1.00
Gutter n-value	= 0.013

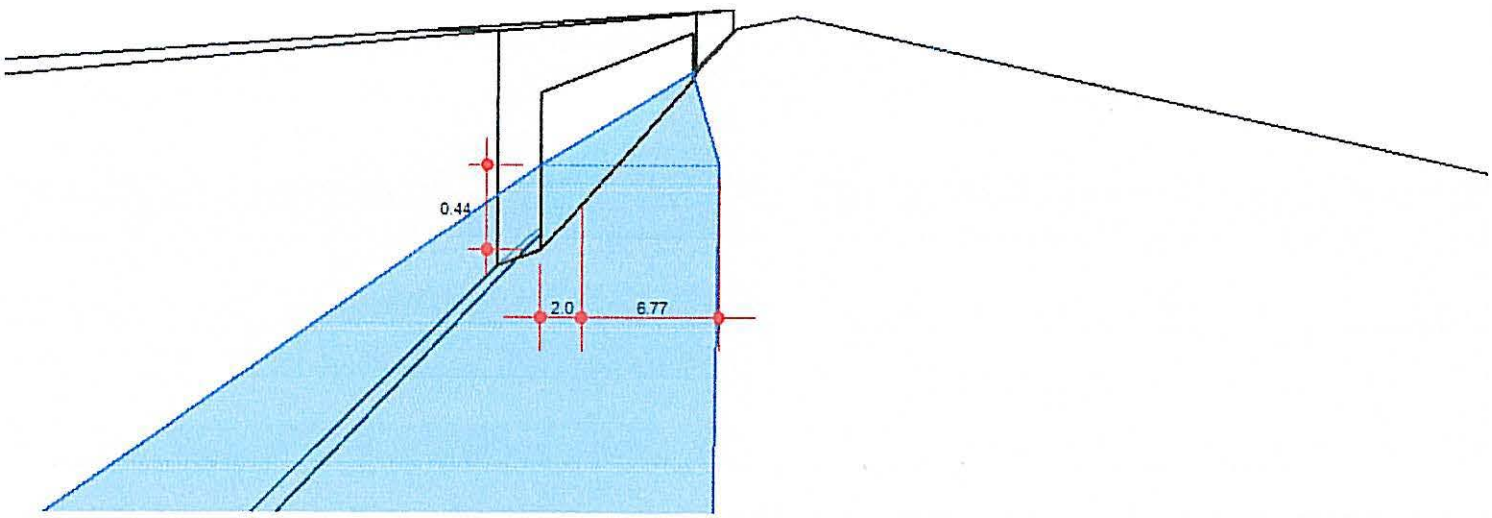
Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 20

Highlighted

Q Total (cfs)	= 4.00
Q Capt (cfs)	= 4.00
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 5.24
Efficiency (%)	= 100
Gutter Spread (ft)	= 10.30
Gutter Vel (ft/s)	= 3.39
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-

All dimensions in feet



Inlet Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - Catch Basin Hydraulics - 14ft with 2in Local Depression

Curb Inlet

Location	= On grade
Curb Length (ft)	= 14.00
Throat Height (in)	= 4.86
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

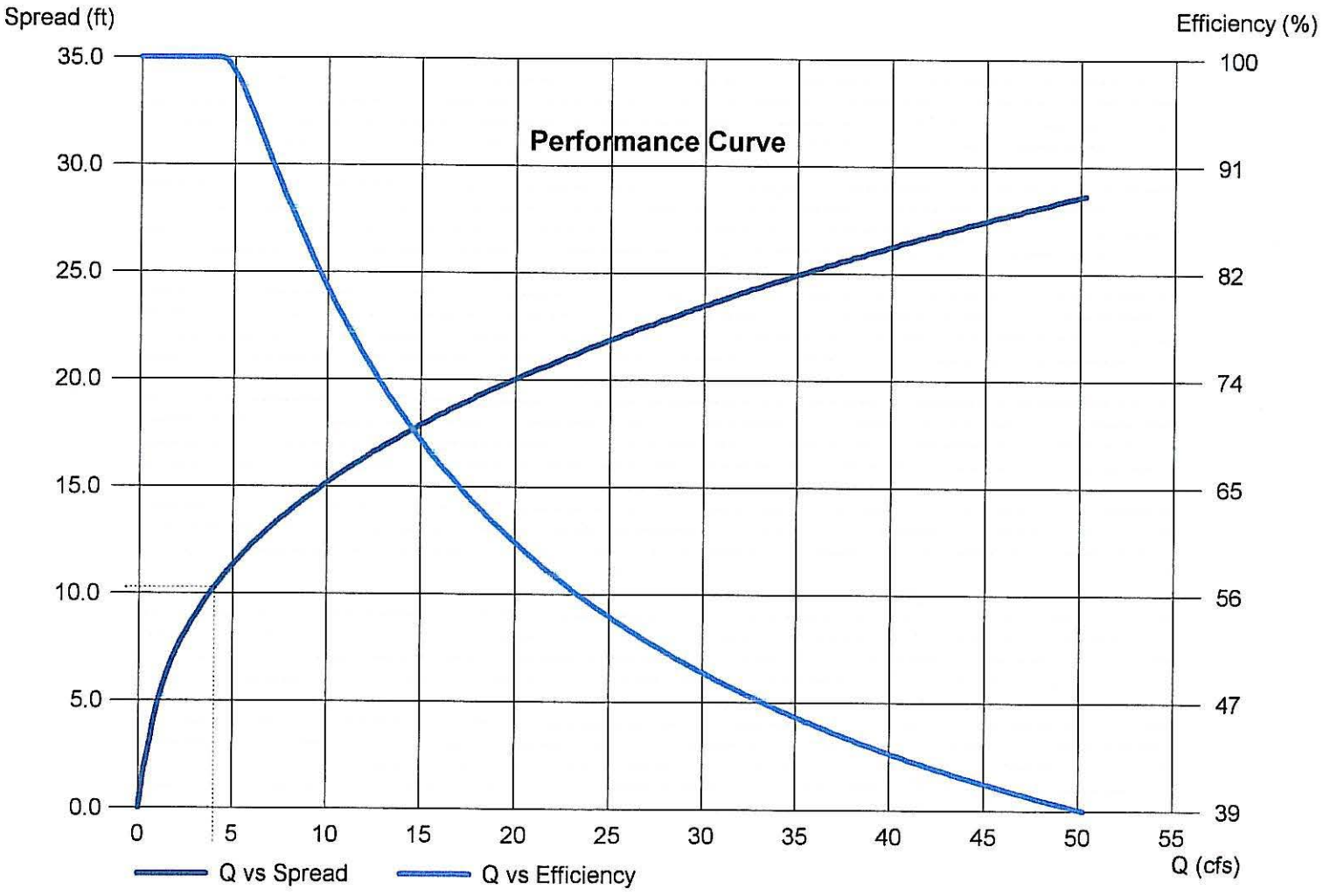
Slope, Sw (ft/ft)	= 0.080
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 3.14
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= 1.00
Gutter n-value	= 0.013

Calculations

Compute by:	Q vs Depth
Max Depth (in)	= 20

Highlighted

Q Total (cfs)	= 4.00
Q Capt (cfs)	= 4.00
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 5.24
Efficiency (%)	= 100
Gutter Spread (ft)	= 10.30
Gutter Vel (ft/s)	= 3.39
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-



Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - 18in Pipe @ 0.50 %

Circular

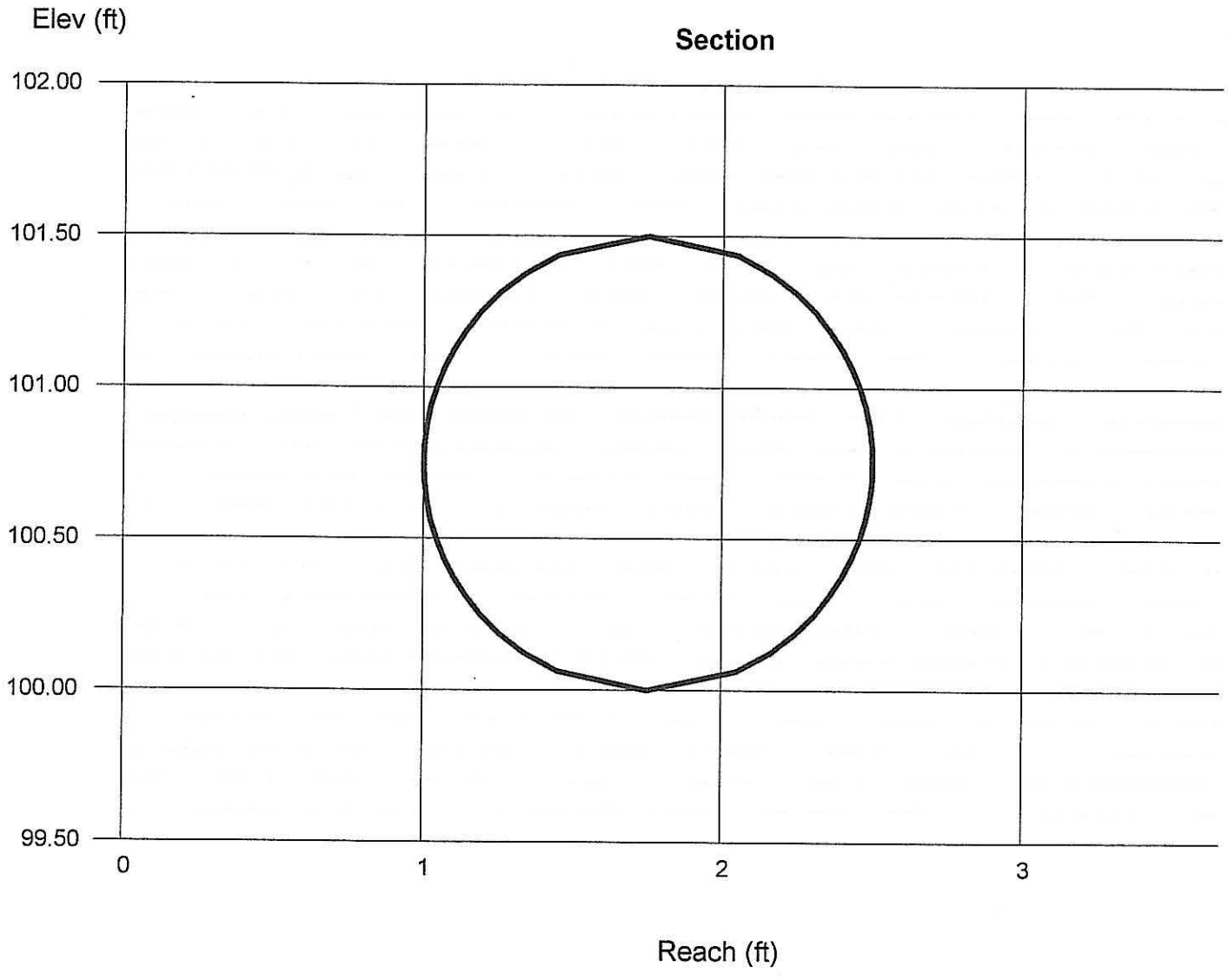
Diameter (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 1.50
Q (cfs)	= 7.425
Area (sqft)	= 1.77
Velocity (ft/s)	= 4.20
Wetted Perim (ft)	= 4.71
Crit Depth, Yc (ft)	= 1.09
Top Width (ft)	= 0.00
EGL (ft)	= 1.77



Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - 18in Pipe @ 0.50 %

Circular

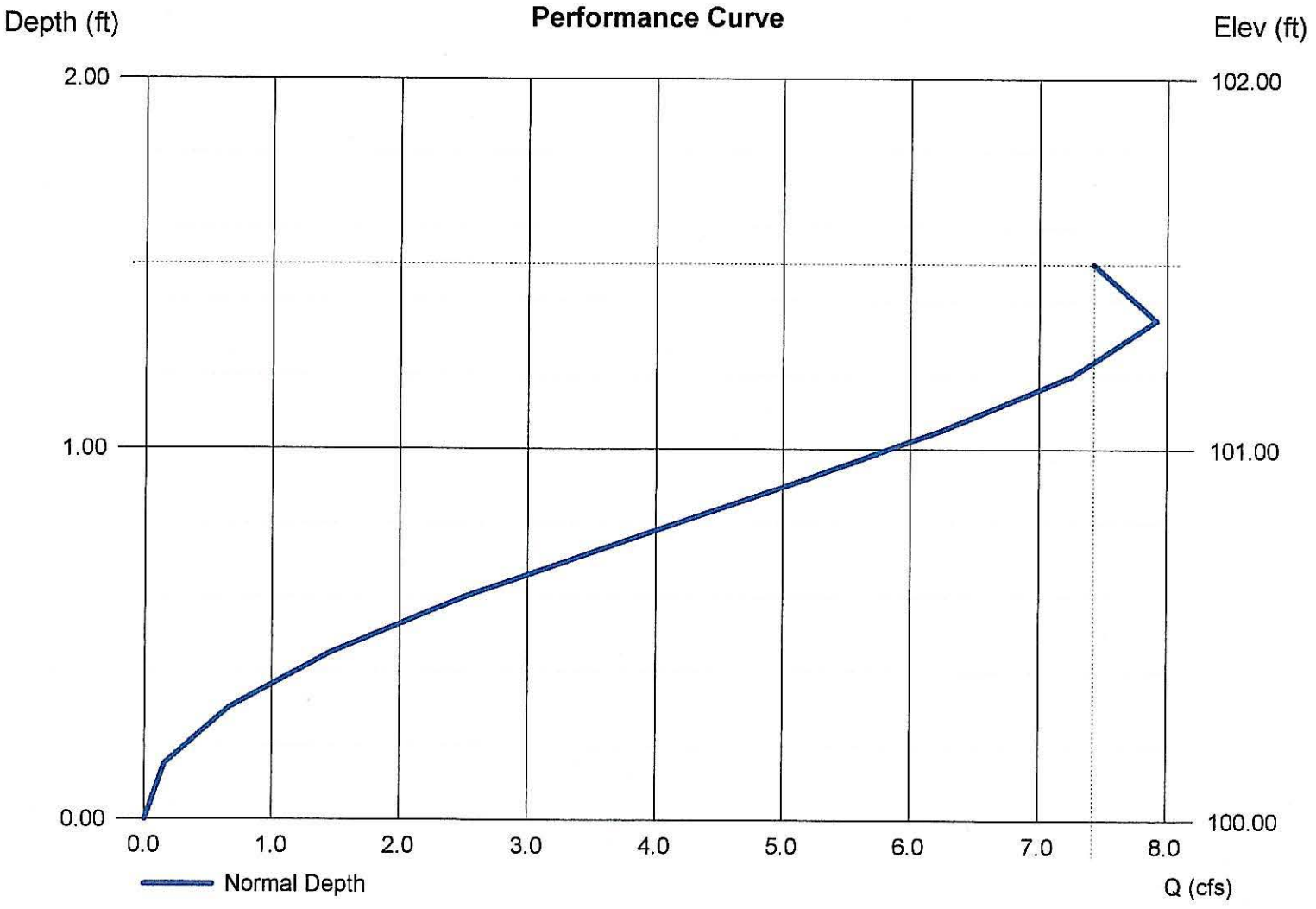
Diameter (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 1.50
Q (cfs)	= 7.425
Area (sqft)	= 1.77
Velocity (ft/s)	= 4.20
Wetted Perim (ft)	= 4.71
Crit Depth, Yc (ft)	= 1.09
Top Width (ft)	= 0.00
EGL (ft)	= 1.77



Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - 18in Pipe @ 1.0 %

Circular

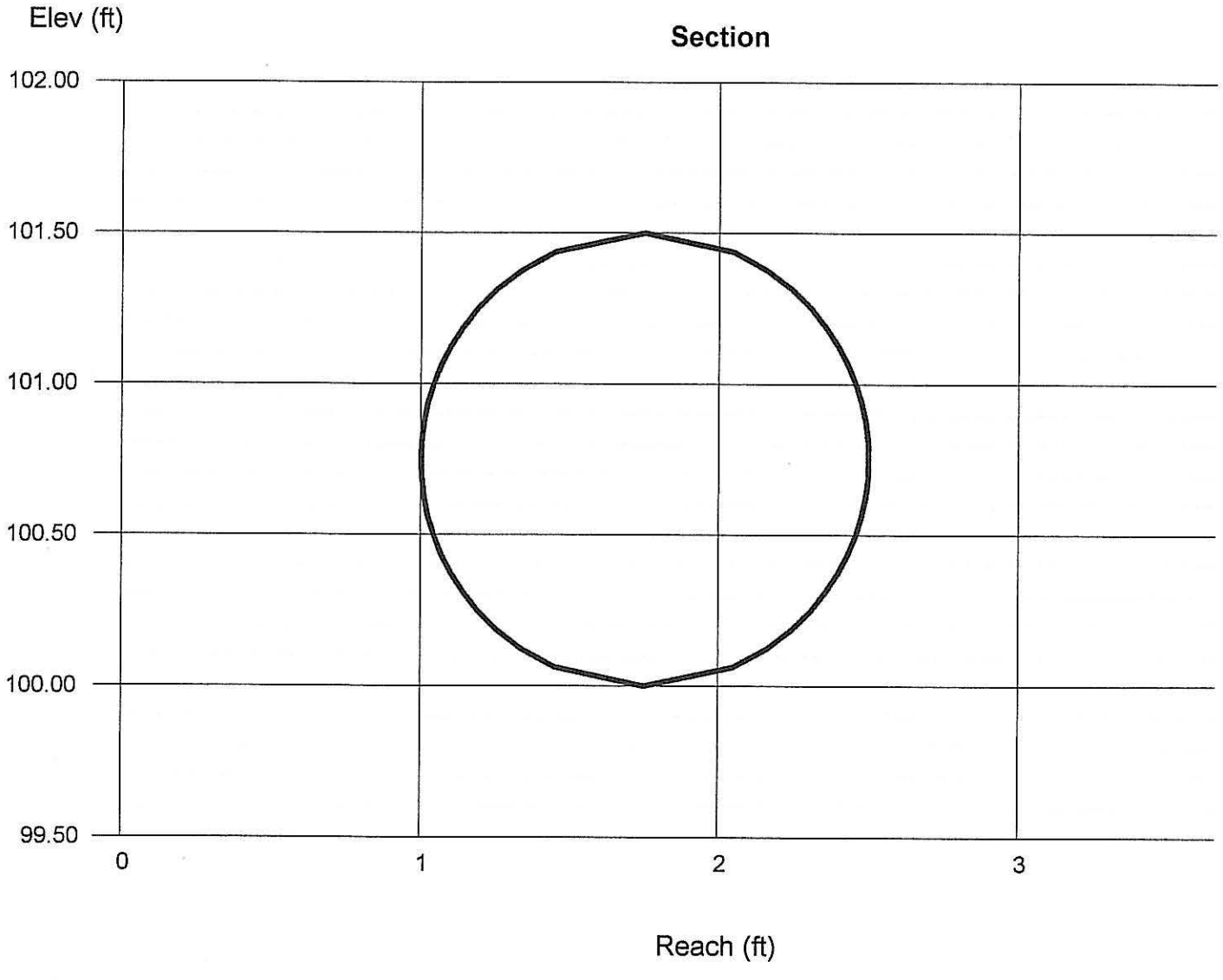
Diameter (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.013

Calculations

Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 1.50
Q (cfs)	= 10.50
Area (sqft)	= 1.77
Velocity (ft/s)	= 5.94
Wetted Perim (ft)	= 4.71
Crit Depth, Yc (ft)	= 1.28
Top Width (ft)	= 0.00
EGL (ft)	= 2.05



Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - 18in Pipe @ 1.0 %

Circular

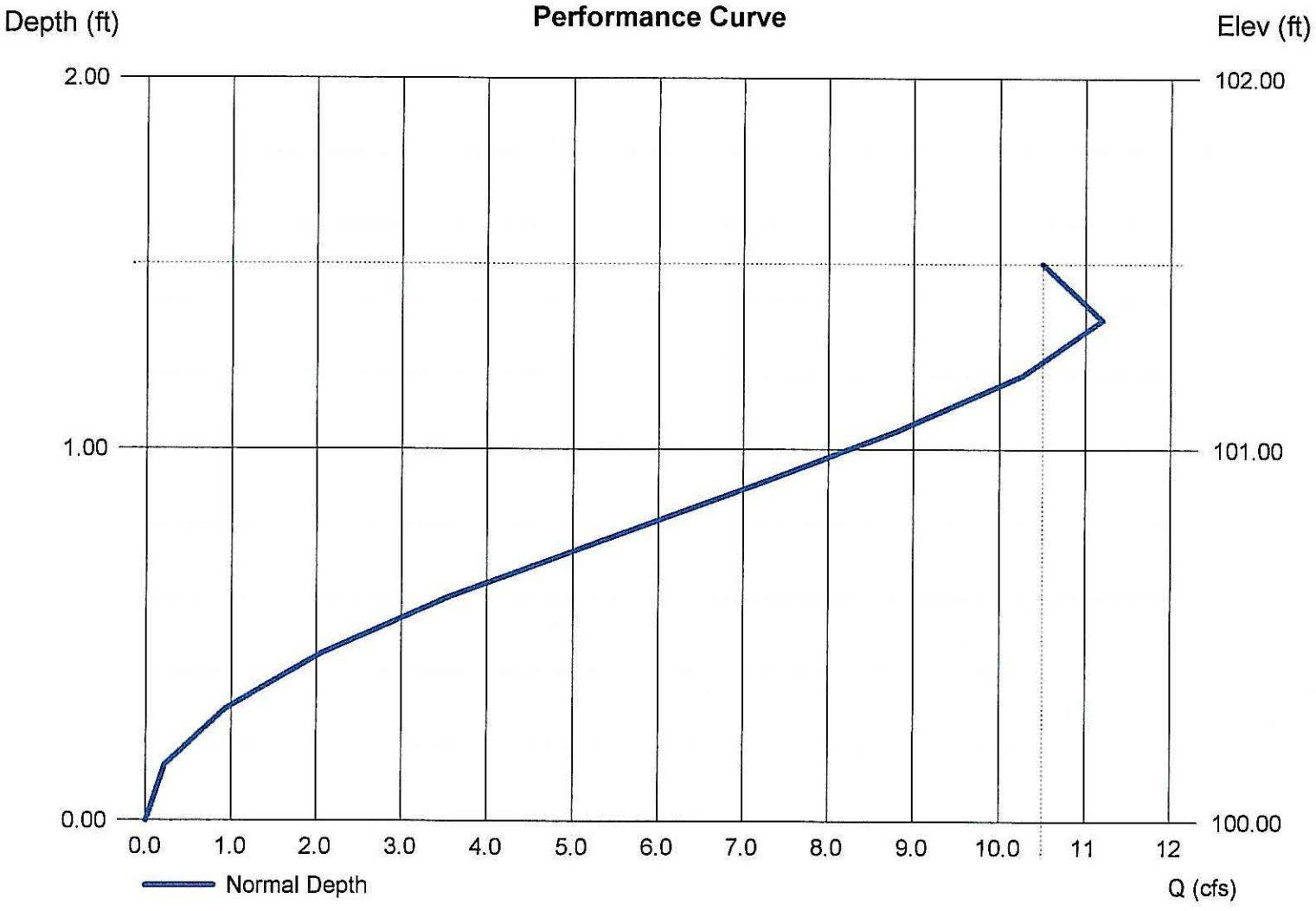
Diameter (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.013

Calculations

Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 1.50
Q (cfs)	= 10.50
Area (sqft)	= 1.77
Velocity (ft/s)	= 5.94
Wetted Perim (ft)	= 4.71
Crit Depth, Yc (ft)	= 1.28
Top Width (ft)	= 0.00
EGL (ft)	= 2.05



Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - 18in Pipe @ 1.50 %

Circular

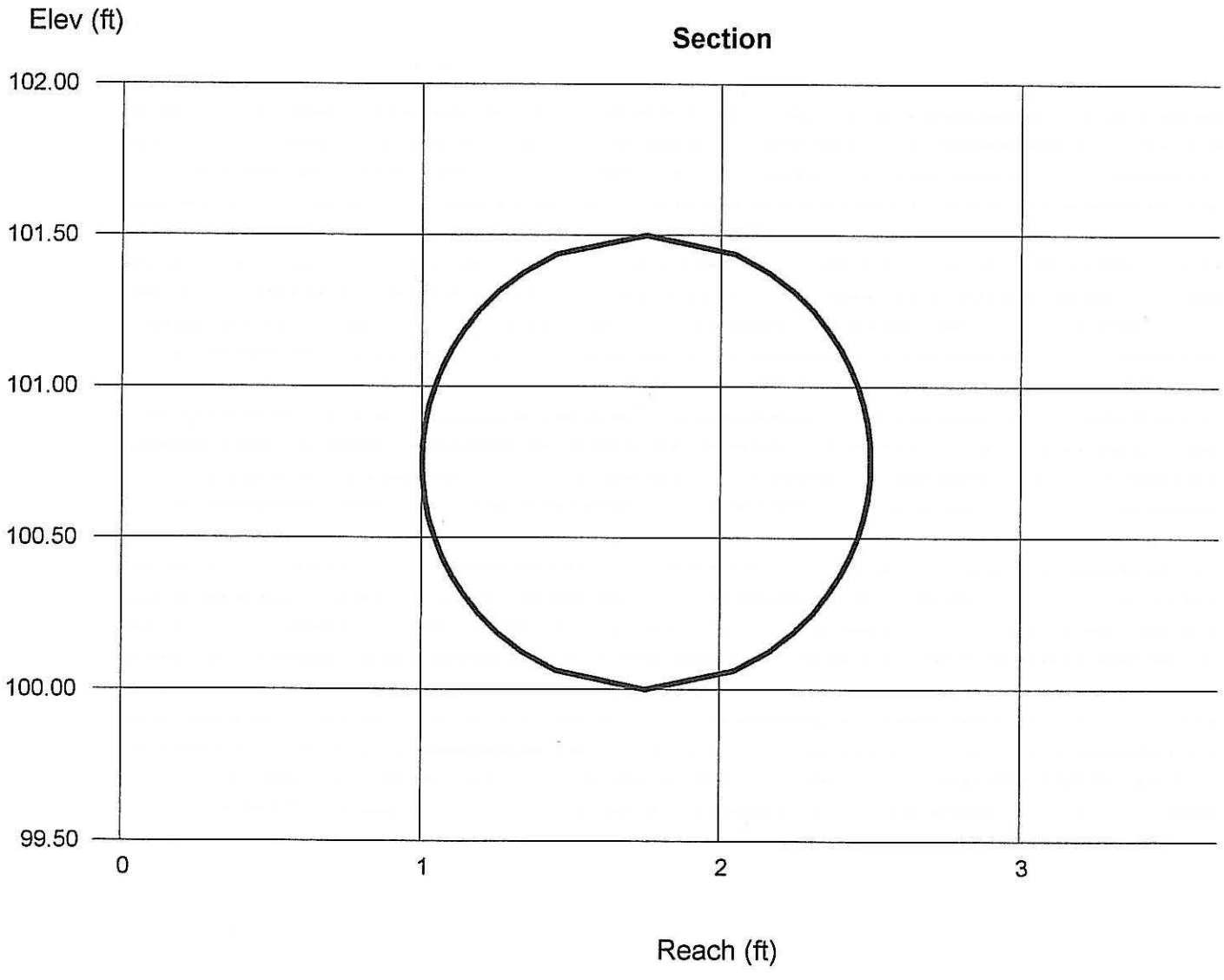
Diameter (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 1.50
N-Value	= 0.013

Calculations

Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 1.50
Q (cfs)	= 12.86
Area (sqft)	= 1.77
Velocity (ft/s)	= 7.28
Wetted Perim (ft)	= 4.71
Crit Depth, Yc (ft)	= 1.38
Top Width (ft)	= 0.00
EGL (ft)	= 2.32



Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - 18in Pipe @ 1.50 %

Circular

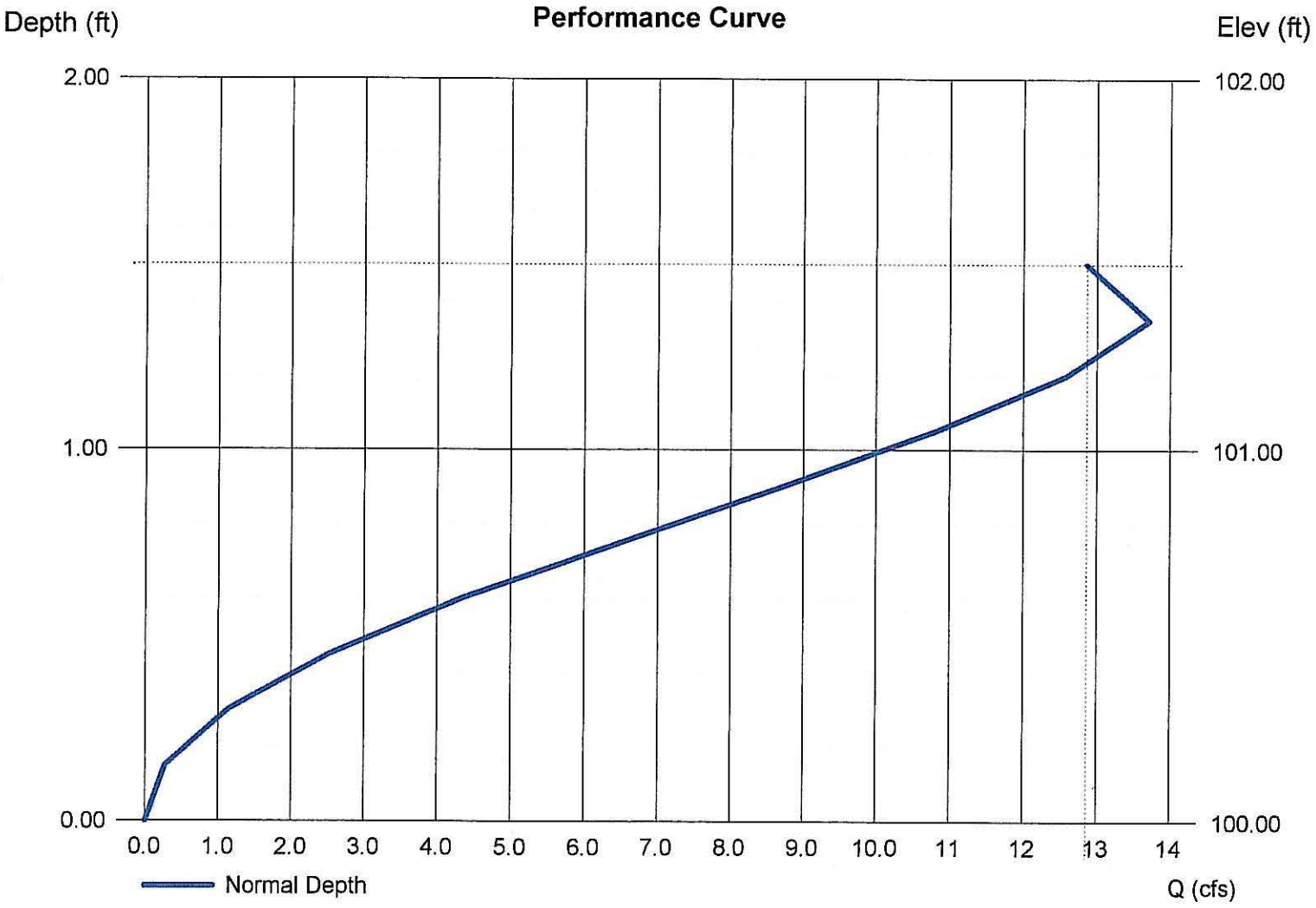
Diameter (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 1.50
N-Value	= 0.013

Calculations

Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 1.50
Q (cfs)	= 12.86
Area (sqft)	= 1.77
Velocity (ft/s)	= 7.28
Wetted Perim (ft)	= 4.71
Crit Depth, Yc (ft)	= 1.38
Top Width (ft)	= 0.00
EGL (ft)	= 2.32



Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - 24in Pipe @ 0.50 %

Circular

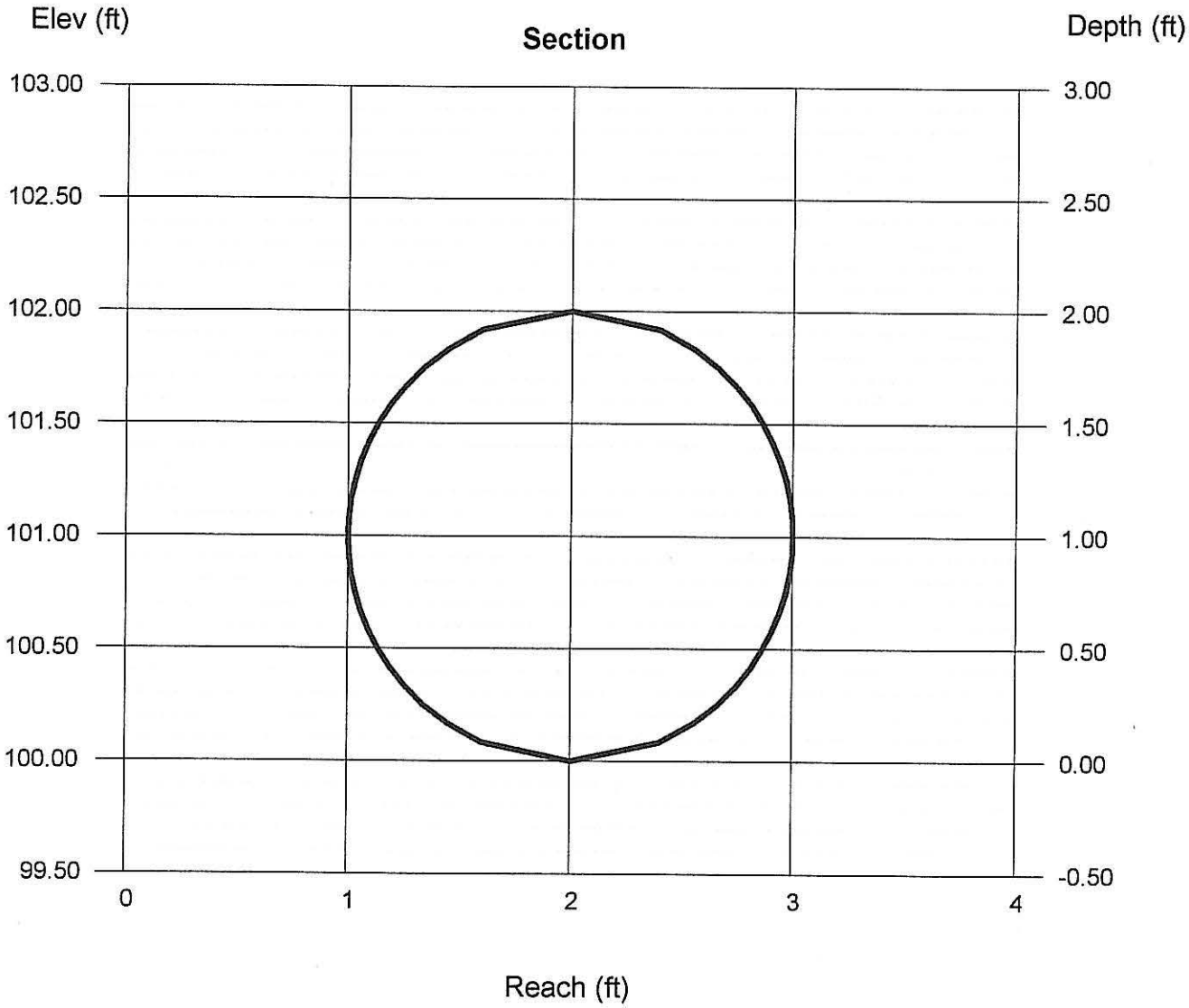
Diameter (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 2.00
Q (cfs)	= 15.99
Area (sqft)	= 3.14
Velocity (ft/s)	= 5.09
Wetted Perim (ft)	= 6.28
Crit Depth, Yc (ft)	= 1.49
Top Width (ft)	= 0.00
EGL (ft)	= 2.40



Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - 24in Pipe @ 0.50 %

Circular

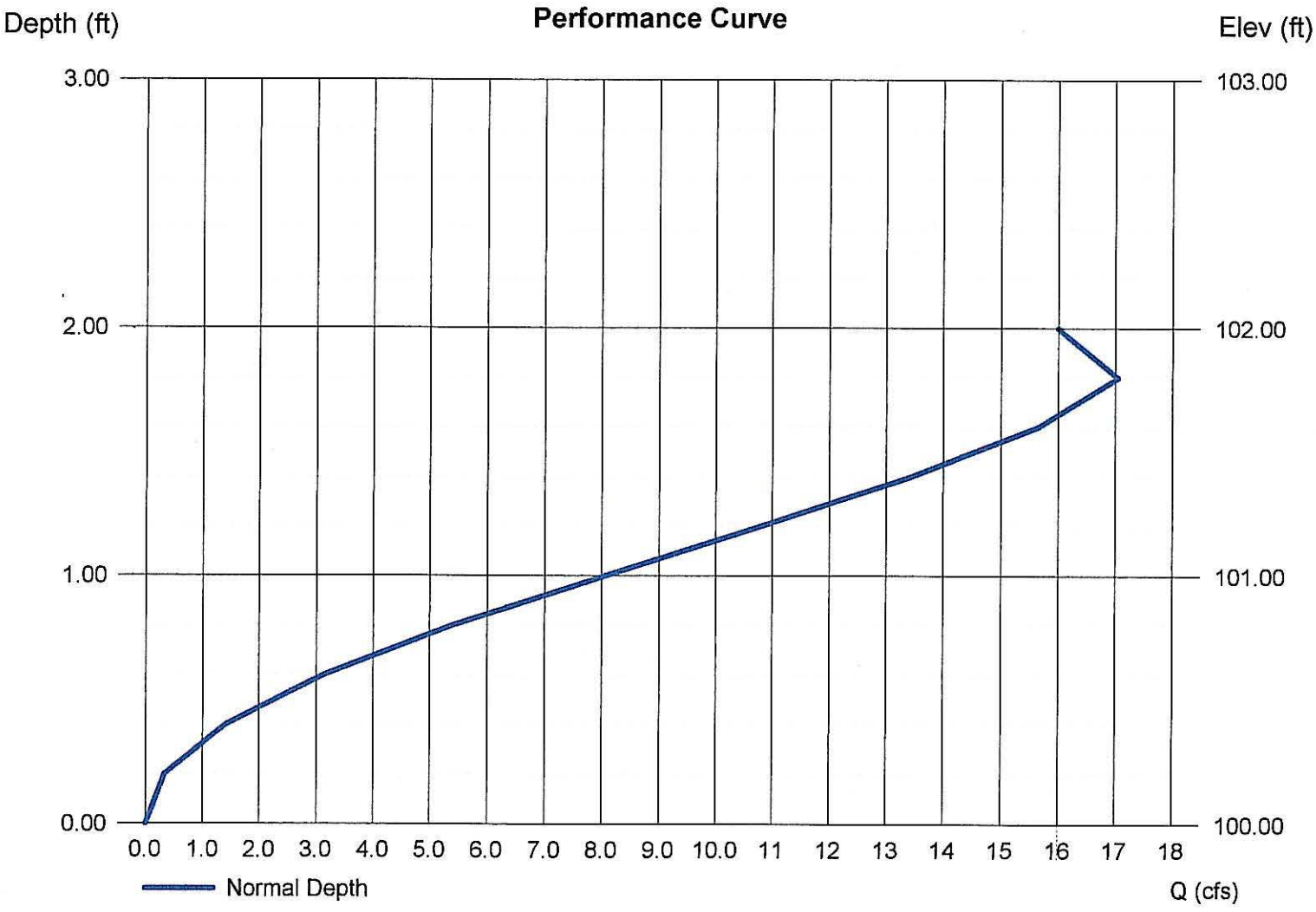
Diameter (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 2.00
Q (cfs)	= 15.99
Area (sqft)	= 3.14
Velocity (ft/s)	= 5.09
Wetted Perim (ft)	= 6.28
Crit Depth, Yc (ft)	= 1.49
Top Width (ft)	= 0.00
EGL (ft)	= 2.40



Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - 24in Pipe @ 1.00 %

Circular

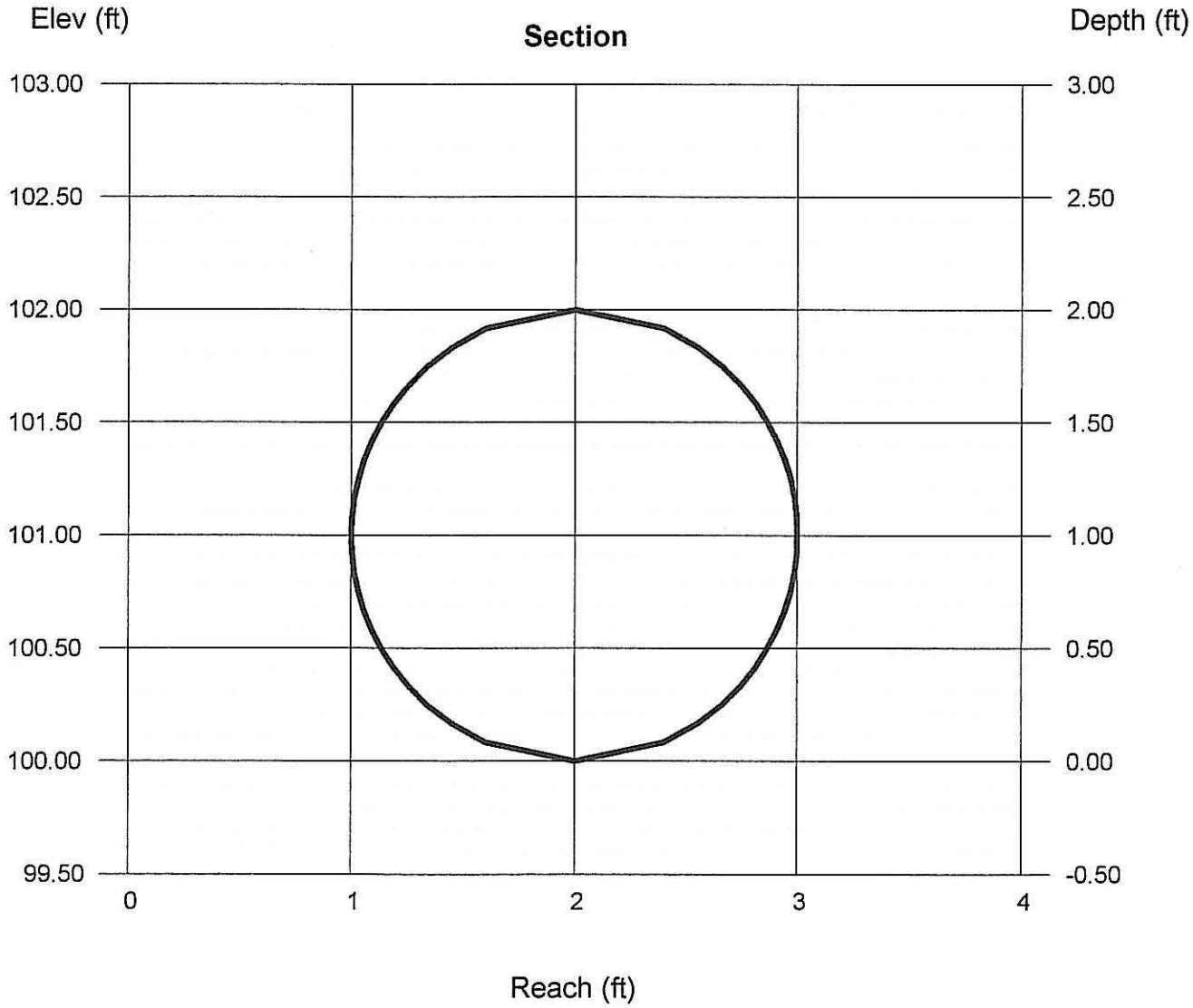
Diameter (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.013

Calculations

Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 2.00
Q (cfs)	= 22.62
Area (sqft)	= 3.14
Velocity (ft/s)	= 7.20
Wetted Perim (ft)	= 6.28
Crit Depth, Yc (ft)	= 1.74
Top Width (ft)	= 0.00
EGL (ft)	= 2.81



Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Friday, Feb 4 2011

Goleta - 24in Pipe @ 1.00 %

Circular

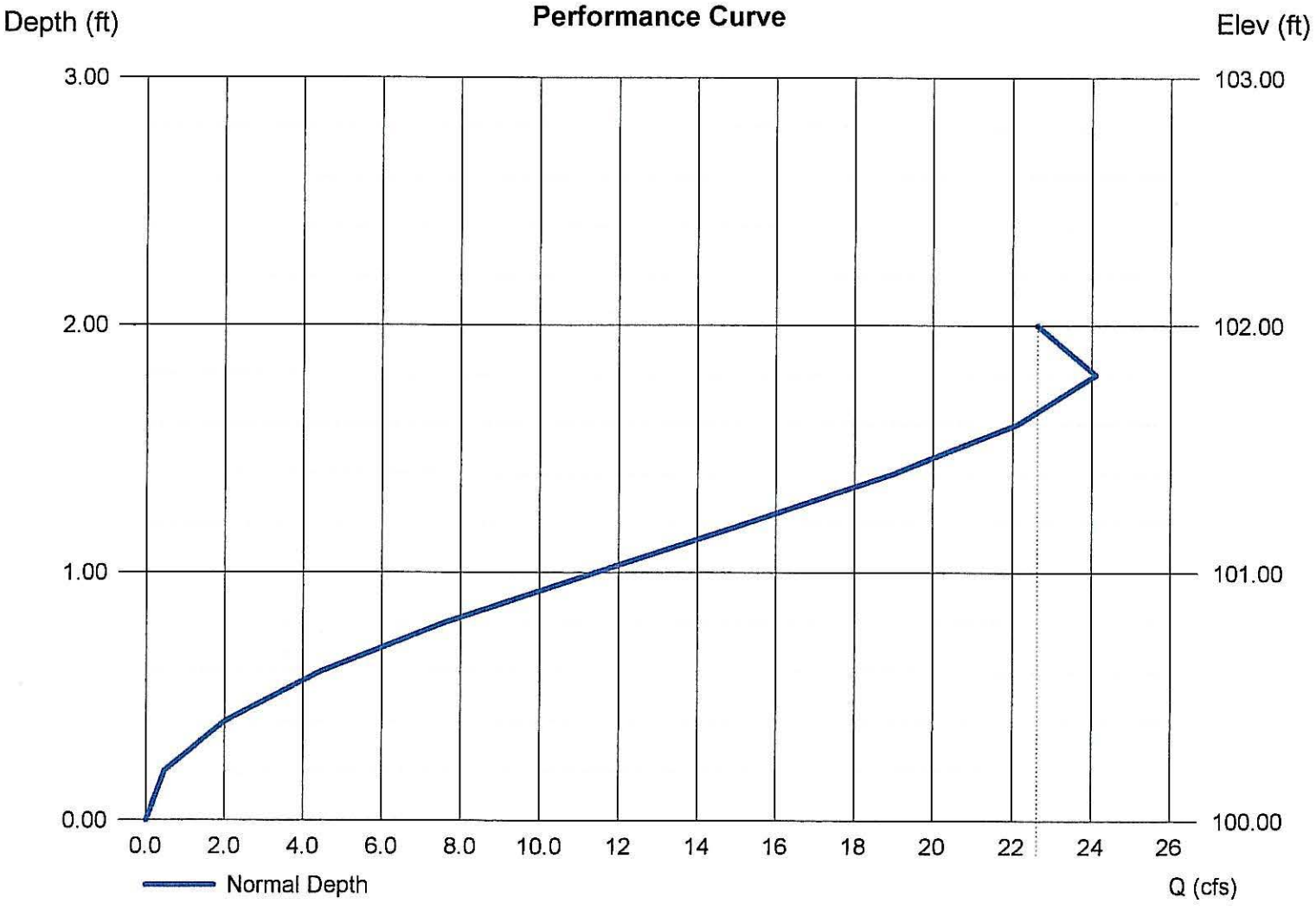
Diameter (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.013

Calculations

Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 2.00
Q (cfs)	= 22.62
Area (sqft)	= 3.14
Velocity (ft/s)	= 7.20
Wetted Perim (ft)	= 6.28
Crit Depth, Yc (ft)	= 1.74
Top Width (ft)	= 0.00
EGL (ft)	= 2.81



Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Saturday, Feb 5 2011

Goleta - Vegetated Swale Section

Trapezoidal

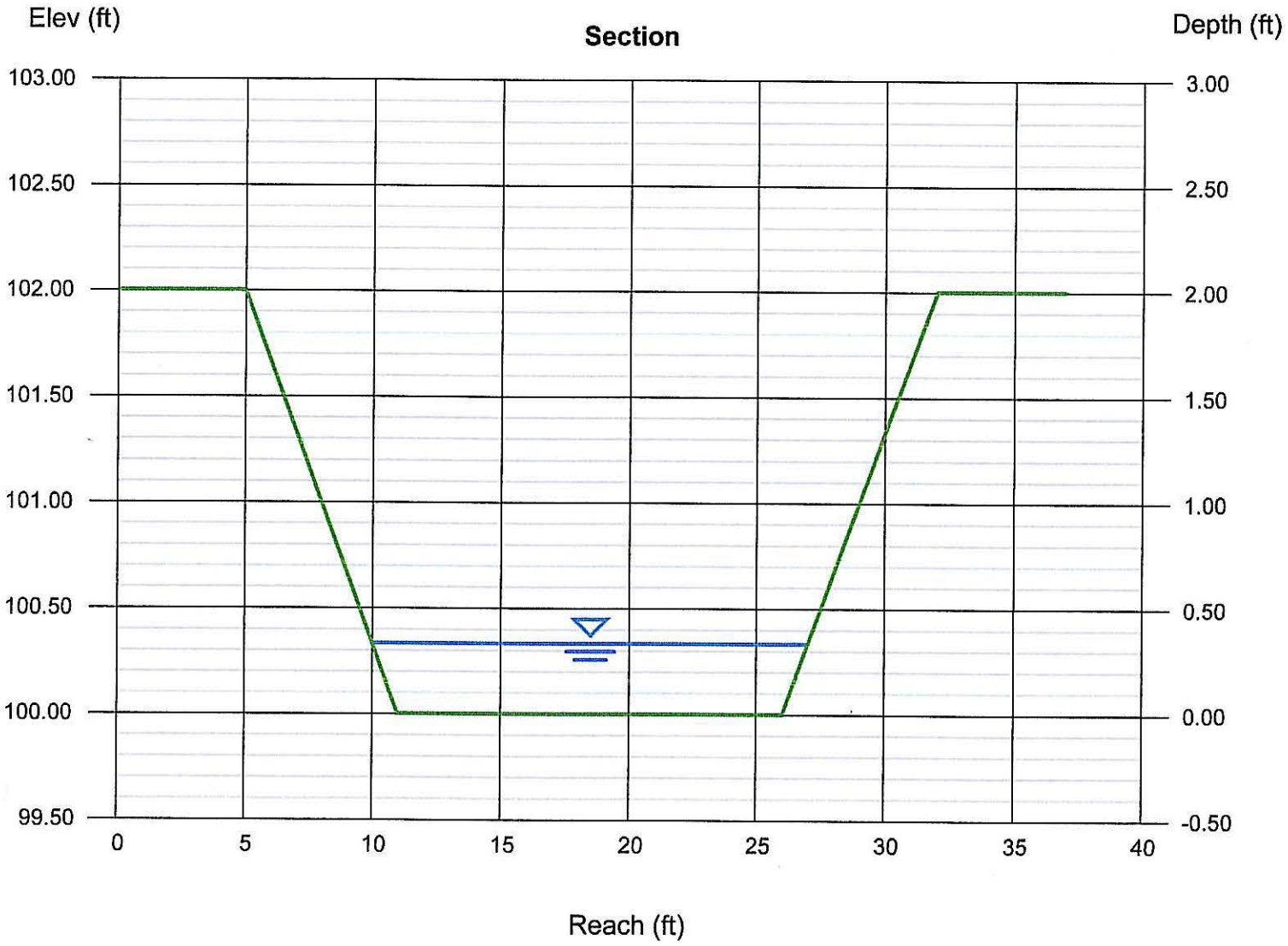
Bottom Width (ft)	= 15.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.50
N-Value	= 0.250

Calculations

Compute by:	Q vs Depth
No. Increments	= 30

Highlighted

Depth (ft)	= 0.33
Q (cfs)	= 1.784
Area (sqft)	= 5.33
Velocity (ft/s)	= 0.33
Wetted Perim (ft)	= 17.11
Crit Depth, Yc (ft)	= 0.06
Top Width (ft)	= 17.00
EGL (ft)	= 0.34



Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Saturday, Feb 5 2011

Goleta - Vegetated Swale Section

Trapezoidal

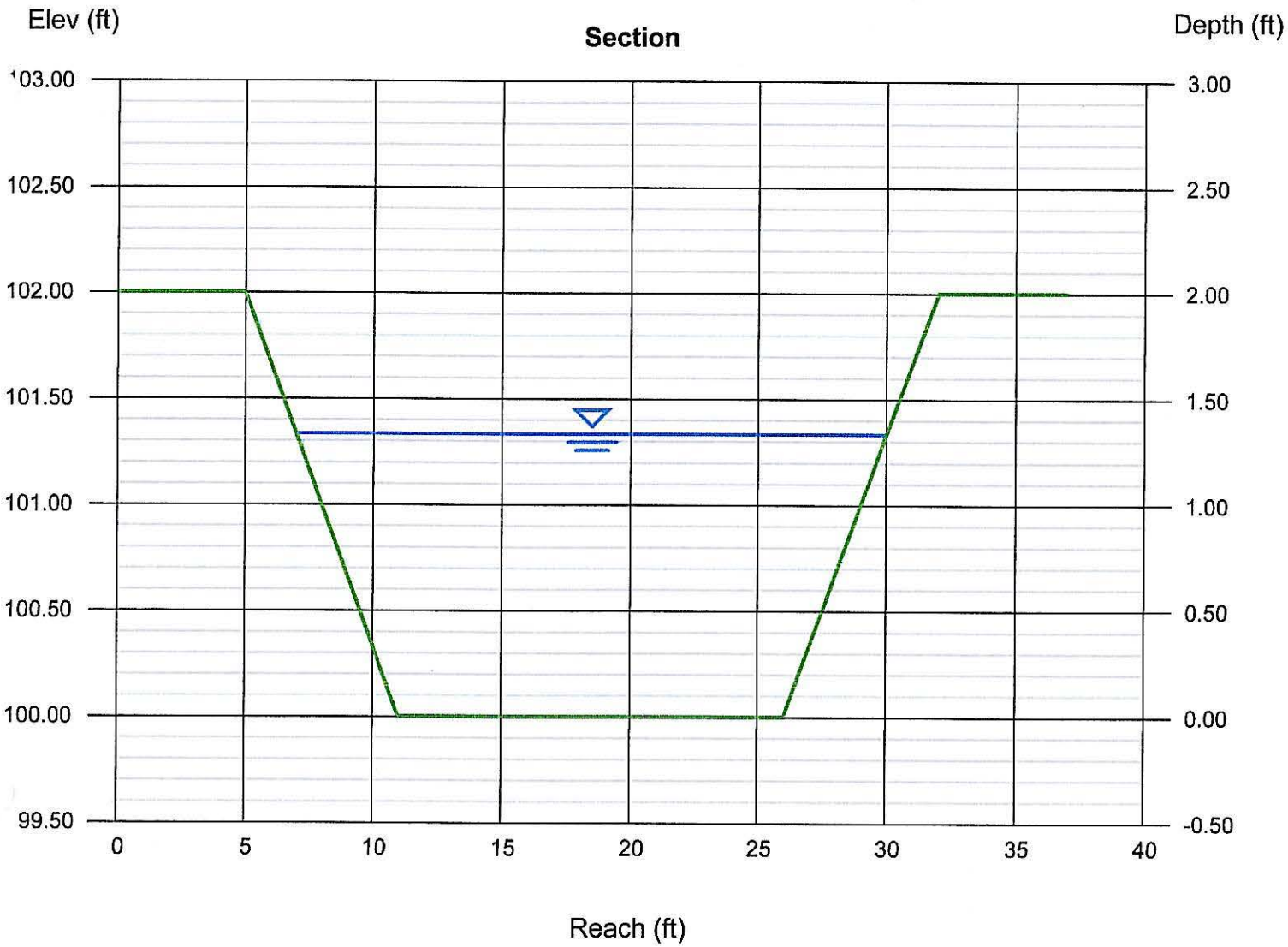
Bottom Width (ft)	= 15.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.50
N-Value	= 0.250

Calculations

Compute by:	Q vs Depth
No. Increments	= 30

Highlighted

Depth (ft)	= 1.33
Q (cfs)	= 19.43
Area (sqft)	= 25.33
Velocity (ft/s)	= 0.77
Wetted Perim (ft)	= 23.43
Crit Depth, Yc (ft)	= 0.35
Top Width (ft)	= 23.00
EGL (ft)	= 1.34



Weir Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Saturday, Feb 5 2011

Vegetated Swale Overflow Weir - 100yr Storm

Trapezoidal Weir

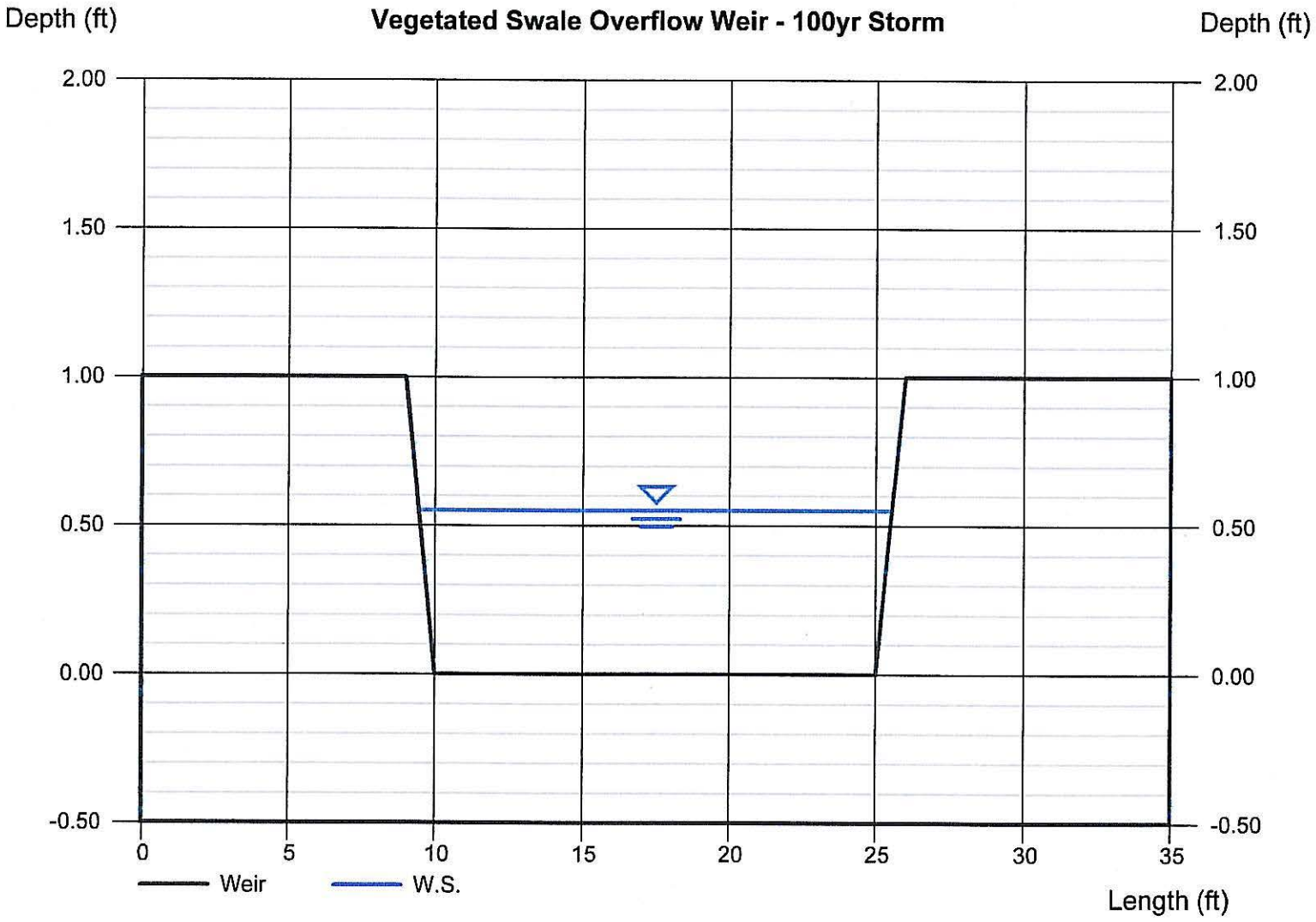
Crest	= Sharp
Bottom Length (ft)	= 15.00
Total Depth (ft)	= 1.00
Side Slope (z:1)	= 1.00

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 0.55
Q (cfs)	= 19.52
Area (sqft)	= 8.55
Velocity (ft/s)	= 2.28
Top Width (ft)	= 16.10



Depth	Q	Area	Veloc	TopWidth	Energy
(ft)	(cfs)	(sqft)	(ft/s)	(ft)	(ft)
0.05	0.521	0.75	0.69	15.10	0.06
0.10	1.478	1.51	0.98	15.20	0.11
0.15	2.723	2.27	1.20	15.30	0.17
0.20	4.203	3.04	1.38	15.40	0.23
0.25	5.890	3.81	1.54	15.50	0.29
0.30	7.763	4.59	1.69	15.60	0.34
0.35	9.808	5.37	1.83	15.70	0.40
0.40	12.01	6.16	1.95	15.80	0.46
0.45	14.37	6.95	2.07	15.90	0.52
0.50	16.88	7.75	2.18	16.00	0.57
0.55	19.52	8.55	2.28	16.10	0.63
0.60	22.30	9.36	2.38	16.20	0.69
0.65	25.21	10.17	2.48	16.30	0.75
0.70	28.25	10.99	2.57	16.40	0.80
0.75	31.41	11.81	2.66	16.50	0.86
0.80	34.69	12.64	2.74	16.60	0.92
0.85	38.09	13.47	2.83	16.70	0.97
0.90	41.61	14.31	2.91	16.80	1.03
0.95	45.24	15.15	2.99	16.90	1.09
1.00	48.98	16.00	3.06	17.00	1.15

Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. Saturday, Feb 5 2011

Goleta - Top of Cut Slope Swale

Triangular

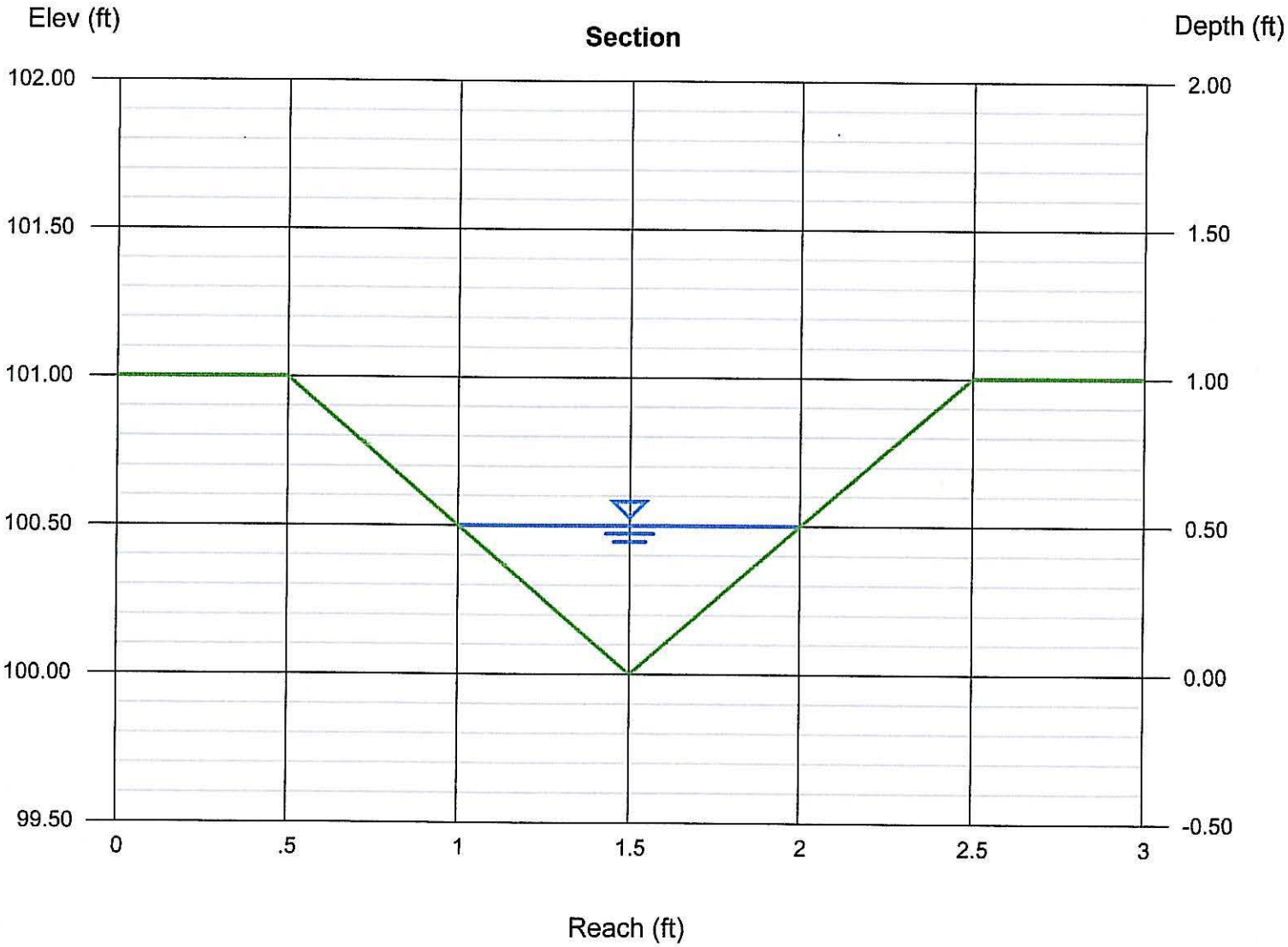
Side Slopes (z:1)	= 1.00, 1.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 100.00
Slope (%)	= 5.00
N-Value	= 0.013

Calculations

Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 0.50
Q (cfs)	= 2.012
Area (sqft)	= 0.25
Velocity (ft/s)	= 8.05
Wetted Perim (ft)	= 1.41
Crit Depth, Yc (ft)	= 0.60
Top Width (ft)	= 1.00
EGL (ft)	= 1.51



Appendix H: References

1. Isohyets Maps

2. SB County Soil Map and Classification

3. Project Soils Report

Legend

Isohyetal

- 0.1 inch interval
- 0.4 inch interval
- Roads
- Project Boundary

Precipitation (inch)

95th Percentile (1949 - 2010)

- < 0.8
- 0.8 - 0.9
- 0.9 - 1.0
- 1.0 - 1.1
- 1.1 - 1.2
- 1.2 - 1.3
- 1.3 - 1.4
- 1.4 - 1.5
- 1.5 - 1.6
- 1.6 - 1.7
- 1.7 - 1.8
- 1.8 - 1.9
- 1.9 - 2.0
- 2.0 - 2.1
- 2.1 - 2.2
- 2.2 - 2.3
- 2.3 - 2.4
- 2.4 - 2.8
- 2.8 - 3.2
- 3.2 - 3.6
- 3.6 - 4.0
- 4.0 - 4.4
- > 4.4

Data Source (for spatial variation):
PRISM Climate Group
Oregon State University
http://prism.oregonstate.edu

Central Coast Region
95th Percentile 24-hour Rainfall Depth

NAD 1983 California Teale Albers

0 20 40 80 Kilometers

0 20 40 80 Miles

Legend

Isohyetal

- 0.1 inch interval
- 0.2 inch interval
- Roads
- Project Boundary

Precipitation (inch)

85th Percentile (1949 - 2010)

- < 0.5
- 0.5 - 0.6
- 0.6 - 0.7
- 0.7 - 0.8
- 0.8 - 0.9
- 0.9 - 1.0
- 1.0 - 1.1
- 1.1 - 1.2
- 1.2 - 1.3
- 1.3 - 1.4
- 1.4 - 1.6
- 1.6 - 1.8
- 1.8 - 2.0
- 2.0 - 2.2
- 2.2 - 2.4
- > 2.4

N

Data Source (for spatial variation):
PRISM Climate Group
Oregon State University
http://prism.oregonstate.edu

Central Coast Region
85th Percentile 24-hour Rainfall Depth

NAD 1983 California Teale Albers

0 20 40 80 Kilometers

0 15 30 60 Miles

United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Santa Barbara County, California, South Coastal Part

Goleta



February 2, 2011

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:3,060 if printed on A size (8.5" x 11") sheet.

N

Meters
0 25 50 100 150

Feet
0 100 200 400 600

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

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

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

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

MAP INFORMATION

Map Scale: 1:3,060 if printed on A size (8.5" × 11") sheet.

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

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

Soil Survey Area: Santa Barbara County, California, South Coastal Part
Survey Area Data: Version 5, Jan 3, 2008

Date(s) aerial images were photographed: 6/6/2005

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

Map Unit Legend

Santa Barbara County, California, South Coastal Part (CA673)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
AhE2	AYAR CLAY, 15 TO 30 PERCENT SLOPES, ERODED	4.1	8.1%
AhF2	AYAR CLAY, 30 TO 50 PERCENT SLOPES, ERODED	9.6	19.2%
DaC	DIABLO CLAY, 2 TO 9 PERCENT SLOPES	25.0	49.8%
DaD	DIABLO CLAY, 9 TO 15 PERCENT SLOPES	4.6	9.2%
GU	GULLIED LAND	6.9	13.8%
Totals for Area of Interest		**50.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Santa Barbara County, California, South Coastal Part

AhE2—AYAR CLAY, 15 TO 30 PERCENT SLOPES, ERODED

Map Unit Setting

Elevation: 200 to 1,900 feet
Mean annual precipitation: 16 to 24 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 300 to 330 days

Map Unit Composition

Ayar and similar soils: 85 percent
Minor components: 15 percent

Description of Ayar

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from mudstone or calcareous shale

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability (nonirrigated): 4e
Ecological site: CLAYEY (R015XD001CA)

Typical profile

0 to 40 inches: Clay
40 to 44 inches: Weathered bedrock

Minor Components

Zaca

Percent of map unit: 3 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex

Gaviota

Percent of map unit: 3 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex

Los osos

Percent of map unit: 3 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex

Unnamed

Percent of map unit: 3 percent

Unnamed

Percent of map unit: 3 percent

AhF2—AYAR CLAY, 30 TO 50 PERCENT SLOPES, ERODED

Map Unit Setting

Elevation: 200 to 1,900 feet
Mean annual precipitation: 16 to 24 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 300 to 330 days

Map Unit Composition

Ayar and similar soils: 85 percent
Minor components: 15 percent

Description of Ayar

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from mudstone or calcareous shale

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability (nonirrigated): 6e
Ecological site: CLAYEY (R015XD001CA)

Typical profile

0 to 40 inches: Clay
40 to 44 inches: Weathered bedrock

Minor Components

Gaviota

Percent of map unit: 3 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex

Los osos

Percent of map unit: 3 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex

Todos

Percent of map unit: 3 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex

Zaca

Percent of map unit: 3 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex

Unnamed

Percent of map unit: 3 percent

DaC—DIABLO CLAY, 2 TO 9 PERCENT SLOPES

Map Unit Setting

Elevation: 50 to 700 feet
Mean annual precipitation: 16 to 20 inches
Mean annual air temperature: 60 to 62 degrees F
Frost-free period: 300 to 330 days

Map Unit Composition

Diablo and similar soils: 85 percent
Minor components: 15 percent

Description of Diablo

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from mudstone and/or soft shale

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: 45 to 60 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 8.5 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability (nonirrigated): 3e
Ecological site: CLAYEY (R015XD001CA)

Typical profile

0 to 50 inches: Clay
50 to 54 inches: Weathered bedrock

Minor Components

Ayar

Percent of map unit: 4 percent
Landform: Hills
Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex

Milpitas

Percent of map unit: 4 percent
Landform: Terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

Positas

Percent of map unit: 4 percent
Landform: Terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

Zaca

Percent of map unit: 3 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex

DaD—DIABLO CLAY, 9 TO 15 PERCENT SLOPES

Map Unit Setting

Elevation: 50 to 3,000 feet
Mean annual precipitation: 16 to 20 inches
Mean annual air temperature: 60 to 62 degrees F
Frost-free period: 300 to 330 days

Map Unit Composition

Diablo and similar soils: 85 percent
Minor components: 15 percent

Description of Diablo

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from mudstone and/or soft shale

Properties and qualities

Slope: 9 to 15 percent
Depth to restrictive feature: 45 to 60 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 8.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability (nonirrigated): 3e
Ecological site: CLAYEY (R015XD001CA)

Typical profile

0 to 50 inches: Clay
50 to 54 inches: Weathered bedrock

Minor Components

Ayar

Percent of map unit: 4 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex

Milpitas

Percent of map unit: 4 percent
Landform: Terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

Positas

Percent of map unit: 4 percent
Landform: Terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

Zaca

Percent of map unit: 3 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex

GU—GULLIED LAND

Map Unit Setting

Elevation: 0 to 1,000 feet
Mean annual air temperature: 59 to 61 degrees F
Frost-free period: 290 to 320 days

Map Unit Composition

Gullied land: 100 percent

Description of Gullied Land

Setting

Landform: Terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Riser
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Alluvium

Interpretive groups

Land capability classification (irrigated): 8e
Land capability (nonirrigated): 8e

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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

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

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

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

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

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

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

Custom Soil Resource Report
Map—Hydrologic Soil Group



Map Scale: 1:3,060 if printed on A size (8.5" x 11") sheet.

N

Meters
0 25 50 100 150

Feet
0 100 200 400 600

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

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

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

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

MAP INFORMATION

Map Scale: 1:3,060 if printed on A size (8.5" × 11") sheet.

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

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

Soil Survey Area: Santa Barbara County, California, South Coastal Part
Survey Area Data: Version 5, Jan 3, 2008

Date(s) aerial images were photographed: 6/6/2005

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

Table—Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Santa Barbara County, California, South Coastal Part				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
AhE2	AYAR CLAY, 15 TO 30 PERCENT SLOPES, ERODED	D	4.1	8.1%
AhF2	AYAR CLAY, 30 TO 50 PERCENT SLOPES, ERODED	D	9.6	19.2%
DaC	DIABLO CLAY, 2 TO 9 PERCENT SLOPES	D	25.0	49.8%
DaD	DIABLO CLAY, 9 TO 15 PERCENT SLOPES	D	4.6	9.2%
GU	GULLIED LAND		6.9	13.8%
Totals for Area of Interest			**50.2**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Lower

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

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7400 CATHEDRAL OAKS ROAD
GOLETA, CALIFORNIA

PRELIMINARY GEOTECHNICAL REPORT

SUBMITTED TO
Mr. Glynne Couvillion
Shelby Partnership LP
690 Lilac Drive
Santa Barbara, California 93108

PREPARED BY
ENGEO Incorporated

July 14, 2025

PROJECT NO.
8724.001.000

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ENGEO
Expect Excellence

Project No.
8724.001.000

July 14, 2025

Mr. Glynne Couvillion
Shelby Partnership LP
690 Lilac Drive
Santa Barbara, California 93108

Subject: 7400 Cathedral Oaks
Goleta, California

PRELIMINARY GEOTECHNICAL REPORT

Dear Mr. Couvillion:

ENGEO prepared this preliminary geotechnical report for Shelby Partnership LP as outlined in our proposal dated June 25, 2025. We characterized the subsurface conditions at the project site to develop our preliminary geotechnical conclusions and recommendations for project planning. The accompanying report contains the findings of our recent study.

The findings of our preliminary geotechnical study indicate that the site is geotechnically feasible for the proposed project, provided that the recommendations contained in this report are incorporated into planning. The main geotechnical considerations for the project include presence of expansive soil and bedrock, existing fill, agriculturally disturbed surficial soil, strong ground shaking, variable depth to bedrock, slope stability, and corrosion potential. Design-level exploration(s) should be conducted prior to site development once additional site access is established.

We are pleased to have been of service on this project and are prepared to consult further with you and your design team as the project progresses. If you have any questions regarding the contents of this report, please do not hesitate to contact us.

Sincerely,

ENGEO Incorporated



Randy Hildebrant, PE, GE

Josef J. Tootle, PE, GE

rh/jjt/cb

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

We prepared this preliminary geotechnical report for the planning of a new residential development located in Goleta, California. As outlined in our proposal dated June 25, 2024, you authorized us to prepare a preliminary geotechnical exploration report that included the following items.

- Review of publicly available geological maps, reports, and historical topographic maps and aerial photographs, in addition to the Safety Element Chapter 5.0 of the City of Goleta General Plan/Land Use Plan.
- Performing a site visit to observe the current surface conditions of the project site and if significant topographic changes have occurred.
- Review of the previous subsurface data and laboratory test results and preparation of a preliminary geotechnical report.

For our use, we received the following.

- L&P Consultants. 2016. Preliminary Grading, Drainage & Improvement Plan for (05-154-GPA/RZN/TM 32,045/FDP). March 2016. Sheets 1 and 2. Project No. 01-023.01

This report was prepared for the exclusive use of our client and their consultants for design of this project. In the event that any changes are made in the character, design, or layout of the development, we must be contacted to review the conclusions and recommendations contained in this report to evaluate whether modifications are recommended. This document may not be reproduced in whole or in part by any means whatsoever, nor may it be quoted or excerpted without our express written consent.

1.2 PROJECT LOCATION AND DESCRIPTION

The proposed project site is located at 7400 Cathedral Oaks Road in Goleta, California (Figures 1 and 2). The approximately 15-acre project area is currently occupied by two single-family dwellings and a storage structure on the western portion of the site. The Preliminary Grading, Drainage, & Improvement Plan also shows existing elevations ranging from approximately 250 feet (NAVD88) at the northeastern corner of the project site to approximately 150 feet along the Cathedral Oaks frontage. The site is accessible through a private driveway from Cathedral Oaks Road at the southwestern corner of the project site.

We understand that 56 single-family residential units with attached garages are proposed. The Preliminary Grading, Drainage, & Improvement Plan shows cuts on the order of 16 feet and fill on the order of approximately 10 feet for the creation of level building pads for the proposed residential structures. The Preliminary Grading, Drainage, & Improvement Plan also shows four units at the northern end of the site situated on split-level lots and the opposing lots located on or adjacent to a fill slope. The building loads are expected to be typical of residential structures up to three stories in height. The Glen Annie Golf Club Course borders the project site to the east, north, and northwest. El Encanto Creek borders the project site to the southwest.

Cut slopes with a gradient of 2:1 (horizontal:vertical) up to 30 feet high are planned at the four northernmost lots. Rear yard slopes straddling a cut-fill transition at the north-central part of the site are shown with a gradient of 2.5:1 up to about 22 feet high. Along Cathedral Oaks Road, an open-space area consisting of up to about 7 feet of fill over existing fill is planned with a gradient of 3:1.

Other site improvements include paved roadways and utilities. A bioretention basin is located along the western boundary of the project site and at the top the bank of El Encanto Creek.

1.3 PREVIOUS EXPLORATION

We previously performed a geotechnical exploration of the project site and published a report dated February 23, 2011. The proposed project was similar, but with 60 single-family residential units proposed. The field exploration consisted of four borings and five test pits performed in 2009. Our previous field exploration is further discussed in Section 2.2.

2.0 FINDINGS

2.1 GEOLOGY AND SEISMICITY

2.1.1 Geology

Our review of available geologic mapping indicates that the site is underlain by south-dipping Rincon shale (Tr) at the northern end of the project site and older silt, sand, and gravel (Qoa) deposits at the central and southern portions of the site (Dibblee, 1987) as shown in Figure 4. The Dibblee geologic shows an east-northeast strike and 23-degree dip. The Glen Annie Fault is shown north of the project site while the More Ranch Fault is shown south of the project site. The Rincon shale is an early Miocene shallow marine gray clay shale or claystone and was observed in TP-2 with an approximate east-northeast strike and 35-degree dip. The older alluvium is incised by a natural drainage along the western property boundary. A more recent geologic map by Conrad et. al. (2014), as shown in Figure 5, also maps the southern portion of the project site within late Pleistocene intermediate-age alluvial deposits (Qoa2) and the northern portion within early Miocene Rincon Shale. We have included site geology in the Site Plan, Figure 2.

2.1.2 Seismicity

The Goleta area contains numerous active earthquake faults. Nearby active faults include the San Luis Range and Oceanic faults. A Holocene-active fault is defined by the California Geologic Survey as one that has had surface displacement within Holocene time (about the last 11,700 years) (CGS, 2018). Faults near or within Goleta include the More Ranch Fault, the Glen Annie Fault, and the Carneros Fault (see Figures 6 and 7). The City of Goleta Safety Element notes that none of these faults are classified as active by the California Geological Survey (CGS) or subject to an Alquist-Priolo Special Studies Zone. However, according to the Santa Barbara County Seismic Safety and Safety Element (SSSE), the More Ranch Fault is considered active based on the existence of a geologically recent fault scarp (County of Santa Barbara 1991). The More Ranch Fault is located south of Highway 101 and not considered a fault rupture risk for the project area; therefore, fault rupture is not anticipated.

To determine nearby active faults that are capable of generating strong seismic ground shaking at the site, we utilized the USGS Unified Hazard Tool* and the peak ground acceleration (PGA) for a 2,475-year return period, with the resulting faults listed below in Table 2.1.2-1.

TABLE 2.1.2-1: Active Faults Capable of Producing Significant Ground Shaking at the Site (Latitude: 34.9695 Longitude: -120.4178)

SOURCE	R_{RUP} (km)	MOMENT MAGNITUDE M_W
San Luis Range (So Margin)[8]	2.4	7.0
San Luis Range [5]	2.5	7.0
San Luis Range [6]	6.3	6.8
San Luis Range - Oceano [0]	6.9	7.0
San Luis Range (So Margin)[7]	7.4	7.4
Oceanic - West Huasna [2]	7.4	6.7
Oceanic - West Huasna [3]	7.9	6.9
Casmalia [5]	13.7	7.5
Los Osos 2011 [6]	15.5	6.8
South Cuyama [0]	16.5	7.0
San Andreas (Cholame) rev [0]	63.0	8.1

*USGS Unified Hazard Tool – Edition: Dynamic Conterminous U.S. 2014 (update)

2.1.3 Site History

We reviewed historical aerial photographs and topographic maps containing the subject site, as summarized in Table 2.1.3-1.

TABLE 2.1.3-1: Historical Review Summary

HISTORICAL MAP/PHOTOGRAPH	YEARS
Topographic Maps	1943, 1951, 1952, 1957, 1965, 1975, 1982, 1987, 1989, 2000, 2012, 2015, 2018, 2022
Aerial Photographs	1947, 1953, 1961, 1967, 1984, 1994, 2002, 2005, 2009, 2010, 2012, 2014, 2016, 2018, 2020, 2022

The 1949 photograph shows the project site occupied by avocado orchards and continue through the 1994 photograph. The 2002 photograph shows the majority of the site cleared of orchards and a few structures along the southwestern boundary of the project site. An orchard is still present in the northern part of the project site and can also be seen in the 2005, 2009, and 2010 photographs. During our previous study, we were notified that the southern and southeastern portions of the site were reportedly regraded in the 1990s; however, supporting documentation was not available at the time of this report. At the time of our previous study, portions of the project site were being used for wood chopping operations. Remnants of the northern orchard can be seen through the 2022 photograph. Some trees have grown, mostly on the western side of the project, since the removal of the majority of the orchard. We did not observe significant deviations between the topographic maps.

2.2 FIELD EXPLORATION

The field exploration of our previous study was performed on June 4, 2009, and consisted of drilling four exploratory test borings (1-B1 through 1-B4) and excavating four test pits (TP-1 through TP-4) at the locations shown in the Site Plan, Figure 2. The borings were drilled at accessible areas to a maximum depth of approximately 51 feet. The exploratory test pits were excavated in accessible areas to a maximum depth of approximately 10 feet deep. Geographical coordinates of the exploration locations were collected using a recreational-grade global positioning unit and should be considered accurately located only to the degree implied by the method used.

The test borings were drilled using a truck-mounted CME-75 drill rig equipped with 6-inch-diameter hollow stem augers. Soil samples recovered during drilling were retrieved using a 3-inch outside-diameter (O.D.) California-type split-spoon sampler fitted with 6-inch-long brass liners or a 2-inch O. D. Standard Penetration Test sampler. The samplers were driven with a 140-pound safety hammer falling a distance of 30 inches. An automatic trip system was used to lift the safety hammer during our exploration. The penetration of the samplers into the native materials was field recorded as the number of blows needed to drive the sampler 18 inches in 6-inch increments. The boring logs show the number of blows required for the last 1 foot of penetration. The blow counts have not been converted using any correction factors.

Boreholes were logged in the field by an ENGEO Engineering Geologist. The field logs were then used to develop the report borelogs in Appendix A. The logs depict subsurface conditions within the borings on the date of drilling; however, subsurface conditions may vary with time.

The test pits were excavated using a backhoe to expose conditions in the subsurface from about 2 to 10 feet deep. Test pit locations were selected to expose firm native soil or bedrock. An ENGEO Engineering Geologist performed the field logging of the test pits. The field logs were used to develop the report test pit logs presented in Appendix A. The logs depict subsurface conditions within the test pits on the date of drilling; however, subsurface conditions may vary with time.

The test pits were backfilled with nominal compactive effort. Test pits within areas that are not completely removed by design cuts will require overexcavation and recompaction during site grading.

2.3 SURFACE CONDITIONS

We performed a site visit on July 1, 2025, to observe the current conditions of the project site. The vegetation in the southern three-quarters of the project site has been mowed and mature trees were observed along the project boundary. The northern slope was covered with overgrown grasses, scrubs, and trees. Any trees related to the previous orchard appeared to have been removed. A wood chopping operation is present in the southeastern corner of the project site. We were not able to observe the current creek banks due to fencing and dense vegetation. We observed large desiccation cracks throughout the area up to about 2 to 3 inches in width and about 1½ feet deep.

PHOTOGRAPH 2.3-1: Project Site Looking North



PHOTOGRAPH 2.3-2: Example Desiccation Cracks



Additional information for notable on-site features is included in the Site Plan, Figure 2.

2.4 LABORATORY TESTING

Selected samples recovered during our previous field exploration were tested to determine the following soil and rock characteristics.

TABLE 2.4-1: Laboratory Testing

CHARACTERISTIC	TEST METHOD
Plasticity Index	ASTM D4318
Hydrometer	ASTM D422
Unconfined Compression	ASTM D2166
Moisture Content and Unit Weight	ASTM D7263
Moisture Only	ASTM D2216
Expansion Index	ASTM D4829
Sulfate	CTM 417

Laboratory data is included in Appendix B.

2.5 SUBSURFACE CONDITIONS

The site soil is relatively uniform and consists predominantly of stiff to very hard clay and silt. Boring 1-B3 encountered existing fill in the upper approximately 7½ feet of the boring. The approximate extent of the fill is shown in the Site Plan, Figure 2; however, additional fill is likely near the existing structures. We observed older alluvium to the maximum depth explored of 51½ feet deep in Boring 1-B1 while in Boring 1-B4, performed at the northern end of the project site, we observed approximately 8 feet of clay over bedrock. The surface clay and bedrock deposits have a high to critical expansion potential with Plasticity Indexes of 50 to 53 and an Expansion Index of 90. Desiccation cracks were observed throughout the site at the surface in addition to alluvium-filled cracks as deep as 7 feet below ground surface observed within TP-1 and TP-2.

2.6 GROUNDWATER CONDITIONS

We did not observe static or perched groundwater in any of our subsurface explorations. The boreholes and test pits were backfilled on the day of drilling. Fluctuations in the level of groundwater may occur due to variations in rainfall, irrigation practice, and other factors not evident at the time measurements were made.

3.0 PRELIMINARY CONCLUSIONS

Based upon this preliminary study, it is our opinion that the project site is feasible for the proposed residential development from a geotechnical standpoint, provided the preliminary recommendations contained in this report and future design-level geotechnical studies are incorporated into the development plans. A site-specific geotechnical exploration should be performed as part of the design process. The exploration would include additional borings, test pits, and laboratory soil testing to provide data for preparation of specific recommendations regarding grading, foundation design, drainage, and stormwater infiltration considerations for the proposed development. The exploration will also allow for more detailed evaluations of the geotechnical issues discussed below and afford the opportunity to provide recommendations regarding techniques and procedures to be implemented during construction to mitigate potential geotechnical/geological hazards.

Based upon our field exploration and review of readily available published maps and reports for the site, the main geotechnical concerns for the proposed site development include existing fill, agriculturally disturbed surficial soil, expansive soil, strong ground shaking, variable depth to

bedrock, slope stability, and corrosion potential. These items and other geotechnical issues are discussed in the following sections of this report.

3.1 EXISTING FILL

As previously mentioned, our borings and test pits indicate that portions of the project site are underlain by up to about 7½ feet of fill as shown in Figure 2. The lateral extent and depth of fill is expected to vary. We are not aware of any documentation of the existing fill; therefore, the acceptability of the existing fill for the current land plan cannot be determined.

If not engineered, existing fill can undergo excessive settlement, especially under new fill or building loads. Without proper documentation of existing fill placed on the site, we recommend complete removal and recompaction of the existing fill. We present fill removal recommendations in Section 4.2.

3.2 DISTURBED SURFICIAL SOIL

The historical photographs and topographic maps indicate the project site had been occupied by an orchard and then removed. It is our experience that the trees and associated root systems introduce significant organic content into the subgrade and the removal of the trees causes disturbance of the upper soil, typically in the upper 3 to 5 feet. Similar to non-engineered fill, agriculturally disturbed soil and soil with significant organic content can undergo excessive settlement. We present disturbed surficial soil removal recommendations in Section 4.2.

3.3 EXPANSIVE SOIL

We observed potentially expansive clay and bedrock near the surface of the site during our site visit and in our borings and test pits. Laboratory testing of representative near-surface soil and bedrock samples collected indicate the soil and bedrock have a Plasticity Index of 53 and 50, respectively. Laboratory testing of a near-surface soil sample collected from Test Pit TP-3 indicated the soil has an Expansion Index of 90. These laboratory test results indicate that the near-surface soil and bedrock have a high to critical expansion potential.

Expansive soil changes in volume with changes in moisture. It can shrink or swell and cause heaving and cracking of slabs-on-grade, pavements, and structures founded on shallow foundations.

Successful performance of structures on expansive soil requires special attention during construction. It is imperative that exposed soil be kept moist prior to placement of concrete for foundation construction. It can be difficult to remoisturize expansive clayey soil without excavation, moisture conditioning, and recompaction.

We have provided specific grading recommendations for compaction of clay soil at the site. The purpose of these recommendations is to minimize the potential detrimental swell potential of the clay by compacting the soil at an increased moisture content and controlling the amount of compaction. Our recommendations for the building foundation and site improvement also consider the differential shrink/swell potential of the site soil.

3.4 SEISMIC HAZARDS

Potential seismic hazards resulting from a nearby moderate to major earthquake can generally be classified as primary and secondary. The primary effect is ground rupture, also called surface faulting. The common secondary seismic hazards include ground shaking, soil liquefaction, lateral spreading, and landslides. The following sections present a discussion of these hazards as they apply to the site. Based on topographic and lithologic data, the risk of regional subsidence or uplift, tsunamis and seiches is considered low to negligible at the site.

3.4.1 Ground Rupture

Since there are no known active faults crossing the property and the site is not located within an Earthquake Fault Special Study Zone, it is our opinion that ground rupture is unlikely at the project site.

3.4.2 Ground Shaking

An earthquake of moderate to high magnitude generated within the Goleta region could cause considerable ground shaking at the site, similar to that which has occurred in the past. To mitigate the shaking effects, structures should be designed using sound engineering judgment and the 2025 California Building Code (CBC) requirements, as a minimum. Seismic design provisions of current building codes generally prescribe minimum lateral forces, applied statically to the structure, combined with the gravity forces of dead and live loads. The code-prescribed lateral forces are generally considered to be substantially smaller than the comparable forces that would be associated with a major earthquake. Therefore, structures should be able to: (1) resist minor earthquakes without damage, (2) resist moderate earthquakes without structural damage but with some non-structural damage, and (3) resist major earthquakes without collapse but with some structural as well as nonstructural damage. Conformance to the current building code recommendations does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake; however, it is reasonable to expect that a well-designed and well-constructed structure will not collapse or cause loss of life in a major earthquake (SEAOC, 1996).

3.4.3 Liquefaction and Seismic Settlement

Soil liquefaction results from loss of strength during cyclic loading, such as imposed by earthquakes. Soil most susceptible to liquefaction is clean, loose, saturated, uniformly graded, fine-grained sand. Empirical evidence indicates that loose to medium dense gravel, silty sand, low plasticity silt, and some low plasticity clay are also potentially liquefiable. Groundwater was not encountered to the terminal depth of our borings as noted earlier, the soil consists stiff to very hard clay and silt, and the soil is considered older alluvium. For these reasons and based upon engineering judgment, it is our opinion that the potential for liquefaction at the site is low during seismic shaking.

Densification of loose granular soil above the water table can cause settlement of the ground surface due to earthquake-induced vibrations. We did not encounter granular soil in our explorations; therefore, dynamic densification should be negligible.

3.4.4 Lateral Spreading

Lateral spreading is a failure within weaker soil material, commonly resulting from liquefaction, which causes the soil to move toward a free face or down a slope. Due to the negligible risk of liquefaction, the potential risk of lateral spreading is also considered negligible.

3.5 LANDSLIDING

The City of Goleta Safety Element (Figure 7) has mapped the northern portion of the project within an area of high landslide potential and noted that the Rincon geologic formation is susceptible to landslides. In addition, the geologic map by Conrad et al. 2014 (Figure 5) and the CGS landslide database (Figure 8) includes several mapped landslides in the region. Due to the general adverse bedding orientation of the bedrock to the proposed cut slope located at the northern portion of the project site (See Figure 3), landslides are an increased risk to the project. We provide grading recommendations in Section 4.8 to reduce the risk of landsliding to the project.

The western roadway improvements appear to be off set from the creek bank a considerable distance from the creek bank and may be considered low landslide risk. However, Lot 1 is located relatively close to the creek bank and should be evaluated further during a design-level study for landslide risk.

3.6 COMPRESSIBLE AND COLLAPSIBLE SOILS

As noted previously, the subgrade soil was stiff to very hard and shallow bedrock was encountered in the northern portion of the project site. Therefore, we anticipate only minor settlement generally occurring during grading and building construction and negligible settlement occurring after the completion of construction.

We did not observe significant pore space in the soil at the project site. In addition, we observed the soil to contain natural moisture and to be relatively stiff. Furthermore, the project site is located in a generally moist climate with seasonal rainfall and not conducive to producing collapsible soil. For these reasons, the risk of hydrocollapse is considered low.

3.7 FLOODING AND TSUNAMI

The Federal Emergency Management Agency (FEMA) has not mapped the project area within an area of flood risk; however, the civil engineer should review pertinent information relating to possible flood levels for the subject site based on final pad elevations and provide appropriate design measures for development of the project, if recommended. The City of Goleta Safety Element also does not indicate flood or tsunami risk to the project.

3.8 NATURALLY OCCURRING RADON GAS

Radon is a radioactive gas formed by the decay of small amounts of naturally occurring uranium and thorium in rock and soil. Sometimes radon gas can move from underlying soil and rock into structures and become concentrated in indoor air. Noted in the City of Goleta Safety Element, Because of its radioactivity, radon levels in excess of 4.0 picocuries per liter are considered hazardous by the U.S. Environmental Protection Agency and require radon reduction measures. Radon gas is associated with the Rincon formation, and areas subject to moderate and high potential for radon gas levels exceeding 4.0 picocuries per liter occur where the Rincon Formation is at or close to the ground surface.

As shown in Figure 9, CGS has mapped in the project area within high risk for indoor Radon gas. Project planning should assume implementation of Radon collection systems and we recommend further consultation with an Environmental Engineer.

3.9 DIFFERENTIAL FILL THICKNESS

Building pads constructed in cuts may encounter variably expansive subsurface conditions in the near-surface soil and rock; these pads may therefore be subject to damaging differential soil movements. Building pads that transition from cut to fill within the building pad area also can experience differential soil movements.

Due to cutting into the hill, we estimate that the bottom of various building foundations may be near or within the Rincon formation while the remainder of the building will be founded in the overlying soil. The performance of the foundation may vary between soil and bedrock; therefore, we provide grading and foundation recommendations to provide a more uniform subgrade to support the building on a relatively rigid mat slab or the use of drilled pier foundations.

3.10 EXCAVATABILITY

Based upon our observation and experience, we anticipate that conventional grading and backhoe equipment will likely be able to excavate the soil deposits. The bedrock should be considered rippable using a CAT D9 or larger bulldozer, equipped with single or multi-shank rippers. To confirm rippability, consideration should be given to performing a seismic refraction survey.

3.11 SOIL CREEP

Soil creep is a natural process that involves slow downhill movement of soil mantle on a slope. Soil creep consists of lateral extension and vertical settlement. Soil creep results when surficial expansive soil is subjected to wetting and drying cycles caused by seasonal moisture changes, precipitation, and/or long-term landscape irrigation; by the growth of roots; and by burrowing animals. The surface manifestations of soil creep include tipping/tilting of fence posts, separations of exterior concrete slabs or other landscape elements from residential buildings, and cracks with vertical and/or horizontal offsets in surface and near-surface improvements. The amounts of vertical and horizontal movement are a function of the soil physical characteristics, such as plasticity, height and gradient of the downhill slope, and the depth of wetting and drying cycles. Improvements constructed on or near downhill slopes will be impacted by soil creep. Any improvements planned on or near the tops of downhill slopes should consider soil creep.

3.12 KEYWAYS AND BENCHED FILL

We anticipate that significant cut and fill slopes will include the construction of drained keyways and benched fill to provide proper stability of the compacted fill. We present typical recommendations for keyways, benching and subdrains in Section 4.3.

3.13 SOIL CORROSION POTENTIAL

One representative sample was taken from a near-surface soil sample obtained from Boring B-2 during our previous field exploration. The sample was tested in our laboratory for water-soluble sulfate (SO_4) in soil. The laboratory test results are included in Appendix B.

The concentration of water-soluble sulfate (SO_4) in soil was determined in accordance with Caltrans Test Method 417. As reported in the attached analytical results, the sample tested contained 0.324 percent by weight water soluble sulfate (SO_4) in soil. The 2025 CBC references the American Concrete Institute Manual ACI 318, which provides guidelines to characterize the potential exposure for sulfate attack and associated recommendations for concrete in contact with soil based upon the exposure risk. The sulfate exposure is considered severe by ACI 318 and Type V cement, 0.45 maximum water/cement ratio, and minimum strength of 4,500 psi are specified.

We recommend additional samples collected of the on-site soil and bedrock during the design-level study and additional corrosion potential testing performed. The analytical tests generally include redox, pH, resistivity, chloride, in addition to sulfate. The additional analytical tests will further indicate risk of corrosion to reinforced concrete and buried metallic improvements.

3.14 2025 CBC SEISMIC DESIGN PARAMETERS

The 2025 CBC utilizes seismic design criteria established in the ASCE/SEI Standard "Minimum Design Loads and Associated Criteria for Buildings and Other Structures," (ASCE 7-22). According to ASCE 7-22, the site soil should be classified based on the time-averaged shear-wave velocity measured from the ground surface to a depth of 100 feet. We did not measure shear-wave velocity during the current exploration, and this should be evaluated during future design-level studies. Since we don't have shear-wave velocity data for the site, a default site class was used for the seismic analysis. This default site class envelopes site classes C, CD, and D.

We provide the 2025 CBC multi-period MCE_R and DE response spectra based on the United States Geological Survey's (USGS's) Seismic Design Geodatabase in Table 3.14-1. We also provide the seismic design parameters based on the two-period spectrum in Table 3.14-2.

TABLE 3.14-1: 2025 CBC Multi-Period MCE_R and DE Response Spectra – Default Site Class (Latitude: 34.9695 Longitude: -120.4178)

PERIOD (seconds)	PSEUDO-SPECTRAL ACCELERATION (g)	
	MCE_R	DE
0	0.61	0.41
0.01	0.61	0.41
0.02	0.61	0.41
0.03	0.64	0.43
0.05	0.78	0.52
0.075	0.99	0.66
0.1	1.16	0.77
0.15	1.35	0.90
0.2	1.47	0.98
0.25	1.52	1.01
0.3	1.57	1.05
0.4	1.55	1.03
0.5	1.47	0.98
0.75	1.18	0.78

PERIOD (seconds)	PSEUDO-SPECTRAL ACCELERATION (g)	
	MCE_R	DE
1	0.96	0.64
1.5	0.68	0.45
2	0.50	0.34
3	0.32	0.22
4	0.23	0.15
5	0.18	0.12
7.5	0.11	0.074
10	0.077	0.052

TABLE 3.14-2: 2025 CBC Seismic Design Parameters (Latitude: 34.9695 Longitude: -120.4178)

PARAMETER	VALUE
Site Class	Default
Mapped MCE_R Spectral Response Acceleration at Short Periods, S_S (g)	1.18
Mapped MCE_R Spectral Response Acceleration at 1-second Period, S_1 (g)	0.38
MCE_R Spectral Response Acceleration at Short Periods, S_{MS} (g)	1.41
MCE_R Spectral Response Acceleration at 1-second Period, S_{M1} (g)	1.96
Design Spectral Response Acceleration at Short Periods, S_{DS} (g)	0.94
Design Spectral Response Acceleration at 1-second Period, S_{D1} (g)	0.64
MCE_G Peak Ground Acceleration adjusted for Site Class effects, PGA_M (g)	0.55

4.0 PRELIMINARY EARTHWORK RECOMMENDATIONS

The following preliminary recommendations are for initial land planning and preliminary estimating purposes. Final recommendations regarding site grading will be provided after additional site-specific exploration has been undertaken.

4.1 GENERAL SITE CLEARING

Grading should begin with the removal of existing structures, including their foundations. Underground structures, such as buried pipes, septic tanks, and leach fields, if any, which will be abandoned or are expected to deteriorate, should be removed from the project site entirely.

All existing vegetation and soft or compressible soil should be removed, as necessary, within the project limits. The depth of removal of these materials should be determined by the geotechnical engineer's qualified representative in the field at the time of grading.

Areas to receive fill or structures and those areas that serve as borrow for fill should be stripped of existing vegetation. Tree roots should be removed to a depth of at least 3 feet below finished grade in cut areas and 3 feet below original grade in fill areas. Subject to approval by the landscape architect, strippings and organically contaminated soil that is not suitable for use as engineered fill may be used in landscape areas. Any topsoil that will be retained for future use in landscape areas should be stockpiled in areas where it will not interfere with the grading operations.

Within the development areas, excavations resulting from demolition and stripping which extend below final grades, should be cleaned to firm undisturbed soil, as determined by the geotechnical engineer's representative. Following clearing and grubbing, all depressions in areas to be filled should be scarified, moisture conditioned, and backfilled with compacted engineered fill.

4.2 EXISTING FILL AND DISTURBED SOIL MITIGATION

All existing fill and soft material should be excavated to firm native soil. Excavated material may be used as fill material if it meets the requirements of Section 4.6. To mitigate disturbed surficial soil, we generally recommend excavating a minimum of 3 to 5 feet from the existing ground surface in areas of fill or limited cut. The excavation should be backfilled with moisture conditioned and compacted engineered fill following scarifying a minimum of 1 foot, moisture conditioning, and compacting the exposed subgrade.

4.3 KEYWAYS

After stripping, grading should begin with constructing keyways. Keyways should be graded at the toe of fill slopes. Slope the key bottom at least 2 percent downward toward the heel of the key. All fill should be adequately keyed into firm natural materials unaffected by shrinkage cracks.

Typical keyway configurations and subdrain details are shown in Figure 10. Actual keyway dimensions will be determined during a design-level study. Subsurface slope keys or benched terraces should be constructed above the lower toe keyway. The actual size of the keyways will be determined by the Geotechnical Engineer following preparation of final 40-scale grading plans and/or in the field during grading.

All keyway excavations should be examined and approved by the engineering geologist during grading for extents of adverse bedding, seepage, or bedrock conditions that may affect slope stability. If adverse geologic conditions are detected during grading, additional recommendations may be necessary.

4.4 CUT/FILL TRANSITION AND CUT BUILDING PAD PREPARATION

To create a more uniform subgrade to support the building foundations overlying cut/fill transitions, as shown in Figure 10, we recommend subexcavating the cut area of the building pad to provide a minimum of 3 feet of engineered fill underlying the building foundation. The fill portion of the building pad should be subexcavated 3 to 5 feet of engineered fill after removal of existing fill, if present, to mitigate disturbed surficial soil. Localized areas may require deeper subexcavation. The subexcavation should extend a minimum of 5 feet beyond building limits. Care should be taken to provide a similar soil type across the building pad. Cut pads should be subexcavated to provide a minimum of 3 feet of engineered fill underlying the building foundation. The fill should be compacted in accordance with Section 4.7.

4.5 OVER-OPTIMUM SOIL MOISTURE CONDITIONS

The contractor should anticipate encountering excessively over-optimum (wet) soil moisture conditions during winter or spring grading, or during or following periods of rain. Wet soil can make proper compaction difficult or impossible. Wet soil conditions can be mitigated by:

1. Frequent spreading and mixing during warm dry weather;
2. Mixing with drier materials;

3. Mixing with a lime, lime-flyash, or cement product; or
4. Stabilizing with aggregate or geotextile stabilization fabric, or both.

Options 3 and 4 should be evaluated by ENGEO prior to implementation.

4.6 ACCEPTABLE FILL

Except for the organically contaminated near-surface material, the site soil and bedrock containing less than 3 percent organics are suitable for use as engineered fill. No rock fragments larger than 6 inches in diameter shall be placed in the fill. ENGEO should be consulted on the use of rock greater than 6 inches in diameter.

Imported fill material should meet the above requirements and have a plasticity index similar to, or less than, the on-site soil material.

4.7 FILL COMPACTION

For land planning and cost estimating purposes, the following compaction control requirements should be anticipated for general fill areas.

- Test Procedures: ASTM D1557
- Required Moisture Content: Not less than 4 to 5 percentage points above optimum moisture content
- Minimum Relative Compaction: 88 to 90 percent for general fill

Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material.

4.8 SLOPES

We have provided specific slope recommendations due to the presence of potentially expansive soil and bedrock. Cut slopes in the Rincon formation should be rebuilt with engineered fill. Slopes inclined as steep as 2:1 (horizontal: vertical) can be constructed up to 8 feet in height. Slopes inclined at 2½:1 can be constructed up to 12 feet tall. Slopes greater than 12 feet tall should be inclined at 3:1 or less. The contractor is responsible for constructing temporary construction slopes in accordance with Cal/OSHA requirements.

As previously discussed, cut slopes with a gradient of 2:1 (horizontal:vertical) up to 30 feet high are planned at the four northernmost lots. Rear yard slopes straddling a cut-fill transition at the north-central part of the site are shown with a gradient of 2.5:1 up to about 22 feet high. We generally recommend these slopes be reduced in inclination or height. Slope gradients can be reduced through the use of retaining walls.

These slope inclinations and heights may be possible by excavating a keyway, rebuilding the outer portion of the slope with import low expansive soil, and placing geogrid reinforcement within the fill as shown in Figure 10. Laboratory fill strength testing and stability analysis should be performed during a design-level study to determine minimum geogrid reinforcement requirements and thickness of the cut slope rebuild.

4.9 EROSION CONTROL

No water should be allowed to discharge in a concentrated manner over downslopes as this could cause erosion and could possibly destabilize slopes. Erosion of graded slopes can be mitigated by hydroseeding, landscaping or placement of topsoil materials prior to the winter rains following rough grading. All landscaped slopes should be maintained in a vegetated state after project completion with drought-tolerant vegetation requiring drip irrigation.

Due to the nature of the soil and bedrock, slopes may experience erosion when grading is halted by heavy rain. Therefore, before work is stopped, it is vital that no completed slope be left standing through a winter season without erosion control measures having been provided.

4.10 SITE DRAINAGE

4.10.1 Surface Drainage

The project civil engineer is responsible for designing surface drainage improvements. Regarding geotechnical engineering issues, we recommend that finish grades be sloped away from buildings and pavements to the maximum extent practical to reduce the potentially damaging effects of expansive soil. The latest California Building Code Section 1804.4 specifies minimum slopes of 5 percent away from foundations. Where surface improvements restrict meeting this slope requirement, we recommend that specific drainage requirements be developed. As a minimum, we recommend the following.

1. Discharge roof downspouts into closed conduits and direct away from foundations to appropriate drainage devices.
2. Consider the use of rear lot surface drainage collection systems to reduce overland surface drainage from back to front of lot.
3. Do not allow water to pond near foundations, pavements, or exterior flatwork.

4.10.2 Subsurface Drainage

Subsurface drainage systems should be installed in keyways and slope rebuild areas. Typical keyway subdrains are shown in Figures 10 and 11. Subdrains should also be added where wet conditions are encountered during grading.

Subdrain systems should consist of a minimum 6-inch-diameter perforated pipe encased in Caltrans Class 2 permeable material, or crushed rock wrapped in filter fabric. As an alternative, prefabricated geocomposite drainage material, such as SKAPS TNS 220-6, could be considered in lieu of the granular medium above the subdrain zone.

Discharge from the subdrains will generally be low but in some instances may be continuous. Subdrains should outlet into the storm drain system or other approved outlets, and their locations should be surveyed and documented by the project civil engineer for future maintenance and for documentation as they relate to the proposed buildings.

Not all sources of seepage are evident during the time of field work because of the intermittent nature of some of these conditions and their dependence on long-term climatic conditions. Furthermore, new sources of seepage may be created by a combination of changed topography, manmade irrigation patterns, and potential utility leakage. Since uncontrolled water movements

are one of the major causes of detrimental soil movements, it is of utmost importance that a geotechnical engineer be advised of any seepage conditions so that remedial action may be initiated, if necessary. Corrective grading plans will be provided to depict the extents of anticipated subdrain locations.

4.11 CORRECTIVE GRADING PLAN

A corrective grading plan showing recommended keyways, subdrains, slope rebuilds and geogrid reinforcement, subexcavations, and pad treatments should be prepared prior to grading. This allows graphic representations of our grading and subsurface drainage recommendations presented in this report. This can assist in obtaining more accurate earthwork bids as well as clarifying the geotechnical recommendations as they apply to the final grading plan.

5.0 PRELIMINARY FOUNDATION RECOMMENDATIONS

Based on our understanding of the soil/bedrock conditions and laboratory testing, we recommend supporting the proposed buildings on a rigid post-tension or conventionally reinforced structural mat slab designed for the anticipated vertical expansive soil conditions on flat pads and the additional lateral component of soil expansion and vertical soil creep on pads that are adjacent to slopes. Alternatively, drilled pier foundations could be considered for split-level lots and lots upslope of a slope.

5.1.1 Structural Mat Slabs

The use of structural mat slabs consisting of post-tensioned or conventional reinforcing is common for residential structures underlain by expansive soil and bedrock. For similar projects with similar soil conditions, we generally encounter structural mat slabs 11 to 14 inches in thickness.

5.1.2 Drilled Piers

Structures located on split-level lots near the top of slopes, including Lot 1, can be supported on drilled piers. The piers should be interconnected by grade beams. The construction of deeper piers with a wider spacing and stiffer grade beams is preferred. We also recommend extending the piers into bedrock. For planning purposes, the piers may be assumed to have a minimum depth of 12 feet and at least 5 feet into bedrock.

Due to the very high expansion potential of some of the site soil, the grade beams should be raised off the ground to protect the grade beams against subgrade swell pressures. A void or pad of compressible or degradable material at least 3 inches thick should be provided between the bottom of the grade beam and the ground.

If any portion of a structure utilizes a raised timber floor, we recommend that a subsurface drain be provided around the perimeter of the residential building to help protect against subsurface seepage under the foundation. In addition, crawl spaces should include subsurface drains, moisture reducing membranes, and waterproofing surface slabs.

6.0 EXTERIOR FLATWORK

Exterior flatwork includes items such as concrete sidewalks, steps, and outdoor courtyards exposed to foot traffic only. Provide a minimum section of 5 inches of concrete over 4 inches of aggregate base. Thicken flatwork edges to at least 9 inches to help control moisture variations in the subgrade and rebar within the middle third of the slab to help control the width and offset of cracks. Consideration should be given to placing rebar reinforcement in the middle third of the concrete flatwork to help control the width and offset of cracks. It is our experience that wire mesh is not sufficient to control cracking. As is common with concrete construction, minor cracking should be expected. Construct control and construction joints in accordance with current Portland Cement Association Guidelines.

7.0 PRELIMINARY PAVEMENT DESIGN

Based on index testing of the site soil and bedrock, an R-value of 5 would be appropriate for design. Using estimated traffic indexes for various pavement loading requirements, we developed the following recommended pavement sections using Chapter 630 of the Caltrans Highway Design Manual (including the asphalt factor of safety), presented in the table below.

TABLE 7.0-1: Recommended Hot Mix Asphalt Pavement Sections

TRAFFIC INDEX	HOT MIX ASPHALT (inches)	CLASS 2 AGGREGATE BASE (inches)
4	2.5	7.0
4.5	2.5	9.0
5	3.0	10.0
5.5	3.0	12.0
6	3.5	13.0

The civil engineer should determine the appropriate traffic indexes based on the estimated traffic loads and frequencies.

8.0 STORMWATER INFILTRATION

Due to the density of the site soil, high fines content (percentage passing the No. 200 sieve), and high plasticity index, the near-surface site soil is expected to have a low permeability value for stormwater infiltration in grassy swales or permeable pavers, unless subdrains are installed. Therefore, Best Management Practices should assume that limited stormwater infiltration will occur at the site.

9.0 STORMWATER BIORETENTION AREAS

Due to the proposed bioretention located at the top of the existing creek bank and potential instability from increased groundwater, we recommend installing an impermeable liner consisting of a minimum 30-mil geomembrane with all seams and penetrations sealed.

If smaller bioretention areas are implemented, we recommend that, when practical, they be planned a minimum of 5 feet away from structural site improvements, such as buildings, roads, retaining walls, and sidewalks/driveways. When this is not practical, bioretention areas located within 5 feet of structural site improvements can either:

1. Be constructed with structural side walls capable of withstanding the loads from the adjacent improvements, or
2. Incorporate filter material compacted to between 85 and 90 percent relative compaction (ASTM D1557, latest edition) and a waterproofing system designed to reduce the potential for moisture transmission into the subgrade soil beneath the adjacent improvement.

In addition, we recommend that bioretention design incorporate a waterproofing system consisting of a 20-mil vapor proof membrane or better lining the bioswale excavation and a subdrain, or other storm drain system, to collect and convey water to an approved outlet. The waterproofing system should cover the bioretention area excavation in such a manner as to reduce the potential for moisture transmission beneath the adjacent improvements.

Site improvements located adjacent to bioretention areas that are underlain by base rock, sand, or other imported granular materials, should be designed with a deepened edge that extends to the bottom of the imported material underlying the improvement.

10.0 LANDSCAPING CONSIDERATION

As the near-surface soil is moderately to very highly expansive, we recommend greatly restricting the amount of surface water infiltration near structures, pavements, and flatwork. This may be accomplished by:

- Selecting landscaping that requires little or no watering, especially within 5 feet of structures, slabs-on-grade, or pavements.
- Using low precipitation sprinkler heads.
- Regulating the amount of water distributed to lawn or planter areas by installing timers on the sprinkler system.
- Providing surface grades to drain rainfall or landscape watering to appropriate collection systems and away from structures, slabs-on-grade, or pavements.
- Preventing water from draining toward or ponding near building foundations, slabs-on-grade, or pavements.
- Avoiding open planting areas within 3 feet of the building perimeter.

We recommend that these items be incorporated into the landscaping plans.

11.0 FUTURE STUDIES

As previously discussed, a site-specific design-level geotechnical exploration should be performed as part of the design process. Preliminary conclusions and recommendations presented herein are based on limited site and laboratory data. The exploration would include test-pits, borings, and laboratory soil testing to provide data for preparation of specific recommendations regarding grading, seismic parameters, foundation design, corrosion potential,

and drainage for the proposed development. The exploration will also allow for more detailed evaluations of the geotechnical issues discussed in this report and afford the opportunity to provide recommendations regarding techniques and procedures to be implemented during construction to mitigate potential geotechnical/geological hazards.

12.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report presents preliminary geotechnical recommendations for planning of the improvements discussed in Section 1.3 for the 7400 Cathedral Oaks Road project. If changes occur in the nature or design of the project, we should be allowed to review this report and provide additional recommendations, if any. It is the responsibility of the owner to transmit the information and recommendations of this report to the appropriate organizations or people involved in design of the project, including but not limited to developers, owners, buyers, architects, engineers, and designers. The conclusions and recommendations contained in this report are solely professional opinions and are valid for a period of no more than 2 years from the date of report issuance.

We strive to perform our professional services in accordance with generally accepted principles and practices currently employed in the area; there is no warranty, express or implied. There are risks of earth movement and property damages inherent in building on or with earth materials. We are unable to eliminate all risks; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions discovered at the time of report preparation. We developed this report with limited subsurface exploration data. We assumed that our subsurface exploration data are representative of the actual subsurface conditions across the site. Considering possible underground variability of soil and groundwater, additional costs may be required to complete the project. We recommend that the owner establish a contingency fund to cover such costs. If unexpected conditions are encountered, ENGEO must be notified immediately to review these conditions and provide additional and/or modified recommendations, as necessary.

Our services did not include excavation sloping or shoring, soil volume change factors, flood potential, or a geohazard exploration. In addition, our geotechnical exploration did not include work to determine the existence of possible hazardous materials. If any hazardous materials are encountered during construction, the proper regulatory officials must be notified immediately.

This document must not be subject to unauthorized reuse, that is, reusing without written authorization of ENGEO. Such authorization is essential because it requires ENGEO to evaluate the document's applicability given new circumstances, not the least of which is passage of time.

Actual field or other conditions will necessitate clarifications, adjustments, modifications, or other changes to ENGEO's documents. Therefore, ENGEO must be engaged to prepare the necessary clarifications, adjustments, modifications, or other changes before construction activities commence or further activity proceeds. If ENGEO's scope of services does not include on-site construction observation, or if other persons or entities are retained to provide such services, ENGEO cannot be held responsible for any or all claims arising from or resulting from the performance of such services by other persons or entities, and from any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies, or other changes necessary to reflect changed field or other conditions.

We determined the lines designating the interface between layers on the exploration logs using visual observations. The transition between the materials may be abrupt or gradual. The exploration logs contain information concerning samples recovered, indications of the presence of various materials such as clay, sand, silt, rock, existing fill, etc., and observations of groundwater encountered. The field logs also contain our interpretation of the subsurface conditions between sample locations. Therefore, the logs contain both factual and interpretative information. Our recommendations are based on the contents of the final logs, which represent our interpretation of the field logs.

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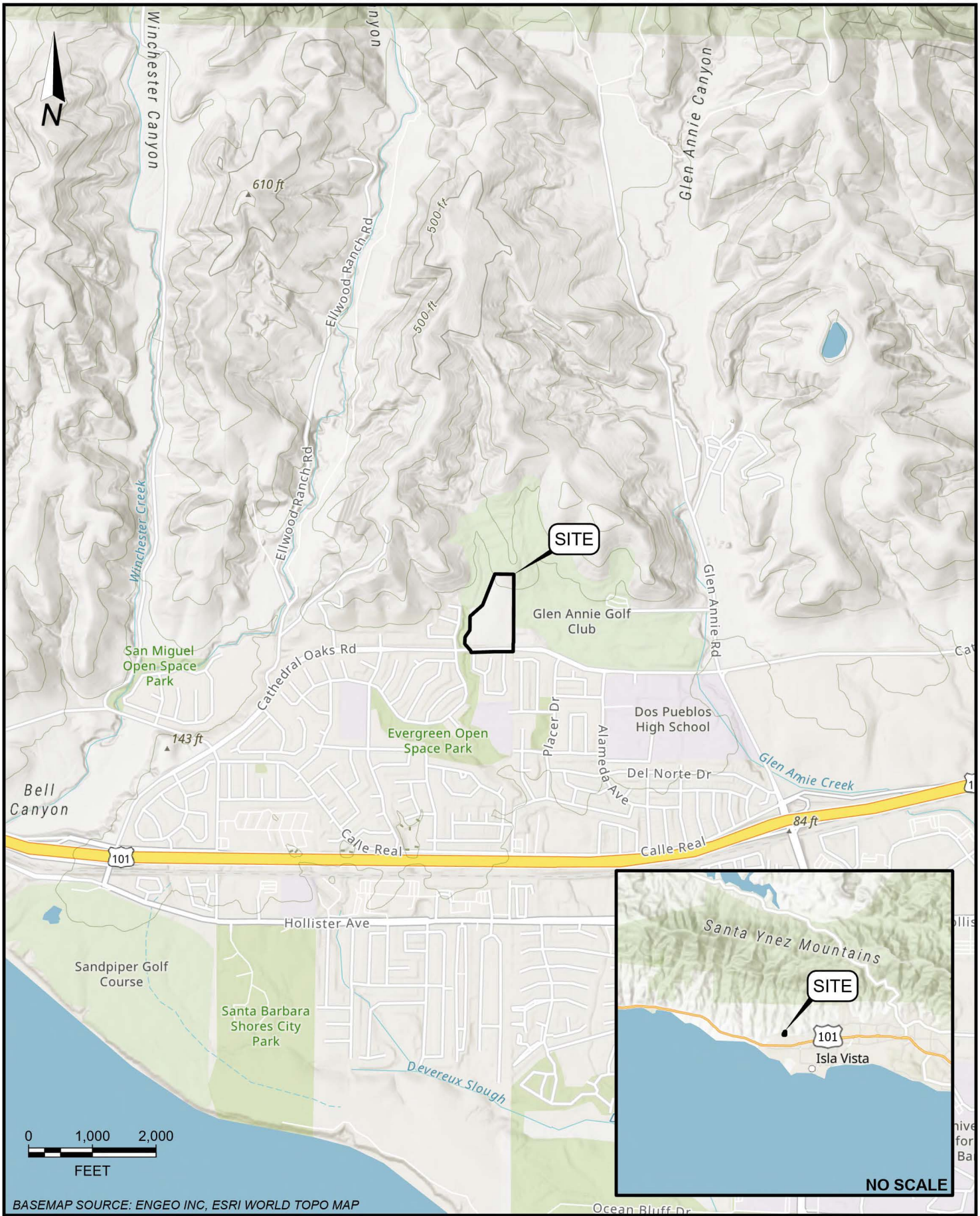
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FIGURES

FIGURE 1: Vicinity Map
FIGURE 2: Site Plan
FIGURE 3: Cross Section A-A’
FIGURE 4: Regional Geologic Map
FIGURE 5: Regional Geologic Map
FIGURE 6: Regional Faulting and Seismicity Map
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FIGURE 8: California Geological Survey Landslide Inventory
FIGURE 9: Indoor Radon Potential
FIGURE 10: Corrective Grading Details
FIGURE 11: Typical Subdrain Details



BASEMAP SOURCE: ENGEO INC, ESRI WORLD TOPO MAP

ENGEO Expect Excellence

VICINITY MAP

7400 CATHEDRAL OAKS ROAD

GOLETA, CALIFORNIA

PROJECT NO.: 8724.001.000	FIGURE NO. 1
SCALE: AS SHOWN	
DRAWN BY: MMH	CHECKED BY: JJT

ORIGINAL FIGURE PRINTED IN COLOR

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PATH: G:\DRAFTING\PROJECTS\8724\8724001000\GEX\GIS\7400 CATHEDRAL OAKS ROAD.APRX
LAYOUT: 01. VICINITY 8.5 X 11 PORTRAIT USER: MHAWKINS



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SITE PLAN

7400 CATHEDRAL OAKS ROAD

GOLETA, CALIFORNIA

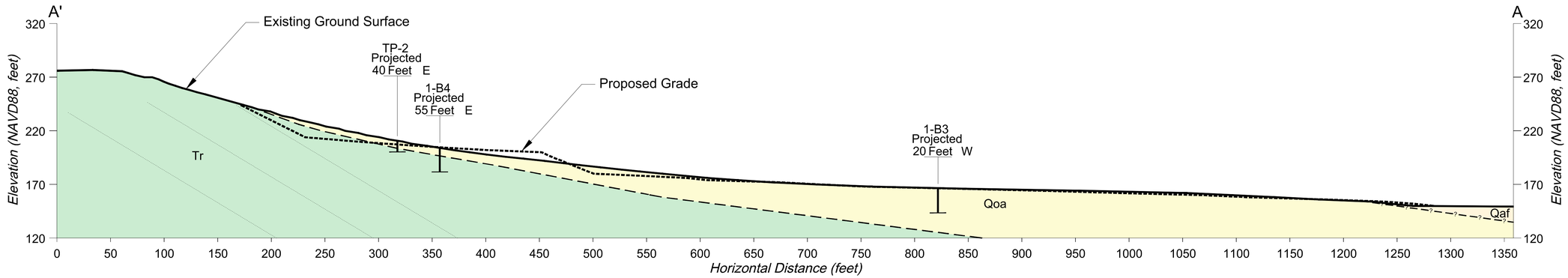
PROJECT NO.:	8724.001.000
SCALE:	AS SHOWN
DRAWN BY: MMH	CHECKED BY: JJT

FIGURE NO. 2

ORIGINAL FIGURE PRINTED IN COLOR

PATH: G:\DRAFTING\PROJECTS\8724\8724001000\GEX\GIS\7400 CATHEDRAL OAKS ROAD.APRX
LAYOUT: 02. SITE PLAN 8.5 X 11 PORTRAIT USER: MHAWKINS

Cross Section A-A'



Legend

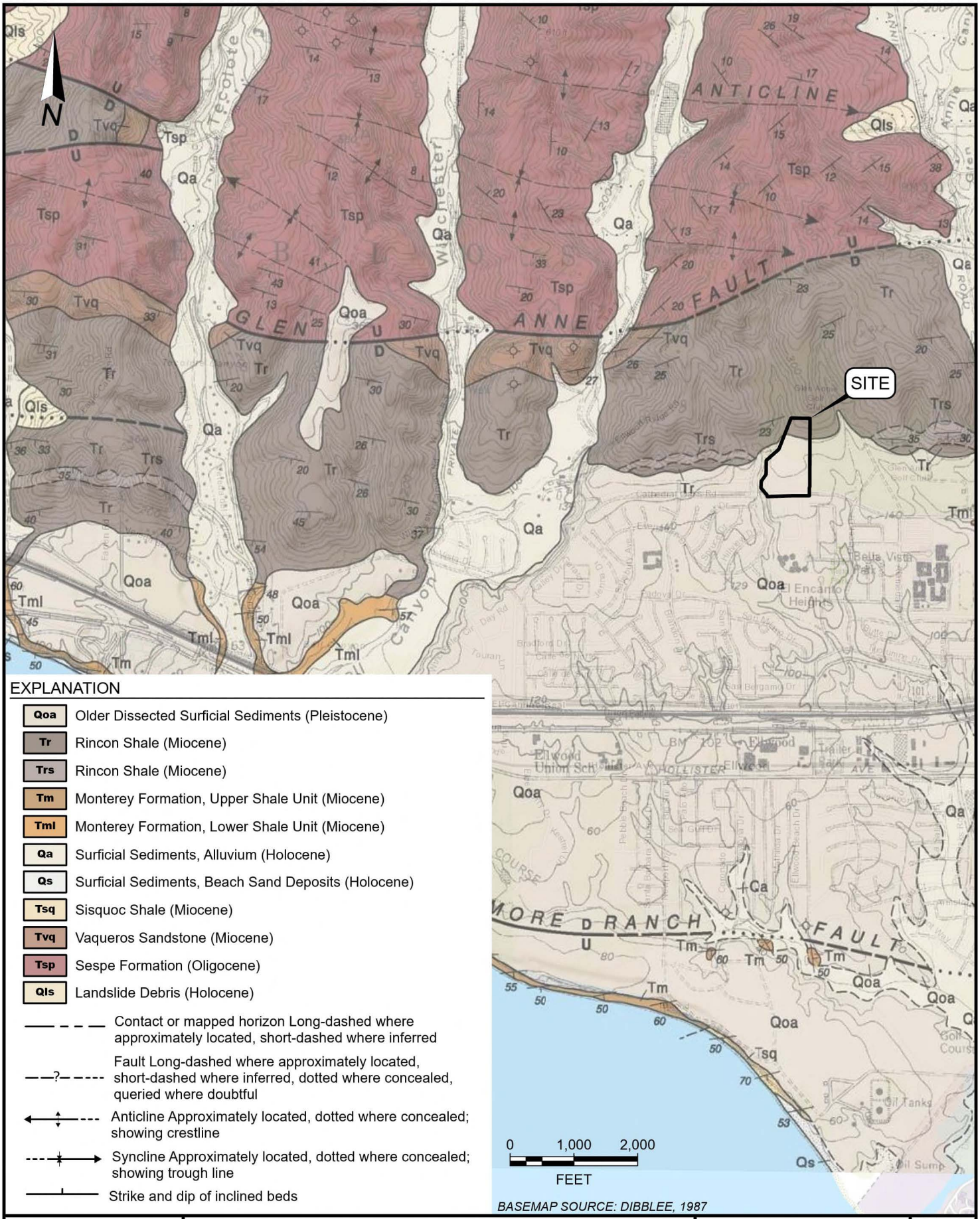
Qaf	Artificial Fill	———	Existing Ground Surface
Qoa	Old Alluvium	- - - - - -	Proposed Ground Surface
Tr	Rincon Formation	— — — — — ——?——?——	Geologic Contact, dashed where approximate queried where inferred
1-BX	Boring (ENGEO, 2011)	///	Apparent Dip of Bedding
TP-X	Test Pit (ENGEO, 2011)		

Disclaimer: Cross Section Is For Illustration Purposes Only. The Transition Between Materials May Be Abrupt Or Gradual. Variations Should Be Expected.

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ENGEO Expect Excellence	CROSS SECTION A-A' 7400 CATHEDRAL OAKS ROAD GOLETA, CALIFORNIA	PROJECT NO.: 8724.001.000 SCALE: AS SHOWN DRAWN BY: LL CHECKED BY: JTT	FIGURE NO. 3

ORIGINAL FIGURE PRINTED IN COLOR



EXPLANATION

Qoa	Older Dissected Surficial Sediments (Pleistocene)
Tr	Rincon Shale (Miocene)
Trs	Rincon Shale (Miocene)
Tm	Monterey Formation, Upper Shale Unit (Miocene)
Tml	Monterey Formation, Lower Shale Unit (Miocene)
Qa	Surficial Sediments, Alluvium (Holocene)
Qs	Surficial Sediments, Beach Sand Deposits (Holocene)
Tsq	Sisquoc Shale (Miocene)
Tvq	Vaqueros Sandstone (Miocene)
Tsp	Sespe Formation (Oligocene)
Qls	Landslide Debris (Holocene)

Contact or mapped horizon Long-dashed where approximately located, short-dashed where inferred

Fault Long-dashed where approximately located, short-dashed where inferred, dotted where concealed, queried where doubtful

Anticline Approximately located, dotted where concealed; showing crestline

Syncline Approximately located, dotted where concealed; showing trough line

Strike and dip of inclined beds

BASEMAP SOURCE: DIBBLEE, 1987

ENGEO Expect Excellence

REGIONAL GEOLOGIC MAP

7400 CATHEDRAL OAKS ROAD

GOLETA, CALIFORNIA

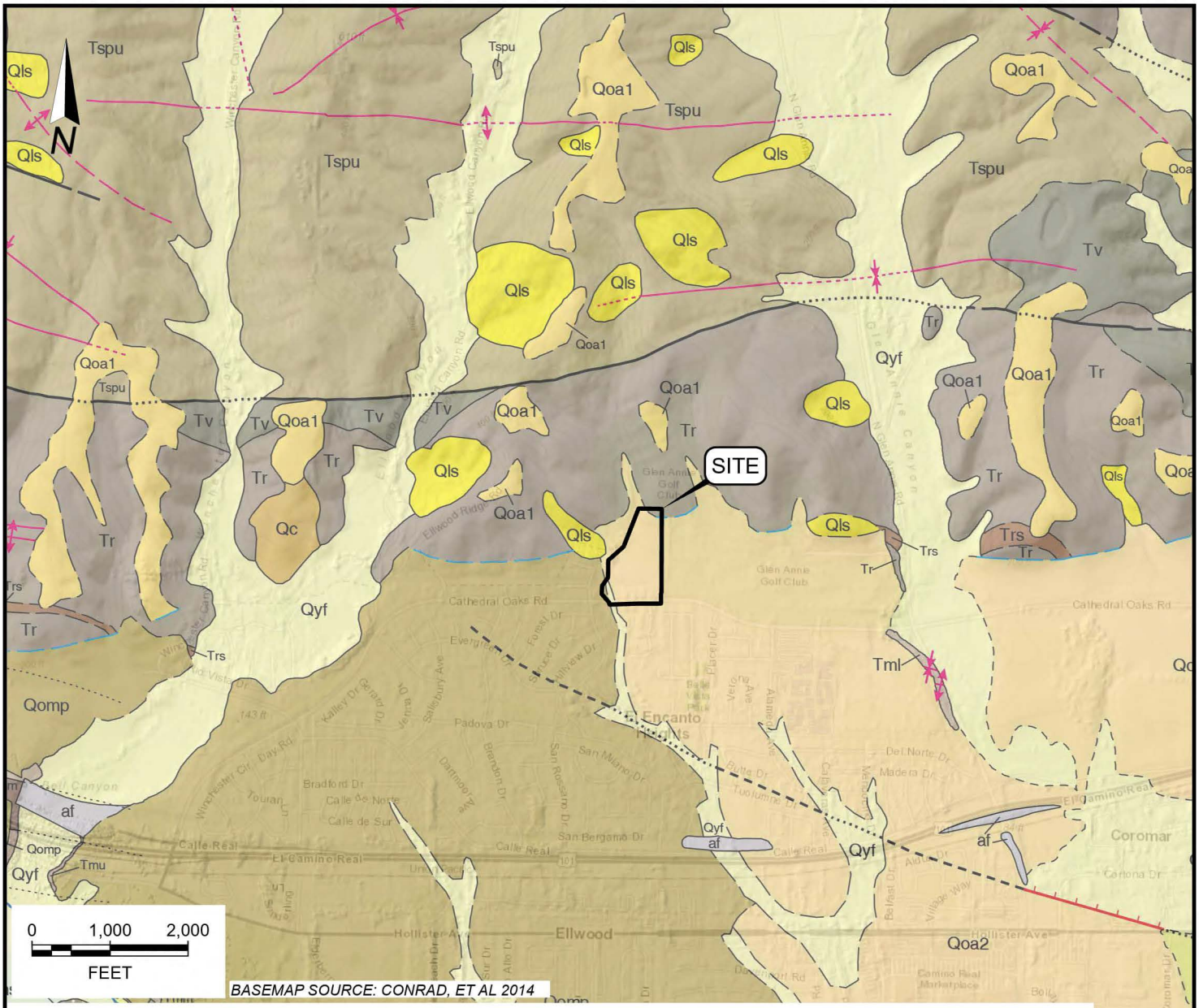
PROJECT NO.:	8724.001.000
SCALE:	AS SHOWN
DRAWN BY: MMH	CHECKED BY: JJT

FIGURE NO. 4

ORIGINAL FIGURE PRINTED IN COLOR

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PATH: G:\DRAFTING\PROJECTS\8724\8724001000\GEX\GIS\7400 CATHEDRAL OAKS ROAD.APRX
LAYOUT: 04. GEOLOGIC DIBLEE USER: MHAWKINS



EXPLANATION

af	Artificial Fill (late Holocene)
Qyf	Alluvium and Colluvium (Holocene and late Pleistocene)
Qoa2	Intermediate-Age Alluvial Deposits (late Pleistocene)
Qoa1	Older Alluvial Deposits (late and middle Pleistocene)
Qomp	Marine-Terrace Deposits (Late Pleistocene)
Qls	Landslide Deposits (Holocene to middle Pleistocene)
Tr	Rincon Shale (early Miocene)
Tv	Vaqueros Formation (late Oligocene)
Qc	Colluvium (Holocene and late Pleistocene)
Trs	Siliceous Shale Interval (early Miocene)
Tspu	Upper Sandstone and Mudstone Unit (late Oligocene)
Tmm	Middle Shale Unit (late and middle Miocene)
Tml	Lower Calcareous Unit (middle and early Miocene)
Qes	Coastal-Estuarine Deposits (Holocene)
Qds	Dune Sand (Holocene)
Qb	Beach Deposits (late Holocene)
Tmu	Upper Siliceous Unit (late Miocene)
Tsq	Sisquoc Formation (early Pliocene and late Miocene)

Contact or mapped horizon Long-dashed where approximately located, short-dashed where inferred

Fault Long-dashed where approximately located, short-dashed where inferred, dotted where concealed, queried where doubtful

Anticline Approximately located, dotted where concealed; showing crestline

Syncline Approximately located, dotted where concealed; showing trough line

Strike and dip of inclined beds

ENGEO
Expect Excellence

REGIONAL GEOLOGIC MAP

7400 CATHEDRAL OAKS ROAD

GOLETA, CALIFORNIA

PROJECT NO.: 8724.001.000

SCALE: AS SHOWN

DRAWN BY: MMH | CHECKED BY: JJT

FIGURE NO. 5

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LAYOUT: 05. GEOLOGIC CONRAD USER: MHAWKINS

ORIGINAL FIGURE PRINTED IN COLOR

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EXPLANATION

HISTORICAL EARTHQUAKE EPICENTERS

- Magnitude 5-6
- Magnitude 6-7
- Magnitude 7+
- Historical Blind Thrust Fault Zone

QUATERNARY FAULTS 2018-2020

Based on time of most recent surface deformation

- Historical (<150 Years), Well Constrained Location
- Historical (<150 Years), Moderately Constrained Location
- Historical (<150 Years), Inferred Location
- Latest Quaternary (<15,000 Years), Well Constrained Location
- Latest Quaternary (<15,000 Years), Moderately Constrained Location
- Latest Quaternary (<15,000 Years), Inferred Location
- Late Quaternary (<130,000 Years), Well Constrained Location
- Late Quaternary (<130,000 Years), Moderately Constrained Location
- Late Quaternary (<130,000 Years), Inferred Location
- Middle And Late Quaternary (<750,000 Years), Well Constrained Location
- Middle And Late Quaternary (<750,000 Years), Moderately Constrained Location
- Middle And Late Quaternary (<750,000 Years), Inferred Location
- Undifferentiated Quaternary(<1.6 Million Years), Well Constrained Location
- Undifferentiated Quaternary(<1.6 Million Years), Moderately Constrained Location
- Undifferentiated Quaternary(<1.6 Million Years), Inferred Location
- Class B (Various Age), Well Constrained Location
- Class B (Various Age), Moderately Constrained Location
- Class B (Various Age), Inferred Location

BASE MAP SOURCE: ESRI, GEBCO, GARMIN, NATURALVUE, CALIFORNIA STATE PARKS, ESRI, TOMTOM, GARMIN, SAFEGRAPH, FAO, METI/NASA, USGS, BUREAU OF LAND MANAGEMENT, EPA, NPS, USFWS
COLOR HILLSHADE IMAGE BASED ON THE NATIONAL ELEVATION DATA SET (NED) AT 30 METER RESOLUTION
U.S.G.S. QUATERNARY FAULT DATABASE, 2020
C.G.S. HISTORIC EARTHQUAKE DATABASE

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REGIONAL FAULTING & SEISMICITY MAP

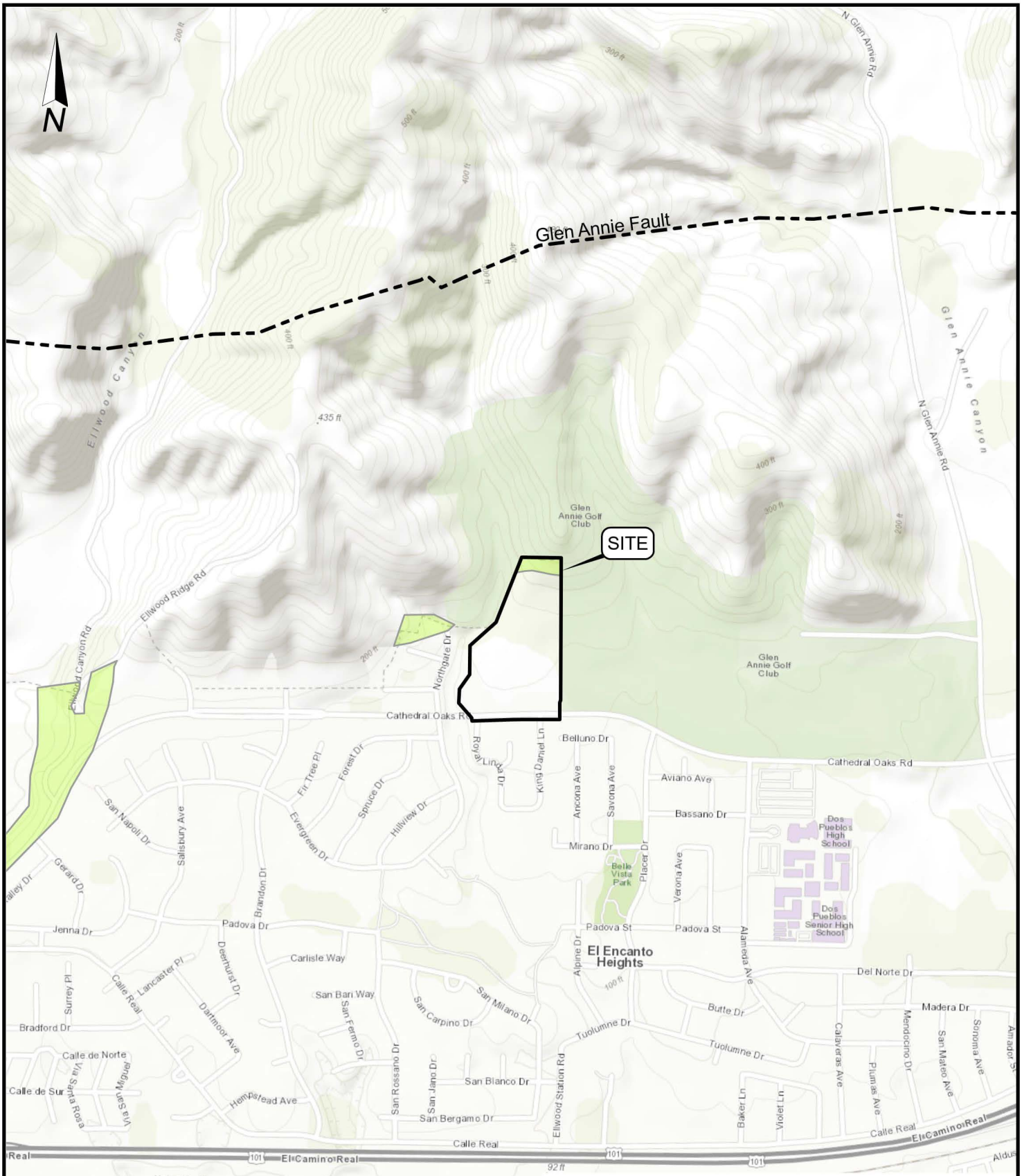
7400 CATHEDRAL OAKS ROAD

GOLETA, CALIFORNIA

PROJECT NO.: 8724.001.000	FIGURE NO. 6
SCALE: AS SHOWN	
DRAWN BY: MMH	CHECKED BY: JJT

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PATH: G:\DRAFTING\PROJECTS\8724\8724001000\GEX\GIS\7400 CATHEDRAL OAKS ROAD.APRX
LAYOUT: 06. FAULT&SEISMICITY 11 X 17 LANDSCAPE USER: MHAWKINS



0 500 1,000
FEET

BASEMAP SOURCE: ESRI WORLD TOPO MAP, CITY OF GOLETA 2009

EXPLANATION

- Fault Zone
- High Landslide Potential

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CITY OF GOLETA GEOLOGIC HAZARDS MAP

7400 CATHEDRAL OAKS ROAD

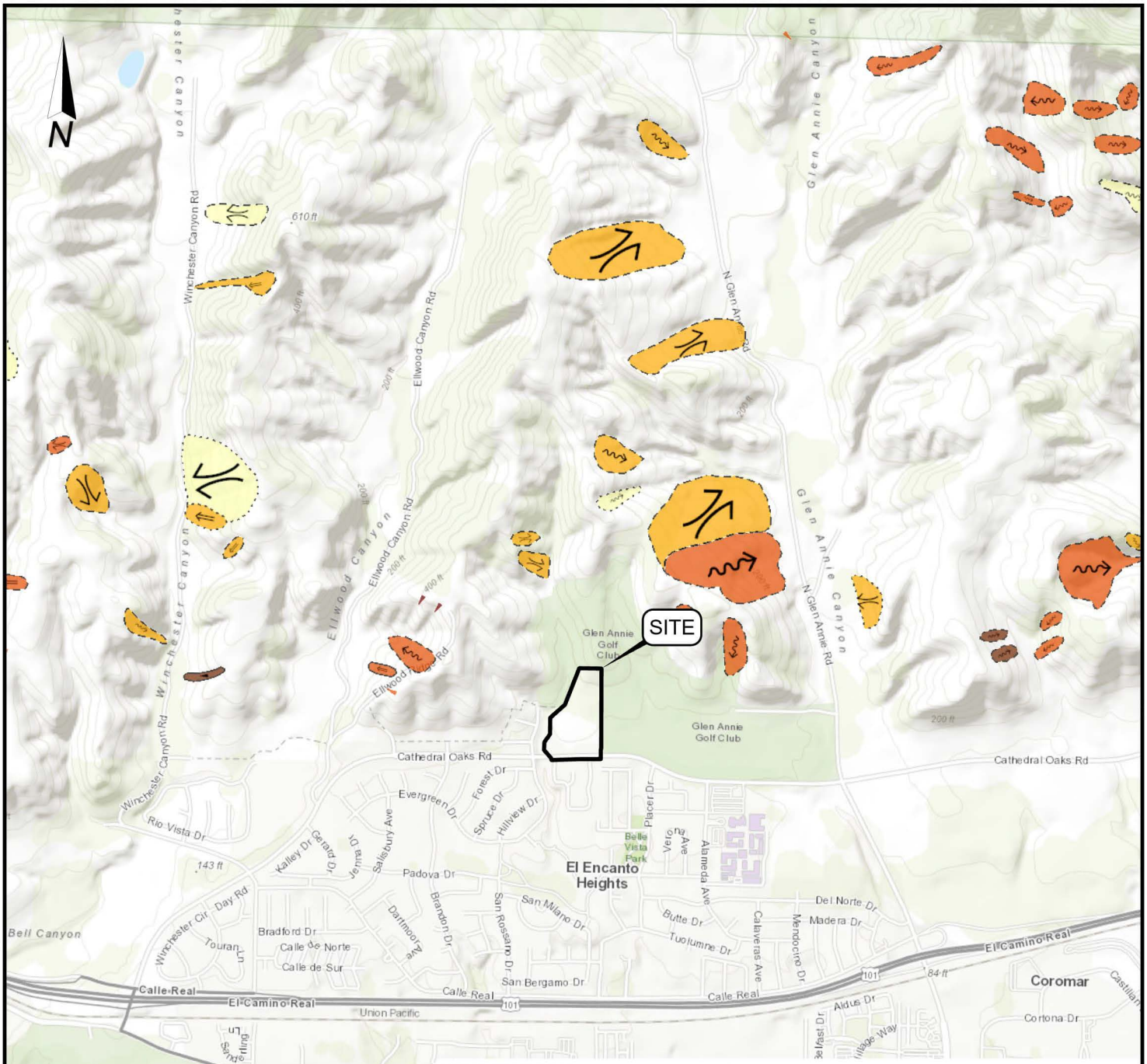
GOLETA, CALIFORNIA

PROJECT NO.: 8724.001.000	FIGURE NO. 7
SCALE: AS SHOWN	
DRAWN BY: MMH	CHECKED BY: JJT

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LAYOUT: 07. GOLETA HAZARDS MAP USER: MHAWKINS

ORIGINAL FIGURE PRINTED IN COLOR



BASEMAP SOURCE: ESRI WORLD TOPO MAP, CALIFORNIA GEOLOGICAL SURVEY (CGS)

EXPLANATION

Landslide

- Dormant Mature, Probable
- Dormant Mature, Questionable
- Dormant Old/Relict, Probable
- Dormant Old/Relict, Questionable
- Historic, Definite
- Historic, Probable
- Dormant Young, Definite
- Dormant Young, Probable

Landslide Debris Flows

- Debris Flow; Active/Historic
- Debris Flow; Dormant Young

Landslide Features - Direction of Movement

- debris flow
- debris slide
- earth flow
- rock slide

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CALIFORNIA GEOLOGICAL SURVEY LANDSLIDE INVENTORY

7400 CATHEDRAL OAKS ROAD

GOLETA, CALIFORNIA

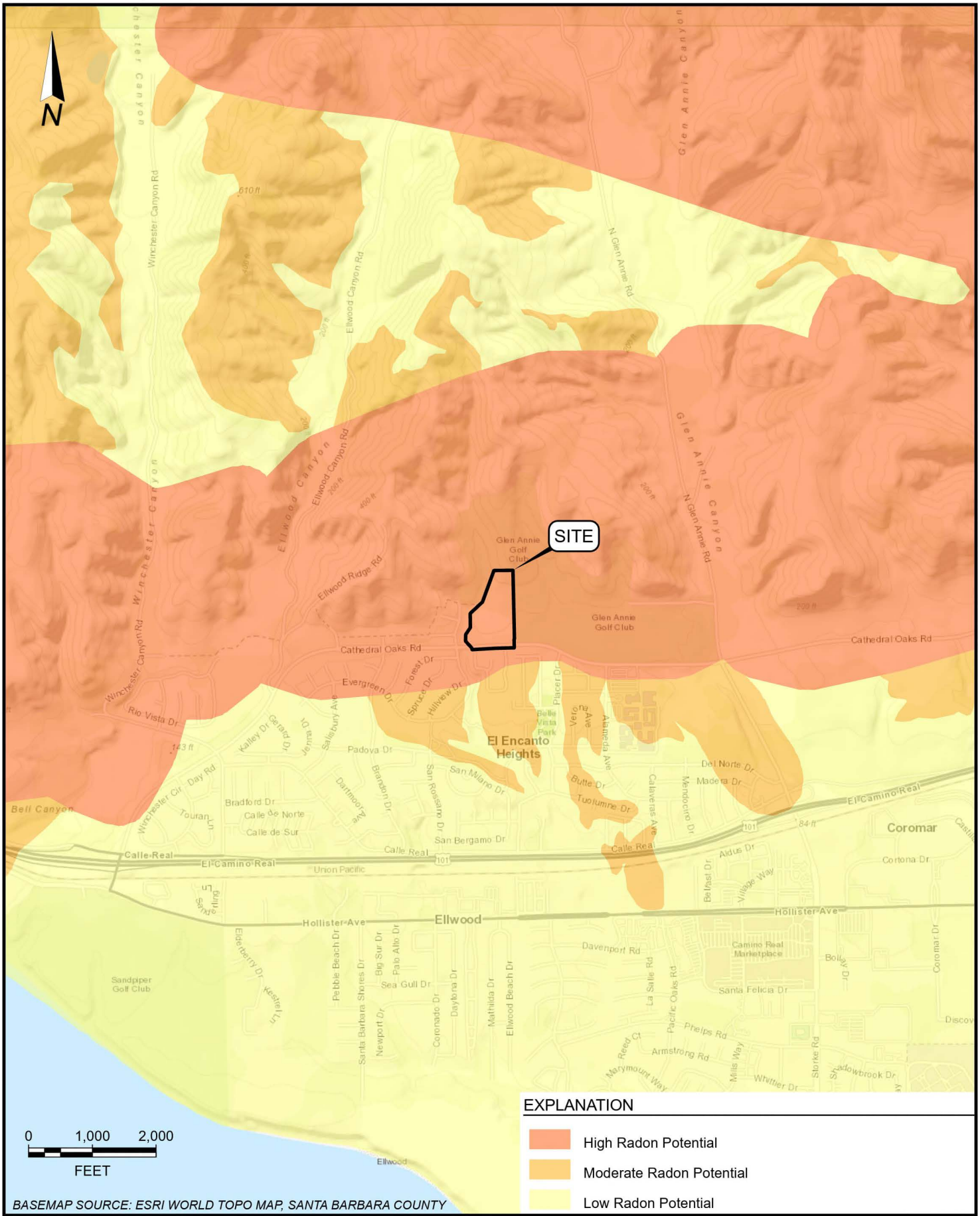
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SCALE:	AS SHOWN
DRAWN BY: MMH	CHECKED BY: JJT

FIGURE NO. 8

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LAYOUT: 08. CGS LANDSLIDE USER: MHAWKINS



BASEMAP SOURCE: ESRI WORLD TOPO MAP, SANTA BARBARA COUNTY

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INDOOR RADON POTENTIAL

7400 CATHEDRAL OAKS ROAD

GOLETA, CALIFORNIA

PROJECT NO.:	8724.001.000
SCALE:	AS SHOWN
DRAWN BY: MMH	CHECKED BY: JJT

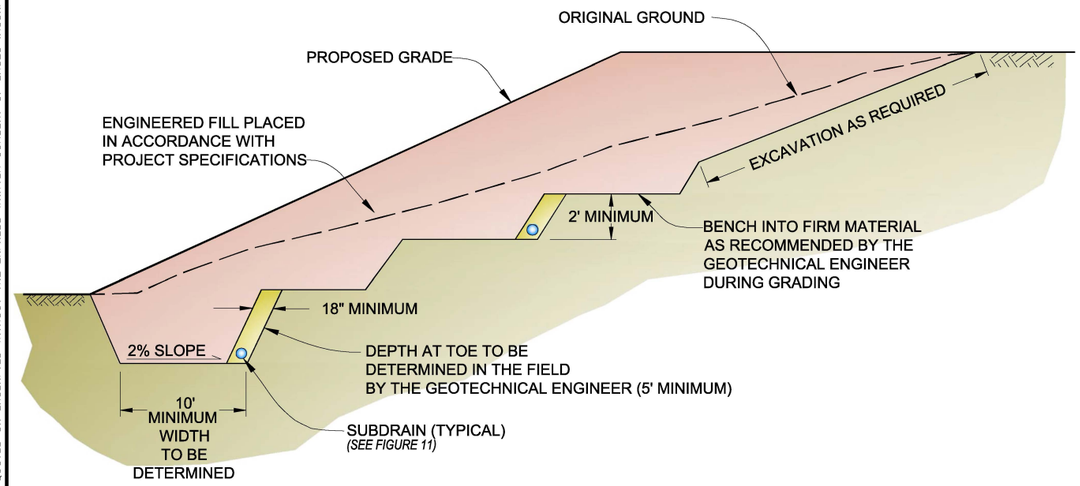
FIGURE NO. 9

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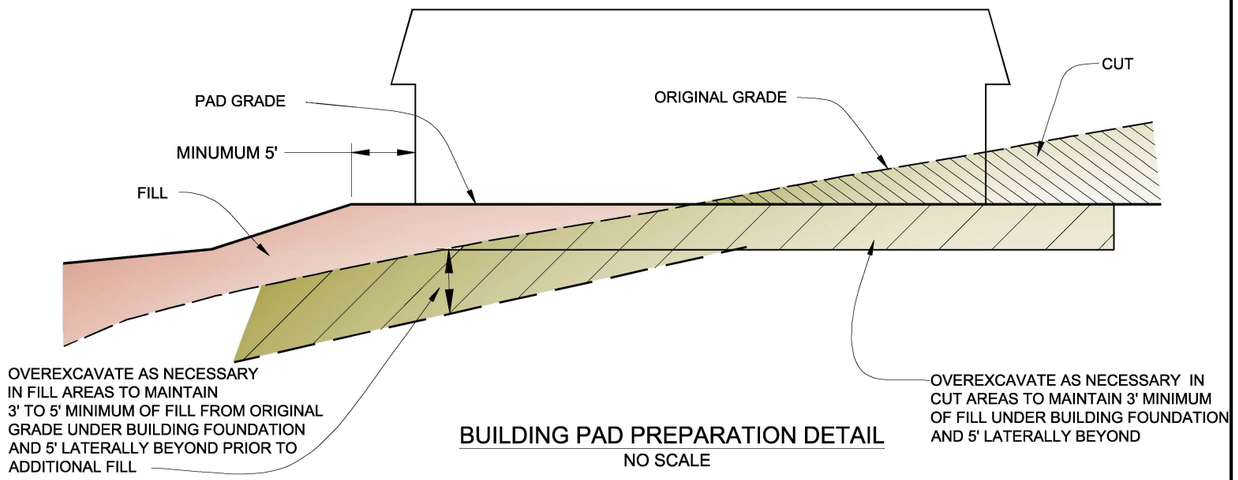
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LAYOUT: 09. INDOOR RADON POTENTIAL USER: MHAWKINS

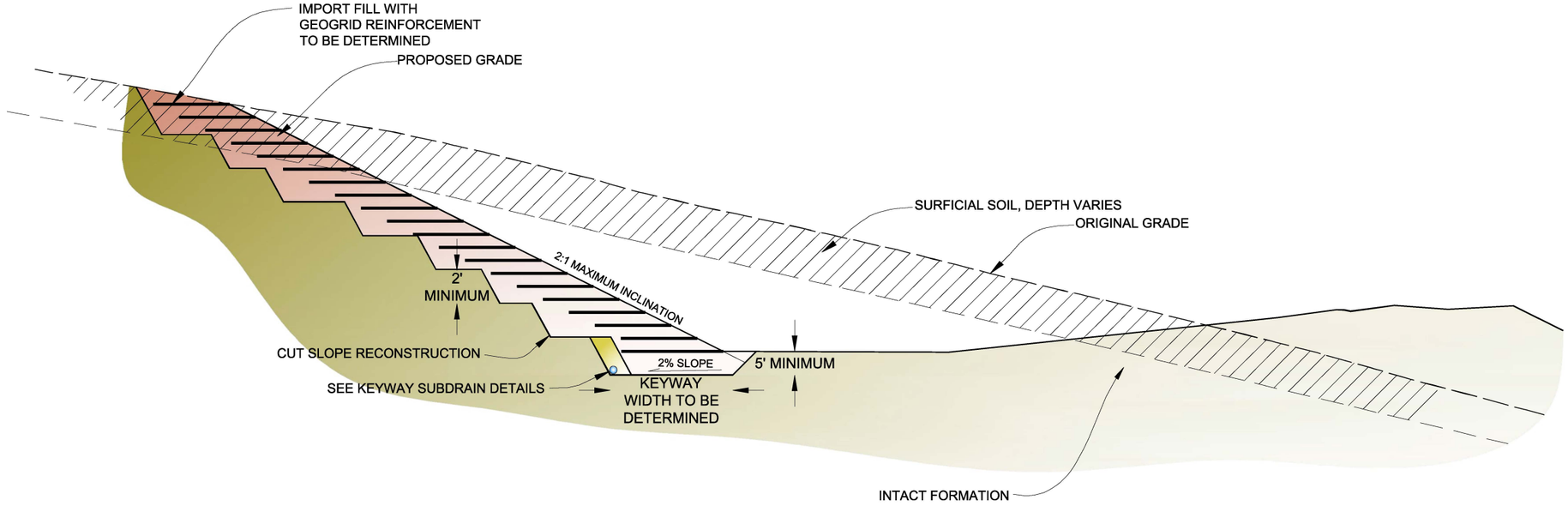
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TYPICAL KEYWAY DETAIL
NO SCALE



BUILDING PAD PREPARATION DETAIL
NO SCALE



2:1 CUT SLOPE REBUILD DETAIL
NO SCALE

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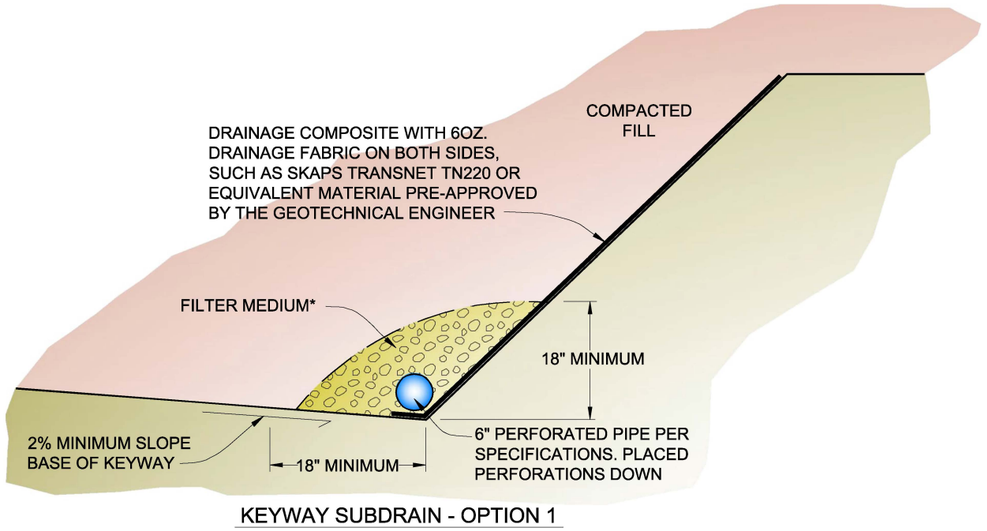
CORRECTIVE GRADING DETAILS
7400 CATHEDRAL OAKS ROAD
GOLETA, CALIFORNIA

PROJECT NO.: 8724.001.000	FIGURE NO. 10
SCALE: AS SHOWN	
DRAWN BY: NWC	CHECKED BY: RH

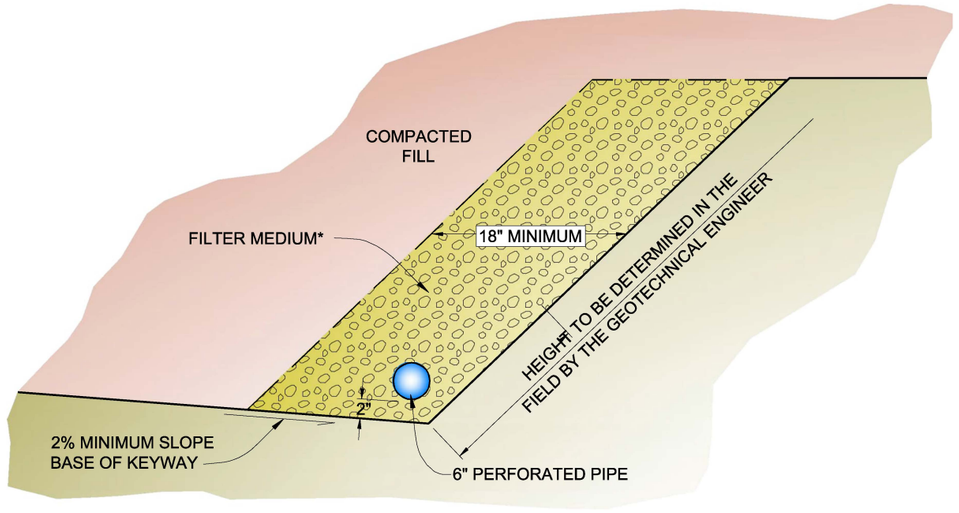
ORIGINAL FIGURE PRINTED IN COLOR

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KEYWAY SUBDRAIN - OPTION 1



KEYWAY SUBDRAIN - OPTION 2

*FILTER MEDIUM

ALTERNATIVE A

CLASS 2 PERMEABLE MATERIAL

MATERIAL SHALL CONSIST OF CLEAN, COARSE SAND AND GRAVEL OR CRUSHED STONE, CONFORMING TO THE FOLLOWING GRADING REQUIREMENTS:

SIEVE SIZE	% PASSING SIEVE
1"	100
3/4"	90-100
3/8"	40-100
#4	25-40
#8	18-33
#30	5-15
#50	0-7
#200	0-3

ALTERNATIVE B

CLEAN CRUSHED ROCK OR GRAVEL WRAPPED IN FILTER FABRIC

ALL FILTER FABRIC SHALL MEET THE FOLLOWING MINIMUM AVERAGE ROLL VALUES UNLESS OTHERWISE SPECIFIED BY ENGEO:

GRAB STRENGTH (ASTM D-4632)	180 lbs
MASS PER UNIT AREA (ASTM D-4751)	6 oz/yd^2
APPARENT OPENING SIZE (ASTM D-4751)	70-100 U.S. STD. SIEVE
FLOW RATE (ASTM D-4491)	80 gal/min/ft
PUNCTURE STRENGTH (ASTM D-4833)	80 lbs

NOTES:

1. ALL PIPE JOINTS SHALL BE GLUED
2. ALL PERFORATED PIPE PLACED PERFORATIONS DOWN
3. 1% FALL (MINIMUM) ON ALL TRENCHES AND DRAIN LINES
4. PERFORATED PIPE REQUIREMENTS:

PIPE TYPE	STANDARD	TYPICAL SIZE (INCHES)	PIPE STIFFNESS (PSI)
BETWEEN 15 AND 50 FEET OF FINISHED GRADE			
PVC SDR 23.5	ASTM D3034	6	153
PVC SCHEDULE 40	ASTM D1785	6	135
BETWEEN 0 TO 15 FEET OF FINISHED GRADE			
PVC SDR 35	ASTM D3034	6	46

ENGEO Expect Excellence

TYPICAL SUBDRAIN DETAILS
7400 CATHEDRAL OAKS ROAD
GOLETA, CALIFORNIA

PROJECT NO.: 8724.001.000
SCALE: AS SHOWN
DRAWN BY: NWC CHECKED BY: RH
FIGURE NO. 11



APPENDIX A

BORING AND TEST PIT LOGS (2009)

KEY TO BORING LOGS

MAJOR TYPES			DESCRIPTION
COARSE-GRAINED SOILS MORE THAN HALF OF MAT'L LARGER THAN #200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LESS THAN 5% FINES	GW - Well graded gravels or gravel-sand mixtures GP - Poorly graded gravels or gravel-sand mixtures
		GRAVELS WITH OVER 12 % FINES	GM - Silty gravels, gravel-sand and silt mixtures GC - Clayey gravels, gravel-sand and clay mixtures
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LESS THAN 5% FINES	SW - Well graded sands, or gravelly sand mixtures SP - Poorly graded sands or gravelly sand mixtures
		SANDS WITH OVER 12 % FINES	SM - Silty sand, sand-silt mixtures SC - Clayey sand, sand-clay mixtures
FINE-GRAINED SOILS MORE THAN HALF OF MAT'L SMALLER THAN #200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50 % OR LESS		ML - Inorganic silt with low to medium plasticity CL - Inorganic clay with low to medium plasticity OL - Low plasticity organic silts and clays
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50 %		MH - Elastic silt with high plasticity CH - Fat clay with high plasticity OH - Highly plastic organic silts and clays
	HIGHLY ORGANIC SOILS		PT - Peat and other highly organic soils

For fine-grained soils with 15 to 29% retained on the #200 sieve, the words "with sand" or "with gravel" (whichever is predominant) are added to the group name.

For fine-grained soil with >30% retained on the #200 sieve, the words "sandy" or "gravelly" (whichever is predominant) are added to the group name.

GRAIN SIZES

U.S. STANDARD SERIES SIEVE SIZE				CLEAR SQUARE SIEVE OPENINGS			
200	40	10	4	3/4 "	3"	12"	
SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

RELATIVE DENSITY

SANDS AND GRAVELS	BLOWS/FOOT (S.P.T.)
VERY LOOSE	0-4
LOOSE	4-10
MEDIUM DENSE	10-30
DENSE	30-50
VERY DENSE	OVER 50

CONSISTENCY

SILTS AND CLAYS	STRENGTH*
VERY SOFT	0-1/4
SOFT	1/4-1/2
MEDIUM STIFF	1/2-1
STIFF	1-2
VERY STIFF	2-4
HARD	OVER 4

SAMPLER SYMBOLS

- Modified California (3" O.D.) sampler
- California (2.5" O.D.) sampler
- S.P.T. - Split spoon sampler
- Shelby Tube
- Continuous Core
- Bag Samples
- Grab Samples
- NR No Recovery

MOISTURE CONDITION

DRY	Dusty, dry to touch
MOIST	Damp but no visible water
WET	Visible freewater

LINE TYPES

- ———— Solid - Layer Break
- – – – – – Dashed - Gradational or approximate layer break

GROUND-WATER SYMBOLS

- Groundwater level during drilling
- Stabilized groundwater level

(S.P.T.) Number of blows of 140 lb. hammer falling 30" to drive a 2-inch O.D. (1-3/8 inch I.D.) sampler

* Unconfined compressive strength in tons/sq. ft., asterisk on log means determined by pocket penetrometer

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LOG OF BORING 1-B1

ENGEO INCORPORATED

Geotechnical Exploration
7400 Cathedral Oaks Road
Goleta, California
08724.000.000

DATE DRILLED: 6/4/2009
HOLE DEPTH: Approx. 51 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (MSL): Approx. 175 ft.

LOGGED / REVIEWED BY: P. Lam / PJS
DRILLING CONTRACTOR: Martini Drilling
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			Bare soil, woodchips, and dessication cracks at surface										
	1		SILTY CLAY (CL), very dark brown / dusky yellowish brown (10YR 2/2), medium stiff, moist, trace rootlets, (Qoa)			24					12.4		>4.5*
5			Stiff, moist			14							>4.5*
	2												
10	3		Reddish brown (5YR 4/3), stiff, moist, trace sand, trace charcoal, trace deeply weathered rock fragments (Qoa)			27					14.4	117.7	4.5*
	4												
15			SANDY CLAY (CL), yellowish brown (10YR 5/8), very stiff, moist, fine- to medium-grained sand, with rock fragments, trace charcoal (Qoa)			24							>4.5*
	5		Increased drilling resistance										
20	6		SILTY CLAY (CL), dark yellowish brown (10YR 4/6), stiff, moist, trace manganese staining on partings (Qoa)			24							
	7												
25			Reddish brown / moderate brown (5YR 4/4), very stiff, moist, trace rock fragments, trace caliche, trace manganese staining on partings, slight increase in relative moisture (Qoa)			45							4.0*
	8												

LOG - GEOTECHNICAL CATHEDRAL OAKS.GPJ ENGEO INC.GDT 2/22/11

LOG OF BORING 1-B1

ENGEO INCORPORATED

Geotechnical Exploration
7400 Cathedral Oaks Road
Goleta, California
08724.000.000

DATE DRILLED: 6/4/2009
HOLE DEPTH: Approx. 51 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (MSL): Approx. 175 ft.

LOGGED / REVIEWED BY: P. Lam / PJS
DRILLING CONTRACTOR: Martini Drilling
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
30	9		Dark yellowish brown (10YR 3/6), stiff, moist, trace fine-grained sand, trace rock fragments, trace charcoal up to 1/2-inch diameter, silty sand at shoe (Qoa)			26							3.5*
35	11		Very stiff, moist, trace fine-grained sand, trace charcoal, with carbonate filaments (Qoa)			41							3.5*
40	12		Very stiff, moist, trace sand, trace charcoal, trace carbonate filaments, carbonate-filled void at shoe (Qoa)			43							4.5*
45	14		Dark yellowish brown (10YR 4/6), stiff, moist, trace sand, trace manganese staining, trace carbonate filaments (Qoa)			24							3.5*
50	15		Stiff, moist, trace sand, trace carbonate filaments (Qoa)			21					23.3	101.1	3.5*
			Bottom of boring at approximately 51 feet below ground surface. Groundwater not encountered.										

LOG - GEOTECHNICAL CATHEDRAL OAKS.GPJ ENGEO INC.GDT 2/22/11

LOG OF BORING 1-B2

ENGEO INCORPORATED

Geotechnical Exploration
7400 Cathedral Oaks Road
Goleta, California
08724.000.000

DATE DRILLED: 6/4/2009
HOLE DEPTH: Approx. 22½ ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (MSL): Approx. 180 ft.

LOGGED / REVIEWED BY: P. Lam / PJS
DRILLING CONTRACTOR: Martini Drilling
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			Bare soil, woodchips, and dessication cracks at surface										
	1		SILTY CLAY (CL), very dark brown / dusky yellowish brown (10YR 2/2), medium stiff, moist, trace sand, trace gravel, trace rootlets, (A)			17					13.6		>4.5*
5			Medium stiff, moist, trace sand, slight increase in moisture from previous (A)			16							3-3.5*
	2												
10	3		Dark yellowish brown (10YR 3/6), stiff, moist, trace sand, slight increase in sand at shoe (Qoa)			21							4.5*
	4												
15			Brown (10YR 4/3), very stiff, moist, trace sand, trace manganese staining on partings (Qoa)			39					18	111.9	>4.5*
	5												
	6												
20			CLAYEY SILT (ML), dark yellowish brown (10YR 3/6), medium stiff, moist, with fine-grained sand, trace charcoal (Qoa)			16							4*
			SILTY CLAY (CL), dark yellowish brown (10YR 4/6), stiff to very stiff, moist, trace sand, (Qoa)			15					20.3		
			Bottom of boring at 22.5 feet below ground surface. No groundwater encountered.										

LOG OF BORING 1-B3

ENGEO INCORPORATED

Geotechnical Exploration
7400 Cathedral Oaks Road
Goleta, California
08724.000.000

DATE DRILLED: 6/4/2009
HOLE DEPTH: Approx. 21 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (MSL): Approx. 180 ft.

LOGGED / REVIEWED BY: P. Lam / PJS
DRILLING CONTRACTOR: Martini Drilling
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			Bare soil, woodchips, and dessication cracks at surface										
	1		SILTY CLAY (CL), dark brown (10YR 3/3), medium stiff, moist, trace sand, (Qaf)			17					17.8		2-2.5*
5			SILTY CLAY / CLAYEY SILT (CL-ML), yellowish red (5YR 4/6), medium stiff, moist, fine- to medium-grained sand, trace rock fragments, (Qaf)			11							
	2												
	3												
10			SILTY CLAY (CL), yellowish brown / moderate yellowish (10YR 5/4), medium stiff to stiff, moist, with angular rock fragments, rock fragments predominantly 1/4-inch diameter and up to 1-inch diameter, trace iron oxide staining (Qaf/Qoa)			18					19.3	102.7	3*
						16							
	4												
15			SILTY CLAY (CL), dark yellowish brown (10YR 4/6), medium stiff to stiff, moist, some fine-grained sand, trace charcoal (Qoa)			18							3*
	5												
	6												
20			Mottled with very dark brown / dusky yellowish brown (10YR 2/2), medium stiff, moist, trace sand, trace charcoal (Qoa)			16					22.2	102	3.5-4*
			Bottom of boring at 22.5 feet below ground surface. No groundwater encountered.										

LOG - GEOTECHNICAL CATHEDRAL OAKS.GPJ ENGEO INC.GDT 2/22/11

LOG OF BORING 1-B4

ENGEO INCORPORATED

Geotechnical Exploration
7400 Cathedral Oaks Road
Goleta, California
08724.000.000

DATE DRILLED: 6/4/2009
HOLE DEPTH: Approx. 21 ft.
HOLE DIAMETER: 6.0 in.
SURF ELEV (MSL): Approx. 195 ft.

LOGGED / REVIEWED BY: P. Lam / PJS
DRILLING CONTRACTOR: Martini Drilling
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			Bare soil and dessication cracks at surface.										
	1		SILTY CLAY (CH), black (10YR 2/1), stiff, moist, trace sand, (A)			9	74	21	53	99			2.5*
5			Brownish yellow / dark yellowish orange (10YR 6/6), stiff, moist, trace rock fragments, trace carbonate filaments, rock fragments consist of Rincon Formation (A)			22							3.5*
	2												
			Color change in cuttings.										
10	3		SHALE, weak (R2), very closely fractured, very thin bedding, completely weathered (WC) to highly weathered (WH), yellowish brown (10YR 5/8) and grayish brown (10YR 5/2), crystalline gypsum veinlet in sample (Tr)			33					27.7	96.3	>4.5* 3.8
	4												
15			Massive, with gypsum (Tr)			21							>4.5*
	5												
20	6		Very closely fractured to crushed, with gypsum (Tr)			18					30.5	101.6	>4.5*
			Bottom of boring at 22.5 feet below ground surface. No groundwater encountered.										

TEST PIT LOGS

7400 Cathedral Oaks Rd. Goleta, CA 8724.000.000	Logged By: P. Lam Logged Date: June 4, 2009

Test Pit Number	Depth (Feet)	Description
1-TP-1	0-5	Silty CLAY (CL), very dark brown, moist, trace gravel, trace sand, with organics, gradational contact with below (A).
	5-7	Silty CLAY (CL), light yellowish brown mottled with caliche, moist, trace gravel, illuviated soil fills partings down to 7 feet (Qoa).
		Bottom at approximately 7 feet. No groundwater encountered.
1-TP-2	0-5	Silty CLAY (CL), very dark brown, moist, trace gravel, trace sand, trace pale yellow sandstone pebbles, gradational contact with below, shrink-swell shears at 3 feet (A).
	5-7	Silty CLAY (CL), light yellowish brown, moist, trace carbonate veinlets, illuviated soil fills partings up to ½-inch wide (Qoa).
	7-10	SHALE, grayish brown, moist, friable to weak, very closely to closely fractured, laminated to very thin bedding, highly weathered, anastomosing weathering rinds (Rincon, Tr). Bedding 80, 35S.
		Bottom at approximately 10 feet. No groundwater encountered.
1-TP-3	0-3	Silty CLAY (CL), dark yellowish brown, moist, trace wood, sharp contact with below (Fill).
	3-8	Silty CLAY (CL), very dark brown, moist, gradational contact with below (A).
	8-9	Silty CLAY (CL), dark yellowish brown, logged from above (Qoa).
		Bottom at approximately 9 feet. No groundwater encountered.

TEST PIT LOGS

7400 Cathedral Oaks Rd. Goleta, CA 8724.000.000	Logged By: P. Lam Logged Date: June 4, 2009

Test Pit Number	Depth (Feet)	Description
1-TP-4	0-3	Silty CLAY (CL), dark yellowish brown mottled with very dark brown, moist, trace wood, sharp contact with below, contact increases in depth to approximately 5 feet at south end of excavation (Fill)
	3-7	Silty CLAY (CL), very dark brown, moist (A). Bottom at approximately 7 feet. No groundwater encountered.
1-TP-5	0-2	Sand (SP), dark yellowish brown, excavation terminated due to potential proximity to gas line, excavation is approximately 15 feet from gas line markings (Fill). Bottom at approximately 2 feet. No groundwater encountered.



APPENDIX B

LABORATORY TEST DATA (2009)

ENGEO INCORPORATED

EXPANSION INDEX TEST REPORT
ASTM D 4829

PROJECT NAME: **Cathedral Oaks Goleta** REPORT DATE: 6/16/09

CLIENT:

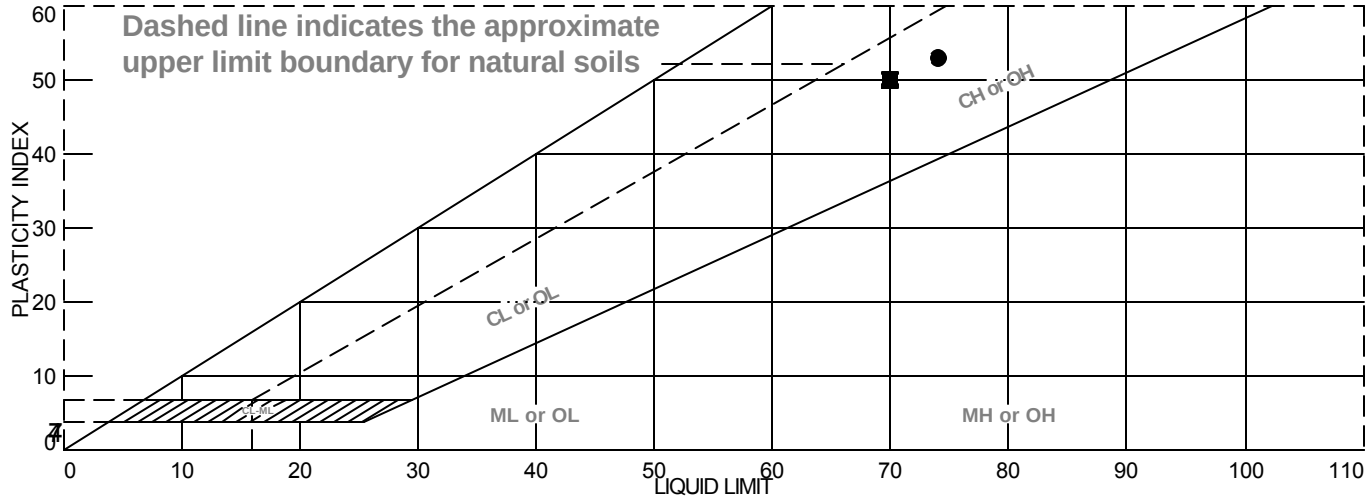
PROJECT NO.: 8724.000.000 TESTED BY: SN

Sample ID	Soil Description	Initial Dry Density (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)	Expansion Index
TP-3 @ 3.0 ft	Dark Gray Clay	97.9 pcf	11.90%	25.40%	90

CLASSIFICATION OF EXPANSIVE SOIL

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

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Very dark gray CLAY	74	21	53		99.1	CH
■	Olive brown CLAYSTONE	70	20	50		98.7	CH

Project No. 8724.000.000 **Client:**

Project: 7400 Cathedral Oaks Road. Goleta, CA

● **Sample Number:** B4 @ 2.5

■ **Sample Number:** TP2 @ 10

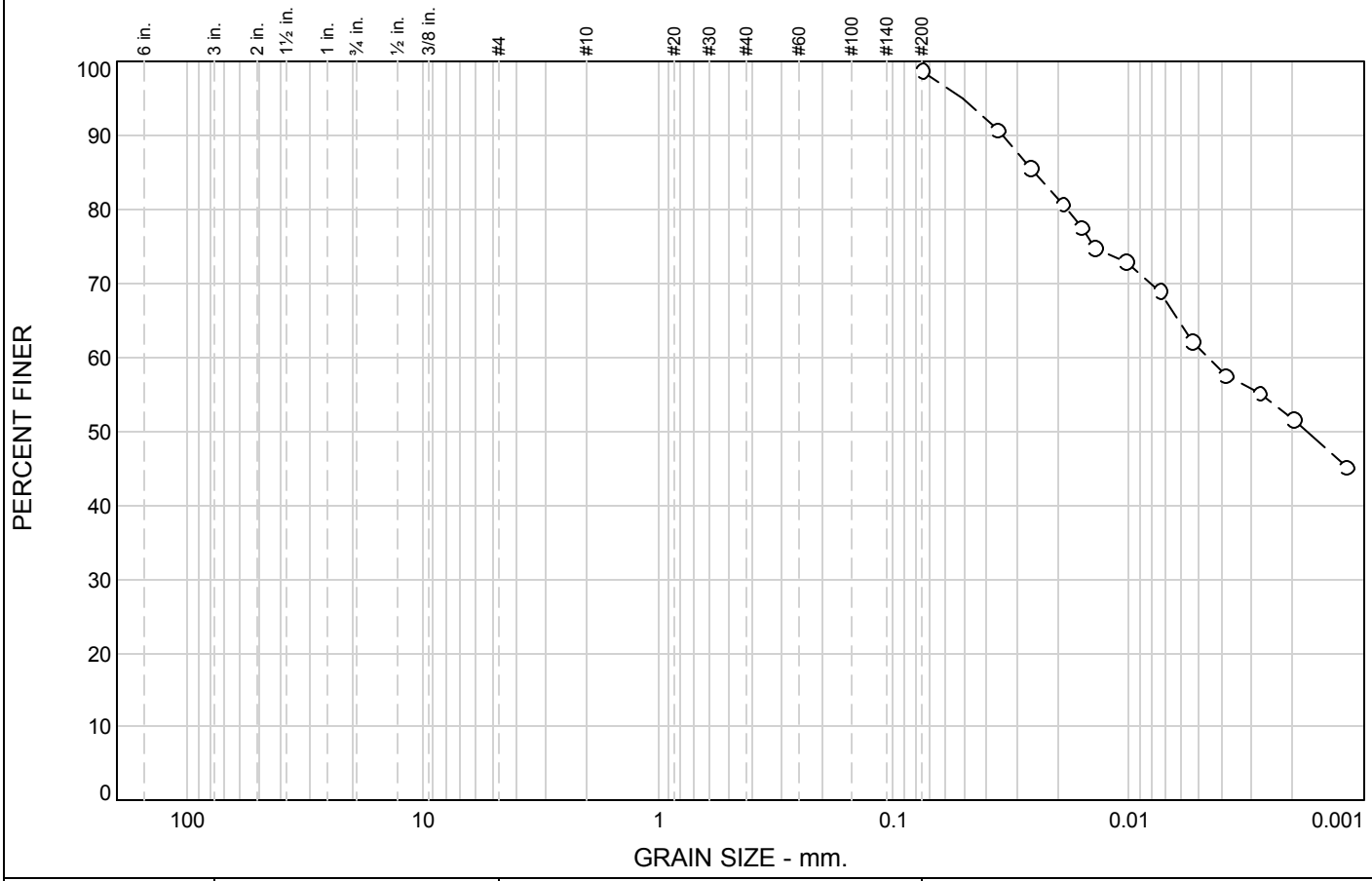
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Remarks:

Plate

Tested By: GC **Checked By:** RC

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						47.1	51.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	98.7		
0.0359 mm.	90.6		
0.0262 mm.	85.4		
0.0190 mm.	80.6		
0.0157 mm.	77.5		
0.0138 mm.	74.8		
0.0102 mm.	72.8		
0.0073 mm.	69.0		
0.0054 mm.	62.0		
0.0039 mm.	57.4		
0.0028 mm.	55.1		
0.0020 mm.	51.4		
0.0012 mm.	45.1		

* (no specification provided)

Soil Description

Olive brown CLAY

Atterberg Limits

PL= 20 LL= 70 PI= 50

Coefficients

D_{85}= 0.0255 D_{60}= 0.0048 D_{50}= 0.0018
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

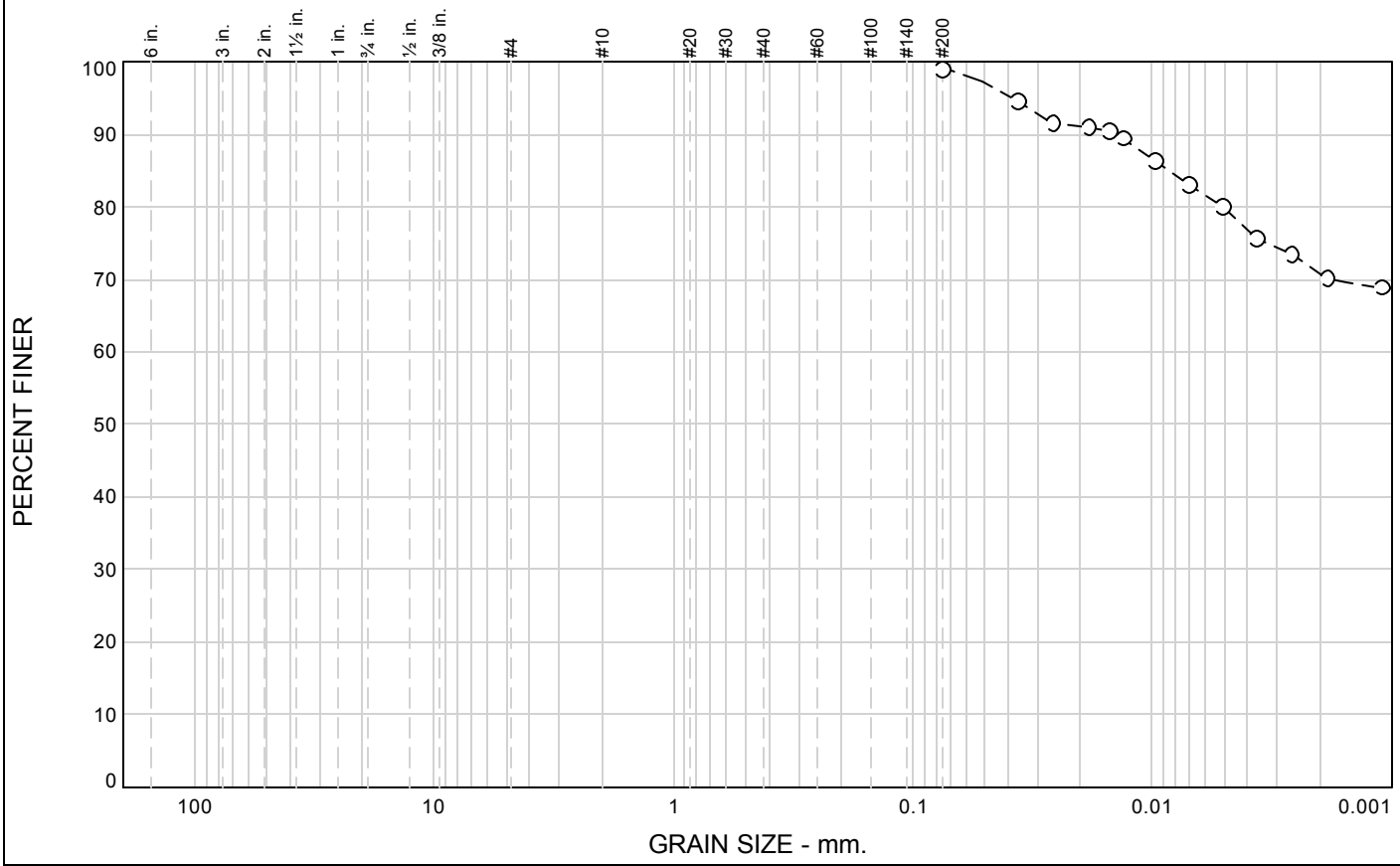
Remarks

Sample No.: TP2 @ 10 **Source of Sample:** **Date:** 6-12-09
Location: **Elev./Depth:**

ENGEO INCORPORATED
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
MATERIALS TESTING

Client:
Project: 7400 Cathedral Oaks Road. Goleta, CA
Project No: 8724.000.000 **Plate**

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						28.4	70.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	99.1		
0.0362 mm.	94.6		
0.0260 mm.	91.5		
0.0185 mm.	90.9		
0.0151 mm.	90.5		
0.0132 mm.	89.5		
0.0098 mm.	86.4		
0.0070 mm.	83.1		
0.0050 mm.	80.0		
0.0037 mm.	75.6		
0.0026 mm.	73.4		
0.0019 mm.	70.1		
0.0011 mm.	68.9		

* (no specification provided)

Soil Description

Very dark gray CLAY

Atterberg Limits

PL= 21 LL= 74 PI= 53

Coefficients

D_{85}= 0.0086 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

Sample No.: B4 @ 2.5 **Source of Sample:** **Date:** 6-12-09
Location: **Elev./Depth:**

ENGEO INCORPORATED — GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS — MATERIALS TESTING

Client:
Project: 7400 Cathedral Oaks Road. Goleta, CA

Project No: 8724.000.000 **Plate**

Tested By: RC **Checked By:** GC

*EN*GEO Incorporated

SULFATE TEST RESULTS

CALTRANS Test Method 417

Project Name: 7400 Cathedral Oaks Road Project Number: 8724.000.000

Tested By: GC Date: June 12, 2009

Measurements less than 15 mg/kg are reported as Not Detectable (ND)

Sample Number	Sample Location	Matrix	Water Soluble Sulfate (SO_4) in Soil	
			mg/kg	% by Weight
1	B2 @ 3.5	soil	3235	0.324



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