BREM 004 - 07-03-2014

BREM 40 B

PROJECT NOT YET NAMED
OFF LONG RIDGE ROAD
CARLISLE, MASSACHUSETTS

PRELIMINARY

STORMWATER MANAGEMENT REPORT

VOLUME 2 OF 2

STORMWATER MANAGEMENT DESIGN

July 1, 2014

PREPARED FOR:

LIFETIME GREEN HOMES, LLC
142 LITTLETON ROAD, WESTFORD, MA 01886

PREPARED BY:

MEISNER BREM CORPORATION
142 LITTLETON ROAD, STE. 16
WESTFORD, MA 01886

MBC JOB NUMBER: 2066

NO.	DATE	REVISION	BY
3			
2			
1			

MEISNER BREM CORPORATION
142 LITTLETON ROAD, STE. 16, WESTFORD, MA 01886

BREM 40B
PROJECT NOT YET NAMED, OFF LONG RIDGE ROAD, CARLISLE, MA

 2066

THE FOLLOWING REPORT HAS BEEN PREPARED UNDER THE SUPERVISION OF A REGISTERED PROFESSIONAL ENGINEER LICENSED IN THE COMMONWEALTH OF MASSACHUSETTS.

BREM 40 B

PROJECT NOT YET NAMED
OFF LONG RIDGE ROAD
CARLISLE, MASSACHUSETTS

Volume 2

STORMWATER MANAGEMENT DESIGN

BREM 40B
PROJECT NOT YET NAMED, OFF LONG RIDGE ROAD, CARLISLE, MA

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BREM 40B
PROJECT NOT YET NAMED, OFF LONG RIDGE ROAD, CARLISLE, MA

STORMWATER CHECKLIST

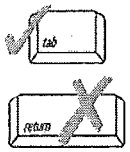
SEE FOLLOWING PAGES FOR MASS DEP STORMWATER CHECKLIST

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

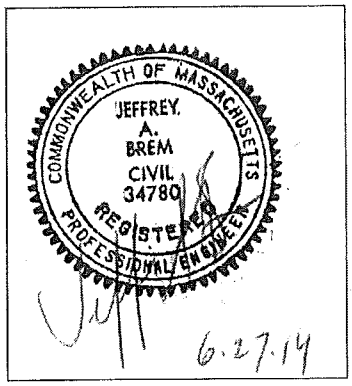
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Signature and Date 6/27/14

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☒ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☐ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☐ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☐ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☒ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☒ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

BREM 40B
PROJECT NOT YET NAMED, OFF LONG RIDGE ROAD, CARLISLE, MA

HYDROCAD WORKSHEETS - 2, 10, & 100 YEAR STORM EVENTS

SEE FOLLOWING PAGES FOR HYDROCAD PRINTOUTS

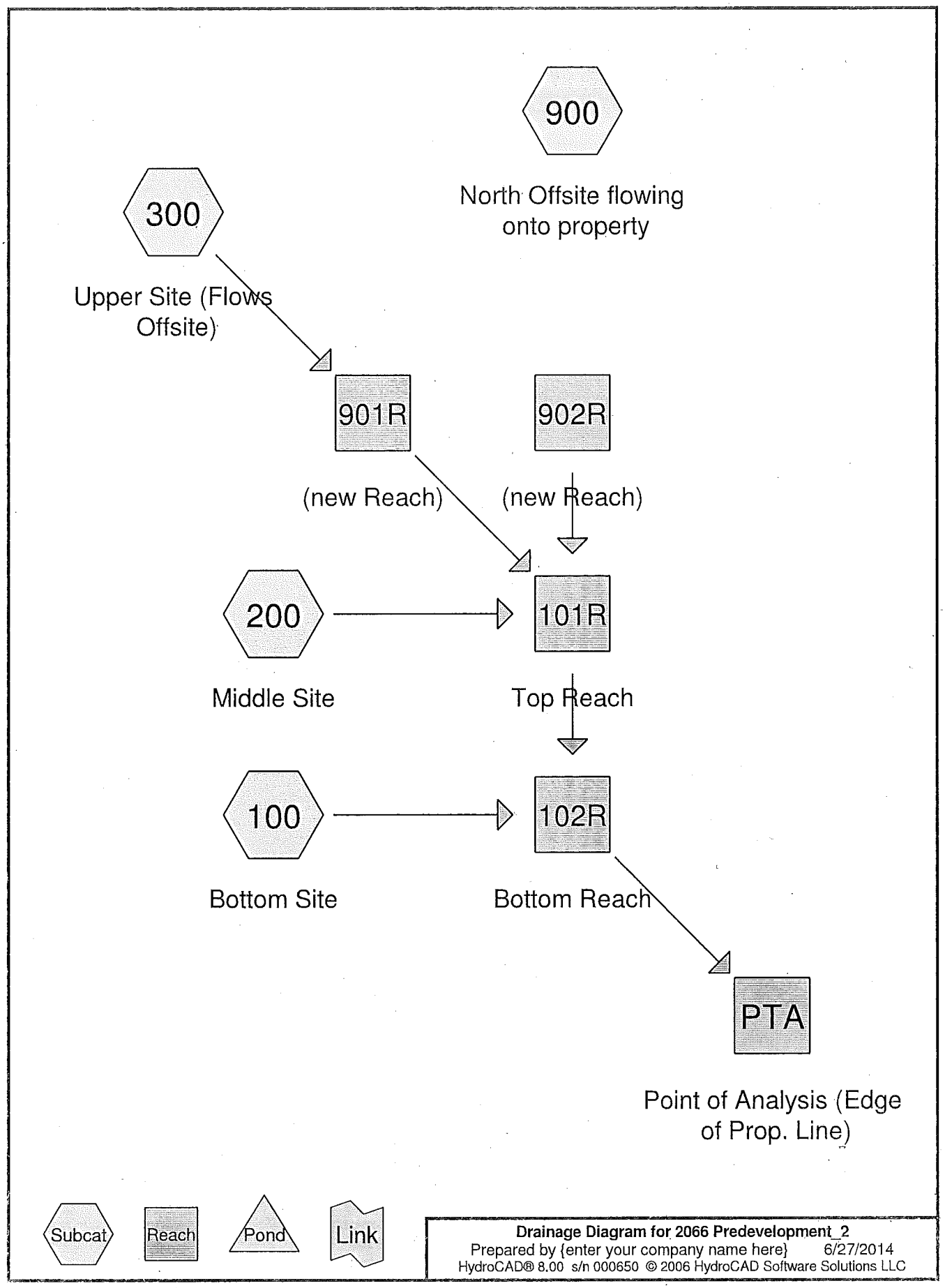
PRE-DEVELOPMENT – 2, 10, 100 YEAR STORM EVENTS

THEN

POST-DEVELOPMENT – 2, 10, 100 YEAR STORM EVENTS

HYDROCAD WORKSHEETS - 2, 10, & 100 YEAR STORM EVENTS

PRE-DEVELOPMENT – 2, 10, 100 YEAR STORM EVENTS



Drainage Diagram for 2066 Predevelopment_2
Prepared by {enter your company name here} 6/27/2014

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcats)
124,146	70	Woods, Good, HSG C (100,200,300)
76,230	74	>75% Grass cover, Good, HSG C (100,200,300)
5,663	89	Gravel roads, HSG C (200)
61,420	91	Fallow, bare soil, HSG C (100,200,300)
22,651	98	Paved parking & roofs (100,200)
290,110		

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 100: Bottom Site Runoff Area=3.260 ac Runoff Depth>0.93"
Flow Length=500' Tc=10.9 min CN=76 Runoff=3.11 cfs 10,952 cf

Subcatchment 200: Middle Site Runoff Area=2.170 ac Runoff Depth>1.21"
Flow Length=545' Tc=10.3 min CN=81 Runoff=2.83 cfs 9,540 cf

Subcatchment 300: Upper Site (Flows Offsite) Runoff Area=1.230 ac Runoff Depth>1.09"
Flow Length=410' Tc=18.9 min CN=79 Runoff=1.15 cfs 4,855 cf

Subcatchment 900: North Offsite flowing onto property
Runoff=0.00 cfs 0 cf

Reach 101R: Top Reach Avg. Depth=0.12' Max Vel=1.95 fps Inflow=3.74 cfs 14,396 cf
n=0.025 L=315.0' S=0.0190 '/' Capacity=1,068.23 cfs Outflow=3.62 cfs 14,338 cf

Reach 102R: Bottom Reach Avg. Depth=0.16' Max Vel=3.75 fps Inflow=6.39 cfs 25,290 cf
n=0.025 L=120.0' S=0.0500 '/' Capacity=1,345.64 cfs Outflow=6.29 cfs 25,266 cf

Reach 901R: (new Reach) Inflow=1.15 cfs 4,855 cf
Outflow=1.15 cfs 4,855 cf

Reach 902R: (new Reach)

Reach PTA: Point of Analysis (Edge of Prop. Line) Inflow=6.29 cfs 25,266 cf
Outflow=6.29 cfs 25,266 cf

Total Runoff Area = 290,110 sf Runoff Volume = 25,347 cf Average Runoff Depth = 1.05"
92.19% Pervious Area = 267,458 sf 7.81% Impervious Area = 22,651 sf

Subcatchment 100: Bottom Site

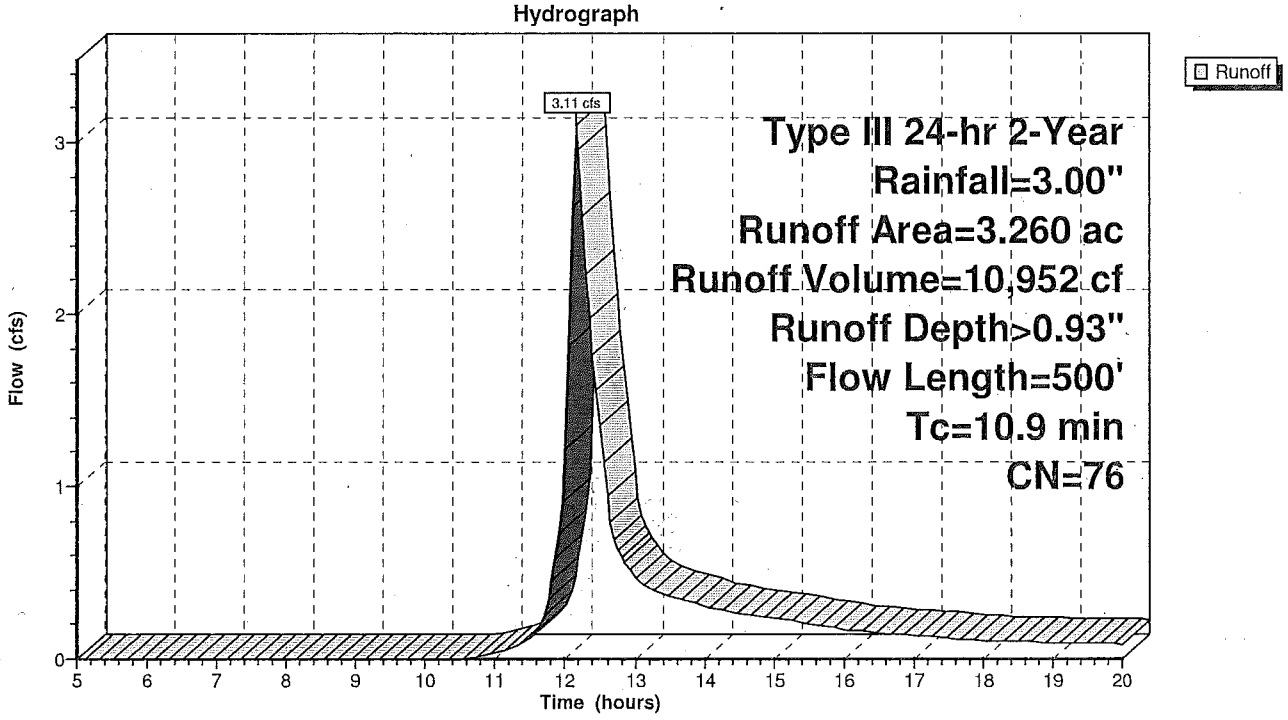
Runoff = 3.11 cfs @ 12.16 hrs, Volume= 10,952 cf, Depth> 0.93"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (ac)	CN	Description
0.420	98	Paved parking & roofs
1.800	70	Woods, Good, HSG C
0.800	74	>75% Grass cover, Good, HSG C
0.240	91	Fallow, bare soil, HSG C
3.260	76	Weighted Average
2.840		Pervious Area
0.420		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	25	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
3.6	300	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	175	0.2100	2.29		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.9	500	Total			

Subcatchment 100: Bottom Site



Subcatchment 200: Middle Site

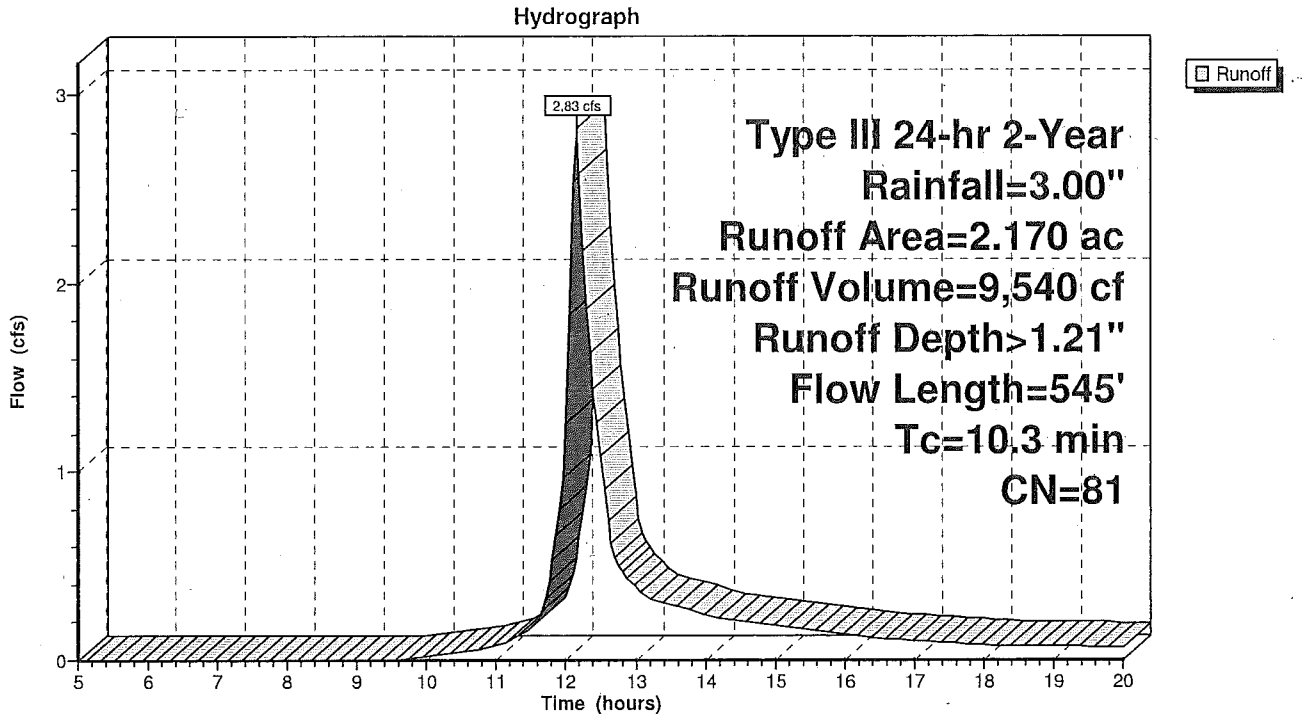
Runoff = 2.83 cfs @ 12.15 hrs, Volume= 9,540 cf, Depth> 1.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (ac)	CN	Description
0.100	98	Paved parking & roofs
0.720	70	Woods, Good, HSG C
0.760	91	Fallow, bare soil, HSG C
0.460	74	>75% Grass cover, Good, HSG C
0.130	89	Gravel roads, HSG C
2.170	81	Weighted Average
2.070		Pervious Area
0.100		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	25	0.0250	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.4	240	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	160	0.1100	2.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	120	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.3	545	Total			

Subcatchment 200: Middle Site



Subcatchment 300: Upper Site (Flows Offsite)

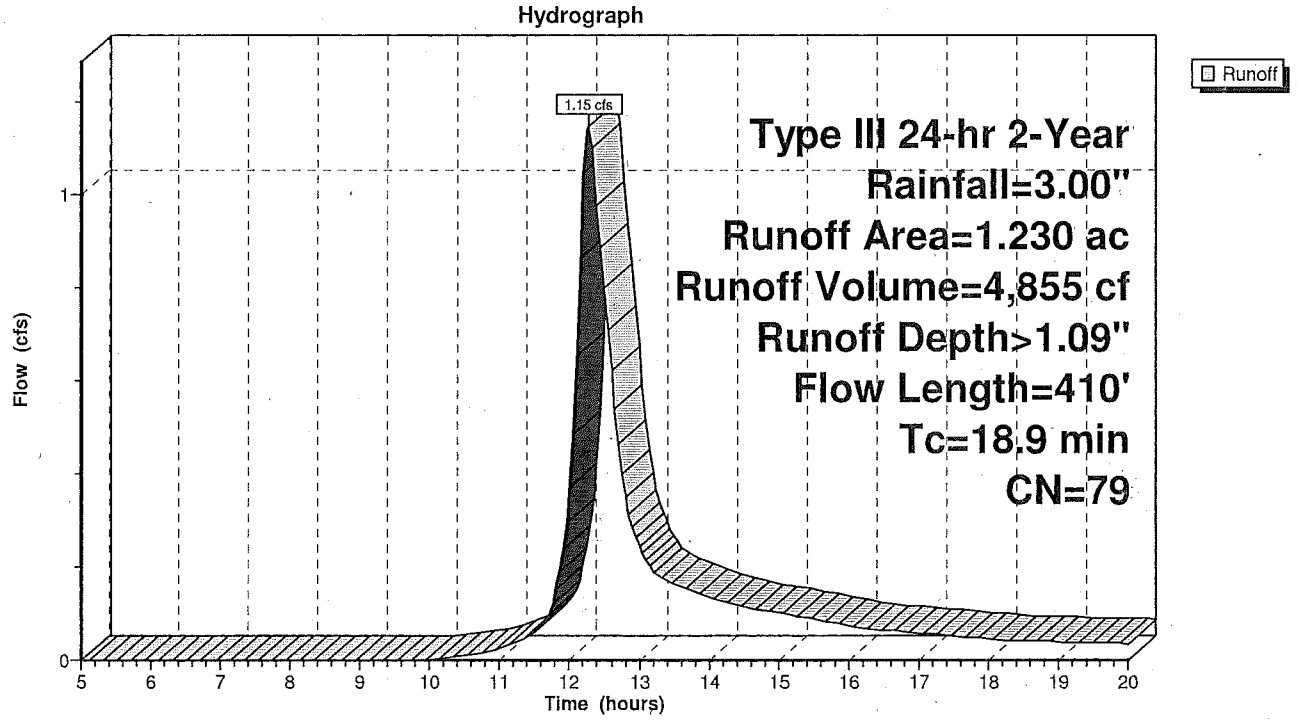
Runoff = 1.15 cfs @ 12.27 hrs, Volume= 4,855 cf, Depth> 1.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (ac)	CN	Description
0.330	70	Woods, Good, HSG C
0.490	74	>75% Grass cover, Good, HSG C
0.410	91	Fallow, bare soil, HSG C
1.230	79	Weighted Average
1.230		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.2	160	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	200	0.1100	2.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.9	410	Total			

Subcatchment 300: Upper Site (Flows Offsite)



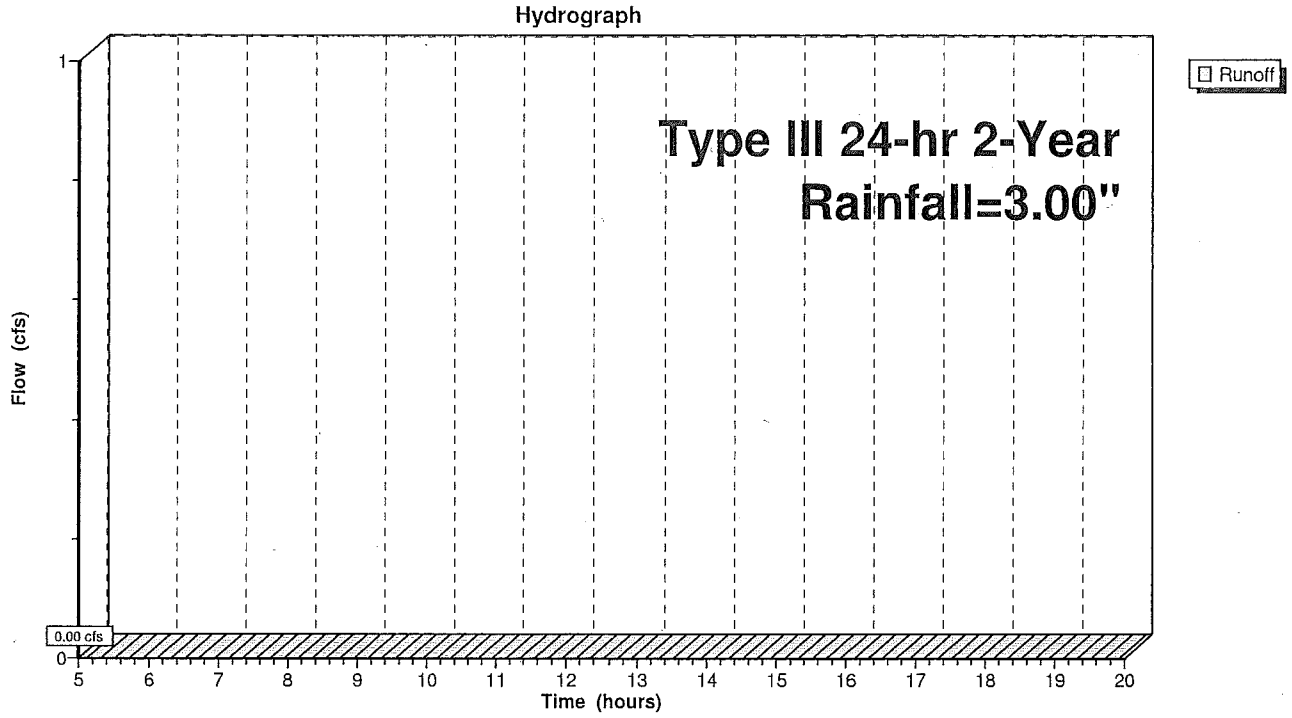
Subcatchment 900: North Offsite flowing onto property

[40] Hint: Not Described (Area=0)

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Subcatchment 900: North Offsite flowing onto property



Reach 101R: Top Reach

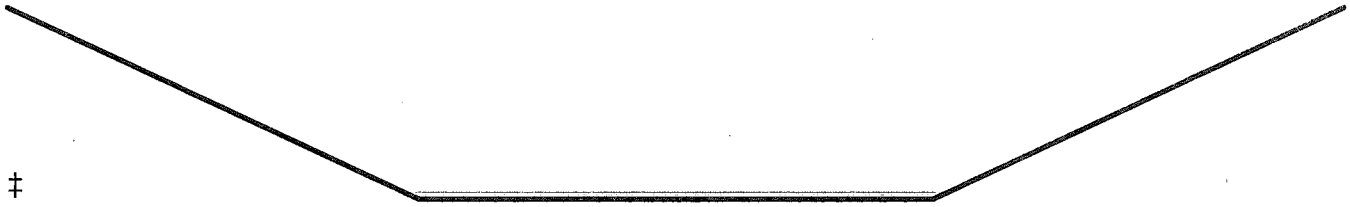
Inflow Area = 148,104 sf, Inflow Depth > 1.17" for 2-Year event
Inflow = 3.74 cfs @ 12.17 hrs, Volume= 14,396 cf
Outflow = 3.62 cfs @ 12.25 hrs, Volume= 14,338 cf, Atten= 3%, Lag= 5.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.95 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.87 fps, Avg. Travel Time= 6.0 min

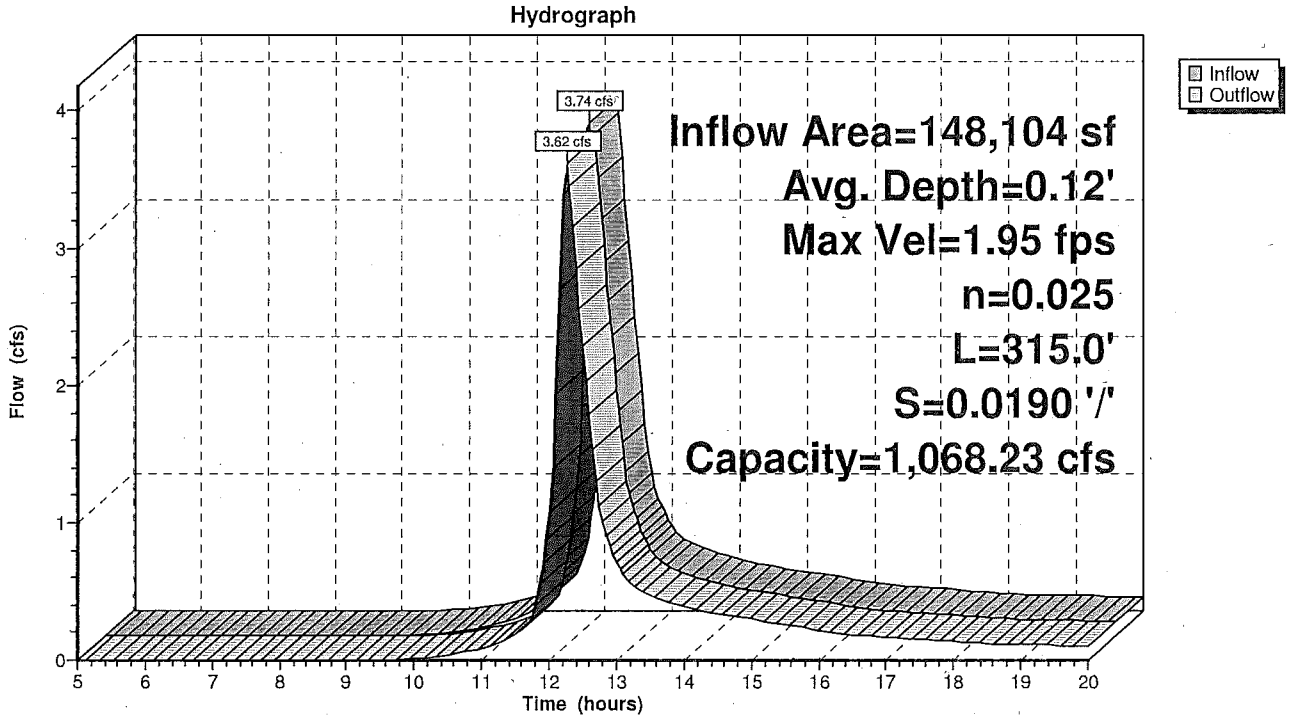
Peak Storage= 586 cf @ 12.21 hrs, Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 1,068.23 cfs

15.00' x 3.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 4.0 '/' Top Width= 39.00'
Length= 315.0' Slope= 0.0190 '/'
Inlet Invert= 94.00', Outlet Invert= 88.00'

‡



Reach 101R: Top Reach



Reach 102R: Bottom Reach

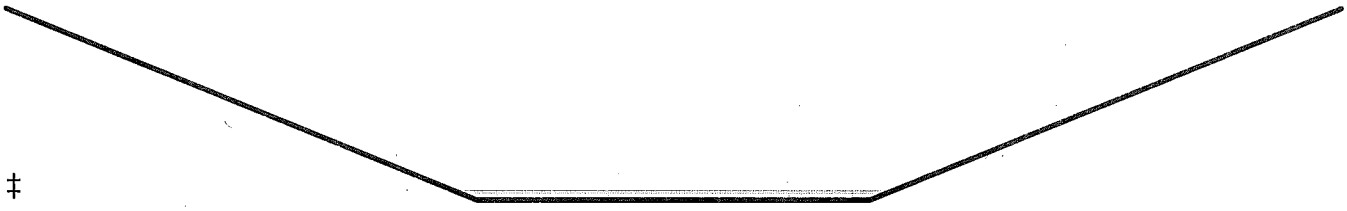
[61] Hint: Submerged 3% of Reach 101R bottom

Inflow Area = 290,110 sf, Inflow Depth > 1.05" for 2-Year event
Inflow = 6.39 cfs @ 12.21 hrs, Volume= 25,290 cf
Outflow = 6.29 cfs @ 12.23 hrs, Volume= 25,266 cf, Atten= 1%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.75 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.54 fps, Avg. Travel Time= 1.3 min

Peak Storage= 204 cf @ 12.22 hrs, Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 1,345.64 cfs

10.00' x 3.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 4.0 '/' Top Width= 34.00'
Length= 120.0' Slope= 0.0500 '/'
Inlet Invert= 88.00', Outlet Invert= 82.00'



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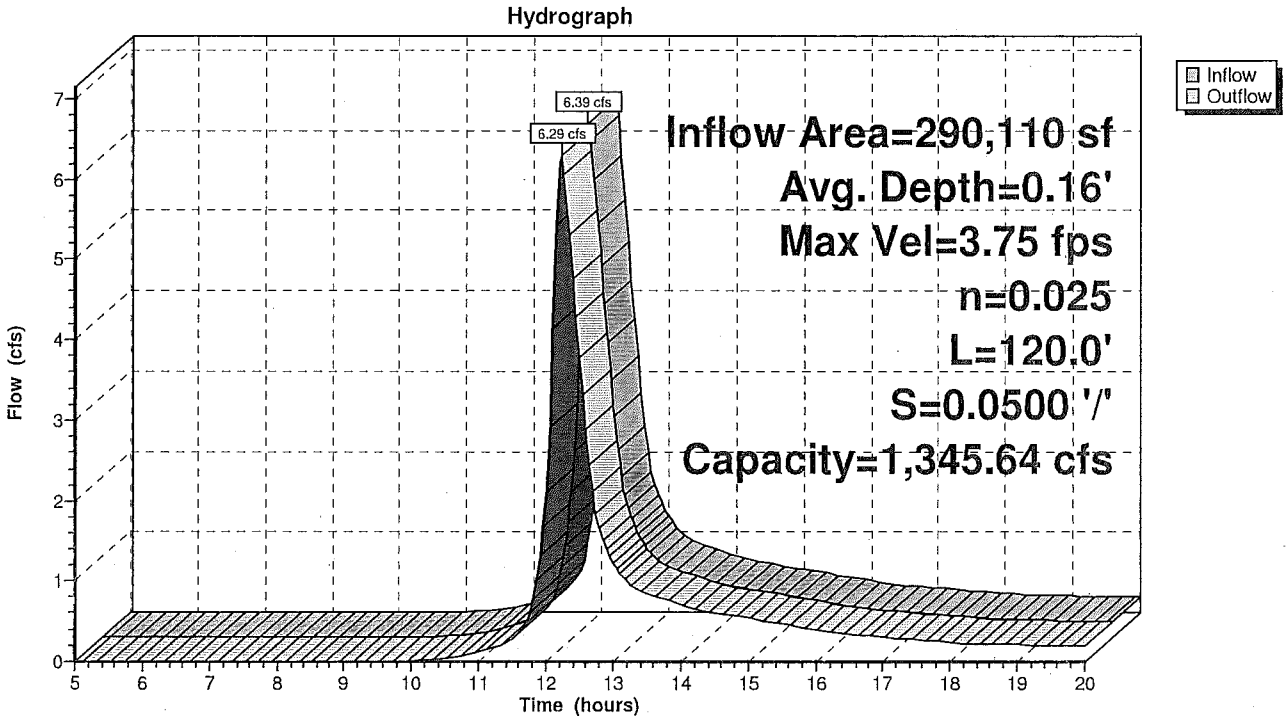
Reach 102R: Bottom Reach



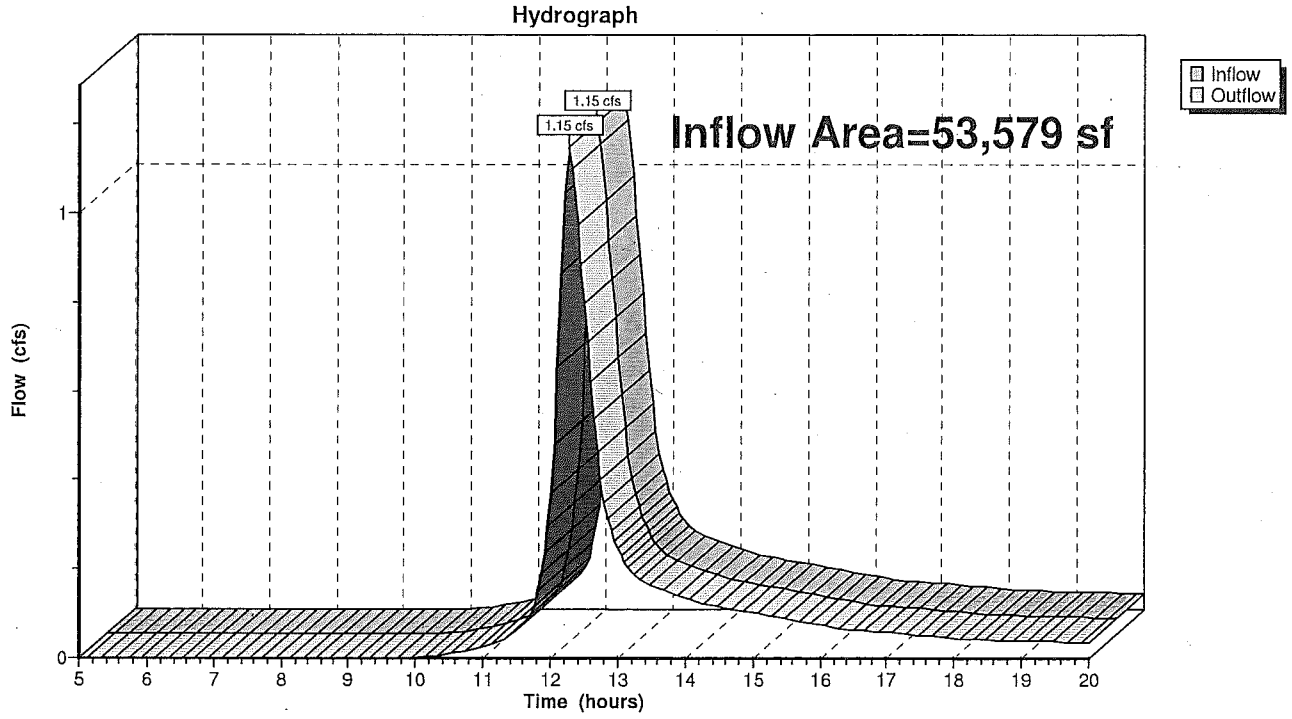
Reach 901R: (new Reach)

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

Inflow Area = 53,579 sf, Inflow Depth > 1.09" for 2-Year event
Inflow = 1.15 cfs @ 12.27 hrs, Volume= 4,855 cf
Outflow = 1.15 cfs @ 12.27 hrs, Volume= 4,855 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 901R: (new Reach)



Reach 902R: (new Reach)

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

Routing by Stor-Ind+Trans method

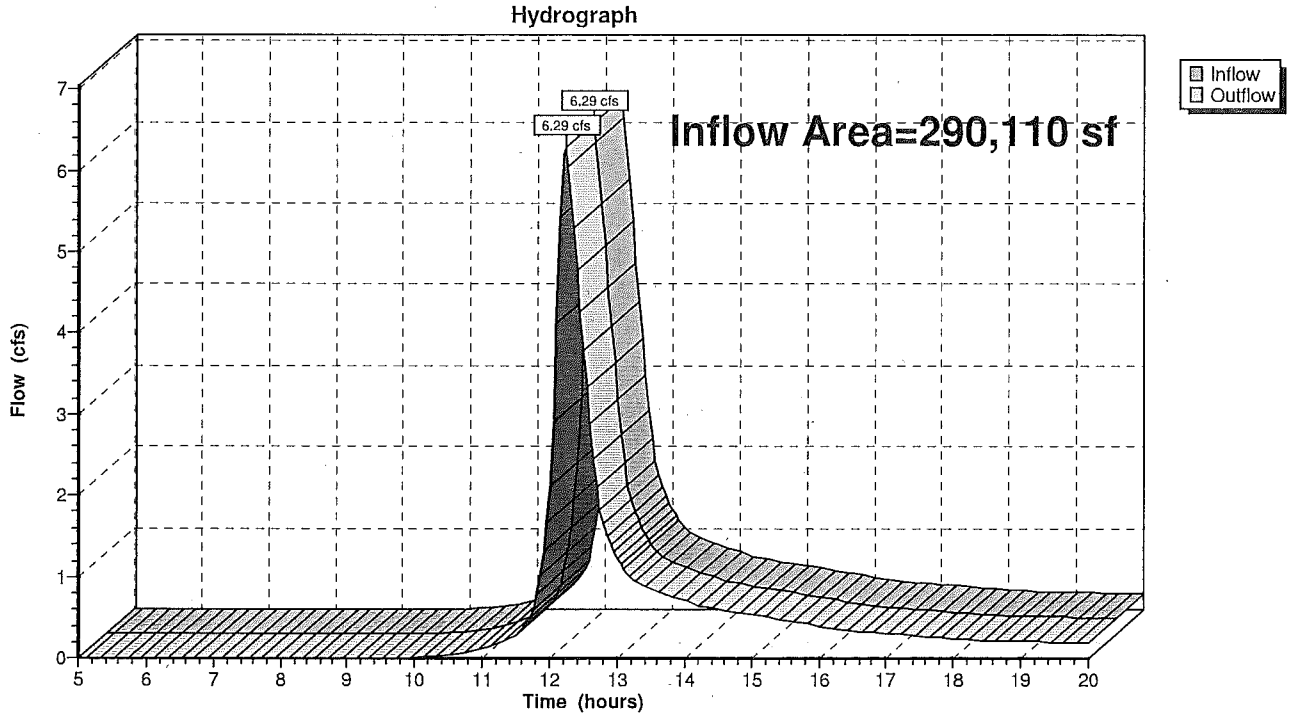
Reach PTA: Point of Analysis (Edge of Prop. Line)

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

Inflow Area = 290,110 sf, Inflow Depth > 1.05" for 2-Year event
Inflow = 6.29 cfs @ 12.23 hrs, Volume= 25,266 cf
Outflow = 6.29 cfs @ 12.23 hrs, Volume= 25,266 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach PTA: Point of Analysis (Edge of Prop. Line)



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 100: Bottom Site Runoff Area=3.260 ac Runoff Depth>1.97"
Flow Length=500' Tc=10.9 min CN=76 Runoff=6.82 cfs 23,311 cf

Subcatchment 200: Middle Site Runoff Area=2.170 ac Runoff Depth>2.37"
Flow Length=545' Tc=10.3 min CN=81 Runoff=5.55 cfs 18,706 cf

Subcatchment 300: Upper Site (Flows Offsite) Runoff Area=1.230 ac Runoff Depth>2.20"
Flow Length=410' Tc=18.9 min CN=79 Runoff=2.36 cfs 9,831 cf

Subcatchment 900: North Offsite flowing onto property
Runoff=0.00 cfs 0 cf

Reach 101R: Top Reach Avg. Depth=0.18' Max Vel=2.56 fps Inflow=7.46 cfs 28,537 cf
n=0.025 L=315.0' S=0.0190 '/' Capacity=1,068.23 cfs Outflow=7.22 cfs 28,446 cf

Reach 102R: Bottom Reach Avg. Depth=0.25' Max Vel=4.95 fps Inflow=13.51 cfs 51,756 cf
n=0.025 L=120.0' S=0.0500 '/' Capacity=1,345.64 cfs Outflow=13.43 cfs 51,717 cf

Reach 901R: (new Reach) Inflow=2.36 cfs 9,831 cf
Outflow=2.36 cfs 9,831 cf

Reach 902R: (new Reach)

Reach PTA: Point of Analysis (Edge of Prop. Line) Inflow=13.43 cfs 51,717 cf
Outflow=13.43 cfs 51,717 cf

Total Runoff Area = 290,110 sf Runoff Volume = 51,848 cf Average Runoff Depth = 2.14"
92.19% Pervious Area = 267,458 sf 7.81% Impervious Area = 22,651 sf

Subcatchment 100: Bottom Site

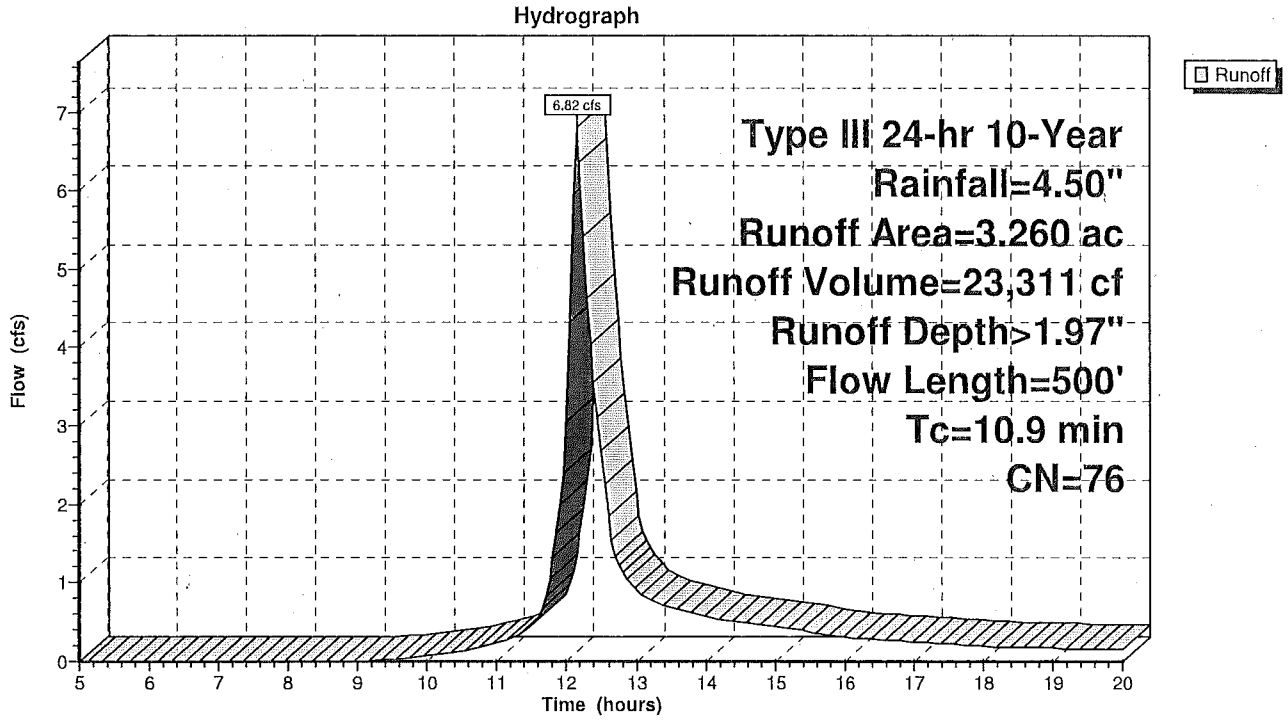
Runoff = 6.82 cfs @ 12.16 hrs, Volume= 23,311 cf, Depth> 1.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (ac)	CN	Description
0.420	98	Paved parking & roofs
1.800	70	Woods, Good, HSG C
0.800	74	>75% Grass cover, Good, HSG C
0.240	91	Fallow, bare soil, HSG C
3.260	76	Weighted Average
2.840		Pervious Area
0.420		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	25	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
3.6	300	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	175	0.2100	2.29		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.9	500	Total			

Subcatchment 100: Bottom Site



Subcatchment 200: Middle Site

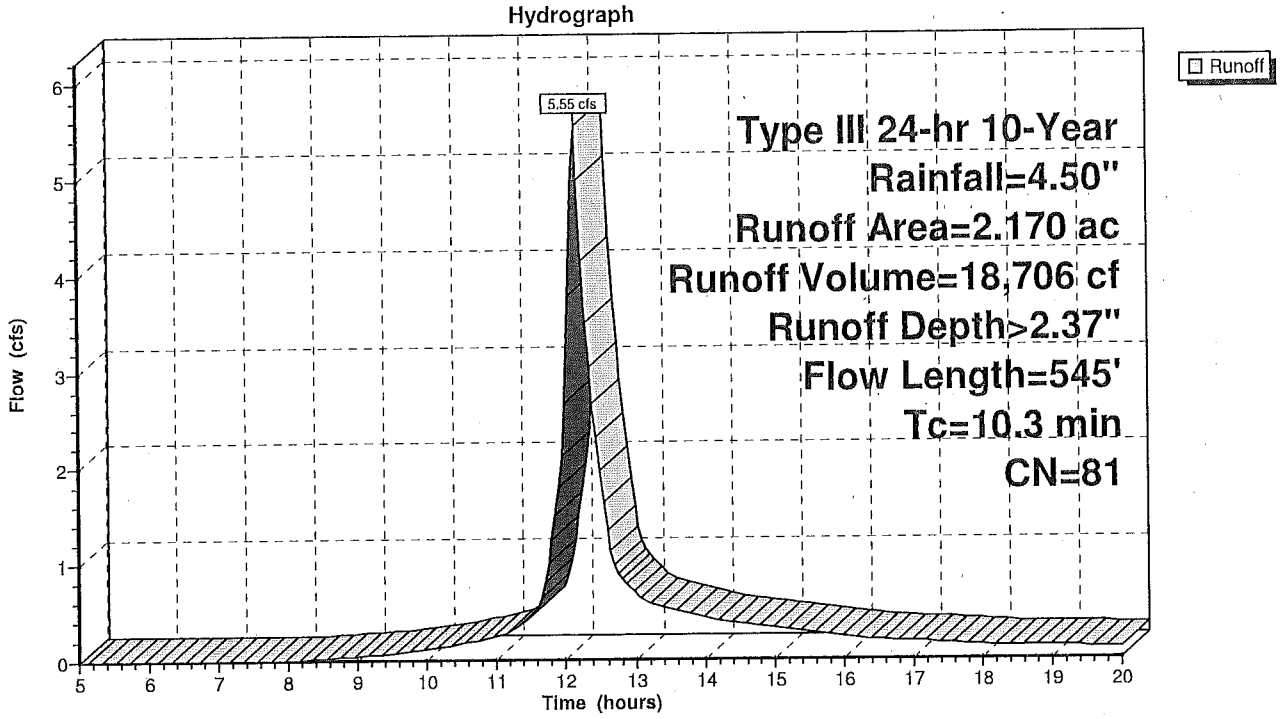
Runoff = 5.55 cfs @ 12.15 hrs, Volume= 18,706 cf, Depth> 2.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (ac)	CN	Description
0.100	98	Paved parking & roofs
0.720	70	Woods, Good, HSG C
0.760	91	Fallow, bare soil, HSG C
0.460	74	>75% Grass cover, Good, HSG C
0.130	89	Gravel roads, HSG C
2.170	81	Weighted Average
2.070		Pervious Area
0.100		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	25	0.0250	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.4	240	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	160	0.1100	2.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	120	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.3	545	Total			

Subcatchment 200: Middle Site



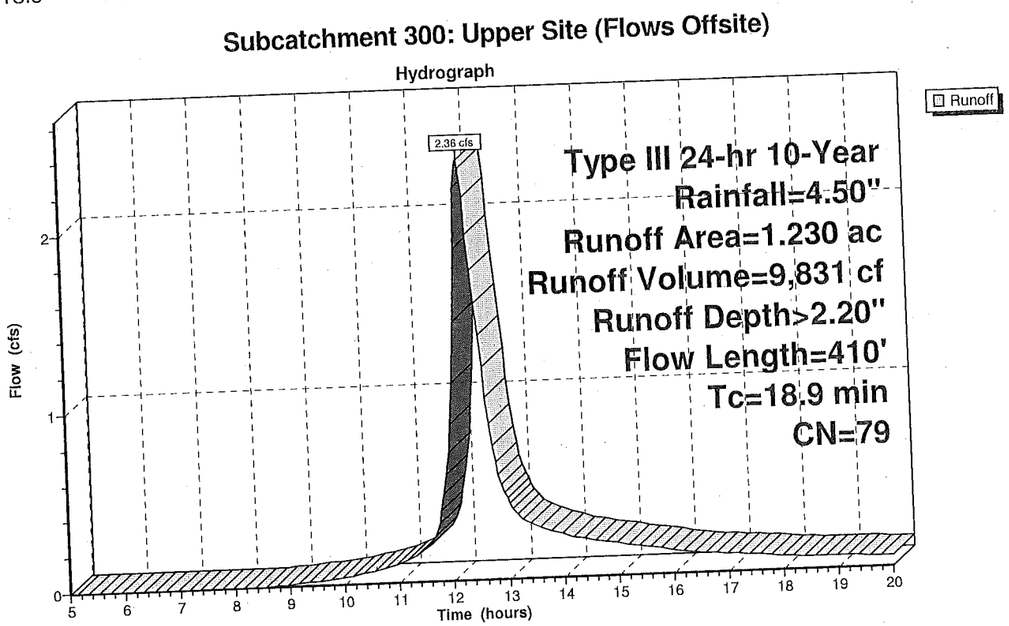
Subcatchment 300: Upper Site (Flows Offsite)

Runoff = 2.36 cfs @ 12.26 hrs, Volume= 9,831 cf, Depth> 2.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (ac)	CN	Description
0.330	70	Woods, Good, HSG C
0.490	74	>75% Grass cover, Good, HSG C
0.410	91	Fallow, bare soil, HSG C
1.230	79	Weighted Average
1.230		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.2	160	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	200	0.1100	2.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.9	410	Total			



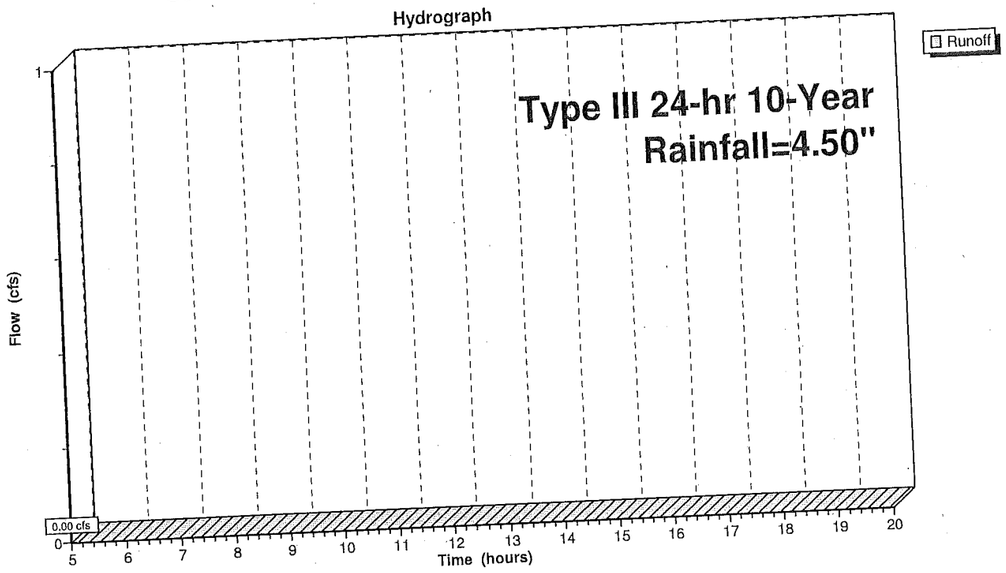
Subcatchment 900: North Offsite flowing onto property

[40] Hint: Not Described (Area=0)

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Subcatchment 900: North Offsite flowing onto property



Reach 101R: Top Reach

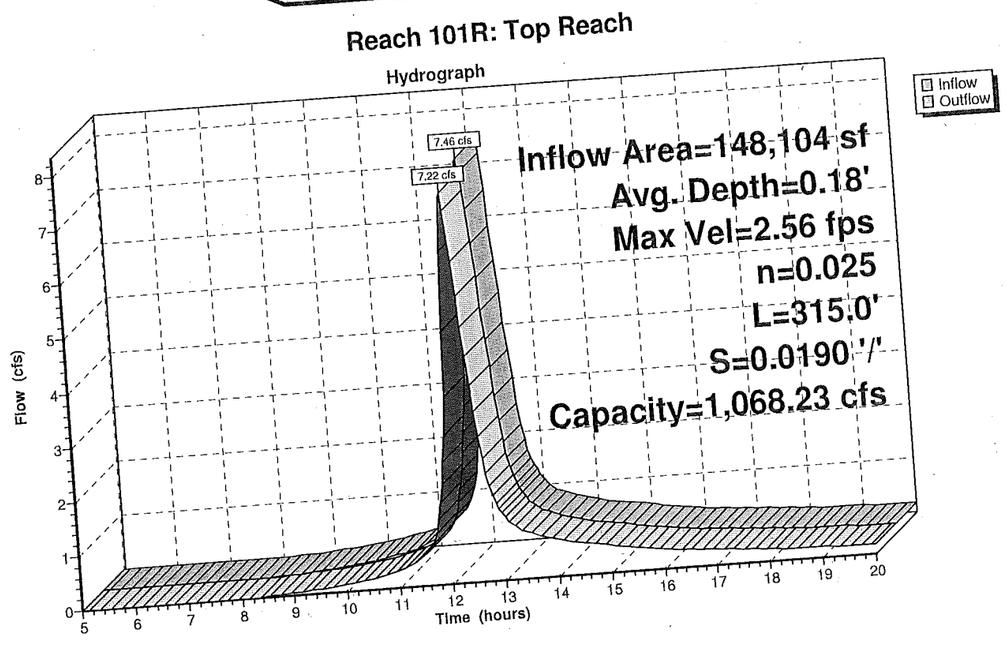
Inflow Area = 148,104 sf, Inflow Depth > 2.31" for 10-Year event
Inflow = 7.46 cfs @ 12.16 hrs, Volume= 28,537 cf
Outflow = 7.22 cfs @ 12.23 hrs, Volume= 28,446 cf, Atten= 3%, Lag= 3.8 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.56 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.96 fps, Avg. Travel Time= 5.5 min

Peak Storage= 903 cf @ 12.19 hrs, Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 1,068.23 cfs

15.00' x 3.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 4.0 '/' Top Width= 39.00'
Length= 315.0' Slope= 0.0190 '/'
Inlet Invert= 94.00', Outlet Invert= 88.00'

‡



Reach 102R: Bottom Reach

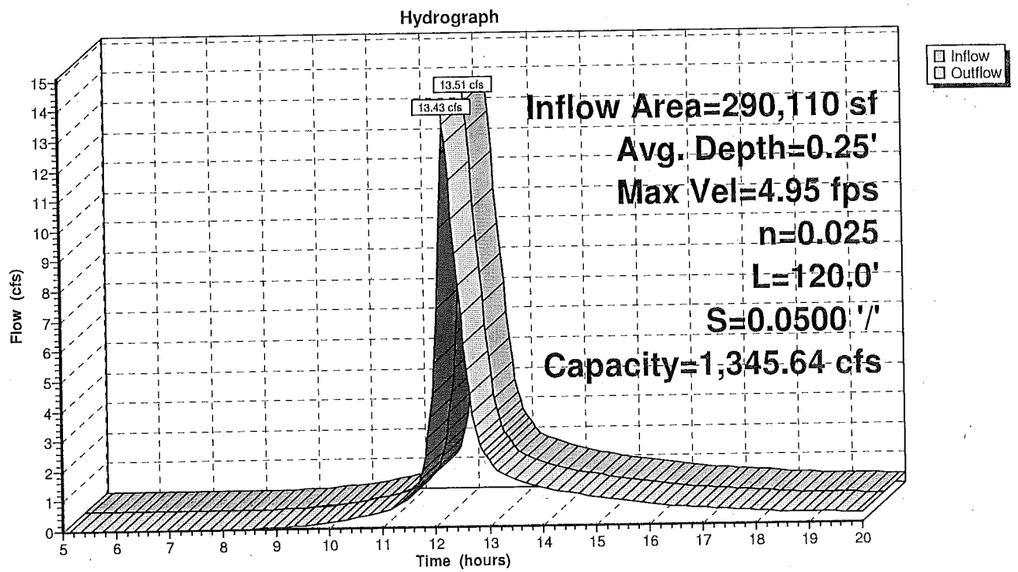
[61] Hint: Submerged 4% of Reach 101R bottom

Inflow Area = 290,110 sf, Inflow Depth > 2.14" for 10-Year event
Inflow = 13.51 cfs @ 12.19 hrs, Volume= 51,756 cf
Outflow = 13.43 cfs @ 12.21 hrs, Volume= 51,717 cf, Atten= 1%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.95 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.76 fps, Avg. Travel Time= 1.1 min

Peak Storage= 328 cf @ 12.20 hrs, Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 1,345.64 cfs

10.00' x 3.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 4.0 '/' Top Width= 34.00'
Length= 120.0' Slope= 0.0500 '/'
Inlet Invert= 88.00', Outlet Invert= 82.00'



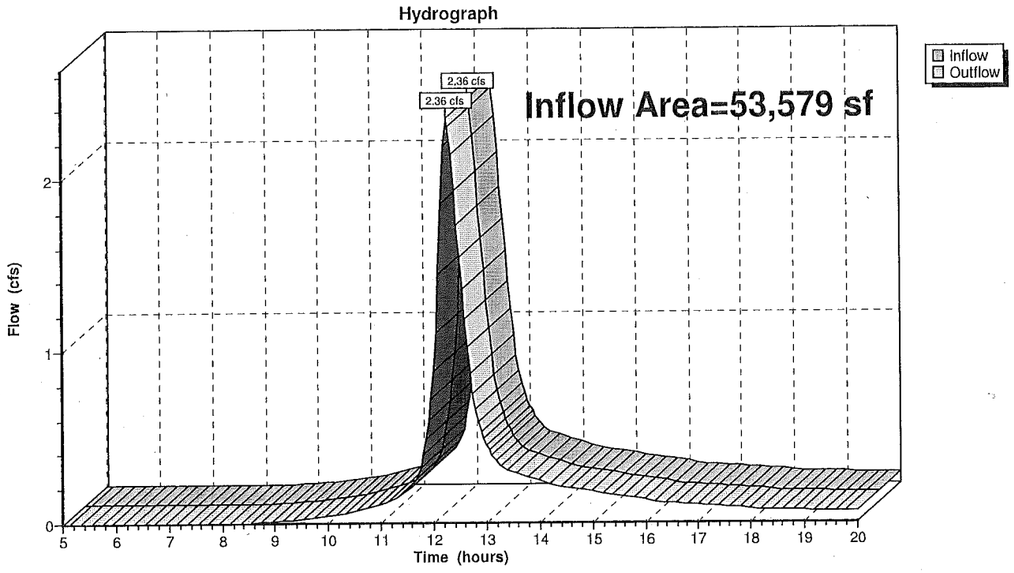
Reach 901R: (new Reach)

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

Inflow Area = 53,579 sf, Inflow Depth > 2.20" for 10-Year event
Inflow = 2.36 cfs @ 12.26 hrs, Volume= 9,831 cf
Outflow = 2.36 cfs @ 12.26 hrs, Volume= 9,831 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 901R: (new Reach)



Reach 902R: (new Reach)

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

Routing by Stor-Ind+Trans method

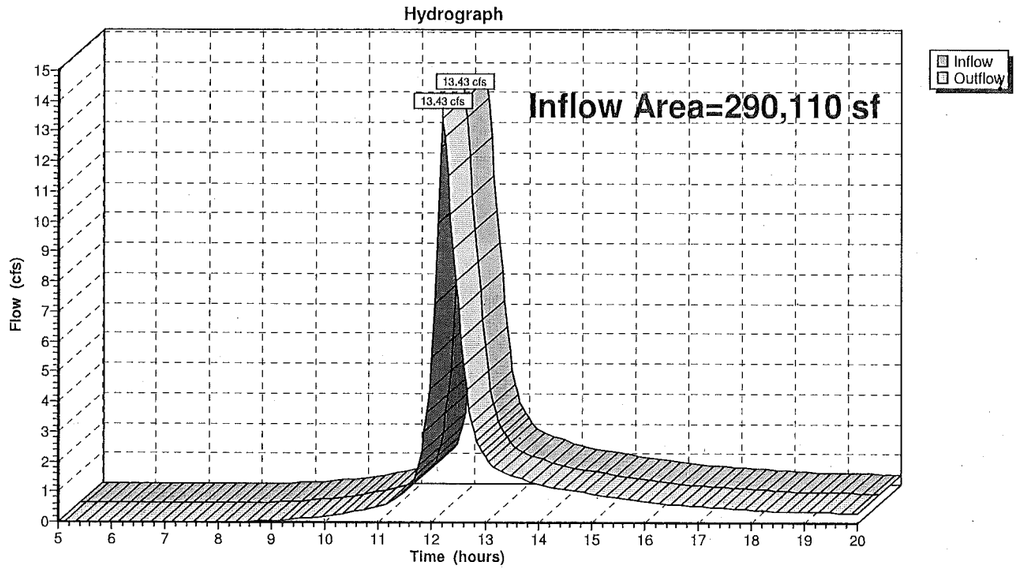
Reach PTA: Point of Analysis (Edge of Prop. Line)

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

Inflow Area = 290,110 sf, Inflow Depth > 2.14" for 10-Year event
Inflow = 13.43 cfs @ 12.21 hrs, Volume= 51,717 cf
Outflow = 13.43 cfs @ 12.21 hrs, Volume= 51,717 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach PTA: Point of Analysis (Edge of Prop. Line)



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 100: Bottom Site Runoff Area=3.260 ac Runoff Depth>3.56"
Flow Length=500' Tc=10.9 min CN=76 Runoff=12.29 cfs 42,134 cf

Subcatchment 200: Middle Site Runoff Area=2.170 ac Runoff Depth>4.07"
Flow Length=545' Tc=10.3 min CN=81 Runoff=9.38 cfs 32,097 cf

Subcatchment 300: Upper Site (Flows Offsite) Runoff Area=1.230 ac Runoff Depth>3.86"
Flow Length=410' Tc=18.9 min CN=79 Runoff=4.09 cfs 17,219 cf

Subcatchment 900: North Offsite flowing onto property Runoff=0.00 cfs 0 cf

Reach 101R: Top Reach Avg. Depth=0.25' Max Vel=3.12 fps Inflow=12.74 cfs 49,316 cf
n=0.025 L=315.0' S=0.0190 '/' Capacity=1,068.23 cfs Outflow=12.42 cfs 49,179 cf

Reach 102R: Bottom Reach Avg. Depth=0.35' Max Vel=6.04 fps Inflow=23.88 cfs 91,313 cf
n=0.025 L=120.0' S=0.0500 '/' Capacity=1,345.64 cfs Outflow=23.76 cfs 91,261 cf

Reach 901R: (new Reach) Inflow=4.09 cfs 17,219 cf
Outflow=4.09 cfs 17,219 cf

Reach 902R: (new Reach)

Reach PTA: Point of Analysis (Edge of Prop. Line) Inflow=23.76 cfs 91,261 cf
Outflow=23.76 cfs 91,261 cf

Total Runoff Area = 290,110 sf Runoff Volume = 91,450 cf Average Runoff Depth = 3.78"
92.19% Pervious Area = 267,458 sf 7.81% Impervious Area = 22,651 sf

Subcatchment 100: Bottom Site

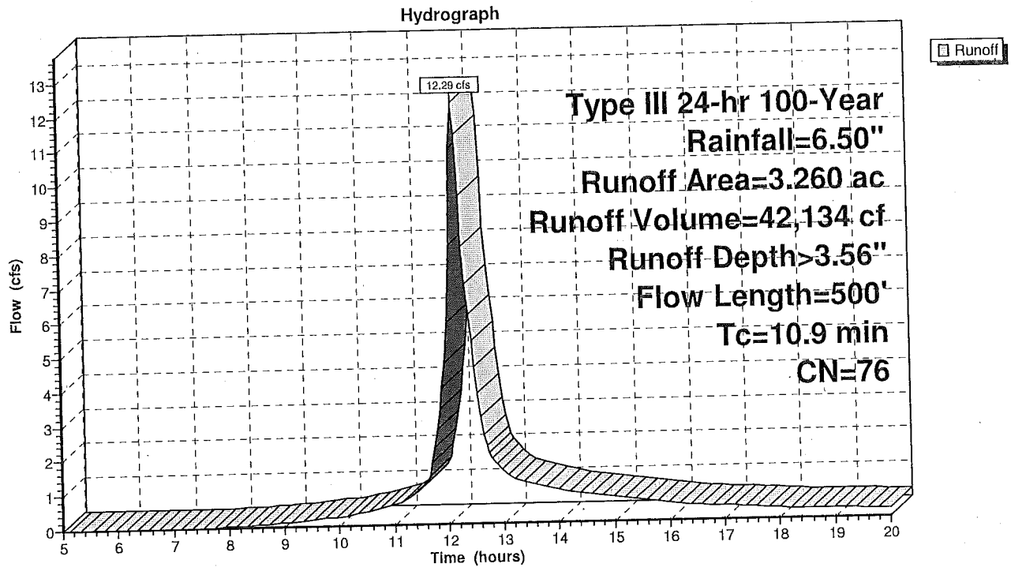
Runoff = 12.29 cfs @ 12.15 hrs, Volume= 42,134 cf, Depth> 3.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (ac)	CN	Description
0.420	98	Paved parking & roofs
1.800	70	Woods, Good, HSG C
0.800	74	>75% Grass cover, Good, HSG C
0.240	91	Fallow, bare soil, HSG C
3.260	76	Weighted Average
2.840		Pervious Area
0.420		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	25	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
3.6	300	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	175	0.2100	2.29		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.9	500	Total			

Subcatchment 100: Bottom Site



Subcatchment 200: Middle Site

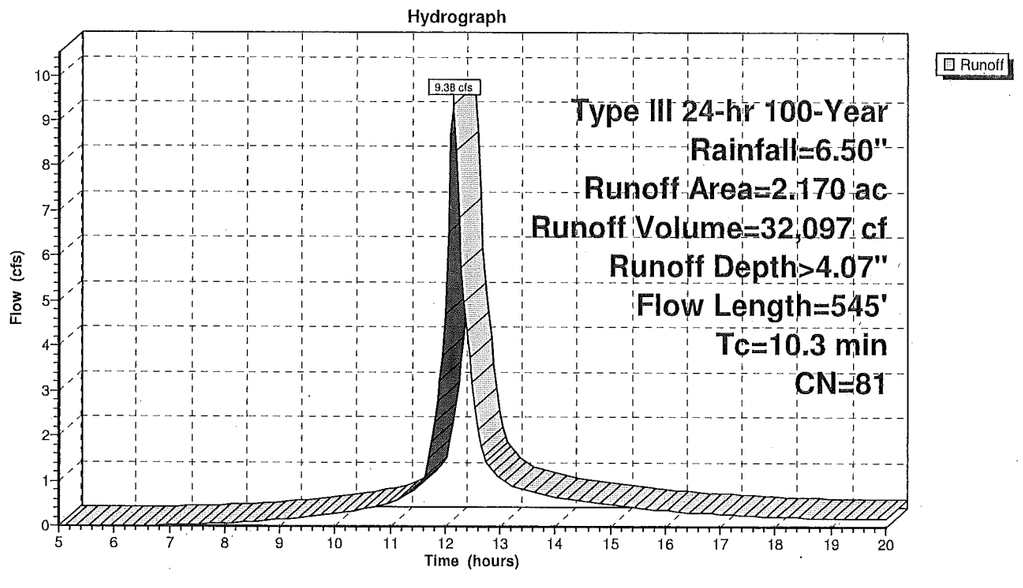
Runoff = 9.38 cfs @ 12.15 hrs, Volume= 32,097 cf, Depth> 4.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (ac)	CN	Description
0.100	98	Paved parking & roofs
0.720	70	Woods, Good, HSG C
0.760	91	Fallow, bare soil, HSG C
0.460	74	>75% Grass cover, Good, HSG C
0.130	89	Gravel roads, HSG C
2.170	81	Weighted Average
2.070		Pervious Area
0.100		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	25	0.0250	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.4	240	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	160	0.1100	2.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	120	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.3	545	Total			

Subcatchment 200: Middle Site



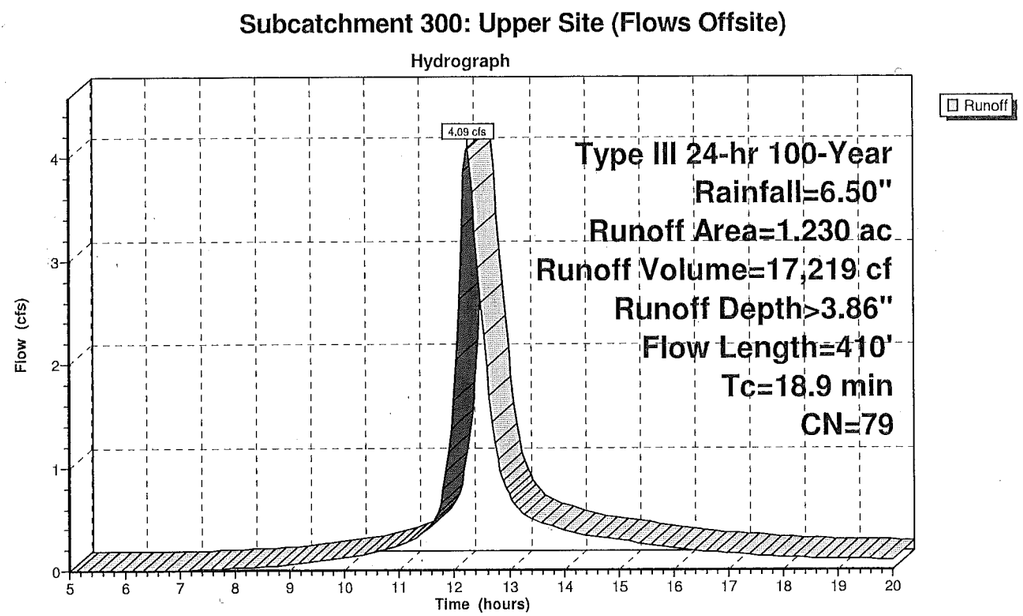
Subcatchment 300: Upper Site (Flows Offsite)

Runoff = 4.09 cfs @ 12.26 hrs, Volume= 17,219 cf, Depth> 3.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (ac)	CN	Description
0.330	70	Woods, Good, HSG C
0.490	74	>75% Grass cover, Good, HSG C
0.410	91	Fallow, bare soil, HSG C
1.230	79	Weighted Average
1.230		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.2	160	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	200	0.1100	2.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.9	410	Total			



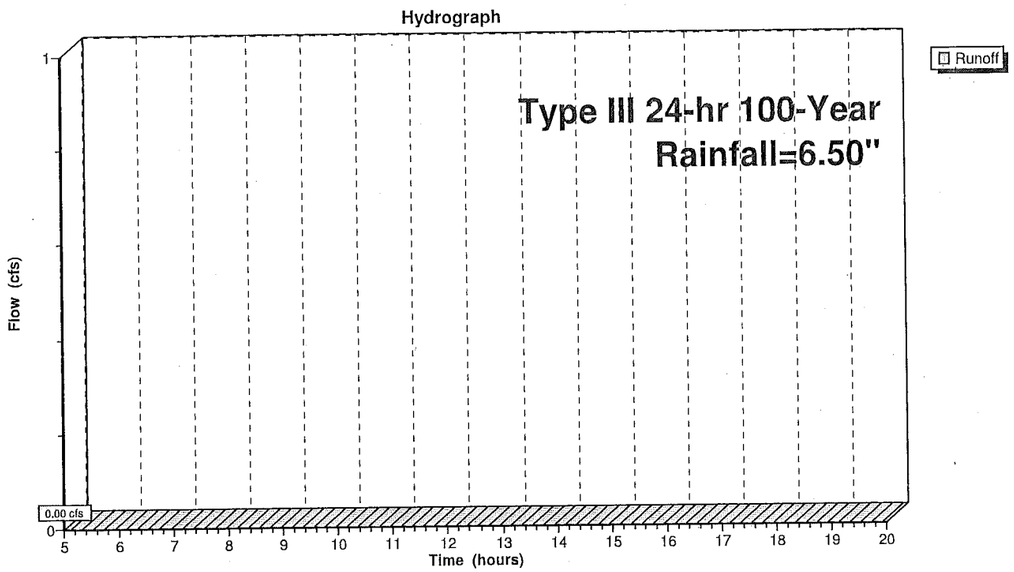
Subcatchment 900: North Offsite flowing onto property

[40] Hint: Not Described (Area=0)

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Subcatchment 900: North Offsite flowing onto property



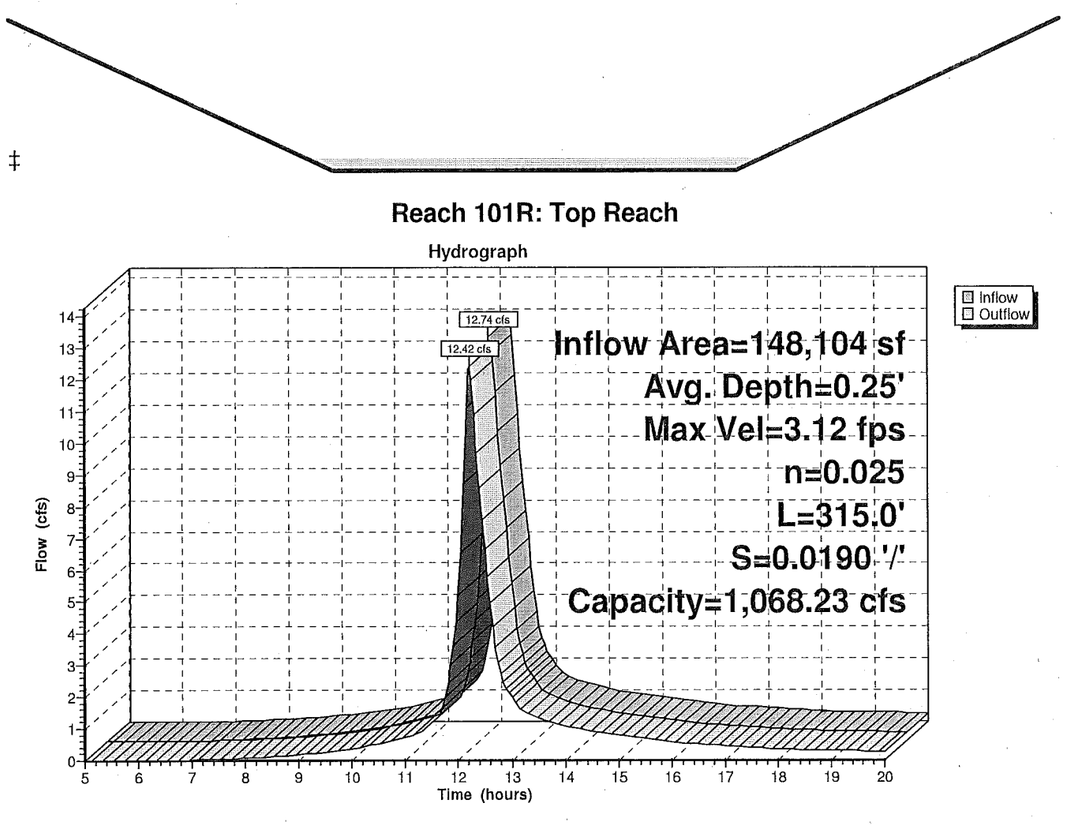
Reach 101R: Top Reach

Inflow Area = 148,104 sf, Inflow Depth > 4.00" for 100-Year event
Inflow = 12.74 cfs @ 12.16 hrs, Volume= 49,316 cf
Outflow = 12.42 cfs @ 12.21 hrs, Volume= 49,179 cf, Atten= 3%, Lag= 3.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.12 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 1.06 fps, Avg. Travel Time= 5.0 min

Peak Storage= 1,263 cf @ 12.18 hrs, Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 1,068.23 cfs

15.00' x 3.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 4.0 '/' Top Width= 39.00'
Length= 315.0' Slope= 0.0190 '/'
Inlet Invert= 94.00', Outlet Invert= 88.00'



Reach 102R: Bottom Reach

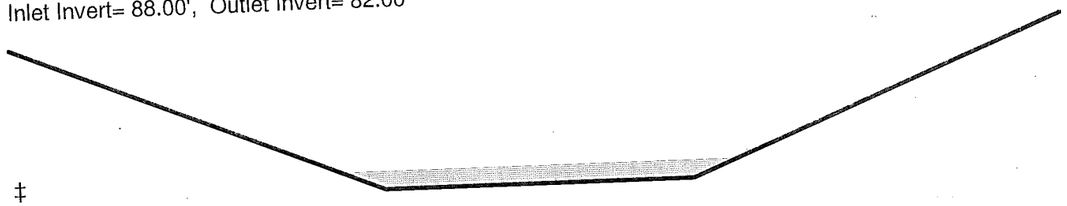
[61] Hint: Submerged 6% of Reach 101R bottom

Inflow Area = 290,110 sf, Inflow Depth > 3.78" for 100-Year event
Inflow = 23.88 cfs @ 12.18 hrs, Volume= 91,313 cf
Outflow = 23.76 cfs @ 12.19 hrs, Volume= 91,261 cf, Atten= 0%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.04 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.02 fps, Avg. Travel Time= 1.0 min

Peak Storage= 474 cf @ 12.19 hrs, Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 1,345.64 cfs

10.00' x 3.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 4.0 '/' Top Width= 34.00'
Length= 120.0' Slope= 0.0500 '/'
Inlet Invert= 88.00', Outlet Invert= 82.00'



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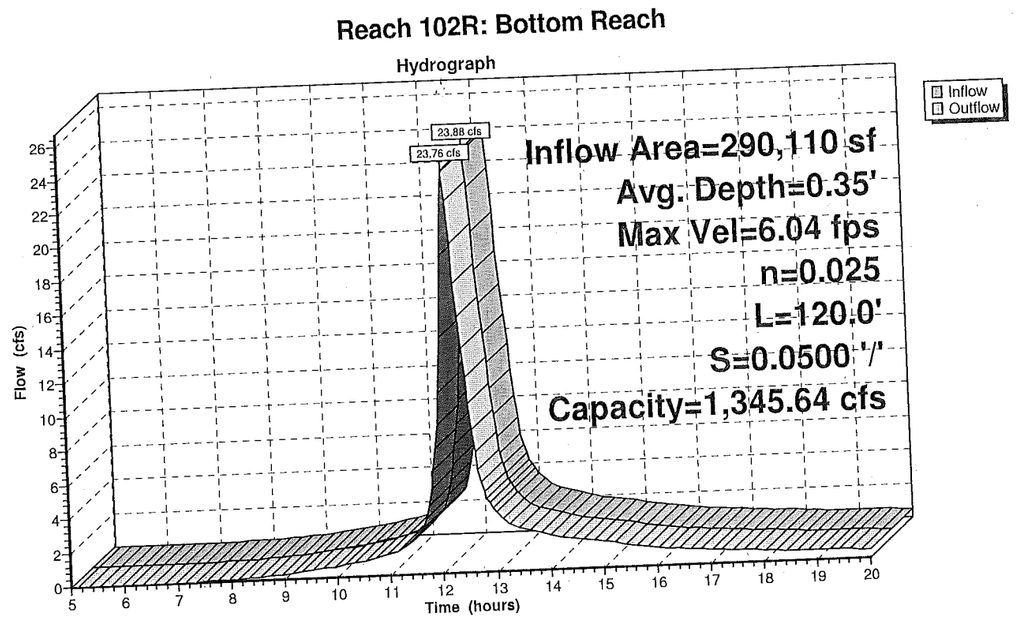


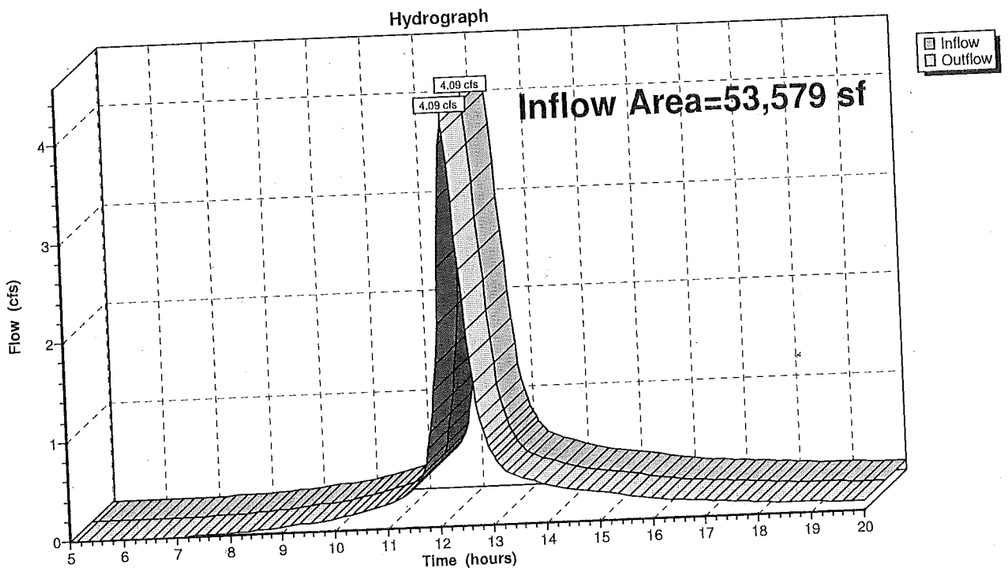
Reach 901R: (new Reach)

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

Inflow Area =	53,579 sf,	Inflow Depth >	3.86"	for 100-Year event
Inflow =	4.09 cfs @	12.26 hrs, Volume=	17,219 cf	
Outflow =	4.09 cfs @	12.26 hrs, Volume=	17,219 cf,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 901R: (new Reach)



Reach 902R: (new Reach)

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

Routing by Stor-Ind+Trans method

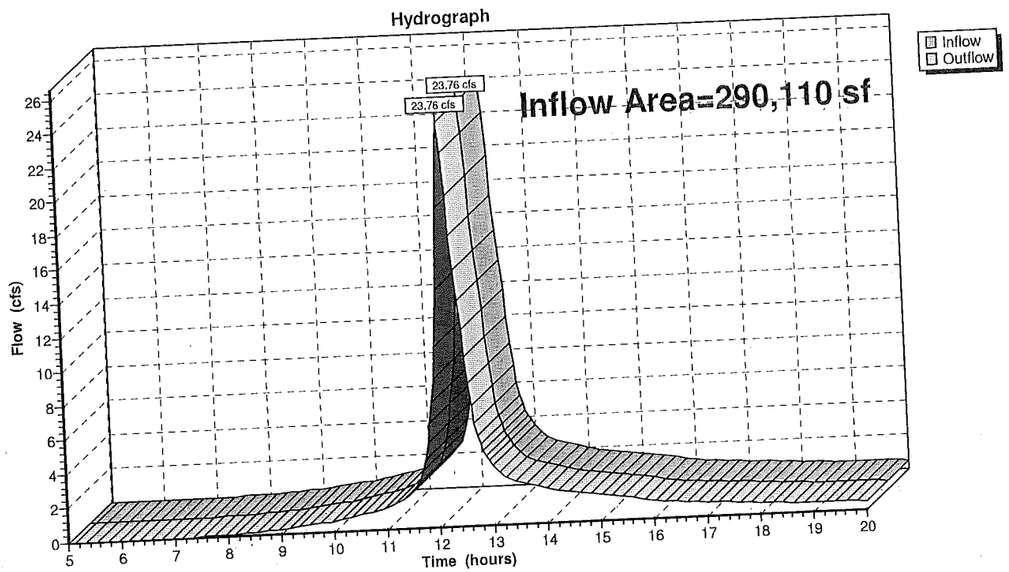
Reach PTA: Point of Analysis (Edge of Prop. Line)

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

Inflow Area = 290,110 sf, Inflow Depth > 3.77" for 100-Year event
Inflow = 23.76 cfs @ 12.19 hrs, Volume= 91,261 cf
Outflow = 23.76 cfs @ 12.19 hrs, Volume= 91,261 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach PTA: Point of Analysis (Edge of Prop. Line)

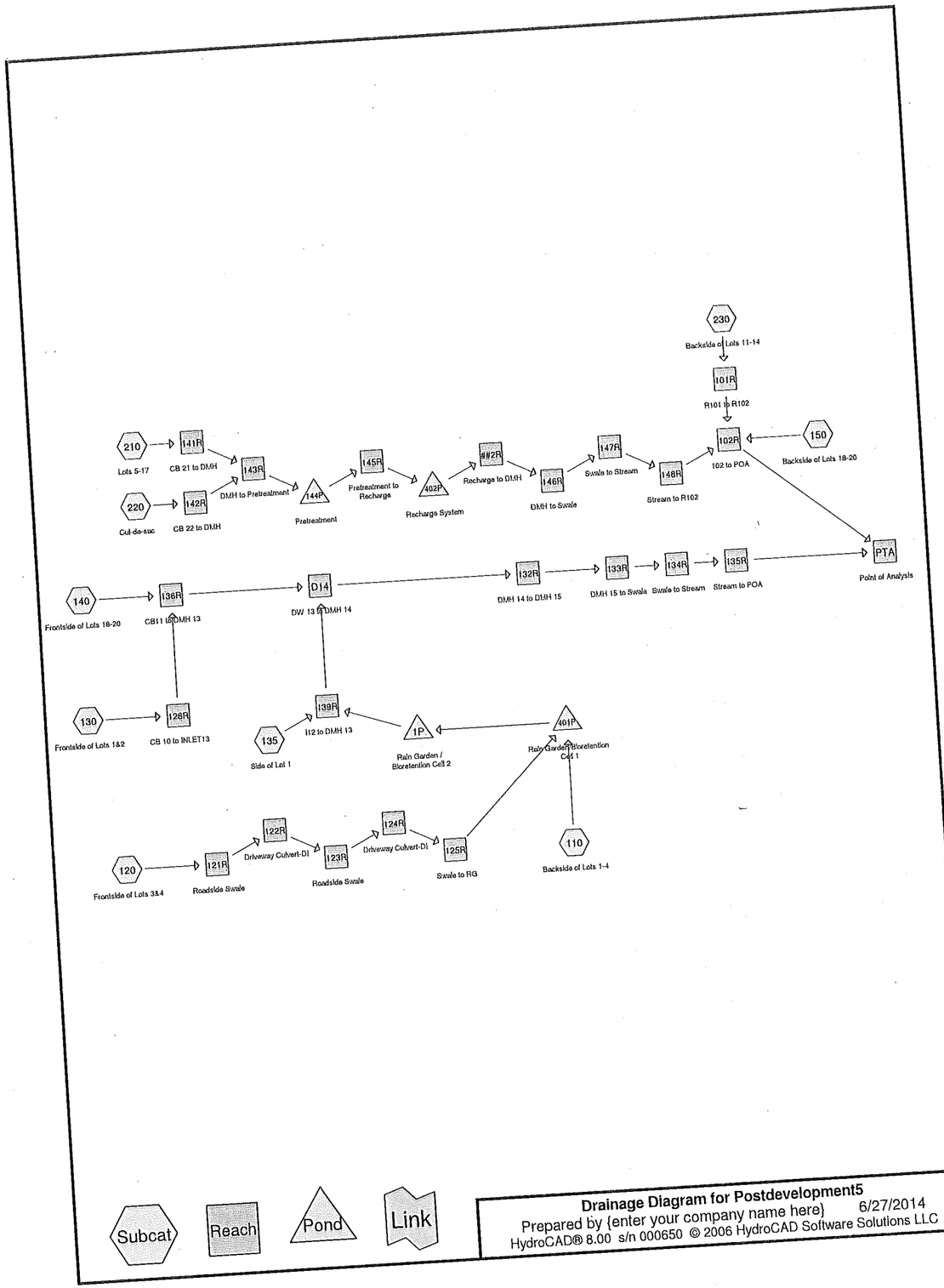


MEISNER BREM CORPORATION
142 LITTLETON ROAD, STE. 16, WESTFORD, MA 01886

BREM 40B
PROJECT NOT YET NAMED, OFF LONG RIDGE ROAD, CARLISLE, MA

HYDROCAD WORKSHEETS - 2, 10, & 100 YEAR STORM EVENTS

POST-DEVELOPMENT – 2, 10, 100 YEAR STORM EVENTS


230
Backside of Lots 11-14
101R
R101 to R102
210
Lots 5-17
141R
CB 21 to DMH
143R
220
Cul-de-sac
142R
CB 22 to DMH
DMH to Pretreatment
144P
Pretreatment
145R
Pretreatment to Recharge
402P
Recharge System
##2R
Recharge to DMH
146R
DMH to Swale
147R
Swale to Stream
148R
Stream to R102
102R
102 to POA
150
Backside of Lots 18-20
PTA
Point of Analysis
140
Frontside of Lots 18-20
136R
CB11 to DMH 13
D14
DW 13 to DMH 14
132R
DMH 14 to DMH 15
133R
DMH 15 to Swale
134R
Swale to Stream
135R
Stream to POA
130
Frontside of Lots 1&2
126R
CB 10 to INLET13
139R
I12 to DMH 13
135
Side of Lot 1
1P
Rain Garden / Bioretention Cell 2
401P
Rain Garden Bioretention Cell 1
110
Backside of Lots 1-4
120
Frontside of Lots 3&4
121R
Roadside Swale
122R
Driveway Culvert-DI
123R
Roadside Swale
124R
Driveway Culvert-DI
125R
Swale to RG
Subcat
Reach
Pond
Link
Drainage Diagram for Postdevelopment5
Prepared by {enter your company name here} 6/27/2014
HydroCAD® 8.00 s/n 000650 © 2006 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcats)
28,532	70	Woods, Good, HSG C (110,130,135,150,210,230)
165,528	74	>75% Grass cover, Good, HSG C (110,120,130,135,140,150,210,220,230)
14,375	98	Paved parking & roofs (110,150,230)
77,101	98	Paved roads w/curbs & sewers (120,130,140,210,220)
285,536		

Time span=2.00-21.00 hrs, dt=0.05 hrs, 381 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 110: Backside of Lots 1-4 Runoff Area=0.620 ac Runoff Depth>1.06"
Tc=5.0 min CN=78 Runoff=0.80 cfs 2,392 cf

Subcatchment 120: Frontside of Lots 3&4 Runoff Area=0.240 ac Runoff Depth>1.58"
Tc=5.0 min CN=86 Runoff=0.47 cfs 1,379 cf

Subcatchment 130: Frontside of Lots 1&2 Runoff Area=0.255 ac Runoff Depth>1.98"
Tc=5.0 min CN=91 Runoff=0.61 cfs 1,837 cf

Subcatchment 135: Side of Lot 1 Runoff Area=0.120 ac Runoff Depth>0.75"
Tc=0.0 min CN=72 Runoff=0.12 cfs 329 cf

Subcatchment 140: Frontside of Lots 18-20 Runoff Area=0.870 ac Runoff Depth>1.37"
Tc=5.0 min CN=83 Runoff=1.47 cfs 4,332 cf

Subcatchment 150: Backside of Lots 18-20 Runoff Area=0.710 ac Runoff Depth>1.01"
Tc=5.0 min CN=77 Runoff=0.86 cfs 2,595 cf

Subcatchment 210: Lots 5-17 Runoff Area=3.000 ac Runoff Depth>1.31"
Tc=5.0 min CN=82 Runoff=4.83 cfs 14,220 cf

Subcatchment 220: Cul-de-sac Runoff Area=0.190 ac Runoff Depth>1.66"
Tc=5.0 min CN=87 Runoff=0.39 cfs 1,143 cf

Subcatchment 230: Backside of Lots 11-14 Runoff Area=0.550 ac Runoff Depth>1.01"
Tc=5.0 min CN=77 Runoff=0.67 cfs 2,010 cf

Reach ##2R: Recharge to DMH Avg. Depth=0.51' Max Vel=6.48 fps Inflow=2.59 cfs 2,132 cf
D=12.0" n=0.013 L=40.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=2.58 cfs 2,139 cf

Reach 101R: R101 to R102 Avg. Depth=0.04' Max Vel=0.98 fps Inflow=0.67 cfs 2,010 cf
n=0.025 L=315.0' S=0.0190 '/' Capacity=1,068.23 cfs Outflow=0.55 cfs 2,000 cf

Reach 102R: 102 to POA Avg. Depth=0.10' Max Vel=2.75 fps Inflow=2.68 cfs 6,734 cf
n=0.025 L=120.0' S=0.0500 '/' Capacity=1,345.64 cfs Outflow=2.64 cfs 6,729 cf

Reach 121R: Roadside Swale Avg. Depth=0.19' Max Vel=2.23 fps Inflow=0.47 cfs 1,379 cf
n=0.023 L=30.0' S=0.0200 '/' Capacity=20.49 cfs Outflow=0.47 cfs 1,378 cf

Reach 122R: Driveway Culvert-DI Avg. Depth=0.21' Max Vel=5.02 fps Inflow=0.47 cfs 1,378 cf
D=8.0" n=0.010 L=32.0' S=0.0200 '/' Capacity=2.22 cfs Outflow=0.46 cfs 1,378 cf

Reach 123R: Roadside Swale Avg. Depth=0.18' Max Vel=2.43 fps Inflow=0.46 cfs 1,378 cf
n=0.023 L=60.0' S=0.0250 '/' Capacity=22.91 cfs Outflow=0.46 cfs 1,377 cf

Reach 124R: Driveway Culvert-DI Avg. Depth=0.21' Max Vel=5.01 fps Inflow=0.46 cfs 1,377 cf
D=8.0" n=0.010 L=32.0' S=0.0200 '/' Capacity=2.22 cfs Outflow=0.45 cfs 1,377 cf

Reach 125R: Swale to RG Avg. Depth=0.13' Max Vel=4.14 fps Inflow=0.45 cfs 1,377 cf
n=0.023 L=120.0' S=0.1101 '/' Capacity=48.07 cfs Outflow=0.44 cfs 1,376 cf

Reach 126R: CB 10 to INLET13 Avg. Depth=0.26' Max Vel=3.72 fps Inflow=0.61 cfs 1,837 cf
D=12.0" n=0.013 L=12.0' S=0.0133 '/' Capacity=4.11 cfs Outflow=0.61 cfs 1,837 cf

Reach 132R: DMH 14 to DMH 15 Avg. Depth=0.39' Max Vel=6.47 fps Inflow=2.14 cfs 6,494 cf
D=15.0" n=0.013 L=104.0' S=0.0238 '/' Capacity=9.98 cfs Outflow=2.12 cfs 6,491 cf

Reach 133R: DMH 15 to Swale Avg. Depth=0.37' Max Vel=7.92 fps Inflow=2.12 cfs 6,491 cf
D=12.0" n=0.013 L=19.0' S=0.0400 '/' Capacity=7.13 cfs Outflow=2.12 cfs 6,491 cf

Reach 134R: Swale to Stream Avg. Depth=0.25' Max Vel=4.90 fps Inflow=2.12 cfs 6,491 cf
n=0.030 L=150.0' S=0.1050 '/' Capacity=228.54 cfs Outflow=2.07 cfs 6,486 cf

Reach 135R: Stream to POA Avg. Depth=0.04' Max Vel=5.05 fps Inflow=2.07 cfs 6,486 cf
n=0.023 L=5.0' S=0.4000 '/' Capacity=4,137.00 cfs Outflow=2.07 cfs 6,486 cf

Reach 136R: CB11 to DMH 13 Avg. Depth=0.55' Max Vel=4.69 fps Inflow=2.08 cfs 6,168 cf
D=12.0" n=0.013 L=42.0' S=0.0100 '/' Capacity=3.56 cfs Outflow=2.07 cfs 6,167 cf

Reach 139R: I12 to DMH 13 Avg. Depth=0.11' Max Vel=2.65 fps Inflow=0.12 cfs 329 cf
D=12.0" n=0.013 L=26.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=0.12 cfs 329 cf

Reach 141R: CB 21 to DMH Inflow=4.83 cfs 14,220 cf
Outflow=4.83 cfs 14,220 cf

Reach 142R: CB 22 to DMH Inflow=0.39 cfs 1,143 cf
Outflow=0.39 cfs 1,143 cf

Reach 143R: DMH to Pretreatment Avg. Depth=0.85' Max Vel=7.31 fps Inflow=5.22 cfs 15,363 cf
D=12.0" n=0.013 L=30.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=5.21 cfs 15,362 cf

Reach 145R: Pretreatment to Recharge Avg. Depth=0.85' Max Vel=7.31 fps Inflow=5.21 cfs 15,362 cf
D=12.0" n=0.013 L=10.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=5.20 cfs 15,361 cf

Reach 146R: DMH to Swale Avg. Depth=0.51' Max Vel=6.46 fps Inflow=2.58 cfs 2,139 cf
D=12.0" n=0.013 L=100.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=2.47 cfs 2,139 cf

Reach 147R: Swale to Stream Avg. Depth=0.22' Max Vel=6.89 fps Inflow=2.47 cfs 2,139 cf
n=0.023 L=50.0' S=0.1420 '/' Capacity=346.67 cfs Outflow=2.41 cfs 2,139 cf

Reach 148R: Stream to R102 Avg. Depth=0.11' Max Vel=1.95 fps Inflow=2.41 cfs 2,139 cf
n=0.023 L=100.0' S=0.0200 '/' Capacity=925.06 cfs Outflow=1.90 cfs 2,139 cf

Reach D14: DW 13 to DMH 14 Avg. Depth=0.38' Max Vel=7.92 fps Inflow=2.15 cfs 6,496 cf
D=12.0" n=0.013 L=80.0' S=0.0400 '/' Capacity=7.13 cfs Outflow=2.14 cfs 6,494 cf

Reach PTA: Point of Analysis Inflow=3.53 cfs 13,215 cf
Outflow=3.53 cfs 13,215 cf

Pond 1P: Rain Garden / Bioretention Cell 2 Peak Elev=111.09' Storage=411 cf Inflow=0.57 cfs 606 cf
Discarded=0.08 cfs 606 cf Primary=0.00 cfs 0 cf Outflow=0.08 cfs 606 cf

Pond 144P: Pretreatment Inflow=5.21 cfs 15,362 cf
Primary=5.21 cfs 15,362 cf

Pond 401P: Rain Garden/Bioretention Cell 1 Peak Elev=111.63' Storage=961 cf Inflow=1.23 cfs 3,768 cf
Discarded=0.13 cfs 3,159 cf Primary=0.57 cfs 606 cf Outflow=0.70 cfs 3,765 cf

Pond 402P: Recharge System Peak Elev=103.60' Storage=4,421 cf Inflow=5.20 cfs 15,361 cf
Discarded=0.42 cfs 13,218 cf Primary=2.59 cfs 2,132 cf Outflow=3.01 cfs 15,350 cf

Total Runoff Area = 285,536 sf Runoff Volume = 30,235 cf Average Runoff Depth = 1.27"
67.96% Pervious Area = 194,060 sf 32.04% Impervious Area = 91,476 sf

Subcatchment 110: Backside of Lots 1-4

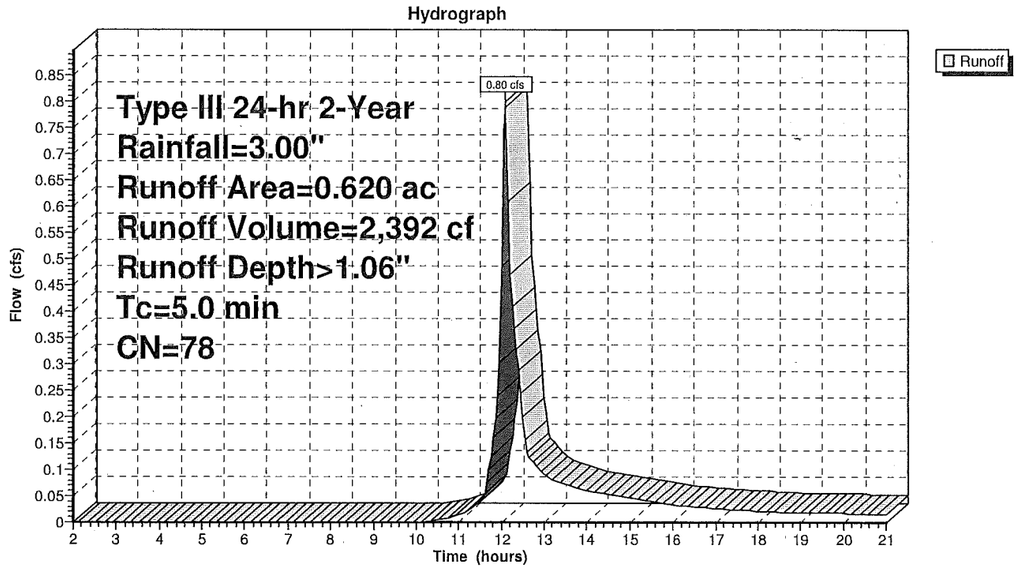
[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.80 cfs @ 12.08 hrs, Volume= 2,392 cf, Depth> 1.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (ac)	CN	Description
0.050	70	Woods, Good, HSG C
0.460	74	>75% Grass cover, Good, HSG C
0.110	98	Paved parking & roofs
0.620	78	Weighted Average
0.510		Pervious Area
0.110		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, MIN**



Subcatchment 120: Frontside of Lots 3&4

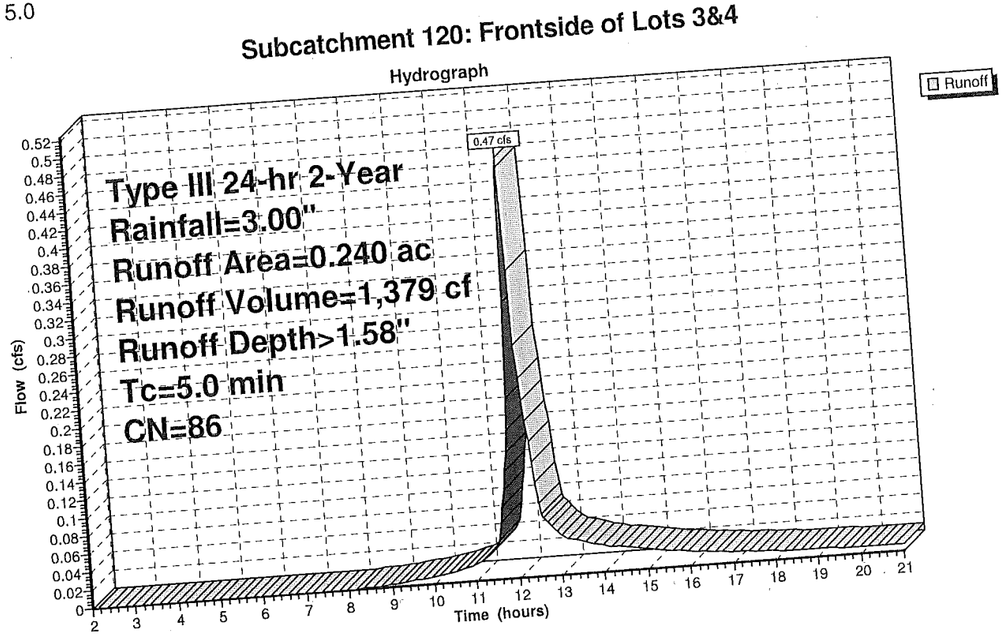
[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.47 cfs @ 12.08 hrs, Volume= 1,379 cf, Depth> 1.58"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (ac)	CN	Description
0.120	74	>75% Grass cover, Good, HSG C
0.120	98	Paved roads w/curbs & sewers
0.240	86	Weighted Average
0.120		Pervious Area
0.120		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, MIN



Subcatchment 130: Frontside of Lots 1&2

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

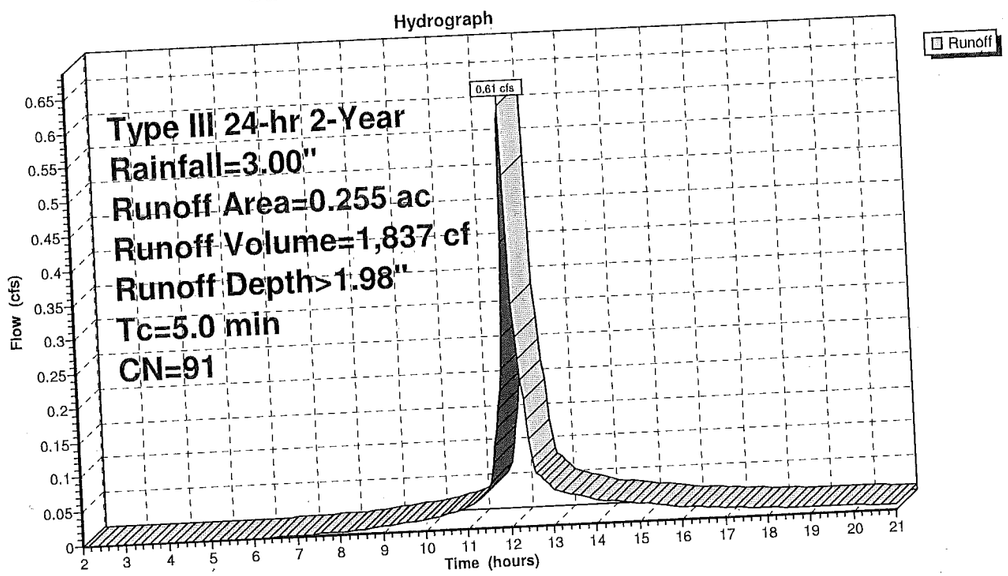
Runoff = 0.61 cfs @ 12.07 hrs, Volume= 1,837 cf, Depth> 1.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (ac)	CN	Description
0.005	70	Woods, Good, HSG C
0.070	74	>75% Grass cover, Good, HSG C
0.180	98	Paved roads w/curbs & sewers
0.255	91	Weighted Average
0.075		Pervious Area
0.180		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, MIN

Subcatchment 130: Frontside of Lots 1&2



Subcatchment 135: Side of Lot 1

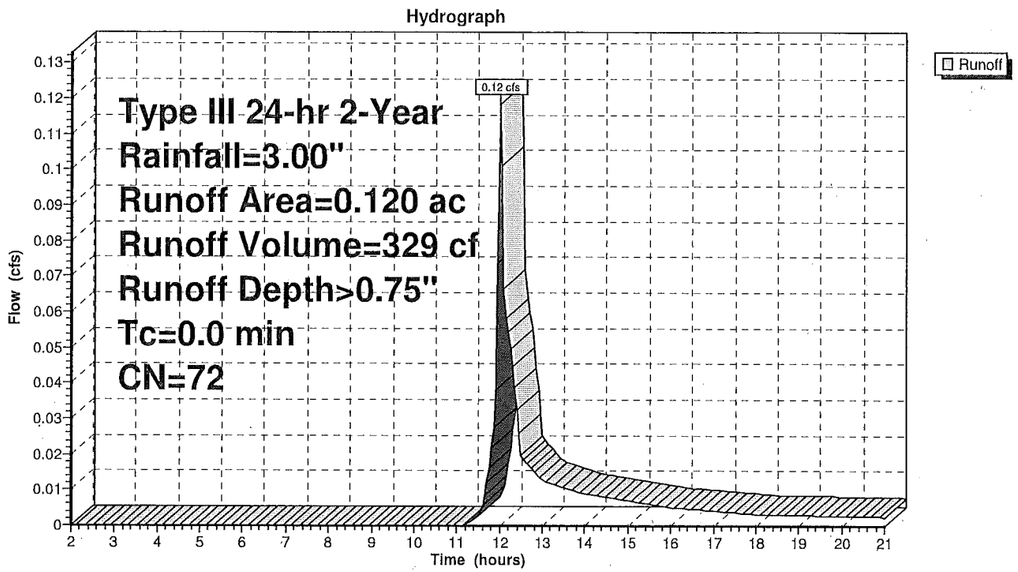
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.12 cfs @ 12.01 hrs, Volume= 329 cf, Depth> 0.75"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (ac)	CN	Description
0.050	70	Woods, Good, HSG C
0.070	74	>75% Grass cover, Good, HSG C
0.120	72	Weighted Average
0.120		Pervious Area

Subcatchment 135: Side of Lot 1



Subcatchment 140: Frontside of Lots 18-20

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

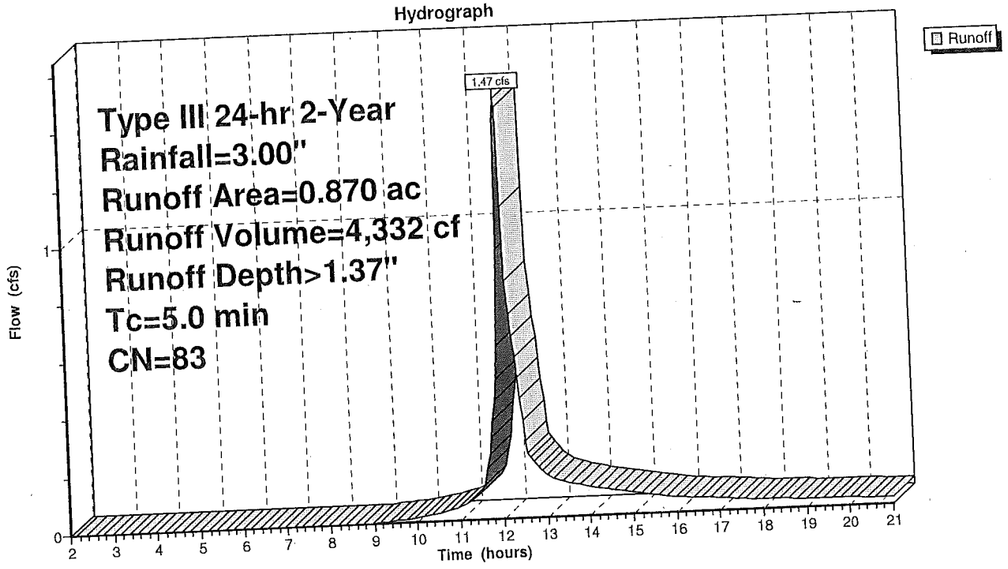
Runoff = 1.47 cfs @ 12.08 hrs, Volume= 4,332 cf, Depth> 1.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (ac)	CN	Description
0.550	74	>75% Grass cover, Good, HSG C
0.320	98	Paved roads w/curbs & sewers
0.870	83	Weighted Average
0.550		Pervious Area
0.320		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, MIN

Subcatchment 140: Frontside of Lots 18-20



Subcatchment 150: Backside of Lots 18-20

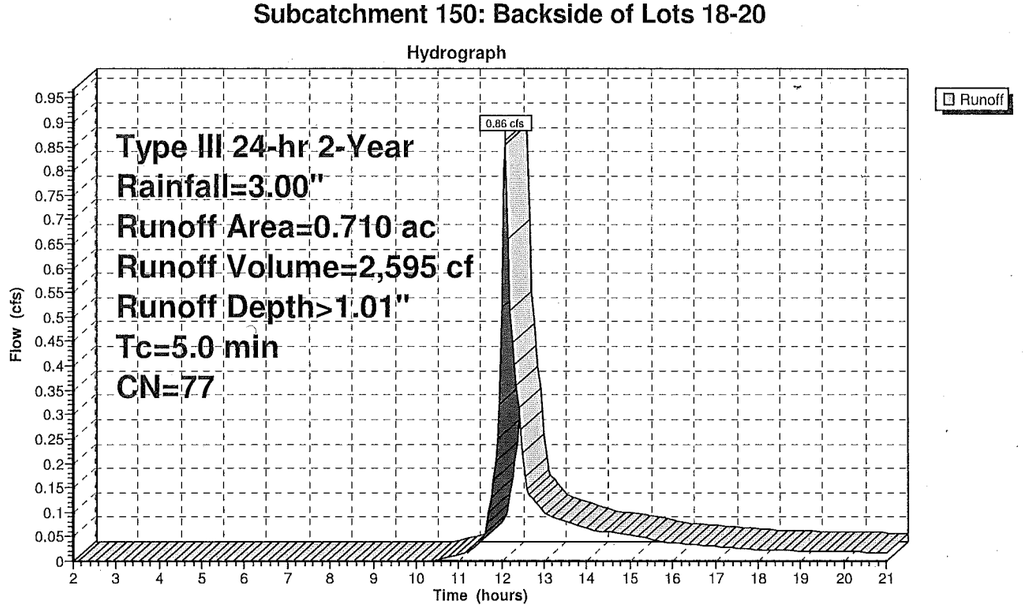
[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.86 cfs @ 12.09 hrs, Volume= 2,595 cf, Depth> 1.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (ac)	CN	Description
0.180	70	Woods, Good, HSG C
0.400	74	>75% Grass cover, Good, HSG C
0.130	98	Paved parking & roofs
0.710	77	Weighted Average
0.580		Pervious Area
0.130		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, MIN**



Subcatchment 210: Lots 5-17

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

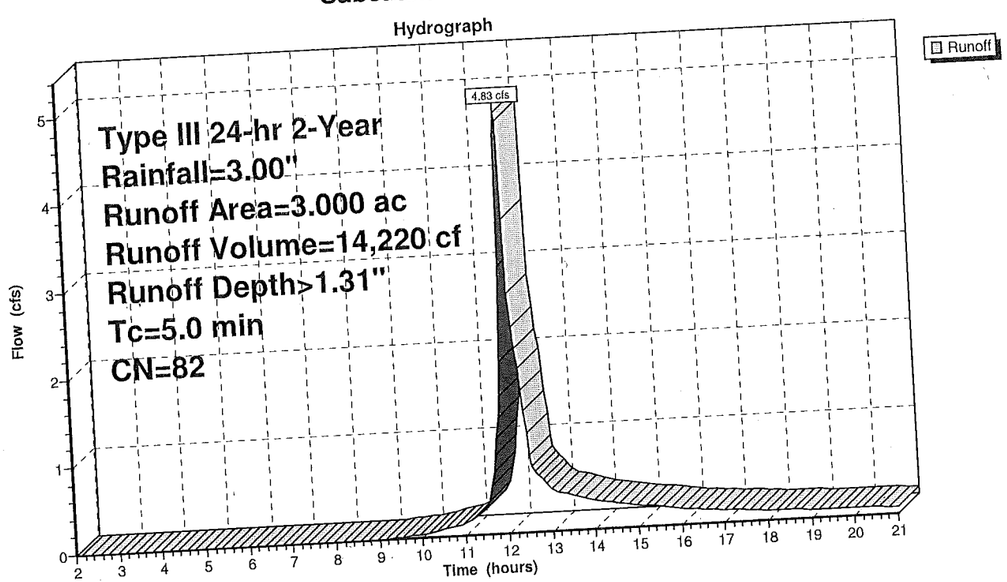
Runoff = 4.83 cfs @ 12.08 hrs, Volume= 14,220 cf, Depth> 1.31"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (ac)	CN	Description
1.730	74	>75% Grass cover, Good, HSG C
1.050	98	Paved roads w/curbs & sewers
0.220	70	Woods, Good, HSG C
3.000	82	Weighted Average
1.950		Pervious Area
1.050		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, MIN

Subcatchment 210: Lots 5-17



Subcatchment 220: Cul-de-sac

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

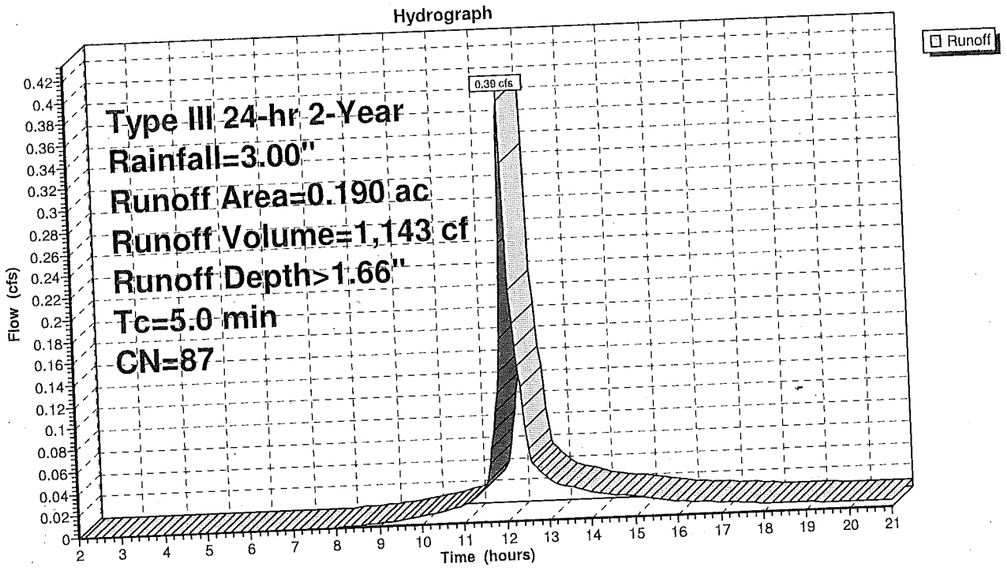
Runoff = 0.39 cfs @ 12.08 hrs, Volume= 1,143 cf, Depth> 1.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (ac)	CN	Description
0.090	74	>75% Grass cover, Good, HSG C
0.100	98	Paved roads w/curbs & sewers
0.190	87	Weighted Average
0.090		Pervious Area
0.100		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, MIN

Subcatchment 220: Cul-de-sac



Subcatchment 230: Backside of Lots 11-14

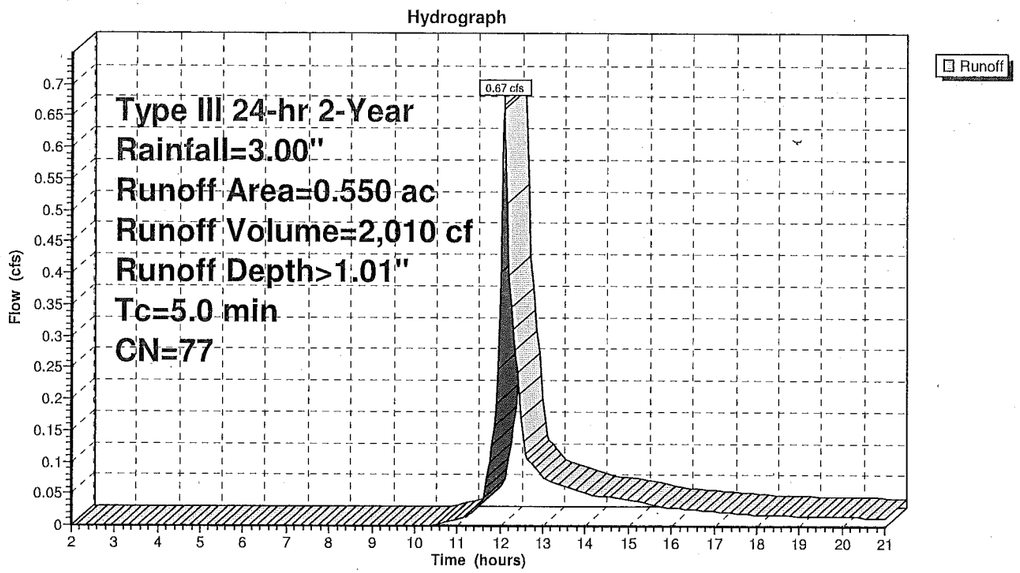
[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.67 cfs @ 12.09 hrs, Volume= 2,010 cf, Depth> 1.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.00"

Area (ac)	CN	Description
0.150	70	Woods, Good, HSG C
0.310	74	>75% Grass cover, Good, HSG C
0.090	98	Paved parking & roofs
0.550	77	Weighted Average
0.460		Pervious Area
0.090		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, MIN**



Reach ##2R: Recharge to DMH

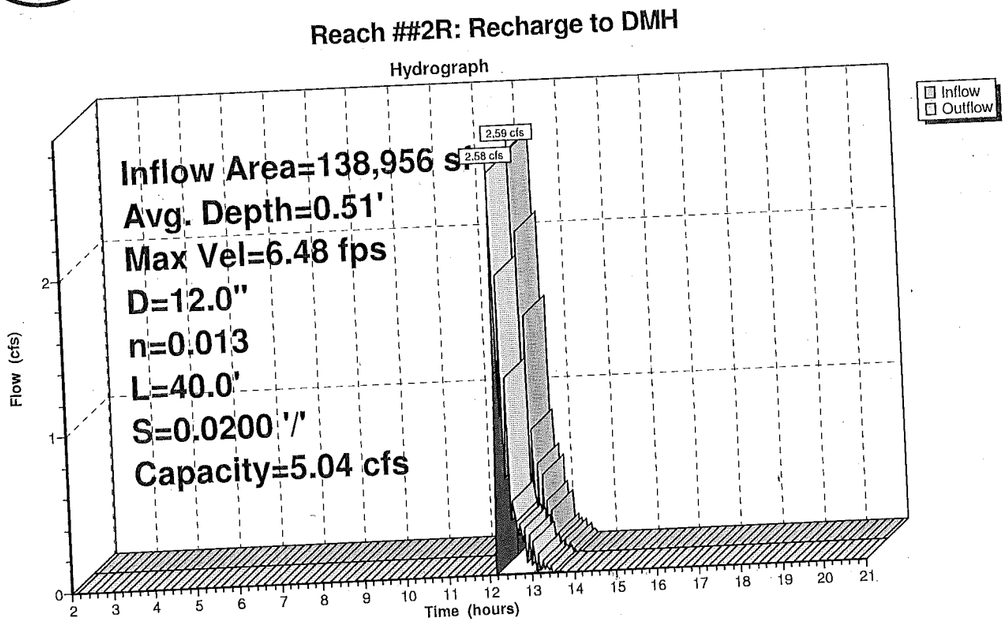
[52] Hint: Inlet conditions not evaluated

Inflow Area =	138,956 sf,	Inflow Depth =	0.18"	for	2-Year event
Inflow =	2.59 cfs @	12.30 hrs,	Volume=		2,132 cf
Outflow =	2.58 cfs @	12.30 hrs,	Volume=		2,139 cf, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.48 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.24 fps, Avg. Travel Time= 0.2 min

Peak Storage= 16 cf @ 12.30 hrs, Average Depth at Peak Storage= 0.51'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.04 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 40.0' Slope= 0.0200 '/'
Inlet Invert= 100.00', Outlet Invert= 99.20'



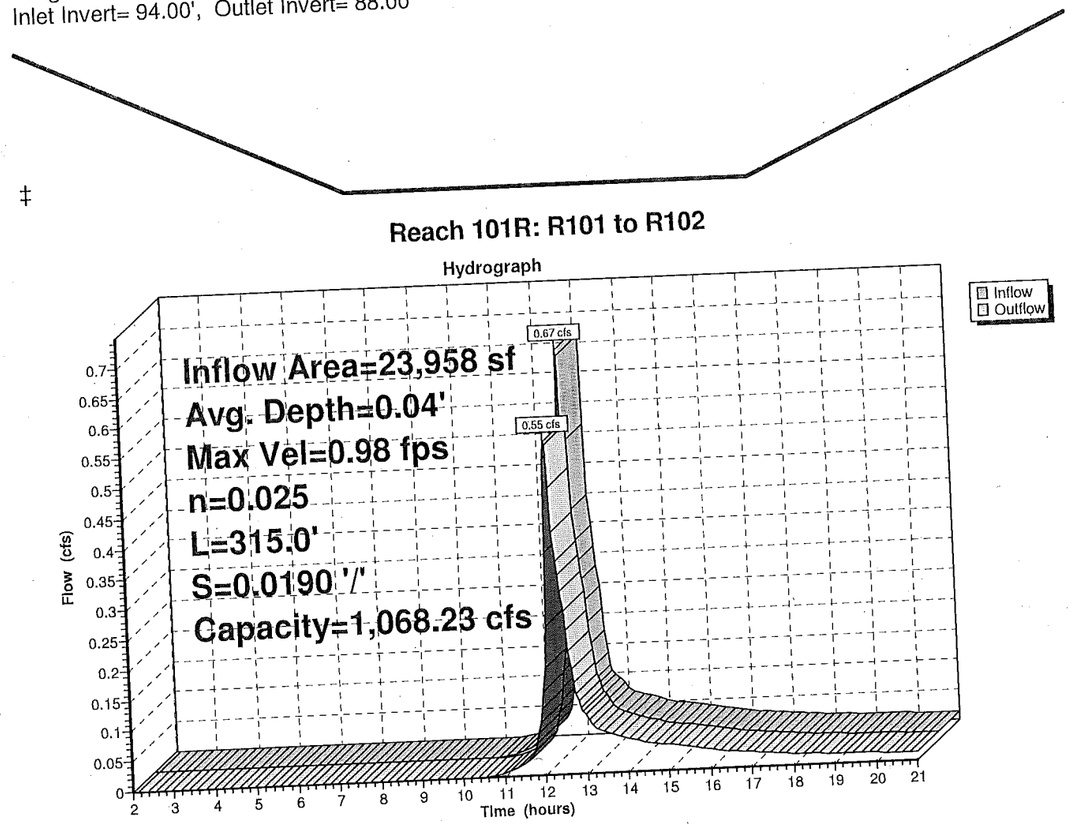
Reach 101R: R101 to R102

Inflow Area = 23,958 sf, Inflow Depth > 1.01" for 2-Year event
Inflow = 0.67 cfs @ 12.09 hrs, Volume= 2,010 cf
Outflow = 0.55 cfs @ 12.24 hrs, Volume= 2,000 cf, Atten= 18%, Lag= 9.2 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.98 fps, Min. Travel Time= 5.4 min
Avg. Velocity = 0.79 fps, Avg. Travel Time= 6.6 min

Peak Storage= 181 cf @ 12.15 hrs, Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 1,068.23 cfs

15.00' x 3.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 4.0 '/' Top Width= 39.00'
Length= 315.0' Slope= 0.0190 '/'
Inlet Invert= 94.00', Outlet Invert= 88.00'



Reach 102R: 102 to POA

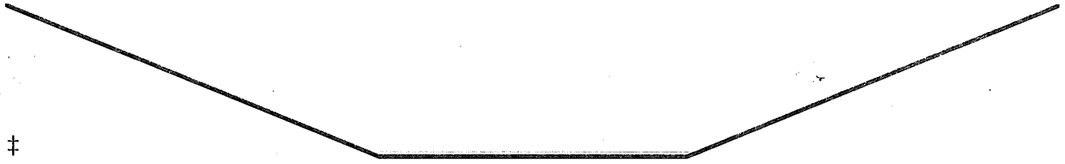
[61] Hint: Submerged 2% of Reach 101R bottom
[61] Hint: Submerged 5% of Reach 148R bottom

Inflow Area = 193,842 sf, Inflow Depth > 0.42" for 2-Year event
Inflow = 2.68 cfs @ 12.34 hrs, Volume= 6,734 cf
Outflow = 2.64 cfs @ 12.36 hrs, Volume= 6,729 cf, Atten= 1%, Lag= 1.3 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.75 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.33 fps, Avg. Travel Time= 1.5 min

Peak Storage= 120 cf @ 12.35 hrs, Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 1,345.64 cfs

10.00' x 3.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 4.0 '/' Top Width= 34.00'
Length= 120.0' Slope= 0.0500 '/'
Inlet Invert= 88.00', Outlet Invert= 82.00'



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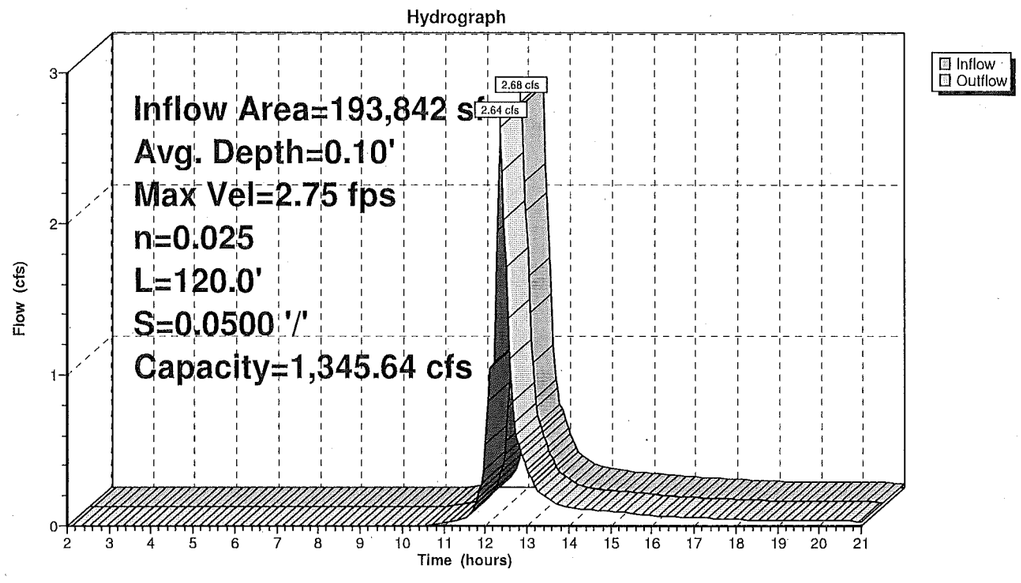
Reach 102R: 102 to POA



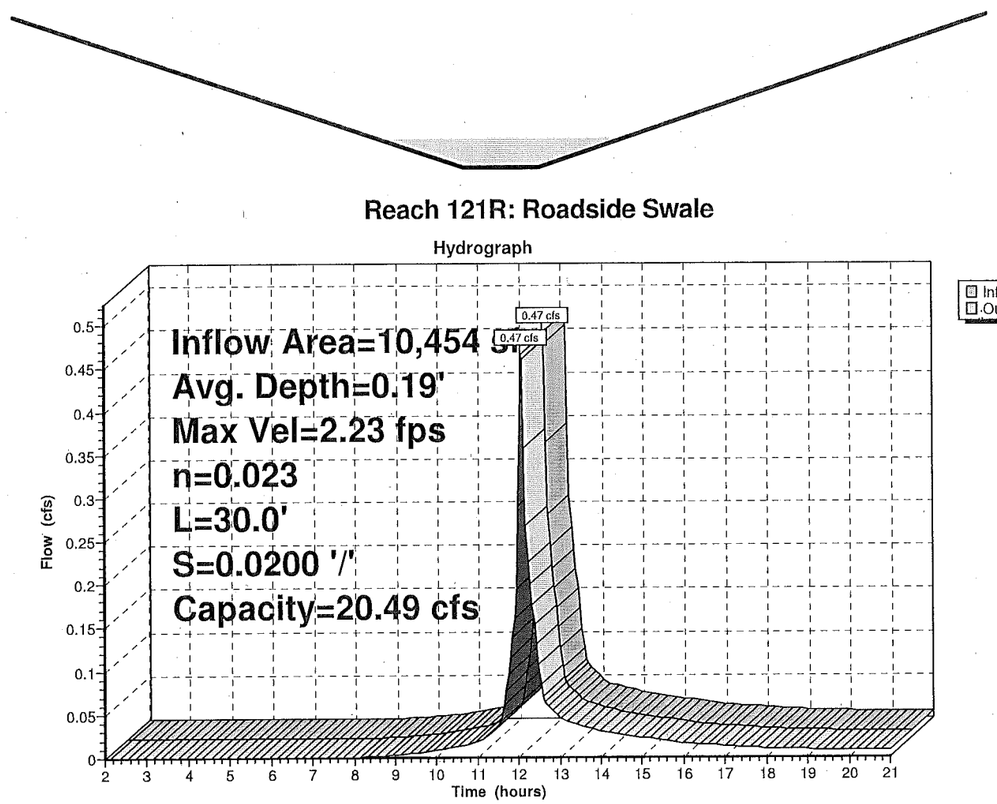
Reach 121R: Roadside Swale

Inflow Area = 10,454 sf, Inflow Depth > 1.58" for 2-Year event
Inflow = 0.47 cfs @ 12.08 hrs, Volume= 1,379 cf
Outflow = 0.47 cfs @ 12.09 hrs, Volume= 1,378 cf, Atten= 1%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.23 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 0.6 min

Peak Storage= 6 cf @ 12.08 hrs, Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 20.49 cfs

0.50' x 1.00' deep channel, n= 0.023 Earth, clean & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.50'
Length= 30.0' Slope= 0.0200 '/'
Inlet Invert= 119.50', Outlet Invert= 118.90'



Reach 122R: Driveway Culvert-DI

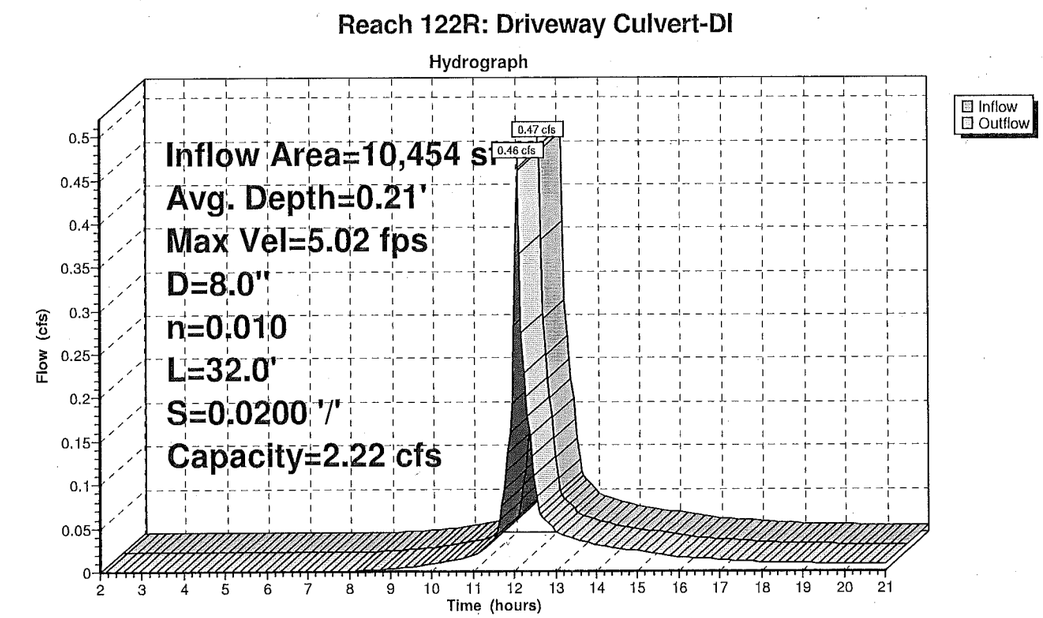
[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 34% of Reach 121R bottom

Inflow Area = 10,454 sf, Inflow Depth > 1.58" for 2-Year event
Inflow = 0.47 cfs @ 12.09 hrs, Volume= 1,378 cf
Outflow = 0.46 cfs @ 12.09 hrs, Volume= 1,378 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.02 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.89 fps, Avg. Travel Time= 0.3 min

Peak Storage= 3 cf @ 12.09 hrs, Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 0.67', Capacity at Bank-Full= 2.22 cfs

8.0" Diameter Pipe, n= 0.010 Cast iron, coated
Length= 32.0' Slope= 0.0200 '/'
Inlet Invert= 118.90', Outlet Invert= 118.26'



Reach 123R: Roadside Swale

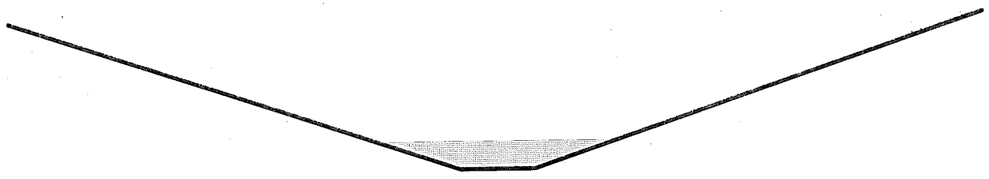
[61] Hint: Submerged 29% of Reach 122R bottom

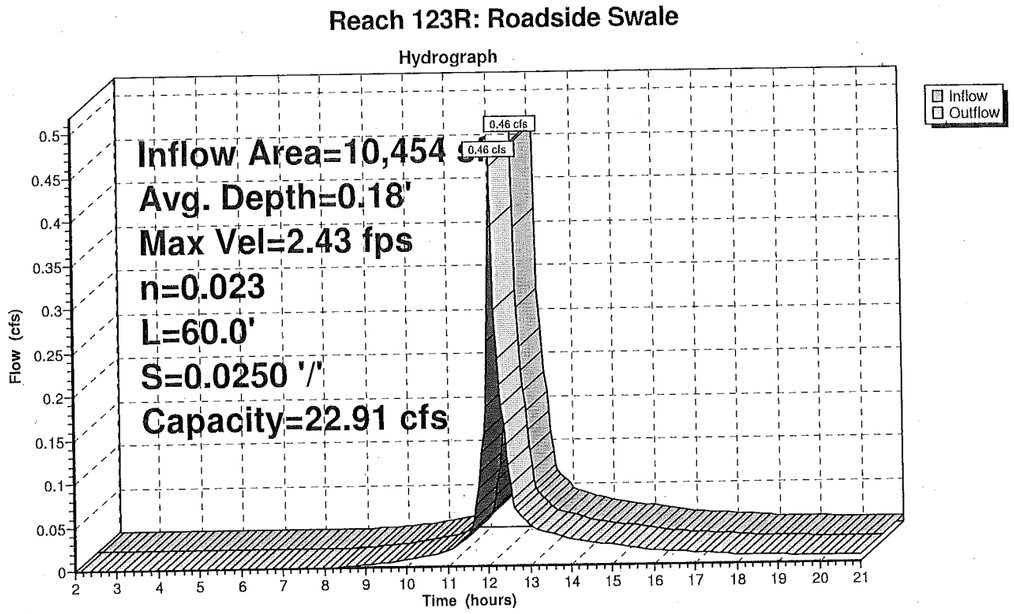
Inflow Area = 10,454 sf, Inflow Depth > 1.58" for 2-Year event
Inflow = 0.46 cfs @ 12.09 hrs, Volume= 1,378 cf
Outflow = 0.46 cfs @ 12.10 hrs, Volume= 1,377 cf, Atten= 1%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.43 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.92 fps, Avg. Travel Time= 1.1 min

Peak Storage= 12 cf @ 12.09 hrs, Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 22.91 cfs

0.50' x 1.00' deep channel, n= 0.023 Earth, clean & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.50'
Length= 60.0' Slope= 0.0250 '/'
Inlet Invert= 118.26', Outlet Invert= 116.76'





Reach 124R: Driveway Culvert-DI

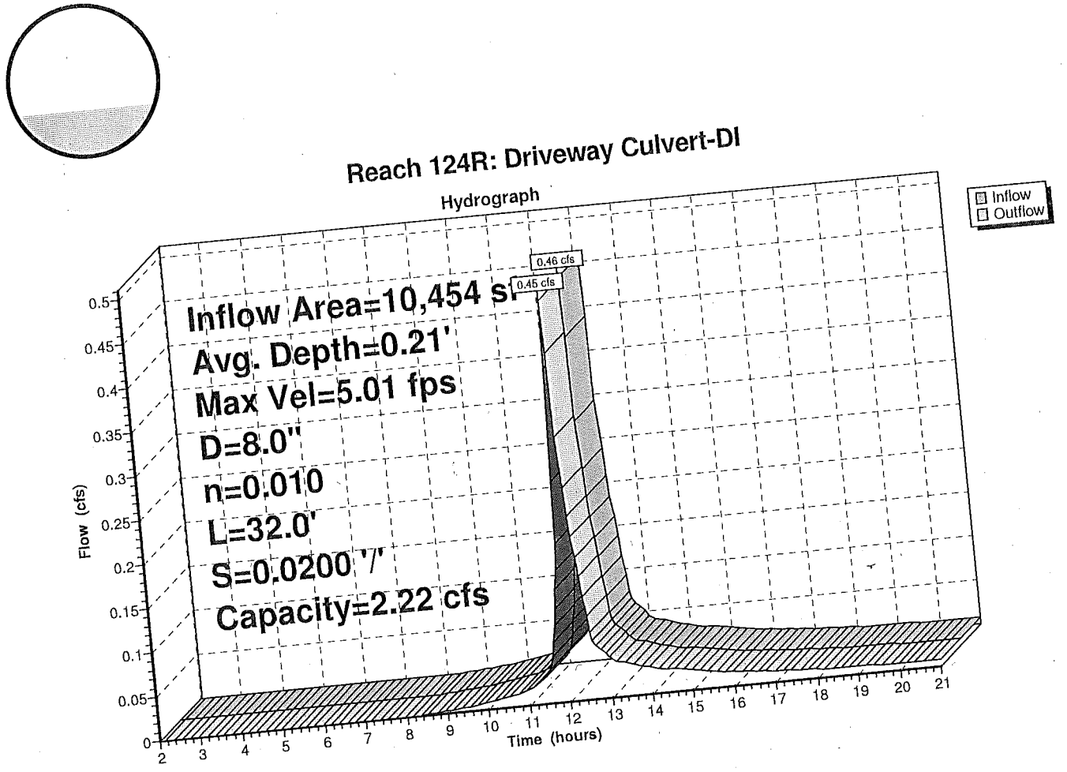
[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 14% of Reach 123R bottom

Inflow Area = 10,454 sf, Inflow Depth > 1.58" for 2-Year event
Inflow = 0.46 cfs @ 12.10 hrs, Volume= 1,377 cf
Outflow = 0.45 cfs @ 12.10 hrs, Volume= 1,377 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.01 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.89 fps, Avg. Travel Time= 0.3 min

Peak Storage= 3 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 0.67', Capacity at Bank-Full= 2.22 cfs

8.0" Diameter Pipe, n= 0.010 Cast iron, coated
Length= 32.0' Slope= 0.0200 '/'
Inlet Invert= 116.76', Outlet Invert= 116.12'



Reach 125R: Swale to RG

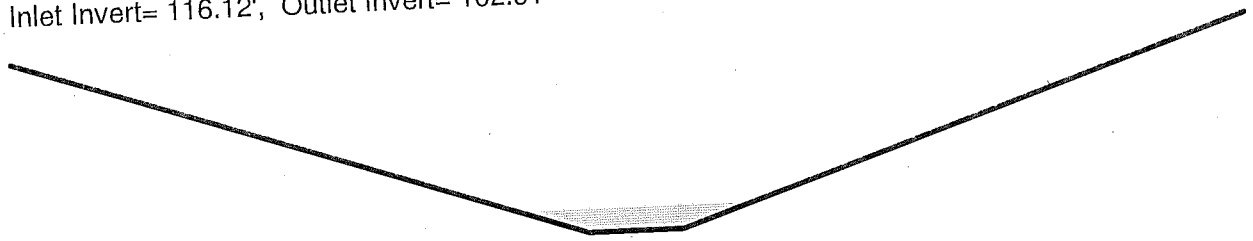
[61] Hint: Submerged 19% of Reach 124R bottom

Inflow Area = 10,454 sf, Inflow Depth > 1.58" for 2-Year event
Inflow = 0.45 cfs @ 12.10 hrs, Volume= 1,377 cf
Outflow = 0.44 cfs @ 12.12 hrs, Volume= 1,376 cf, Atten= 3%, Lag= 0.8 min

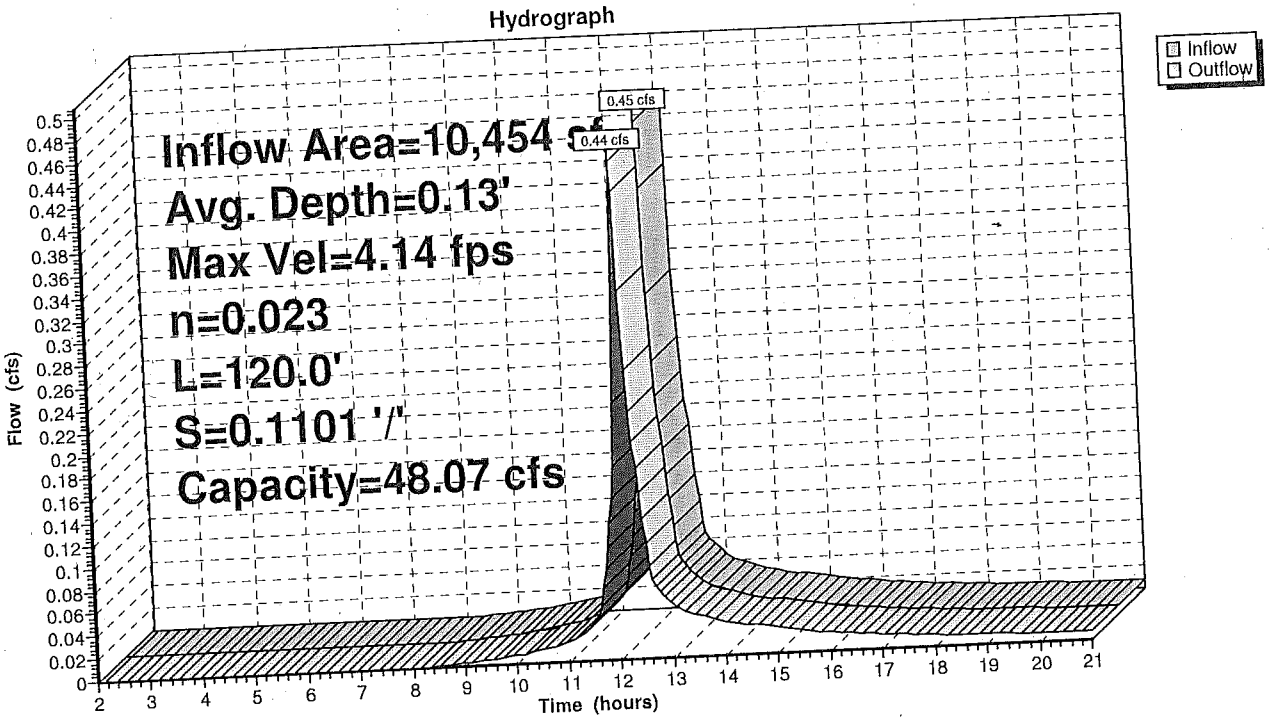
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.14 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.54 fps, Avg. Travel Time= 1.3 min

Peak Storage= 13 cf @ 12.11 hrs, Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 48.07 cfs

0.50' x 1.00' deep channel, n= 0.023 Earth, clean & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.50'
Length= 120.0' Slope= 0.1101 '/'
Inlet Invert= 116.12', Outlet Invert= 102.91'



Reach 125R: Swale to RG



Reach 126R: CB 10 to INLET13

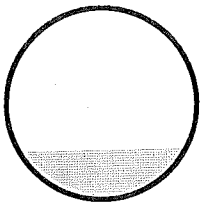
[52] Hint: Inlet conditions not evaluated

Inflow Area = 11,108 sf, Inflow Depth > 1.98" for 2-Year event
Inflow = 0.61 cfs @ 12.07 hrs, Volume= 1,837 cf
Outflow = 0.61 cfs @ 12.08 hrs, Volume= 1,837 cf, Atten= 1%, Lag= 0.1 min

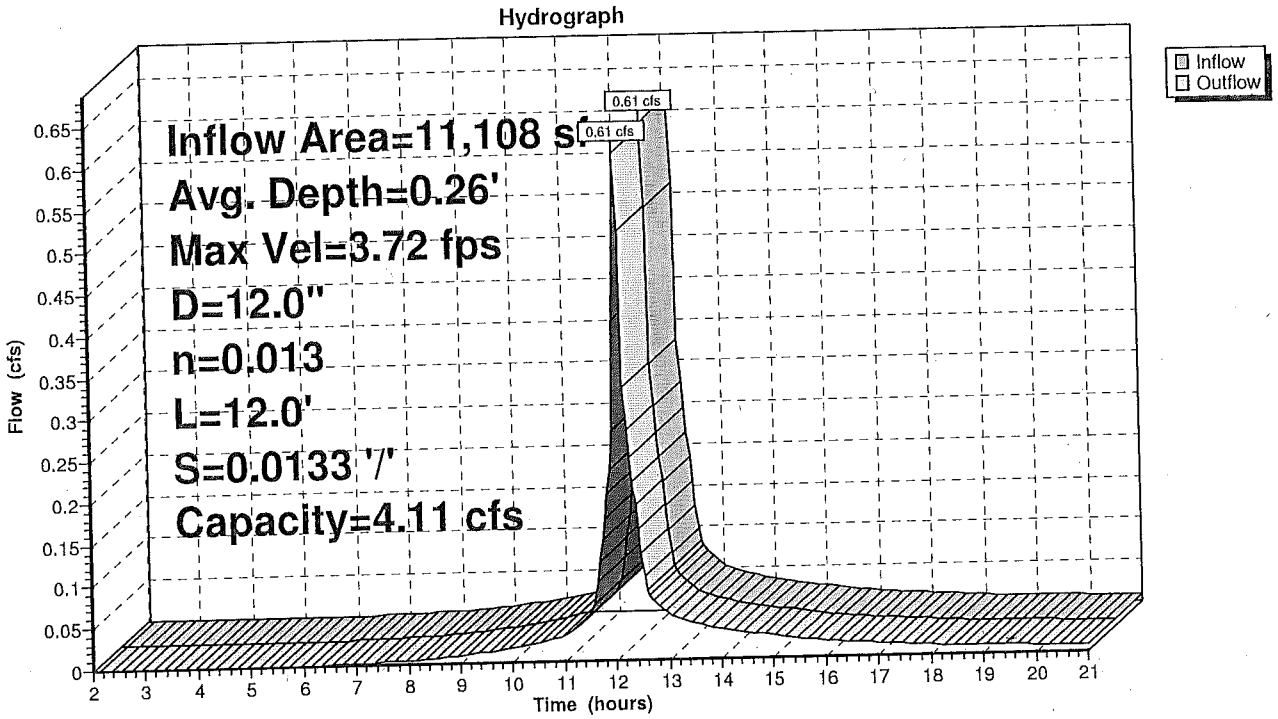
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.72 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.32 fps, Avg. Travel Time= 0.2 min

Peak Storage= 2 cf @ 12.07 hrs, Average Depth at Peak Storage= 0.26'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 4.11 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 12.0' Slope= 0.0133 '/'
Inlet Invert= 105.16', Outlet Invert= 105.00'



Reach 126R: CB 10 to INLET13



Reach 132R: DMH 14 to DMH 15

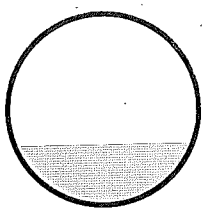
[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 1% of Reach D14 bottom

Inflow Area = 91,694 sf, Inflow Depth > 0.85" for 2-Year event
Inflow = 2.14 cfs @ 12.09 hrs, Volume= 6,494 cf
Outflow = 2.12 cfs @ 12.09 hrs, Volume= 6,491 cf, Atten= 1%, Lag= 0.5 min

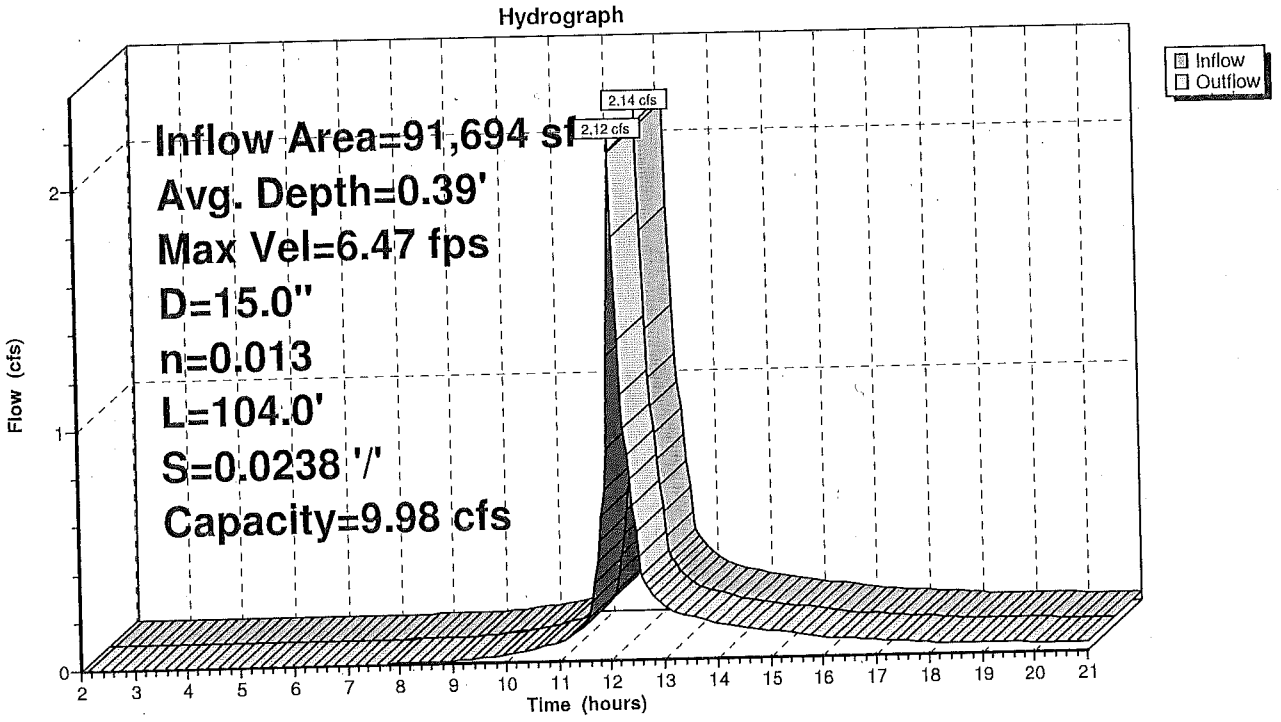
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.47 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.23 fps, Avg. Travel Time= 0.8 min

Peak Storage= 34 cf @ 12.09 hrs, Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 1.25', Capacity at Bank-Full= 9.98 cfs

15.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 104.0' Slope= 0.0238 '/'
Inlet Invert= 101.09', Outlet Invert= 98.61'



Reach 132R: DMH 14 to DMH 15



Reach 133R: DMH 15 to Swale

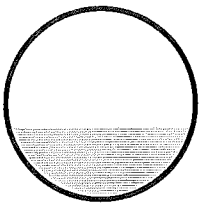
[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 11% of Reach 132R bottom

Inflow Area = 91,694 sf, Inflow Depth > 0.85" for 2-Year event
Inflow = 2.12 cfs @ 12.09 hrs, Volume= 6,491 cf
Outflow = 2.12 cfs @ 12.10 hrs, Volume= 6,491 cf, Atten= 0%, Lag= 0.1 min

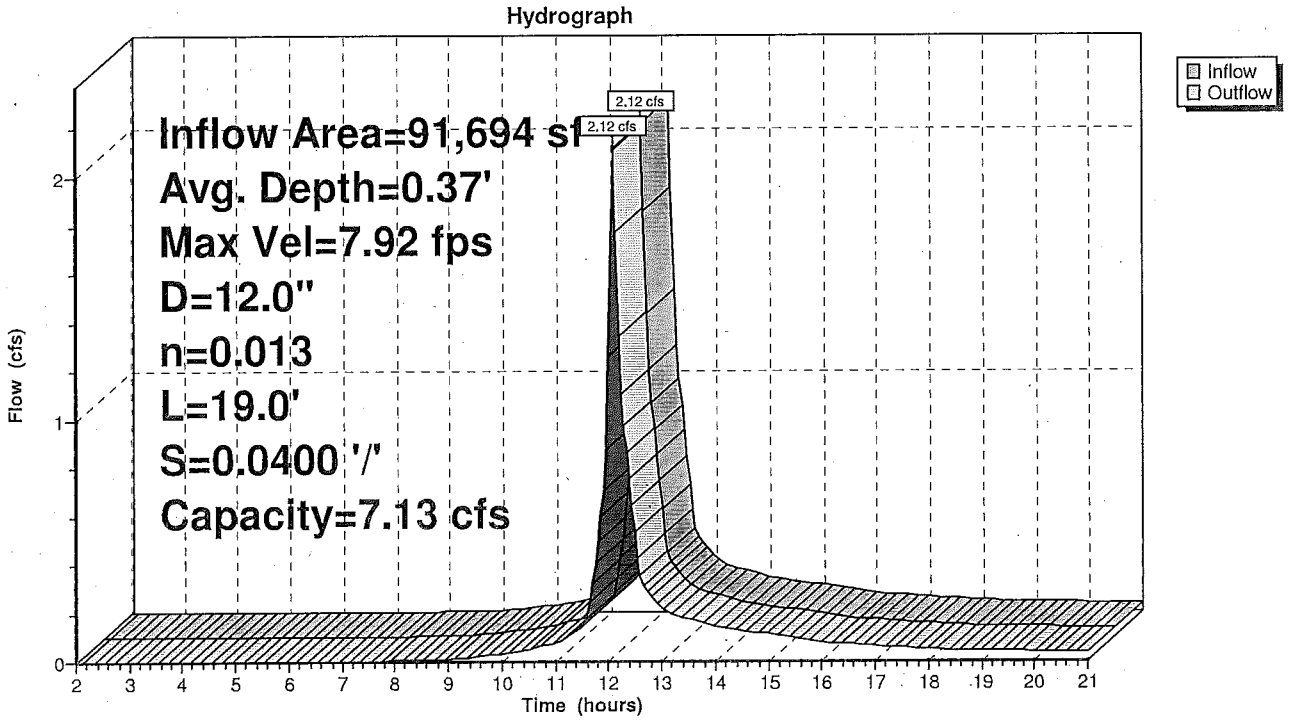
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.92 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.74 fps, Avg. Travel Time= 0.1 min

Peak Storage= 5 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.37'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.13 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 19.0' Slope= 0.0400 '/'
Inlet Invert= 98.51', Outlet Invert= 97.75'



Reach 133R: DMH 15 to Swale



Reach 134R: Swale to Stream

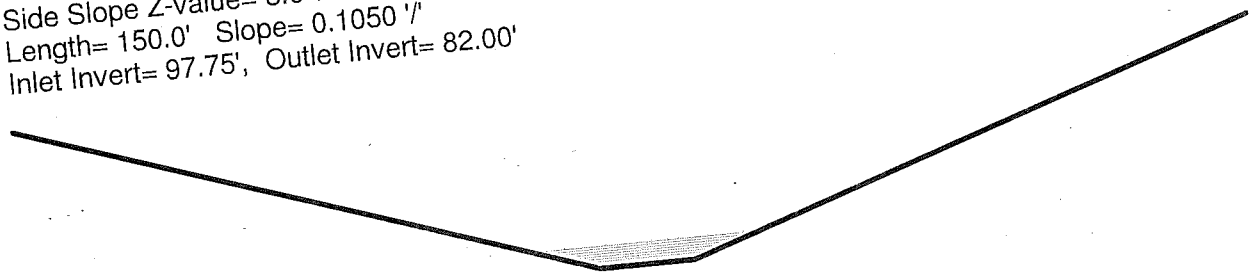
[61] Hint: Submerged 33% of Reach 133R bottom

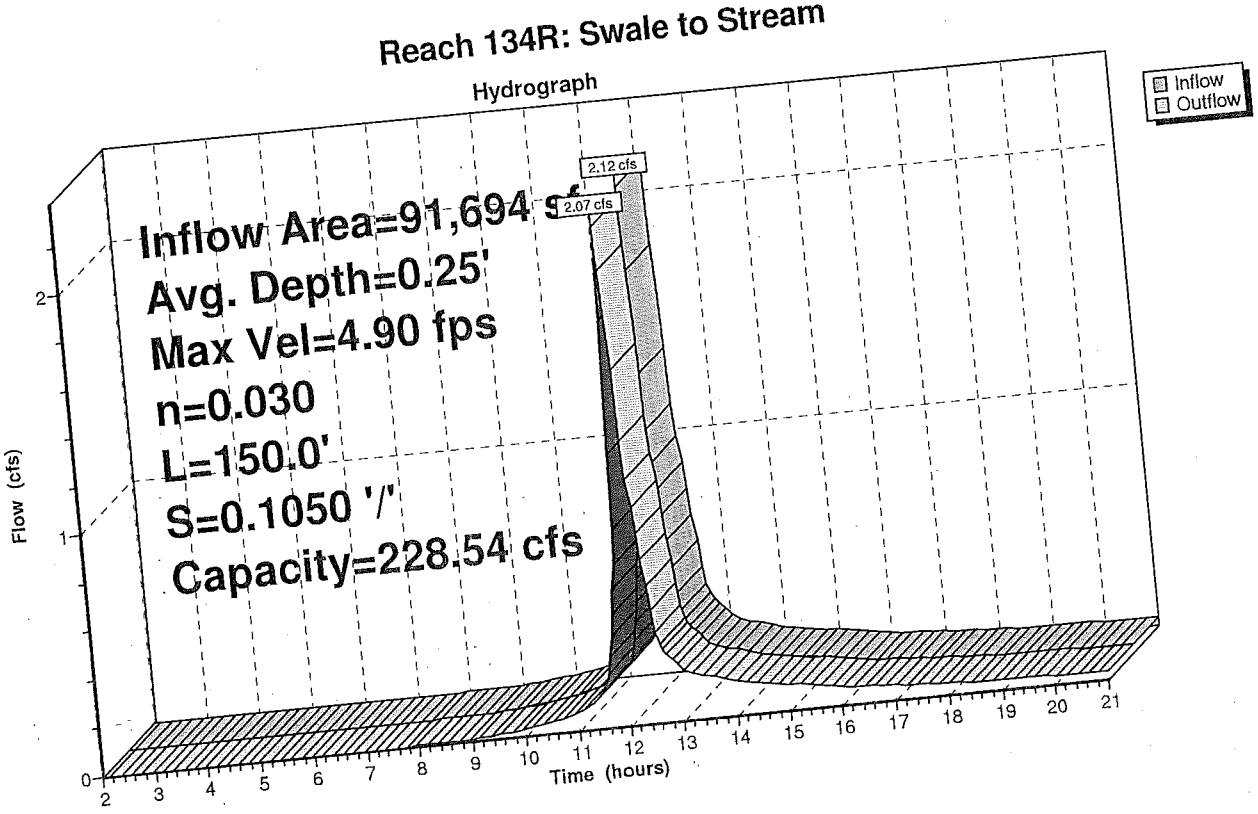
Inflow Area = 91,694 sf, Inflow Depth > 0.85" for 2-Year event
Inflow = 2.12 cfs @ 12.10 hrs, Volume= 6,491 cf
Outflow = 2.07 cfs @ 12.11 hrs, Volume= 6,486 cf, Atten= 2%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.90 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.73 fps, Avg. Travel Time= 1.4 min

Peak Storage= 65 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 228.54 cfs

1.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 13.00'
Length= 150.0' Slope= 0.1050 '/'
Inlet Invert= 97.75', Outlet Invert= 82.00'





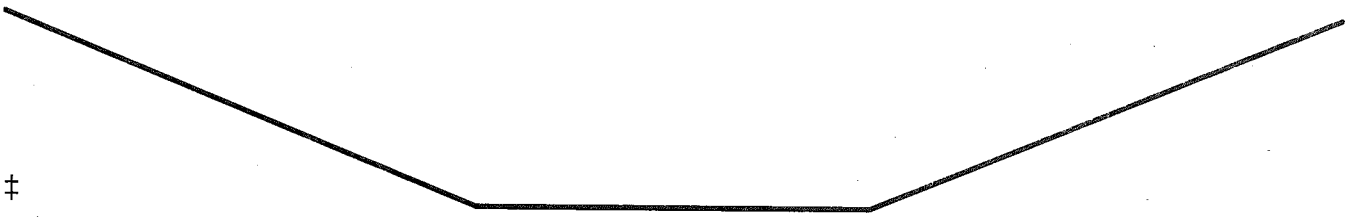
Reach 135R: Stream to POA

Inflow Area = 91,694 sf, Inflow Depth > 0.85" for 2-Year event
Inflow = 2.07 cfs @ 12.11 hrs, Volume= 6,486 cf
Outflow = 2.07 cfs @ 12.11 hrs, Volume= 6,486 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.05 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 3.92 fps, Avg. Travel Time= 0.0 min

Peak Storage= 2 cf @ 12.11 hrs, Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 4,137.00 cfs

10.00' x 3.00' deep channel, n= 0.023 Earth, clean & winding
Side Slope Z-value= 4.0 '/' Top Width= 34.00'
Length= 5.0' Slope= 0.4000 '/'
Inlet Invert= 82.00', Outlet Invert= 80.00'



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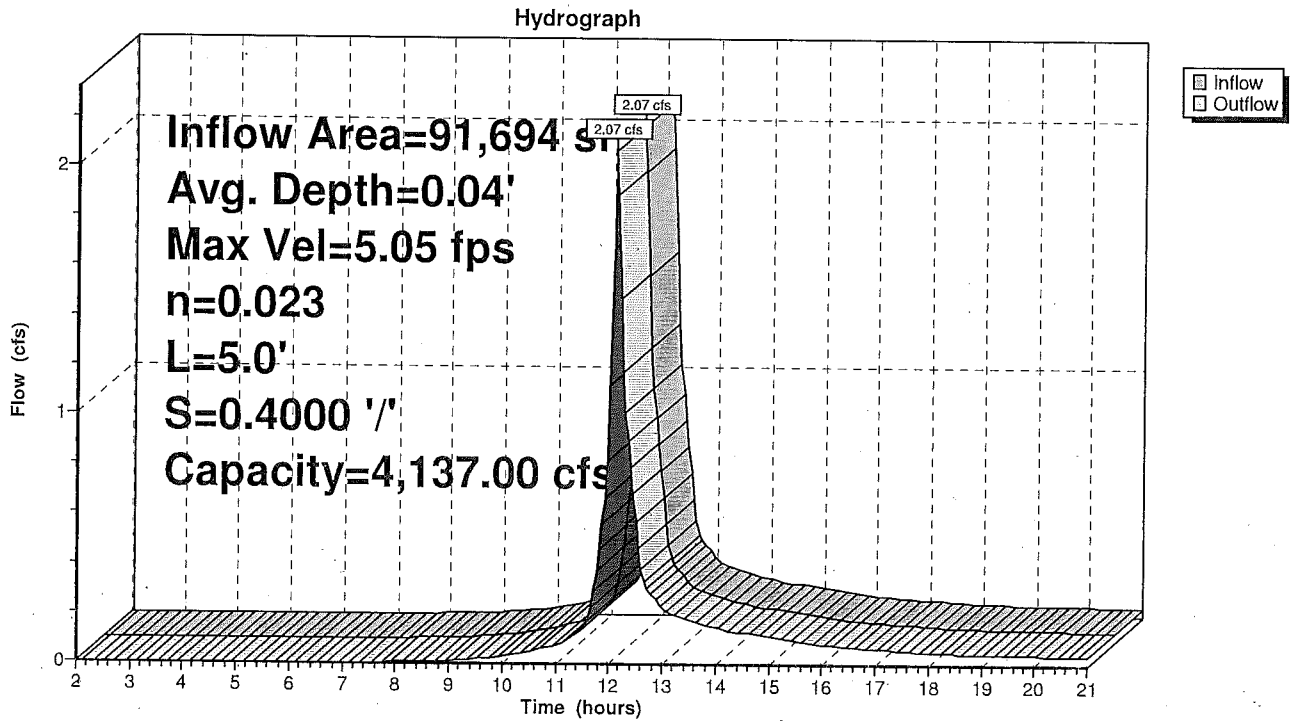
Reach 135R: Stream to POA



Reach 136R: CB11 to DMH 13

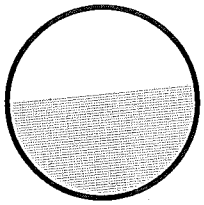
[52] Hint: Inlet conditions not evaluated
[63] Warning: Exceeded Reach 126R inflow depth by 0.29' @ 12.10 hrs

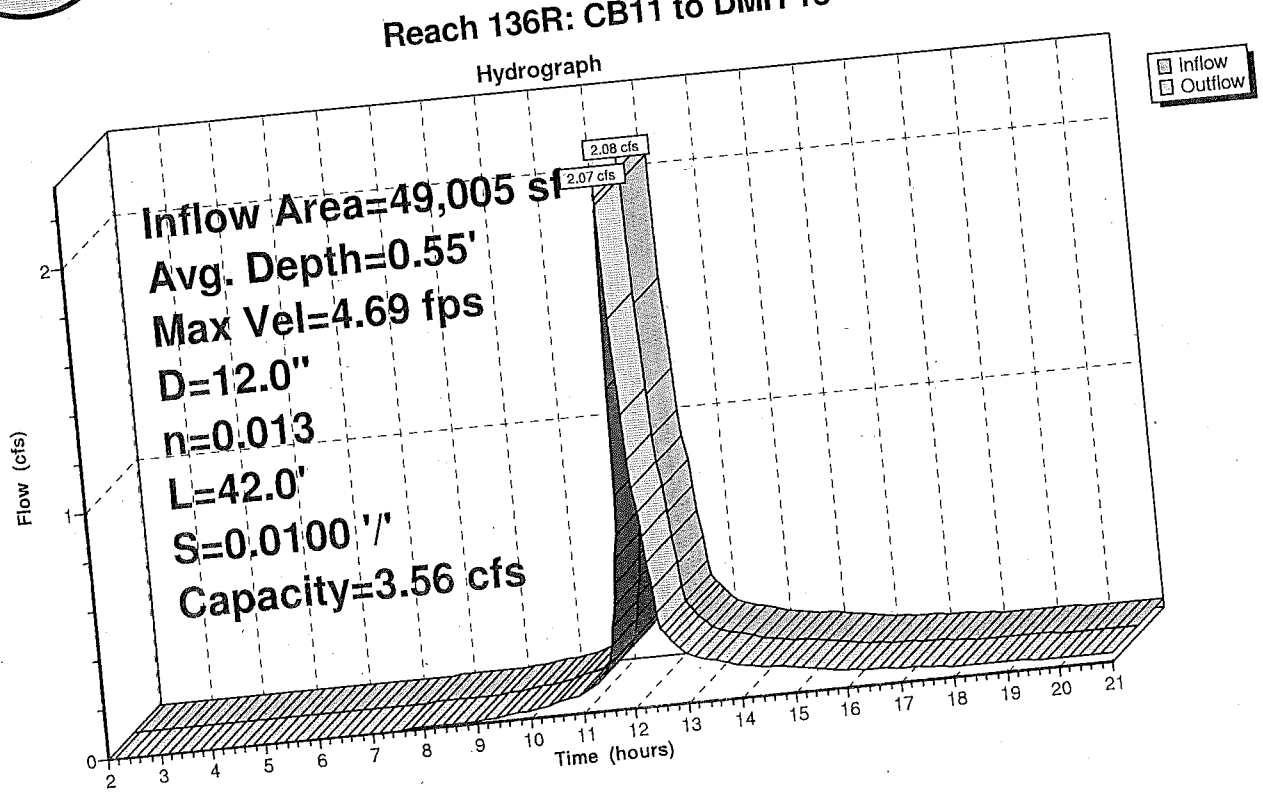
Inflow Area =	49,005 sf,	Inflow Depth >	1.51"	for 2-Year event
Inflow =	2.08 cfs @	12.08 hrs, Volume=	6,168 cf	
Outflow =	2.07 cfs @	12.08 hrs, Volume=	6,167 cf, Atten= 0%, Lag= 0.3 min	

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.69 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.65 fps, Avg. Travel Time= 0.4 min

Peak Storage= 19 cf @ 12.08 hrs, Average Depth at Peak Storage= 0.55'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 3.56 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 42.0' Slope= 0.0100 '/'
Inlet Invert= 105.16', Outlet Invert= 104.74'





Reach 139R: I12 to DMH 13

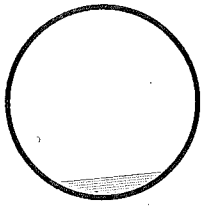
[52] Hint: Inlet conditions not evaluated

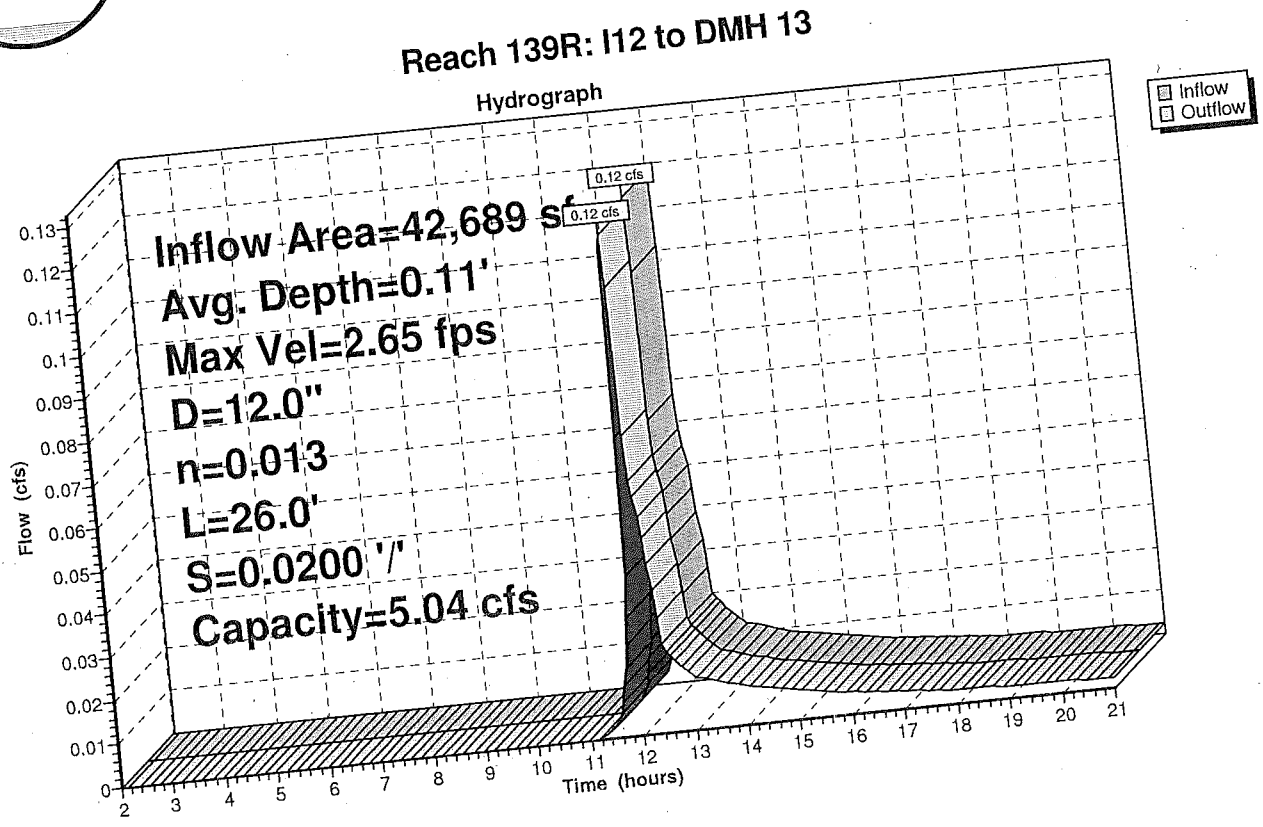
Inflow Area = 42,689 sf, Inflow Depth > 0.09" for 2-Year event
Inflow = 0.12 cfs @ 12.01 hrs, Volume= 329 cf
Outflow = 0.12 cfs @ 12.02 hrs, Volume= 329 cf, Atten= 2%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.65 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.11 fps, Avg. Travel Time= 0.4 min

Peak Storage= 1 cf @ 12.01 hrs, Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.04 cfs

12.0" Diameter Pipe, n= 0.013 Concrete pipe, bends & connections
Length= 26.0' Slope= 0.0200 '/'
Inlet Invert= 105.26', Outlet Invert= 104.74'



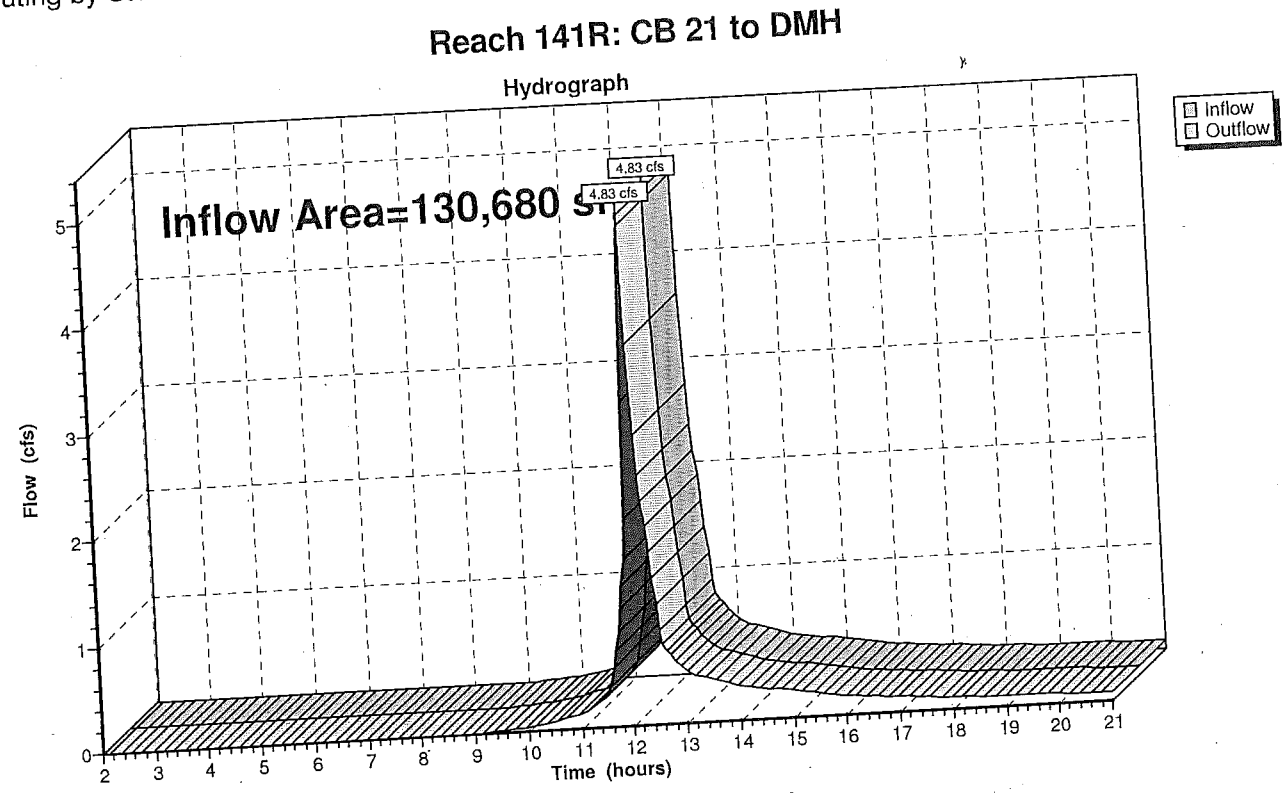


Reach 141R: CB 21 to DMH

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

Inflow Area =	130,680 sf,	Inflow Depth >	1.31"	for 2-Year event
Inflow =	4.83 cfs @	12.08 hrs,	Volume=	14,220 cf
Outflow =	4.83 cfs @	12.08 hrs,	Volume=	14,220 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs

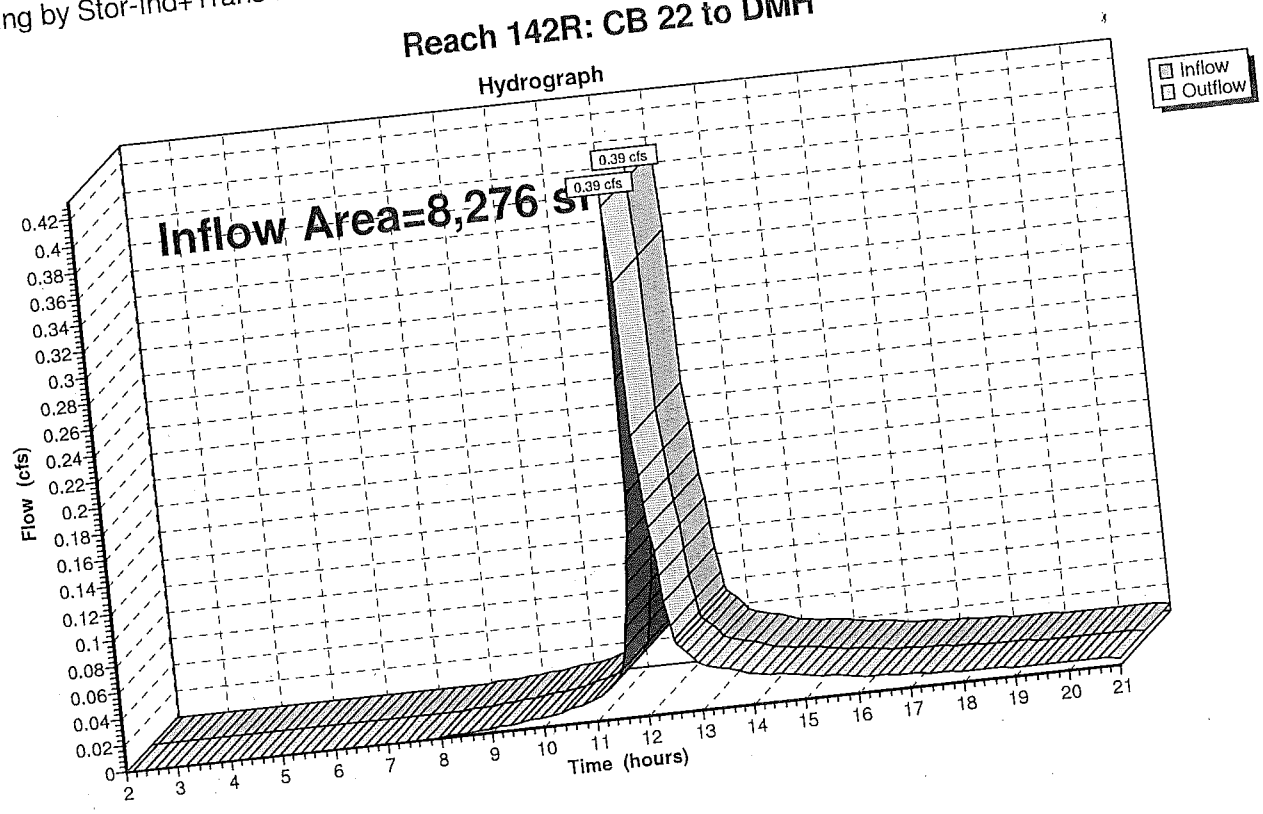


Reach 142R: CB 22 to DMH

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

Inflow Area = 8,276 sf, Inflow Depth > 1.66" for 2-Year event
Inflow = 0.39 cfs @ 12.08 hrs, Volume= 1,143 cf
Outflow = 0.39 cfs @ 12.08 hrs, Volume= 1,143 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs



Reach 143R: DMH to Pretreatment

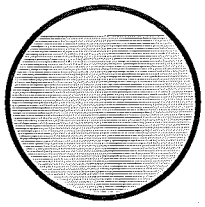
[52] Hint: Inlet conditions not evaluated
[55] Hint: Peak inflow is 104% of Manning's capacity

Inflow Area = 138,956 sf, Inflow Depth > 1.33" for 2-Year event
Inflow = 5.22 cfs @ 12.08 hrs, Volume= 15,363 cf
Outflow = 5.21 cfs @ 12.08 hrs, Volume= 15,362 cf, Atten= 0%, Lag= 0.2 min

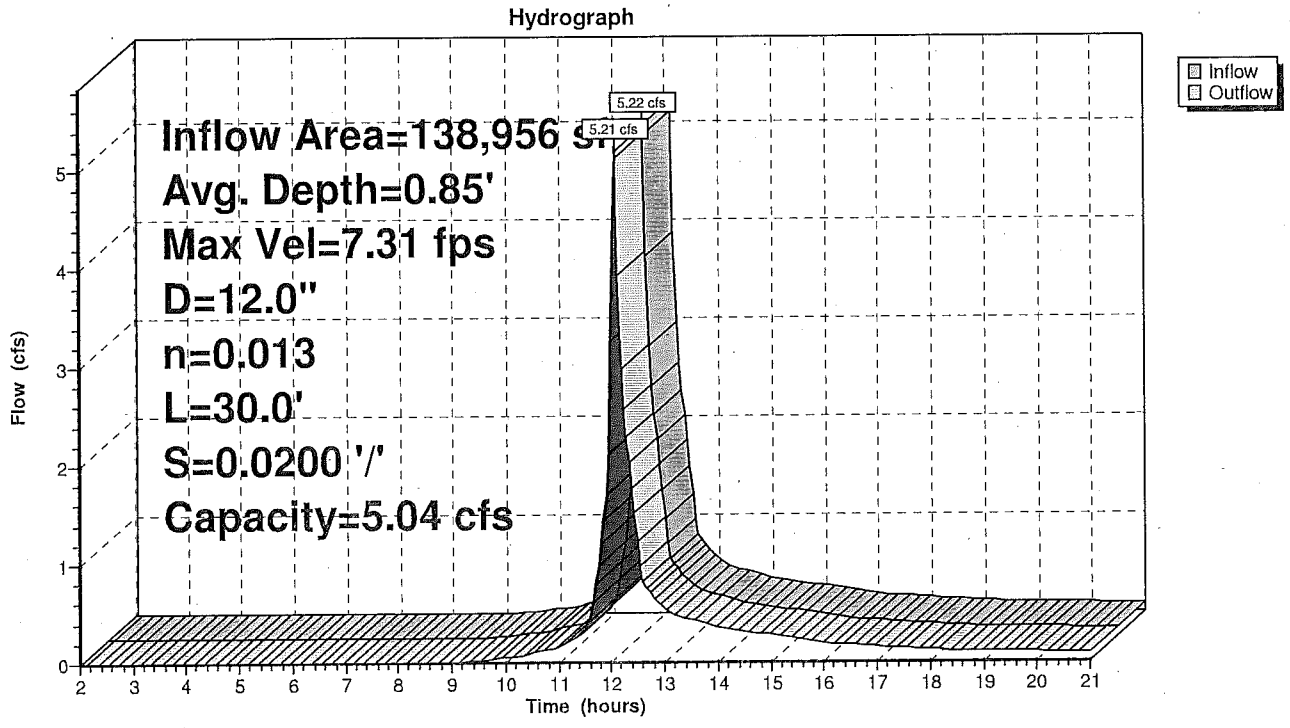
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.31 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.89 fps, Avg. Travel Time= 0.2 min

Peak Storage= 21 cf @ 12.08 hrs, Average Depth at Peak Storage= 0.85'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.04 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 30.0' Slope= 0.0200 '/'
Inlet Invert= 101.00', Outlet Invert= 100.40'



Reach 143R: DMH to Pretreatment



Reach 145R: Pretreatment to Recharge

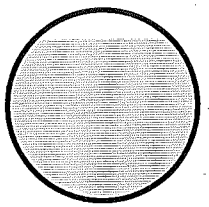
[52] Hint: Inlet conditions not evaluated
[55] Hint: Peak inflow is 103% of Manning's capacity

Inflow Area = 138,956 sf, Inflow Depth > 1.33" for 2-Year event
Inflow = 5.21 cfs @ 12.08 hrs, Volume= 15,362 cf
Outflow = 5.20 cfs @ 12.08 hrs, Volume= 15,361 cf, Atten= 0%, Lag= 0.1 min

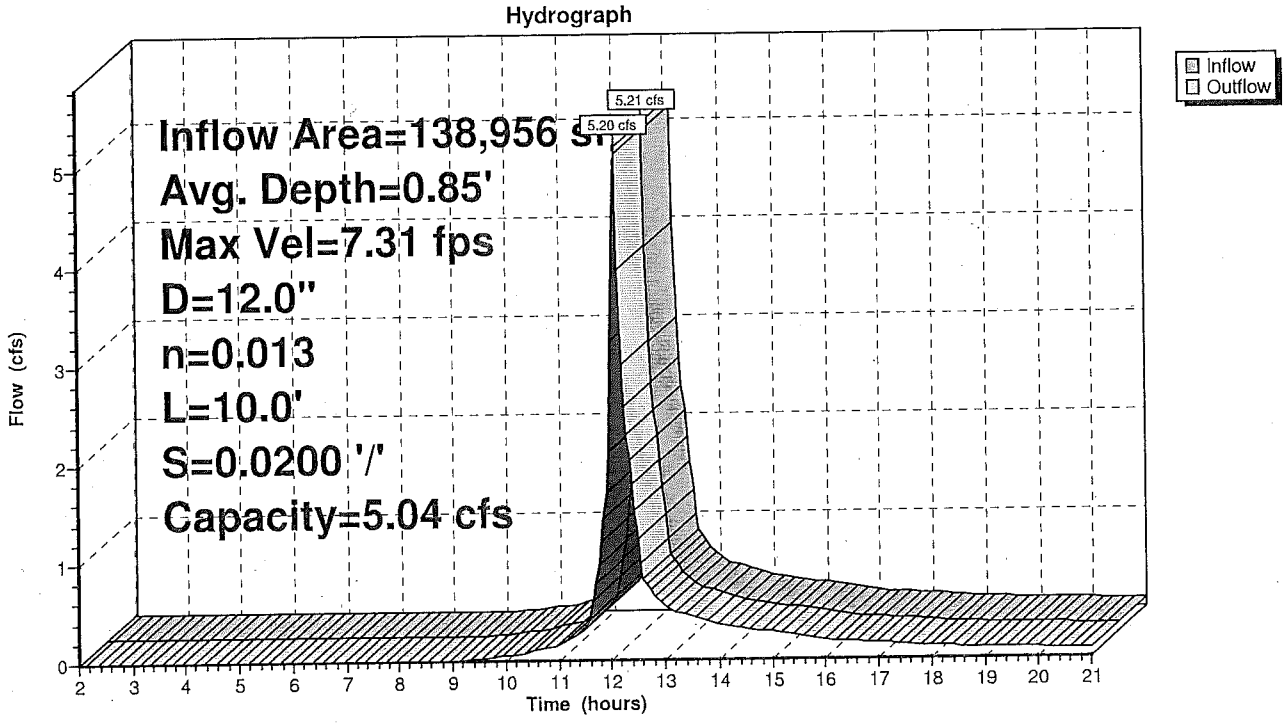
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.31 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.90 fps, Avg. Travel Time= 0.1 min

Peak Storage= 7 cf @ 12.08 hrs, Average Depth at Peak Storage= 0.85'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.04 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 10.0' Slope= 0.0200 '/'
Inlet Invert= 100.30', Outlet Invert= 100.10'



Reach 145R: Pretreatment to Recharge



Reach 146R: DMH to Swale

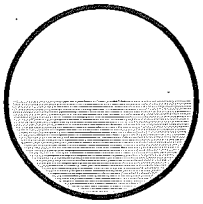
[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 51% of Reach ##2R bottom

Inflow Area = 138,956 sf, Inflow Depth = 0.18" for 2-Year event
Inflow = 2.58 cfs @ 12.30 hrs, Volume= 2,139 cf
Outflow = 2.47 cfs @ 12.30 hrs, Volume= 2,139 cf, Atten= 4%, Lag= 0.3 min

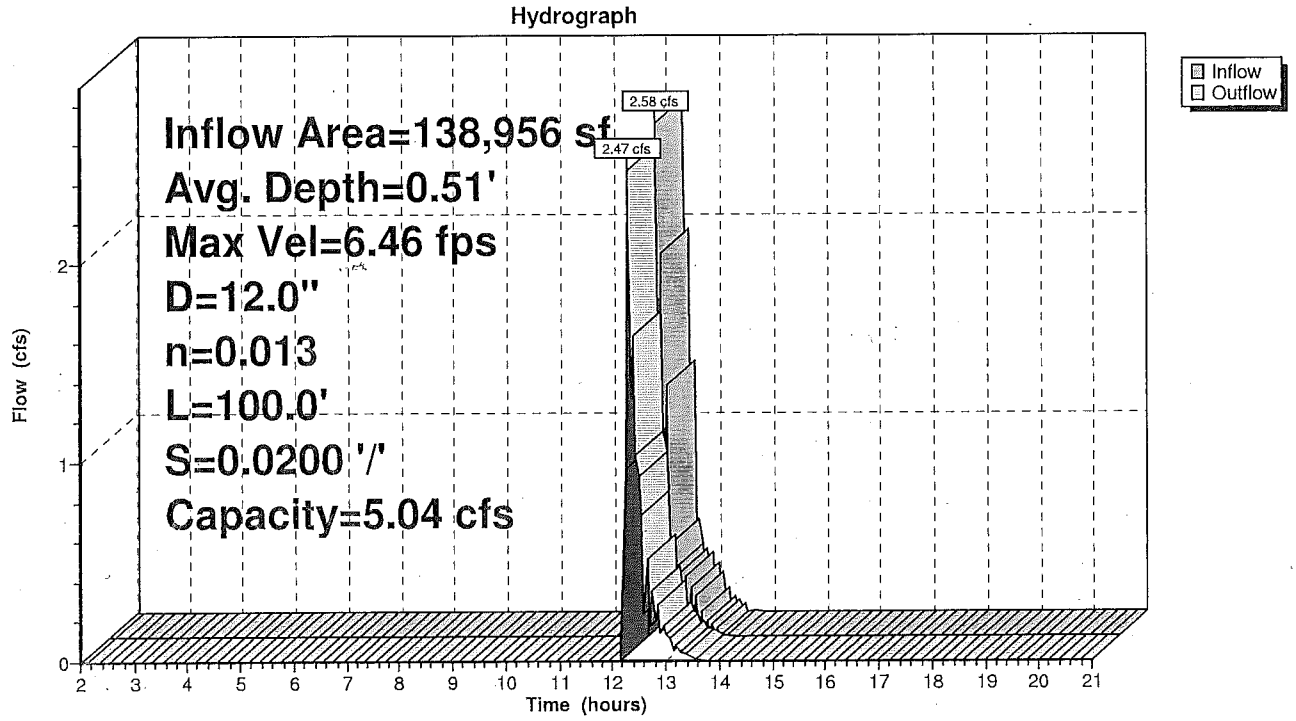
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.46 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.85 fps, Avg. Travel Time= 0.6 min

Peak Storage= 40 cf @ 12.30 hrs, Average Depth at Peak Storage= 0.51'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.04 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 100.0' Slope= 0.0200 '/'
Inlet Invert= 99.10', Outlet Invert= 97.10'



Reach 146R: DMH to Swale



Reach 147R: Swale to Stream

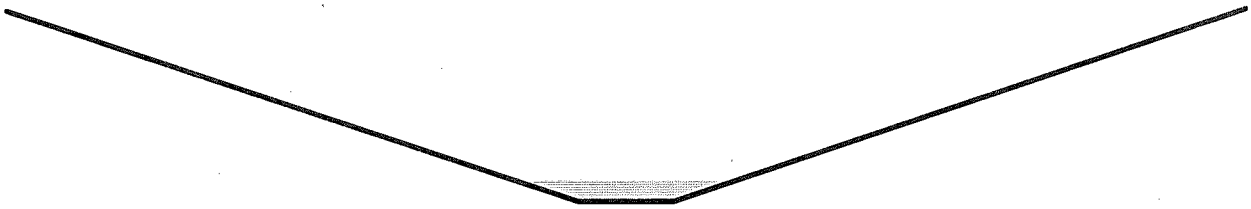
[61] Hint: Submerged 11% of Reach 146R bottom

Inflow Area = 138,956 sf, Inflow Depth = 0.18" for 2-Year event
Inflow = 2.47 cfs @ 12.30 hrs, Volume= 2,139 cf
Outflow = 2.41 cfs @ 12.31 hrs, Volume= 2,139 cf, Atten= 2%, Lag= 0.2 min

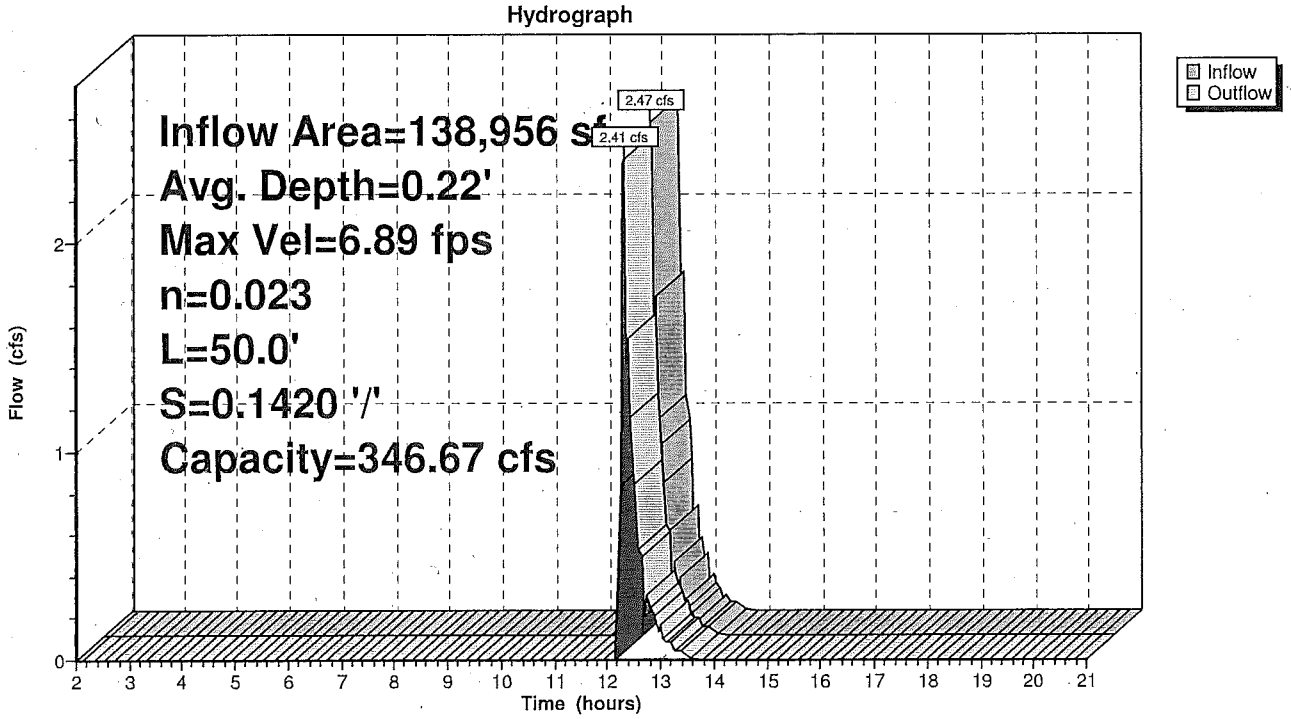
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.89 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.23 fps, Avg. Travel Time= 0.3 min

Peak Storage= 18 cf @ 12.31 hrs, Average Depth at Peak Storage= 0.22'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 346.67 cfs

1.00' x 2.00' deep channel, n= 0.023 Earth, clean & winding
Side Slope Z-value= 3.0 '/' Top Width= 13.00'
Length= 50.0' Slope= 0.1420 '/'
Inlet Invert= 97.10', Outlet Invert= 90.00'



Reach 147R: Swale to Stream



Reach 148R: Stream to R102

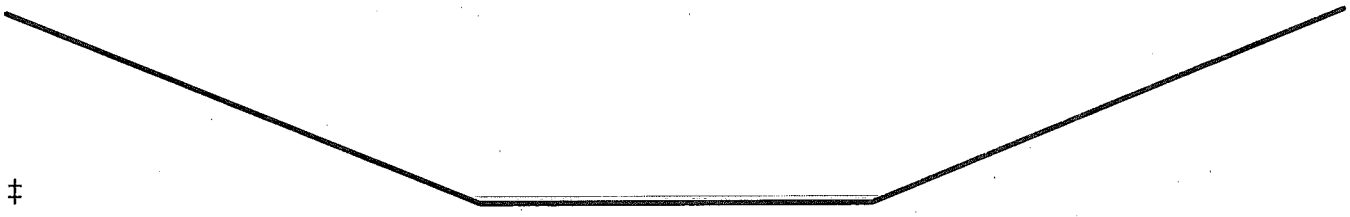
[61] Hint: Submerged 1% of Reach 147R bottom

Inflow Area = 138,956 sf, Inflow Depth = 0.18" for 2-Year event
Inflow = 2.41 cfs @ 12.31 hrs, Volume= 2,139 cf
Outflow = 1.90 cfs @ 12.35 hrs, Volume= 2,139 cf, Atten= 21%, Lag= 2.4 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.95 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.04 fps, Avg. Travel Time= 1.6 min

Peak Storage= 112 cf @ 12.32 hrs, Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 925.06 cfs

10.00' x 3.00' deep channel, n= 0.023 Earth, clean & winding
Side Slope Z-value= 4.0 '/' Top Width= 34.00'
Length= 100.0' Slope= 0.0200 '/'
Inlet Invert= 90.00', Outlet Invert= 88.00'



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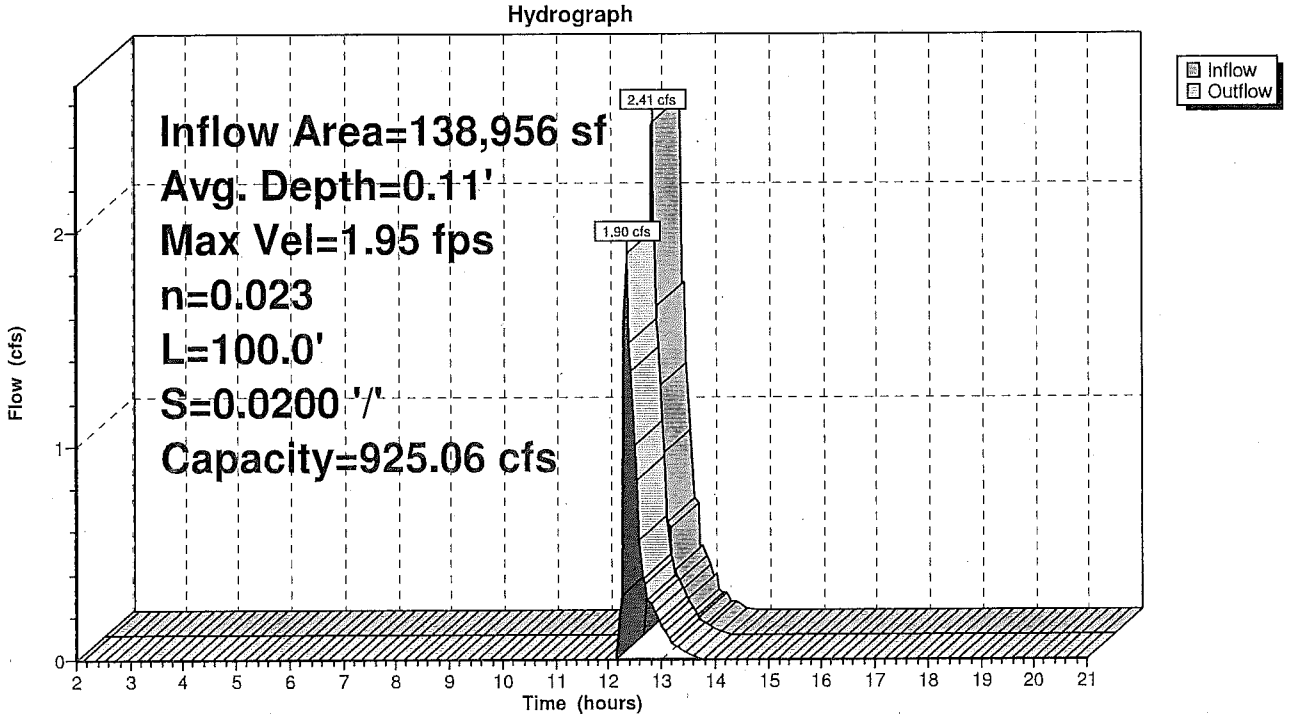
Reach 148R: Stream to R102



Reach D14: DW 13 to DMH 14

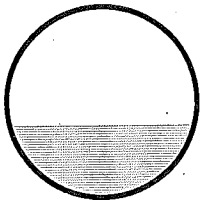
[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 65% of Reach 136R bottom
[61] Hint: Submerged 53% of Reach 139R bottom

Inflow Area = 91,694 sf, Inflow Depth > 0.85" for 2-Year event
Inflow = 2.15 cfs @ 12.08 hrs, Volume= 6,496 cf
Outflow = 2.14 cfs @ 12.09 hrs, Volume= 6,494 cf, Atten= 0%, Lag= 0.3 min

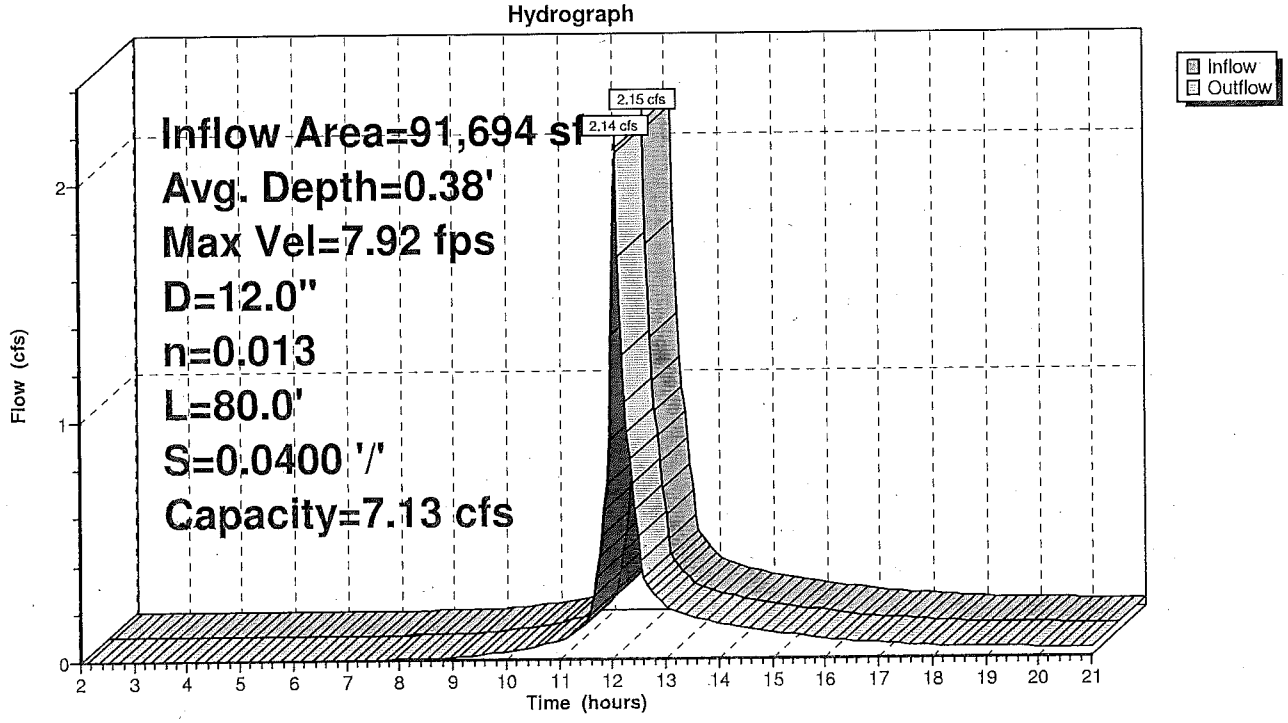
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.92 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.74 fps, Avg. Travel Time= 0.5 min

Peak Storage= 22 cf @ 12.08 hrs, Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.13 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 80.0' Slope= 0.0400 '/'
Inlet Invert= 104.64', Outlet Invert= 101.44'



Reach D14: DW 13 to DMH 14



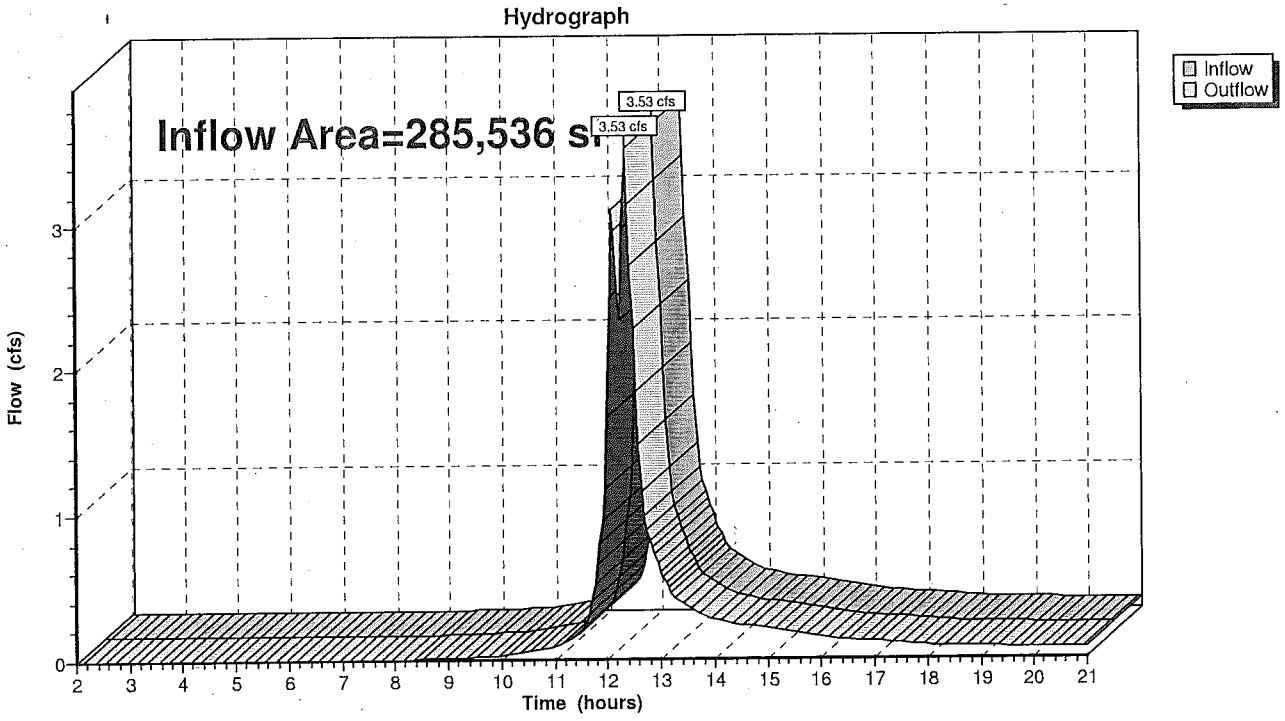
Reach PTA: Point of Analysis

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

Inflow Area = 285,536 sf, Inflow Depth > 0.56" for 2-Year event
Inflow = 3.53 cfs @ 12.35 hrs, Volume= 13,215 cf
Outflow = 3.53 cfs @ 12.35 hrs, Volume= 13,215 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs

Reach PTA: Point of Analysis



Pond 1P: Rain Garden / Bioretention Cell 2

Inflow Area = 37,462 sf, Inflow Depth = 0.19" for 2-Year event
Inflow = 0.57 cfs @ 12.27 hrs, Volume= 606 cf
Outflow = 0.08 cfs @ 12.68 hrs, Volume= 606 cf, Atten= 86%, Lag= 24.6 min
Discarded = 0.08 cfs @ 12.68 hrs, Volume= 606 cf
Primary = 0.00 cfs @ 2.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Peak Elev= 111.09' @ 12.68 hrs Surf.Area= 425 sf Storage= 411 cf

Plug-Flow detention time= 52.1 min calculated for 605 cf (100% of inflow)
Center-of-Mass det. time= 52.2 min (797.3 - 745.1)

Volume	Invert	Avail.Storage	Storage Description
#1	110.00'	843 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

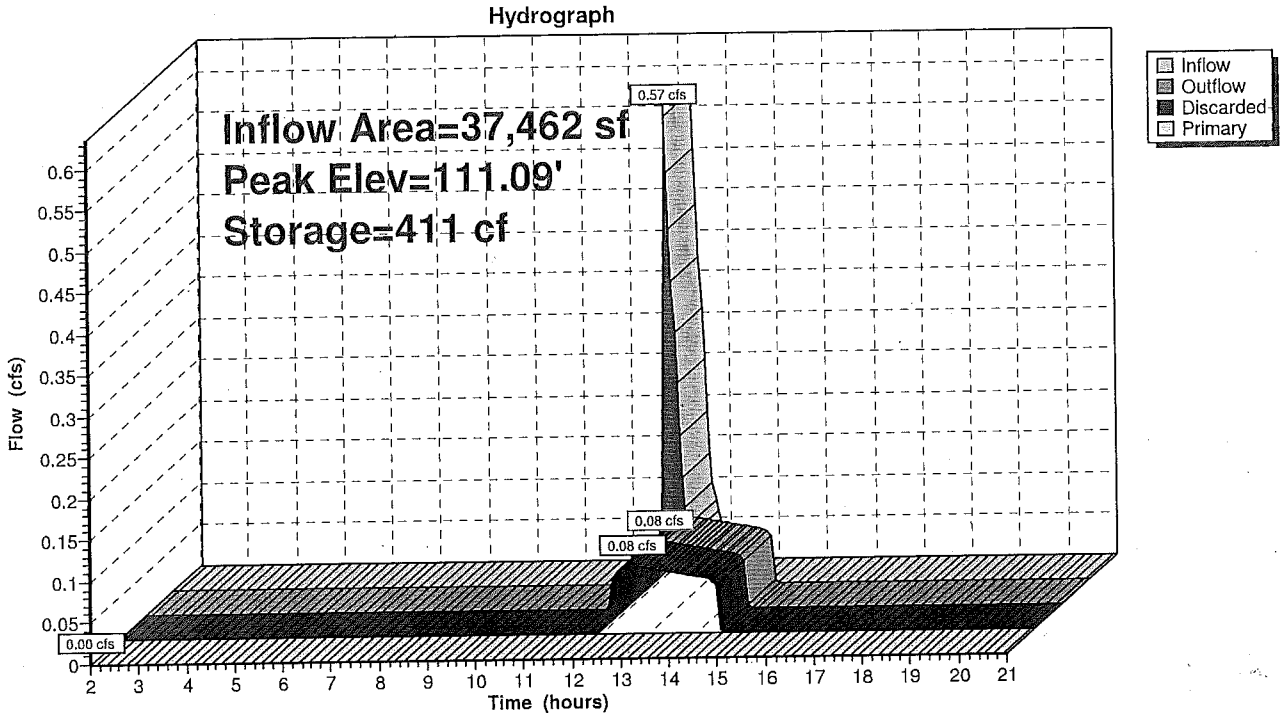
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
110.00	330	0	0
111.00	415	373	373
112.00	525	470	843

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	111.20'	**8.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.08 cfs @ 12.68 hrs HW=111.09' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 2.00 hrs HW=110.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Rain Garden / Bioretention Cell 2



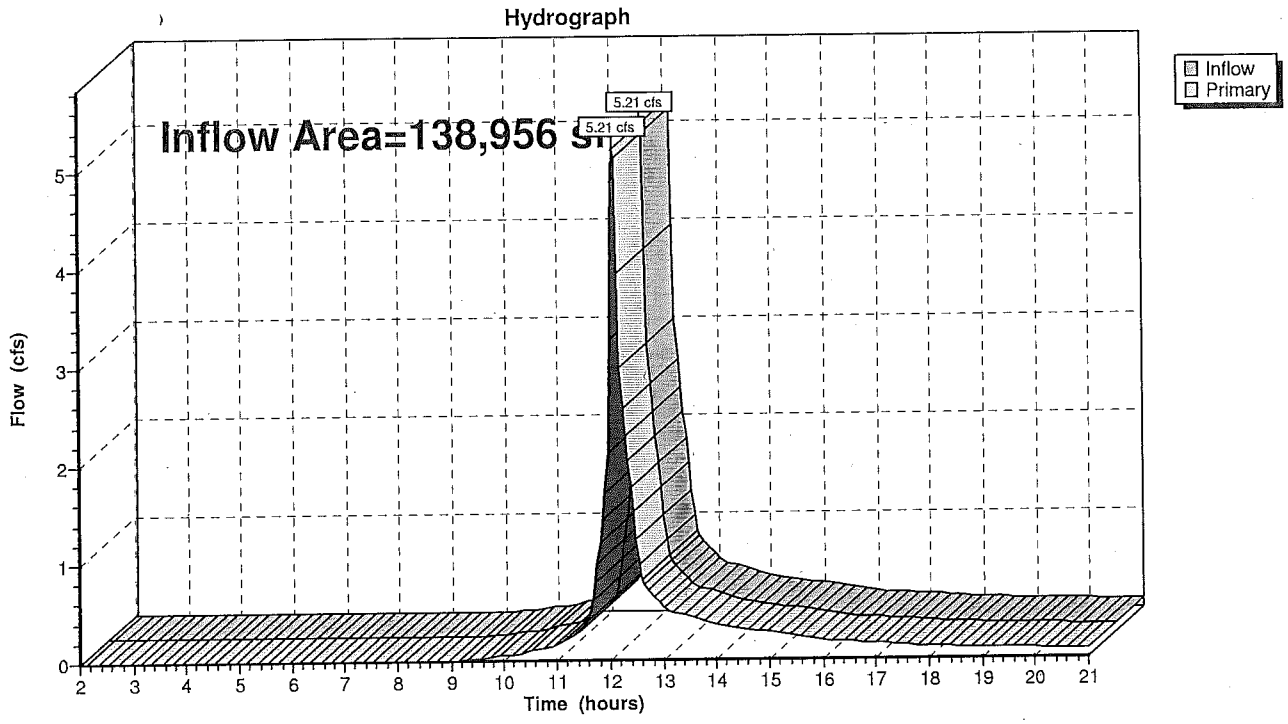
Pond 144P: Pretreatment

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

Inflow Area =	138,956 sf,	Inflow Depth >	1.33"	for 2-Year event
Inflow =	5.21 cfs @	12.08 hrs,	Volume=	15,362 cf
Primary =	5.21 cfs @	12.08 hrs,	Volume=	15,362 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs

Pond 144P: Pretreatment



Pond 401P: Rain Garden/Bioretention Cell 1

[61] Hint: Submerged 66% of Reach 125R bottom

Inflow Area =	37,462 sf,	Inflow Depth >	1.21"	for	2-Year event
Inflow =	1.23 cfs @	12.10 hrs,	Volume=	3,768 cf	
Outflow =	0.70 cfs @	12.27 hrs,	Volume=	3,765 cf,	Atten= 43%, Lag= 10.4 min
Discarded =	0.13 cfs @	12.27 hrs,	Volume=	3,159 cf	
Primary =	0.57 cfs @	12.27 hrs,	Volume=	606 cf	

Routing by Stor-Ind method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Peak Elev= 111.63' @ 12.27 hrs Surf.Area= 701 sf Storage= 961 cf

Plug-Flow detention time= 55.3 min calculated for 3,755 cf (100% of inflow)
Center-of-Mass det. time= 54.9 min (868.5 - 813.7)

Volume	Invert	Avail.Storage	Storage Description
#1	110.00'	1,229 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

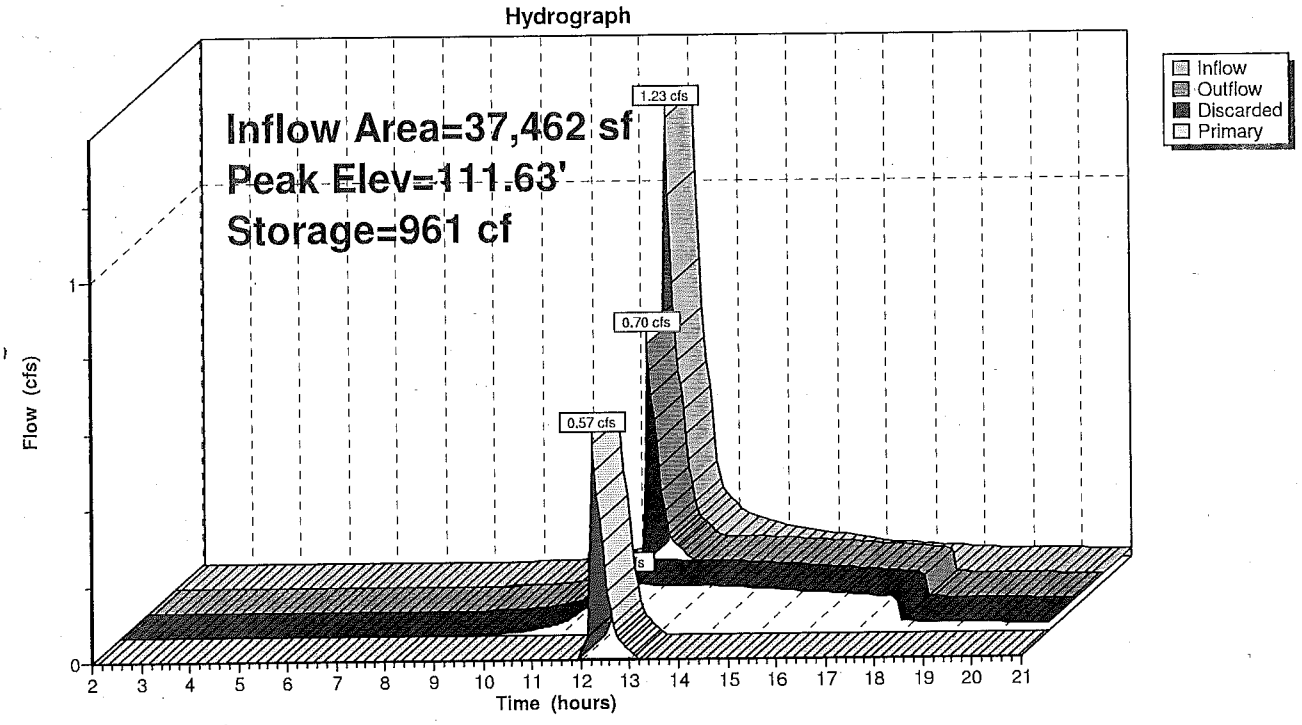
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
110.00	486	0	0
111.00	608	547	547
112.00	755	682	1,229

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	111.50'	**5.0' long x 4.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.13 cfs @ 12.27 hrs HW=111.62' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.53 cfs @ 12.27 hrs HW=111.62' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.53 cfs @ 0.84 fps)

Pond 401P: Rain Garden/Bioretention Cell 1



Pond 402P: Recharge System

[93] Warning: Storage range exceeded by 1.10'
[85] Warning: Oscillations may require Finer Routing>1
[63] Warning: Exceeded Reach 145R inflow depth by 2.83' @ 12.30 hrs

Inflow Area =	138,956 sf,	Inflow Depth >	1.33"	for 2-Year event
Inflow =	5.20 cfs @	12.08 hrs, Volume=	15,361 cf	
Outflow =	3.01 cfs @	12.30 hrs, Volume=	15,350 cf,	Atten= 42%, Lag= 12.7 min
Discarded =	0.42 cfs @	11.65 hrs, Volume=	13,218 cf	
Primary =	2.59 cfs @	12.30 hrs, Volume=	2,132 cf	

Routing by Stor-Ind method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Peak Elev= 103.60' @ 12.29 hrs Surf.Area= 2,200 sf Storage= 4,421 cf

Plug-Flow detention time= 87.9 min calculated for 15,309 cf (100% of inflow)
Center-of-Mass det. time= 87.3 min (896.3 - 809.0)

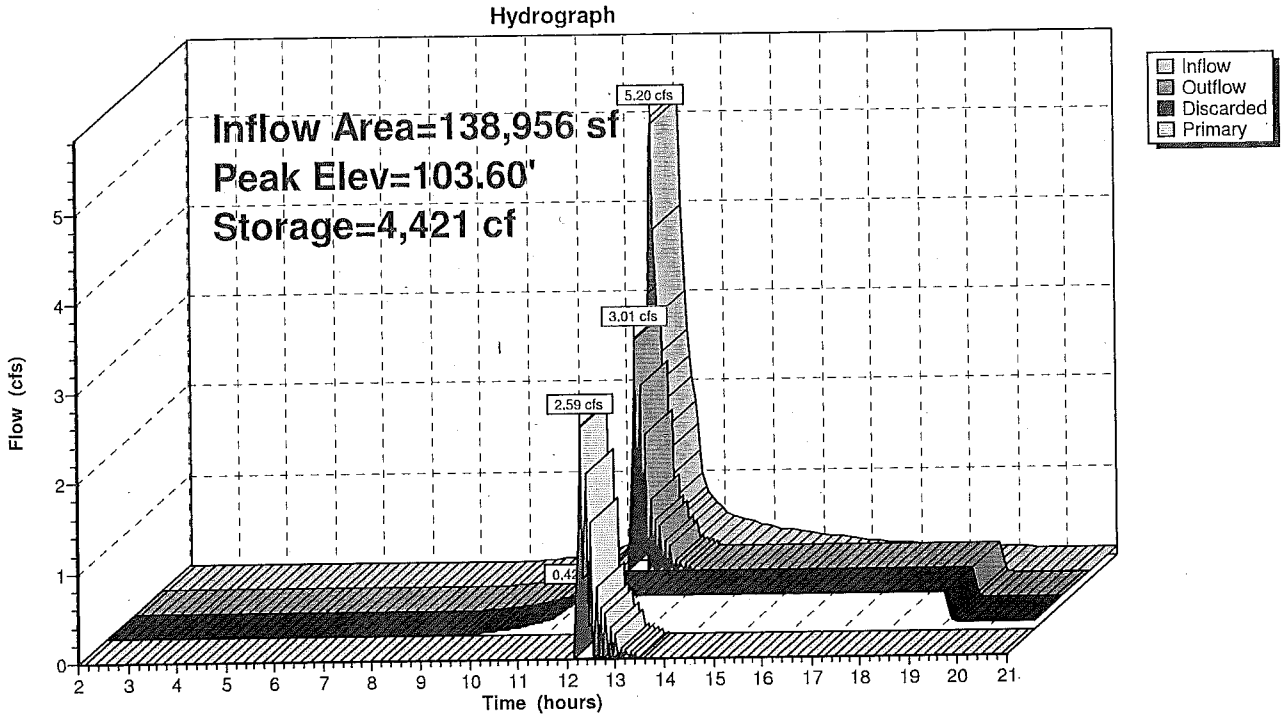
Volume	Invert	Avail.Storage	Storage Description
#1	99.00'	2,186 cf	**44.00'W x 50.00'L x 3.50'H Prismatoid** 7,700 cf Overall - 2,235 cf Embedded = 5,465 cf x 40.0% Voids
#2	100.00'	2,235 cf	**47.8"W x 30.0"H x 6.25'L Cultec R-330** x 48 Inside #1
		4,421 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	103.00'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Primary	105.00'	**2.00' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Discarded OutFlow Max=0.42 cfs @ 11.65 hrs HW=99.08' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.42 cfs)

Primary OutFlow Max=2.46 cfs @ 12.30 hrs HW=103.58' (Free Discharge)
↑—**2=Orifice/Grate** (Orifice Controls 2.46 cfs @ 2.60 fps)
└—**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 402P: Recharge System



Time span=2.00-21.00 hrs, dt=0.05 hrs, 381 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 110: Backside of Lots 1-4 Runoff Area=0.620 ac Runoff Depth>2.18"
Tc=5.0 min CN=78 Runoff=1.67 cfs 4,901 cf

Subcatchment 120: Frontside of Lots 3&4 Runoff Area=0.240 ac Runoff Depth>2.87"
Tc=5.0 min CN=86 Runoff=0.84 cfs 2,504 cf

Subcatchment 130: Frontside of Lots 1&2 Runoff Area=0.255 ac Runoff Depth>3.36"
Tc=5.0 min CN=91 Runoff=1.01 cfs 3,113 cf

Subcatchment 135: Side of Lot 1 Runoff Area=0.120 ac Runoff Depth>1.72"
Tc=0.0 min CN=72 Runoff=0.29 cfs 749 cf

Subcatchment 140: Frontside of Lots 18-20 Runoff Area=0.870 ac Runoff Depth>2.60"
Tc=5.0 min CN=83 Runoff=2.77 cfs 8,215 cf

Subcatchment 150: Backside of Lots 18-20 Runoff Area=0.710 ac Runoff Depth>2.10"
Tc=5.0 min CN=77 Runoff=1.84 cfs 5,405 cf

Subcatchment 210: Lots 5-17 Runoff Area=3.000 ac Runoff Depth>2.51"
Tc=5.0 min CN=82 Runoff=9.27 cfs 27,371 cf

Subcatchment 220: Cul-de-sac Runoff Area=0.190 ac Runoff Depth>2.97"
Tc=5.0 min CN=87 Runoff=0.69 cfs 2,047 cf

Subcatchment 230: Backside of Lots 11-14 Runoff Area=0.550 ac Runoff Depth>2.10"
Tc=5.0 min CN=77 Runoff=1.42 cfs 4,187 cf

Reach ##2R: Recharge to DMH Avg. Depth=1.00' Max Vel=7.23 fps Inflow=6.46 cfs 11,879 cf
D=12.0" n=0.013 L=40.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=5.02 cfs 11,880 cf

Reach 101R: R101 to R102 Avg. Depth=0.06' Max Vel=1.30 fps Inflow=1.42 cfs 4,187 cf
n=0.025 L=315.0' S=0.0190 '/' Capacity=1,068.23 cfs Outflow=1.24 cfs 4,172 cf

Reach 102R: 102 to POA Avg. Depth=0.17' Max Vel=3.95 fps Inflow=7.18 cfs 21,457 cf
n=0.025 L=120.0' S=0.0500 '/' Capacity=1,345.64 cfs Outflow=7.20 cfs 21,450 cf

Reach 121R: Roadside Swale Avg. Depth=0.25' Max Vel=2.59 fps Inflow=0.84 cfs 2,504 cf
n=0.023 L=30.0' S=0.0200 '/' Capacity=20.49 cfs Outflow=0.83 cfs 2,503 cf

Reach 122R: Driveway Culvert-DI Avg. Depth=0.28' Max Vel=5.88 fps Inflow=0.83 cfs 2,503 cf
D=8.0" n=0.010 L=32.0' S=0.0200 '/' Capacity=2.22 cfs Outflow=0.83 cfs 2,503 cf

Reach 123R: Roadside Swale Avg. Depth=0.24' Max Vel=2.82 fps Inflow=0.83 cfs 2,503 cf
n=0.023 L=60.0' S=0.0250 '/' Capacity=22.91 cfs Outflow=0.82 cfs 2,502 cf

Reach 124R: Driveway Culvert-DI Avg. Depth=0.28' Max Vel=5.88 fps Inflow=0.82 cfs 2,502 cf
D=8.0" n=0.010 L=32.0' S=0.0200 '/' Capacity=2.22 cfs Outflow=0.82 cfs 2,502 cf

Reach 125R: Swale to RG Avg. Depth=0.17' Max Vel=4.86 fps Inflow=0.82 cfs 2,502 cf
n=0.023 L=120.0' S=0.1101 '/' Capacity=48.07 cfs Outflow=0.80 cfs 2,500 cf

Reach 126R: CB 10 to INLET13 Avg. Depth=0.34' Max Vel=4.30 fps Inflow=1.01 cfs 3,113 cf
D=12.0" n=0.013 L=12.0' S=0.0133 '/' Capacity=4.11 cfs Outflow=1.01 cfs 3,113 cf

Reach 132R: DMH 14 to DMH 15 Avg. Depth=0.65' Max Vel=8.24 fps Inflow=5.40 cfs 13,989 cf
D=15.0" n=0.013 L=104.0' S=0.0238 '/' Capacity=9.98 cfs Outflow=5.18 cfs 13,986 cf

Reach 133R: DMH 15 to Swale Avg. Depth=0.63' Max Vel=9.89 fps Inflow=5.18 cfs 13,986 cf
D=12.0" n=0.013 L=19.0' S=0.0400 '/' Capacity=7.13 cfs Outflow=5.15 cfs 13,985 cf

Reach 134R: Swale to Stream Avg. Depth=0.38' Max Vel=6.16 fps Inflow=5.15 cfs 13,985 cf
n=0.030 L=150.0' S=0.1050 '/' Capacity=228.54 cfs Outflow=4.88 cfs 13,978 cf

Reach 135R: Stream to POA Avg. Depth=0.07' Max Vel=6.86 fps Inflow=4.88 cfs 13,978 cf
n=0.023 L=5.0' S=0.4000 '/' Capacity=4,137.00 cfs Outflow=4.88 cfs 13,978 cf

Reach 136R: CB11 to DMH 13 Avg. Depth=0.88' Max Vel=5.17 fps Inflow=3.78 cfs 11,327 cf
D=12.0" n=0.013 L=42.0' S=0.0100 '/' Capacity=3.56 cfs Outflow=3.76 cfs 11,326 cf

Reach 139R: I12 to DMH 13 Avg. Depth=0.54' Max Vel=6.59 fps Inflow=2.92 cfs 2,666 cf
D=12.0" n=0.013 L=26.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=2.80 cfs 2,666 cf

Reach 141R: CB 21 to DMH Inflow=9.27 cfs 27,371 cf
Outflow=9.27 cfs 27,371 cf

Reach 142R: CB 22 to DMH Inflow=0.69 cfs 2,047 cf
Outflow=0.69 cfs 2,047 cf

Reach 143R: DMH to Pretreatment Avg. Depth=1.00' Max Vel=7.30 fps Inflow=9.95 cfs 29,418 cf
D=12.0" n=0.013 L=30.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=5.16 cfs 29,416 cf

Reach 145R: Pretreatment to Recharge Avg. Depth=0.84' Max Vel=7.31 fps Inflow=5.16 cfs 29,416 cf
D=12.0" n=0.013 L=10.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=5.16 cfs 29,415 cf

Reach 146R: DMH to Swale Avg. Depth=0.81' Max Vel=7.31 fps Inflow=5.02 cfs 11,880 cf
D=12.0" n=0.013 L=100.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=4.84 cfs 11,880 cf

Reach 147R: Swale to Stream Avg. Depth=0.30' Max Vel=8.29 fps Inflow=4.84 cfs 11,880 cf
n=0.023 L=50.0' S=0.1420 '/' Capacity=346.67 cfs Outflow=4.79 cfs 11,880 cf

Reach 148R: Stream to R102 Avg. Depth=0.17' Max Vel=2.67 fps Inflow=4.79 cfs 11,880 cf
n=0.023 L=100.0' S=0.0200 '/' Capacity=925.06 cfs Outflow=4.72 cfs 11,880 cf

Reach D14: DW 13 to DMH 14 Avg. Depth=0.66' Max Vel=10.00 fps Inflow=5.58 cfs 13,991 cf
D=12.0" n=0.013 L=80.0' S=0.0400 '/' Capacity=7.13 cfs Outflow=5.40 cfs 13,989 cf

Reach PTA: Point of Analysis Inflow=12.07 cfs 35,428 cf
Outflow=12.07 cfs 35,428 cf

Pond 1P: Rain Garden / Bioretention Cell 2 Peak Elev=111.48' Storage=582 cf Inflow=2.28 cfs 2,972 cf
Discarded=0.09 cfs 1,055 cf Primary=2.79 cfs 1,916 cf Outflow=2.88 cfs 2,972 cf

Pond 144P: Pretreatment Inflow=5.16 cfs 29,416 cf
Primary=5.16 cfs 29,416 cf

Pond 401P: Rain Garden/Bioretention Cell 1 Peak Elev=111.82' Storage=1,098 cf Inflow=2.44 cfs 7,401 cf
Discarded=0.14 cfs 4,425 cf Primary=2.28 cfs 2,972 cf Outflow=2.42 cfs 7,397 cf

Pond 402P: Recharge System Peak Elev=104.23' Storage=4,421 cf Inflow=5.16 cfs 29,415 cf
Discarded=0.42 cfs 16,999 cf Primary=6.46 cfs 11,879 cf Outflow=6.88 cfs 28,878 cf

Total Runoff Area = 285,536 sf Runoff Volume = 58,492 cf Average Runoff Depth = 2.46"
67.96% Pervious Area = 194,060 sf 32.04% Impervious Area = 91,476 sf

Subcatchment 110: Backside of Lots 1-4

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

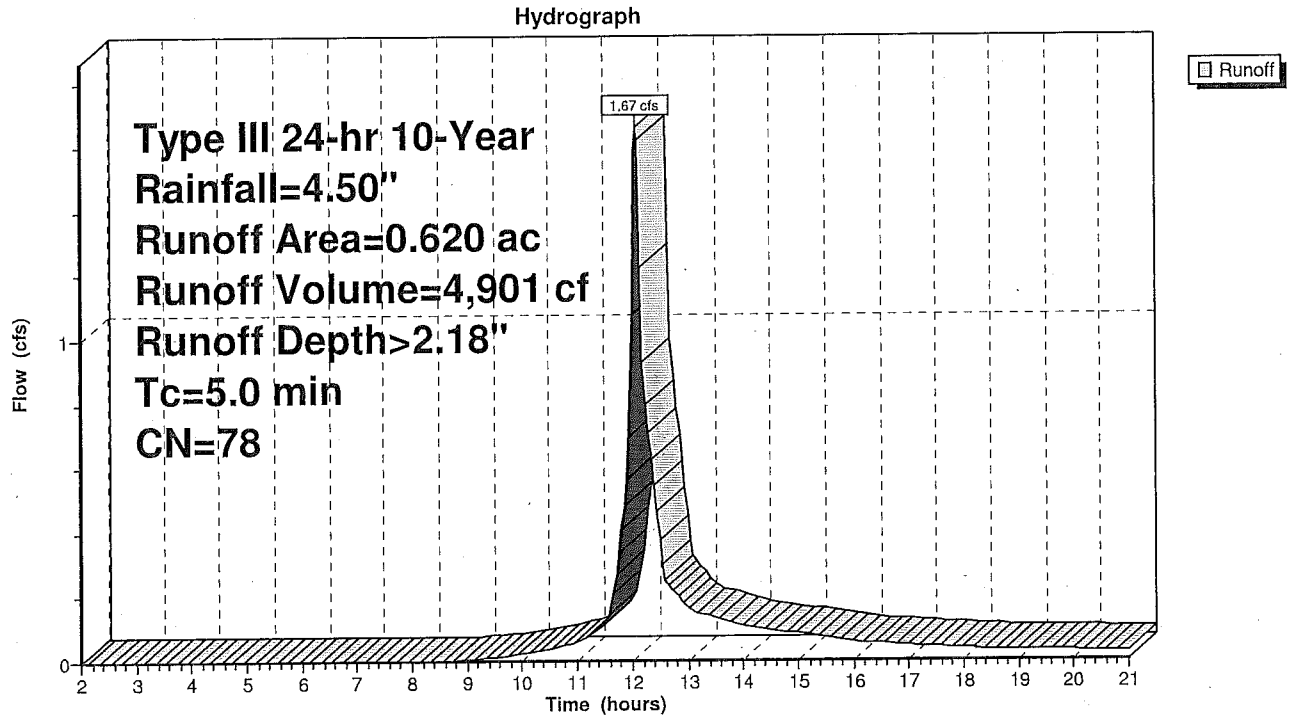
Runoff = 1.67 cfs @ 12.08 hrs, Volume= 4,901 cf, Depth> 2.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (ac)	CN	Description
0.050	70	Woods, Good, HSG C
0.460	74	>75% Grass cover, Good, HSG C
0.110	98	Paved parking & roofs
0.620	78	Weighted Average
0.510		Pervious Area
0.110		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, MIN**

Subcatchment 110: Backside of Lots 1-4



Subcatchment 120: Frontside of Lots 3&4

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

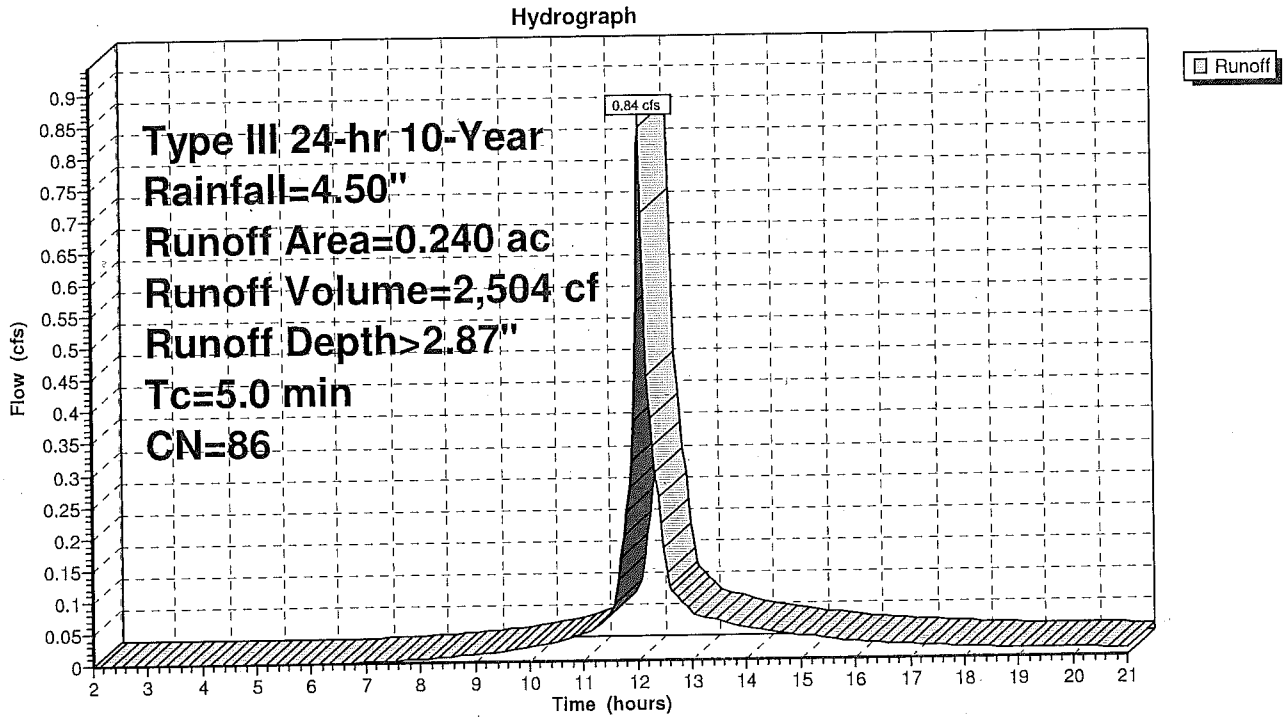
Runoff = 0.84 cfs @ 12.07 hrs, Volume= 2,504 cf, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (ac)	CN	Description
0.120	74	>75% Grass cover, Good, HSG C
0.120	98	Paved roads w/curbs & sewers
0.240	86	Weighted Average
0.120		Pervious Area
0.120		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, MIN

Subcatchment 120: Frontside of Lots 3&4



Subcatchment 130: Frontside of Lots 1&2

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

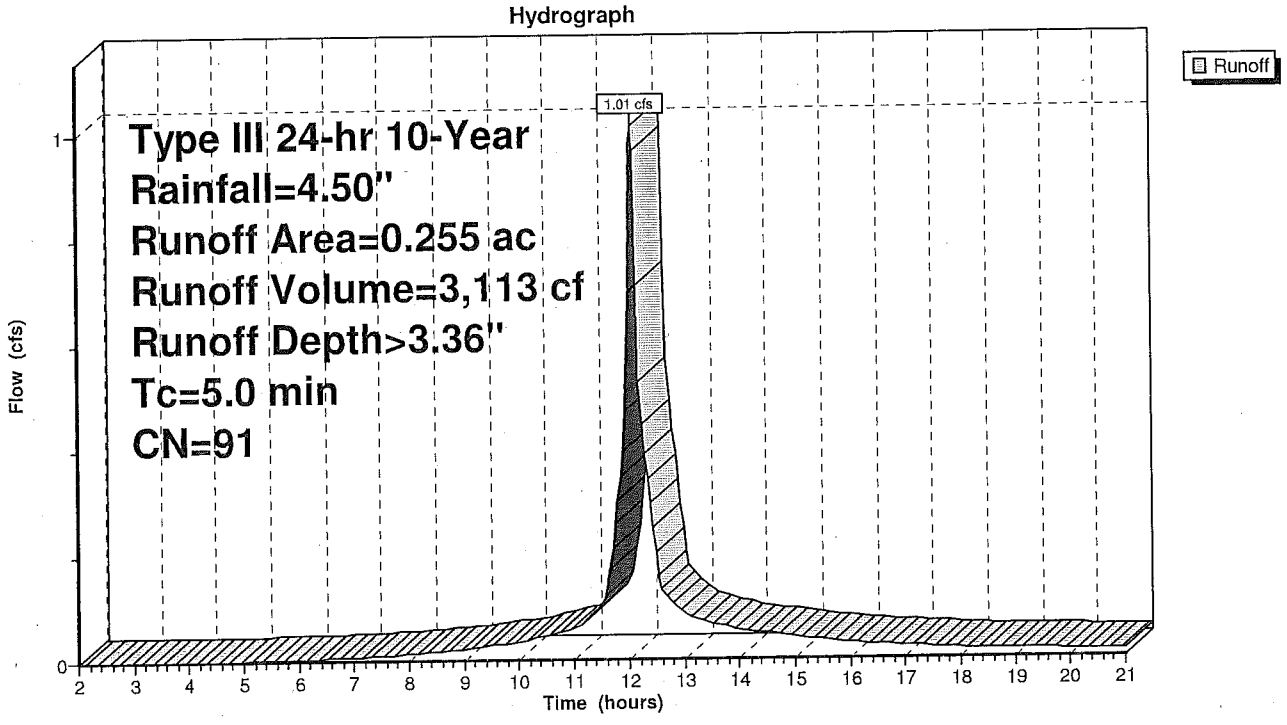
Runoff = 1.01 cfs @ 12.07 hrs, Volume= 3,113 cf, Depth> 3.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (ac)	CN	Description
0.005	70	Woods, Good, HSG C
0.070	74	>75% Grass cover, Good, HSG C
0.180	98	Paved roads w/curbs & sewers
0.255	91	Weighted Average
0.075		Pervious Area
0.180		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, MIN**

Subcatchment 130: Frontside of Lots 1&2



Subcatchment 135: Side of Lot 1

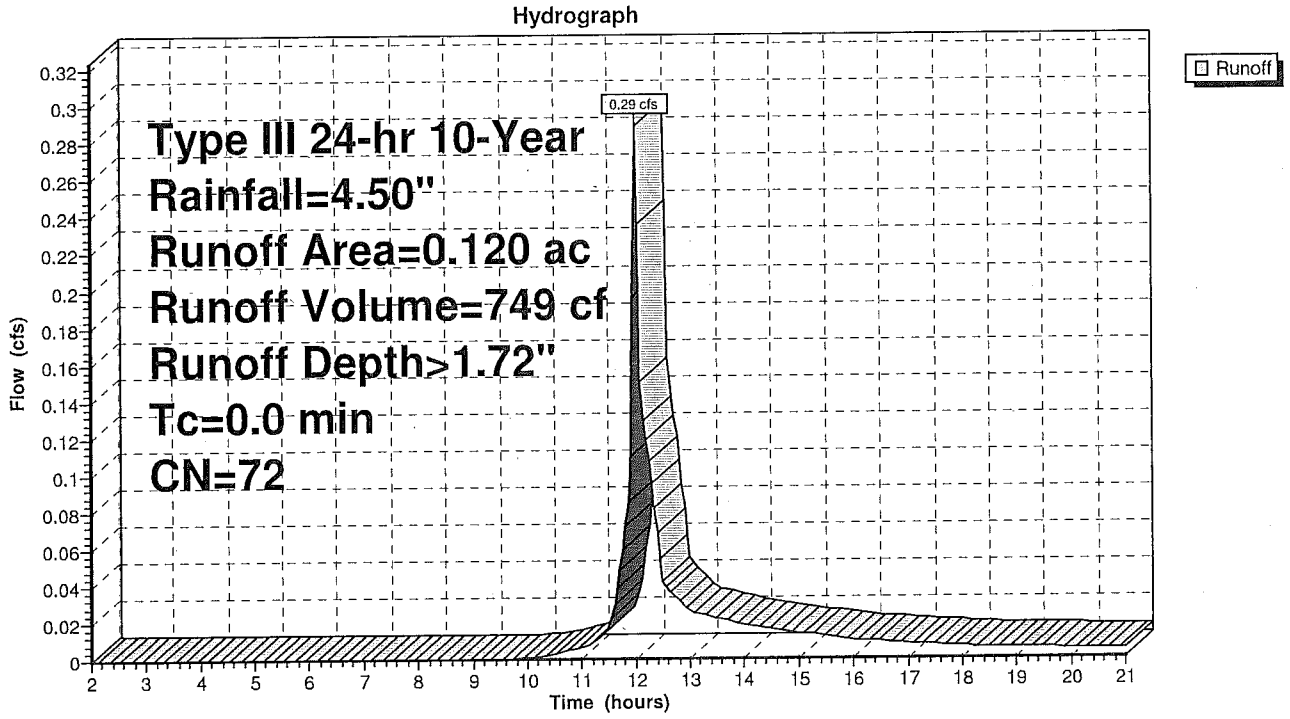
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.29 cfs @ 12.01 hrs, Volume= 749 cf, Depth> 1.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (ac)	CN	Description
0.050	70	Woods, Good, HSG C
0.070	74	>75% Grass cover, Good, HSG C
0.120	72	Weighted Average
0.120		Pervious Area

Subcatchment 135: Side of Lot 1



Subcatchment 140: Frontside of Lots 18-20

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

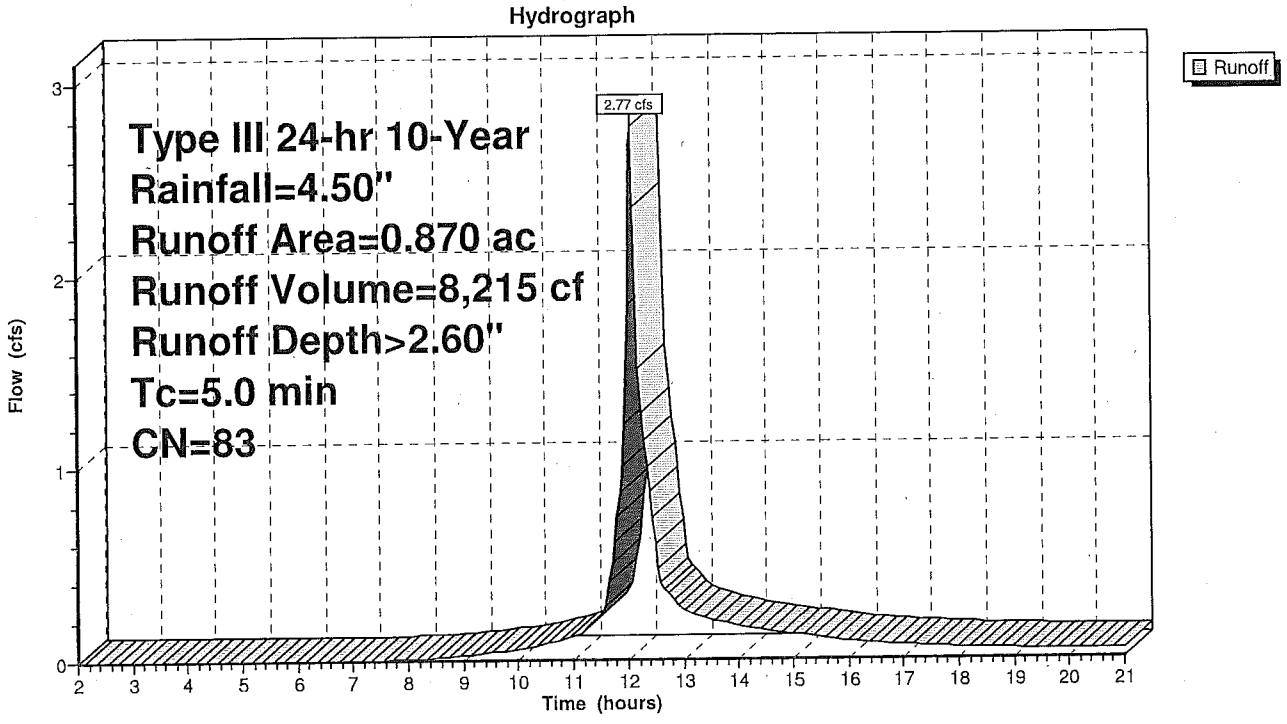
Runoff = 2.77 cfs @ 12.08 hrs, Volume= 8,215 cf, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (ac)	CN	Description
0.550	74	>75% Grass cover, Good, HSG C
0.320	98	Paved roads w/curbs & sewers
0.870	83	Weighted Average
0.550		Pervious Area
0.320		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, MIN

Subcatchment 140: Frontside of Lots 18-20



Subcatchment 150: Backside of Lots 18-20

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

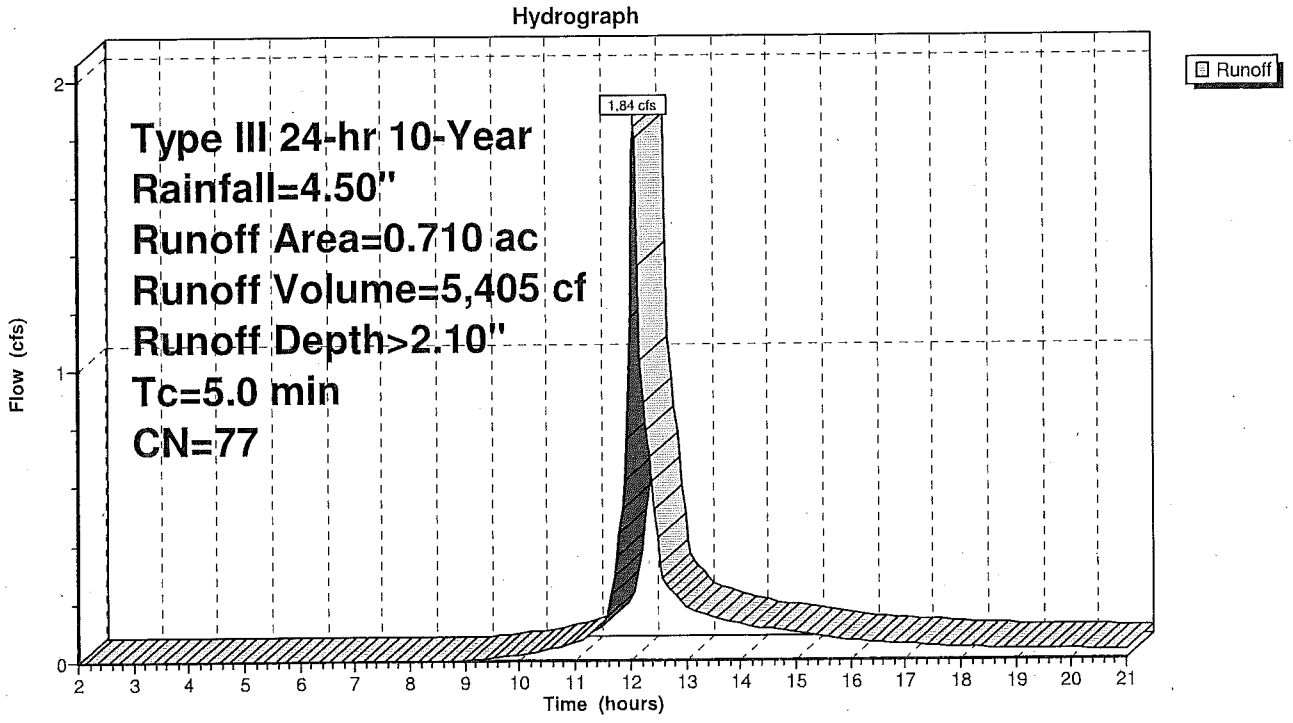
Runoff = 1.84 cfs @ 12.08 hrs, Volume= 5,405 cf, Depth> 2.10"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (ac)	CN	Description
0.180	70	Woods, Good, HSG C
0.400	74	>75% Grass cover, Good, HSG C
0.130	98	Paved parking & roofs
0.710	77	Weighted Average
0.580		Pervious Area
0.130		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, MIN**

Subcatchment 150: Backside of Lots 18-20



Subcatchment 210: Lots 5-17

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

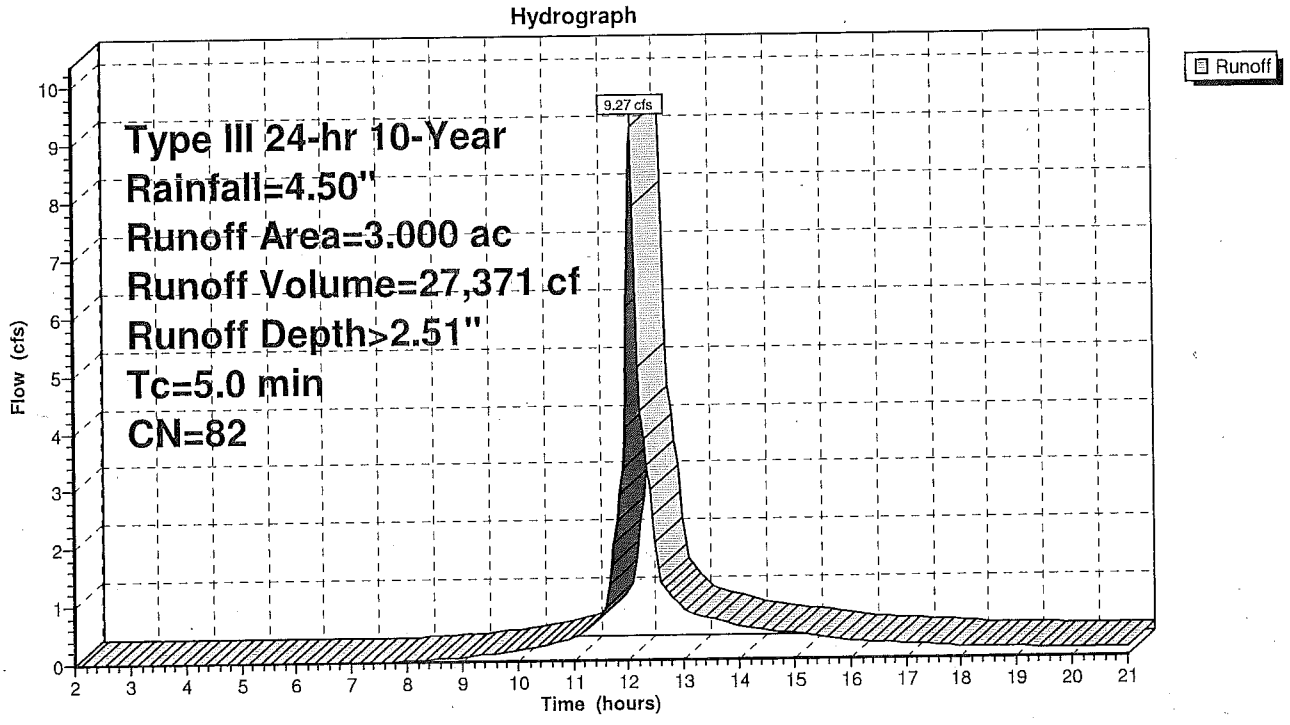
Runoff = 9.27 cfs @ 12.08 hrs, Volume= 27,371 cf, Depth> 2.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (ac)	CN	Description
1.730	74	>75% Grass cover, Good, HSG C
1.050	98	Paved roads w/curbs & sewers
0.220	70	Woods, Good, HSG C
3.000	82	Weighted Average
1.950		Pervious Area
1.050		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, MIN**

Subcatchment 210: Lots 5-17



Subcatchment 220: Cul-de-sac

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

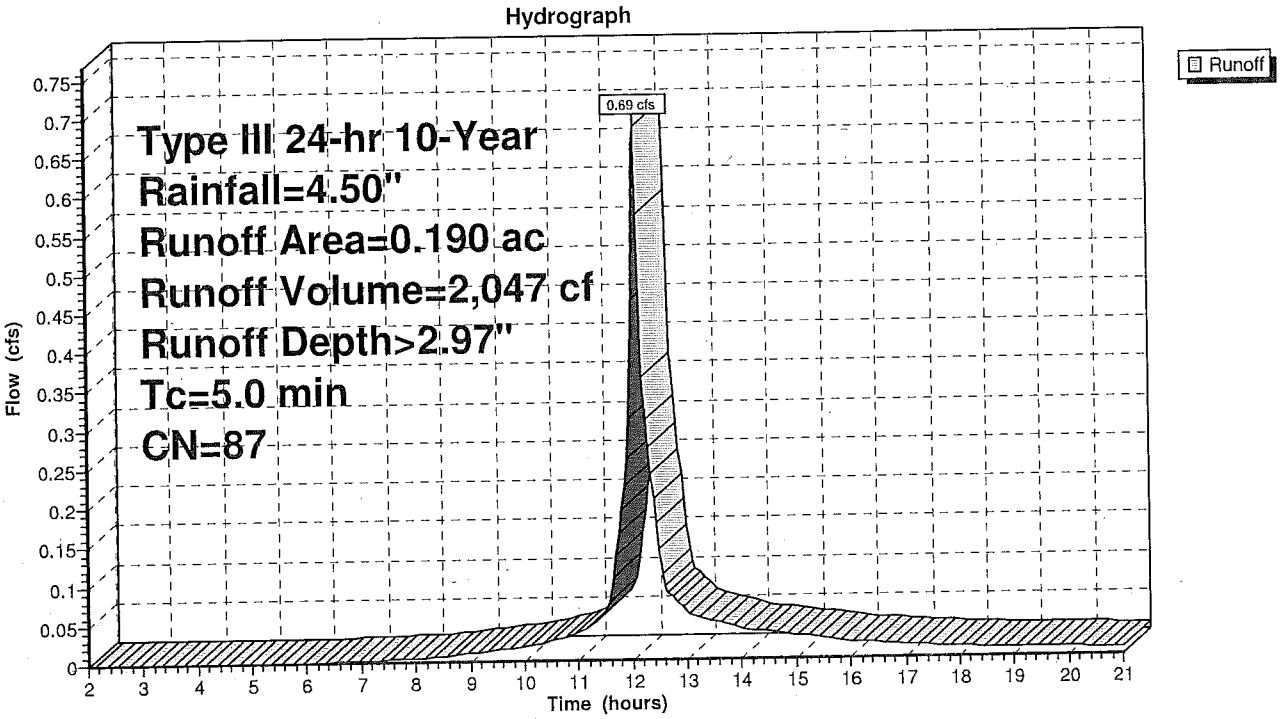
Runoff = 0.69 cfs @ 12.07 hrs, Volume= 2,047 cf, Depth> 2.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (ac)	CN	Description
0.090	74	>75% Grass cover, Good, HSG C
0.100	98	Paved roads w/curbs & sewers
0.190	87	Weighted Average
0.090		Pervious Area
0.100		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, MIN**

Subcatchment 220: Cul-de-sac



Subcatchment 230: Backside of Lots 11-14

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

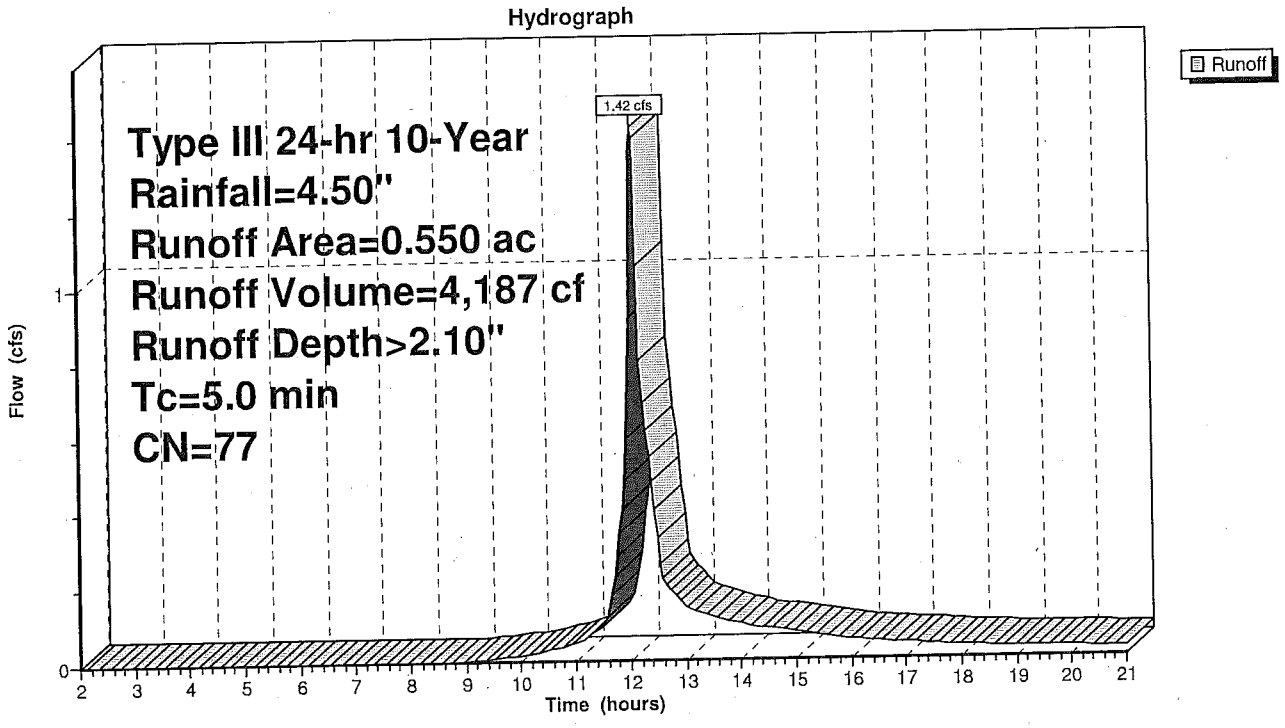
Runoff = 1.42 cfs @ 12.08 hrs, Volume= 4,187 cf, Depth> 2.10"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (ac)	CN	Description
0.150	70	Woods, Good, HSG C
0.310	74	>75% Grass cover, Good, HSG C
0.090	98	Paved parking & roofs
0.550	77	Weighted Average
0.460		Pervious Area
0.090		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, MIN

Subcatchment 230: Backside of Lots 11-14



Reach ##2R: Recharge to DMH

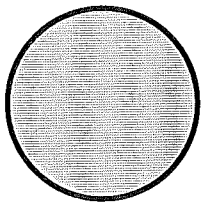
[52] Hint: Inlet conditions not evaluated
[55] Hint: Peak inflow is 128% of Manning's capacity
[76] Warning: Detained 257 cf (Pond w/culvert advised)

Inflow Area =	138,956 sf,	Inflow Depth =	1.03"	for 10-Year event
Inflow =	6.46 cfs @	12.50 hrs,	Volume=	11,879 cf
Outflow =	5.02 cfs @	12.50 hrs,	Volume=	11,880 cf, Atten= 22%, Lag= 0.0 min

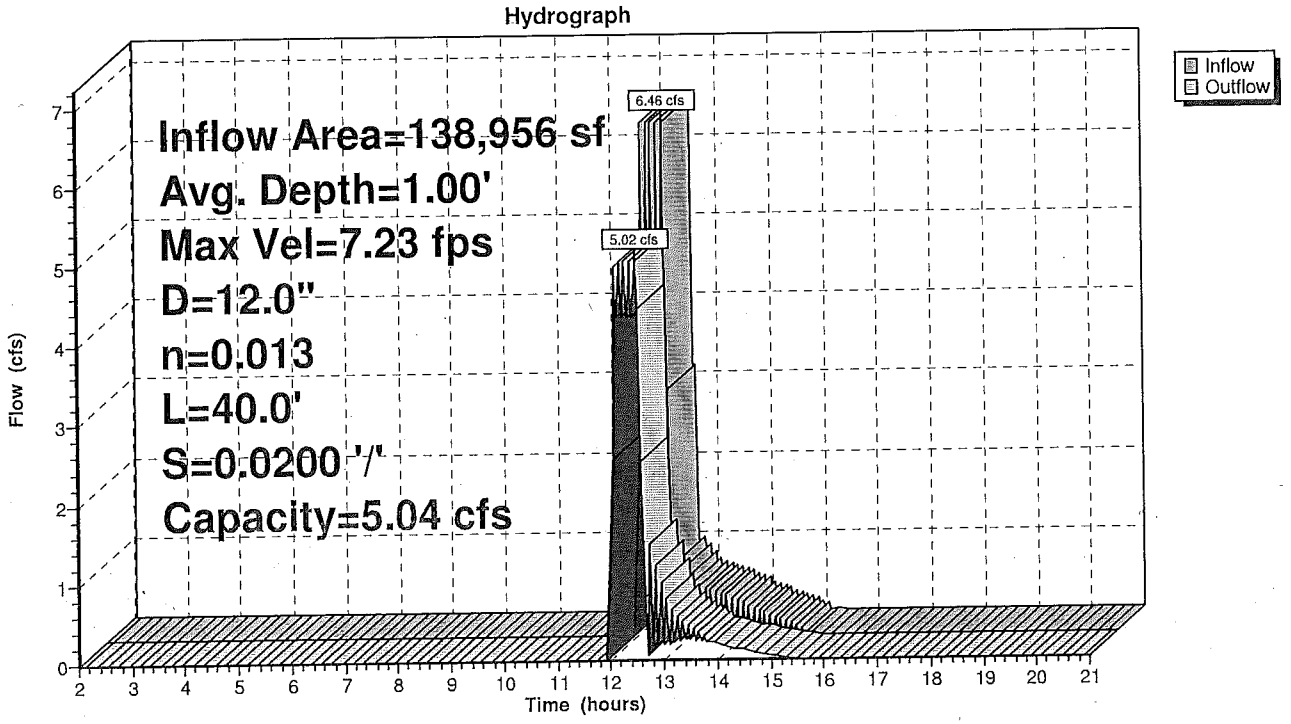
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.23 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.72 fps, Avg. Travel Time= 0.2 min

Peak Storage= 31 cf @ 12.10 hrs, Average Depth at Peak Storage= 1.00'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.04 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 40.0' Slope= 0.0200 '/'
Inlet Invert= 100.00', Outlet Invert= 99.20'



Reach ##2R: Recharge to DMH



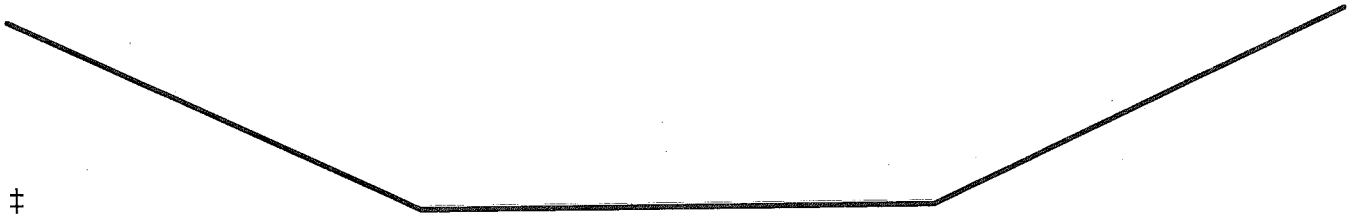
Reach 101R: R101 to R102

Inflow Area = 23,958 sf, Inflow Depth > 2.10" for 10-Year event
Inflow = 1.42 cfs @ 12.08 hrs, Volume= 4,187 cf
Outflow = 1.24 cfs @ 12.19 hrs, Volume= 4,172 cf, Atten= 13%, Lag= 6.8 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.30 fps, Min. Travel Time= 4.0 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 6.6 min

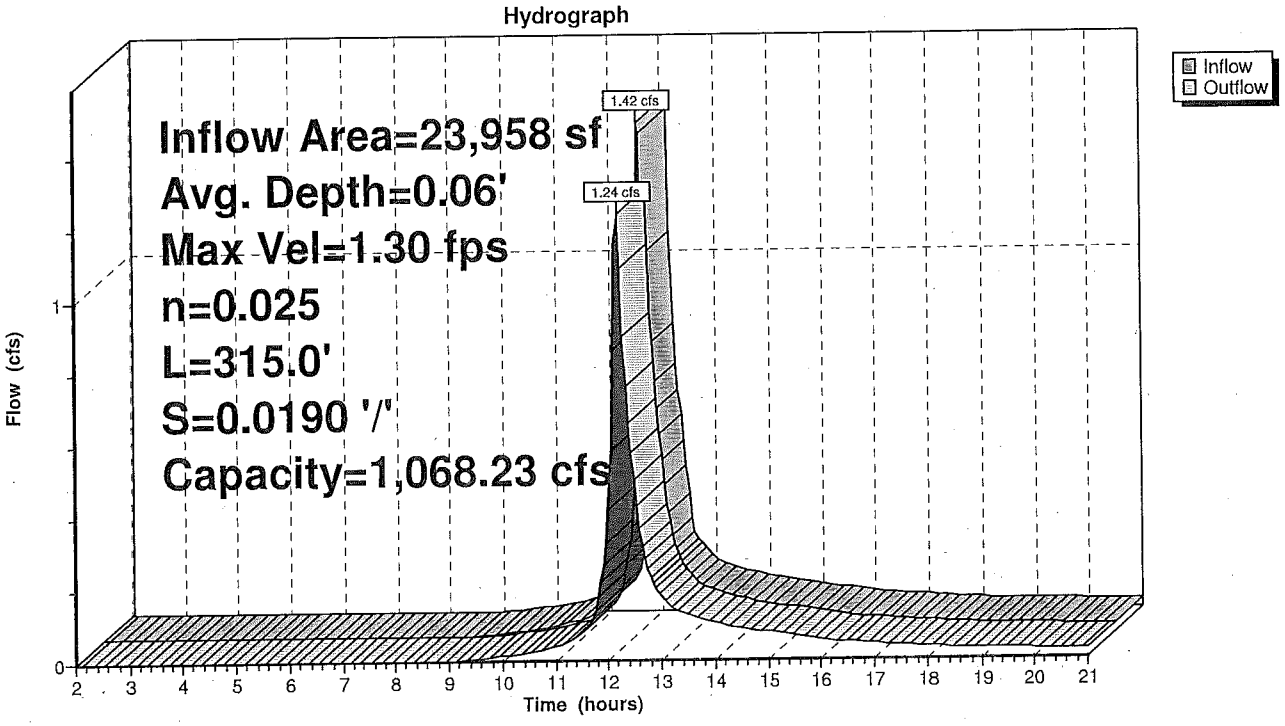
Peak Storage= 309 cf @ 12.12 hrs, Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 1,068.23 cfs

15.00' x 3.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 4.0 '/' Top Width= 39.00'
Length= 315.0' Slope= 0.0190 '/'
Inlet Invert= 94.00', Outlet Invert= 88.00'



‡

Reach 101R: R101 to R102



Reach 102R: 102 to POA

[88] Warning: Qout>Qin may require Finer Routing>1
[61] Hint: Submerged 3% of Reach 101R bottom
[61] Hint: Submerged 9% of Reach 148R bottom

Inflow Area =	193,842 sf,	Inflow Depth >	1.33"	for 10-Year event
Inflow =	7.18 cfs @	12.16 hrs, Volume=	21,457 cf	
Outflow =	7.20 cfs @	12.17 hrs, Volume=	21,450 cf,	Atten= 0%, Lag= 0.5 min

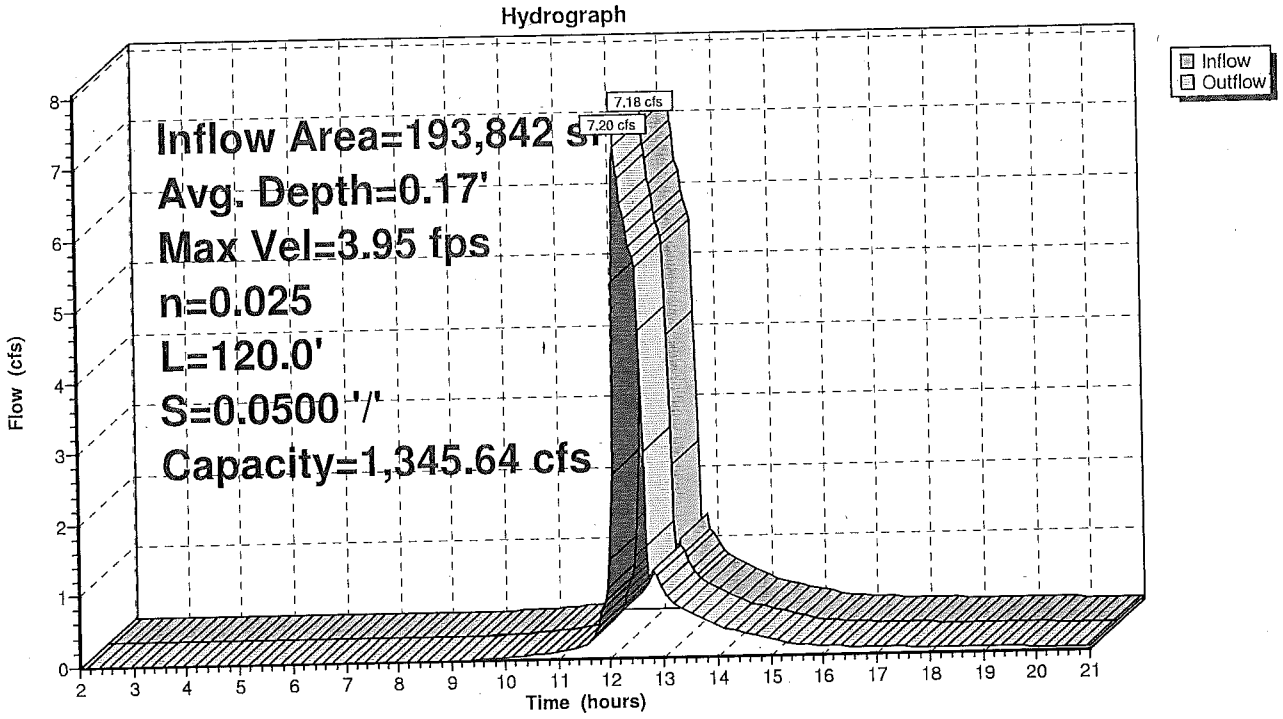
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.95 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.45 fps, Avg. Travel Time= 1.4 min

Peak Storage= 222 cf @ 12.16 hrs, Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 1,345.64 cfs

10.00' x 3.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 4.0 '/' Top Width= 34.00'
Length= 120.0' Slope= 0.0500 '/'
Inlet Invert= 88.00', Outlet Invert= 82.00'

‡

Reach 102R: 102 to POA



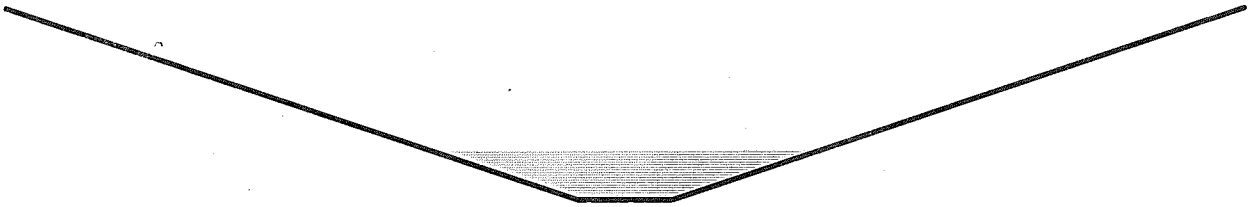
Reach 121R: Roadside Swale

Inflow Area = 10,454 sf, Inflow Depth > 2.87" for 10-Year event
Inflow = 0.84 cfs @ 12.07 hrs, Volume= 2,504 cf
Outflow = 0.83 cfs @ 12.08 hrs, Volume= 2,503 cf, Atten= 1%, Lag= 0.5 min

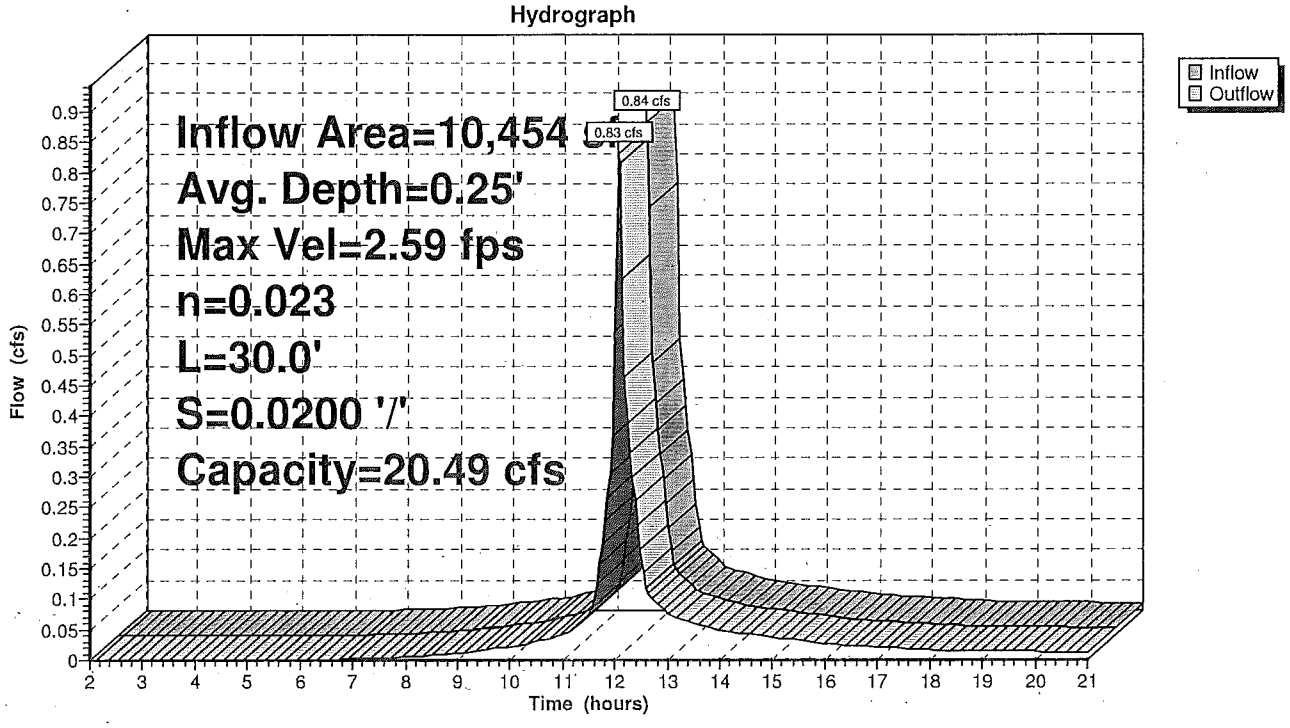
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.59 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.96 fps, Avg. Travel Time= 0.5 min

Peak Storage= 10 cf @ 12.08 hrs, Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 20.49 cfs

0.50' x 1.00' deep channel, n= 0.023 Earth, clean & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.50'
Length= 30.0' Slope= 0.0200 '/'
Inlet Invert= 119.50', Outlet Invert= 118.90'



Reach 121R: Roadside Swale



Reach 122R: Driveway Culvert-DI

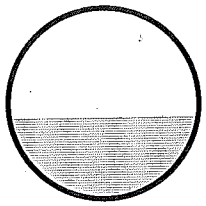
[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 47% of Reach 121R bottom

Inflow Area = 10,454 sf, Inflow Depth > 2.87" for 10-Year event
Inflow = 0.83 cfs @ 12.08 hrs, Volume= 2,503 cf
Outflow = 0.83 cfs @ 12.09 hrs, Volume= 2,503 cf, Atten= 0%, Lag= 0.2 min

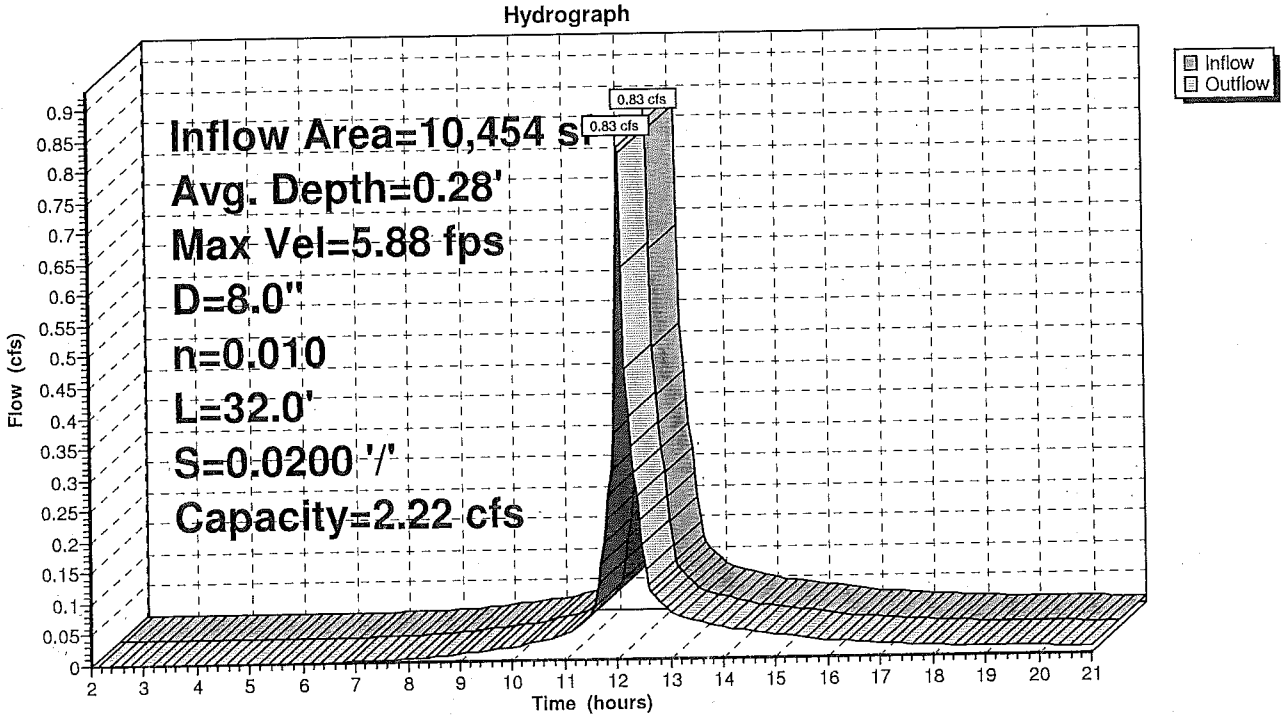
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.88 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.14 fps, Avg. Travel Time= 0.2 min

Peak Storage= 5 cf @ 12.08 hrs, Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 0.67', Capacity at Bank-Full= 2.22 cfs

8.0" Diameter Pipe, n= 0.010 Cast iron, coated
Length= 32.0' Slope= 0.0200 '/'
Inlet Invert= 118.90', Outlet Invert= 118.26'



Reach 122R: Driveway Culvert-DI



Reach 123R: Roadside Swale

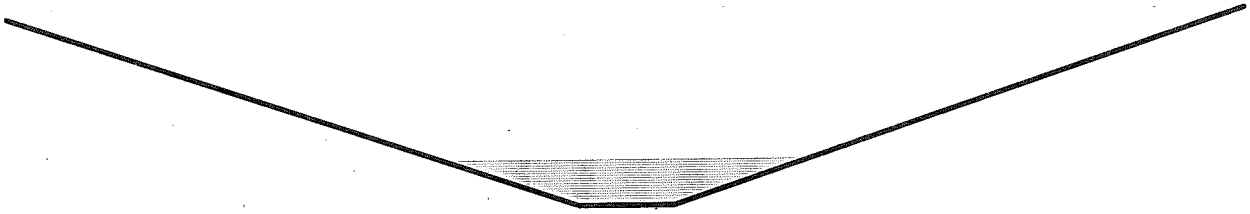
[61] Hint: Submerged 38% of Reach 122R bottom

Inflow Area = 10,454 sf, Inflow Depth > 2.87" for 10-Year event
Inflow = 0.83 cfs @ 12.09 hrs, Volume= 2,503 cf
Outflow = 0.82 cfs @ 12.10 hrs, Volume= 2,502 cf, Atten= 1%, Lag= 0.6 min

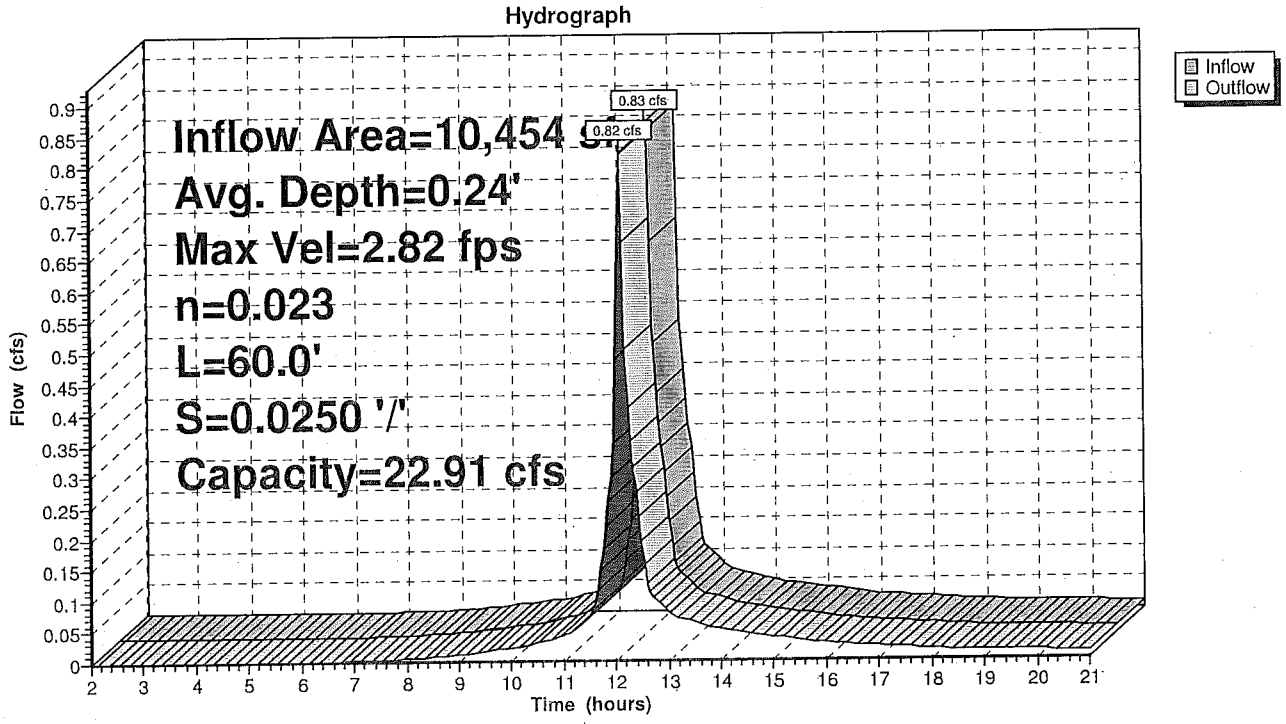
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.82 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.04 fps, Avg. Travel Time= 1.0 min

Peak Storage= 18 cf @ 12.09 hrs, Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 22.91 cfs

0.50' x 1.00' deep channel, n= 0.023 Earth, clean & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.50'
Length= 60.0' Slope= 0.0250 '/'
Inlet Invert= 118.26', Outlet Invert= 116.76'



Reach 123R: Roadside Swale



Reach 124R: Driveway Culvert-DI

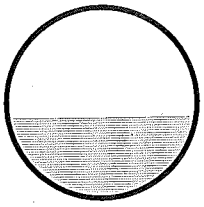
[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 19% of Reach 123R bottom

Inflow Area = 10,454 sf, Inflow Depth > 2.87" for 10-Year event
Inflow = 0.82 cfs @ 12.10 hrs, Volume= 2,502 cf
Outflow = 0.82 cfs @ 12.10 hrs, Volume= 2,502 cf, Atten= 0%, Lag= 0.1 min

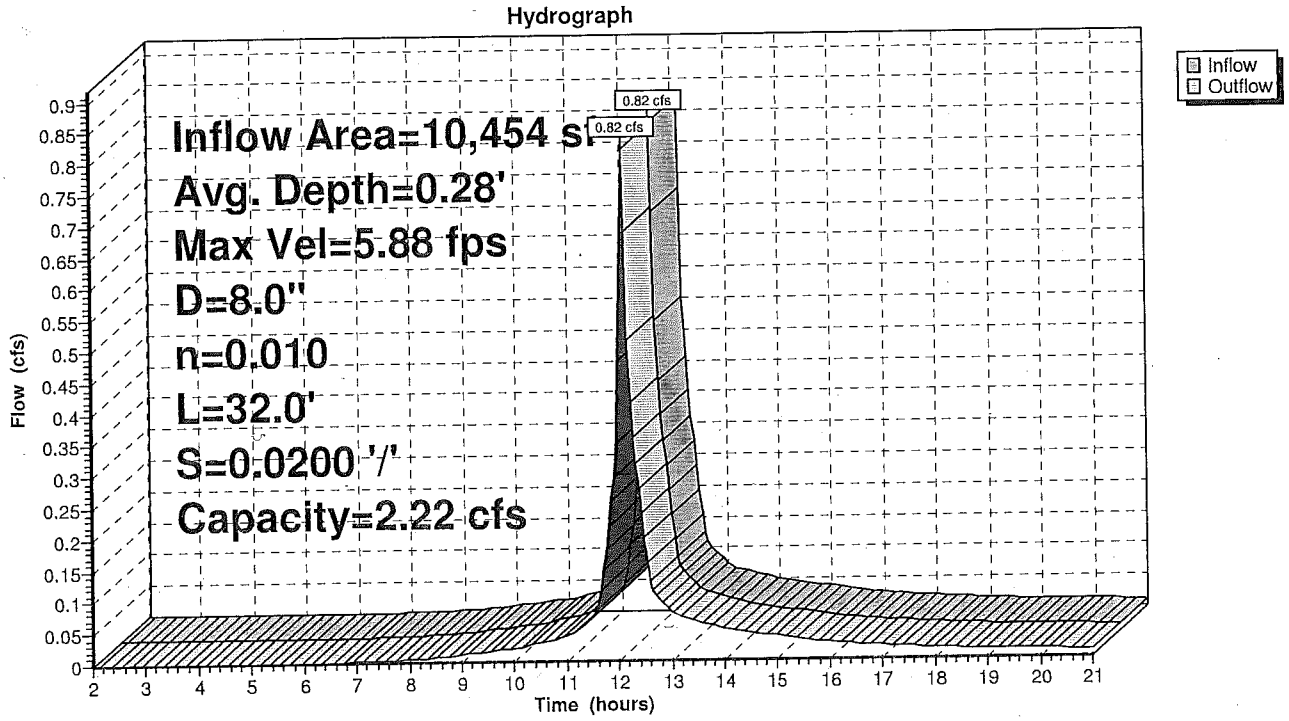
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.88 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.14 fps, Avg. Travel Time= 0.2 min

Peak Storage= 4 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 0.67', Capacity at Bank-Full= 2.22 cfs

8.0" Diameter Pipe, n= 0.010 Cast iron, coated
Length= 32.0' Slope= 0.0200 '/'
Inlet Invert= 116.76', Outlet Invert= 116.12'



Reach 124R: Driveway Culvert-DI



Reach 125R: Swale to RG

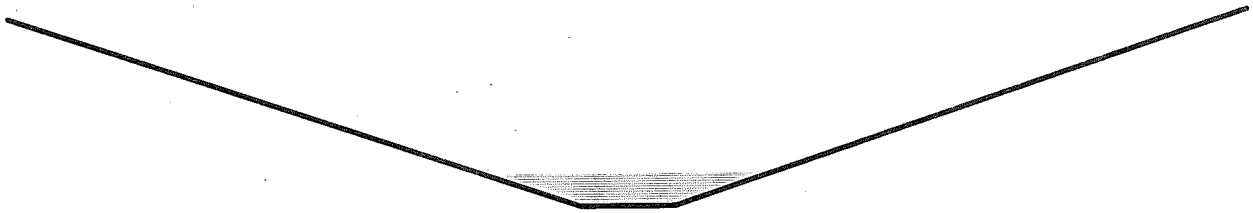
[61] Hint: Submerged 26% of Reach 124R bottom

Inflow Area = 10,454 sf, Inflow Depth > 2.87" for 10-Year event
Inflow = 0.82 cfs @ 12.10 hrs, Volume= 2,502 cf
Outflow = 0.80 cfs @ 12.11 hrs, Volume= 2,500 cf, Atten= 2%, Lag= 0.6 min

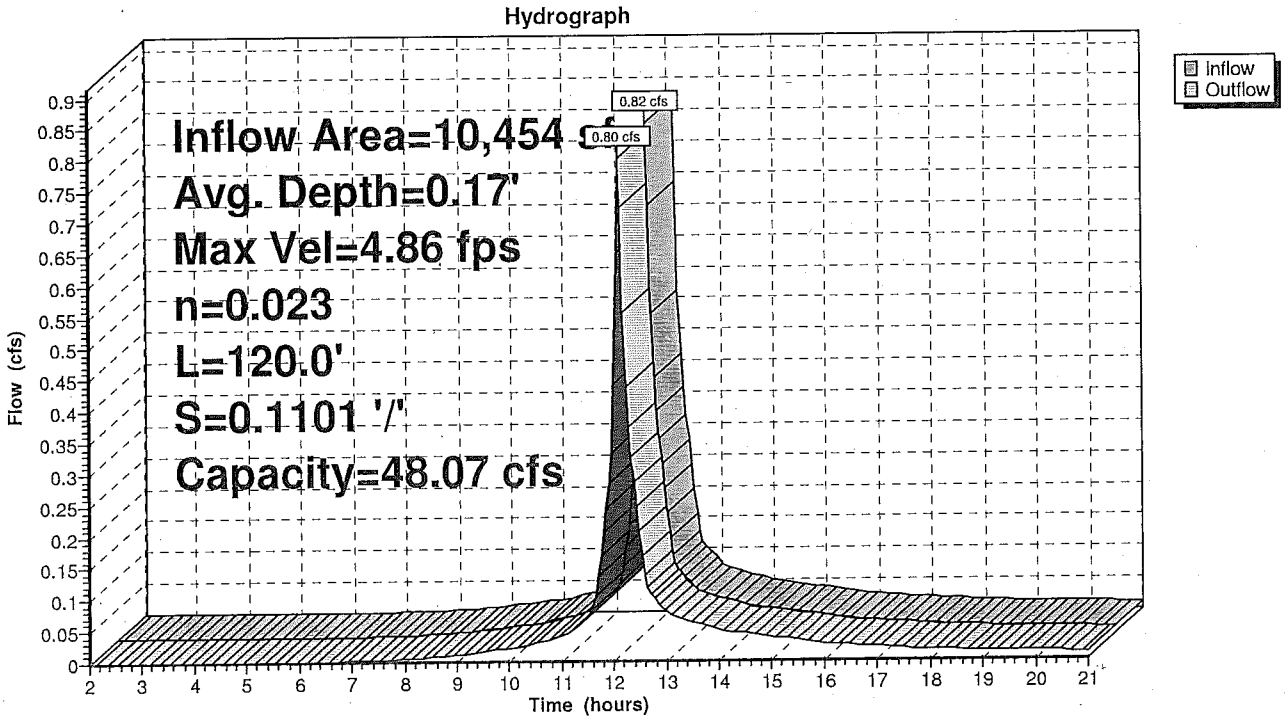
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.86 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.75 fps, Avg. Travel Time= 1.1 min

Peak Storage= 20 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 48.07 cfs

0.50' x 1.00' deep channel, n= 0.023 Earth, clean & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.50'
Length= 120.0' Slope= 0.1101 '/'
Inlet Invert= 116.12', Outlet Invert= 102.91'



Reach 125R: Swale to RG



Reach 126R: CB 10 to INLET13

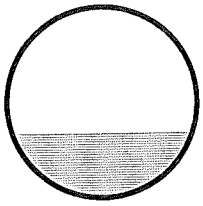
[52] Hint: Inlet conditions not evaluated

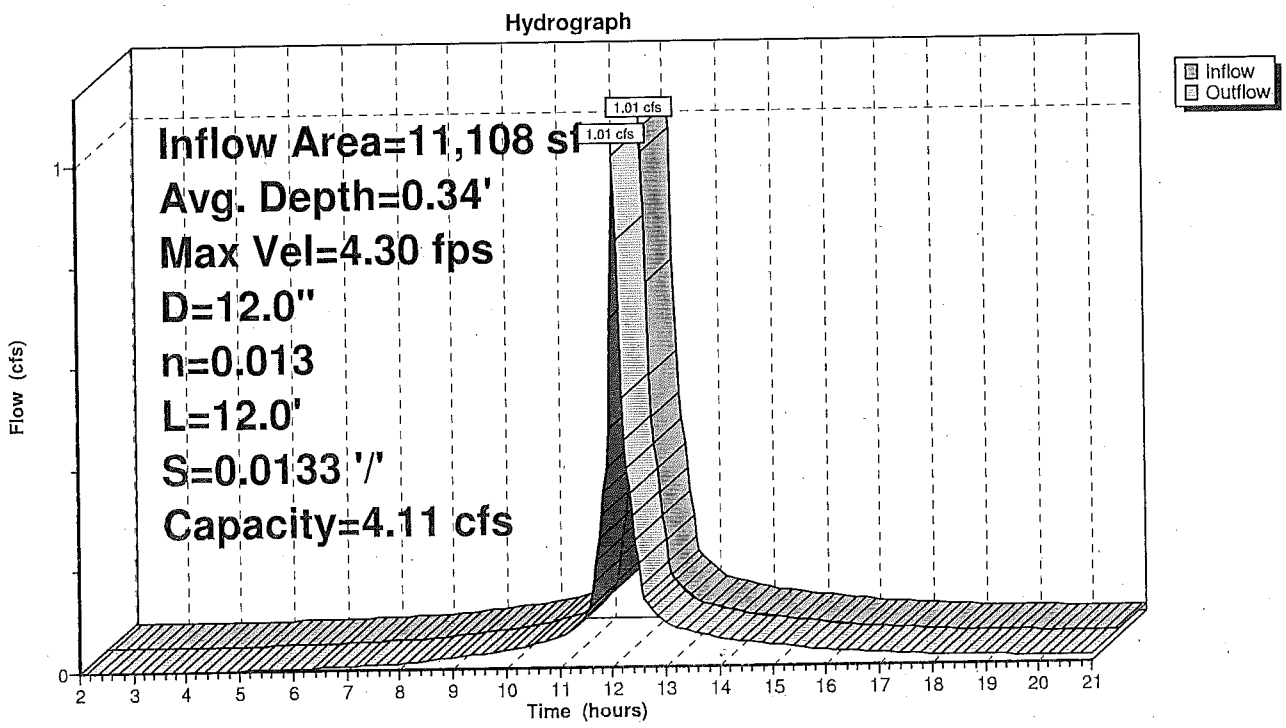
Inflow Area = 11,108 sf, Inflow Depth > 3.36" for 10-Year event
Inflow = 1.01 cfs @ 12.07 hrs, Volume= 3,113 cf
Outflow = 1.01 cfs @ 12.07 hrs, Volume= 3,113 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.30 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.49 fps, Avg. Travel Time= 0.1 min

Peak Storage= 3 cf @ 12.07 hrs, Average Depth at Peak Storage= 0.34'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 4.11 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 12.0' Slope= 0.0133 '/'
Inlet Invert= 105.16', Outlet Invert= 105.00'





Reach 132R: DMH 14 to DMH 15

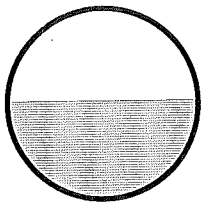
[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 9% of Reach D14 bottom

Inflow Area = 91,694 sf, Inflow Depth > 1.83" for 10-Year event
Inflow = 5.40 cfs @ 12.15 hrs, Volume= 13,989 cf
Outflow = 5.18 cfs @ 12.15 hrs, Volume= 13,986 cf, Atten= 4%, Lag= 0.2 min

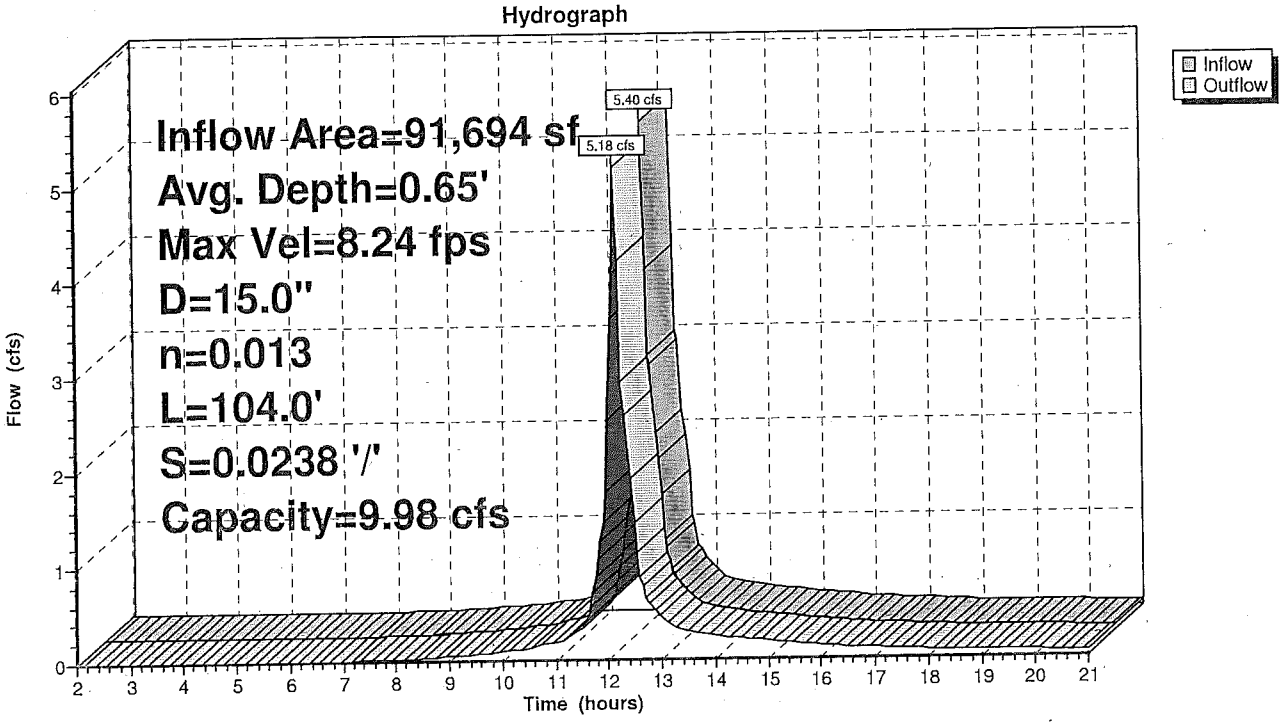
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.24 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.59 fps, Avg. Travel Time= 0.7 min

Peak Storage= 66 cf @ 12.15 hrs, Average Depth at Peak Storage= 0.65'
Bank-Full Depth= 1.25', Capacity at Bank-Full= 9.98 cfs

15.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 104.0' Slope= 0.0238 '/'
Inlet Invert= 101.09', Outlet Invert= 98.61'



Reach 132R: DMH 14 to DMH 15



Reach 133R: DMH 15 to Swale

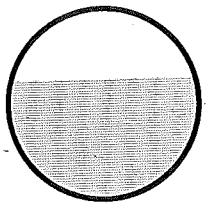
[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 21% of Reach 132R bottom

Inflow Area = 91,694 sf, Inflow Depth > 1.83" for 10-Year event
Inflow = 5.18 cfs @ 12.15 hrs, Volume= 13,986 cf
Outflow = 5.15 cfs @ 12.15 hrs, Volume= 13,985 cf, Atten= 1%, Lag= 0.0 min

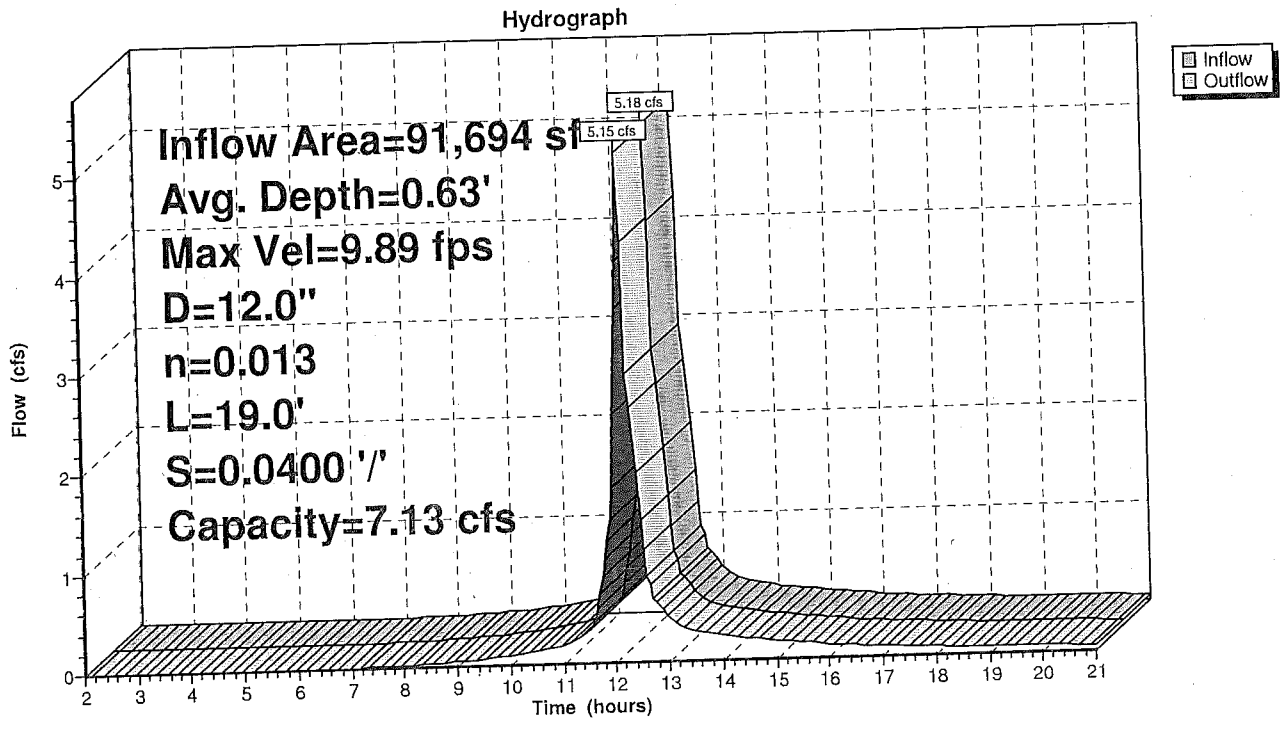
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.89 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 3.19 fps, Avg. Travel Time= 0.1 min

Peak Storage= 10 cf @ 12.15 hrs, Average Depth at Peak Storage= 0.63'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.13 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 19.0' Slope= 0.0400 '/'
Inlet Invert= 98.51', Outlet Invert= 97.75'



Reach 133R: DMH 15 to Swale



Reach 134R: Swale to Stream

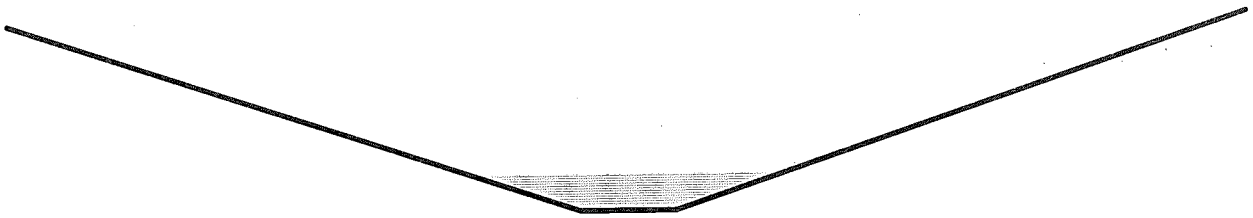
[61] Hint: Submerged 50% of Reach 133R bottom

Inflow Area =	91,694 sf,	Inflow Depth >	1.83"	for 10-Year event
Inflow =	5.15 cfs @	12.15 hrs,	Volume=	13,985 cf
Outflow =	4.88 cfs @	12.16 hrs,	Volume=	13,978 cf, Atten= 5%, Lag= 0.7 min

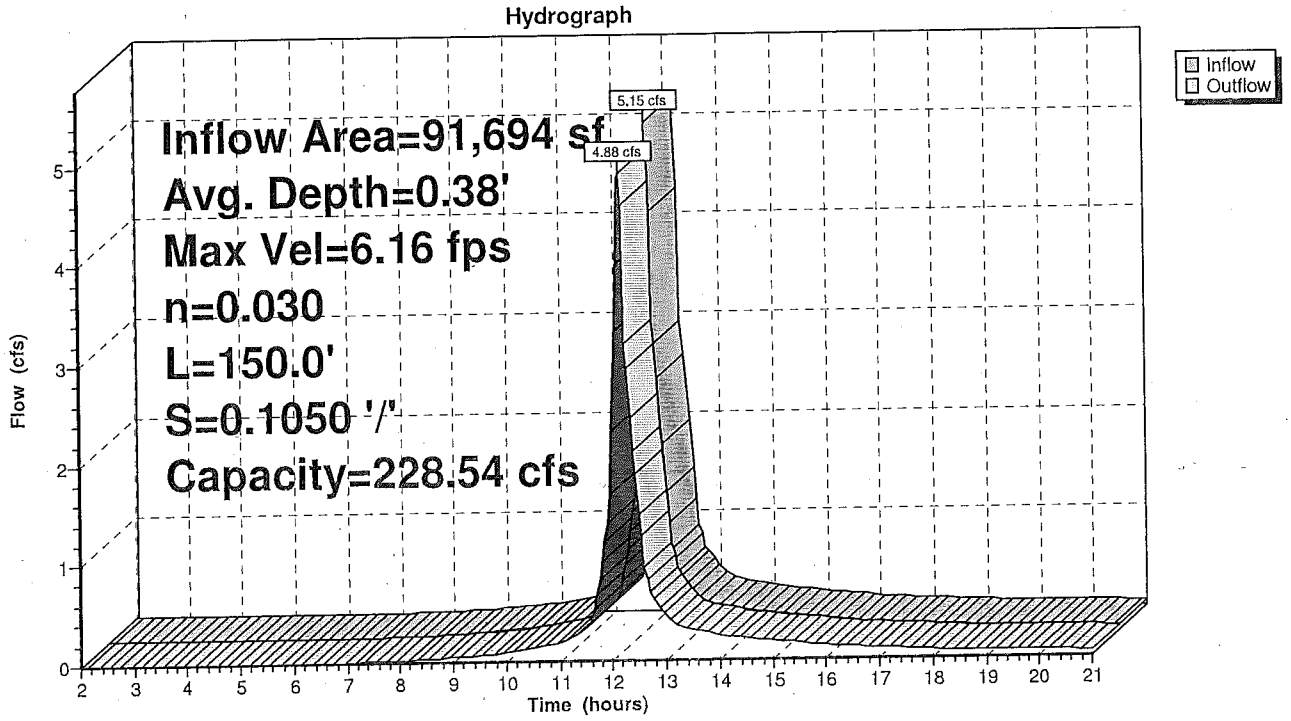
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.16 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.00 fps, Avg. Travel Time= 1.2 min

Peak Storage= 121 cf @ 12.16 hrs, Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 228.54 cfs

1.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 13.00'
Length= 150.0' Slope= 0.1050 '/'
Inlet Invert= 97.75', Outlet Invert= 82.00'



Reach 134R: Swale to Stream



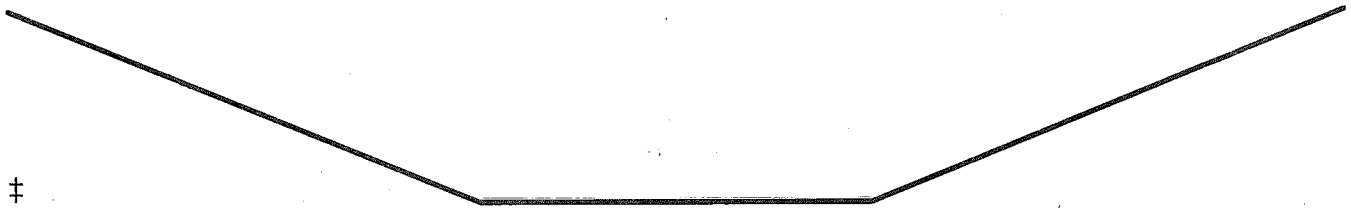
Reach 135R: Stream to POA

Inflow Area = 91,694 sf, Inflow Depth > 1.83" for 10-Year event
Inflow = 4.88 cfs @ 12.16 hrs, Volume= 13,978 cf
Outflow = 4.88 cfs @ 12.16 hrs, Volume= 13,978 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.86 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 3.97 fps, Avg. Travel Time= 0.0 min

Peak Storage= 4 cf @ 12.16 hrs, Average Depth at Peak Storage= 0.07'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 4,137.00 cfs

10.00' x 3.00' deep channel, n= 0.023 Earth, clean & winding
Side Slope Z-value= 4.0 '/' Top Width= 34.00'
Length= 5.0' Slope= 0.4000 '/'
Inlet Invert= 82.00', Outlet Invert= 80.00'



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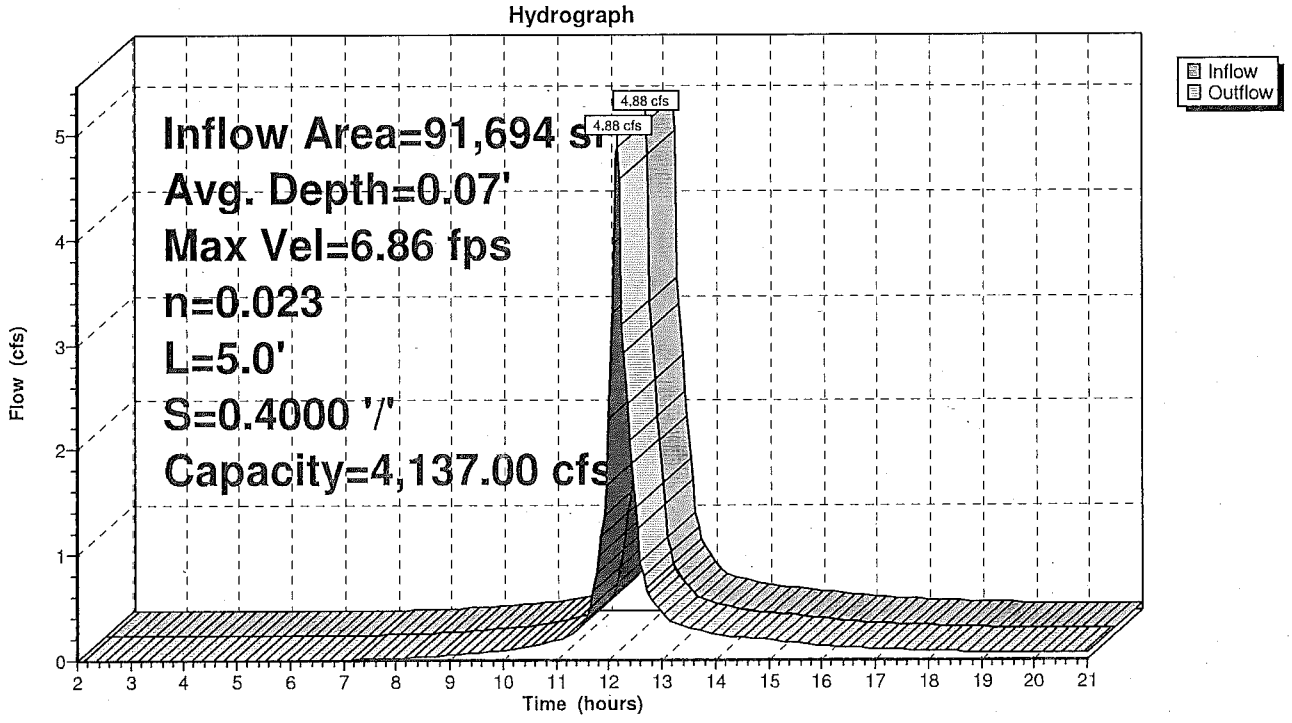
Reach 135R: Stream to POA



Reach 136R: CB11 to DMH 13

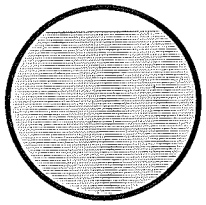
[52] Hint: Inlet conditions not evaluated
[55] Hint: Peak inflow is 106% of Manning's capacity
[63] Warning: Exceeded Reach 126R inflow depth by 0.53' @ 12.10 hrs

Inflow Area = 49,005 sf, Inflow Depth > 2.77" for 10-Year event
Inflow = 3.78 cfs @ 12.08 hrs, Volume= 11,327 cf
Outflow = 3.76 cfs @ 12.08 hrs, Volume= 11,326 cf, Atten= 0%, Lag= 0.4 min

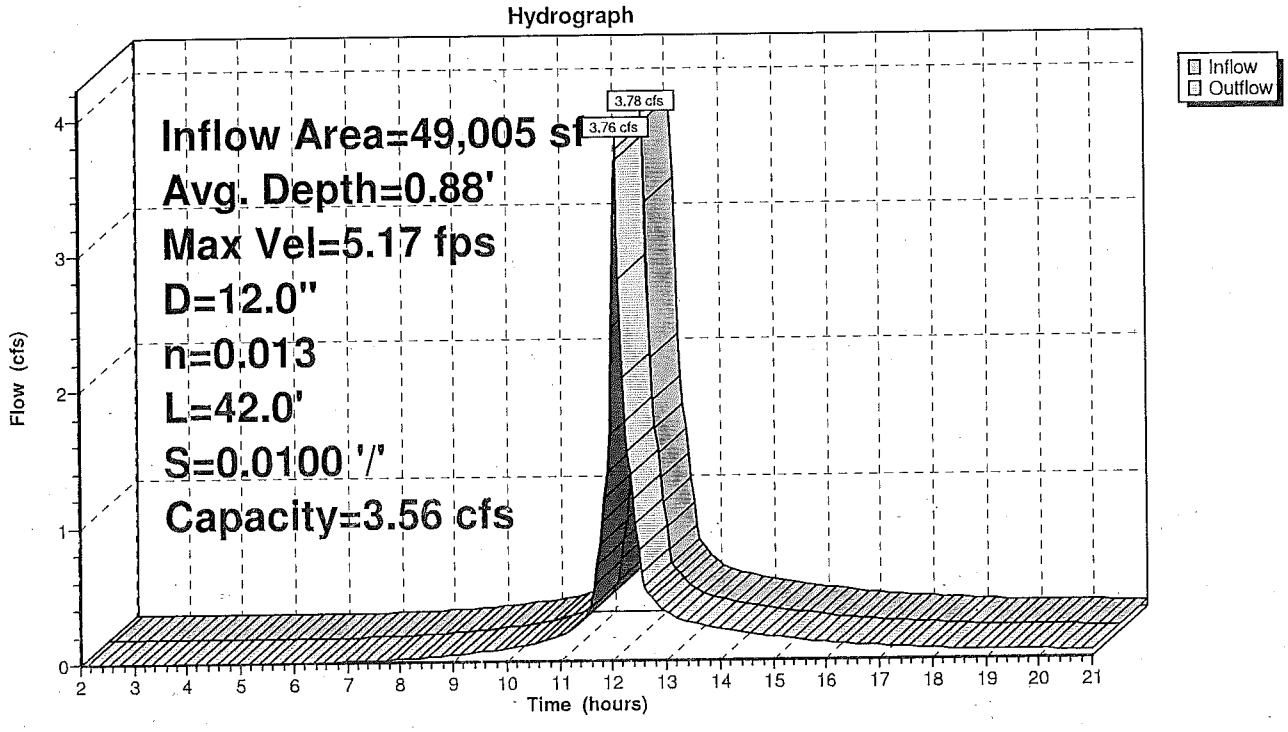
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.17 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.89 fps, Avg. Travel Time= 0.4 min

Peak Storage= 31 cf @ 12.08 hrs, Average Depth at Peak Storage= 0.88'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 3.56 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 42.0' Slope= 0.0100 '/'
Inlet Invert= 105.16', Outlet Invert= 104.74'



Reach 136R: CB11 to DMH 13



Reach 139R: I12 to DMH 13

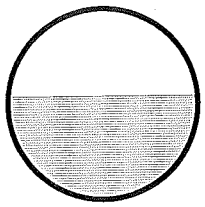
[52] Hint: Inlet conditions not evaluated
[85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 42,689 sf, Inflow Depth > 0.75" for 10-Year event
Inflow = 2.92 cfs @ 12.16 hrs, Volume= 2,666 cf
Outflow = 2.80 cfs @ 12.16 hrs, Volume= 2,666 cf, Atten= 4%, Lag= 0.1 min

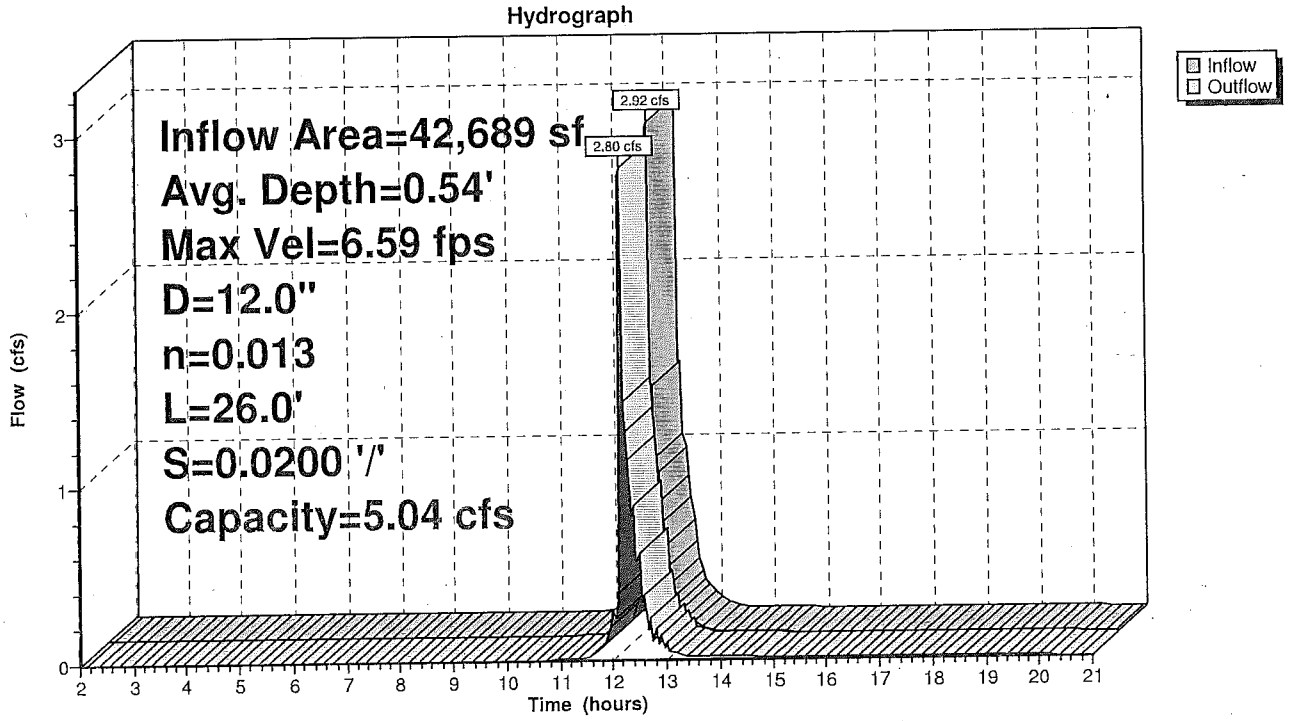
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.59 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.48 fps, Avg. Travel Time= 0.3 min

Peak Storage= 11 cf @ 12.16 hrs, Average Depth at Peak Storage= 0.54'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.04 cfs

12.0" Diameter Pipe, n= 0.013 Concrete pipe, bends & connections
Length= 26.0' Slope= 0.0200 '/'
Inlet Invert= 105.26', Outlet Invert= 104.74'



Reach 139R: I12 to DMH 13



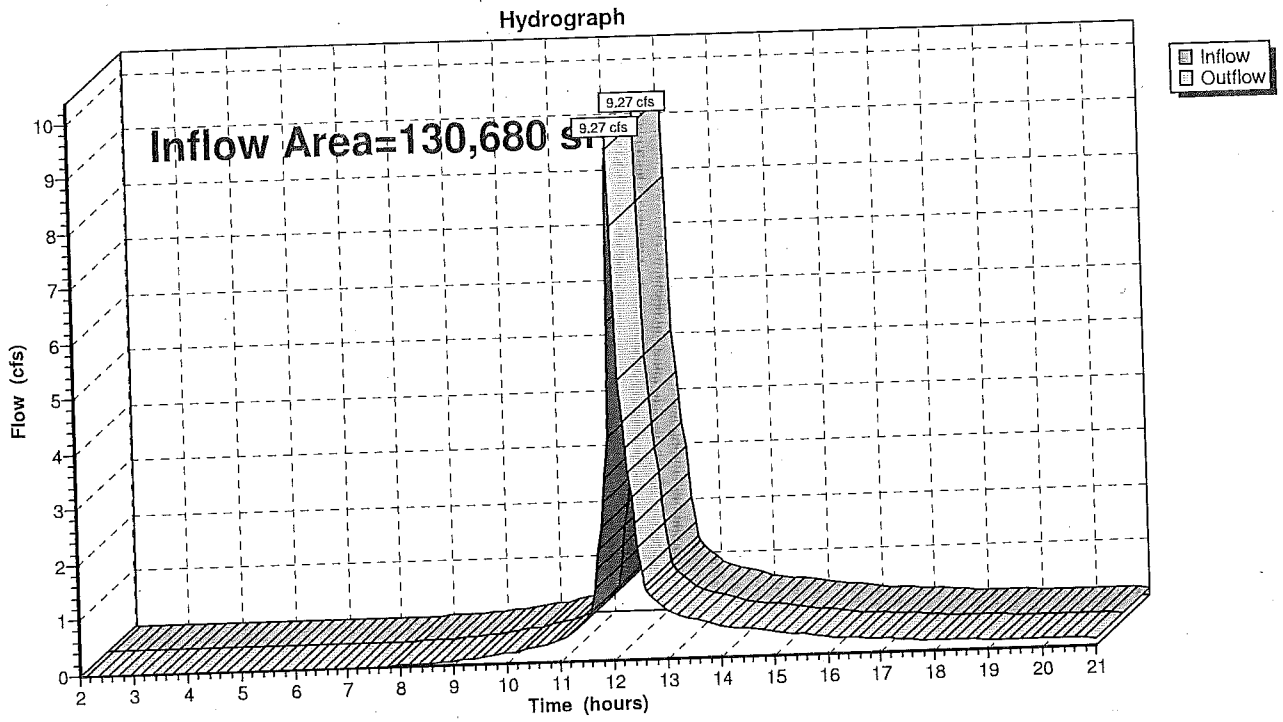
Reach 141R: CB 21 to DMH

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

Inflow Area = 130,680 sf, Inflow Depth > 2.51" for 10-Year event
Inflow = 9.27 cfs @ 12.08 hrs, Volume= 27,371 cf
Outflow = 9.27 cfs @ 12.08 hrs, Volume= 27,371 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs

Reach 141R: CB 21 to DMH

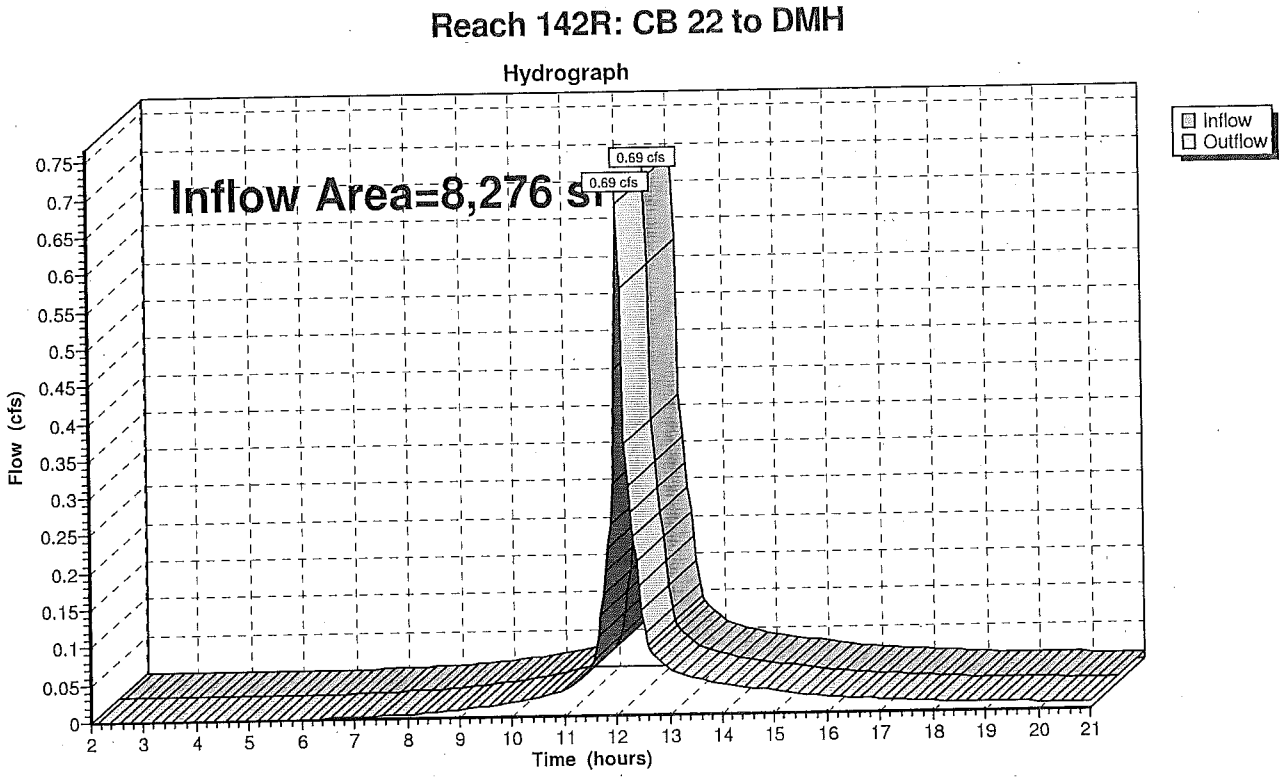


Reach 142R: CB 22 to DMH

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

Inflow Area =	8,276 sf,	Inflow Depth > 2.97"	for 10-Year event
Inflow =	0.69 cfs @	12.07 hrs, Volume=	2,047 cf
Outflow =	0.69 cfs @	12.07 hrs, Volume=	2,047 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs



Reach 143R: DMH to Pretreatment

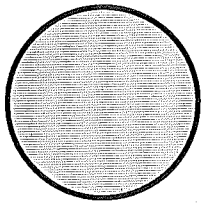
[52] Hint: Inlet conditions not evaluated
[55] Hint: Peak inflow is 197% of Manning's capacity
[76] Warning: Detained 2,389 cf (Pond w/culvert advised)
[85] Warning: Oscillations may require Finer Routing>1

Inflow Area =	138,956 sf,	Inflow Depth >	2.54"	for 10-Year event
Inflow =	9.95 cfs @	12.08 hrs, Volume=	29,418 cf	
Outflow =	5.16 cfs @	12.55 hrs, Volume=	29,416 cf, Atten= 48%, Lag= 28.4 min	

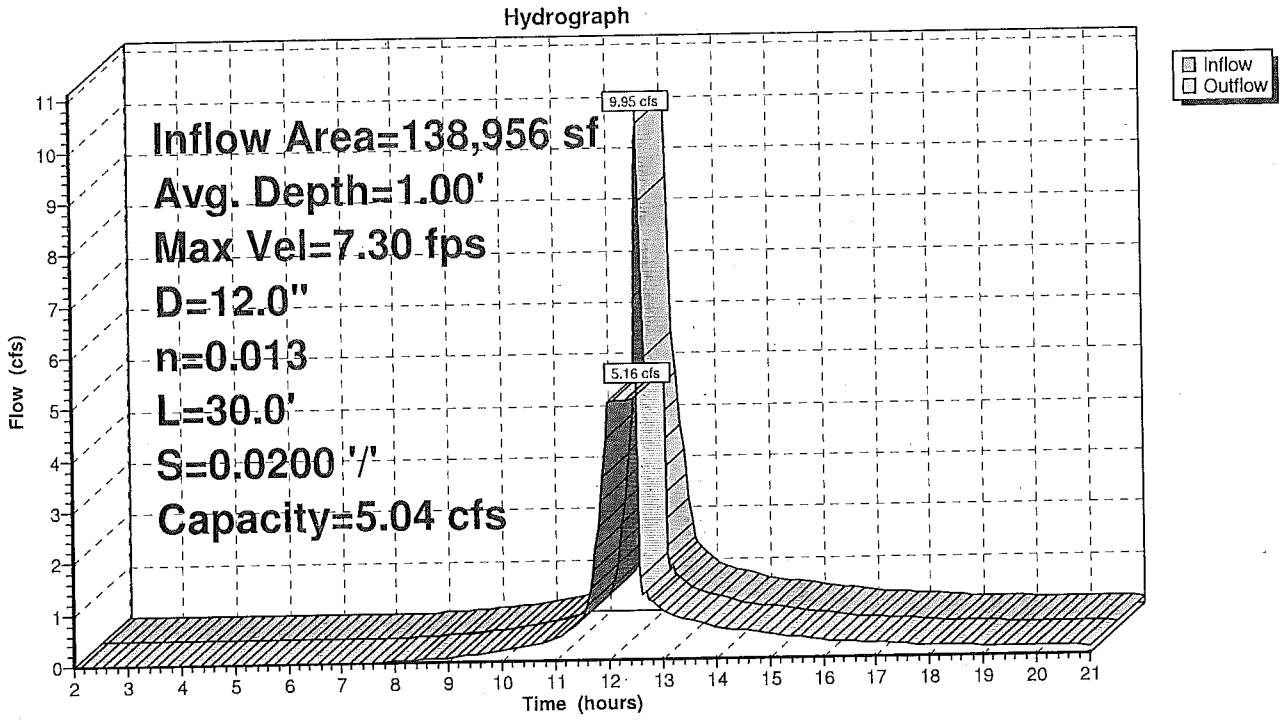
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.30 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.28 fps, Avg. Travel Time= 0.2 min

Peak Storage= 24 cf @ 12.00 hrs, Average Depth at Peak Storage= 1.00'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.04 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 30.0' Slope= 0.0200 '/'
Inlet Invert= 101.00', Outlet Invert= 100.40'



Reach 143R: DMH to Pretreatment



Reach 145R: Pretreatment to Recharge

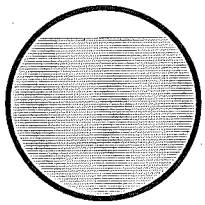
[52] Hint: Inlet conditions not evaluated
[55] Hint: Peak inflow is 102% of Manning's capacity
[85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 138,956 sf, Inflow Depth > 2.54" for 10-Year event
Inflow = 5.16 cfs @ 12.55 hrs, Volume= 29,416 cf
Outflow = 5.16 cfs @ 12.55 hrs, Volume= 29,415 cf, Atten= 0%, Lag= 0.0 min

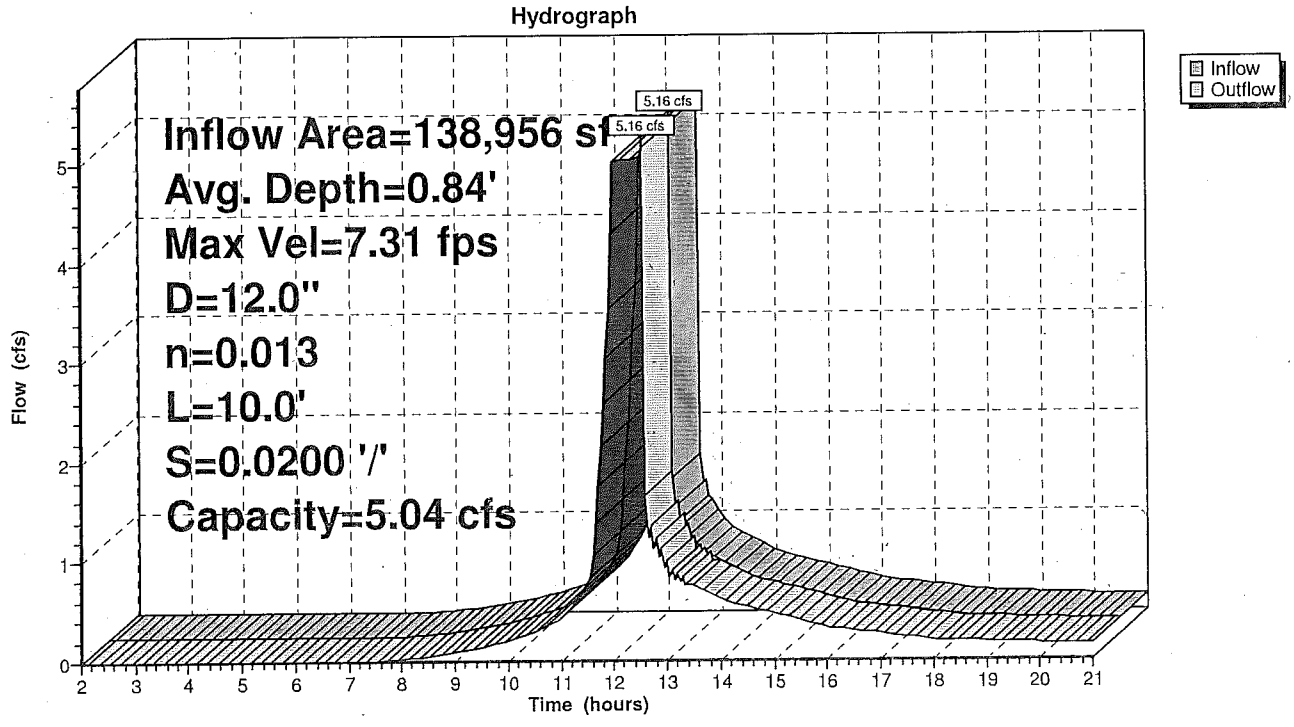
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.31 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 3.31 fps, Avg. Travel Time= 0.1 min

Peak Storage= 7 cf @ 12.55 hrs, Average Depth at Peak Storage= 0.84'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.04 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 10.0' Slope= 0.0200 '/'
Inlet Invert= 100.30', Outlet Invert= 100.10'



Reach 145R: Pretreatment to Recharge



Reach 146R: DMH to Swale

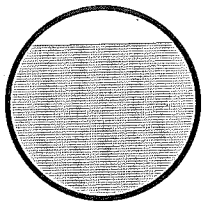
[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 89% of Reach ##2R bottom

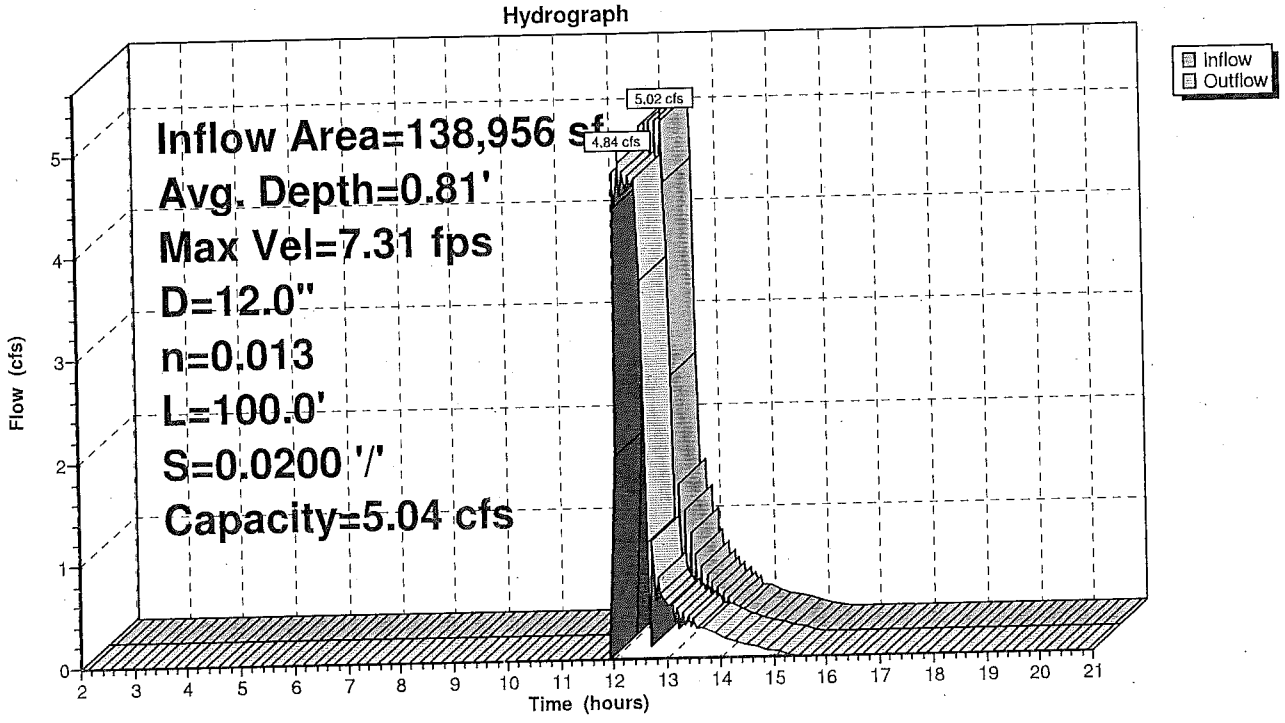
Inflow Area = 138,956 sf, Inflow Depth = 1.03" for 10-Year event
Inflow = 5.02 cfs @ 12.50 hrs, Volume= 11,880 cf
Outflow = 4.84 cfs @ 12.20 hrs, Volume= 11,880 cf, Atten= 3%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.31 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 3.63 fps, Avg. Travel Time= 0.5 min

Peak Storage= 68 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.81'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.04 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 100.0' Slope= 0.0200 '/'
Inlet Invert= 99.10', Outlet Invert= 97.10'





Reach 147R: Swale to Stream

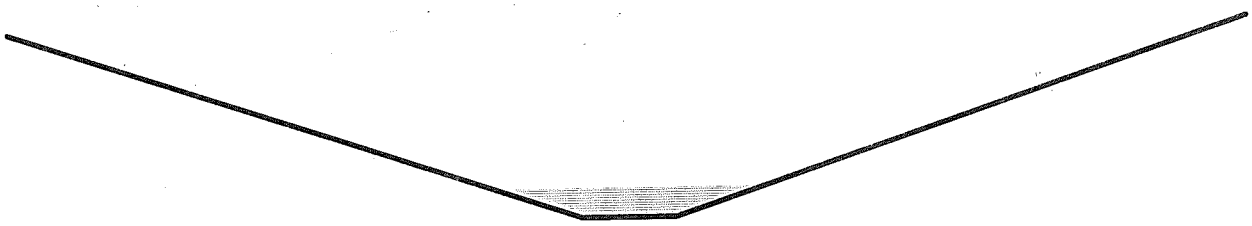
[61] Hint: Submerged 15% of Reach 146R bottom

Inflow Area =	138,956 sf,	Inflow Depth =	1.03"	for 10-Year event
Inflow =	4.84 cfs @	12.20 hrs, Volume=	11,880 cf	
Outflow =	4.79 cfs @	12.21 hrs, Volume=	11,880 cf,	Atten= 1%, Lag= 0.1 min

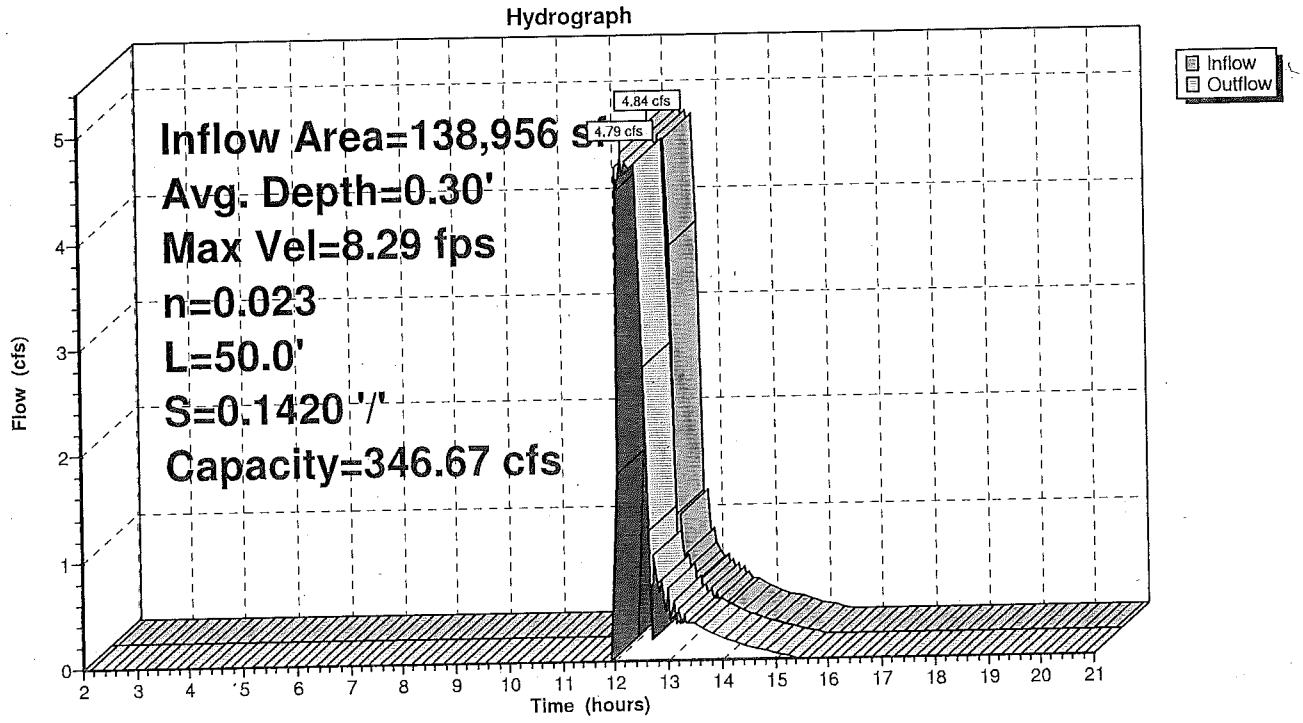
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.29 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.00 fps, Avg. Travel Time= 0.2 min

Peak Storage= 29 cf @ 12.21 hrs, Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 346.67 cfs

1.00' x 2.00' deep channel, n= 0.023 Earth, clean & winding
Side Slope Z-value= 3.0 '/' Top Width= 13.00'
Length= 50.0' Slope= 0.1420 '/'
Inlet Invert= 97.10', Outlet Invert= 90.00'



Reach 147R: Swale to Stream



Reach 148R: Stream to R102

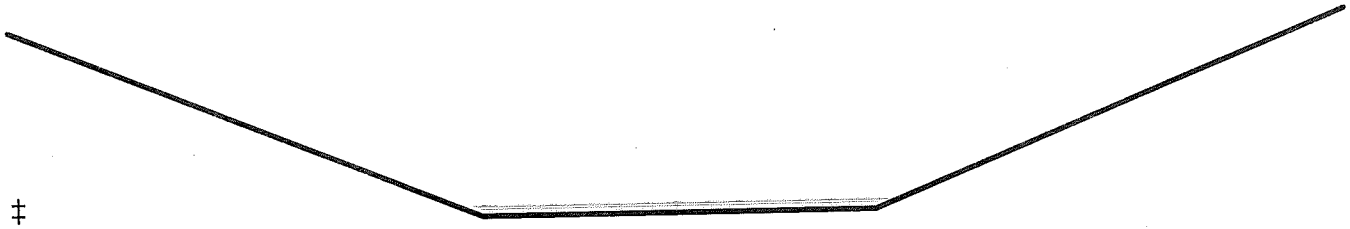
[61] Hint: Submerged 2% of Reach 147R bottom

Inflow Area =	138,956 sf,	Inflow Depth = 1.03"	for 10-Year event
Inflow =	4.79 cfs @	12.21 hrs, Volume=	11,880 cf
Outflow =	4.72 cfs @	12.55 hrs, Volume=	11,880 cf, Atten= 2%, Lag= 20.6 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.67 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.23 fps, Avg. Travel Time= 1.4 min

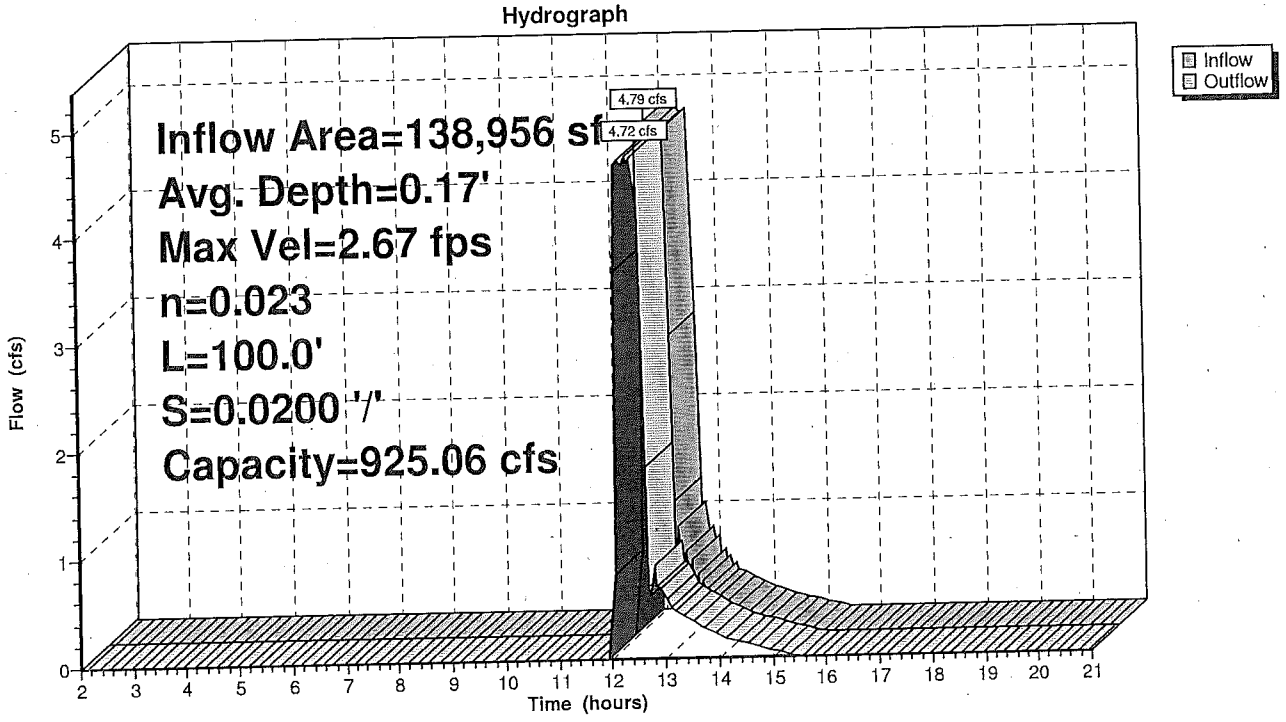
Peak Storage= 178 cf @ 12.25 hrs, Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 925.06 cfs

10.00' x 3.00' deep channel, n= 0.023 Earth, clean & winding
Side Slope Z-value= 4.0 '/' Top Width= 34.00'
Length= 100.0' Slope= 0.0200 '/'
Inlet Invert= 90.00', Outlet Invert= 88.00'



‡

Reach 148R: Stream to R102



Reach D14: DW 13 to DMH 14

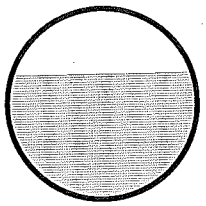
[52] Hint: Inlet conditions not evaluated
[62] Warning: Submerged 14% of Reach 136R inlet
[62] Warning: Submerged 4% of Reach 139R inlet

Inflow Area = 91,694 sf, Inflow Depth > 1.83" for 10-Year event
Inflow = 5.58 cfs @ 12.15 hrs, Volume= 13,991 cf
Outflow = 5.40 cfs @ 12.15 hrs, Volume= 13,989 cf, Atten= 3%, Lag= 0.1 min

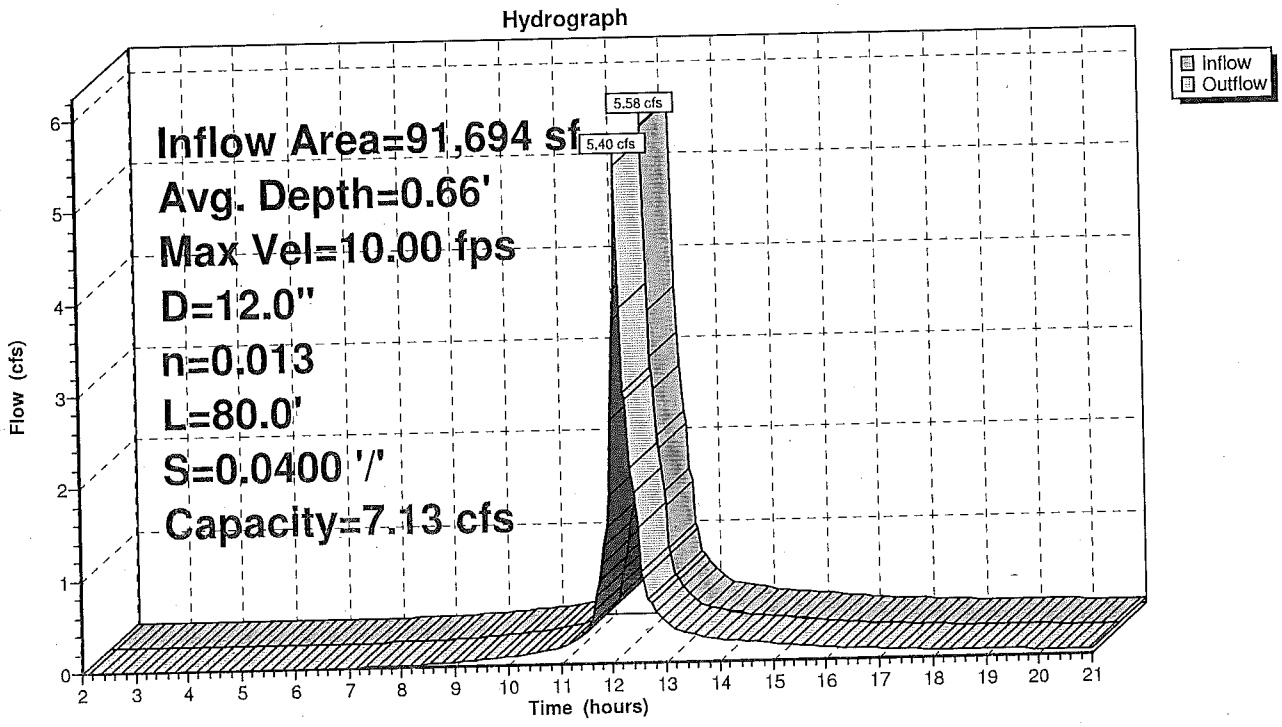
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 10.00 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.20 fps, Avg. Travel Time= 0.4 min

Peak Storage= 44 cf @ 12.15 hrs, Average Depth at Peak Storage= 0.66'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.13 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 80.0' Slope= 0.0400 '/'
Inlet Invert= 104.64', Outlet Invert= 101.44'



Reach D14: DW 13 to DMH 14



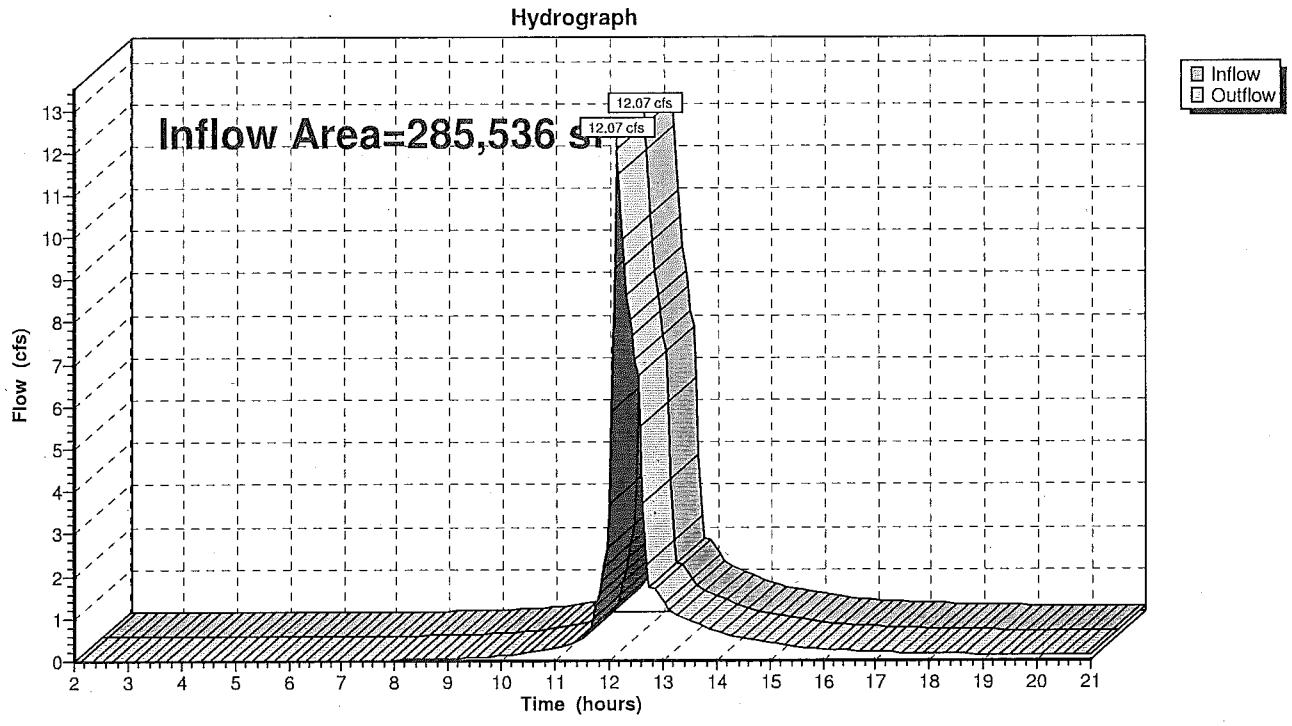
Reach PTA: Point of Analysis

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

Inflow Area = 285,536 sf, Inflow Depth > 1.49" for 10-Year event
Inflow = 12.07 cfs @ 12.17 hrs, Volume= 35,428 cf
Outflow = 12.07 cfs @ 12.17 hrs, Volume= 35,428 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs

Reach PTA: Point of Analysis



Pond 1P: Rain Garden / Bioretention Cell 2

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

Inflow Area =	37,462 sf,	Inflow Depth =	0.95"	for	10-Year event
Inflow =	2.28 cfs @	12.11 hrs,	Volume=	2,972 cf	
Outflow =	2.88 cfs @	12.16 hrs,	Volume=	2,972 cf,	Atten= 0%, Lag= 2.7 min
Discarded =	0.09 cfs @	12.16 hrs,	Volume=	1,055 cf	
Primary =	2.79 cfs @	12.16 hrs,	Volume=	1,916 cf	

Routing by Stor-Ind method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Peak Elev= 111.48' @ 12.16 hrs Surf.Area= 467 sf Storage= 582 cf

Plug-Flow detention time= 25.4 min calculated for 2,964 cf (100% of inflow)
Center-of-Mass det. time= 25.5 min (770.4 - 744.9)

Volume	Invert	Avail.Storage	Storage Description
#1	110.00'	843 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

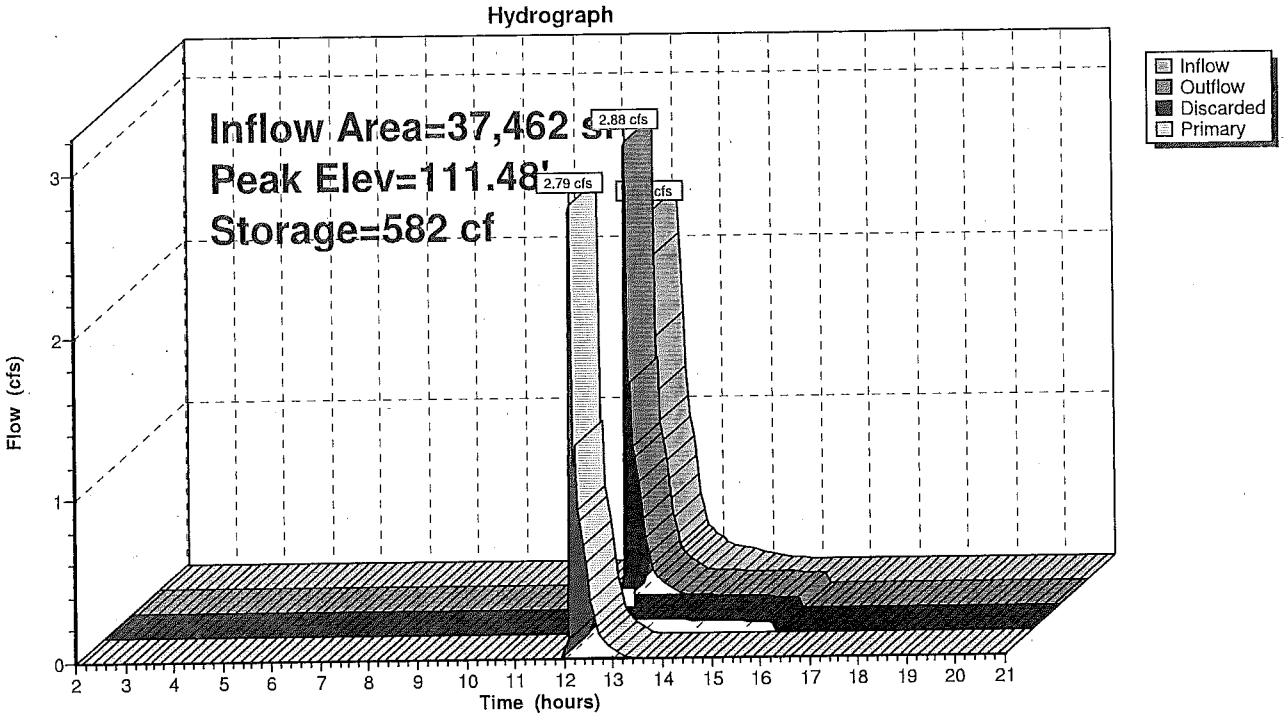
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
110.00	330	0	0
111.00	415	373	373
112.00	525	470	843

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	111.20'	**8.0' long x 4.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.09 cfs @ 12.16 hrs HW=111.45' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=2.55 cfs @ 12.16 hrs HW=111.46' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 2.55 cfs @ 1.23 fps)

Pond 1P: Rain Garden / Bioretention Cell 2



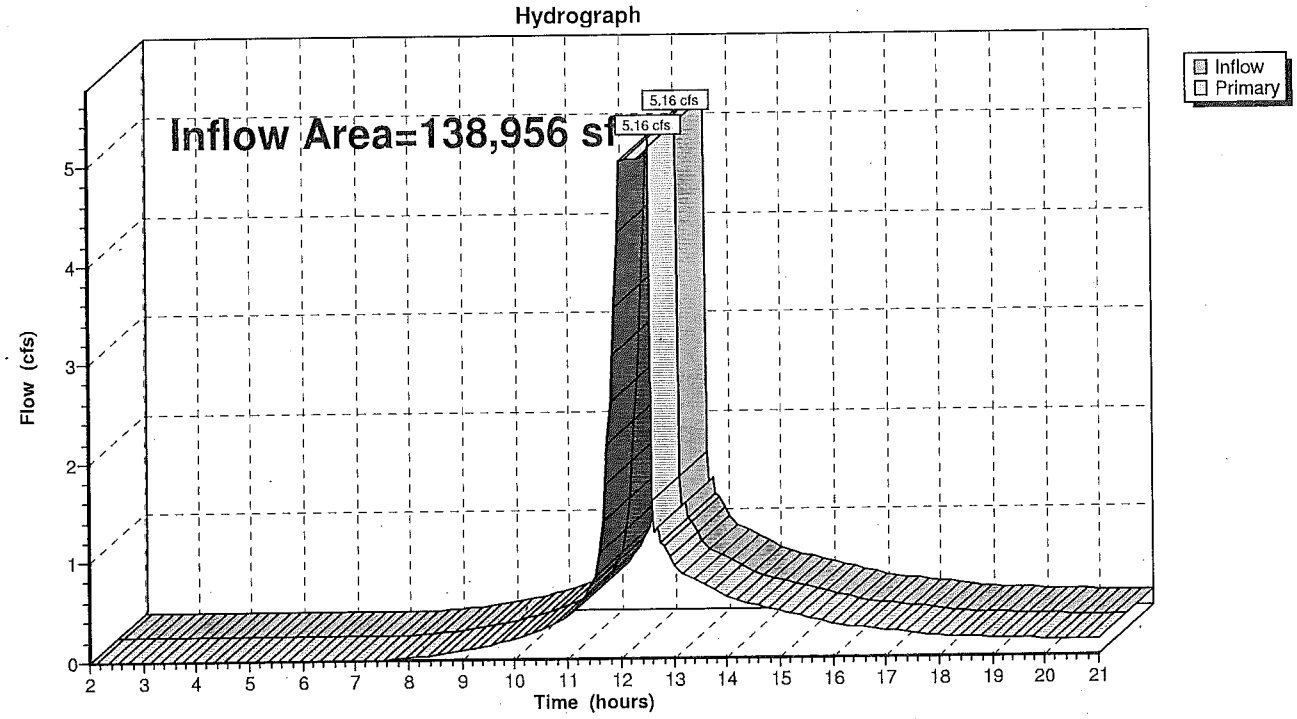
Pond 144P: Pretreatment

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

Inflow Area =	138,956 sf,	Inflow Depth > 2.54"	for 10-Year event
Inflow =	5.16 cfs @	12.55 hrs, Volume=	29,416 cf
Primary =	5.16 cfs @	12.55 hrs, Volume=	29,416 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs

Pond 144P: Pretreatment



Pond 401P: Rain Garden/Bioretention Cell 1

[61] Hint: Submerged 67% of Reach 125R bottom

Inflow Area =	37,462 sf,	Inflow Depth >	2.37"	for 10-Year event
Inflow =	2.44 cfs @	12.09 hrs, Volume=	7,401 cf	
Outflow =	2.42 cfs @	12.11 hrs, Volume=	7,397 cf,	Atten= 1%, Lag= 1.3 min
Discarded =	0.14 cfs @	12.11 hrs, Volume=	4,425 cf	
Primary =	2.28 cfs @	12.11 hrs, Volume=	2,972 cf	

Routing by Stor-Ind method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Peak Elev= 111.82' @ 12.11 hrs Surf.Area= 729 sf Storage= 1,098 cf

Plug-Flow detention time= 44.2 min calculated for 7,397 cf (100% of inflow)
Center-of-Mass det. time= 43.9 min (841.5 - 797.6)

Volume	Invert	Avail.Storage	Storage Description
#1	110.00'	1,229 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

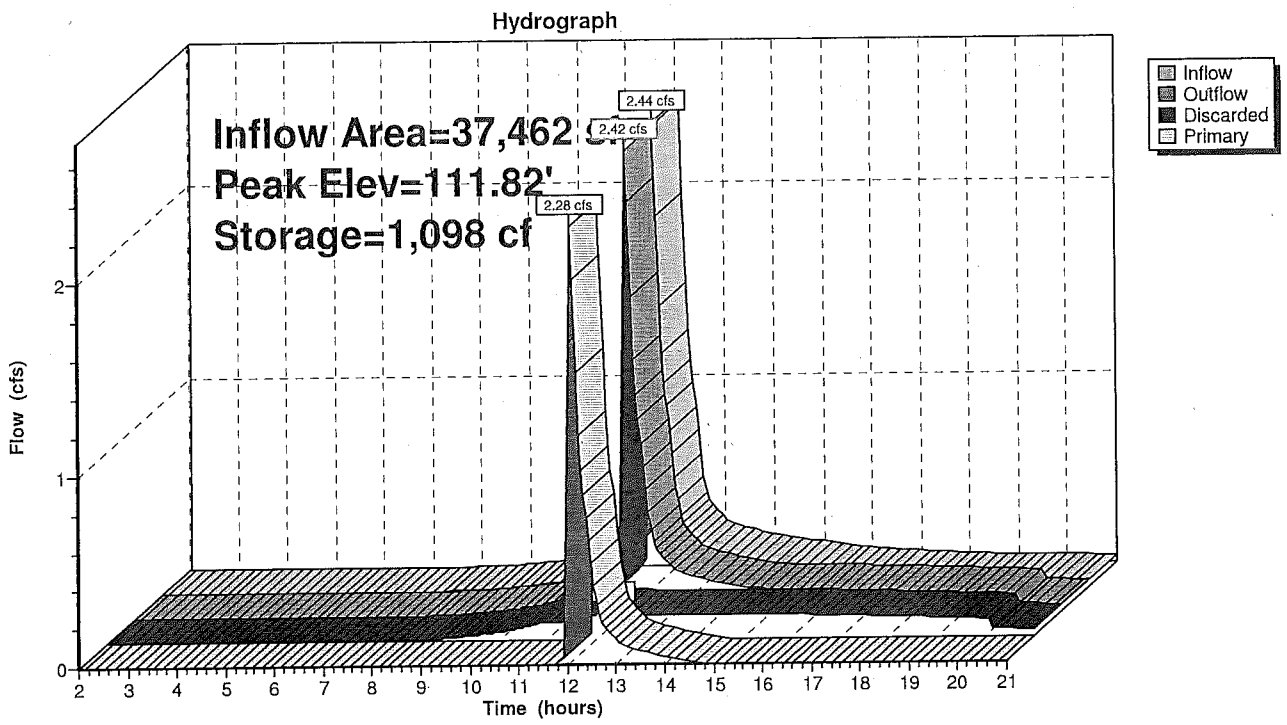
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
110.00	486	0	0
111.00	608	547	547
112.00	755	682	1,229

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	111.50'	**5.0' long x 4.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.14 cfs @ 12.11 hrs HW=111.82' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=2.22 cfs @ 12.11 hrs HW=111.82' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 2.22 cfs @ 1.39 fps)

Pond 401P: Rain Garden/Bioretention Cell 1



Pond 402P: Recharge System

[93] Warning: Storage range exceeded by 1.73'
[88] Warning: Qout>Qin may require Finer Routing>1
[85] Warning: Oscillations may require Finer Routing>1
[63] Warning: Exceeded Reach 145R inflow depth by 3.11' @ 12.50 hrs

Inflow Area =	138,956 sf,	Inflow Depth >	2.54"	for	10-Year event
Inflow =	5.16 cfs @	12.55 hrs,	Volume=	29,415 cf	
Outflow =	6.88 cfs @	12.50 hrs,	Volume=	28,878 cf,	Atten= 0%, Lag= 0.0 min
Discarded =	0.42 cfs @	11.05 hrs,	Volume=	16,999 cf	
Primary =	6.46 cfs @	12.50 hrs,	Volume=	11,879 cf	

Routing by Stor-Ind method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Peak Elev= 104.23' @ 12.50 hrs Surf.Area= 2,200 sf Storage= 4,421 cf

Plug-Flow detention time= 66.0 min calculated for 28,878 cf (98% of inflow)
Center-of-Mass det. time= 57.9 min (852.9 - 795.1)

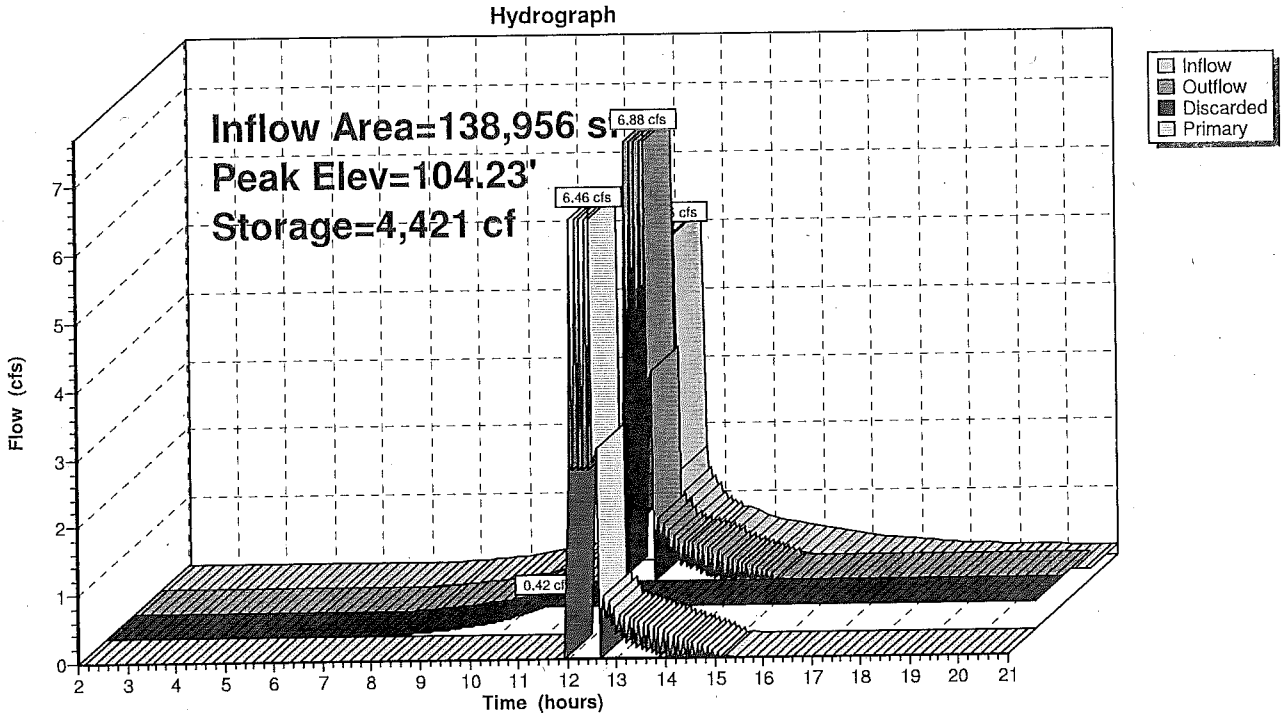
Volume	Invert	Avail.Storage	Storage Description
#1	99.00'	2,186 cf	**44.00'W x 50.00'L x 3.50'H Prismatoid** 7,700 cf Overall - 2,235 cf Embedded = 5,465 cf x 40.0% Voids
#2	100.00'	2,235 cf	**47.8"W x 30.0"H x 6.25'L Cultec R-330** x 48 Inside #1
		4,421 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	103.00'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Primary	105.00'	**2.00' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Discarded OutFlow Max=0.42 cfs @ 11.05 hrs HW=99.06' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.42 cfs)

Primary OutFlow Max=6.46 cfs @ 12.50 hrs HW=104.23' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 6.46 cfs @ 4.11 fps)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 402P: Recharge System



Time span=2.00-21.00 hrs, dt=0.05 hrs, 381 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 110: Backside of Lots 1-4 Runoff Area=0.620 ac Runoff Depth>3.84"
Tc=5.0 min CN=78 Runoff=2.92 cfs 8,648 cf

Subcatchment 120: Frontside of Lots 3&4 Runoff Area=0.240 ac Runoff Depth>4.69"
Tc=5.0 min CN=86 Runoff=1.34 cfs 4,088 cf

Subcatchment 130: Frontside of Lots 1&2 Runoff Area=0.255 ac Runoff Depth>5.25"
Tc=5.0 min CN=91 Runoff=1.54 cfs 4,858 cf

Subcatchment 135: Side of Lot 1 Runoff Area=0.120 ac Runoff Depth>3.24"
Tc=0.0 min CN=72 Runoff=0.55 cfs 1,413 cf

Subcatchment 140: Frontside of Lots 18-20 Runoff Area=0.870 ac Runoff Depth>4.37"
Tc=5.0 min CN=83 Runoff=4.60 cfs 13,795 cf

Subcatchment 150: Backside of Lots 18-20 Runoff Area=0.710 ac Runoff Depth>3.74"
Tc=5.0 min CN=77 Runoff=3.26 cfs 9,639 cf

Subcatchment 210: Lots 5-17 Runoff Area=3.000 ac Runoff Depth>4.26"
Tc=5.0 min CN=82 Runoff=15.55 cfs 46,407 cf

Subcatchment 220: Cul-de-sac Runoff Area=0.190 ac Runoff Depth>4.80"
Tc=5.0 min CN=87 Runoff=1.08 cfs 3,312 cf

Subcatchment 230: Backside of Lots 11-14 Runoff Area=0.550 ac Runoff Depth>3.74"
Tc=5.0 min CN=77 Runoff=2.52 cfs 7,467 cf

Reach ##2R: Recharge to DMH Avg. Depth=1.00' Max Vel=7.31 fps Inflow=6.67 cfs 28,124 cf
D=12.0" n=0.013 L=40.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=5.31 cfs 28,177 cf

Reach 101R: R101 to R102 Avg. Depth=0.09' Max Vel=1.65 fps Inflow=2.52 cfs 7,467 cf
n=0.025 L=315.0' S=0.0190 '/' Capacity=1,068.23 cfs Outflow=2.34 cfs 7,444 cf

Reach 102R: 102 to POA Avg. Depth=0.20' Max Vel=4.39 fps Inflow=9.73 cfs 45,260 cf
n=0.025 L=120.0' S=0.0500 '/' Capacity=1,345.64 cfs Outflow=9.64 cfs 45,249 cf

Reach 121R: Roadside Swale Avg. Depth=0.32' Max Vel=2.92 fps Inflow=1.34 cfs 4,088 cf
n=0.023 L=30.0' S=0.0200 '/' Capacity=20.49 cfs Outflow=1.33 cfs 4,087 cf

Reach 122R: Driveway Culvert-DI Avg. Depth=0.37' Max Vel=6.62 fps Inflow=1.33 cfs 4,087 cf
D=8.0" n=0.010 L=32.0' S=0.0200 '/' Capacity=2.22 cfs Outflow=1.32 cfs 4,087 cf

Reach 123R: Roadside Swale Avg. Depth=0.30' Max Vel=3.18 fps Inflow=1.32 cfs 4,087 cf
n=0.023 L=60.0' S=0.0250 '/' Capacity=22.91 cfs Outflow=1.31 cfs 4,085 cf

Reach 124R: Driveway Culvert-DI Avg. Depth=0.37' Max Vel=6.62 fps Inflow=1.31 cfs 4,085 cf
D=8.0" n=0.010 L=32.0' S=0.0200 '/' Capacity=2.22 cfs Outflow=1.31 cfs 4,085 cf

Reach 125R: Swale to RG Avg. Depth=0.21' Max Vel=5.50 fps Inflow=1.31 cfs 4,085 cf
n=0.023 L=120.0' S=0.1101 '/' Capacity=48.07 cfs Outflow=1.29 cfs 4,083 cf

Reach 126R: CB 10 to INLET13 Avg. Depth=0.42' Max Vel=4.82 fps Inflow=1.54 cfs 4,858 cf
D=12.0" n=0.013 L=12.0' S=0.0133 '/' Capacity=4.11 cfs Outflow=1.54 cfs 4,858 cf

Reach 132R: DMH 14 to DMH 15 Avg. Depth=0.79' Max Vel=8.87 fps Inflow=7.37 cfs 25,580 cf
D=15.0" n=0.013 L=104.0' S=0.0238 '/' Capacity=9.98 cfs Outflow=7.35 cfs 25,576 cf

Reach 133R: DMH 15 to Swale Avg. Depth=0.85' Max Vel=10.34 fps Inflow=7.35 cfs 25,576 cf
D=12.0" n=0.013 L=19.0' S=0.0400 '/' Capacity=7.13 cfs Outflow=7.34 cfs 25,575 cf

Reach 134R: Swale to Stream Avg. Depth=0.45' Max Vel=6.79 fps Inflow=7.34 cfs 25,575 cf
n=0.030 L=150.0' S=0.1050 '/' Capacity=228.54 cfs Outflow=7.27 cfs 25,565 cf

Reach 135R: Stream to POA Avg. Depth=0.09' Max Vel=7.92 fps Inflow=7.27 cfs 25,565 cf
n=0.023 L=5.0' S=0.4000 '/' Capacity=4,137.00 cfs Outflow=7.26 cfs 25,565 cf

Reach 136R: CB11 to DMH 13 Avg. Depth=1.00' Max Vel=5.02 fps Inflow=6.14 cfs 18,653 cf
D=12.0" n=0.013 L=42.0' S=0.0100 '/' Capacity=3.56 cfs Outflow=3.56 cfs 18,650 cf

Reach 139R: I12 to DMH 13 Avg. Depth=0.70' Max Vel=7.17 fps Inflow=4.11 cfs 6,933 cf
D=12.0" n=0.013 L=26.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=4.17 cfs 6,933 cf

Reach 141R: CB 21 to DMH Inflow=15.55 cfs 46,407 cf
Outflow=15.55 cfs 46,407 cf

Reach 142R: CB 22 to DMH Inflow=1.08 cfs 3,312 cf
Outflow=1.08 cfs 3,312 cf

Reach 143R: DMH to Pretreatment Avg. Depth=1.00' Max Vel=7.28 fps Inflow=16.63 cfs 49,720 cf
D=12.0" n=0.013 L=30.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=5.41 cfs 49,716 cf

Reach 145R: Pretreatment to Recharge Avg. Depth=0.91' Max Vel=7.31 fps Inflow=5.41 cfs 49,716 cf
D=12.0" n=0.013 L=10.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=5.40 cfs 49,715 cf

Reach 146R: DMH to Swale Avg. Depth=0.80' Max Vel=7.31 fps Inflow=5.31 cfs 28,177 cf
D=12.0" n=0.013 L=100.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=4.91 cfs 28,177 cf

Reach 147R: Swale to Stream Avg. Depth=0.31' Max Vel=8.33 fps Inflow=4.91 cfs 28,177 cf
n=0.023 L=50.0' S=0.1420 '/' Capacity=346.67 cfs Outflow=4.89 cfs 28,177 cf

Reach 148R: Stream to R102 Avg. Depth=0.17' Max Vel=2.71 fps Inflow=4.89 cfs 28,177 cf
n=0.023 L=100.0' S=0.0200 '/' Capacity=925.06 cfs Outflow=4.79 cfs 28,177 cf

Reach D14: DW 13 to DMH 14 Avg. Depth=1.00' Max Vel=10.33 fps Inflow=7.73 cfs 25,583 cf
D=12.0" n=0.013 L=80.0' S=0.0400 '/' Capacity=7.13 cfs Outflow=7.37 cfs 25,580 cf

Reach PTA: Point of Analysis Inflow=16.78 cfs 70,815 cf
Outflow=16.78 cfs 70,815 cf

Pond 1P: Rain Garden / Bioretention Cell 2 Peak Elev=111.53' Storage=610 cf Inflow=3.99 cfs 7,105 cf
Discarded=0.09 cfs 1,584 cf Primary=3.85 cfs 5,521 cf Outflow=3.94 cfs 7,105 cf

Pond 144P: Pretreatment Inflow=5.41 cfs 49,716 cf
Primary=5.41 cfs 49,716 cf

Pond 401P: Rain Garden/Bioretention Cell Peak Elev=111.96' Storage=1,196 cf Inflow=4.16 cfs 12,732 cf
Discarded=0.14 cfs 5,372 cf Primary=3.99 cfs 7,105 cf Outflow=4.14 cfs 12,476 cf

Pond 402P: Recharge System Peak Elev=104.28' Storage=4,421 cf Inflow=5.40 cfs 49,715 cf
Discarded=0.42 cfs 19,033 cf Primary=6.67 cfs 28,124 cf Outflow=7.09 cfs 47,157 cf

Total Runoff Area = 285,536 sf Runoff Volume = 99,628 cf Average Runoff Depth = 4.19"
67.96% Pervious Area = 194,060 sf 32.04% Impervious Area = 91,476 sf

Subcatchment 110: Backside of Lots 1-4

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

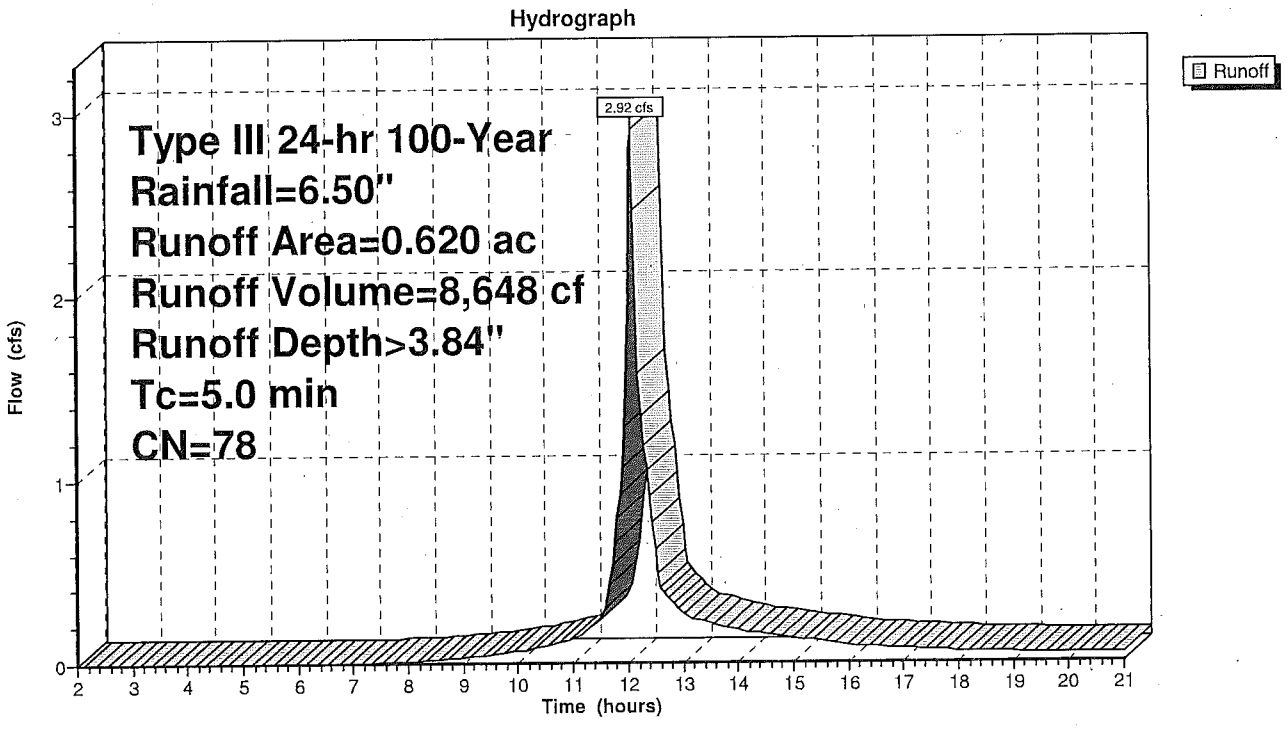
Runoff = 2.92 cfs @ 12.08 hrs, Volume= 8,648 cf, Depth> 3.84"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (ac)	CN	Description
0.050	70	Woods, Good, HSG C
0.460	74	>75% Grass cover, Good, HSG C
0.110	98	Paved parking & roofs
0.620	78	Weighted Average
0.510		Pervious Area
0.110		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, MIN**

Subcatchment 110: Backside of Lots 1-4



Subcatchment 120: Frontside of Lots 3&4

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

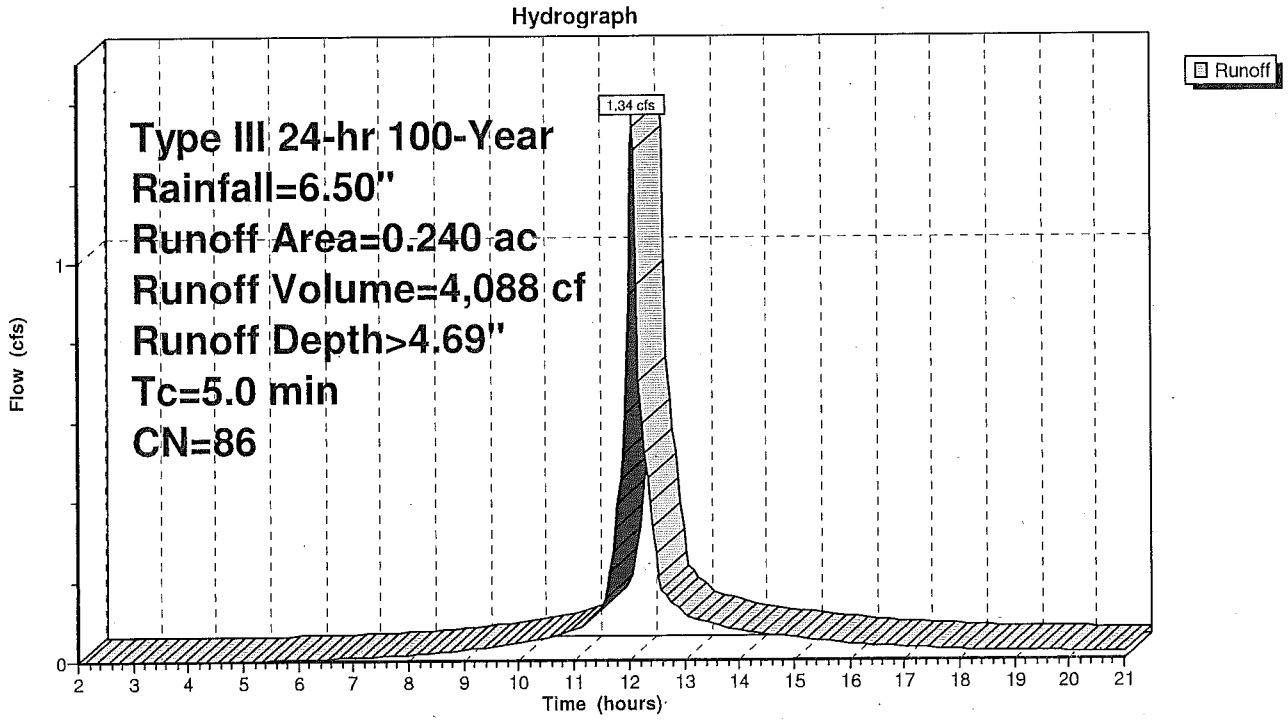
Runoff = 1.34 cfs @ 12.07 hrs, Volume= 4,088 cf, Depth> 4.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (ac)	CN	Description
0.120	74	>75% Grass cover, Good, HSG C
0.120	98	Paved roads w/curbs & sewers
0.240	86	Weighted Average
0.120		Pervious Area
0.120		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, MIN**

Subcatchment 120: Frontside of Lots 3&4



Subcatchment 130: Frontside of Lots 1&2

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

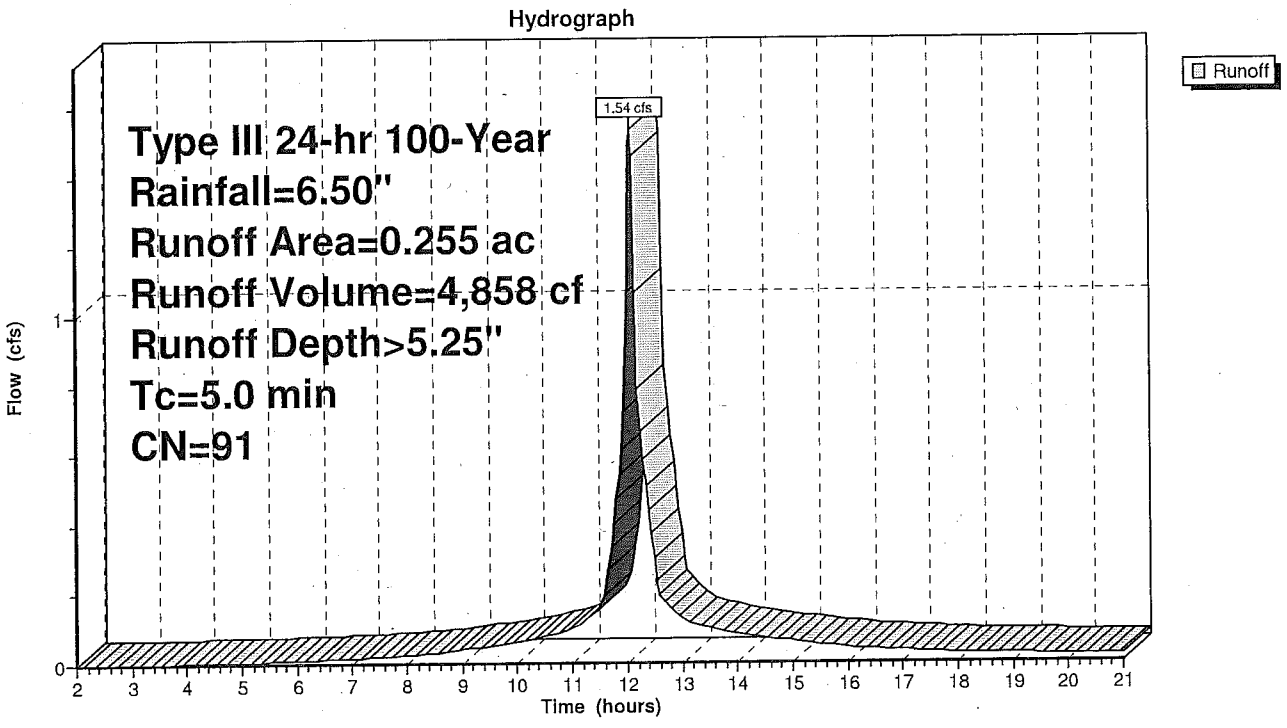
Runoff = 1.54 cfs @ 12.07 hrs, Volume= 4,858 cf, Depth> 5.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (ac)	CN	Description
0.005	70	Woods, Good, HSG C
0.070	74	>75% Grass cover, Good, HSG C
0.180	98	Paved roads w/curbs & sewers
0.255	91	Weighted Average
0.075		Pervious Area
0.180		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, MIN**

Subcatchment 130: Frontside of Lots 1&2



Subcatchment 135: Side of Lot 1

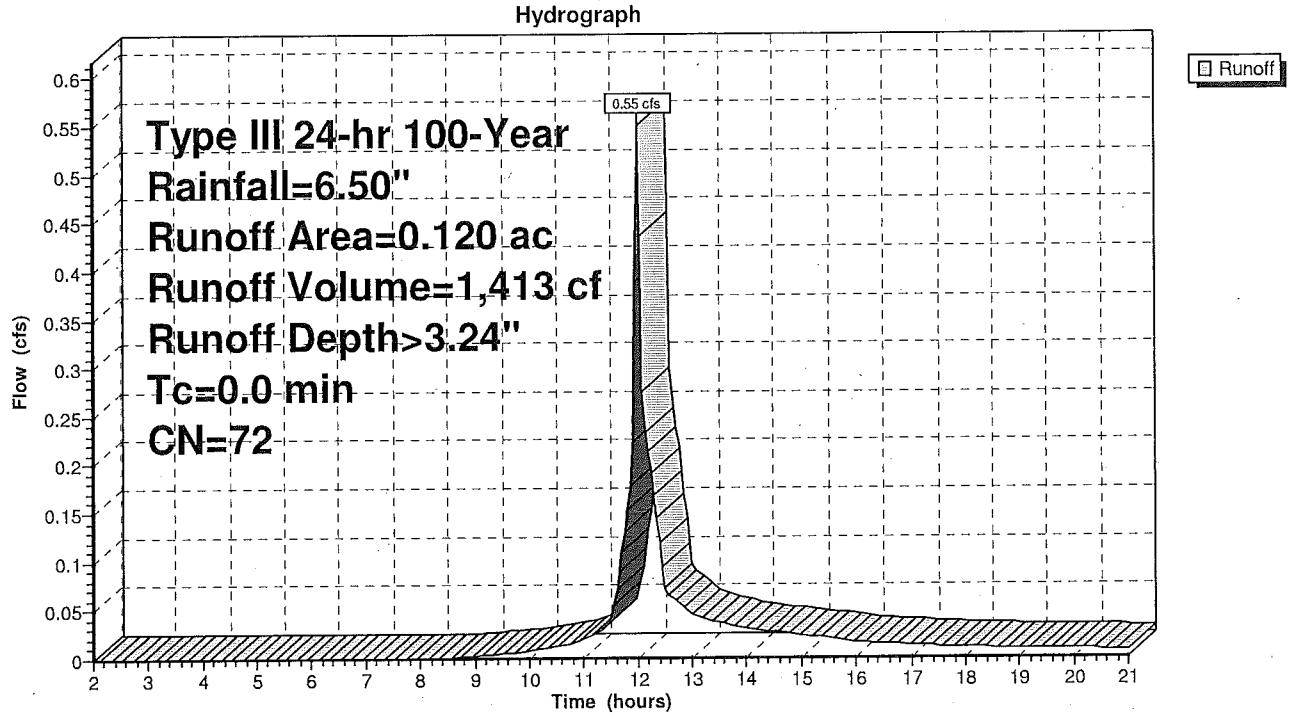
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.55 cfs @ 12.00 hrs, Volume= 1,413 cf, Depth> 3.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (ac)	CN	Description
0.050	70	Woods, Good, HSG C
0.070	74	>75% Grass cover, Good, HSG C
0.120	72	Weighted Average
0.120		Pervious Area

Subcatchment 135: Side of Lot 1



Subcatchment 140: Frontside of Lots 18-20

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

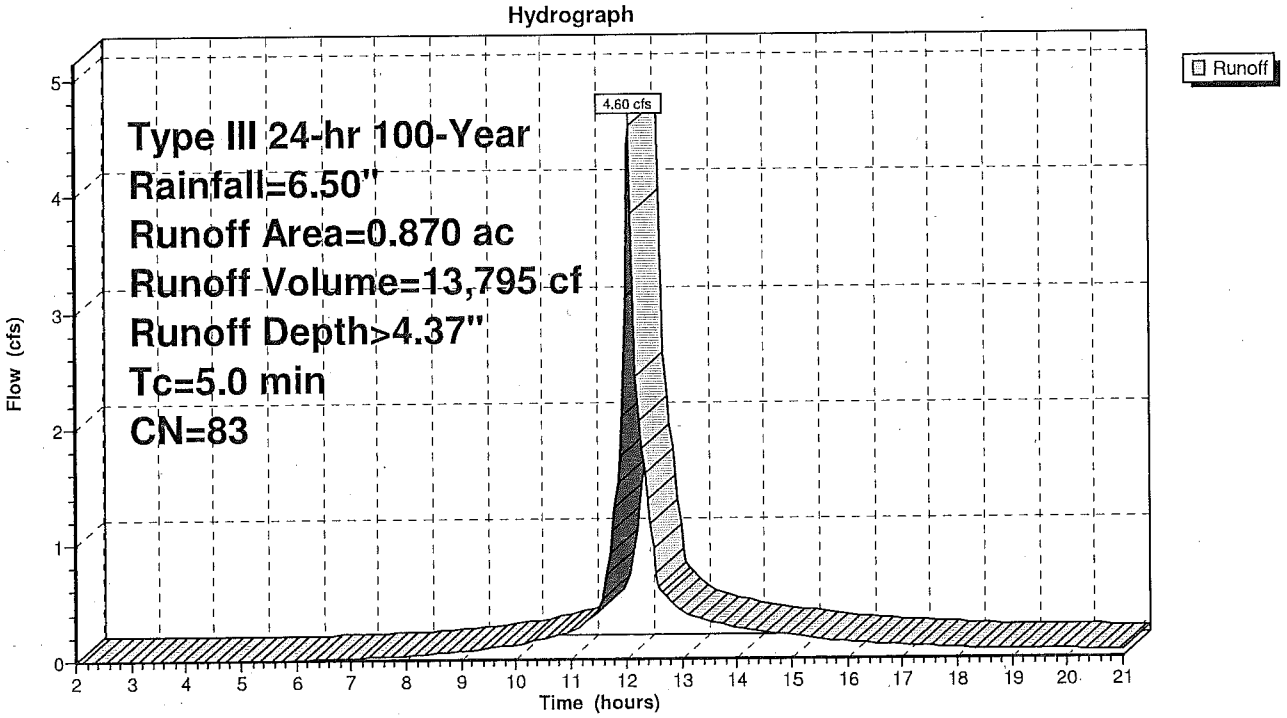
Runoff = 4.60 cfs @ 12.07 hrs, Volume= 13,795 cf, Depth> 4.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (ac)	CN	Description
0.550	74	>75% Grass cover, Good, HSG C
0.320	98	Paved roads w/curbs & sewers
0.870	83	Weighted Average
0.550		Pervious Area
0.320		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, MIN**

Subcatchment 140: Frontside of Lots 18-20



Subcatchment 150: Backside of Lots 18-20

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

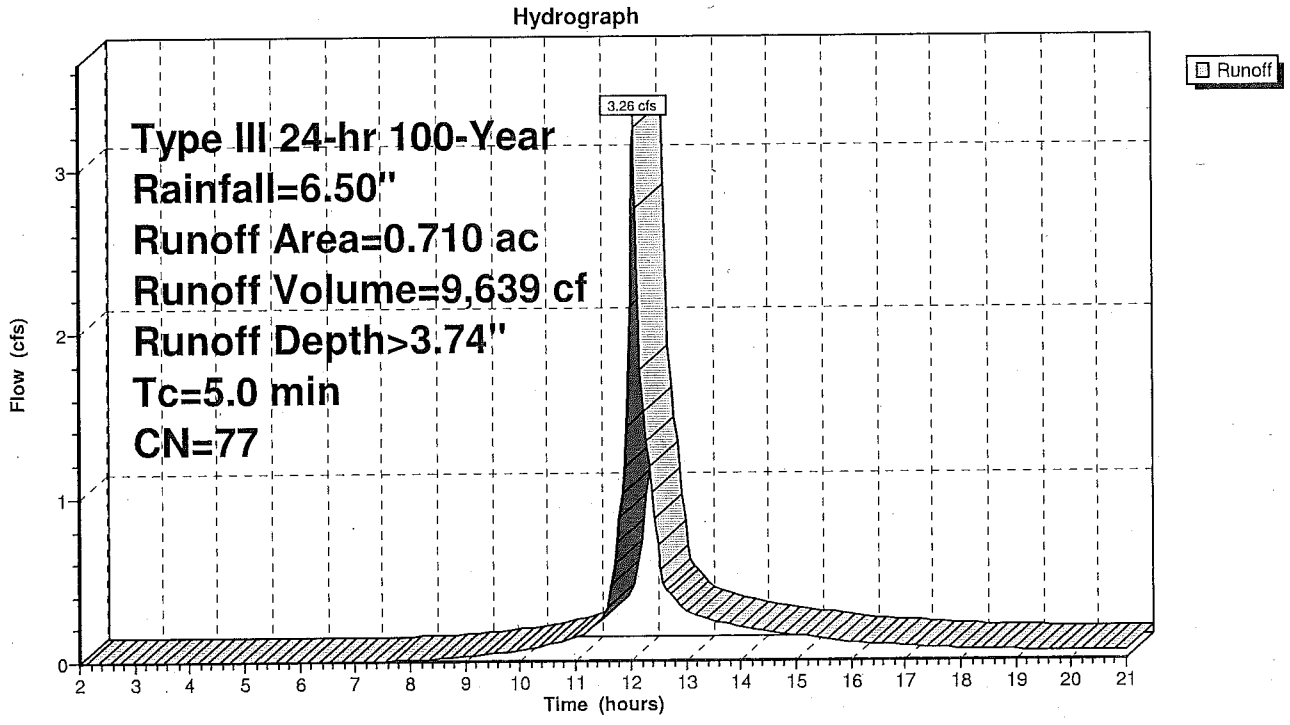
Runoff = 3.26 cfs @ 12.08 hrs, Volume= 9,639 cf, Depth> 3.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (ac)	CN	Description
0.180	70	Woods, Good, HSG C
0.400	74	>75% Grass cover, Good, HSG C
0.130	98	Paved parking & roofs
0.710	77	Weighted Average
0.580		Pervious Area
0.130		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, MIN**

Subcatchment 150: Backside of Lots 18-20



Subcatchment 210: Lots 5-17

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

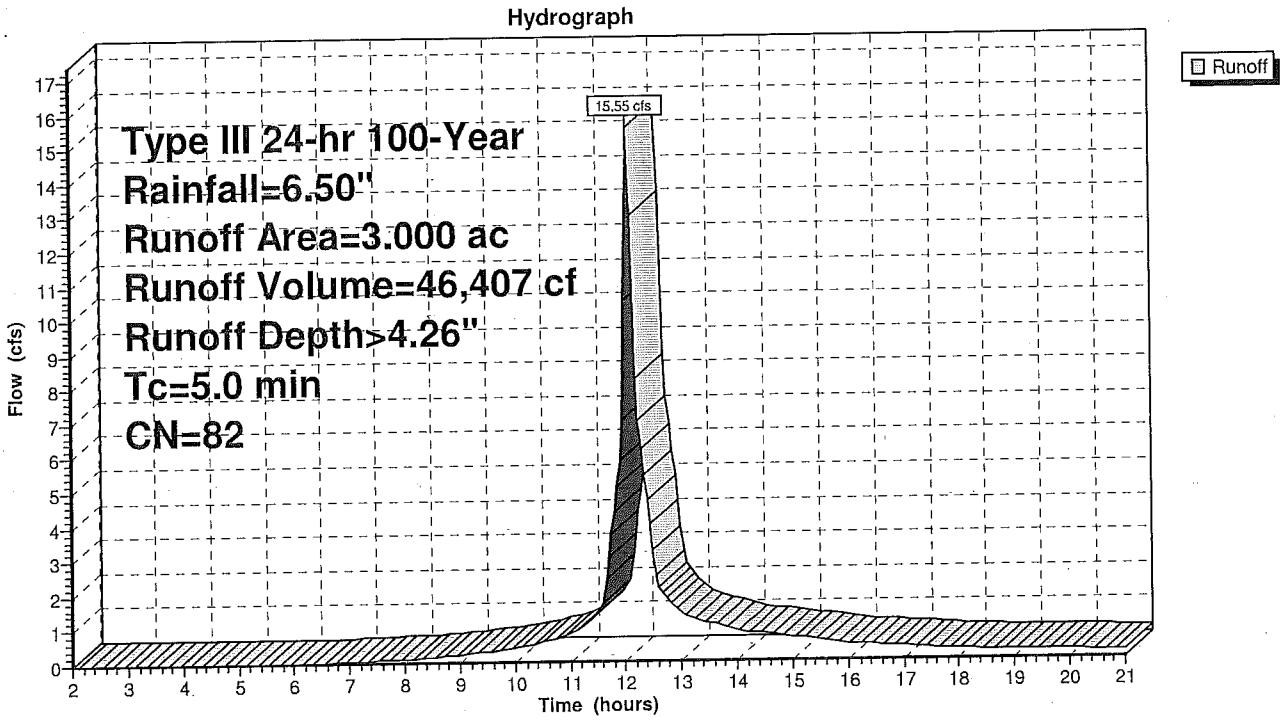
Runoff = 15.55 cfs @ 12.07 hrs, Volume= 46,407 cf, Depth> 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (ac)	CN	Description
1.730	74	>75% Grass cover, Good, HSG C
1.050	98	Paved roads w/curbs & sewers
0.220	70	Woods, Good, HSG C
3.000	82	Weighted Average
1.950		Pervious Area
1.050		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, MIN**

Subcatchment 210: Lots 5-17



Subcatchment 220: Cul-de-sac

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

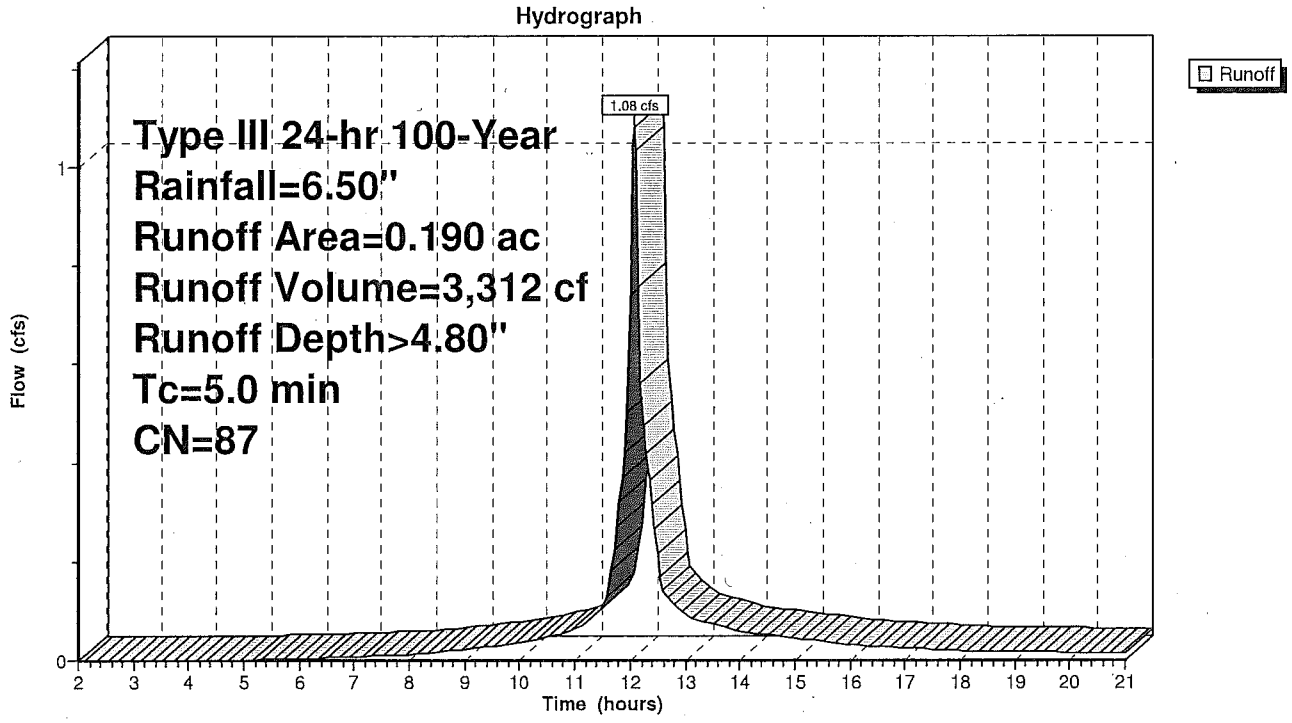
Runoff = 1.08 cfs @ 12.07 hrs, Volume= 3,312 cf, Depth> 4.80"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (ac)	CN	Description
0.090	74	>75% Grass cover, Good, HSG C
0.100	98	Paved roads w/curbs & sewers
0.190	87	Weighted Average
0.090		Pervious Area
0.100		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, MIN**

Subcatchment 220: Cul-de-sac



Subcatchment 230: Backside of Lots 11-14

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

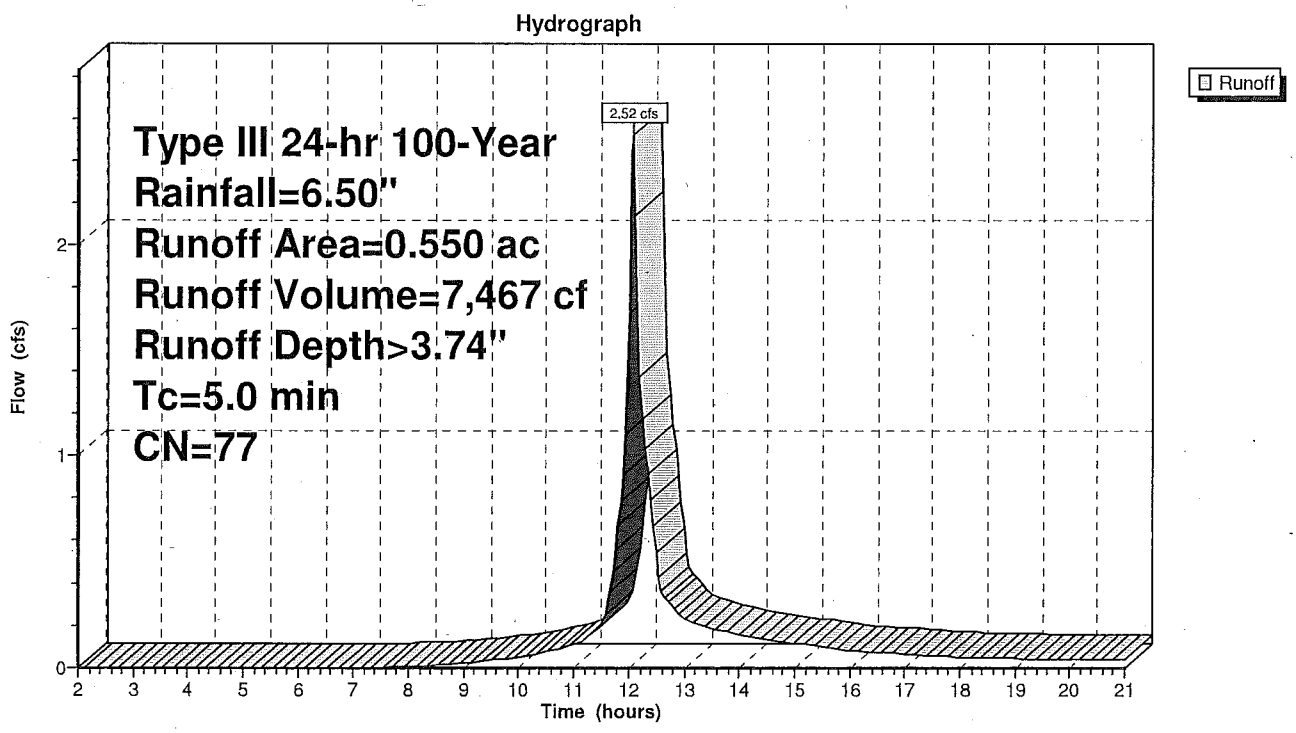
Runoff = 2.52 cfs @ 12.08 hrs, Volume= 7,467 cf, Depth> 3.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (ac)	CN	Description
0.150	70	Woods, Good, HSG C
0.310	74	>75% Grass cover, Good, HSG C
0.090	98	Paved parking & roofs
0.550	77	Weighted Average
0.460		Pervious Area
0.090		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, MIN**

Subcatchment 230: Backside of Lots 11-14



Reach ##2R: Recharge to DMH

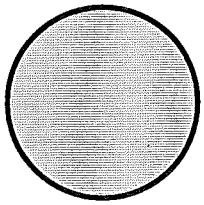
[52] Hint: Inlet conditions not evaluated
[55] Hint: Peak inflow is 132% of Manning's capacity
[76] Warning: Detained 290 cf (Pond w/culvert advised)

Inflow Area = 138,956 sf, Inflow Depth = 2.43" for 100-Year event
Inflow = 6.67 cfs @ 11.85 hrs, Volume= 28,124 cf
Outflow = 5.31 cfs @ 12.45 hrs, Volume= 28,177 cf, Atten= 20%, Lag= 35.7 min

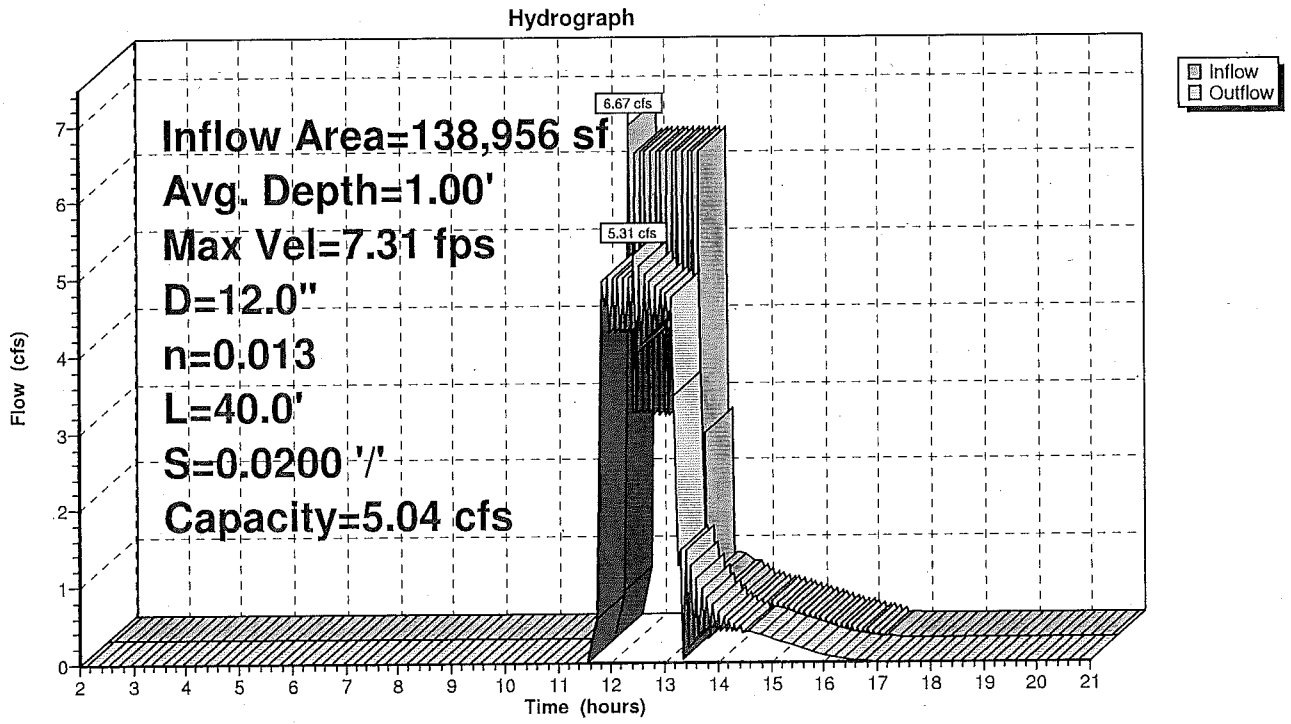
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.31 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.37 fps, Avg. Travel Time= 0.2 min

Peak Storage= 31 cf @ 11.85 hrs, Average Depth at Peak Storage= 1.00'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.04 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 40.0' Slope= 0.0200 '/'
Inlet Invert= 100.00', Outlet Invert= 99.20'



Reach ##2R: Recharge to DMH



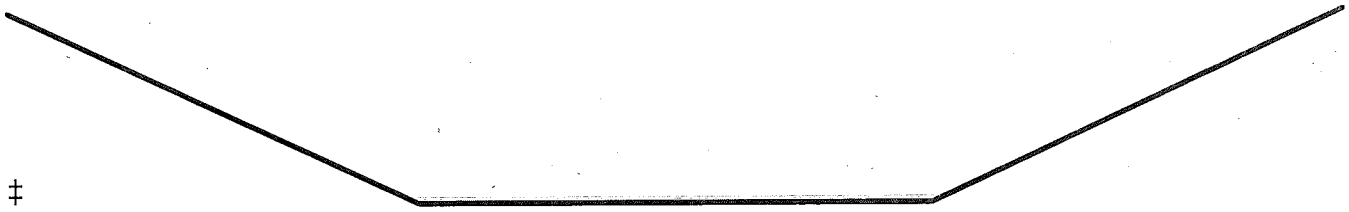
Reach 101R: R101 to R102

Inflow Area = 23,958 sf, Inflow Depth > 3.74" for 100-Year event
Inflow = 2.52 cfs @ 12.08 hrs, Volume= 7,467 cf
Outflow = 2.34 cfs @ 12.16 hrs, Volume= 7,444 cf, Atten= 7%, Lag= 5.2 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.65 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 0.81 fps, Avg. Travel Time= 6.4 min

Peak Storage= 449 cf @ 12.11 hrs, Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 1,068.23 cfs

15.00' x 3.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 4.0 '/' Top Width= 39.00'
Length= 315.0' Slope= 0.0190 '/'
Inlet Invert= 94.00', Outlet Invert= 88.00'



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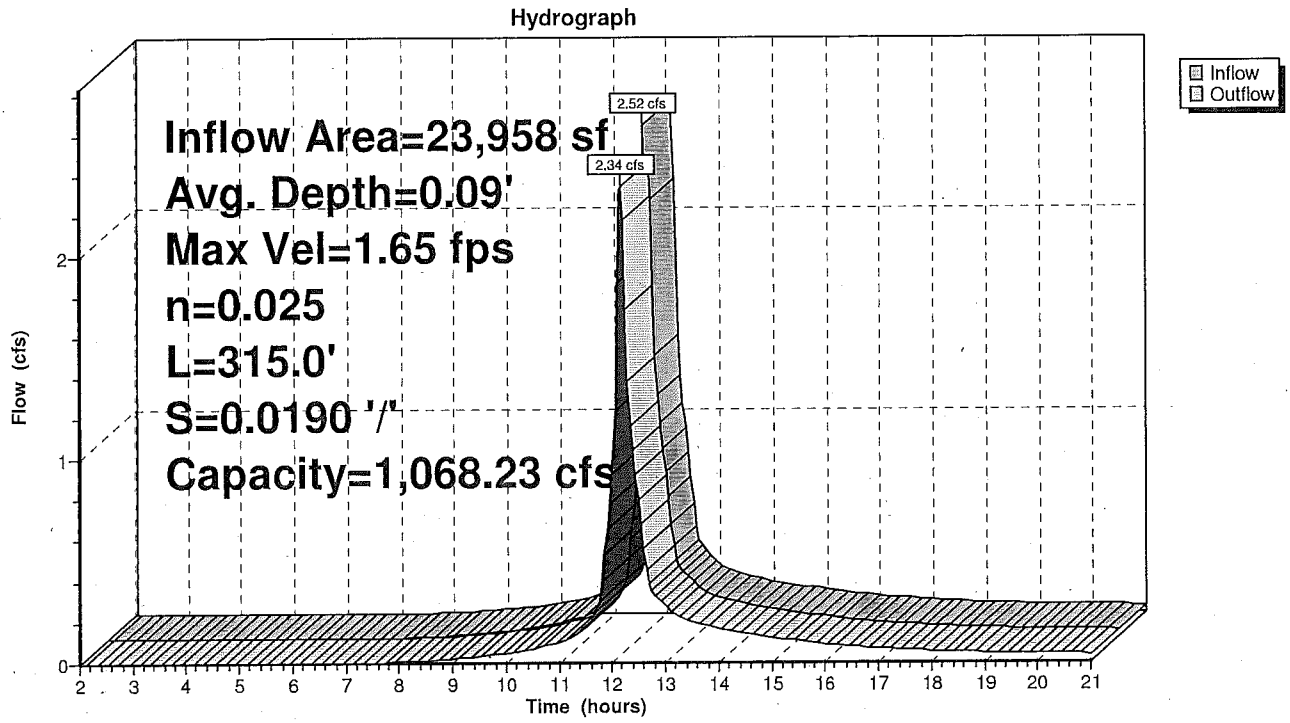
Reach 101R: R101 to R102



Reach 102R: 102 to POA

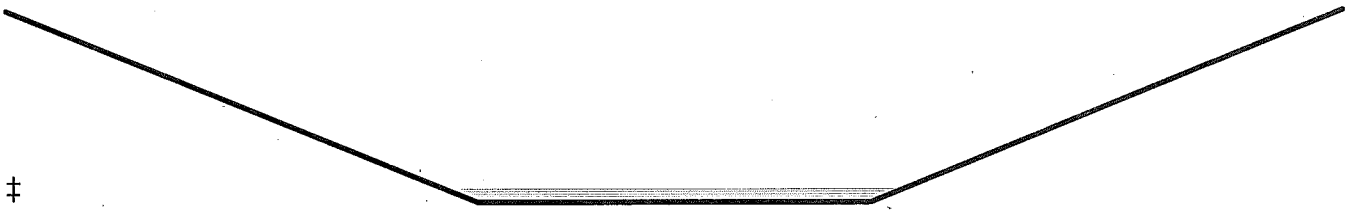
[61] Hint: Submerged 3% of Reach 101R bottom
[61] Hint: Submerged 10% of Reach 148R bottom

Inflow Area = 193,842 sf, Inflow Depth > 2.80" for 100-Year event
Inflow = 9.73 cfs @ 12.11 hrs, Volume= 45,260 cf
Outflow = 9.64 cfs @ 12.12 hrs, Volume= 45,249 cf, Atten= 1%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.39 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.62 fps, Avg. Travel Time= 1.2 min

Peak Storage= 266 cf @ 12.11 hrs, Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 1,345.64 cfs

10.00' x 3.00' deep channel, n= 0.025 Earth, clean & winding
Side Slope Z-value= 4.0 '/' Top Width= 34.00'
Length= 120.0' Slope= 0.0500 '/'
Inlet Invert= 88.00', Outlet Invert= 82.00'



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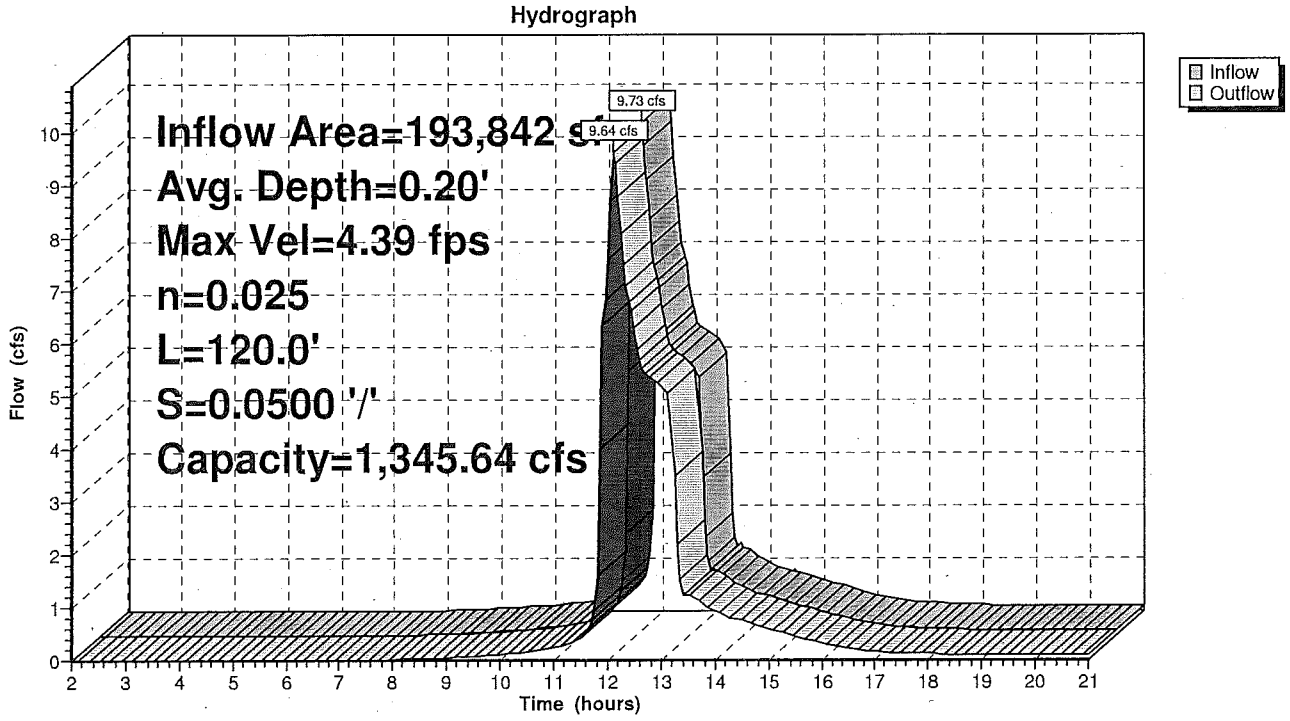
Reach 102R: 102 to POA



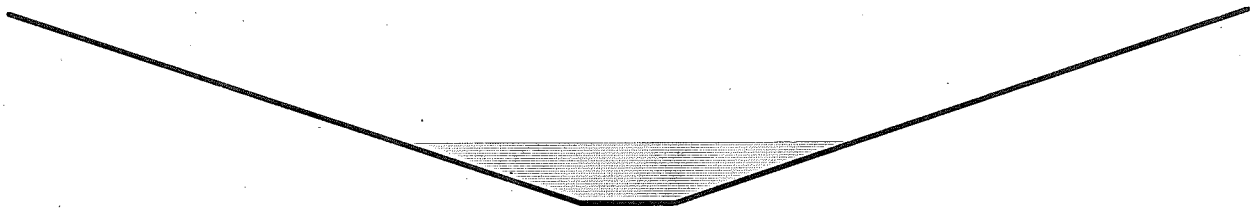
Reach 121R: Roadside Swale

Inflow Area = 10,454 sf, Inflow Depth > 4.69" for 100-Year event
Inflow = 1.34 cfs @ 12.07 hrs, Volume= 4,088 cf
Outflow = 1.33 cfs @ 12.08 hrs, Volume= 4,087 cf, Atten= 1%, Lag= 0.4 min

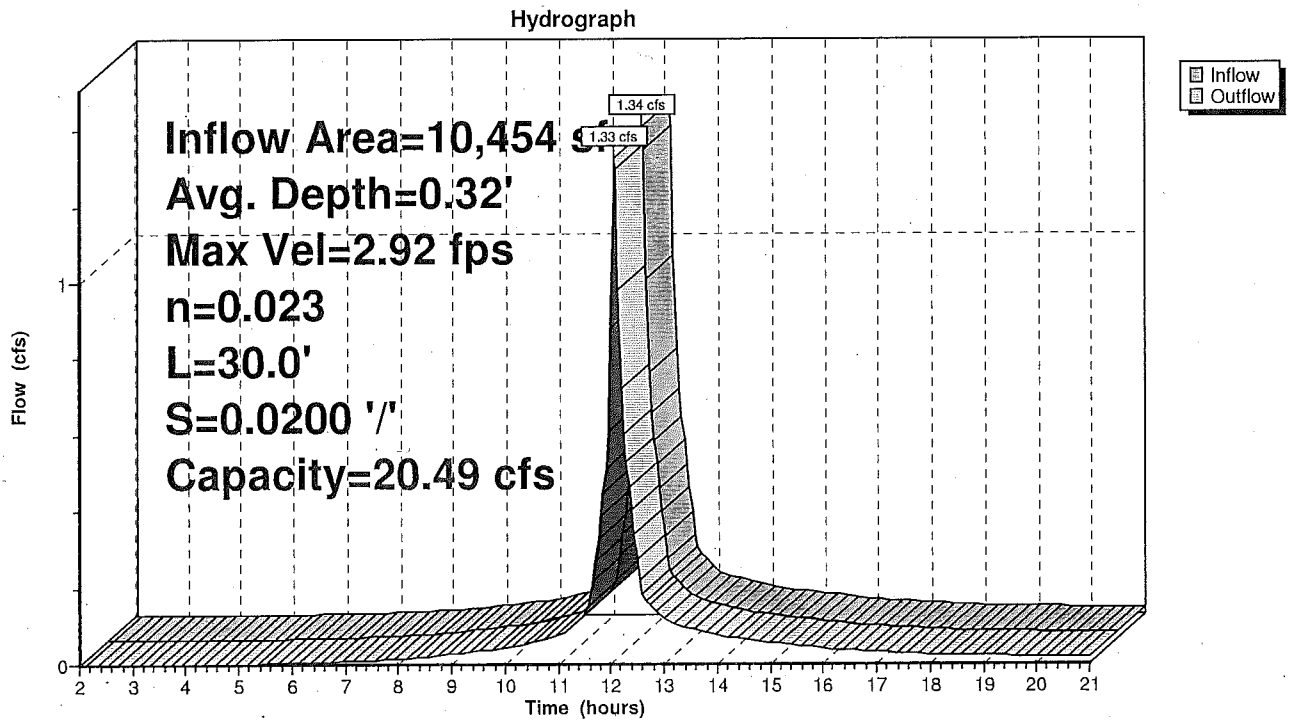
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.92 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.08 fps, Avg. Travel Time= 0.5 min

Peak Storage= 14 cf @ 12.08 hrs, Average Depth at Peak Storage= 0.32'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 20.49 cfs

0.50' x 1.00' deep channel, n= 0.023 Earth, clean & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.50'
Length= 30.0' Slope= 0.0200 '/'
Inlet Invert= 119.50', Outlet Invert= 118.90'



Reach 121R: Roadside Swale



Reach 122R: Driveway Culvert-DI

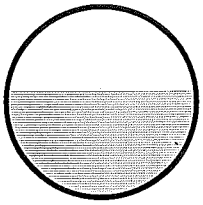
[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 61% of Reach 121R bottom

Inflow Area = 10,454 sf, Inflow Depth > 4.69" for 100-Year event
Inflow = 1.33 cfs @ 12.08 hrs, Volume= 4,087 cf
Outflow = 1.32 cfs @ 12.08 hrs, Volume= 4,087 cf, Atten= 0%, Lag= 0.2 min

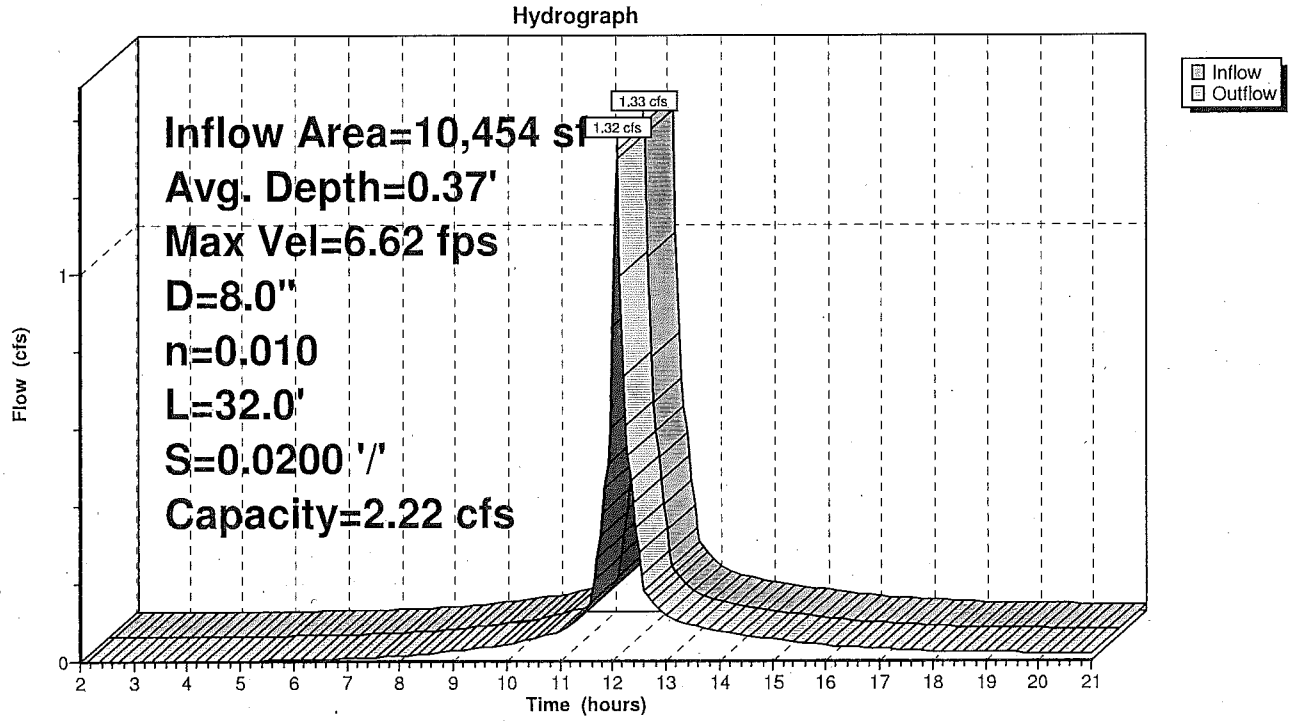
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.62 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.38 fps, Avg. Travel Time= 0.2 min

Peak Storage= 6 cf @ 12.08 hrs, Average Depth at Peak Storage= 0.37'
Bank-Full Depth= 0.67', Capacity at Bank-Full= 2.22 cfs

8.0" Diameter Pipe, n= 0.010 Cast iron, coated
Length= 32.0' Slope= 0.0200 '/'
Inlet Invert= 118.90', Outlet Invert= 118.26'



Reach 122R: Driveway Culvert-DI



Reach 123R: Roadside Swale

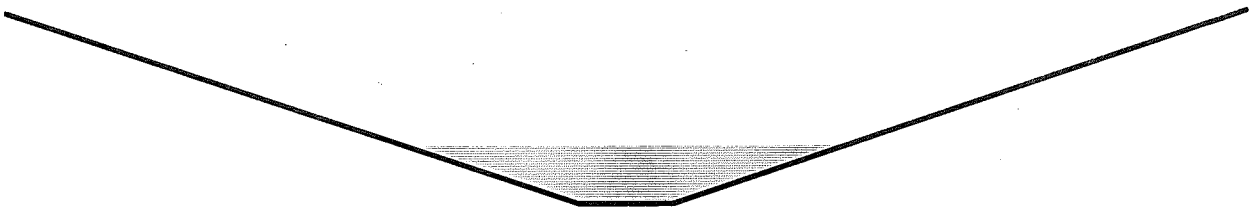
[61] Hint: Submerged 46% of Reach 122R bottom

Inflow Area = 10,454 sf, Inflow Depth > 4.69" for 100-Year event
Inflow = 1.32 cfs @ 12.08 hrs, Volume= 4,087 cf
Outflow = 1.31 cfs @ 12.09 hrs, Volume= 4,085 cf, Atten= 1%, Lag= 0.6 min

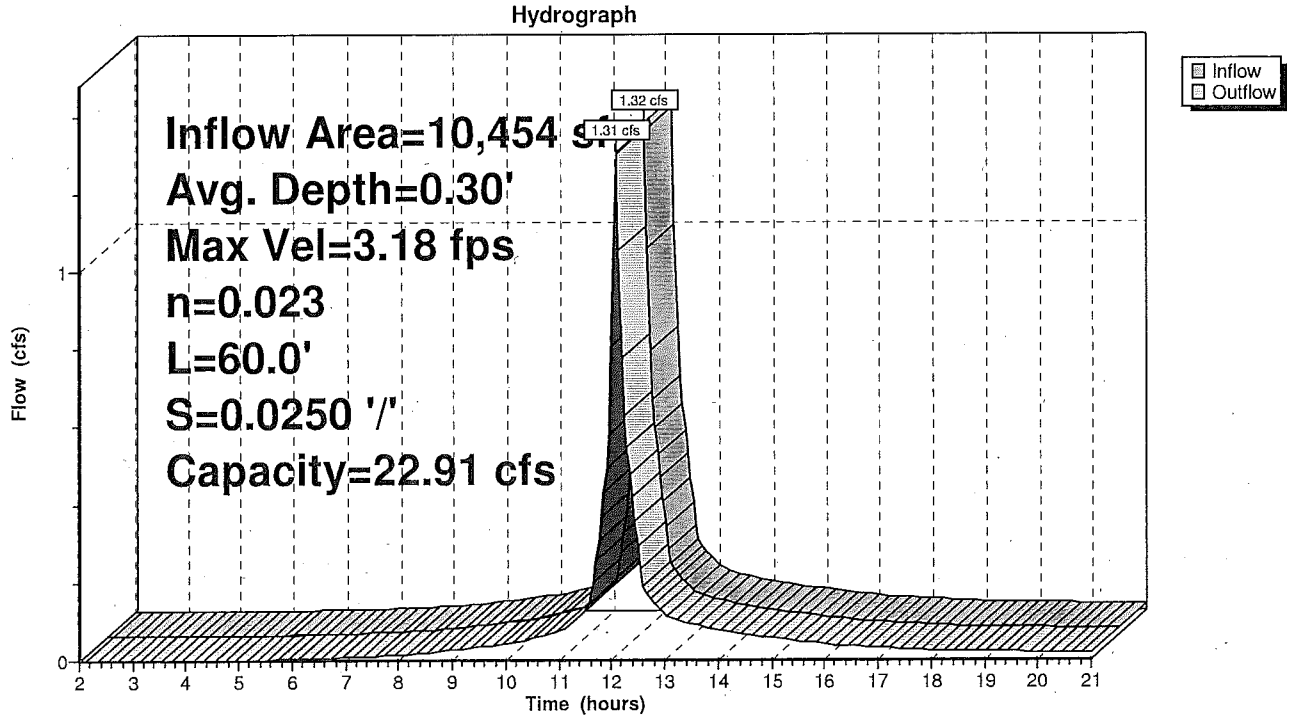
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.18 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.17 fps, Avg. Travel Time= 0.9 min

Peak Storage= 25 cf @ 12.09 hrs, Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 22.91 cfs

0.50' x 1.00' deep channel, n= 0.023 Earth, clean & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.50'
Length= 60.0' Slope= 0.0250 '/'
Inlet Invert= 118.26', Outlet Invert= 116.76'



Reach 123R: Roadside Swale



Reach 124R: Driveway Culvert-DI

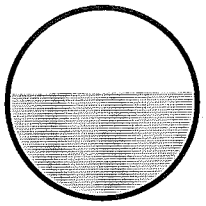
[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 25% of Reach 123R bottom

Inflow Area = 10,454 sf, Inflow Depth > 4.69" for 100-Year event
Inflow = 1.31 cfs @ 12.09 hrs, Volume= 4,085 cf
Outflow = 1.31 cfs @ 12.09 hrs, Volume= 4,085 cf, Atten= 0%, Lag= 0.1 min

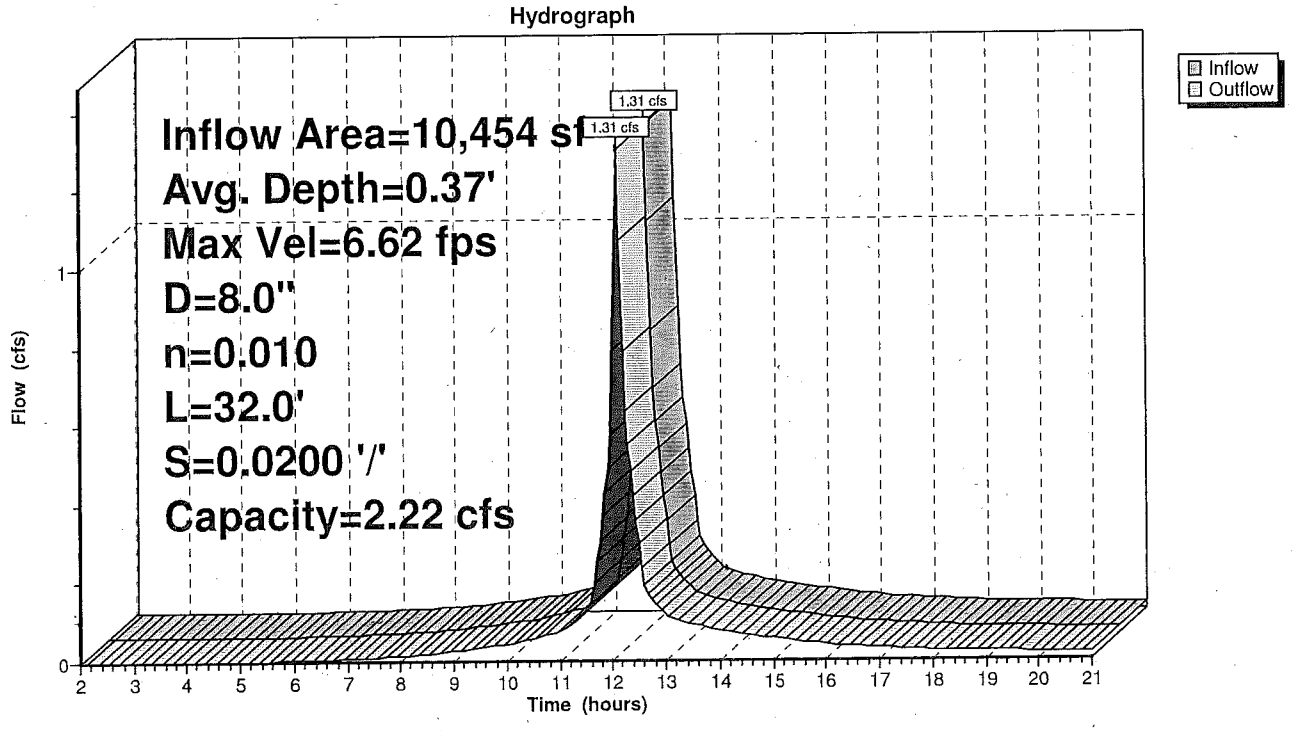
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.62 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.38 fps, Avg. Travel Time= 0.2 min

Peak Storage= 6 cf @ 12.09 hrs, Average Depth at Peak Storage= 0.37'
Bank-Full Depth= 0.67', Capacity at Bank-Full= 2.22 cfs

8.0" Diameter Pipe, n= 0.010 Cast iron, coated
Length= 32.0' Slope= 0.0200 '/'
Inlet Invert= 116.76', Outlet Invert= 116.12'



Reach 124R: Driveway Culvert-DI



Reach 125R: Swale to RG

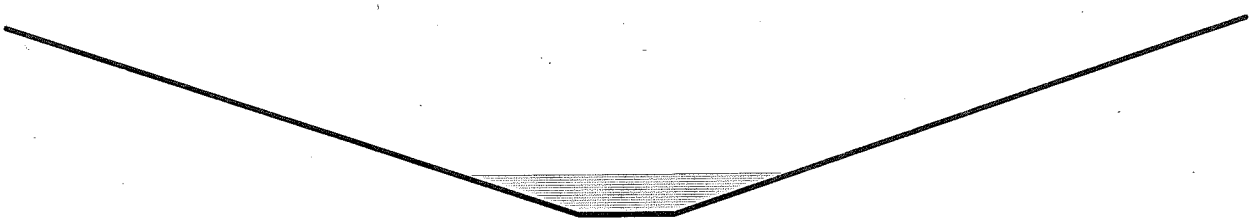
[61] Hint: Submerged 33% of Reach 124R bottom

Inflow Area = 10,454 sf, Inflow Depth > 4.69" for 100-Year event
Inflow = 1.31 cfs @ 12.09 hrs, Volume= 4,085 cf
Outflow = 1.29 cfs @ 12.10 hrs, Volume= 4,083 cf, Atten= 2%, Lag= 0.6 min

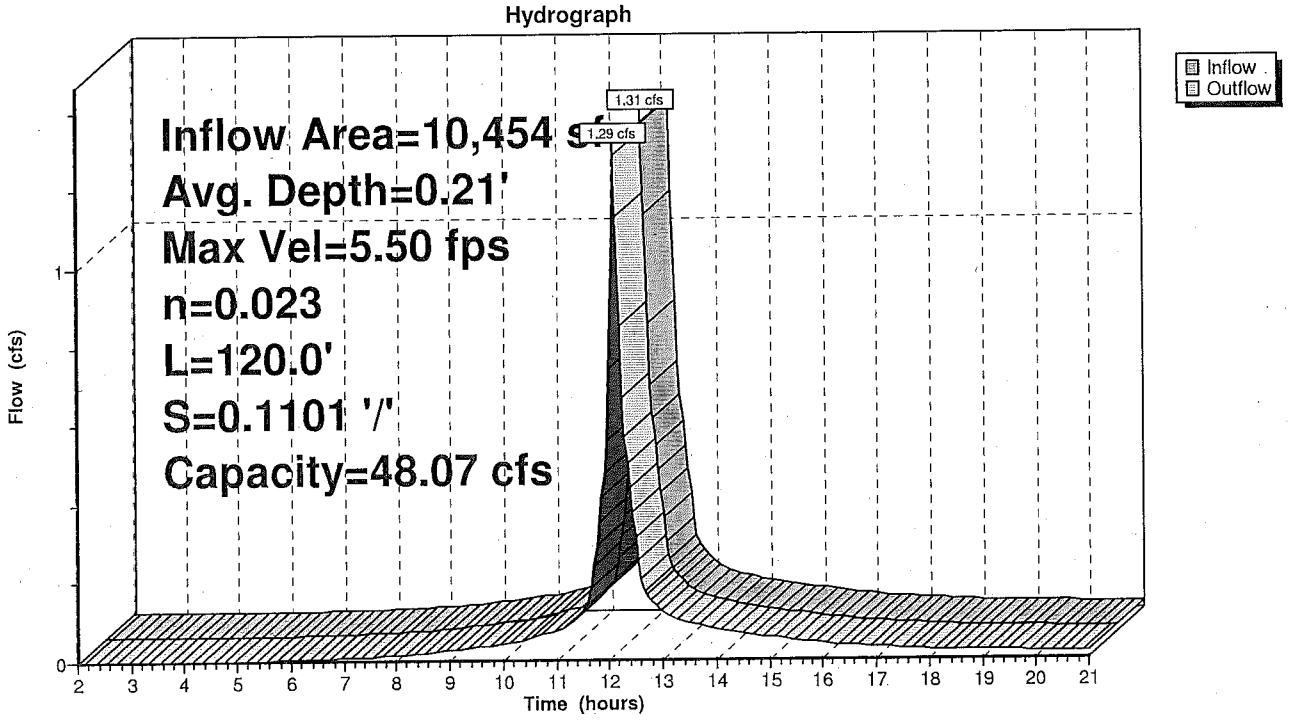
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.50 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.96 fps, Avg. Travel Time= 1.0 min

Peak Storage= 29 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 48.07 cfs

0.50' x 1.00' deep channel, n= 0.023 Earth, clean & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.50'
Length= 120.0' Slope= 0.1101 '/'
Inlet Invert= 116.12', Outlet Invert= 102.91'



Reach 125R: Swale to RG



Reach 126R: CB 10 to INLET13

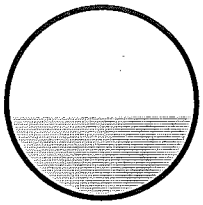
[52] Hint: Inlet conditions not evaluated

Inflow Area = 11,108 sf, Inflow Depth > 5.25" for 100-Year event
Inflow = 1.54 cfs @ 12.07 hrs, Volume= 4,858 cf
Outflow = 1.54 cfs @ 12.07 hrs, Volume= 4,858 cf, Atten= 0%, Lag= 0.1 min

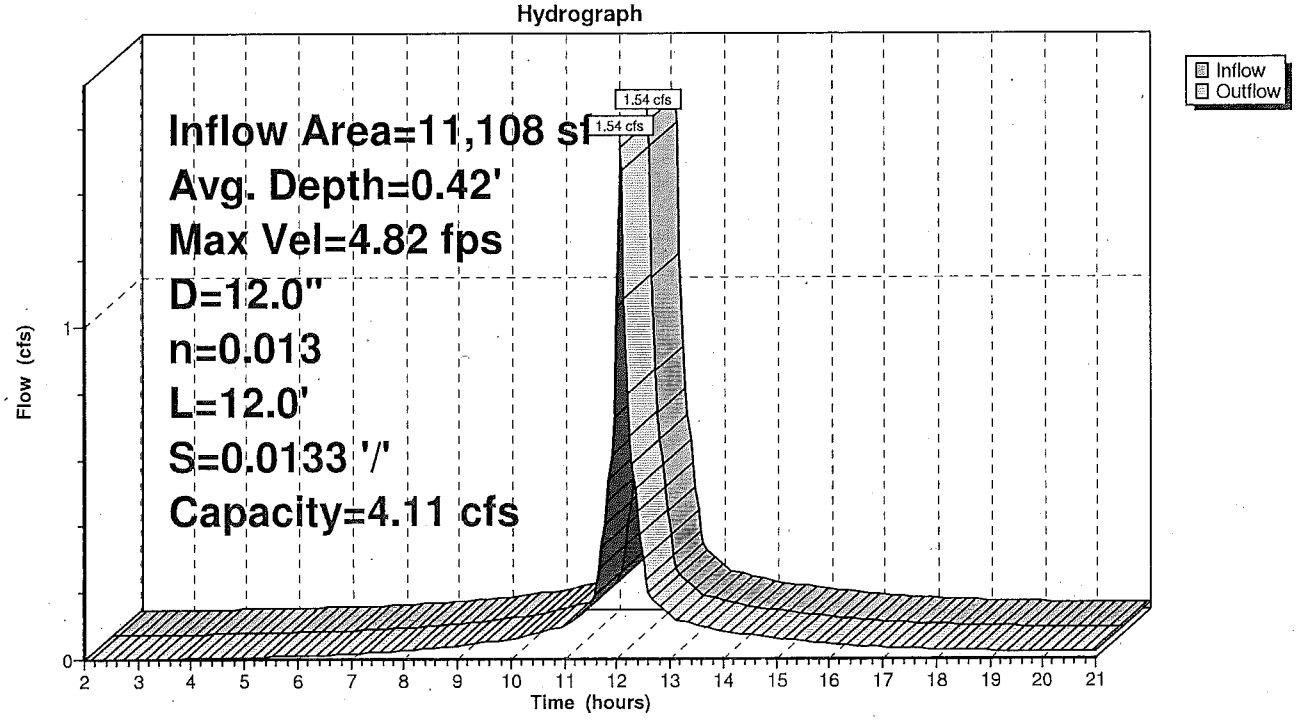
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.82 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.67 fps, Avg. Travel Time= 0.1 min

Peak Storage= 4 cf @ 12.07 hrs, Average Depth at Peak Storage= 0.42'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 4.11 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 12.0' Slope= 0.0133 '/'
Inlet Invert= 105.16', Outlet Invert= 105.00'



Reach 126R: CB 10 to INLET13



Reach 132R: DMH 14 to DMH 15

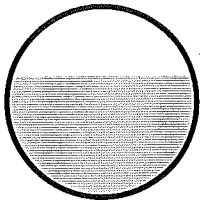
[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 14% of Reach D14 bottom

Inflow Area = 91,694 sf, Inflow Depth > 3.35" for 100-Year event
Inflow = 7.37 cfs @ 12.18 hrs, Volume= 25,580 cf
Outflow = 7.35 cfs @ 12.18 hrs, Volume= 25,576 cf, Atten= 0%, Lag= 0.1 min

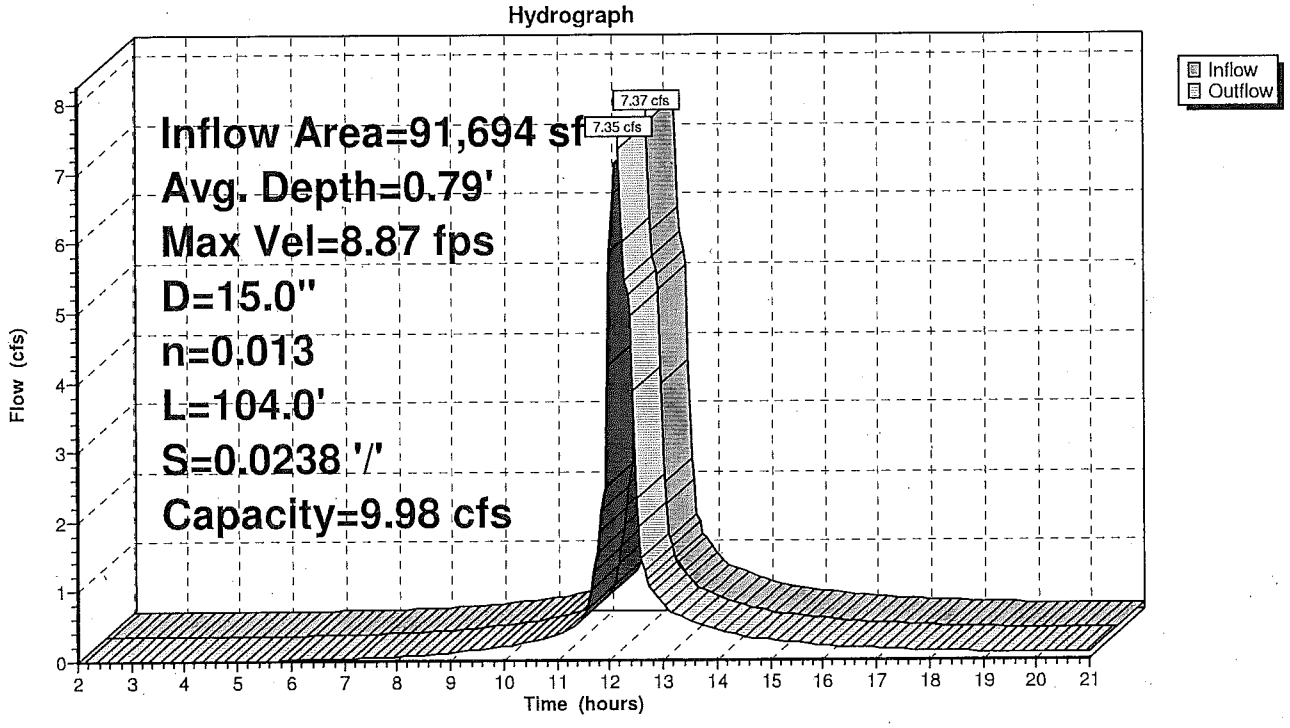
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.87 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.99 fps, Avg. Travel Time= 0.6 min

Peak Storage= 85 cf @ 12.20 hrs, Average Depth at Peak Storage= 0.79'
Bank-Full Depth= 1.25', Capacity at Bank-Full= 9.98 cfs

15.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 104.0' Slope= 0.0238 '/'
Inlet Invert= 101.09', Outlet Invert= 98.61'



Reach 132R: DMH 14 to DMH 15



Reach 133R: DMH 15 to Swale

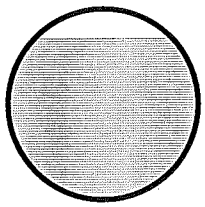
[52] Hint: Inlet conditions not evaluated
[55] Hint: Peak inflow is 103% of Manning's capacity
[61] Hint: Submerged 30% of Reach 132R bottom

Inflow Area = 91,694 sf, Inflow Depth > 3.35" for 100-Year event
Inflow = 7.35 cfs @ 12.18 hrs, Volume= 25,576 cf
Outflow = 7.34 cfs @ 12.18 hrs, Volume= 25,575 cf, Atten= 0%, Lag= 0.0 min

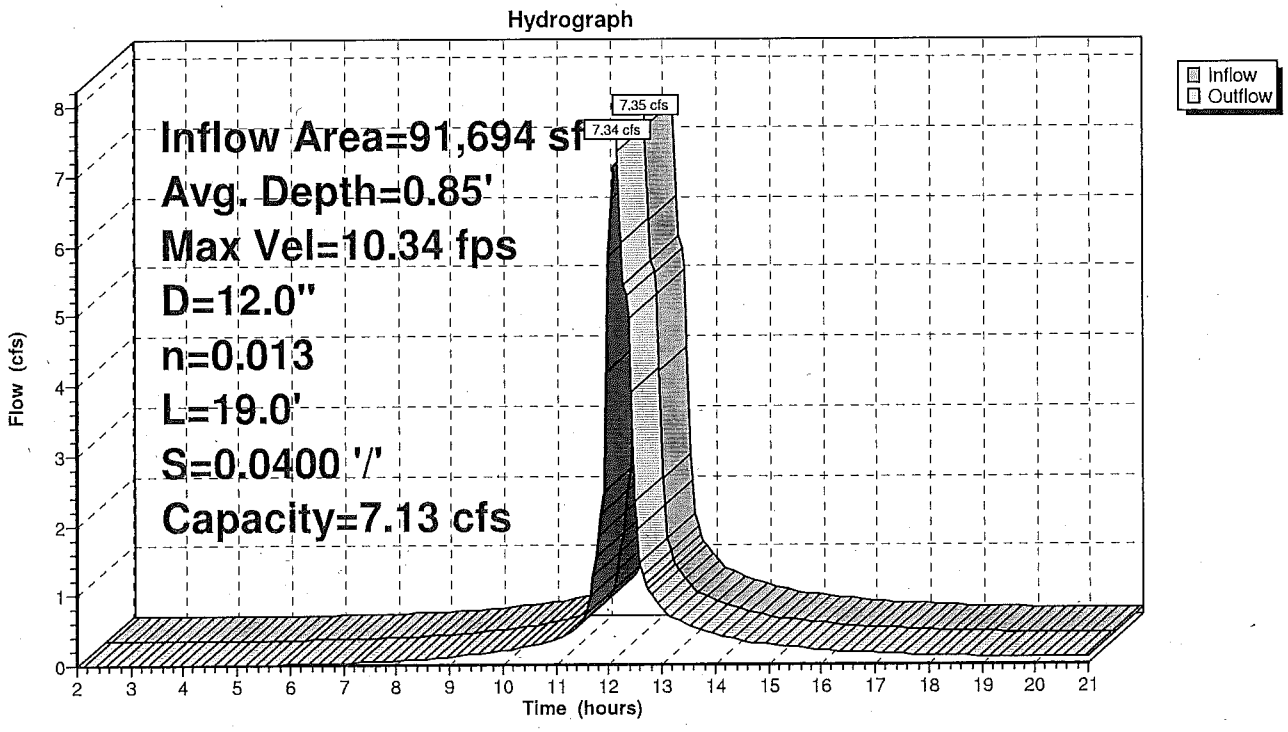
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 10.34 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 3.68 fps, Avg. Travel Time= 0.1 min

Peak Storage= 13 cf @ 12.18 hrs, Average Depth at Peak Storage= 0.85'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.13 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 19.0' Slope= 0.0400 '/'
Inlet Invert= 98.51', Outlet Invert= 97.75'



Reach 133R: DMH 15 to Swale



Reach 134R: Swale to Stream

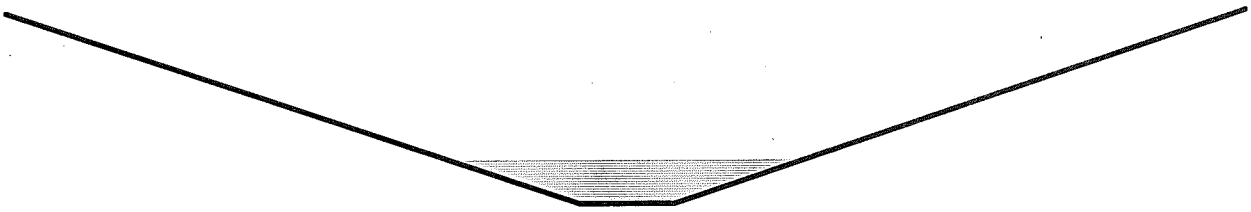
[61] Hint: Submerged 59% of Reach 133R bottom

Inflow Area = 91,694 sf, Inflow Depth > 3.35" for 100-Year event
Inflow = 7.34 cfs @ 12.18 hrs, Volume= 25,575 cf
Outflow = 7.27 cfs @ 12.18 hrs, Volume= 25,565 cf, Atten= 1%, Lag= 0.0 min

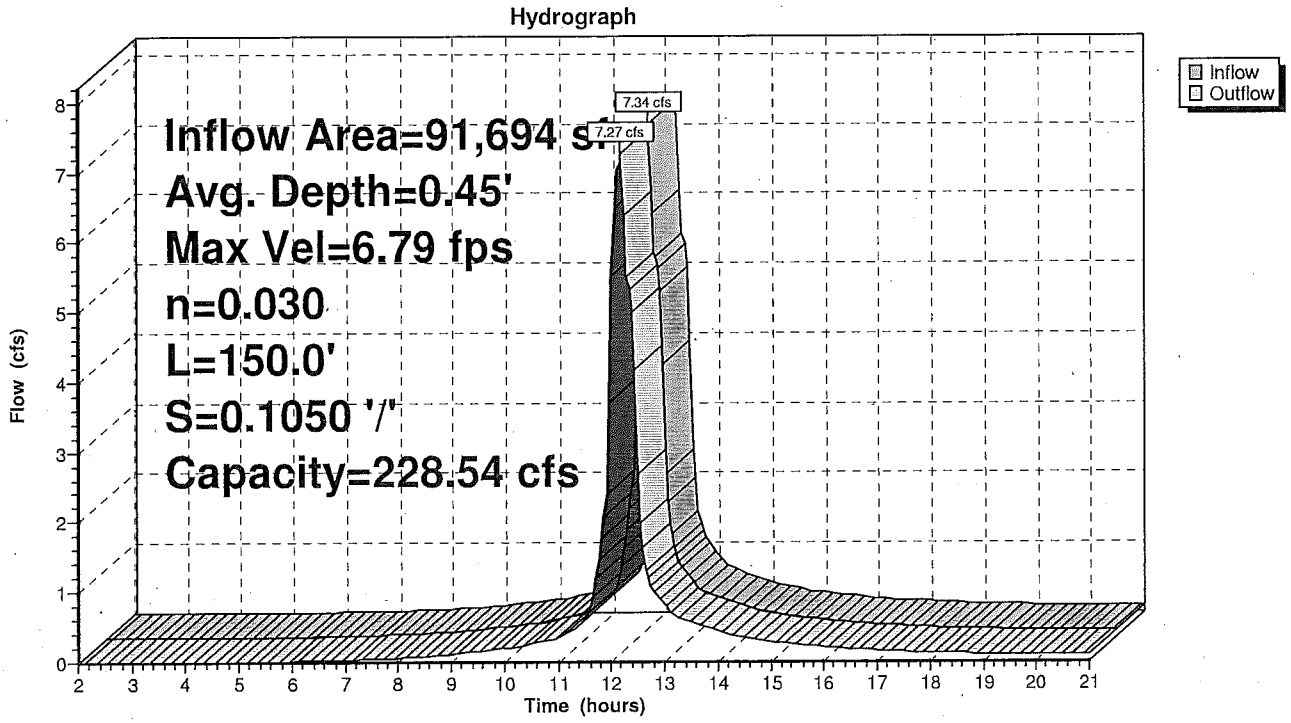
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.79 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.29 fps, Avg. Travel Time= 1.1 min

Peak Storage= 159 cf @ 12.20 hrs, Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 228.54 cfs

1.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 13.00'
Length= 150.0' Slope= 0.1050 '/'
Inlet Invert= 97.75', Outlet Invert= 82.00'



Reach 134R: Swale to Stream



Reach 135R: Stream to POA

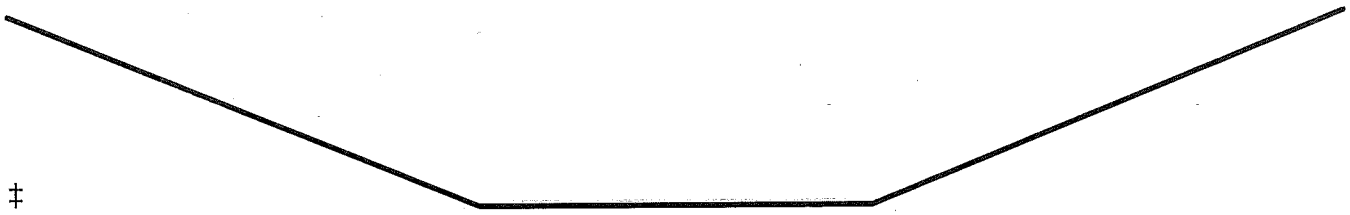
[61] Hint: Submerged 1% of Reach 134R bottom

Inflow Area = 91,694 sf, Inflow Depth > 3.35" for 100-Year event
Inflow = 7.27 cfs @ 12.18 hrs, Volume= 25,565 cf
Outflow = 7.26 cfs @ 12.18 hrs, Volume= 25,565 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.92 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 4.04 fps, Avg. Travel Time= 0.0 min

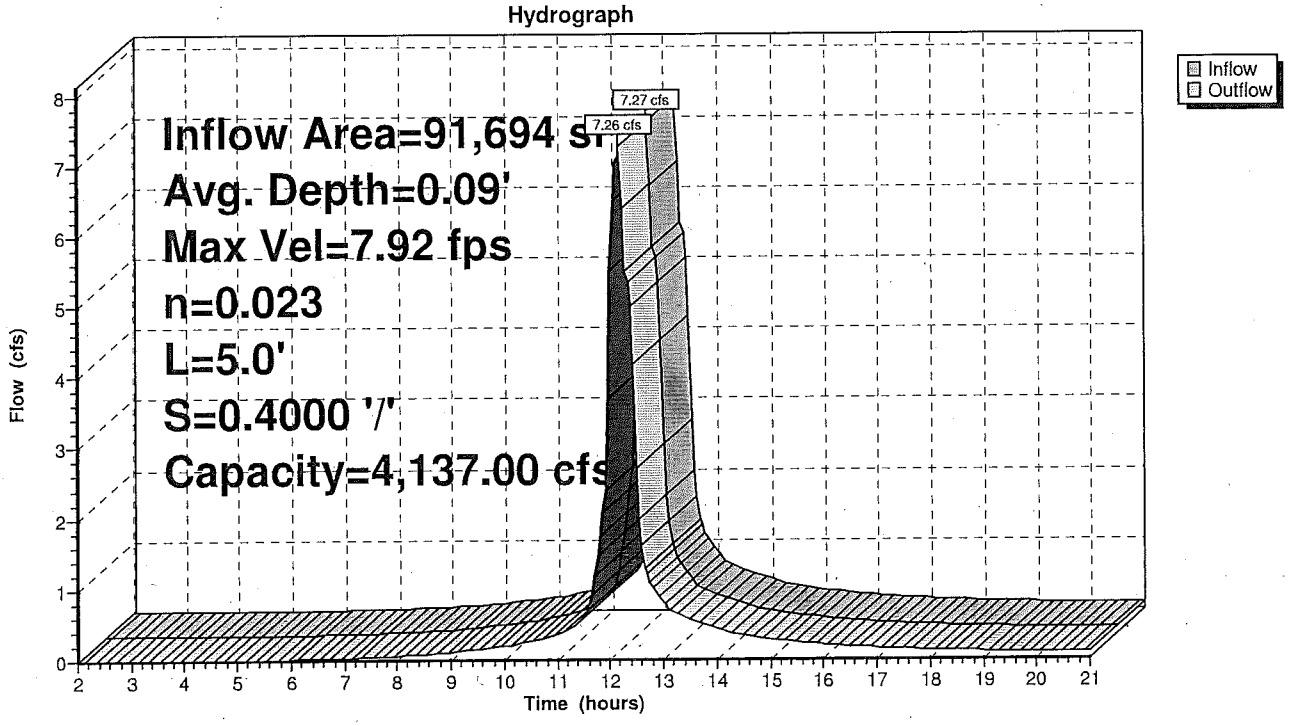
Peak Storage= 5 cf @ 12.18 hrs, Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 4,137.00 cfs

10.00' x 3.00' deep channel, n= 0.023 Earth, clean & winding
Side Slope Z-value= 4.0 '/' Top Width= 34.00'
Length= 5.0' Slope= 0.4000 '/'
Inlet Invert= 82.00', Outlet Invert= 80.00'



‡

Reach 135R: Stream to POA



Reach 136R: CB11 to DMH 13

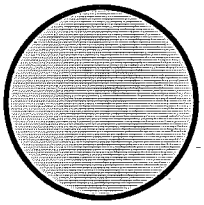
[52] Hint: Inlet conditions not evaluated
[55] Hint: Peak inflow is 172% of Manning's capacity
[76] Warning: Detained 1,093 cf (Pond w/culvert advised)
[85] Warning: Oscillations may require Finer Routing>1
[63] Warning: Exceeded Reach 126R inflow depth by 0.78' @ 12.40 hrs

Inflow Area = 49,005 sf, Inflow Depth > 4.57" for 100-Year event
Inflow = 6.14 cfs @ 12.07 hrs, Volume= 18,653 cf
Outflow = 3.56 cfs @ 12.05 hrs, Volume= 18,650 cf, Atten= 42%, Lag= 0.0 min

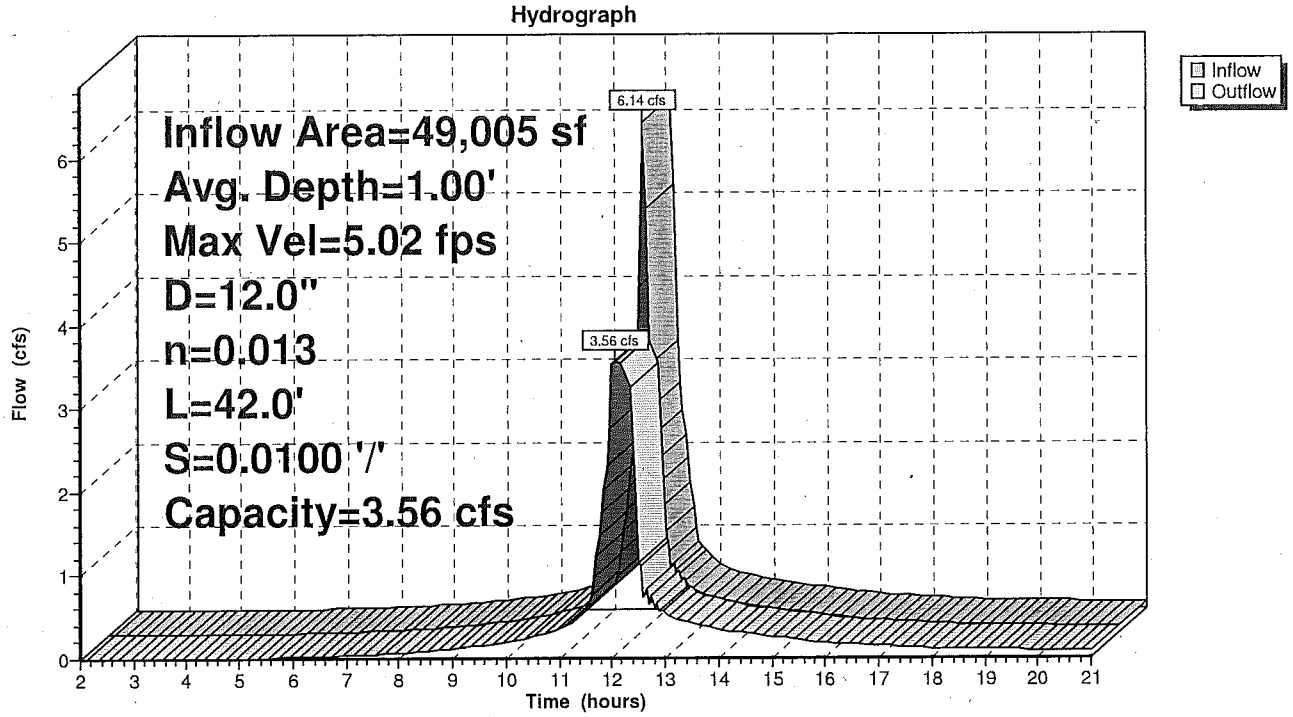
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.02 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.14 fps, Avg. Travel Time= 0.3 min

Peak Storage= 33 cf @ 12.00 hrs, Average Depth at Peak Storage= 1.00'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 3.56 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 42.0' Slope= 0.0100 '/'
Inlet Invert= 105.16', Outlet Invert= 104.74'



Reach 136R: CB11 to DMH 13



Reach 139R: I12 to DMH 13

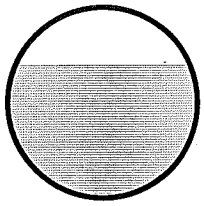
[52] Hint: Inlet conditions not evaluated
[88] Warning: Qout>Qin may require Finer Routing>1
[85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 42,689 sf, Inflow Depth > 1.95" for 100-Year event
Inflow = 4.11 cfs @ 12.11 hrs, Volume= 6,933 cf
Outflow = 4.17 cfs @ 12.11 hrs, Volume= 6,933 cf, Atten= 0%, Lag= 0.0 min

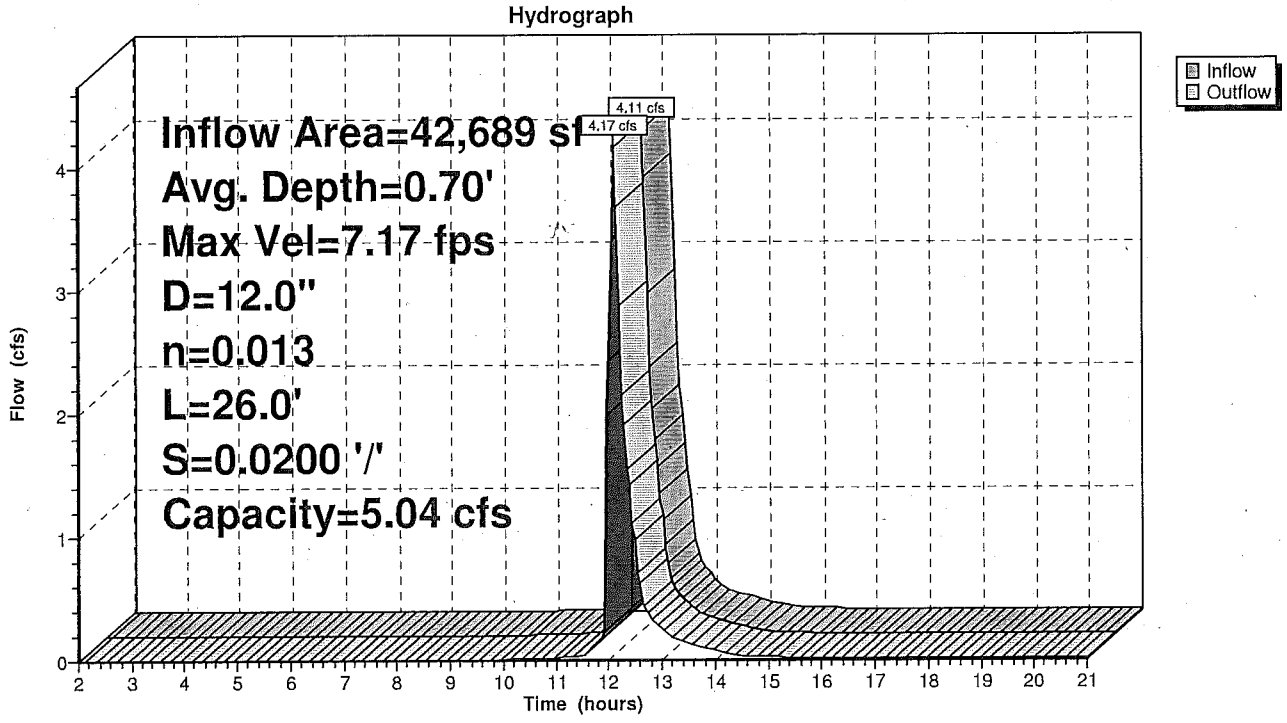
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.17 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.80 fps, Avg. Travel Time= 0.2 min

Peak Storage= 15 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.70'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.04 cfs

12.0" Diameter Pipe, n= 0.013 Concrete pipe, bends & connections
Length= 26.0' Slope= 0.0200 '/'
Inlet Invert= 105.26', Outlet Invert= 104.74'



Reach 139R: I12 to DMH 13



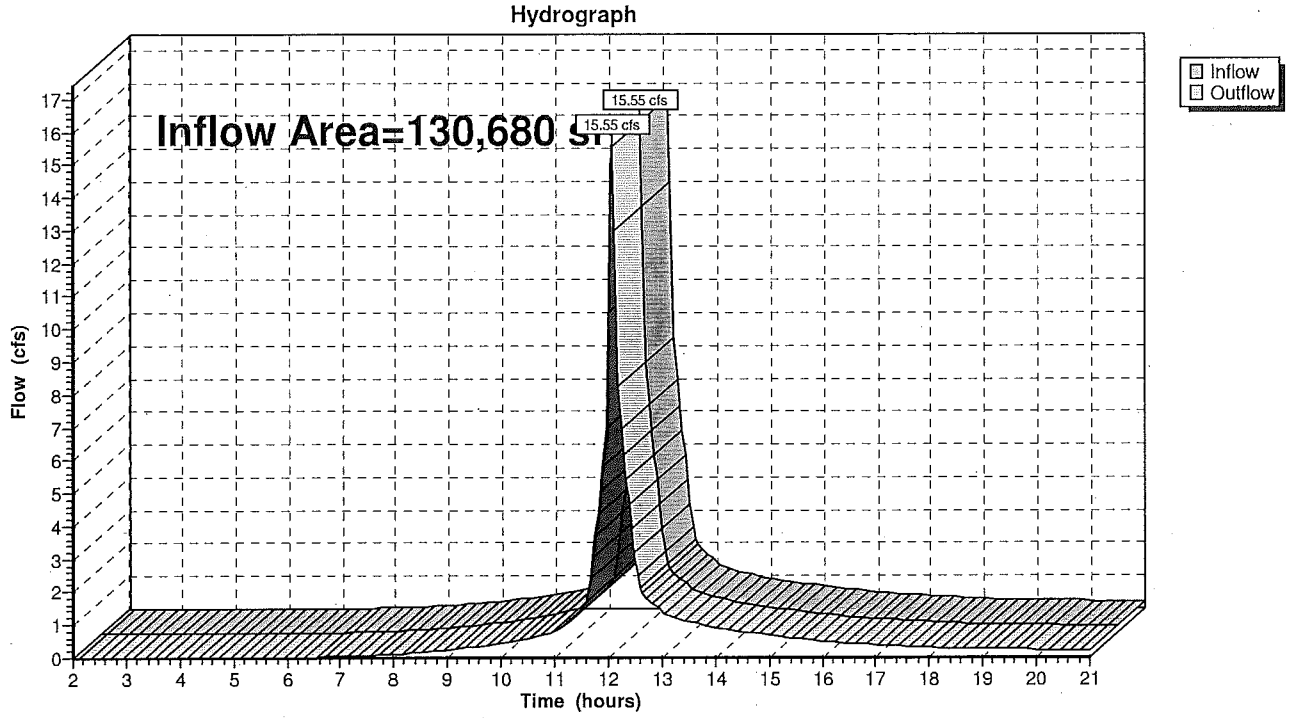
Reach 141R: CB 21 to DMH

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

Inflow Area = 130,680 sf, Inflow Depth > 4.26" for 100-Year event
Inflow = 15.55 cfs @ 12.07 hrs, Volume= 46,407 cf
Outflow = 15.55 cfs @ 12.07 hrs, Volume= 46,407 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs

Reach 141R: CB 21 to DMH



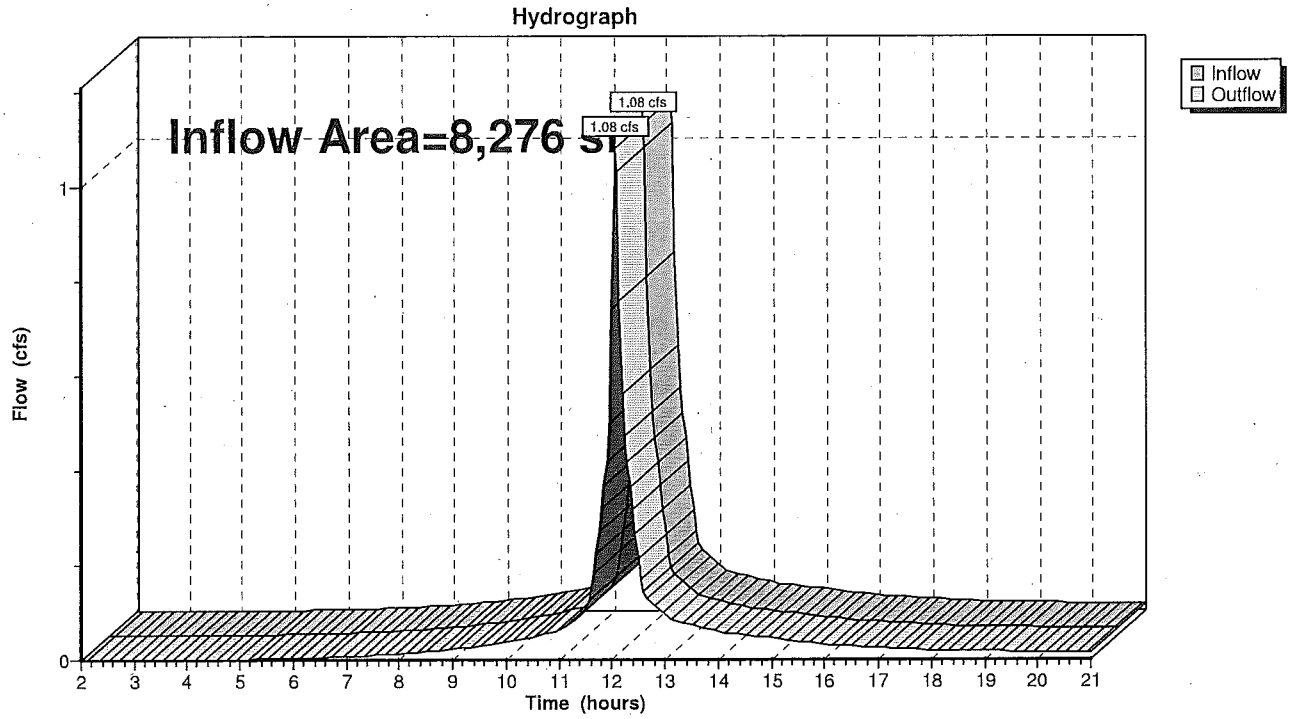
Reach 142R: CB 22 to DMH

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

Inflow Area = 8,276 sf, Inflow Depth > 4.80" for 100-Year event
Inflow = 1.08 cfs @ 12.07 hrs, Volume= 3,312 cf
Outflow = 1.08 cfs @ 12.07 hrs, Volume= 3,312 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs

Reach 142R: CB 22 to DMH



Reach 143R: DMH to Pretreatment

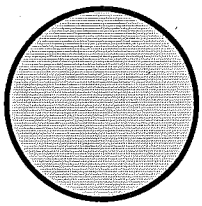
[52] Hint: Inlet conditions not evaluated
[55] Hint: Peak inflow is 330% of Manning's capacity
[76] Warning: Detained 8,464 cf (Pond w/culvert advised)

Inflow Area = 138,956 sf, Inflow Depth > 4.29" for 100-Year event
Inflow = 16.63 cfs @ 12.07 hrs, Volume= 49,720 cf
Outflow = 5.41 cfs @ 11.86 hrs, Volume= 49,716 cf, Atten= 67%, Lag= 0.0 min

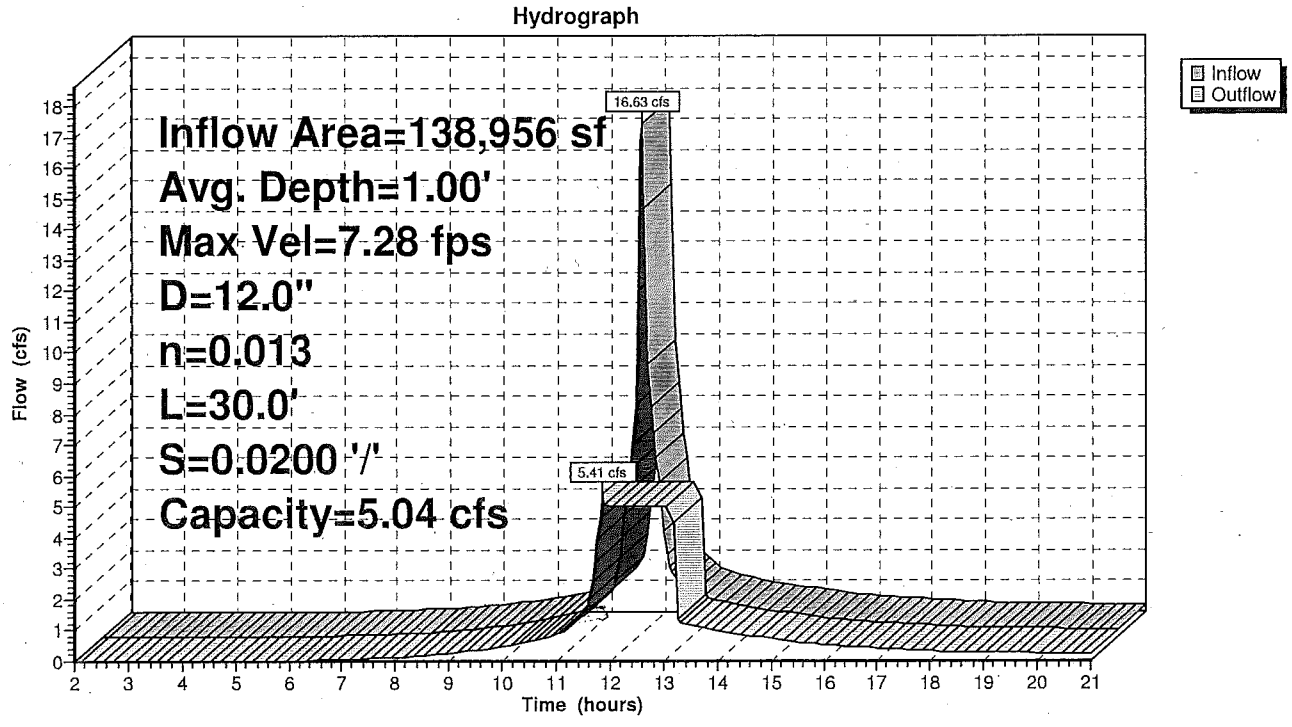
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.28 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.68 fps, Avg. Travel Time= 0.1 min

Peak Storage= 24 cf @ 11.90 hrs, Average Depth at Peak Storage= 1.00'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.04 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 30.0' Slope= 0.0200 '/'
Inlet Invert= 101.00', Outlet Invert= 100.40'



Reach 143R: DMH to Pretreatment



Reach 145R: Pretreatment to Recharge

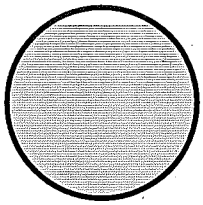
[52] Hint: Inlet conditions not evaluated
[55] Hint: Peak inflow is 107% of Manning's capacity

Inflow Area = 138,956 sf, Inflow Depth > 4.29" for 100-Year event
Inflow = 5.41 cfs @ 11.86 hrs, Volume= 49,716 cf
Outflow = 5.40 cfs @ 11.86 hrs, Volume= 49,715 cf, Atten= 0%, Lag= 0.1 min

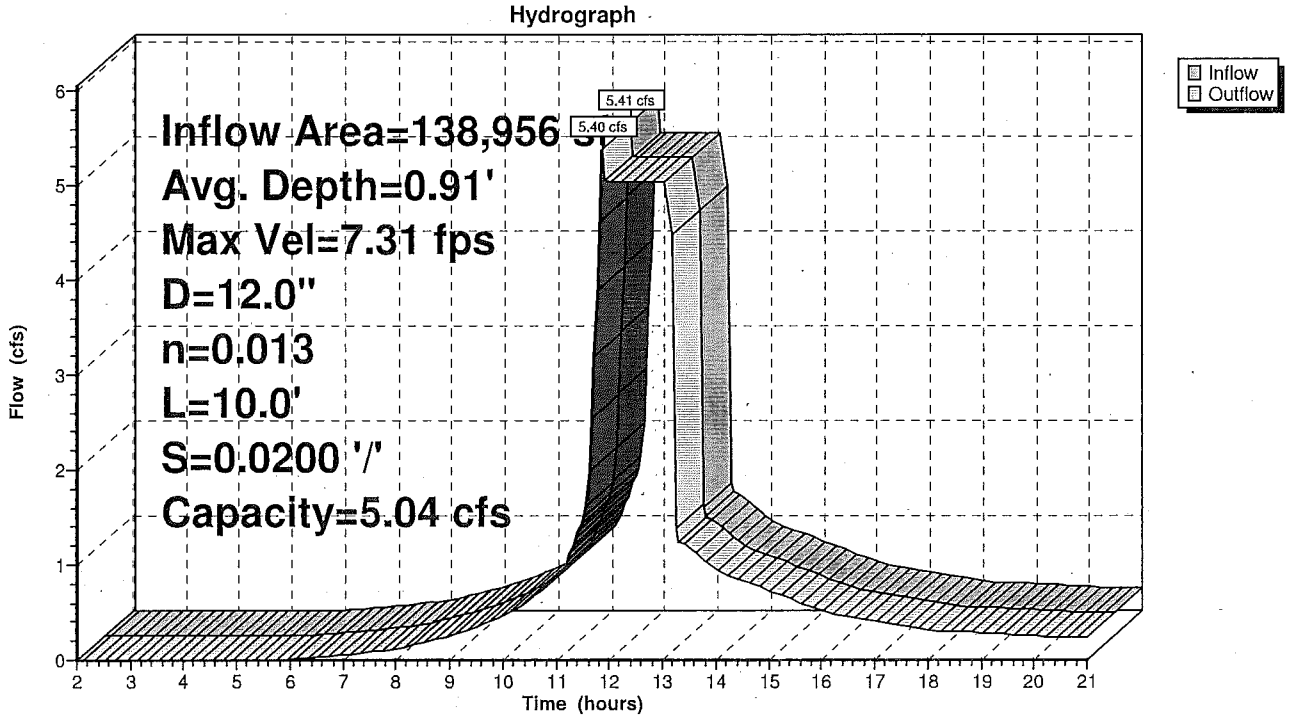
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.31 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 3.75 fps, Avg. Travel Time= 0.0 min

Peak Storage= 8 cf @ 11.86 hrs, Average Depth at Peak Storage= 0.91'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.04 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 10.0' Slope= 0.0200 '/'
Inlet Invert= 100.30', Outlet Invert= 100.10'



Reach 145R: Pretreatment to Recharge



Reach 146R: DMH to Swale

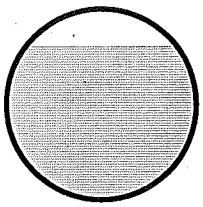
[52] Hint: Inlet conditions not evaluated
[55] Hint: Peak inflow is 105% of Manning's capacity
[61] Hint: Submerged 88% of Reach ##2R bottom

Inflow Area = 138,956 sf, Inflow Depth = 2.43" for 100-Year event
Inflow = 5.31 cfs @ 12.45 hrs, Volume= 28,177 cf
Outflow = 4.91 cfs @ 12.44 hrs, Volume= 28,177 cf, Atten= 8%, Lag= 0.0 min

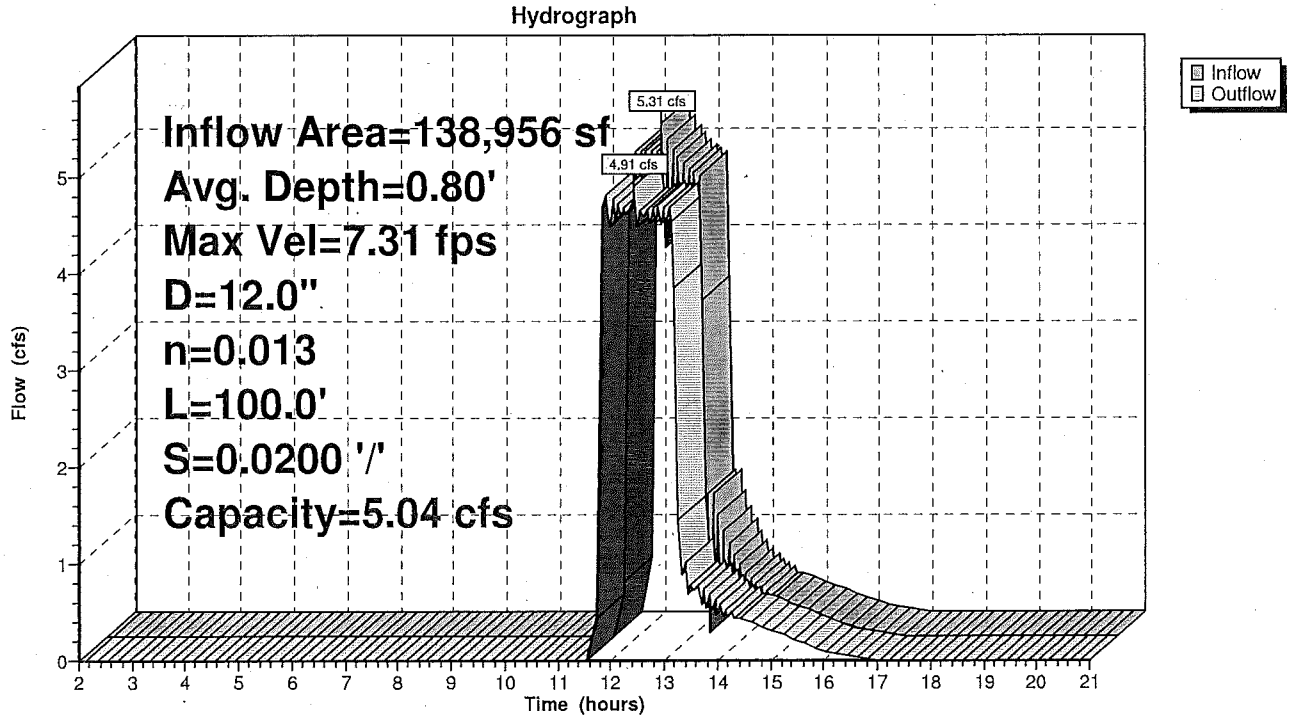
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.31 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 4.42 fps, Avg. Travel Time= 0.4 min

Peak Storage= 68 cf @ 12.44 hrs, Average Depth at Peak Storage= 0.80'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.04 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 100.0' Slope= 0.0200 '/'
Inlet Invert= 99.10', Outlet Invert= 97.10'



Reach 146R: DMH to Swale



Reach 147R: Swale to Stream

[61] Hint: Submerged 15% of Reach 146R bottom

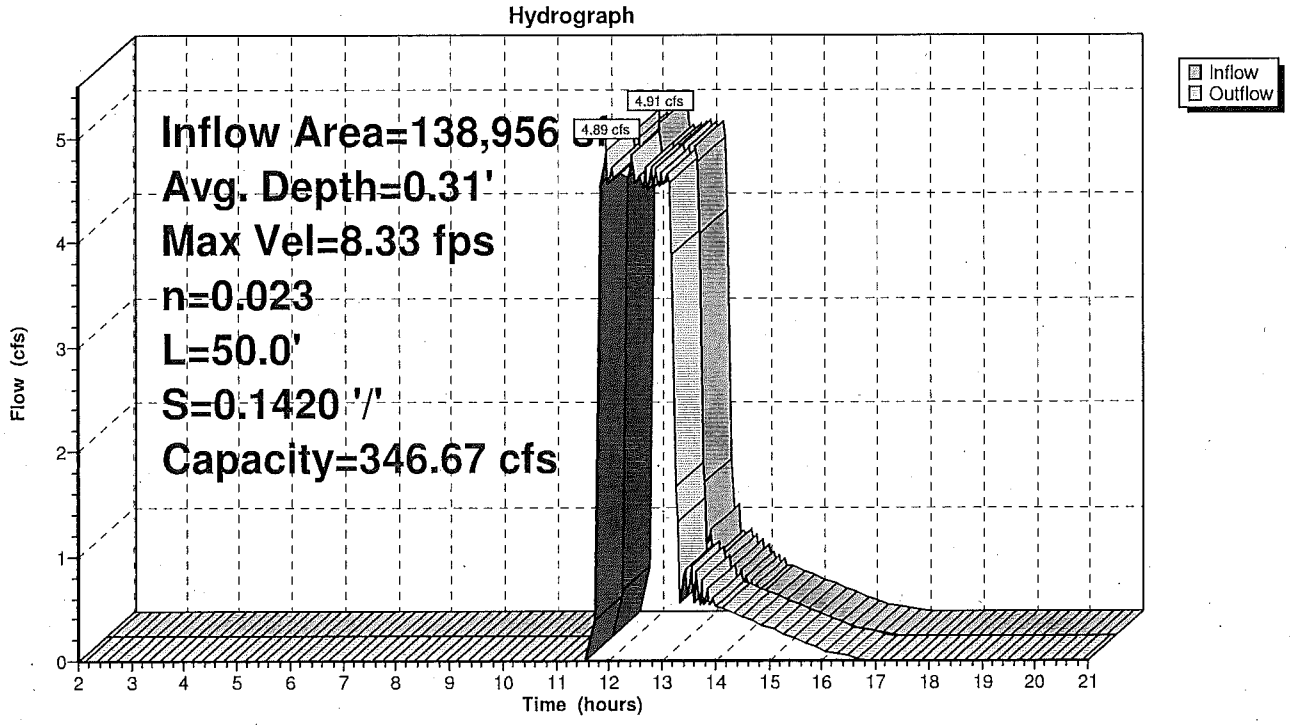
Inflow Area = 138,956 sf, Inflow Depth = 2.43" for 100-Year event
Inflow = 4.91 cfs @ 12.44 hrs, Volume= 28,177 cf
Outflow = 4.89 cfs @ 11.94 hrs, Volume= 28,177 cf, Atten= 1%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.33 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.75 fps, Avg. Travel Time= 0.2 min

Peak Storage= 29 cf @ 11.94 hrs, Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 346.67 cfs

1.00' x 2.00' deep channel, n= 0.023 Earth, clean & winding
Side Slope Z-value= 3.0 '/' Top Width= 13.00'
Length= 50.0' Slope= 0.1420 '/'
Inlet Invert= 97.10', Outlet Invert= 90.00'

Reach 147R: Swale to Stream



Reach 148R: Stream to R102

[61] Hint: Submerged 2% of Reach 147R bottom

Inflow Area = 138,956 sf, Inflow Depth = 2.43" for 100-Year event
Inflow = 4.89 cfs @ 11.94 hrs, Volume= 28,177 cf
Outflow = 4.79 cfs @ 12.45 hrs, Volume= 28,177 cf, Atten= 2%, Lag= 30.7 min

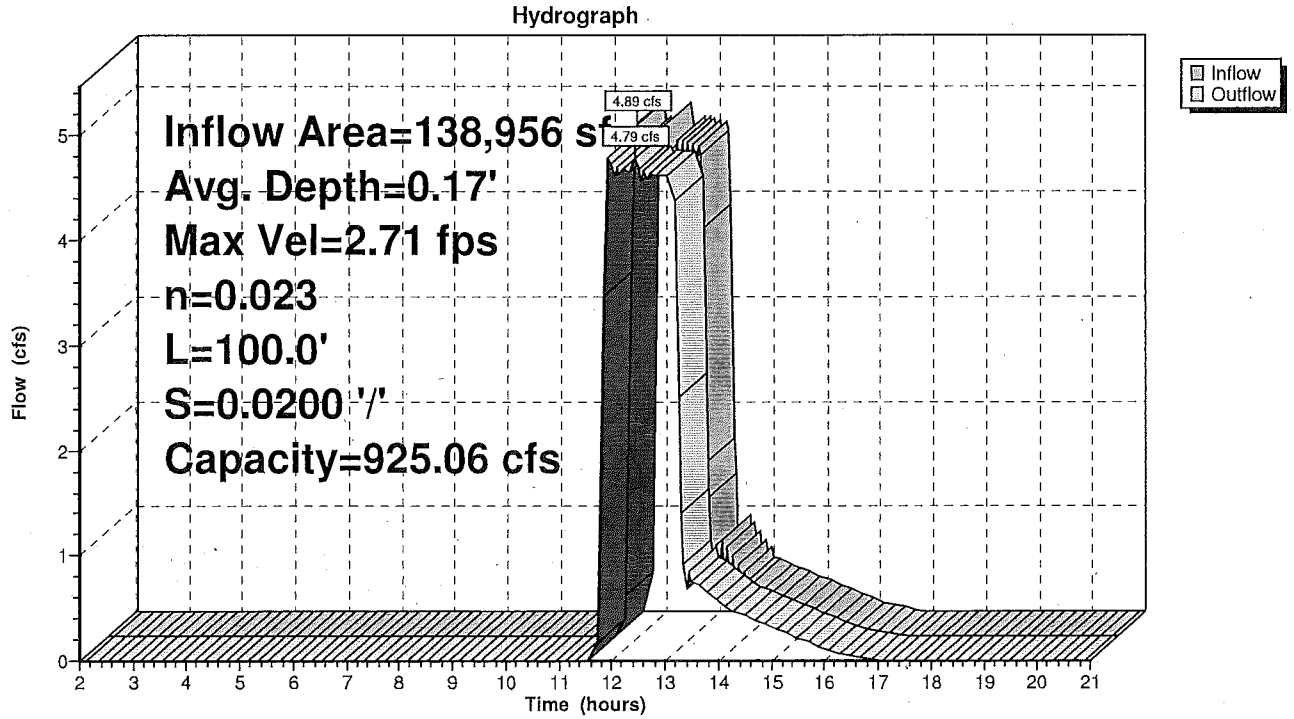
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.71 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.46 fps, Avg. Travel Time= 1.1 min

Peak Storage= 183 cf @ 11.90 hrs, Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 925.06 cfs

10.00' x 3.00' deep channel, n= 0.023 Earth, clean & winding
Side Slope Z-value= 4.0 '/' Top Width= 34.00'
Length= 100.0' Slope= 0.0200 '/'
Inlet Invert= 90.00', Outlet Invert= 88.00'

‡

Reach 148R: Stream to R102



Reach D14: DW 13 to DMH 14

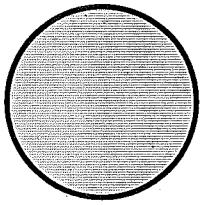
[52] Hint: Inlet conditions not evaluated
[55] Hint: Peak inflow is 109% of Manning's capacity
[76] Warning: Detained 130 cf (Pond w/culvert advised)
[62] Warning: Submerged 48% of Reach 136R inlet
[62] Warning: Submerged 38% of Reach 139R inlet

Inflow Area =	91,694 sf,	Inflow Depth >	3.35"	for	100-Year event
Inflow =	7.73 cfs @	12.11 hrs,	Volume=		25,583 cf
Outflow =	7.37 cfs @	12.18 hrs,	Volume=		25,580 cf, Atten= 5%, Lag= 4.4 min

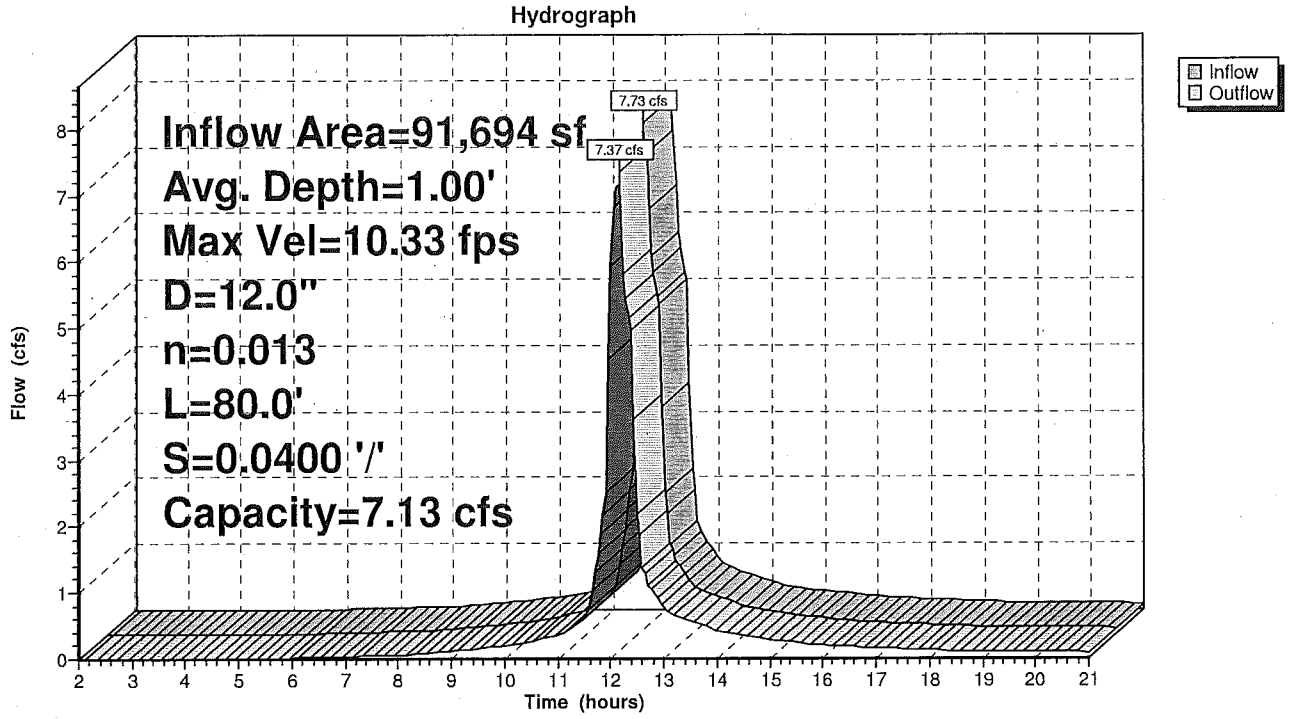
Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Max. Velocity= 10.33 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.66 fps, Avg. Travel Time= 0.4 min

Peak Storage= 64 cf @ 12.13 hrs, Average Depth at Peak Storage= 1.00'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.13 cfs

12.0" Diameter Pipe, n= 0.013 Concrete sewer w/manholes & inlets
Length= 80.0' Slope= 0.0400 '/'
Inlet Invert= 104.64', Outlet Invert= 101.44'



Reach D14: DW 13 to DMH 14



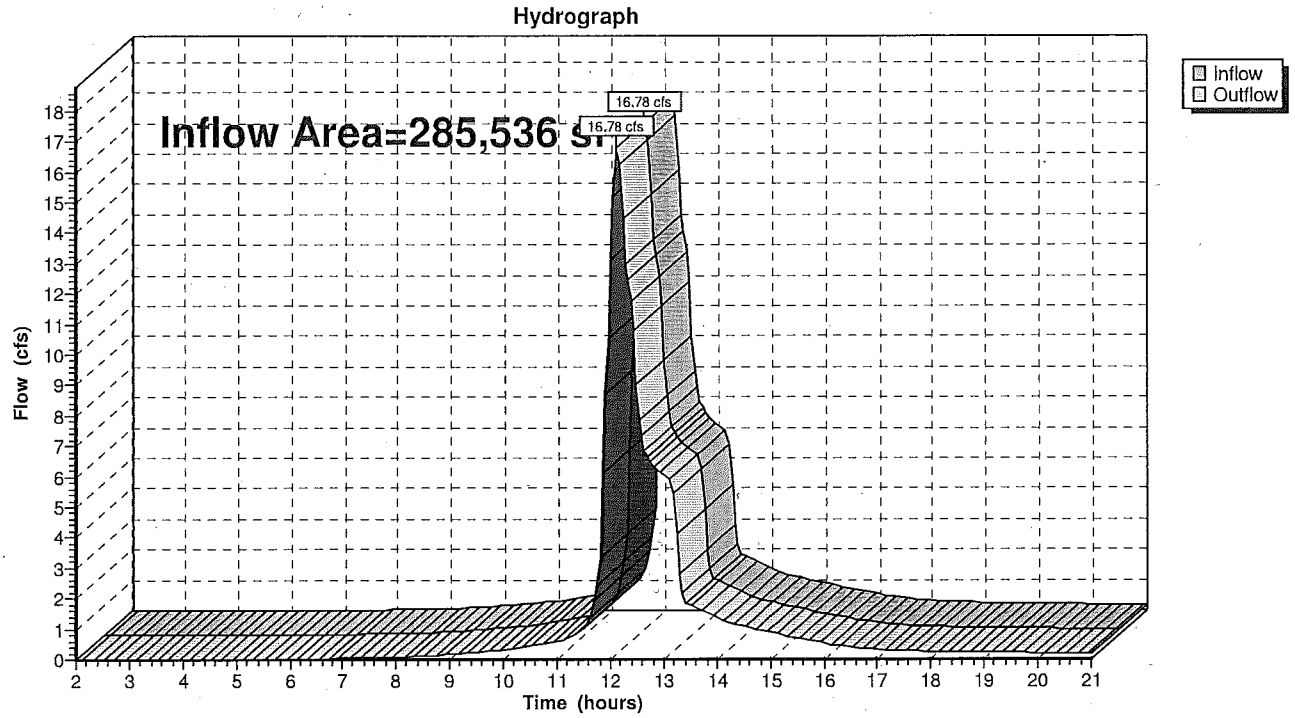
Reach PTA: Point of Analysis

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

Inflow Area = 285,536 sf, Inflow Depth > 2.98" for 100-Year event
Inflow = 16.78 cfs @ 12.12 hrs, Volume= 70,815 cf
Outflow = 16.78 cfs @ 12.12 hrs, Volume= 70,815 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs

Reach PTA: Point of Analysis



Pond 1P: Rain Garden / Bioretention Cell 2

[79] Warning: Submerged Pond 401P Primary device # 2 by 0.03'

Inflow Area =	37,462 sf,	Inflow Depth =	2.28"	for 100-Year event
Inflow =	3.99 cfs @	12.10 hrs, Volume=	7,105 cf	
Outflow =	3.94 cfs @	12.11 hrs, Volume=	7,105 cf,	Atten= 1%, Lag= 0.5 min
Discarded =	0.09 cfs @	12.11 hrs, Volume=	1,584 cf	
Primary =	3.85 cfs @	12.11 hrs, Volume=	5,521 cf	

Routing by Stor-Ind method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Peak Elev= 111.53' @ 12.11 hrs Surf.Area= 474 sf Storage= 610 cf

Plug-Flow detention time= 17.6 min calculated for 7,086 cf (100% of inflow)
Center-of-Mass det. time= 17.7 min (767.5 - 749.8)

Volume	Invert	Avail.Storage	Storage Description
#1	110.00'	843 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

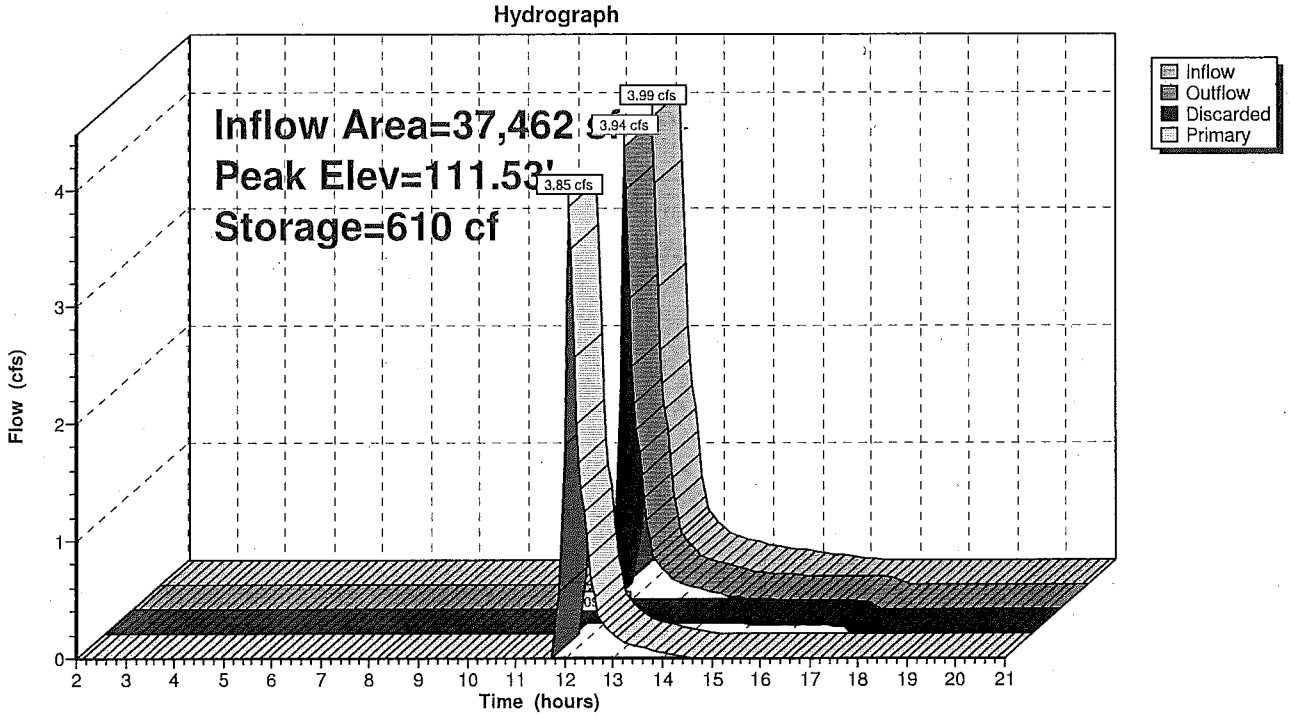
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
110.00	330	0	0
111.00	415	373	373
112.00	525	470	843

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	111.20'	**8.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.09 cfs @ 12.11 hrs HW=111.53' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=3.77 cfs @ 12.11 hrs HW=111.53' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 3.77 cfs @ 1.43 fps)

Pond 1P: Rain Garden / Bioretention Cell 2



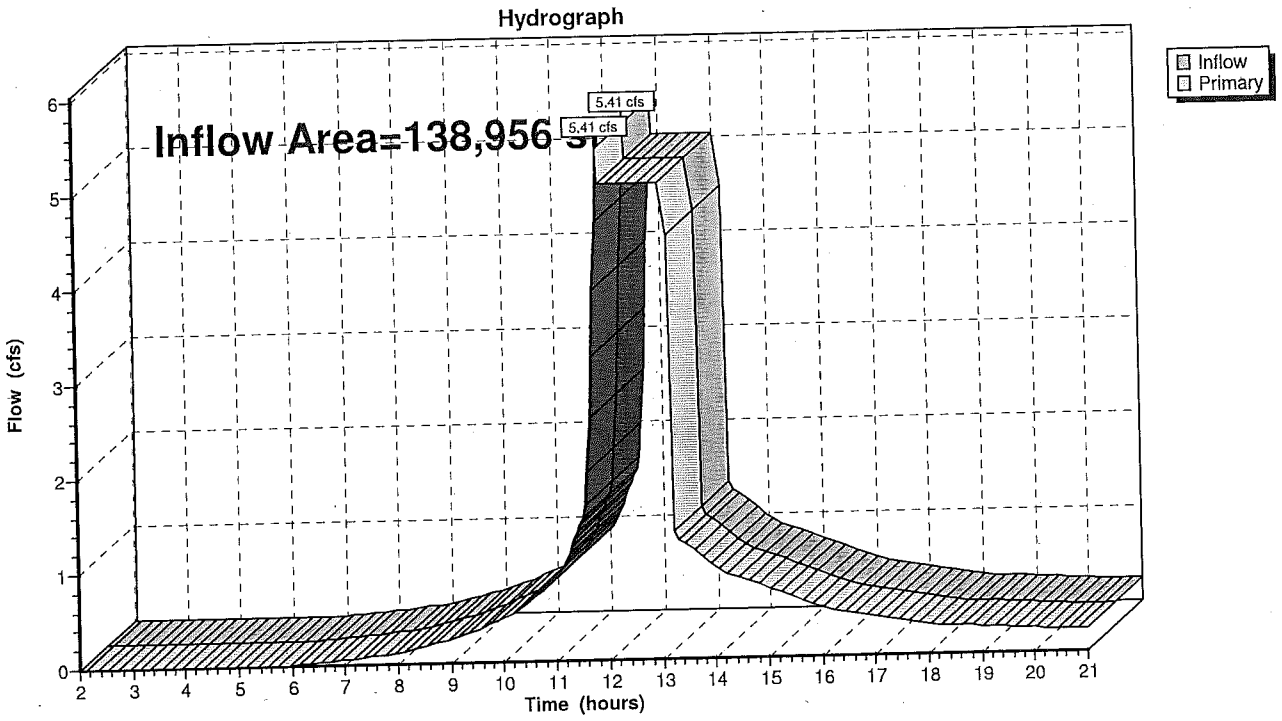
Pond 144P: Pretreatment

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

Inflow Area =	138,956 sf,	Inflow Depth >	4.29"	for 100-Year event
Inflow =	5.41 cfs @	11.86 hrs,	Volume=	49,716 cf
Primary =	5.41 cfs @	11.86 hrs,	Volume=	49,716 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs

Pond 144P: Pretreatment



Pond 401P: Rain Garden/Bioretention Cell 1

[61] Hint: Submerged 68% of Reach 125R bottom

Inflow Area =	37,462 sf,	Inflow Depth >	4.08"	for 100-Year event
Inflow =	4.16 cfs @	12.08 hrs, Volume=	12,732 cf	
Outflow =	4.14 cfs @	12.10 hrs, Volume=	12,476 cf,	Atten= 1%, Lag= 1.0 min
Discarded =	0.14 cfs @	12.10 hrs, Volume=	5,372 cf	
Primary =	3.99 cfs @	12.10 hrs, Volume=	7,105 cf	

Routing by Stor-Ind method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Peak Elev= 111.96' @ 12.10 hrs Surf.Area= 749 sf Storage= 1,196 cf

Plug-Flow detention time= 35.6 min calculated for 12,444 cf (98% of inflow)
Center-of-Mass det. time= 26.6 min (811.1 - 784.5)

Volume	Invert	Avail.Storage	Storage Description
#1	110.00'	1,229 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

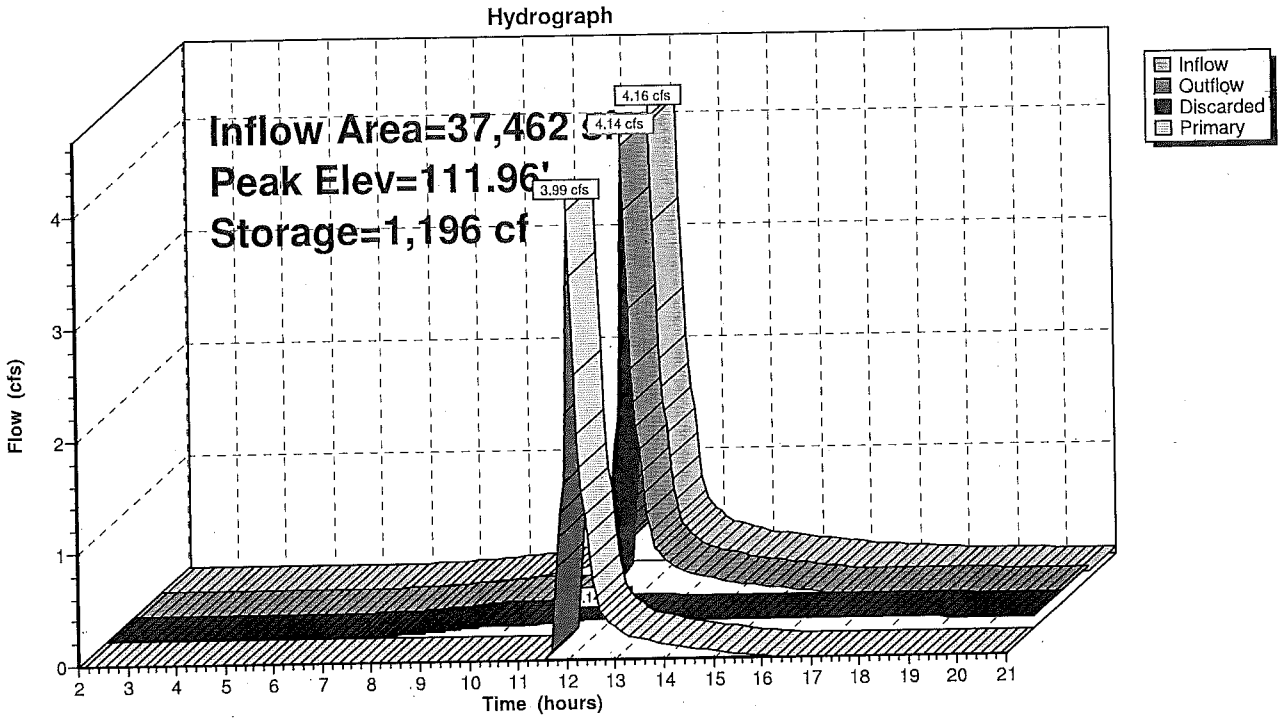
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
110.00	486	0	0
111.00	608	547	547
112.00	755	682	1,229

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	111.50'	**5.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.14 cfs @ 12.10 hrs HW=111.96' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=3.97 cfs @ 12.10 hrs HW=111.96' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 3.97 cfs @ 1.74 fps)

Pond 401P: Rain Garden/Bioretention Cell 1



Pond 402P: Recharge System

[93] Warning: Storage range exceeded by 1.78'
[88] Warning: Qout>Qin may require Finer Routing>1
[85] Warning: Oscillations may require Finer Routing>1
[63] Warning: Exceeded Reach 145R inflow depth by 3.08' @ 13.15 hrs

Inflow Area =	138,956 sf,	Inflow Depth >	4.29"	for	100-Year event
Inflow =	5.40 cfs @	11.86 hrs,	Volume=	49,715 cf	
Outflow =	7.09 cfs @	11.85 hrs,	Volume=	47,157 cf,	Atten= 0%, Lag= 0.0 min
Discarded =	0.42 cfs @	9.90 hrs,	Volume=	19,033 cf	
Primary =	6.67 cfs @	11.85 hrs,	Volume=	28,124 cf	

Routing by Stor-Ind method, Time Span= 2.00-21.00 hrs, dt= 0.05 hrs
Peak Elev= 104.28' @ 11.85 hrs Surf.Area= 2,200 sf Storage= 4,421 cf

Plug-Flow detention time= 45.8 min calculated for 47,033 cf (95% of inflow)
Center-of-Mass det. time= 25.0 min (813.2 - 788.2)

Volume	Invert	Avail.Storage	Storage Description
#1	99.00'	2,186 cf	**44.00'W x 50.00'L x 3.50'H Prismatoid**
			7,700 cf Overall - 2,235 cf Embedded = 5,465 cf x 40.0% Voids
#2	100.00'	2,235 cf	**47.8"W x 30.0"H x 6.25'L Cultec R-330** x 48 Inside #1
		4,421 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	103.00'	**12.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Primary	105.00'	**2.00' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Discarded OutFlow Max=0.42 cfs @ 9.90 hrs HW=99.06' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.42 cfs)

Primary OutFlow Max=6.59 cfs @ 11.85 hrs HW=104.26' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 6.59 cfs @ 4.20 fps)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 402P: Recharge System